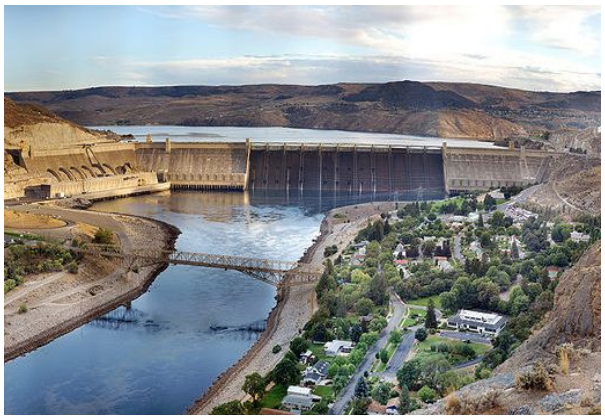
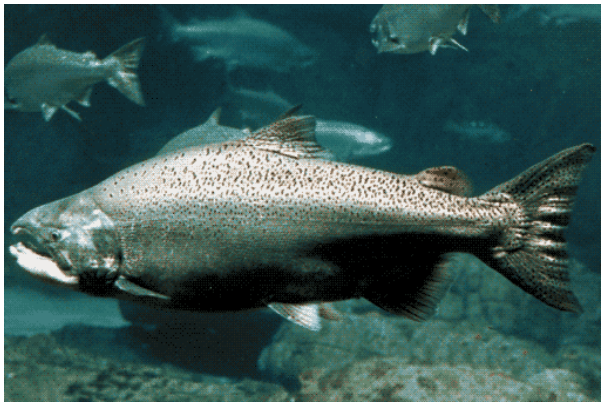
# BONNEVILLE POWER ADMINISTRATION
# 2012 CAPITAL INVESTMENT REVIEW
## INITIAL PUBLICATION





**March 8, 2012**

# TABLE OF CONTENTS

# 1 INTRODUCTION

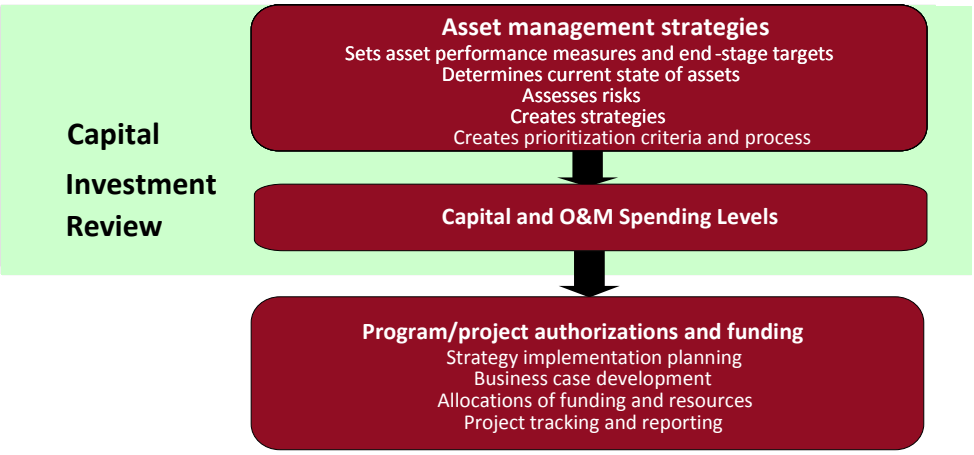
The Capital Investment Review (CIR) provides an opportunity for Bonneville Power Administration (BPA) to share with stakeholders the strategic drivers of BPA's long-term capital program based on its asset strategies. Asset strategies provide a 10-year guideline for asset management and the associated capital spending forecasts. Capital spending influences power and transmission rates because capital-related costs represent the largest revenue requirement category.

For this CIR, the agency has draft asset strategies for Transmission, Facilities, Security, Information Technology, Fish and Wildlife, Energy Efficiency and Federal Hydropower available for review and comment. In addition, an agency overview and summaries of draft asset strategies are included in this initial publication. BPA welcomes your comments and thoughtful discussion during this process, which is designed, in part, to prepare for the upcoming Integrated Program Review (IPR).

The CIR will take place between March and May 2012, prior to the start of the formal IPR in June 2012. The IPR will conclude in September with a Final Close-Out Letter on spending decisions for FY 2013-2015.

# 2 ASSET STRATEGY AND CAPITAL BUDGET DEVELOPMENT PROCESS

BPA's asset management process and capital budgeting process are interrelated. The asset strategies provide a great deal of information about the health of the assets and long-term capital investment needs and priorities providing the foundation for capital budgets.




BPA's asset strategies set long-term direction for managing power and transmission system assets to maximize their economic value. They include objectives and targets for asset performance, assessments of asset health, assessments of other risks, evaluations of alternative courses of action and recommendations for investments and maintenance. The strategies also provide criteria for prioritizing capital projects.

After asset strategies are developed, business units propose spending levels based on their asset strategies. Business unit managers review the spending level requests to ascertain what can be achieved given financial, workforce and outage constraints. The business unit managers then submit consolidated spending level requests for their units. BPA senior management reviews each of the spending level forecasts and either approves the forecast or requires that it be modified prior to being proposed in the CIR process. These proposals are shared with

customers and other stakeholders for comment as part of the CIR process. The administrator considers the comments when he makes a determination on capital program levels to be proposed in the upcoming IPR process.

Most near-term projects are high priority and time sensitive. The near-term forecast (for example, FY 2012-2013) are generally constrained by the capital spending levels determined in the previous Final IPR Close-Out Report. Given that capital needs are constantly changing, individual projects may be canceled or added during development of start-of-year budgets. Nevertheless, the total capital spending amount normally does not change in the start-of-year budgets for the two-year rate period.

Approval of strategies is not approval of budgets, and approval of budgets is not approval of projects. Each of the three phases – strategies, budgets and projects – requires review and approval at the executive level. The level of project approval varies based on the size of the project. Projects with an estimated direct capital cost of $3 million or more are subject to both business unit and agency-level review and approval. The approval process is overseen by the agency's executive level Capital Allocation Board.

Business cases for projects must demonstrate a business need for investment, assess the project's financial and nonfinancial implications and risks, evaluate alternatives, propose project implementation targets and otherwise justify the capital project. Details on the project prioritization and approval process can be found in Section 4.5.

## 2.1 2012 Agency Guidance and Capital Funding Constraints

The guidance given for developing the capital forecasts for the FY 2013-2021 period included a maximum annual capital forecast for each asset category or program. Those constraints are to be used now in the CIR and going into the 2012 IPR. These capital levels were shared in BPA's Strategic Capital Discussions in the fall of 2011. In January, each asset category provided a proposed capital spending scenario that is based on the priorities identified in its asset strategy and consistent with its cap. Each asset category was also allowed to provide an alternative scenario unconstrained by these caps along with a justification. Both sets of capital scenarios are under analysis for potential rate impacts and review by executives.

## 2.2 Next Steps

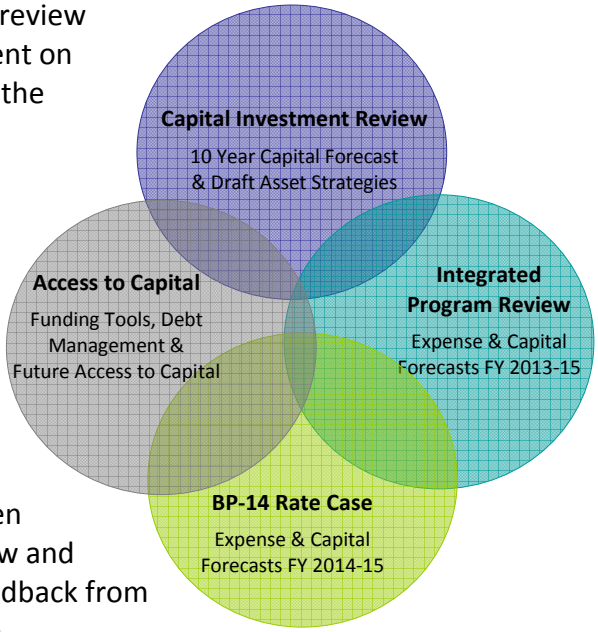
BPA will be developing its expense forecasts in preparation for the IPR. Following the CIR, BPA will consider both the comments received in this process and the proposed program levels for FY 2013-2015 and will then determine the capital and expense levels to be proposed in the IPR for the upcoming rate period.

# 3 Finance Public Process

BPA currently offers two major public processes: the CIR, which leads into the IPR. In addition, BPA has initiated discussions with the public on Access to Capital. These processes address interrelated agency financial issues such as capital planning and long-term asset strategies, future access to capital, debt management, alternative funding tools and near-term spending

estimates. Topics addressed in these public processes help inform the upcoming rate case as reflected in Figure 1.

**Figure 1 - Finance Public Processes**




Each process offers interested parties an opportunity to review proposals, ask questions and provide meaningful comment on financial issues prior to decision making and inclusion of the decisions in the upcoming rate case.

## 3.1 CIR Process

The CIR process provides interested parties a chance to review, discuss and comment on BPA's draft asset strategies and 10-year capital forecast. As a direct result, draft asset strategies and long-term capital forecasts will not be addressed in the IPR.

BPA will consider comments received during the CIR when finalizing the current draft asset strategies for final review and approval by the Capital Allocation Board. In addition, feedback from the CIR will help inform proposed capital spending in the 2012 IPR for FY 2013-2015 and associated debt service expenses in the upcoming rate case.

### *What's New*

The CIR public process has incorporated the following process changes to enhance the effectiveness of the information presented while minimizing required resources such as time and travel.

- Information will be provided in one comprehensive initial publication, which allows enhanced accessibility to all information in a centralized location and consistent format.
- Summaries of detailed asset strategies will be provided for easier review.
- Participants will have two weeks to review the initial publication following its external release, which makes it possible for parties to review material outside of scheduled workshops.
- During the two-week review, participants may request additional information or meetings targeting specific asset strategies, which will allow participants to limit their engagement and resources to areas of specific interest.
- Technical discussions are planned for mid-April. The discussions will be based on participants' specific questions and requests. This option encourages collaborative discussions on participants' specific areas of interest.
- An eight-week public comment period will provide interested participants an opportunity to comment on the draft asset strategies and proposed capital investment levels.
- Comments received will help inform proposed capital spending in the 2012 IPR. No formal close-out report for the CIR will be issued.

### *Requesting additional information and/or meetings*

In addition to the information provided in this report, detailed draft asset strategies are available for review online. Each asset category has also prepared and made available online a prioritized list of major projects driven by prioritization criteria described in Section 4.5 of this report.

Participants may request additional information or meetings targeting specific asset strategies between March 8 and March 23, 2012. Requests can be submitted online, by email, or by mail to BPA, P.O. Box 14428, Portland, OR 97293-4428. All requests for additional information or meetings will be viewable online. If you wish for your name and/or request to remain confidential, please make note of that in your submission.

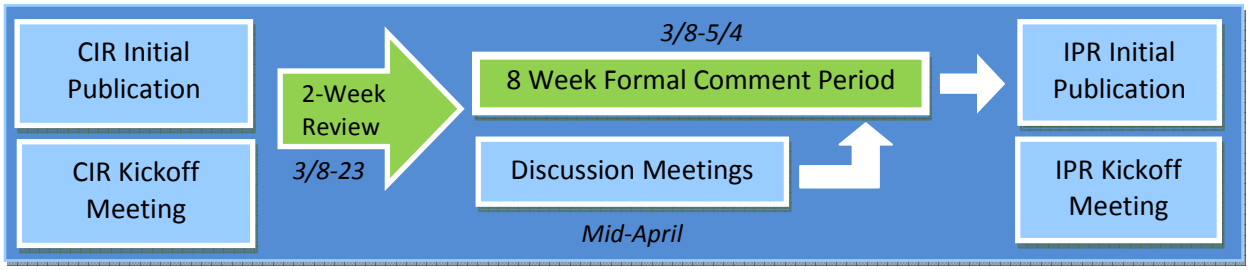
To help BPA gauge the level of interest in meetings on specific asset strategies, please submit your request for a meeting regardless of requests already submitted by others. BPA currently anticipates holding meetings the week of April 16, 2012. The region will be notified of specific times and meeting topics in late March or early April; details will be made available on BPA's Public Calendar.

Material posted in response to request for additional information will be accessible on BPA's Capital Investment Review website. Requestors will be notified via email when material is made available.

### *Commenting on Draft Asset Strategies and Proposed Capital Levels*

Participants have an opportunity to submit comments on BPA's draft asset strategies and proposed capital levels during an eight-week public comment period beginning March 8, 2012 and concluding May 4, 2012. Comments can be submitted online, by email, or by mail to BPA, P.O. Box 14428, Portland, OR 97293-4428.

**Figure 2 – Capital Investment Review Public Process Map**




## 3.2 INTEGRATED PROGRAM REVIEW PROCESS

The IPR will offer interested parties an opportunity to review, discuss and comment on forecast expense and capital spending levels for the upcoming three years. BPA anticipates the 2012 IPR process will begin June 2012 and last approximately eight weeks. Draft asset strategies and long-term capital investment levels will not be discussed in the 2012 IPR because they will have been covered in the CIR. Additional information pertaining to the upcoming IPR can be accessed online.

## 3.3 ACCESS TO CAPITAL

Access to Capital has two primary objectives: to ensure that capital-financing needs are covered over a rolling 10-year period through development of strategies and tools that will extend BPA's Treasury borrowing authority while reserving the $750 million liquidity facility and to ensure BPA is able to meet its capital requirements at the least overall cost. Achieving these objectives is an ongoing effort.

# BPA's Asset Management Strategies Agency Overview

Aging Infrastructure

System Capacity and Flexibility Needs

Technological Opportunities and Risks

Increasing Compliance Requirements

# 4 AGENCY OVERVIEW

## 4.1 INTRODUCTION

BPA's mission is to provide the Pacific Northwest with reliable, adequate power and transmission services at low rates and to mitigate the impacts of the federal hydro system on fish and wildlife. The four pillars of the agency's vision are: system reliability, low rates, environmental stewardship and accountability to region.

Assets such as hydroelectric plants, transmission lines and substations, information systems and investment in fish and wildlife mitigation enable BPA and its Federal Columbia River Power System (FCRPS) partners to deliver this mission and vision.

- BPA provides about 75 percent of the Pacific Northwest's high voltage transmission. The transmission system includes more than 15,000 miles of high voltage power lines, a dependable network of transmission highways that deliver electricity across the Pacific Northwest and into California, Canada and Montana. BPA manages the real-time operation of this system and provides the maintenance, replacement, upgrade and expansion of infrastructure needed to meet a range of customer needs for service and interconnection.
- Approximately 80 percent of BPA's firm power supply comes from 31 federal hydroelectric projects at costs among the most affordable in the nation. BPA's power is emission free.
- Energy efficiency accounts for BPA's largest resource acquisition over the last 29 years. BPA has acquired more than 1,200 average megawatts of energy efficiency savings – more than twice the energy that Bonneville Dam produces in a year.
- BPA funds and co-manages the largest fish and wildlife program in the nation. BPA invests over $400 million of ratepayer funds every year to protect fish and wildlife affected by the development and operation of the hydro system. The investments are driven by biological performance. The investments include: dam modifications, flow and spill operations that make fish passage safer, land and water acquisition and restoration activities that improve fish and wildlife habitat, funding that supports fish hatcheries as well as fish research and monitoring.

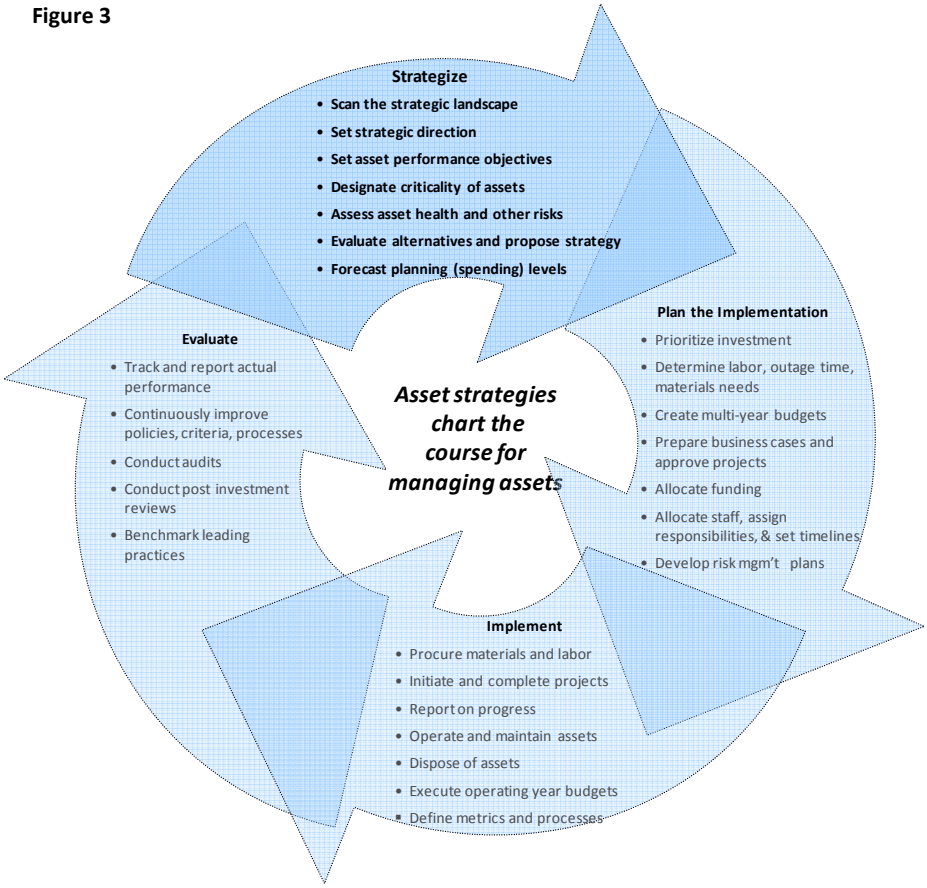
**Asset management strategies** set the direction for maintaining, replacing and adding capabilities to the power and transmission systems. The strategies chart the course for managing equipment and facility health, performance and costs. The goal of the strategies is to maximize the long-term operational and economic value of the assets. The goal is reached if the following two standards are met:

- Assets operate efficiently and effectively and provide the capacity, as well as capabilities needed to meet health and safety, reliability, availability, adequacy, environmental, security and other standards.
- Total economic costs are minimized over the long-term. Total economic costs include not only BPA's costs to maintain, replace and expand assets but also the costs that customers and others may bear should the assets fail to perform (customer outages).

Asset strategies generally cover a 10-year planning horizon, and they consist of asset performance objectives and targets, assessments of asset health and other risks, evaluations of

alternative courses of action and recommendations for a program of investment and maintenance. The strategies are developed as part of an asset management cycle depicted in Figure 3.

**Figure 3**



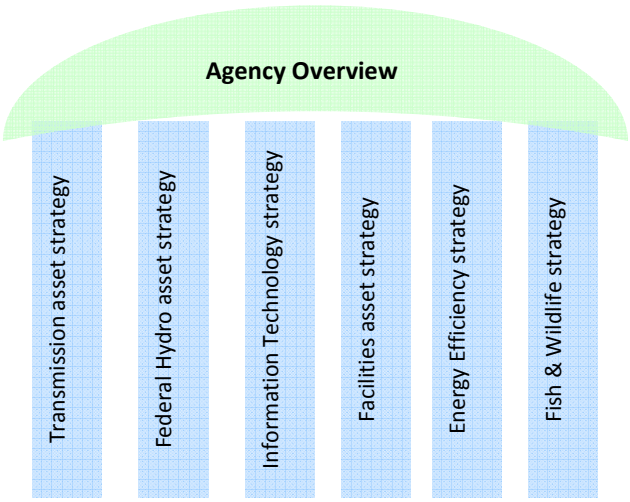

In 2006, BPA's Asset Management Enterprise Process Improvement project established seven asset categories. In 2010, BPA developed asset strategies for four of the seven categories. In 2012, BPA has developed strategies for six of the seven: Federal Hydro, Transmission, Facilities, Information Technology, Energy Efficiency, and Fish and Wildlife. In addition, a supplemental strategy has been developed for Security infrastructure. An asset strategy for the remaining asset category, Columbia Generating Station, has not been developed for this year's CIR process; however, Energy Northwest has developed a long-range capital investment plan that will be presented during the 2012 IPR.

Asset strategies now include prioritization criteria for capital projects and proposed lists of major capital projects. The prioritization criteria and prioritized lists of major projects are driven by the objectives, risk assessments and strategic choices in the asset strategies.

BPA's business units develop their asset management strategies under the guidance of agency policies. Once drafted, the strategies undergo internal review and then stakeholder review during the CIR process.

The purpose of this Agency Overview is to integrate and give context to the strategies that have been developed for each asset

**Figure 4**



category. It covers the following:

- Assets covered
- Strategic challenges
- Strategic priorities
- Project prioritization
- Process for approving and monitoring capital projects
- Metrics for monitoring asset management performance

A summary of each asset strategy follows this Agency Overview. Full versions of the draft asset strategies are available online.

Proposed long-term capital investment levels in this publication are based on the asset strategies. Subsequent to completing the draft asset strategies, proposed spending levels were reshaped through the budget development process and reflected in the March 8 kickoff meeting material. Capital investment levels within strategies will be updated consistent with the IPR Final Close-Out Report and prior to finalizing Asset Strategies.

## 4.2 Assets Covered

**Federal Hydro assets** comprise 31 hydroelectric plants with over 200 generating units. Installed generating capacity is 22,060 megawatts; in an average water year, 76 million megawatt-hours of electricity is generated. 21 of the plants are owned and operated by the Corps of Engineers and 10 by the Bureau of Reclamation.

**Transmission assets** include 15,200 circuit miles of high voltage transmission lines, 251 substations, 368 communications sites and 266,600 acres of transmission line corridor rights-of-way. Transmission assets also include hardware and software applications for grid operations. BPA owns or leases the Transmission assets.

**Facilities assets** include substation control houses, administrative offices, maintenance shops, warehouses and other nonelectric plant. BPA owns 1,013 buildings at 434 sites in five states. BPA leases another 12 buildings.

**IT assets** include desktops, laptops and other office automation hardware and software; servers, operating systems and other data center hardware and software; data, voice and video networks systems; and applications for a range of business purposes. These assets are owned by or licensed to BPA.

**Energy Efficiency** assets include measures and projects in all end use categories – residential, commercial, industrial and agricultural. Examples include building envelope measures to reduce heat loss/gain and infiltration; lighting measures that reduce energy consumption; and heating, ventilating and air conditioning systems and water heating equipment that are more energy efficient. These assets are owned and operated by end use electric customers served by BPA preference customers.

**Fish and Wildlife** assets include more than 450 fish and wildlife projects in the Columbia Basin. The projects include habitat restoration, research, fish hatcheries, conservation land acquisitions, predator control and culvert replacement. The assets also include fish and wildlife improvements at federal dams and fish hatcheries. The assets are owned and operated by federal and state agencies, conservation organizations, tribes and private property owners.

Not covered at this time, the **Columbia Generating Station**, a nuclear generation plant owned and operated by Energy Northwest.

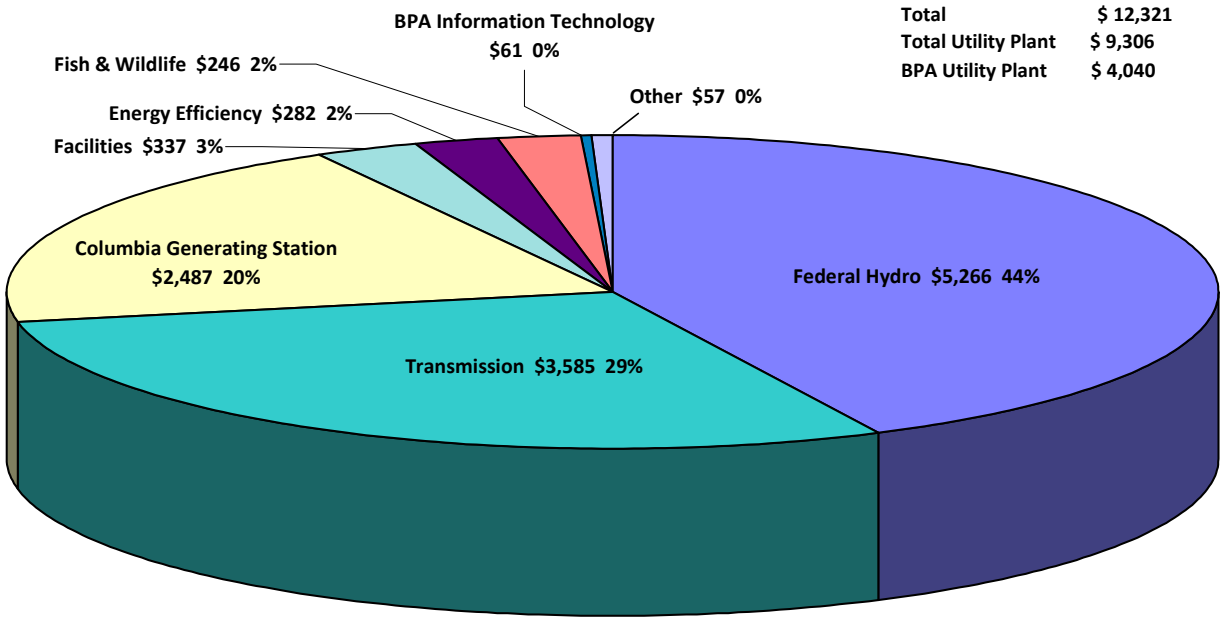
As of September 30, 2011, the Federal Columbia River Power System cumulative historical investment net of depreciation was $12.3 billion as shown in Figure 5.

These investment totals include:

- Utility plant (Federal Hydro, Transmission, Facilities, IT and "other"),
- Columbia Generating Station (treated by BPA as a capitalized contract) and
- Fish and Wildlife and Energy Efficiency assets (treated as regulatory assets).

**Figure 5**

**FEDERAL COLUMBIA RIVER POWER SYSTEM & THE COLUMBIA GENERATING STATION**
**Historical Investment Costs for Assets In-Service**
**After Depreciation**
**as of September 30, 2011 ($Millions)**




## 4.3 STRATEGIC CHALLENGES

### *An aging infrastructure*

The majority of the transmission system and its high voltage power lines and substations are more than 40 years old. Much of the critical infrastructure needs to be replaced or upgraded so that systems continue to provide reliable service and needed capacity and capabilities.

The average age of the federal hydroelectric plants is about 50 years, with some that exceed 60 years. In some cases, federal hydro assets are reaching and exceeding the end of their expected service lives. Maintaining the availability and increasing the efficiency of the plants is critical to ensuring that the region has an adequate, reliable and low-cost power system.

After years of underinvestment, the aging, deteriorating state of facility assets has become a serious issue. Most facilities were built before 1960, and, as a result, do not comply with current life safety, fire protection and seismic codes. This presents risks to personnel and

operations as well as to the preservation of these assets. Many of the facilities contain building materials that are deemed to be hazardous, such as asbestos, polychlorinated biphenyls, lead and mercury. Many buildings and systems have exceeded their design life many times over. In other cases, maintenance has been deferred, and assets are subject to break-fix maintenance only.

Figure 6 illustrates the aging asset issue for two groups of transmission assets. The first chart shows the age demographics for alternating current power transformers, and the second shows the same data for wood poles. These charts indicate that 40 percent of AC power transformers are over 50 years old although they have an expected life of 45 years, and almost 30 percent of wood poles are over 50 years of age with an expected life of 60 years. Eight percent of the wood poles are beyond their service life, with 20 percent to 35 percent reaching their expected service life within 10 years.

**Figure 6**

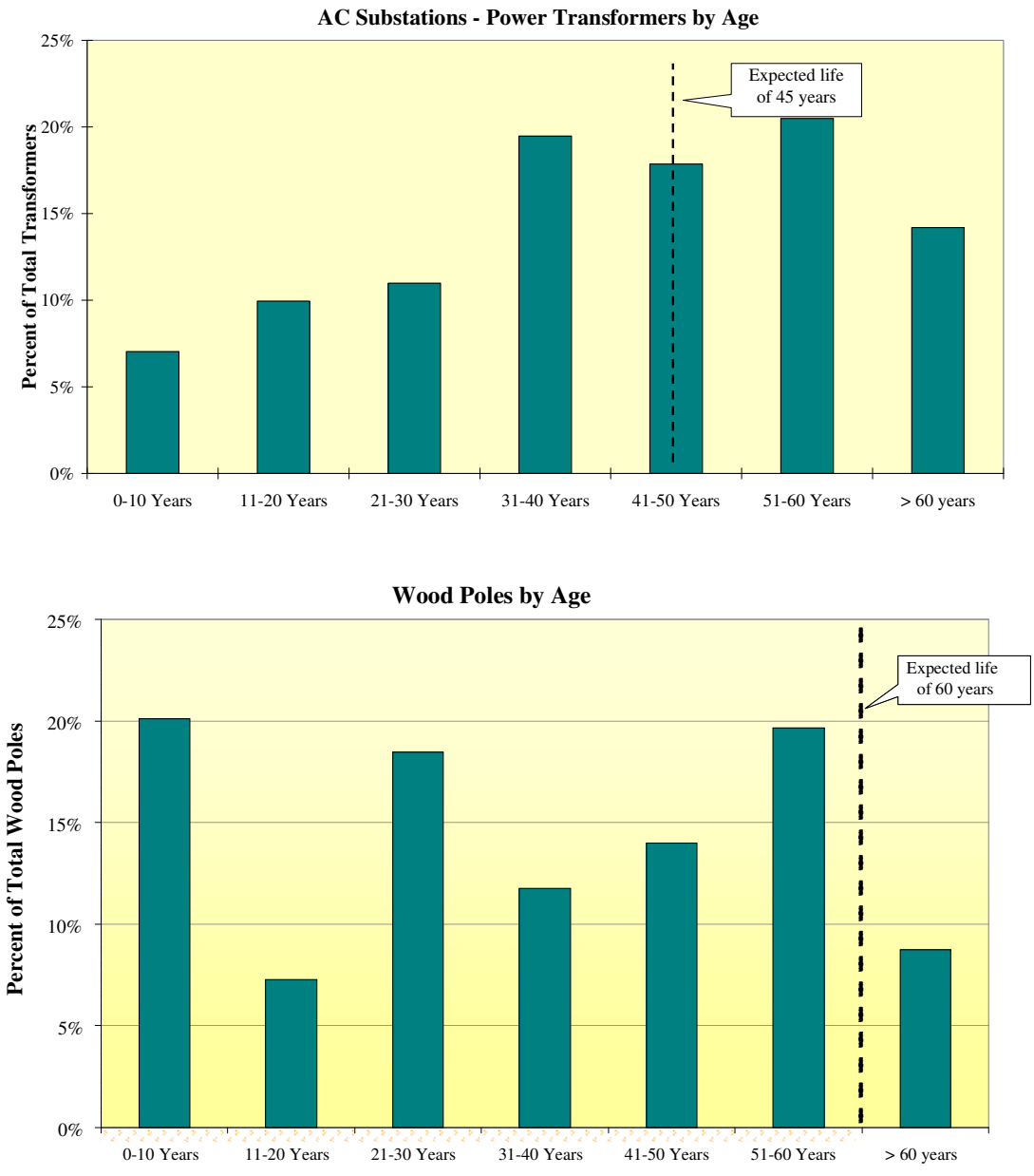
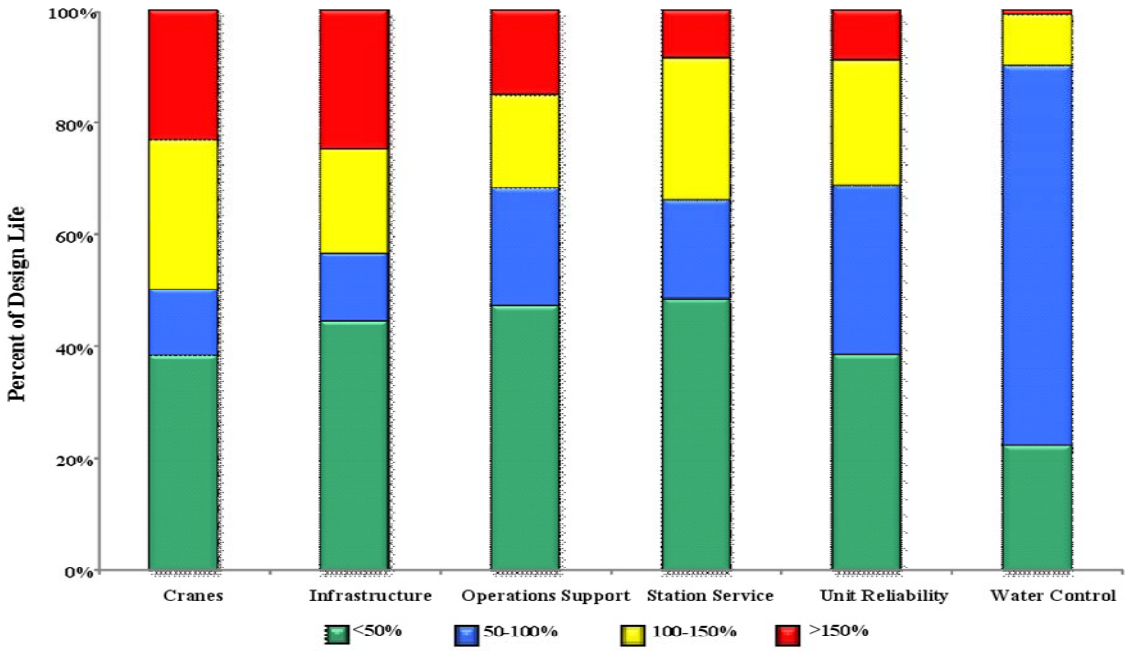


Figure 7 illustrates the age of federal hydroelectric assets. Large portions of hydro equipment have exceeded design life, which includes nearly 50 percent of cranes and infrastructure equipment.

**Figure 7**




Age by itself does not determine when an asset should be refurbished or replaced. The physical condition along with the performance, maintenance and repair cost history of equipment and facilities are often significant drivers for planning and prioritizing maintenance and replacements.

To illustrate, Figure 8 is a risk map excerpted from the Federal Hydro Asset Strategy. The map shows the equipment units that are likely or not likely to fail based on health assessments (shown in rows). Health assessments involve inspections to examine the physical condition and performance of equipment and facilities to ascertain the risk of failure and other risks. The risk map also shows the potential ranges of financial impact if equipment were to fail (columns). Hydro equipment failures can lead to reduced levels of generation, which in turn can lead to reduced sales or increased purchases of costly replacement power. Failures can also lead to increased repair, replacement and other costs.

Figure 8 shows that a substantial number of critical hydro equipment units are in need of replacement if failures and large financial losses are to be avoided (the red and orange zones on the map).

Comparable risk assessments are prepared for each asset strategy. The risk assessments play a key role in prioritizing refurbishment, replacement and certain upgrade investments, as explained later.

**Figure 8**

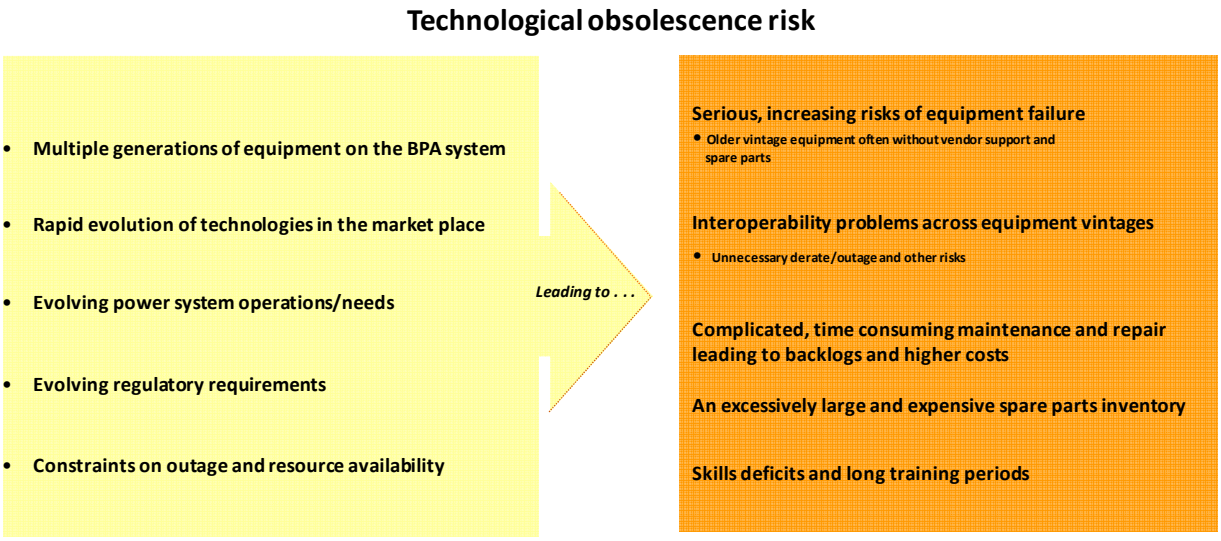
| Likelihood | Insignificant<br>< $ 10K | Minor<br>$ 10K to $ 100K | Moderate<br>$ 100K to $ 1 M | Major<br>$ 1 M to $ 10 M | Extreme<br>> $ 10 M |
|---|---|---|---|---|---|
| Almost Certain | 1 Operations Support | 1 Unit Reliability<br>2 Station Service<br>8 Operations Support<br>1 Water Control | 21 Unit Reliability<br>9 Station Service<br>40 Operations Support<br>13 Water Control<br>25 Infrastructure | 26 Unit Reliability<br>10 Station Service<br>4 Operations Support<br>5 Water Control<br>1 Infrastructure | 4 Unit Reliability<br>2 Operations Support<br>3 Water Control |
| Likely | 16 Operations Support | 53 Unit Reliability<br>26 Station Service<br>19 Operations Support<br>2 Water Control<br>1 Infrastructure | 92 Unit Reliability<br>38 Station Service<br>55 Operations Support<br>26 Water Control<br>9 Cranes<br>17 Infrastructure | 182 Unit Reliability<br>118 Station Service<br>22 Water Control<br>11 Cranes | 11 Unit Reliability<br>1 Operations Support<br>2 Water Control |
| Possible | 18 Operations Support | 44 Unit Reliability<br>22 Station Service<br>8 Operations Support<br>6 Infrastructure | 213 Unit Reliability<br>33 Station Service<br>19 Operations Support<br>46 Water Control<br>48 Cranes<br>13 Infrastructure | 330 Unit Reliability<br>63 Station Service<br>4 Operations Support<br>20 Water Control<br>34 Cranes<br>4 Infrastructure | 32 Unit Reliability<br>2 Water Control |
| Unlikely | 6 Operations Support | 4 Unit Reliability<br>6 Station Service<br>10 Operations Support<br>2 Water Control<br>6 Infrastructure | 114 Unit Reliability<br>21 Station Service<br>16 Operations Support<br>37 Water Control<br>4 Cranes<br>6 Infrastructure | 240 Unit Reliability<br>17 Station Service<br>1 Operations Support<br>14 Water Control<br>7 Cranes<br>2 Infrastructure | 29 Unit Reliability |
| Rare | 52 Operations Support<br>1 Infrastructure | 299 Unit Reliability<br>73 Station Service<br>43 Operations Support<br>2 Water Control<br>3 Cranes<br>12 Infrastructure | 582 Unit Reliability<br>145 Station Service<br>69 Operations Support<br>5 Water Control<br>66 Cranes<br>57 Infrastructure | 1254 Unit Reliability<br>62 Station Service<br>14 Operations Support<br>21 Water Control<br>35 Cranes<br>5 Infrastructure | 223 Unit Reliability<br>1 Operations Support<br>1 Water Control |

Consequence

| Risk Level | Low | Medium | High |
|---|---|---|---|


## *Technological risks and opportunities*

For some classes of equipment, such as telecommunications and control systems equipment, technological obsolescence has emerged as a major risk factor. BPA's system contains multiple generations of telecommunications and control systems equipment, which has led to interoperability problems and increasing maintenance and repair costs. Meanwhile, the rapid evolution of technologies has led to shortages of spare parts and skills deficits for repairing older equipment.




**Technological obsolescence risk** is distinct from failure risk. Obsolescence risk can affect equipment maintainability, interoperability, and the duration of a curtailment/outage should a failure occur. Equipment may be in healthy physical condition, but technologically obsolete. Conversely, equipment may be in poor physical condition, but technologically up to date.

New technologies present opportunities for greater efficiency and effectiveness. For example, evolving server technologies and the onset of "cloud-based" services should enable BPA to meet a steep growth in information requirements more cost effectively.

As another example, BPA and several other utilities in the Western Interconnection are deploying a synchronized phasor measurement system with selected smart grid functions. The synchrophasors will enhance real-time information on grid performance, which will, in turn, help reduce the risk of large-scale outages, enable faster restoration of the system, increase transfer capacity and enable better management of transmission congestion.

Technological advances are instrumental to the success of many industrywide initiatives, including integrating intermittent generation, enhancing the reliability and efficiency of system operations, deploying demand response programs and enabling energy storage devices. However, cyber security compliance requirements must be satisfied in order to use the new technologies.

### *Increasing demands on the power and transmission system*

Renewable portfolio standards in the West continue to drive wind energy growth. In the Pacific Northwest, 6,500 MW of wind energy were operating by the end of 2011, and forecasts indicate this could rise to as much as 10,000 MW by 2020. In the BPA balancing authority area, 36 wind projects totaling 4,300 MW have been interconnected into the transmission grid, which has required BPA to build eight substations and seven tap lines. Forecasts indicate wind generation on BPA's system could rise to as much as 6,000 MW by the end of 2013. Most wind projects are concentrated in the Columbia River Plateau where there is access to BPA's transmission lines and the interties to California. This concentration produces large unexpected swings in aggregate generation output, which requires BPA to provide significant balancing reserves to preserve reliability.

Planned coal plant shutdowns and other state renewable policy decisions and incentives are expected to contribute to continued growth in renewable resource development in the Pacific

Northwest. The rapid pace of wind growth is expected to ease over the next two to four years. Contributing factors include a volatile global and national economic environment and uncertainty about whether production tax credits or other federal alternative energy incentives will be extended. In addition, California – which was once expected to meet a significant portion of its renewable portfolio standard needs with Northwest wind energy – is now expected to rely primarily on its own in-state resources, including wind, solar and distributed generation. Despite this change, BPA still expects as much as 6,000 MW of wind energy to be operating or under construction in its balancing authority by the end of 2013.

The Northwest transmission grid and federal power system are operated in ways not originally envisioned due, not only to the ramp up in wind generation, but also to changes in markets and transmission patterns. Several transmission paths are at or near their capacity limits, as noted in the Transmission Asset Management Summary. Among other effects, transmission congestion can force a change from the optimal dispatch of generating resources, which can in turn lead to higher regional costs for delivered power. Further, a heavily loaded system constrains the agency's ability to take line or substation assets out of service for needed maintenance, repairs and replacements.

Demands are increasing on the federal hydro system as well, including competing requirements to conduct fish operations, ensure flood control and provide balancing reserves for renewable energy. In sum, new capacity and flexibility will be needed to meet tariff and regulatory requirements and to provide adequate, efficient and reliable transmission and power services.

### *Increasing compliance requirements*

*Reliability standards*

The Energy Policy Act of 2005 subjects utilities to a wide range of North American Electric Reliability Corporation reliability standards that are enforced by the Western Electricity Coordinating Council. The challenge that BPA and similar entities face is the amount and rate of change in reliability standards since their inception. Since 2007, reliability compliance standards have steadily increased and are expected to continue to increase over the next several years. These standards create funding, labor and outage requirements for the agency.

*Security and continuity of operations requirements*

Growth in regulatory requirements for protecting BPA and other national critical infrastructure has been rapid. The requirements are outlined in presidential decision directives issued by the North American Electric Reliability Corporation, Federal Energy Regulatory Commission, U.S. Department of Energy and U.S. Department of Homeland Security.

Keeping a balance between compliance-driven initiatives and risk-based protection programs is a challenge. Compliance requirements for physical security have left the agency with little discretion for funding protection strategies based on BPA risk assessments.

BPA's information technology systems must also conform to federal and industry mandated laws and regulations, including the Federal Information Security Management Act of 2002. 42 of BPA's systems are deemed to be critical business systems. These systems support power and

transmission scheduling and marketing and must be available around the clock seven days a week. Continuity of operation requirements have been established for these systems.

### *Endangered Species Act requirements*

The FCRPS biological opinion (BiOp) is the federal plan for operating 13 Main stem hydroelectric dams while protecting Endangered Species Act-listed salmon and steelhead on the Columbia and Snake rivers. Since 2001, the FCRPS BiOps (2000, 2004, 2008 and 2010 Supplemental) have been in litigation. Under the biological opinions, flows, spills and dam operations are provided for fish spawning, rearing and migration. While the most recent federal District Court decision left the 2008/2010 BiOp in place through 2013, the Court remanded the BiOp back to the federal agencies to produce a new biological opinion in 2014 that evaluates actions that are "reasonably certain to occur."

## 4.4 STRATEGIC PRIORITIES

For FY 2012-2017, the agency is pursuing six strategic priorities, four of which have a direct bearing on its investment and maintenance strategies.

- Preserve and enhance the value of the generation and transmission system.
- Implement the agency's Endangered Species and other fish and wildlife related responsibilities.
- Advance energy efficiency.
- Expand capabilities and resources for balancing system operations.

The goal is to preserve and enhance federal generation and transmission assets and the economic, environmental and operational value they produce for the region while anticipating and adapting to industry developments and regulatory change.

### *Transmission*

Significant investment is needed to sustain and expand the transmission system. This investment will refurbish or replace aging equipment, integrate wind and other new generating resources, and remove constraints that limit economic trade or the ability to maintain the system.

To *sustain* existing transmission assets, Transmission Services is maintaining or replacing high-risk, obsolete and maintenance-intensive facilities and equipment to preserve the system's reliability performance. Asset strategies have been developed for eight sustain programs: steel lines, wood lines, rights-of-way, alternating current substations, direct current substations, power system control, system protection control and control centers. In each of these programs, proposed investments are based on the criticality of the asset and its health condition. Highest priority is assigned to the most critical assets at greatest risk of safety and health issues, operational failure, obsolescence, environmental damage or security shortfall. This asset criticality and health condition-based approach serves to maintain reliability and manage other risks while optimizing the use of limited funding, labor and outage time.

Over the years, the Transmission and Facilities asset categories have accumulated sizeable backlogs in making replacements. To address this, BPA is implementing a multiyear ramp up in

replacement and maintenance programs. With its 2010 asset strategies, BPA, with the support of its customers and other stakeholders, committed to implementing long-term risk-informed programs for replacements and maintenance. Stable, predictable levels of funding for replacements and upgrades are essential if asset age and health risks are to be managed efficiently and effectively.

To this end, BPA proposes to set a floor on funding transmission asset replacements. The floor would be set conservatively at the level of annual depreciation expense for transmission assets. This means that the funding for transmission replacements would be set at a level no lower than the original actual cost of the equipment and spread pro rata over the average expected service lives of the equipment (as of the end of FY 2011, this amount was $128.7 million). Additional amounts may be added to this floor annually to fund backlog reductions and cover commodity and equipment price escalation.

During the past two years, Transmission Services has begun implementing an economic value-based method to better determine the level of effort that is needed for each sustain program and the priorities that should be set when replacing equipment. This new, leading practice method involves: assessing the health condition of equipment, the likelihood of equipment failure, the potential for line derates and outages should equipment failure occur, and the economic losses that BPA, customers and regional end users might suffer as a result. The method produces a risk-informed prioritized program of replacements and internal process improvements designed to minimize BPA costs and customer value losses from equipment failures over time. The method has been applied to power system control assets, and a project that applies the method to all control system assets is nearing completion. The method will be extended to remedial action schemes and other selected assets in FY 2012-2014.

**Repair versus Replace?**

Life cycle costing plays a big role when deciding whether to maintain and repair equipment in declining health or to replace it.

Repair versus replace decisions affect equipment reliability -- and long-term costs and cost savings. Sometimes it is more economic to replace equipment early, ahead of the end of its service life.

Additional details available online.

To *expand* transmission, Transmission Services is proposing significant investments in infrastructure to meet generation interconnection and customer service requests, relieve congestion and meet load requirements. These investments fall into four areas, that together, assure compliance with reliability standards and guidelines; provide a reliable transmission system for open access, per NERC criteria; provide relief for transmission system congestion; and enable contractual obligations to be met.

- *Main grid*: Expands the main grid to interconnect new wind generation and provide new point-to point service through projects such as 28-mile Big Eddy-Knight 500-kV line and the 38-mile Little Goose-Lower Monumental 500-kV line.
- *Area and customer service*: Provides facilities to support customer loads (230-kV and lower).
- *Interregional paths*: Provides lines and facilities that interconnect with transmission providers and generating resources between the Pacific Northwest and other regions (500-kV and lower).

- *Upgrades and additions*: Upgrades the capacity and capabilities of substations, transmission lines, control center systems, telecommunications equipment and other electrical equipment.

BPA will continue to develop innovative approaches to planning transmission development in the region. To support the load growth and marketing needs of the agency's transmission customers, BPA is collaborating with stakeholders to revise and enhance its policies and processes in three areas:

- *Network transmission.* BPA continues to strengthen network planning processes to better anticipate the ongoing transmission needs of network integration transmission service customers.
- *Network open season.* This addresses the process for managing transmission service requests and identifying and subscribing new transmission infrastructure.
- *Generation interconnection*. This addresses the process for connecting new generation to the grid.

The objectives of these efforts include: promoting more efficient and effective regional transmission planning processes and timelines, clarifying rights and responsibilities for BPA and its customers, ensuring equitable cost allocation, reducing financial risks to BPA and its ratepayers, and mitigating stranded investment exposure.

## *Generation*

With the goals of providing low cost, reliable power and being a trusted steward of the FCRPS, BPA is making ongoing investments in FCRPS hydro assets in collaboration with the U.S. Army Corps of Engineers and the Bureau of Reclamation. The purpose of the investments is to:

- supply reliable, low-cost generation through proper operation, inspection and maintenance;
- mitigate risk of power generation failures by replacing or refurbishing equipment;
- increase the efficiency and capability of power facilities where economically feasible;
- ensure that safety and environmental requirements are met; and
- meet FCRPS commitments for fish and wildlife and cultural resource programs.

The investments are targeted in six areas: unit reliability, water control, station service, operations support, infrastructure and cranes. Unit reliability is by far the largest investment category, ensuring the full and reliable performance of equipment such as turbines, generators, transformers, exciters and governors. Among the largest investment programs in flight are the Bureau of Reclamation's 10-year rehabilitation program for powerhouse units at Grand Coulee Dam and the Corps of Engineers' replacement of turbine runners to improve unit performance at Chief Joseph Dam.

### *Integrated transmission and power activities*

To anticipate the changing demands of the industry and BPA's stakeholders, the agency is exploring new approaches to operating the federal generation and transmission system and maximize the value they produce for the region.

- Through initiatives in pumped storage, demand response, smart grid and technology innovation, BPA is evaluating cost-effective solutions that meet its business needs.
- BPA will seek new ways of capturing the value of excess hydro power through surplus sales into the energy, ancillary service and emerging capacity markets as well as through structured storage and shaping products with the potential to better monetize federal hydro capacity.
- BPA will improve planning, coordination and practices in and between its transmission and power systems to improve their flexibility and alignment. Examples include coordinating hydro operational impacts on transmission line loadings and line outage planning, and exploring new technology applications for energized maintenance to increase transmission line availability.

### *Advance energy efficiency*

Meet 85 percent of the load growth of regional public utilities through energy efficiency and conservation over 20 years.

Energy efficiency is BPA's priority resource for meeting load growth for the customers the agency serves. It is the lowest cost and least risk resource in the Pacific Northwest. Together with its public power customers, BPA aims to achieve 85 percent of public power's 20-year load growth from energy efficiency consistent with the Northwest Power and Conservation Council's Sixth Power Plan targets.

According to the Plan, the population of the Pacific Northwest will increase from about 13 million in 2010 to 16.7 million by 2030. Load is projected to increase from 21,000 aMW to 28,000 aMW. The implication is that the region will invest in energy efficiency rather than new generation facilities for 85 percent, or 5,900 aMW, of the expected load growth.

To meet the 85 percent target, the agency is pursuing energy saving strategies in three areas.

- *Utility program savings*. Utility programs will represent the bulk of savings accomplishments. The efforts will emphasize the following efforts.
    - Infrastructure support, which includes developing policies to encourage energy efficiency, improving the region's ability to achieve energy efficiency through regional programs and funds for utilities, reaching out and engaging with customers and other project implementation stakeholders and providing technical support for project implementation.
    - Acquisition funding and support, which is provided in the form of incentive dollars to help customers achieve cost-effective energy efficiency.
    - Innovation in new technologies, which continues to find new ways to save energy at the lowest possible cost.
- *Market transformation savings.* Market transformation savings will leverage the regional market's power to accelerate innovation and adoption of energy efficient products, services and practices. Examples include collaborating with manufacturers to integrate energy efficiency in their product designs and with architects and builders to promote early adoption of energy efficient designs and practices.
- *Nonprogrammatic savings*. Nonprogrammatic savings will target energy efficiency that occurs outside of utility programs or market transformation efforts. For instance, thousands

of compact fluorescent light bulbs are purchased and installed in the region without the use of utility financial incentives, making these efforts extremely cost-effective.

### *Expand balancing capabilities and resources*

Expand BPA balancing authority capabilities and customer access to flexible balancing resources in order to support reliability and renewables.

Variable energy generators play an integral role in the regional power system, making significant clean energy contributions to the region's resource portfolio and providing significant economic value to some of the most financially distressed rural communities. Along with state renewable portfolio standards, innovative BPA transmission policies and processes for transmission service requests have helped spur the region's renewables growth.

The continued growth of wind also requires that BPA and the region jointly understand and manage the costs and risks that come with increased variability in the region's resource portfolio so that the reliability and cost effectiveness of the system can be sustained. The federal hydro system has been the principal source of balancing reserves to manage fluctuations in wind generation, but these supplies are limited and could be exhausted by 2013.

It is vital to broaden customer access to nonfederal balancing resources while enhancing the operational tools of the BPA balancing authority, developing new products and increasing coordination within and across the region's balancing authorities. To achieve this, BPA is pursuing several strategies.

- *Oversupply.* In collaboration with regional stakeholders, the agency is developing durable solutions to address occasional events that produce an oversupply of power. This can result from concurrent high wind and high water events, especially during the spring runoff season.
- *Balancing services*. Energy Efficiency is taking a systematic approach to leverage both federal and nonfederal resources to provide balancing services to meet BPA's obligations as a balancing authority. This approach can act as a bridge to a possible regional imbalance market or can function as a stand-alone approach. This strategy has four goals:
    - Reduce generation imbalance demands on the BPA balancing authority.
    - Expand the supply of generation imbalance resources, such as pumped storage.
    - Better manage generation imbalance reserve deployment.
    - Consider a regional imbalance market.

These strategies may lead to new investments in communications and control system infrastructure, new information technology solutions, acquisition of energy storage and demand response capabilities, and transmission integration requirements.

### *Implement Endangered Species Act responsibilities*

Implement hydro, habitat and hatchery actions that effectively and efficiently advance the recovery and restoration of fish, including salmon, steelhead, sturgeon, and bull trout.

BPA invests over $400 million every year to protect fish and wildlife affected by the development and operation of the Columbia River hydro system. The investment portion of this funding includes capitalized habitat restoration, fish hatcheries, conservation land acquisitions,

predator control and culvert replacements. Fish and wildlife improvements at federal dams and fish hatcheries are also included.

BPA's long-term objective for Fish and Wildlife is that, "BPA's Endangered Species Act, NW Power Act, National Environmental Policy Act, Fish Accords and other environmental responsibilities are met using a performance-based approach." Within this context, the agency's strategic priority to implement its Endangered Species Act responsibilities has three main thrusts.

- *Biological performance.* BPA has committed to a range of biological targets to guide its hydro and habitat mitigation.
- *Regional partnerships.* As environmental steward for the FCRPS, BPA implements its hydro, habitat and hatchery mitigation projects in close partnership with state and tribal governments and other federal agencies. BPA also collaborates with BPA customers, river users, conservation groups and an array of stakeholders to meet its many environmental responsibilities.
- *Ongoing litigation.* The federal plan for Endangered Species Act compliance for the Main stem dams on the Columbia and Snake rivers is one of the most extensive, complex and comprehensive biological opinions ever developed in the U.S. BPA will continue to implement the 2008/2010 BiOp and will work with federal agencies, stakeholders and the Court to produce a new BiOp in 2014.

To meet this challenge, BPA and its partner agencies are expending significant resources to meet the performance requirements of the 2008/2010 BiOp while also initiating an intensive effort with the region to specify actions to improve salmon habitat and evaluate biological benefits.

## 4.5 PRIORITIZING PROJECTS

BPA's objective is that capital projects be prioritized so that:

- Assets operate efficiently and effectively and provide the capacity and capabilities needed to meet health and safety, reliability, availability, adequacy, environmental, security and other standards.
- Total economic costs are minimized over the long term. Total economic costs include not only costs incurred by BPA, but also costs potentially incurred by customers and other stakeholders should assets fail to perform.

The prioritization of projects must align with the agency's asset management strategies, recognize the business needs of the individual asset categories and enable efficient and timely decision making.

### *Defining project prioritization*

BPA defines project prioritization in terms of the ***importance*** of projects. That is, the purpose of project prioritization is to distinguish more important projects from less important projects, so that critical business needs are met, reliability and other risks are managed well and limited resources such as capital, labor and outage time are directed to the greatest benefit.

Project prioritization is distinct from the ***timing*** of projects. The sequencing and timing of projects occurs after projects have been prioritized. It can happen that the highest priority projects are not the first projects to be scheduled and implemented. This is because a project's implementation is based not only on its importance (priority) but factors such as:

- Availability of skilled labor
- Availability of outage time
- Interdependencies with other projects
- Urgency of asset health risks
- NEPA process timelines
- Contractual timelines
- Regulatory directives (with hard deadlines)

Project prioritization is also distinct from decision making on financing a project. Prioritization is focused on the merits – the worth – of projects as projects without regard to the source of capital that may be used to finance the investment.

## *Proposed prioritization methods for the agency*

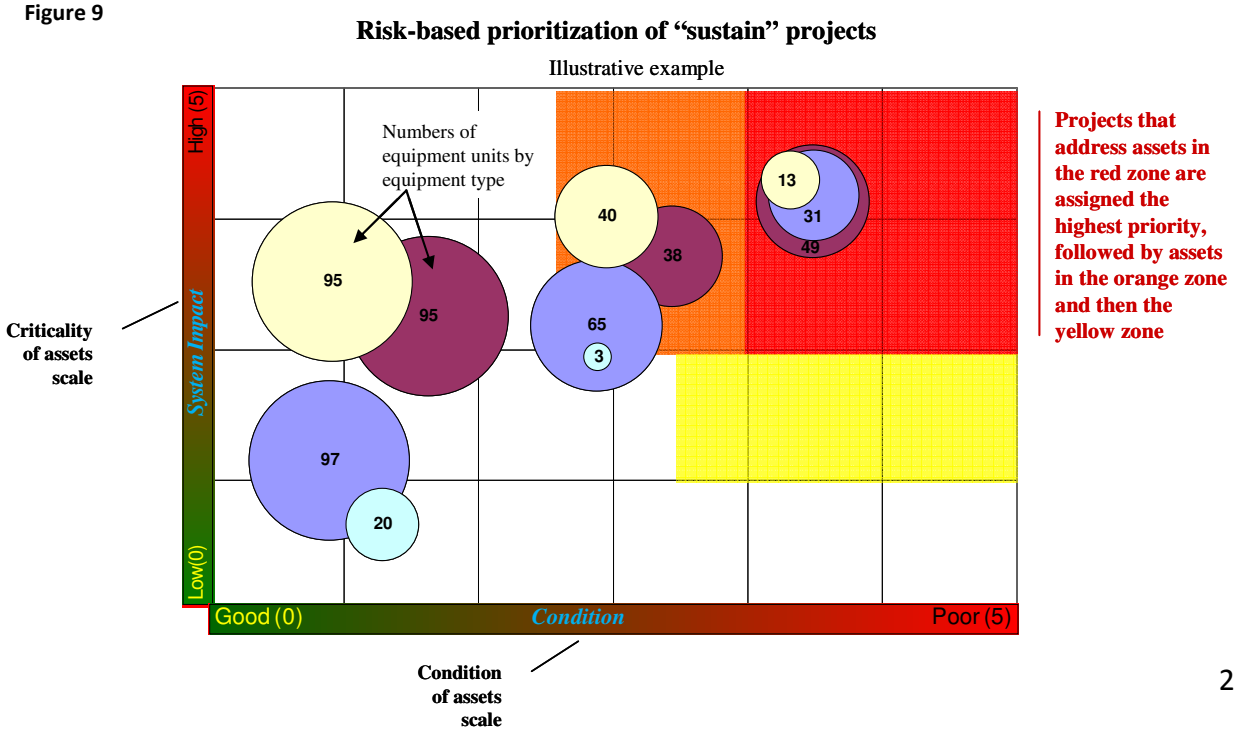
BPA proposes prioritizing investments into two categories: "sustain" investment and "expand" investment.

**Sustain investment** is defined as capital projects for which the primary purpose is to replace, modernize or refurbish equipment and facilities in order to maintain asset capabilities and system performance.

Sustain investment is focused on preserving the asset base, not adding to it. Sustain investments are prioritized via the asset strategies developed by each of the six asset categories. This prioritization assigns highest priority to the most critical facilities and equipment that are at the greatest risk. Risks are determined through asset condition assessments to determine the likelihood of safety mishap, equipment or facility failure, technological obsolescence, environmental damage or security breach.

Figure 9 illustrates the prioritization method used for sustain investments.

**Figure 9**



In no case are sustain projects canceled or deferred if it would lead to a violation of standards, tariff provisions or other legal commitments and requirements. Emergency situations take precedence.

The asset strategy summaries that follow this Agency Overview include discussions of project prioritizations. For example, the Transmission Asset Strategy includes prioritization criteria and methods for transmission sustain investments.

**Expand investment,** by contrast, is defined as capital projects for which the primary purpose is to add capacity or flexibility or to increase operational output or productivity.

BPA proposes to prioritize expand investment by assigning highest priority to mandatory expand projects and second priority to high ranked discretionary expand projects.

*Mandatory expansion projects* are tentatively defined as investments that a law, appropriations act, regulation, tariff or contract requires be made. Mandatory projects would be limited to investments that, if not made, would likely result in noncompliance. Specifically, mandatory projects would include projects that are required by

- federal statute or appropriations act,
- federal regulation (issued by FERC, NERC, EPA, OSHA and the like),
- executive orders and other executive branch directives,
- judicial orders or instructions,
- contracts that obligate BPA make to an investment or
- specific load service obligations or tariff provisions.

Mandatory expansion projects would be assigned the highest priority among expand projects. Examples of mandatory projects are projects that are essential to meeting OSHA or NERC CIP standards, meeting the BiOp and Fish Accords, relocating telecommunications on the radio spectrum, upgrading capacity to meet load service obligations, and interconnecting generating resources.

Expansion projects that do not meet the mandatory test – *discretionary expand projects* – would be subject to priority ranking. The priority ranking would be conducted at least annually at the agency level. The rankings would be based on structured, risk-informed evaluations of such factors as

- alignment with the agency's strategic priorities,
- operational value,
- economic value (net present value, benefit/cost ratio, and present value: revenue requirements metrics) and
- value in mitigating an agency top enterprise risk.

Once the discretionary Expand projects are priority ranked, a cut line would be drawn to delineate projects that are "go" versus "no-go." The cut line would take into account capital, labor resources, and other constraints.

The result would be an agency prioritized list of discretionary expansion projects. Examples of discretionary expand projects: integration projects driven by the network open season process, the potential Keys pumped storage project, most major IT applications and the Transmission Services Facility.

### *How project prioritization fits into asset strategies*

Each of the six asset categories – Federal Hydro, Transmission, Facilities, Information Technology, Energy Efficiency and Fish and Wildlife – has an asset strategy. (A supplemental strategy has also been developed for security infrastructure.) The strategies are developed under guidance of an agency policy.

The asset strategies set the direction for prioritizing projects. The strategies are directed at answering these questions:

- Which assets are critical to achieving BPA's mission and business objectives?
- What performance objectives should BPA set for these critical assets?
- How are these assets performing?
- What gaps are there to meeting the performance objectives?
- What are the risks to closing these gaps?
- What should the agency's investment and maintenance strategies be?

Beginning with the FY 2011-2012 strategy cycle, a prioritized list of major projects for each asset category was prepared based on prioritization criteria. The prioritization criteria and prioritized lists of projects are driven by asset performance objectives, gap analyses, risk assessments, and investment and maintenance strategy in the asset strategies.

The strategies, including the prioritization criteria and prioritized list of major projects, are subject to stakeholder review and to BPA's Capital Allocation Board approval, the CAB being an agency-level executive body chaired by the chief financial officer. In addition to approving asset strategies, the CAB's role includes reviewing, authorizing and tracking the implementation of major capital projects. As designed, the prioritization process occurs in the context of other determinations that the agency makes, including decisions on the level of capital spending that will be authorized for each asset category. The box on the next page summarizes how project prioritizations fit in.

## *How priority projects move through the approval process*

The prioritized list of each asset category is multiyear, extending through the end of the next rate period (for example, through the end of FY 2015). The lists of projects are expected to evolve over time, as conditions change and as out-year projects get defined. Accordingly, BPA proposes to share a refreshed list of projects with customers and other stakeholders annually.

It is important to note that project prioritization is not project approval. All projects and capital programs – whether sustain, expand mandatory or expand discretionary – must be vetted and authorized through BPA's capital project authorization process. Projects with an estimated capital cost of $3 million or more are subject to agency-level review and approval through a process managed by the agency's Capital Allocation Board. Once prioritized, capital projects must be justified by means of a business case and submitted to a rigorous review, authorization and tracking process as depicted in Figure 10.

**Capital allocation and prioritization**

***Basic sequence of the FY 2011-12 process for preparing asset strategies, determining affordability, allocating capital, and prioritizing major projects***

**Call for Asset Strategies is issued** *(July 2011)*
- Sets a ceiling on capital spend that each asset category is asked to meet as strategies are developed

**Proposed strategies are developed by each asset category** *(July 2011 - January 2012)*
- The strategies include asset performance objectives, risk assessments, evaluations of strategy alternatives, proposed planning levels, and proposed criteria for prioritizing capital projects
- The strategies are accompanied by prioritized list of major projects

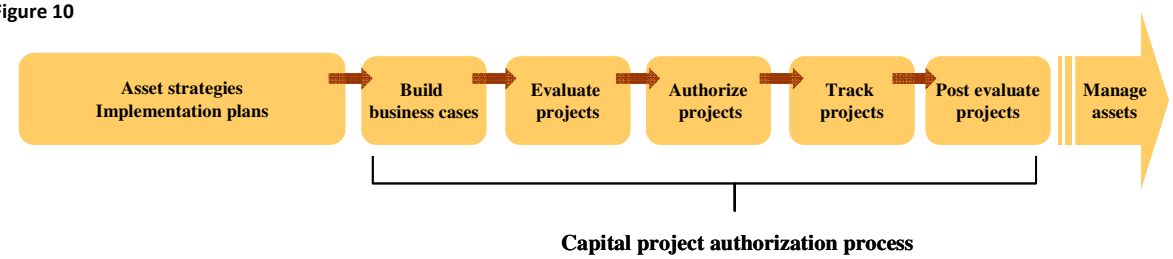
**Affordability is determined** *(ongoing)*
- Rate impacts and access to capital impacts of proposed strategies are assessed
- Determines the level of capital spend that the agency can "afford" given its financial and rate objectives and its asset investment needs taking into consideration the expense and revenue effects

**Stakeholder views are considered** *(Capital Investment Review)*
- Asset strategies may be revised as a result
- Prioritization criteria are refined and capital projects may be reprioritized

**Capital is allocated strategically across asset categories** *(September 2012)*
- Ceilings on capital spend (capital budgets) are finalized for each asset category

**Capital Allocation Board reviews and approves the strategies** *(September-October 2012)*

**Figure 10**




Business cases must identify whether the project was part of the business unit's asset strategy. Projects that were not included in an approved asset strategy are subject to further scrutiny to determine why they were not included. BPA's policy on capital project authorizations is available online. Through regular updates to its Asset Management site, BPA makes available to customers and other stakeholders a synopsis of each approved major project, a quarterly project performance report and a six-month forecast of major projects expected to be submitted for authorization.

## 4.6 COST PROJECTIONS

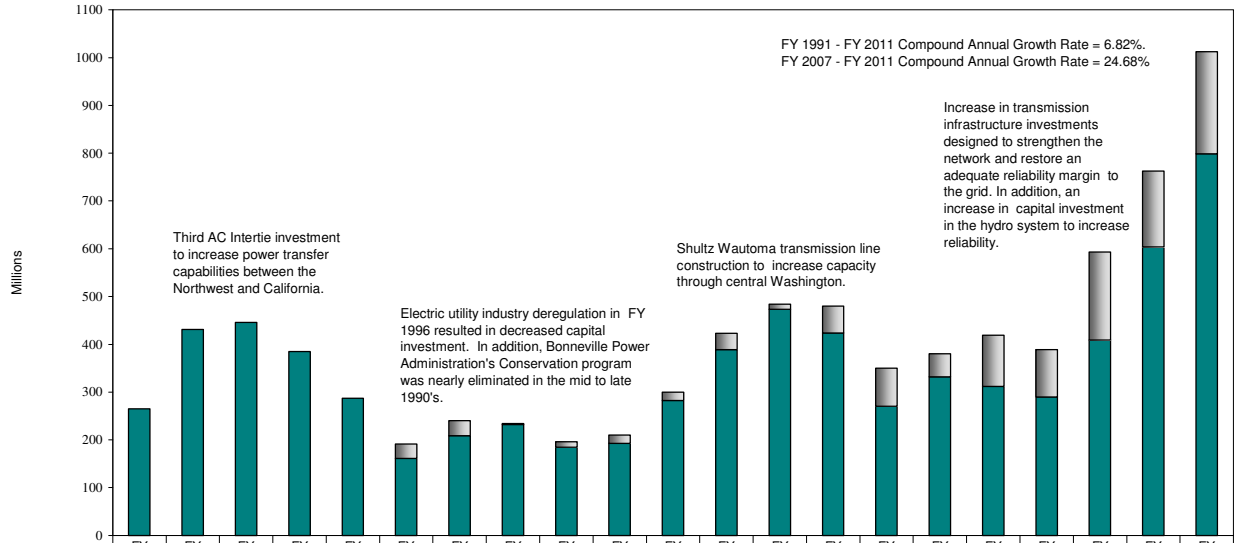
**Proposed capital investment levels and asset-related O&M expense forecasts through FY 2021 for all asset categories, centralized in one summary table.**

### *Capital Spending*

In 2009, BPA began a robust program to replace and renew aging assets in poor condition and expand transmission capacity to integrate wind resources and meet load obligations.

**Figure 11**

**Actual Capital Expenditures**
**(With AFUDC and Corporate Overhead, Nominal Dollars)**

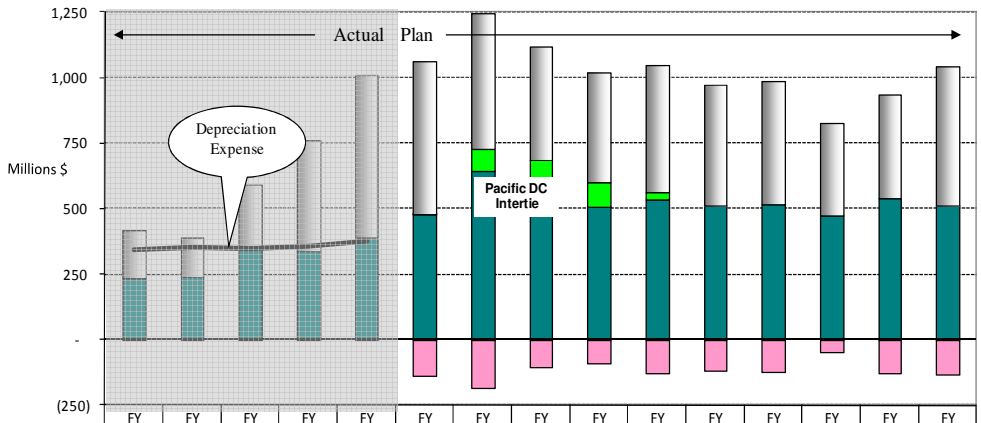



| | FY 1991 | FY 1992 | FY 1993 | FY 1994 | FY 1995 | FY 1996 | FY 1997 | FY 1998 | FY 1999 | FY 2000 | FY 2001 | FY 2002 | FY 2003 | FY 2004 | FY 2005 | FY 2006 | FY 2007 | FY 2008 | FY 2009 | FY 2010 | FY 2011 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PFIA Actuals | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 30.0 | 31.0 | 2.0 | 11.0 | 17.0 | 18.0 | 34.0 | 11.0 | 56.0 | 80.0 | 48.0 | 107.0 | 98.7 | 184.0 | 158.7 | 213.5 |
| Capital Actuals | 265.0 | 431.0 | 446.1 | 385.3 | 287.0 | 161.0 | 209.0 | 232.0 | 184.9 | 192.8 | 282.0 | 389.0 | 473.0 | 424.0 | 270.0 | 332.0 | 312.0 | 290.0 | 409.2 | 603.6 | 799.0 |
| Total Actuals | 265.0 | 431.0 | 446.1 | 385.3 | 287.0 | 191.0 | 240.0 | 234.0 | 195.9 | 209.8 | 300.0 | 423.0 | 484.0 | 480.0 | 350.0 | 380.0 | 419.0 | 388.7 | 593.1 | 762.3 | 1012.5 |

PFIA includes Projects Funded in Advance, Master Lease, Customer Financed Projects, Third Party Financed Projects, and Revenue and Reserve Financed Projects.

**Figure 12**

Agency Total Capital Expenditures*
Expand vs. Sustain Investment



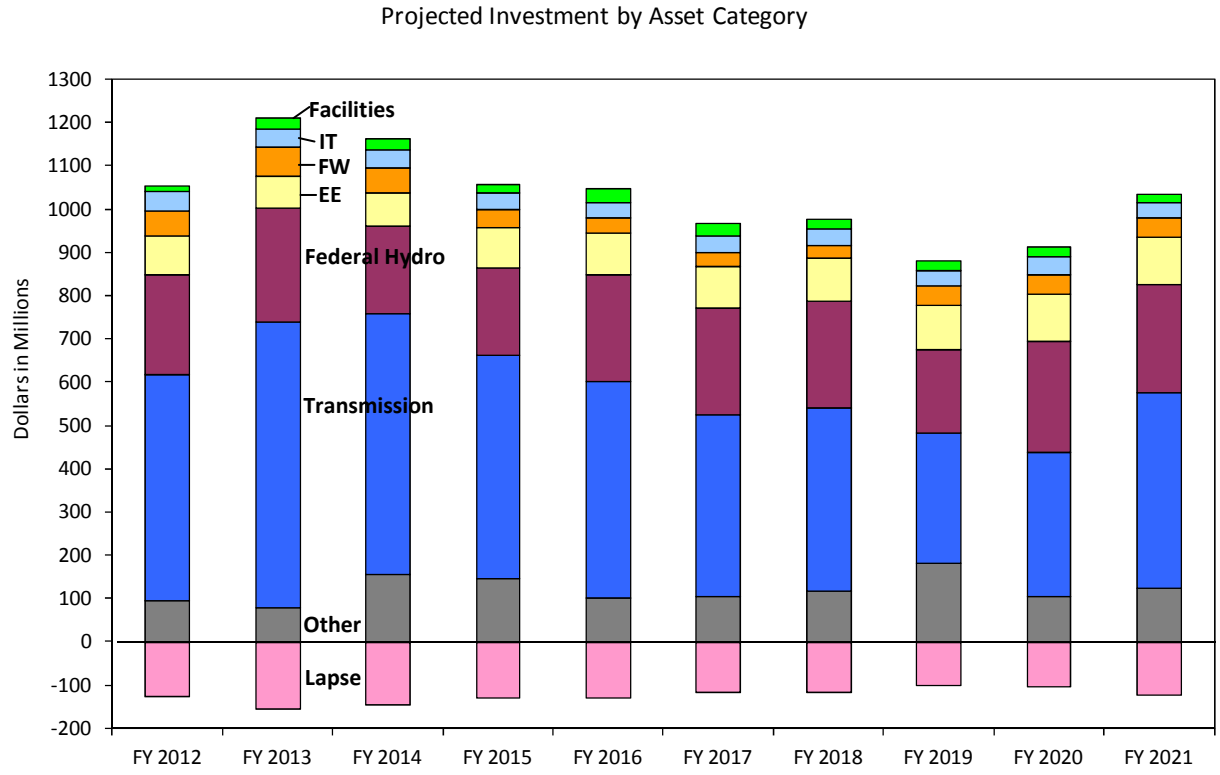

| | FY 2007 | FY 2008 | FY 2009 | FY 2010 | FY 2011 | FY 2012 | FY 2013 | FY 2014 | FY 2015 | FY 2016 | FY 2017 | FY 2018 | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total BPA Capital | 419 | 389 | 593 | 761 | 1,012 | 928 | 1,059 | 1,018 | 928 | 919 | 852 | 860 | 781 | 808 | 912 |
| Expansion | 187 | 149 | 247 | 426 | 623 | 584 | 517 | 436 | 415 | 486 | 458 | 467 | 356 | 394 | 530 |
| PDCI | - | - | - | - | - | 1 | 85 | 116 | 94 | 28 | - | - | - | - | - |
| Sustain | 233 | 240 | 346 | 336 | 389 | 478 | 641 | 568 | 509 | 534 | 513 | 518 | 472 | 542 | 513 |
| Lapse & Timing Adj. | | | | | | (135) | (185) | (102) | (90) | (128) | (119) | (125) | (48) | (128) | (132) |
| Depr Exp | 344 | 354 | 346 | 355 | 377 | | | | | | | | | | |

* Includes AFUDC, Transmission and Corporate indirects

Over the last five years, replacements and renewals represented about 40 percent and expansion-related investment represented about 60 percent of total capital spending. Going forward, BPA proposes to continue its program of replacements and renewals at levels that peak in FY 2013-2014. Over 90 percent of sustain investment is directed at maintaining the system's reliability and availability.

Projected capital spending over the 10-year planning horizon is depicted in Figure 13. The highest capital spending is projected for FY 2013-2014, driven largely by some large expansion projects.

**Figure 13**




| | | FY 2012 | FY 2013 | FY 2014 | FY 2015 | 4-Year Total | FY 2016 | FY 2017 | FY 2018 | FY 2019 | FY 2020 | FY 2021 | 10-Year Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Facilities | 14.0 | 25.5 | 25.3 | 19.6 | 84.4 | 30.2 | 30.8 | 20.7 | 20.3 | 20.5 | 16.2 | 223.0 |
| | Information Technology | 42.9 | 41.0 | 39.5 | 37.0 | 160.4 | 35.6 | 38.0 | 39.0 | 35.0 | 43.0 | 38.0 | 389.0 |
| | Fish and Wildlife | 59.8 | 67.1 | 60.3 | 41.8 | 229.0 | 36.6 | 30.8 | 28.6 | 44.8 | 45.0 | 43.6 | 458.5 |
| | Energy Efficiency | 89.0 | 75.2 | 75.2 | 92.0 | 331.4 | 94.8 | 97.6 | 100.5 | 103.6 | 106.7 | 109.9 | 944.4 |
| | Federal Hydro | 231.6 | 262.6 | 201.0 | 203.3 | 898.5 | 248.9 | 244.6 | 247.9 | 193.4 | 256.8 | 248.8 | 2,338.9 |
| | Transmission | 520.6 | 660.2 | 603.5 | 515.9 | 2,300.2 | 498.8 | 421.7 | 421.5 | 301.9 | 333.5 | 454.0 | 4,731.6 |
| | Other | | | | | | | | | | | | |
| | Security Infrastructure | 4.2 | 4.9 | 4.9 | 4.9 | 19.0 | 6.0 | 5.2 | 5.9 | 6.1 | 5.2 | 5.7 | 53.0 |
| | Fleet | 9.2 | 8.7 | 6.8 | 6.9 | 31.6 | 7.5 | 7.7 | 8.3 | 8.9 | 9.3 | 9.9 | 83.2 |
| | Environment | 5.1 | 5.4 | 5.1 | 5.1 | 20.7 | 5.0 | 5.0 | 5.0 | 5.1 | 5.1 | 5.1 | 51.0 |
| | AFUDC | 42.9 | 47.9 | 52.9 | 44.9 | 188.7 | 37.1 | 41.4 | 58.4 | 59.4 | 59.8 | 60.0 | 504.7 |
| | Corporate Overheads | 44.3 | 44.8 | 45.2 | 46.1 | 180.4 | 47.0 | 48.0 | 48.9 | 49.9 | 50.9 | 51.9 | 477.0 |
| | Timing Adjustments | (8.4) | (32.0) | 42.7 | 39.8 | 42.2 | (0.1) | (2.0) | (7.6) | 51.7 | (23.6) | (9.2) | 51.4 |
| | **Sub Total** | 1,055.2 | 1,211.4 | 1,162.5 | 1,057.3 | 4,486.4 | 1,047.4 | 968.7 | 977.2 | 880.1 | 912.1 | 1,033.9 | 10,305.8 |
| | Lapse | (126.9) | (152.9) | (144.7) | (129.6) | (554.1) | (128.3) | (116.9) | (117.2) | (99.6) | (104.4) | (122.4) | (1,242.9) |
| | **Total** | 928.3 | 1,058.5 | 1,017.8 | 927.7 | 3,932.3 | 919.1 | 851.8 | 860.0 | 780.5 | 807.7 | 911.5 | 9,062.9 |

Proposed long-term capital investment levels shown in Figure 13 are consistent with asset strategy documents. Subsequent to finalizing the asset strategies, capital investment levels were reshaped through the budget development process and reflected in the March 8 kickoff material. Capital investment levels within strategies will be updated consistent with the IPR Final Close-Out Report and prior to finalizing Asset Strategies.

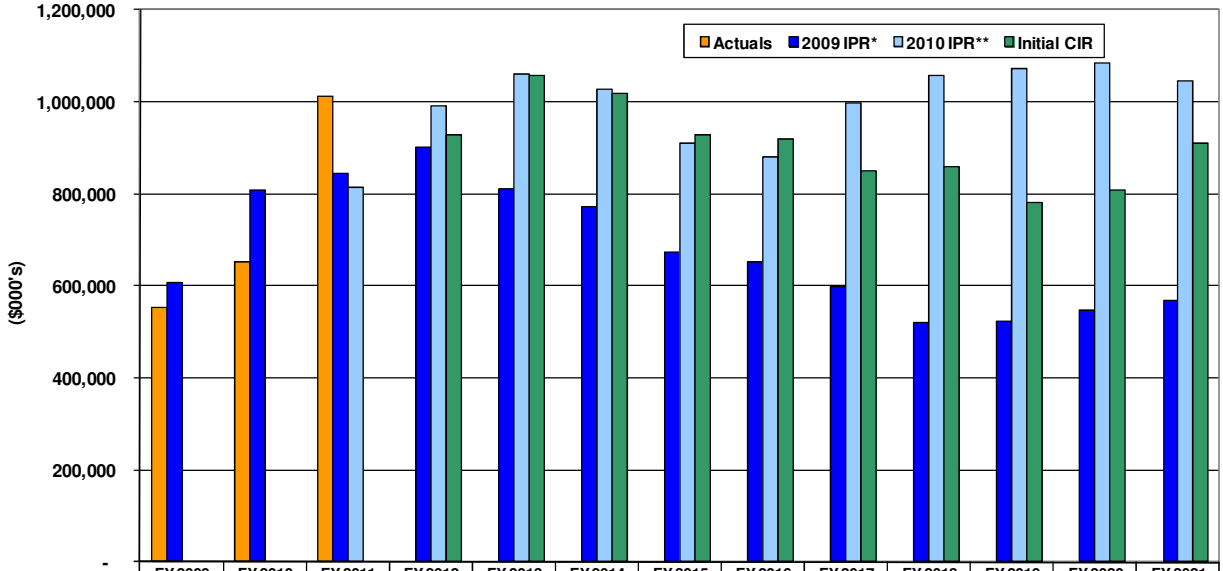
As noted, the investment projections shown in Figures 12 and 13 reflect initial CIR capital investment levels. The Federal Hydro, Transmission, Facilities and Security asset strategies

include preferred alternatives with investment levels that enable reliability risks to be better managed and capacity needs to be met sooner.

- Federal Hydro would retain the capital funding levels set in the 2010 IPR for critical hydro plant replacements.
- Transmission would retain the original schedules for major expansion projects such as the I-5 Corridor Reinforcement and Northern Intertie.
- Facilities' would address space requirements in the Portland/Vancouver area, reduce lease costs, resolve life safety and seismic concerns, and replace aging modular buildings that are nearing end-of-useful life.
- Security would enable compliance obligations to be fully met while also improving agency protection, with savings anticipated from reduced criminal activity and avoided lost productivity.

**Figure 14**

**Comparison of Capital Spending Forecasts**
**(Includes AFUDC, Corporate Overheads and Lapse)**




| | FY 2009 | FY 2010 | FY 2011 | FY 2012 | FY 2013 | FY 2014 | FY 2015 | FY 2016 | FY 2017 | FY 2018 | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Actuals | 553,531 | 651,494 | 1,012,540 | | | | | | | | | | |
| 2009 IPR* | 607,047 | 809,108 | 844,699 | 902,398 | 812,347 | 773,178 | 674,540 | 652,049 | 597,148 | 521,574 | 523,737 | 548,362 | 568,987 |
| 2010 IPR** | | | 815,272 | 992,563 | 1,059,876 | 1,028,778 | 911,133 | 879,448 | 997,406 | 1,058,740 | 1,072,291 | 1,085,921 | 1,044,280 |
| Initial CIR | | | - | 928,349 | 1,058,534 | 1,017,796 | 927,698 | 919,067 | 851,826 | 860,021 | 780,443 | 807,695 | 911,510 |

*FYs 2015 - 2021 are forecasts from the 2009 repayment study
**FYs 2018 - 2021 are forecasts from the 2010 repayment study

Figure 14 compares the 2010 IPR and the proposed 2012 CIR initial capital investment levels.

Before the CIR, a large share of FY 2012-2015 estimated capital spending had been authorized through BPA's capital authorization process.

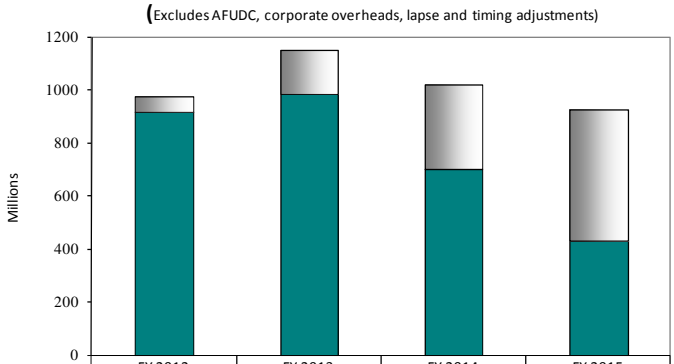
For purposes of Figure 15, "authorized" is defined as projects/ programs that have been presented in a business case and approved through the agency's capital authorization process. Early stage approvals, such as National Environmental Policy Act studies for transmission projects and approval to proceed with alternative analyses for information technology projects, are not considered authorized. Most fish and wildlife and all energy efficiency projects are deemed authorized.

## *Maintenance and other asset-related expenses*

**Figure 15**

**Portion of Capital Programs Authorized**

(Excludes AFUDC, corporate overheads, lapse and timing adjustments)

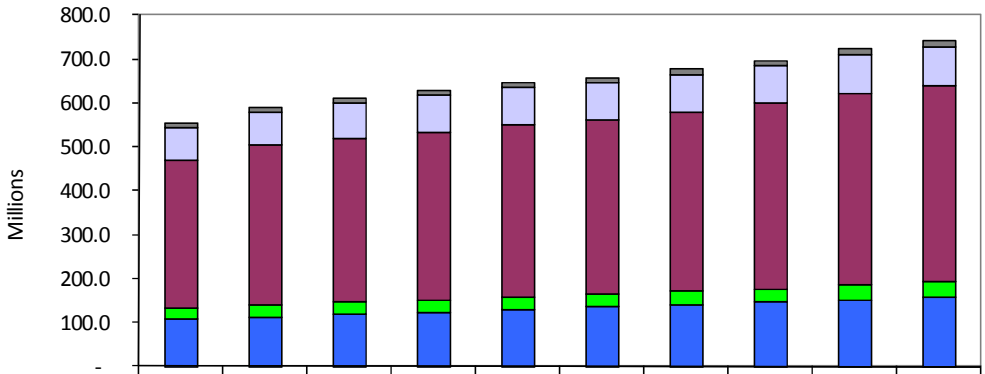



| | FY 2012 | FY 2013 | FY 2014 | FY 2015 |
|---|---|---|---|---|
| Total | 976.4 | 1,150.7 | 1,021.6 | 926.5 |
| Not Currently Authorized | 60.5 | 166.2 | 319.7 | 496.6 |
| Authorized | 915.9 | 984.4 | 702.0 | 429.9 |

Maintenance and some operations activities play a critical role in sustaining the performance and service lives of transmission and power system assets. As assets age, maintenance requirements tend to rise. The rise in maintenance expense can be offset through replacement or refurbishment of assets that are in deteriorating health. Figure 16 depicts estimated spending for asset-related operations and maintenance expenses.

**Figure 16**

Asset Related O&M Expense




| | FY 2012 | FY 2013 | FY 2014 | FY 2015 | FY 2016 | FY 2017 | FY 2018 | FY 2019 | FY 2020 | FY 2021 |
|---|---|---|---|---|---|---|---|---|---|---|
| Total | 552.8 | 589.7 | 610.0 | 628.1 | 645.3 | 655.4 | 676.5 | 695.2 | 722.9 | 740.7 |
| Other | 10.0 | 10.1 | 10.8 | 11.8 | 10.6 | 10.9 | 11.0 | 11.1 | 12.2 | 11.6 |
| Information Technology | 72.6 | 76.9 | 79.2 | 83.4 | 84.4 | 84.5 | 85.0 | 85.4 | 89.5 | 88.7 |
| Federal Hydro | 337.0 | 363.7 | 373.7 | 380.9 | 392.3 | 395.9 | 410.4 | 422.7 | 435.4 | 448.4 |
| Facilities | 25.9 | 26.1 | 28.0 | 28.1 | 28.6 | 29.2 | 29.7 | 30.1 | 34.5 | 35.1 |
| Transmission | 107.4 | 112.9 | 118.4 | 123.9 | 129.4 | 134.9 | 140.4 | 145.9 | 151.4 | 156.9 |

Common planning assumptions used to develop asset strategies and spending forecasts are available online. Common planning assumptions include inflation, overhead cost, market price and other assumptions.

BPA places emphasis on developing and tracking asset performance objectives and targets. The detailed asset strategies include a large number of metrics for tracking asset performance. Additional details on asset performance metrics can be found online.

# TRANSMISSION

# ASSET STRATEGY SUMMARY

# 5 TRANSMISSION

## 5.1 PURPOSE AND SCOPE

The Bonneville Power Administration owns and manages about three-fourths of the region's high voltage transmission assets. BPA's transmission system is the largest of 17 balancing authorities in the Pacific Northwest. This system spans approximately 300,000 square miles and much of four states (with service to four others) and includes more than 15,000 circuit miles of transmission lines and 251 substations. These assets deliver electric power, directly or indirectly, to a Northwest population of more than 12 million through four product categories.

- Transmission service to regional utilities and to commercial, industrial and other loads
- Generation and line and load interconnections
- Interregional transfers of capacity and energy
- Ancillary services, such as regulation and load following services

Transmission Services' Asset Management Strategy provides the roadmap for managing the health, performance, costs and risks of transmission assets owned or leased by BPA. Its strategic ambition is two-fold and ensures.

- that critical existing assets, including transmission lines, substations, control center equipment and other facilities and equipment are ***sustained*** to meet reliability and availability requirements; and
- that ***expansion*** of the system provides the needed transmission capacity and flexibility into the future.

These objectives are to be accomplished while minimizing long-term costs.

## 5.2 BPA'S TRANSMISSION PROGRAMS

### *Sustain existing assets*

Because of the age of the transmission system, the deteriorating condition of some equipment and facilities, and years of underinvestment, serious backlogs of needed replacements have developed. BPA has spent the past two years refining its transmission sustain programs and creating long-term asset strategies to overcome the backlogs and determine an optimized replacement plan. Strategies are developed for:

- Alternating and direct current substations
- Control centers
- Power system control/telecommunications
- System protection and control
- Rights-of-way
- Steel lines
- Wood lines

Sustainment planning is asset driven and takes into account the condition of the assets and the demands placed on them. Each of the program strategies now contains an evaluation of asset health and risk of failure to the system along with a strategy for mitigating the risks. The strategies provide the direction for replacing the most critical assets first.

The challenges facing BPA's transmission sustain programs include managing the risks of an aging infrastructure, including equipment failure and technological obsolescence risks, and managing funding, labor, outage and other constraints to implementation. These challenges are made worse by years of underinvestment in replacing and renewing the system. Some equipment, such as critical communications components, is technologically obsolete. This means that interoperability problems are arising and vendor support and spare parts are less and less available. Some transmission assets are more than 25 percent past their design life, which puts the system's reliability at risk. The capital plan includes investments in each of these programs in order to regain and maintain asset health over the long term and thereby assure the system will perform with the required reliability and availability.

The sustain program strategies, specify an implementation plan to mitigate risks, slow down or eliminate growing backlogs, and reach the optimal steady state of replacements.

### *Expand the system*

BPA's transmission expansion program includes investments to add capacity and flexibility, increase operational output, improve reliability and meet load growth. The expansion program also includes investments to interconnect generation, meet customer service requests and relieve transmission congestion. Projects range from minor upgrades and substation additions to major transmission line additions. Included are projects that are tariff driven or customer requested and that may be funded in part or wholly by customers or a third party (project funded in advance).

Expand investments are divided into four groups:

- **Main grid,** consisting of 500-kilovolt (kV) transmission and substation facilities as well as some 345-kV and a few 230-kV facilities.
- **Area and customer service**, consisting of facilities, typically 230 kV and below, that function primarily to serve customer loads at their request.
- **Interregional paths**, consisting of 500 kV and some lower voltage lines and facilities that interconnect with transmission providers and generating resources outside the Pacific Northwest.
- **Upgrades and additions,** consisting of upgrades to substations, line capacity, hardware, software and other electrical equipment. These include modernization and upgrades to the Celilo Converter Station and the Pacific Direct Current Intertie north of the California-Oregon border.

The expand load service strategy proposes a set of investments to meet expansion requirements as well as to upgrade and modernize a system that is over 70 years old. Currently, several transmission paths are at or near their capacity limits, which can force changes to the optimal dispatch of generating resources and lead to higher regional costs for delivered power. Further, a heavily loaded system constrains the agency's ability to schedule outage time for

needed maintenance, repairs and replacements. The generation interconnection strategy fulfills the need to incorporate and integrate the ramp up in wind and other generating resources. Increased congestion requires that new capacity and flexibility be added to the system to meet tariff and regulatory requirements and provide adequate, efficient and reliable service.

Transmission Services also funds capital investments in information technology, environmental work, nonelectric facilities and security enhancements in support of the transmission program. These investments are addressed in the asset strategies for these asset types due to the unique drivers behind the investments.

## 5.3 TRANSMISSION ASSETS COVERED

**Alternating Current Substations:** 251 Substations and 32,000 major voltage equipments

*Power Transformers and Reactors, Power Circuit Breakers, Circuit Switchers, DC Control Batteries and Chargers. Shunt Capacitors, Current Limiting Reactors, Instrument Transformers, Engine Generators, Surge Arrestors, Fuses, Disconnect Switches, Seismic Hardening, Substation Grounding, Substation Bus and Structures, Low Voltage Station Auxiliary*

**Direct Current Substations:** Celilo Converter Station

*HVDC Converter Station, Static Var Compensators, Fixed Series Capacitor Banks, Thyristor Controlled Series Capacitor Bank*

**Control Center**: 2 Control Centers with 65 + systems

*Real-time Grid control and management systems; Grid and data center monitoring, protection, and alarm systems; CC critical power infrastructure; Non-real-time operations support systems; Commercial Business Systems/facilities*

**Power System Control / Telecommunications:** 732 sites and 11,250 pieces of equipment, 3,000 miles of fiber optic cable

*RAS, Transfer Trip, SCADA, Fiber cable, Comm batteries/chargers, SONET/MW Radios, VHF/mobile/portable radios, UHF, DATS, Multiplex, Power Line Carrier, Telemetering, Operational Networks/NMS, Engine Generators, Supervisory Control Systems, UPS, Telephone systems, Telephone protection, FIN network, Misc support systems*

**Rights of Way:** 266,600 acres of BPA maintained ROW corridors, 295 corridors, 423 transmission lines, 289 substations, 368 communication sites, 19,146 miles of access roads, approx. 80,000 tracts of easement

*Access roads, Roads, Bridges, Culverts, Trails and gates, Tracts of easement*

**System Protection and Control:** 950 locations, 28,391 pieces of equipment, 33 equipment types

*Transformer relays, Bus relays, Line relays, Breaker relays, RAS, Reactive relays, Revenue metering and Control, SER, DFR, Control equip, Load shedding relay, Indicating Meter Transducers, Relay Communications*

**Steel Lines:** 10,660 circuit miles with 43,000 steel lattice towers

*Towers, Connectors, Conductors, Insulator assemblies, Footings, Dampers, Counterpoise*

**Wood Lines:** Approx. 5,000 miles, 336 separate transmission lines with 75,000 wood poles

*Poles, Conductors, Insulator assemblies, Guy assemblies, Fiber optic cable, Line disconnect switches, Ground wire, Counterpoise*

## 5.4 KEY ACCOMPLISHMENTS

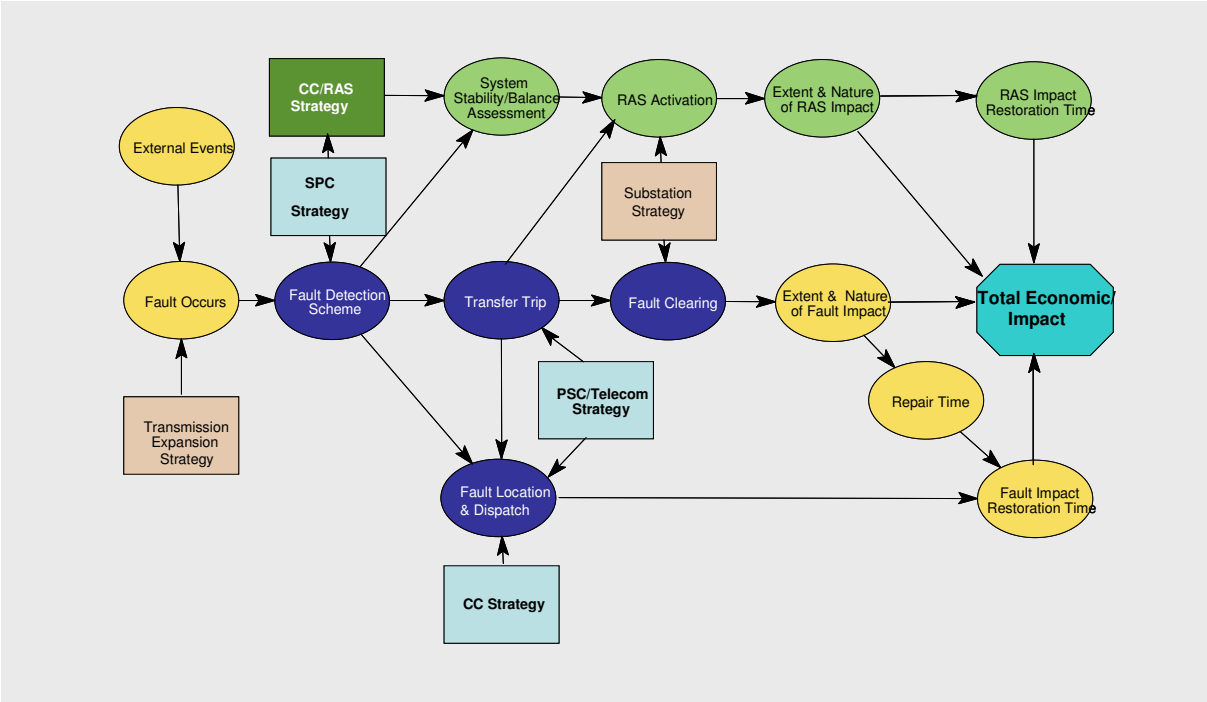
During the 2010 IPR, Transmission Services laid out a set of objectives for enhancing its asset management program. Key objectives included developing asset strategies for sustain programs that were not included in the 2010 IPR and making process improvements in resource planning and project management processes.

### *Asset strategy development*

In addition to the asset strategies presented at the 2010 IPR, strategies have now been developed for rights-of-way, AC substations and power system control/telecom assets.

During the past two years, Transmission Services has begun implementing an economic value-based method (shown in Figure 17) to better determine the level of effort that is needed for each sustain program and the priority that should be assigned when replacing equipment. This new, leading-practice method involves assessing the health condition of equipment, the likelihood of equipment failure and the potential for line derates and outages should equipment failure occur. The method produces a risk-informed prioritized program of replacements and internal process improvements designed to minimize BPA costs and customer value losses from equipment failures over time. Application of the method has been completed for power system control assets, and a project that applies the method to all control system assets is nearing completion. This will be extended to remedial action schemes and other selected assets in FY 2012-2014.

**Figure 17 - Economic Value Based Method**



### *Resource planning*

As a result of a greatly expanded capital program, Transmission Services determined it needed a strategic staffing approach for project execution. The Strategic Capability Planning team was formed in 2011 to increase efficiency in project execution through more effective forecasting and use of staffing resources. An extensive evaluation of the personnel required for implementing various work was conducted and analyzed to determine where capacity exists and where there are constraints. The knowledge gained from this evaluation will drive the development of a staffing strategy based on the availability of key resources required to execute the work plans identified in the asset strategies.

### *Contract Management Office (CMO)*

At the 2010 IPR, the CMO introduced use of an owner's engineer; a pool of engineers, procure and construct firms; and other contracting approaches to complete additional capital projects without increasing federal employee levels. Using these methods, BPA has completed over $30 million in projects so far in FY 2012 and over $171 million of projects in FY 2011. The team projects BPA will complete over $210 million in projects in FY 2012. Further, BPA has initiated a construction administration and inspection contract that has enabled much better coverage of contracted construction and higher quality results. The CMO will continue to assess, improve and expand these approaches to deliver the capital program well into the foreseeable future.

### *Project and program accomplishments*

As a result of significant improvement in project management processes, training and operating procedures, as well as the increased use of CMO-administered owner's engineer contracts, BPA executed 95 percent of its direct capital spending in 2011 as compared to 72 percent in 2010.

## Sustain programs

In FY 2010 and FY 2011, the sustain programs met many key targets toward replacing at-risk assets. In general, the programs achieved what was planned. Some of the accomplishments are noted below.

During the past two years, BPA replaced a total of 2,130 wood poles as part of the life extension portion of the transmission wood line strategy – 1,278 poles in FY 2010 and 852 poles in FY 2011 – in nine wood pole line rebuild projects. As of the end of calendar year 2011, approximately 146 miles of wood pole transmission lines have been rebuilt using owner's engineer contracts.

In FY 2009, Transmission Services discovered that the spacer damper materials installed on approximately 1,700 miles of BPA's system from 2001 to 2008 were defective. After extensive analysis, Transmission Services initiated an aggressive three-year program in FY 2012 to replace all defective units and renewed its commitment to a robust quality assurance/quality control program to minimize this risk in the future. Meanwhile, in FY 2010-2011 the steel lines sustain program successfully replaced over 1,500 miles of spacer dampers. In FY 2011, the program replaced 87 miles of insulators while installing bird dung deflectors on 11 towers.

Support from the right-of-way program is essential to the success of the lines programs. In FY 2010-2011, the right-of-way program successfully completed 97 percent of the access road projects planned in support of the wood and steel lines programs on schedule and within budget.

The 2010 control center strategy identified nine projects to address critical asset risks. Five have been completed – the remaining four will be completed between FY 2012 and FY 2014. Transmission Services made significant improvements in control center program project portfolio management, including project standards and oversight processes, in FY 2011, which will improve program and project visibility and execution performance.

The AC substations program made great progress in replacing key equipment such as circuit breakers, circuit switchers, disconnect switches, transformers, reactors and low voltage auxiliary equipment such as DC control batteries and chargers. The program met all targets while addressing multiple emergency replacements of various equipment including control batteries, instrument transformers, bus risers, switchgear and transformers.

## Expand program

The expansion program efforts have been focused on developing and constructing numerous large projects, many of which were identified during the 2010 IPR process.

**Main Grid:**

- John Day-McNary – a new 79-mile 500-kV transmission line connecting BPA's John Day and McNary substations (energized in November 2011).
- Big Eddy-Knight – a new 500-kV substation (Knight) and a new 28-mile, 500-kV transmission line connecting BPA's Big Eddy 500-kV substation to the new substation.
- Central Oregon Reinforcement – a new 500/230 kV bay at Ponderosa Substation.
- Puget Sound Area Northern Intertie Memorandum of Agreement – a new 500/230-kV bank at BPA's Raver Substation and improved remedial action scheme for the Northern Intertie.
- Lower Mid-Columbia – line and substation upgrade to increase peak rating.
- Forest Grove – addition of 115-kV bay.
- Ostrander – new 500/230-kV transformation.

**Upgrades and Additions:**

- Purchased and installed 500-kV single phase spare transformers at five key substations.
- California-Oregon Intertie Series Capacitor Control and Protection System Upgrade – replaced existing analog controls with new modern digital controls for the series capacitors at Sand Springs, Fort Rock, Sycan, Captain Jack and Alvey substations.
- Pacific Direct Current Intertie Modernization and Upgrade (Celilo) – completed phase 1 work including a technical analysis that defined the scope and performance requirements, a risk analysis and mitigation study, a preliminary design, a refined project cost estimate and a high voltage direct current market analysis.
- The COI communication upgrade migrated from analog microwave to fiber and digital radio communication. Also completed a joint fiber ring in the Puget Sound area with Puget Sound Energy.

**Customer Requested Projects (Projects Funded in Advance):**

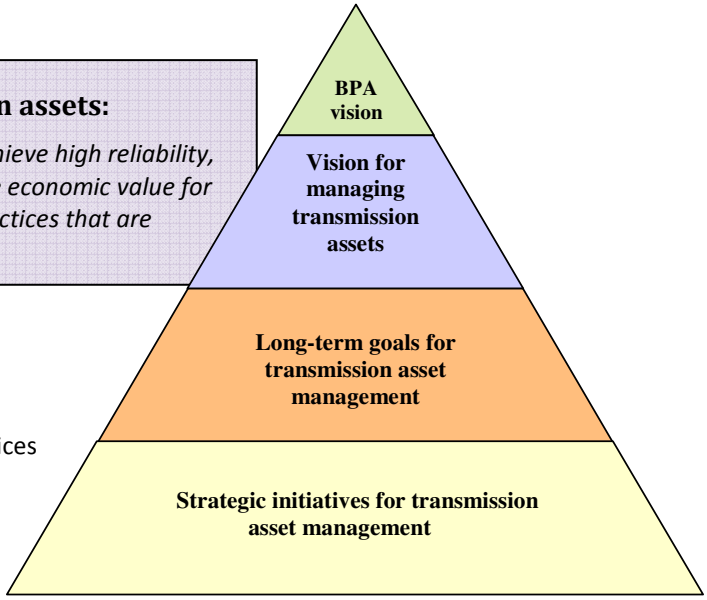
- Spectrum Relocation project – multiyear project will be finished in FY 2013.
- Generator interconnection projects at numerous sites.
- COI addition project – wrapping up work on COI 4800 project.
- Miscellaneous customer requested projects – numerous smaller wind and customer projects.
- Six large generation interconnection projects approved.

## 5.5 Asset Management Objectives

BPA's transmission asset management vision and strategic objectives are derived from BPA's mission, vision and agency-level strategic business objectives.[1] Seven of the strategic objectives are important drivers of this asset management strategy and are detailed in Appendix A in the Transmission Asset Strategy Appendices found online. These strategic objectives drive important long-term goals for managing assets and together with a number of strategic initiatives, form the foundation of Transmission's long-term approach for improving and optimizing its asset management program.

**Vision for managing transmission assets:**

*Transmission Services will manage its assets to achieve high reliability, availability and adequacy standards and maximize economic value for the region. It will use efficient and transparent practices that are effective in managing risks and delivering results.*




### *Long-term goals*

*for improving asset management practices:*

G1 Transmission asset management practices conform to leading practices.

G2 Expansion, replacements, and maintenance are integrated, prioritized in terms of asset criticality and risk, and directed at meeting reliability and other standards at least life cycle cost.

G3 Asset management plans deliver on the transmission asset management strategy through an optimized funding and resourcing plan. Projects are completed within scope, on schedule and within budget.

*for expanding transmission:*

G4 Load service obligations and customer service requests meet standards and tariff requirements.

G5 An integrated regional expansion planning process is implemented

G6 A robust grid that effectively and efficiently integrates diverse energy resources

G7 Inter-regional transfer capacity meets reliability standards and commercial needs

G8 Fuller, more optimal use is made of existing transmission capacity through technological, policy and process change

[1] BPA's mission statement and strategic objectives are available at: http://www.bpa.gov/corporate/About_BPA/

*for sustaining assets:*

G9 Information on asset attributes (condition, performance, and costs) is complete, accurate, and readily accessible

G10 Assets are proactively maintained and replaced

- Maintenance, replacements and sparing integrated
- Priority given to critical assets at greatest risk
- Reliability, availability, and other standards met at least life cycle cost

G11 Maintenance is reliability-centered (condition-based)

### *Strategic initiatives*

Transmission Services approved a set of 18 robust and aggressive strategic initiatives to assure it is on track to meet its long-term goals. The complete list of initiatives can be found in Appendix B.

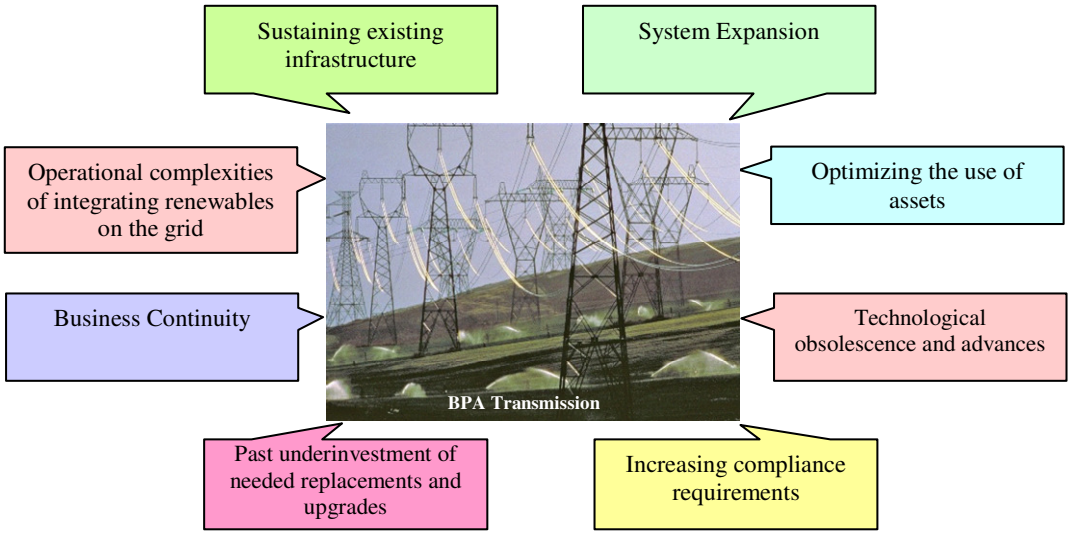
### *System performance measures and targets*

Transmission Services has adopted system performance measures, or metrics, to monitor the overall reliability, adequacy and availability of BPA's transmission system (shown in Figure 18). Most of these measures are included in Transmission Services' annual balanced scorecard for managing performance. The methodology for tracking and documenting the progress on these measures are in Appendix C.

End-stage targets are defined as the "future state" level of performance to be achieved for each metric over time. These system performance measures and targets are supplemented with asset program-specific metrics and targets contained in the sustain and expand program strategies. Reports on BPA's transmission system performance results are in Appendix D.

**Figure 18 - System Performance Measures and End Stage Targets**

| | System Performance Measures | End-stage Targets |
|---|---|---|
| Reliability | **System Average Interruption Duration Index (SAIDI) - Average duration of automatic outage minutes by BPA line category.**<br><br>Provides an indication of BPA's success at minimizing the duration of unplanned transmission line outages.<br><br>Included in Transmission Services FY 2012 balanced scorecard. | No control chart violations per year for line importance categories 1-2.<br><br>No more than 1 control chart violation per year for line importance categories 3-4. |
| Reliability | **System Average Interruption Frequency Index (SAIFI) - Average number of automatic outages by BPA line category.**<br><br>Provides an indication of BPA's success at minimizing the number of unplanned transmission line outages.<br><br>Included in Transmission Services FY 2012 balanced scorecard. | No control violations per year for line importance categories 1-2.<br><br>No more than 1 control chart violation per year for line importance categories 3-4. |
| Reliability | **Report of number of outages to transmission lines of all voltage levels caused by vegetation growing into the conductor or within flashover distance to the conductor. (Relates to vegetation growing from either inside or outside the BPA right-of-way)** | No outages to transmission lines of all voltage levels caused by vegetation growth. |
| Adequacy | **System Operating Limits (SOL) for BPA Paths, Interties, & Flowgates.**<br><br>Number of minutes that actual path flows are near, at or above System Operating Limits. Indicates congested areas for which capacity expansion may merit consideration. | No end-stage target will be set for this metric during this planning cycle. |
| Availability | **Availability for service of BPA's most important transmission lines (Category 1 and 2)**<br><br>Included in Transmission Services FY 2012 balanced scorecard. | BPA's most important transmission lines (Category 1 and 2) are available for service at least 98.0% of the time. |



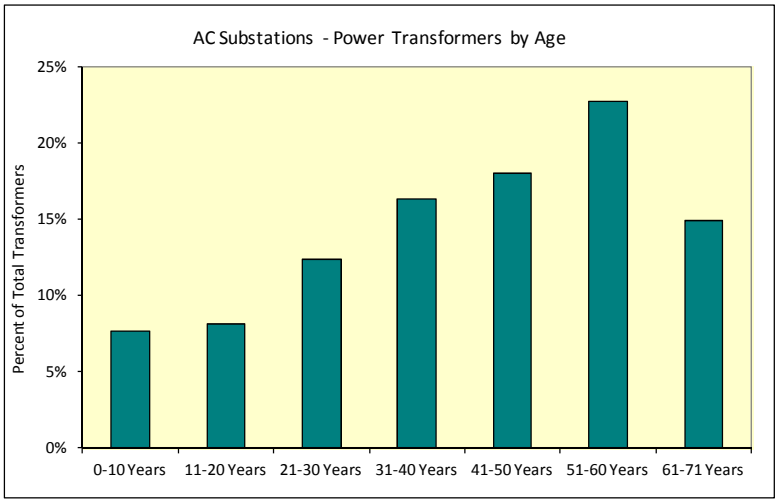

## 5.6 KEY DRIVERS AND RISK

### *Existing infrastructure*

The majority of the transmission system and its high voltage power lines and substations are more than 40 years old. It was designed to move power from known points of dispatchable generation to stable predictable load centers. The environment has changed dramatically over the years and upgrades to the grid are now critical to keeping up with the demands. Insufficient modernization has been performed over the past two decades.

Transmission assets generally have long expected lives. On BPA's system, it's not unusual to encounter transformers, poles or other components that are over 60 years old. Over the years, long asset lives have enabled BPA to push replacements farther and farther into the future. This provided BPA with flexibility to address expansion needs, budget and rate pressures, and unplanned contingencies. However, persistent delay of investment has resulted in a substantial backlog of replacement needs, higher maintenance expense and higher risk of equipment failure and obsolescence.

**Figure 19**

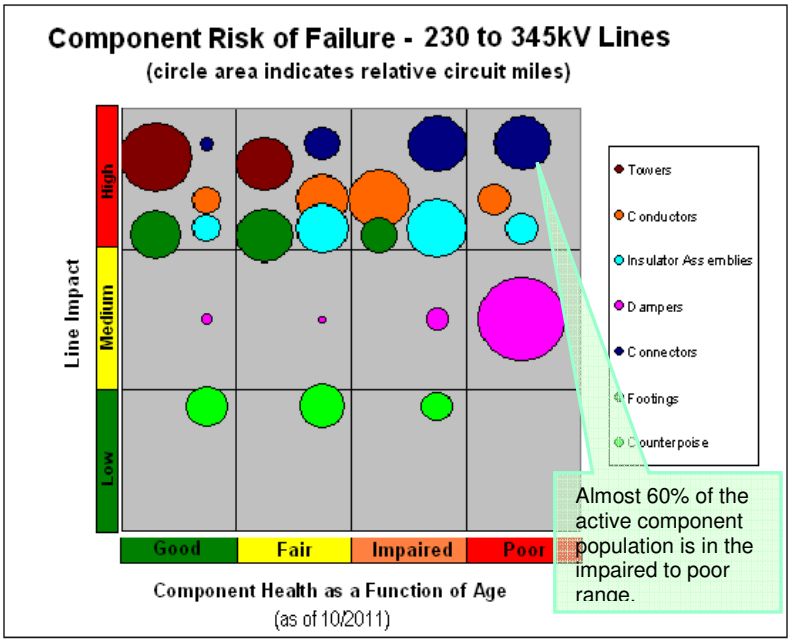



To illustrate, Figure 19 indicates that 40 percent of AC power transformers with an expected life of 45 years are over 50 years old. In 2010, BPA's Transmission organization participated in a benchmarking study conducted by 1st Quartile that compared BPA's line and substation assets and capital program with other North American utilities such as the Tennessee Valley Authority,

National Grid and Pacific Gas & Electric. In general, the results showed that BPA's substations are older than the substations of most other surveyed utilities. Overall, capital spending at BPA is lower than average, and the agency's rate of replacement is lower than most other utilities benchmarked.

Prior years of underinvestment created issues in most of the sustain programs. Although progress has been made, replacement has lagged behind expansion projects, and investment in sustaining the existing infrastructure has not kept up with depreciation. For example, based on system requirements, the power system and control program replacement investments should be approximately $20 million annually. Historically, only $3 million to $4 million has been spent each year on replacements, which has created a perpetual problem of emergency replacements and high maintenance costs.

**Figure 20**




As a result, failures occur that regularly require costly outages with accompanying high emergency response costs. Failures lead to unplanned transmission and customer outages that put the system's reliability at risk (see Figure 20). As part of the integrated control system strategy underway this year, reliability risks from equipment failures and line outages are being monetized and are considered to be a key factor for determining an optimized replacement plan based on total economic cost. While the strategies lay out the plans to address the backlog of repair and replacements, an effort to extend the economic evaluation method beyond the control system assets to line and substations is in the works to fully account for the cost associated with reliability risks. This is paramount to developing a work plan that best mitigates risks at the lowest total economic cost.

### *Technological Obsolescence*

A major challenge facing Transmission Services is the rapid evolution of technology in areas such as communications. The system currently is a mix of analog microwave and Synchronous Optical Network (SONET) digital communications equipment. Migration to a fully digital system is underway but will take approximately eight years to complete. BPA has lagged behind the industry and is feeling the effects of this delay on system reliability. Maintaining system and equipment operability with multiple older vintages of equipment has increased the inventory of equipment needed for spare parts and creates additional instances of equipment failure and system mis-operations. Costs for maintenance and inventory are up substantially as a result. In

addition, while some equipment may still be in fair or good condition, the lack of vendor support and replacement parts makes repairs very expensive and increases the potential for outages of unacceptable duration.

### *New Transmission*

BPA has recently relied on increasing the capability of existing lines through the addition of remedial action schemes, reactive power support and dynamic operating limits. These systems have added to the complexity of operating and maintaining a reliable transmission system.

As utilization of the existing assets increases, operational flexibility can be reduced because planned outages for required maintenance become more difficult to obtain and unplanned outages cause greater disruptions. BPA currently monitors 10 flowgates for transmission congestion. Transmission congestion in real time or on a long-term firm basis may lead to suboptimal dispatch and generation resource development. Present tools for managing congestion are generally limited to actions within the BPA balancing authority.

### *Collaborative projects*

Transmission lines are often discrete investments available in a limited number because of standard designs and operating voltages. The capacity that a single utility needs may be less than the standard increment available. Regional transmission investments can be optimized if multiple utilities partner on a project and share capacity. For example, opportunities to build a more efficient line with a higher operating voltage or a double-circuit configuration may exist in some instances. Therefore, BPA is currently exploring joint participation in multiple regional transmission projects with other utilities.

BPA is a signatory to the ColumbiaGrid Planning and Expansion Functional Agreement. This planning process provides an open stakeholder forum to recommend what should be built, who should build it and who should pay for it. The Puget Sound Area Study Team project is an example of a recent joint project developed through this process.

The timelines for investment decisions on collaborative regional projects and external project proposals may not always align closely with BPA's present budgeting cycles. BPA risks lost opportunities if it is unable to respond to the schedule requirements of potential partners.

### *FERC Order 1000*

FERC Order 1000[2] establishes the following requirements for transmission planning and transmission cost allocation:

- Each transmission provider must participate in a regional transmission planning process that produces a single regional transmission plan and satisfies the principles under Order No. 890.
- Each transmission planning process at the local and regional level must consider transmission needs driven by federal or state laws or regulations.

[2] Transmission Planning and Cost Allocation by Transmission Owning and Operating Public Utilities

- Transmission providers in neighboring transmission planning regions must coordinate concerning more efficient or cost-effective solutions.
- Each transmission provider must participate in a regional transmission planning process that has a regional cost allocation method for new transmission facilities that satisfies six regional cost allocation principles.
- Transmission providers in neighboring planning regions must have a common interregional cost allocation method for new interregional transmission facilities that satisfies six regional cost allocation principles.
- Participant funding of new transmission facilities is permitted but not as part of the regional or interregional cost allocation method.

FERC Order 1000 is likely to be another driver toward increased coordinated and collaborative regional transmission planning. The outcome of future regional planning processes is expected to affect the timing of BPA investment decisions more than it has in the past. BPA is currently working with other ColumbiaGrid members on a compliance filing to resolve the implementation details.

### *Non-wires alternatives*

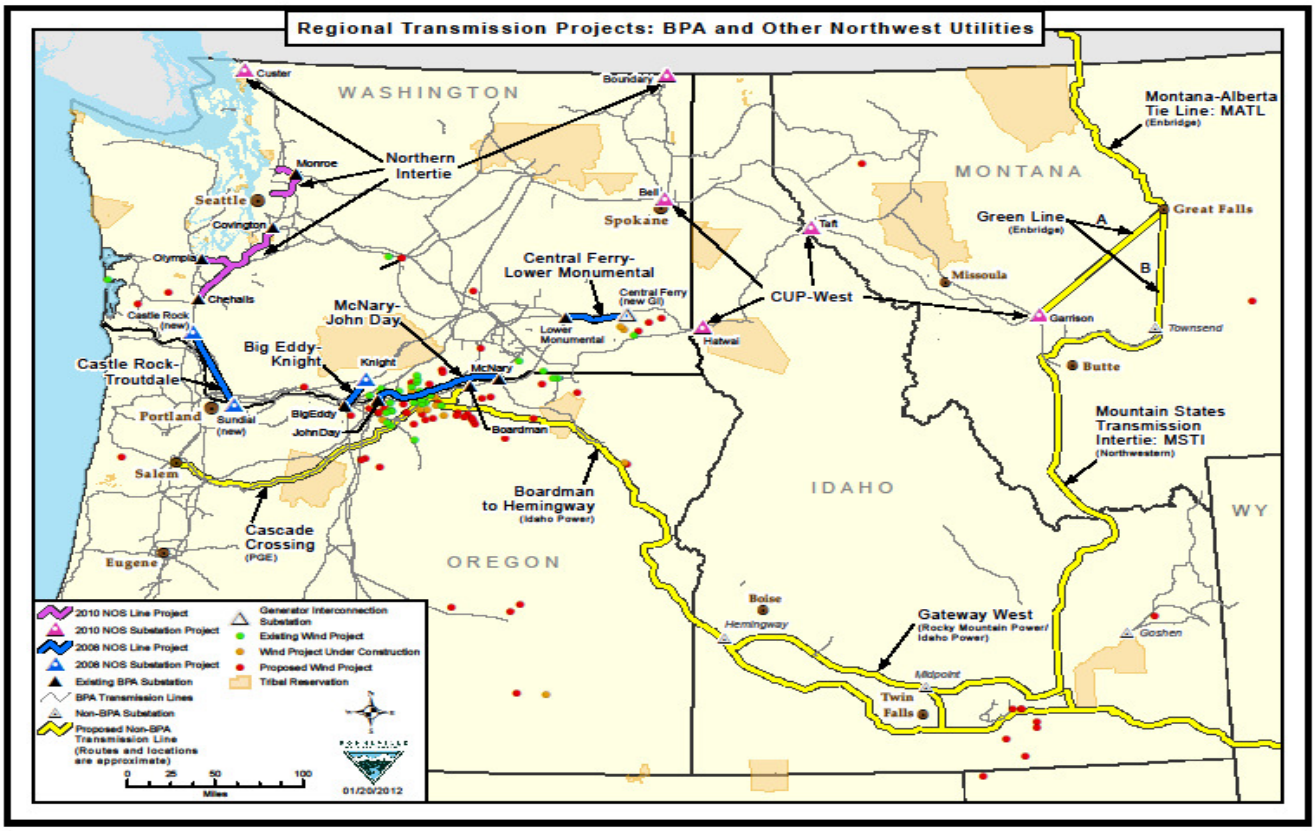
BPA evaluates non-wires alternatives to building or expanding transmission lines to determine if measures such as local generation, enhanced energy efficiency or demand management could meet BPA's reliability and commercial objectives and, thereby, defer construction. Transmission Services determines the preferred alternative from a least-cost and risk-management perspective. BPA has reconvened the Non-Wires Roundtable to review the I-5 Corridor Reinforcement and Hooper Springs projects to evaluate the feasibility of deferral alternatives to the transmission build proposals. Established in 2003, this Roundtable consists of an independent group of energy experts and utility leaders to provide knowledgeable and authoritative input on alternatives to constructing new transmission lines.

Recent experience has shown non-wires analysis needs to be incorporated relatively early in the planning process. When BPA considers non-wires alternatives for future proposed transmission projects, the agency will need to make informed decisions on whether to fund development activities such as permitting and preliminary engineering on both non-wires and wires alternatives while knowing that there could be some sunk costs related to the option that is not selected.

### *Operational complexities of integrating renewables on the grid*

BPA plays a pivotal role in integrating renewable generation in the Northwest. On a percent of load basis, the BPA balancing authority has one of the nation's highest levels of wind penetration. As of January 2012, BPA has interconnected 36 renewables projects totaling approximately 4,300 MW into the transmission grid while building eight substations and seven tap lines. BPA is building or proposing to build three new transmission lines to increase the capacity of the BPA system to meet increased loads and reliability needs and to accommodate new generation sources including wind projects. As shown in Figure 21, the wind resources are geographically concentrated along the Columbia River east of the Columbia River Gorge.

**Figure 21**




For BPA's grid, higher penetration of wind resources has required new operating procedures (for example, DSO-216) to assure reliability is maintained and to address the nondispatchable variability of wind and solar generation. This is particularly challenging during high spring runoff when BPA has limited flexibility with hydro spill levels due to migratory fish passage requirements. Low load conditions and mandatory fish flows (releases of water to increase flows between dams) has become another operational issue for wind projects that is being addressed within BPA. BPA has also initiated several new wind integration efforts to find ways to reduce the operational issues associated with wind generation. Several of these initiatives are now becoming models for other regions as wind generation penetration increases in their areas. Although regional diversity would be beneficial, the cost of new transmission lines far exceeds the costs associated to implement many of the wind integration projects. BPA has developed new rate products as well to assure that those benefiting bear the costs of integrating firmed Pacific Northwest renewable power and maintaining system reliability standards. BPA continues to look for alternatives to reduce the impact of variable generation on the FCRPS's Pacific Northwest preference customers.

The wind resources being added to the BPA control area are greater than the Northwest renewable portfolio standards requirement at this time. Much of the renewable generation is being exported to California under short-term sales to offset the initial cost of the investments Northwest utilities made in wind developments. Some longer term sales are to meet the California renewable portfolio standard. Recent changes in the economic outlook and California RPS policies will slow the rapid growth after this year, but, long term, utilities in Oregon and Washington will need as much as 10,000 MW of qualified renewable generation to meet the

higher renewable portfolio requirements that take effect in 2020. The forecast for wind/renewable generation is shown online.

### *Dynamic transfer capability*

The significant increase in the number of wind projects interconnected to BPA's system has created a need to manage within-hour variability associated with wind resources. To keep the system balanced, BPA must move generation inversely to changes in wind power output. In some instances, BPA customers use BPA's system to balance their wind resources with their own generation. To accomplish this, these customers seek dynamic transfer capability from BPA. Dynamic transfer capability is a transmission system's ability to accommodate dynamic movement of a generating resource within the delivery hour in response to a signal from some other generator (for example, a wind resource) or load.

The dynamic transfers have been relatively easy to accommodate. They have been limited to allowing load service entities to supply regulation or load following service using generating resources that are remote. The generation from the remote resources is transmitted through BPA's system in response to load signals. Such historic uses are characterized by small movements in generation in response to relatively predictable changes in load.

By contrast, movements by generators to balance wind output are significantly larger than movements to balance load variation and are often more rapid as winds pick up or drop off. Accommodating these large, rapid swings in power flows on BPA's system is possible but challenging, particularly with respect to keeping voltage excursions caused by these variations in flow within acceptable limits. In some instances, customers have asked BPA to change its policies from the current limit of dynamic transfer capability awards of two years' duration to awards of perhaps 20 years. Such change in policy may require capital investments in equipment.

Over the next five years, BPA expects the demand for dynamic transfers to increase as more wind is interconnected to BPA's system. To address a regional need for ancillary services to accommodate a large wind fleet, BPA, other balancing authorities and customers are considering creating a regional imbalance market that would facilitate the use of regional generators to supply within-hour imbalance energy to help balancing authorities and others balance wind and other resources as well as load.

A regional imbalance market may create a demand to invest capital in regional transmission systems, including BPA's system, to increase dynamic transfer capability to allow more resources to be moved within-hour. This also would increase BPA's need for capital to invest in growing dynamic transfer capability on its system.

### *Optimizing the use of assets*

As with most other electric grids, the BPA grid was built gradually over 70 years. The system was built to deliver power to fairly predictable loads from very stable and controllable generation resources, primarily hydro based. Today, however, approximately 4,300 MW of wind generation has been installed on the system with a considerably larger amount in the queue that may be installed over the next several years. This variable resource, as well as

substantial changes in policy and regulation, has forced the system to be operated in ways that were not envisioned even 20 years ago.

Today's environment contains far more constraints in outage planning because of the increasing requirements of customers, both direct service and public, and the need to abide by regulations such as recent biological opinions. All these items make the system far more complex and require increasing amounts of real-time data and sophisticated solutions to properly manage the grid. Add to this the amount of time it takes today to plan, perform environmental studies, permit, finance and construct transmission lines, and it becomes imperative to wring the most capacity possible from the existing assets.

### *Increasing compliance requirements*

Each year, BPA is challenged to address changes in regulatory requirements (Federal Energy Regulatory Commission, North American Electric Reliability Corporation and Western Electricity Coordinating Council) that affect operations and reliability. At the same time, it is incumbent upon BPA to meet statutory requirements, comply with open access and stay competitive in an ever changing energy market.

Today, BPA is subject to over 120 mandatory reliability standards, and FERC, NERC and the regional regulatory authorities are actively engaged in auditing entities for compliance and enforcing noncompliance. Enforcement actions typically result in assessment of monetary and nonmonetary sanctions.

Recent FERC changes (and subsequent NERC and WECC changes) in requirements, as well as the growth in new generation, has required significantly more system studies to ensure system integrity and stability. Because of these studies and changes in the loading of various paths throughout the system, Transmission Services has had to replace fault duty breakers, install additional system spares, upgrade transformers and install increased monitoring and control hardware and software.

State and regional requirements also significantly influence operations and maintenance of transmission assets. This includes conforming to environmental standards for handling and disposing material and limiting noise and electrical field strength. Contractual obligations for open access and interconnection responsibilities greatly affect system operations.

### *Technological advances*

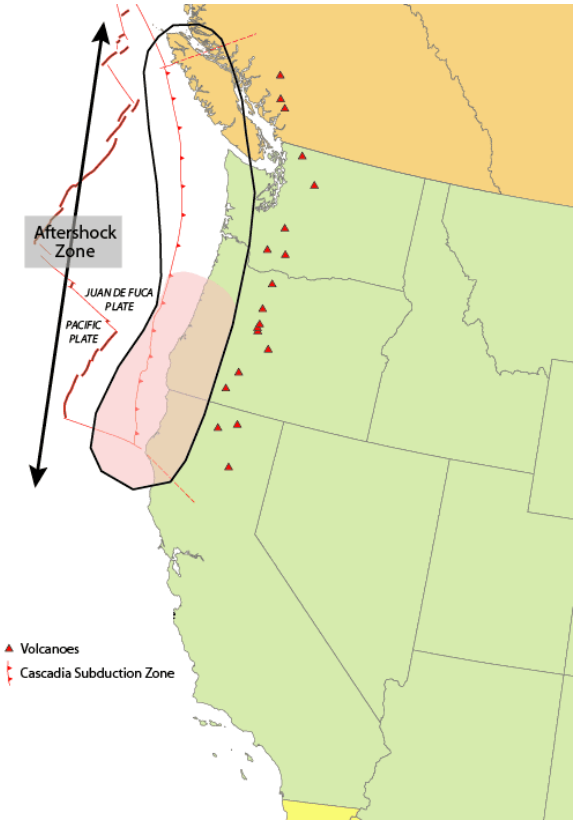
Increasingly, technological advances are influencing electric industry asset strategies. These advances allow BPA to pursue opportunities to improve available transfer capacity. Good examples of the technology include:

- Synchrophasor-based remedial action schemes. This project is scheduled for deployment in 2015. It will be used initially as a safety net, providing voltage and transient stability margin for the AC intertie and the Portland metro area. If it is successful, the scheme could be used to maximize short-term available transfer capability during forced or planned system outages.
- Grid-friendly appliances that use information available at the plug to make useful contributions to grid stability.

- Flexible AC transmission system elements: power electronic-based devices that provide dynamic reactive compensation to the transmission network. Examples include static VAR compensation systems and thyristor controlled series capacitors.

At BPA, new technology and its viable application to BPA's transmission system is evaluated through a Technology Innovation program that invests 0.5 percent of revenues (approximately $15 million annually) in a disciplined program of research, demonstration and development focused on BPA's business challenges.

Figure 22




### *Business continuity*

BPA's electrical transmission system is located within the Cascadia Subduction Zone, widely recognized as a seismic hazard that can produce very large earthquakes of magnitude 9.0 or greater (see Figure 22). This places transmission facilities at risk of potentially severe damage and loss of operation during seismic events. In order to mitigate this risk, BPA adopted a seismic design standard that specifies how to design and strengthen transmission facilities to withstand the hazards associated with seismic activity. The seismic standard provides design requirements that will enable essential electrical facilities to remain in service or be capable of being returned to service in a reasonable and timely manner.

A business continuity program for transmission assets is being implemented in the areas of critical business function redundancy, critical equipment anchoring, rigid bus riser replacement, river-crossing mitigation and building strengthening. The building seismic strengthening program is included in the Facilities Asset Management Strategy.

### *Availability risk*

The growing backlog of age-related replacement work will require an increasing number of planned outages. This, in turn, will reduce transmission line availability. Efforts are underway to create a portfolio management system that enables the sustain programs to better coordinate work during outages to help minimize this availability risk. This project is currently identified as a priority. It will be launched in FY 2012 and is anticipated to take two to three years to complete.

## 5.7 Strategy Proposal

BPA's 2012-2021 asset management strategy for transmission assets is a prioritized set of sustain and expand investments to meet the objectives and drivers identified in this document. The proposed forecast has been updated and reshaped over the past year to keep within the

total and annual capital investment level presented during the 2011 Strategic Capital Discussions. The 10-year investment forecast equals $3.9 billion in direct capital costs,[3] with 46 percent of the direct capital being allocated to sustain projects, 46 percent to expand projects and 8 percent to the Celilo upgrade project. The Celilo upgrade project is estimated at $324 million direct capital costs, an increase of $216 million since the 2010 IPR. With AFUDC and overheads, the total capital cost is estimated to be $428.1 million. Given its criticality, the Celilo project is now being treated separately from other forecast spending estimates due to the large capital outlay required. If included in the initial CIR capital forecast, it would squeeze out many other necessary projects. In addition, the project can be funded primarily from non-Treasury sources and costs will be recovered only from parties benefiting from the California-Oregon intertie.

The transmission 10-year capital program also includes $328 million for customer requested projects (PFIA) and $483 million of capitalized indirect costs. This brings the total capital requirement to $4.7 billion for the 10-year planning period.

In addition, it should be noted that the following projects and initiatives are **not** represented in the current proposed 10-year capital forecast due to spending limitations:

- Network Open Season 2012
- Boardman-to-Hemingway/MISTI (estimated $300-400 million)
- Boardman Substation – Morrow County server load (estimated $30 million)
- Changes to Caribou Substation/Hooper Springs (estimated $29 million)
- Pending Central Ferry-Lower Monumental decision (could result in schedule shift affecting implementation of other projects)
- Regional imbalance market

## Sustain

To meet transmission asset management objectives and respond to the drivers outlined earlier, Transmission Services has developed specific strategies for sustaining the existing transmission infrastructure. Highlights from each of the sustain strategies are included below to provide context to the capital investment levels being forecast for FY 2012-2021. Detailed strategies and supporting asset information can be found in the individual strategy documents.

### *AC substations*

- A long-term strategic approach proactively maintains assets and evaluates them based on evolving reliability centered maintenance principles. Assets will be replaced based on their effective life cycle. Strategic drivers for asset replacement are based on technical obsolescence, limited long-term vendor support, spare parts availability and cost, decreasing equipment operating margins and skilled workforce shortages.
- The strategy is focused on four key areas for all major equipment groups.
    - Performance monitoring and data analysis
    - Maintenance and operations approaches

[3] Does not include investments for fleet, environment, information technology, nonelectric facilities and security enhancements, all covered through separate strategies.

  - Equipment standardization
  - A proper level of equipment spares
- Assets are targeted for replacement based on three key drivers.
  - Asset condition assessment
  - System upgrade (capability/capacity)
  - Asset risk (failure and consequence)

### ***Control centers***

- The strategies to improve control center asset performance are focused on
  - addressing critical asset risks first, as well as high risk asset issues before they reach critical stage;
  - migrating OpenVMS-technology systems such as major control systems to a Windows platform to improve manageability and maintain sufficient software vendor support;
  - ensuring that critical systems meet their established availability targets by taking appropriate maintenance, support and replacement actions;
  - conducting annual asset risk assessments; and
  - developing a two-to-three-year rolling resource plan and sourcing strategies to support sufficiently maintaining and replacing risk assets.
- Asset management improvement strategies include
  - identifying a plan for completing condition-based standards refinements and assessment methodology;
  - identifying availability targets for other assets as appropriate and implementing processes to manage tracking, reporting and responding to them;
  - identifying control center asset management requirements and establishing a plan to address them; and
  - adopting an integrated investment planning process with power system control and system protection and control to address related and dependent assets.

### ***Power system control***

- The strategy is aimed at aggressively reducing the risks of
  - asset failure through surmounting large backlogs resulting from years of underinvestment;
  - interoperability issues by designing and conducting a comprehensive, integrated testing program; and
  - technological obsolescence by developing and implementing a long-term strategy for moving off SONET.
- PSC and telecommunication equipment is upgraded and replaced to enable the agency to deliver on its strategic initiatives, including possible regional imbalance market formation, greater use of dynamic transfer capacity and demand response resources, and changes in scheduling.
- Documentation activities are improved to address backlogs and reduce rework.
- Replacement plans are integrated with system protection and control and associated control center assets.

## *Rights-of-way*

- Vegetation management
  - Implement an integrated vegetative management approach – a system of managing plant communities whereby managers set objectives, identify compatible and incompatible vegetation, consider action thresholds and evaluate, select and implement the most appropriate control methods to achieve set objectives. The choice of control methods should be based on the environmental impact and anticipated effectiveness along with site characteristics, security, economics, current land use and other factors.
  - Assure the highest level of regulatory compliance by adopting the integrated vegetative management approach, which is considered an industry best practice.
- Access roads
  - Implement a systematic long-term method for upgrading and maintaining BPA access to and through rights-of-way corridors. This allows a corridor approach for planning work in support of the wood pole and steel line sustain programs. It also considers bundling projects to allow greater implementation through the owner's engineer contract.
  - Ensure that safe access in compliance with environmental regulations is provided throughout the entire transmission system.
- Land rights
  - Develop a long-term plan to meet program objectives/targets, including reducing backlogs and supporting asset plans for access roads, vegetation and poles/lines. This strategy prioritizes the needs for rights (alternative routes, risk of complaints/litigation/trespass violations, criticality of the line, tribal renewals) in a comprehensive view.

## *System protection and control*

- Over the next 10 years, replace specific populations of equipment groups that are at highest risk of failure or technological obsolescence. Targeting these replacements will mitigate the risks associated with
  - the documented poor health of aged equipment,
  - the lack of manufacturer support for older equipment,
  - the increased corrective maintenance on aged asset population and
  - the challenge of retaining the skill set necessary to work on older equipment models.

## *Steel lines*

- The strategy includes a proactive plan to replace vital overhead system components nearing end of life.
- It sets standard metrics for collecting and retaining asset condition data with enough granularity to identify condition trends, target and pace replacement efforts, manage components over time and better predict remaining service life.
- It standardizes the process for sampling and testing retired components.
- It develops a long-term strategy for evaluating and mitigating a continuously aging asset.

- It incorporates standardized components and technology innovations into replacement efforts.

### *Wood lines*

- The strategy focuses on shifting from individual components of the line, such as wood poles, to an asset life cycle strategy that combines life extension replacement of all of the aged components on the structure and systematic replacement of aged, poorly performing wood pole lines.
- It implements projects on a three-year program schedule to allow adequate time for gaining road rights, acquiring land and materials, and performing NEPA activities.
- It retires old de-energized lines to mitigate safety and liability risks and reduce maintenance responsibility.

## Expand

The expand strategy has been developed to

- meet regulatory requirements,
- improve reliability,
- meet customer service requirements,
- deliver new generation sources and
- upgrade key transmission infrastructure.

Details on the specific expand projects can be found in the Load Service and Generation Integration strategy documents.

BPA spends about $80 million to $100 million annually on upgrades and additions of transmission assets to implement special remedial action control schemes to accommodate new generation and mitigate immediate operational and market constrained paths.

### *Process improvement efforts*

While Transmission Services continues to improve its asset management practices, growth is still needed in critical areas to effectively manage assets and mitigate some of the risks mentioned above. Several improvement initiatives are underway including

- asset tracking tools and systems development,
- resource capability planning,
- outage coordination and
- standardized risk assessment methodology development.

***Asset tracking tools and systems:***

*Transmission Asset System (TAS):* Over the past two years, the TAS project development focused on substations, power system control and system protection and control assets information. This phase of the project concluded in 2011.

In the meantime, Transmission Services has been working on an approach to develop tools for capturing line asset condition information. The business objectives for this approach are

currently being refined and the supporting IT project is expected to begin in the second quarter of FY 2012. In the meantime, until this project can be concluded, the line assets will have to rely on a more manual method of identifying condition trends or predicting service life.

*Asset Portfolio Management ("Endeavor"):* In 2012, Transmission Asset Management is launching an initiative to design an integrated system and set of processes to enable real-time management of asset strategies and resultant projects.

The expected outcome from this effort, called "Endeavor," is a solution that will provide an up-to-date integrated set of data and incorporate consistently applied business processes. It will create a holistic view of current and future projects with visibility of attributes such as location, timing, resource requirements and outage scheduling that is necessary to facilitate optimal planning. It is anticipated that this project will take at least two to three years to completely address all the identified requirements.

### *Resource capability planning*

In order to execute on the asset strategies as designed, adequate staffing levels with the necessary skills are critical. Many of the sustain programs are experiencing implementation delays because of a lack of available resources. The system protection and control sustain program, for instance, has slowed the rate of replacement projects to below the strategy level presented at the 2010 IPR as a direct result of the unavailability of resources. This is in part due to the increased volume of deferred replacements and repairs that Transmission Services is attempting to overcome. Until the aged infrastructure can be updated, emergency projects will continue, thereby affecting the system's reliability, costs and staff availability to an even greater degree. To relieve this constraint, adequate funding for project staffing and maintenance, both preventative and corrective, needs to be provided.

The challenge is not only to have the right number of staff but also to have the right capabilities. The Strategic Capability Planning team is working to close this gap through an in-depth analysis of the resource and capability requirements for program implementation. This will drive the creation of a comprehensive staffing strategy and implementation plan.

***Outage work coordination***: Historically, schedules for work and schedules for outages have not always been aligned, thus creating conflicts and scheduling changes that cause an ineffective use of resources and outages. Some outages are extremely difficult to schedule because of reliability, season or other issues and should/may dictate the rest of the project schedule. This situation does not always facilitate an adequate planning window for all work needing to be performed during the outage.

In order to ensure that BPA can deliver on its transmission system upgrades, improvements and replacements while continuing to maintain a reliable and compliant transmission system, there must be a cohesive process that identifies when outages are a significant constraint to accomplishing the work and a methodology that effectively enables optimized planning and scheduling around those constraints.

BPA's outage team is evaluating these issues and developing a recommendation that will address the challenges in outage planning and coordination. During FY 2012, the team will be

focused on developing recommendations for two areas: coordination of outages in progress and advance planning of outages needed in 45 days to 18 months. An approval from Transmission Services Tier 2 vice presidents will be sought by the end of the second quarter. The team will then move forward on the specifics of the implementation plan. The basic approach is to develop a plan for initiating pilot projects, documenting lessons learned and creating specific processes around these learnings.

***Standardized risk assessments:*** Although many of the risks identified in the asset strategies are common across programs, using a standard evaluation methodology in assessing the impact of the risks is challenging. In the risk assessments of each strategy, every program has evaluated condition assessment, the impact of failures and the age of critical equipment as it relates to expected service life. The approach taken by each program manager has been driven by the availability of adequate data, which differs greatly between programs. With the progression of the Transmission Asset System project to include asset health data on other asset groups in 2013, Transmission Services will be better positioned to create a standard approach for assessing risks across all programs.

## 5.8 PREFERRED ALTERNATE STRATEGY

As described previously in section 5.7, the current expansion strategy is limited by the availability of capital funding. Decisions to implement or defer key projects were driven by priority and limited by affordability. Transmission Services prefers an alternative scenario that proposes to retain the originally proposed timelines for major expansion projects such as the I-5 reinforcement and Northern Intertie projects. This alternative, however, exceeds the established investment level presented to customers in the 2011 Strategic Capital Discussions and puts pressure on sustaining capital availability. Note that this scenario still does not provide funding for the excluded projects in Section 5.7 Strategy Proposal.

## 5.9 PRIORITIZING PROJECTS

### *Background*

Transmission Services has established a set of criteria that prioritizes its capital program toward providing the greatest benefit to BPA and its customers. This criteria should be applied to all capital projects regardless of the project size or financing source and is consistent with the agency's strategic direction, agency policies and transmission asset strategies.

Project prioritization is focused on the *importance* of projects, as distinct from the sequencing and timing of projects. The criteria separate more important projects from less important projects so that the agency's limited funding, staffing, planned outage time and other resources are directed to the greatest benefit over time. The actual sequencing and timing of projects and the allocating of funding and resources occur after projects have been prioritized.

Transmission investment is prioritized under separate criteria for sustain projects and for expand projects. Separate criteria are used because the business drivers for sustain and expand projects are very different. Sustain programs are driven by the need to manage equipment failure, obsolescence, safety, security and other risks so that the system continues

to perform with the reliability, availability, and efficiency that is required. By contrast, expansion projects are driven largely by system capacity and flexibility needs, customer requests and tariff requirements to

- increase capacity to meet load growth and reliability standards,
- meet generation interconnection and customer service requests,
- provide congestion relief,
- meet requirements of the biological opinion and
- capture economic opportunities.

### *Prioritization of sustain projects*

The strategies articulate the condition of the aging transmission system. Critical equipment is at risk of operating failure and technological obsolescence and significant backlogs in upgrades, replacements and maintenance require ramp up and a sustained effort over many years.

A stable, predictable level of funding for replacements and upgrades is critical to managing asset age and health risks efficiently and effectively. To be sustainable, the level of funding should be tied to an objective measure of asset life expectancy and the size and composition of the transmission asset base. Accordingly, total annual funding for sustain investment would be set at the *sum of* two factors.

- Annual depreciation expense (that is, annual depreciation rates as established in the agency's depreciation study *times* gross historical plant).
- Added amounts, as approved by the agency, to compensate for years of underinvestment in select asset groups and to accommodate inflation.

Total annual depreciation expense for transmission assets was $181.8 million in FY 2011. Because sustain program forecast are prepared on a direct expenditure basis, corporate and AFUDC costs estimated at $53.1 million must be removed from the total. The adjusted transmission depreciation total is $128.7 million.

The criteria that follows optimize the use of this capital funding total by prioritizing replacements and upgrades across the eight sustain programs.

**Prioritization principle for sustain**

Highest priority is assigned to replacing and maintaining equipment and facilities with the *highest system impact* (greatest importance) and the *poorest health condition*. These are facilities at greatest risk of

- safety mishap or health issue,
- operational failure,
- technological obsolescence,
- environmental damage or noncompliance, or
- security breach or noncompliance with directives and requirements.

**Determining "system impact":**

System impact reflects the underlying importance or criticality of an asset, regardless of its health condition. It is determined in three steps:

1. *Delineate the transmission lines, substations and other facilities that are strategically and operationally more important from those that are less important.*

   Generally, the higher the voltage of the equipment, the more critical the asset is. BPA's main grid is the 500-kV backbone of the transmission system. It moves bulk power through the system, including power to lower voltage facilities. BPA's reliability criteria impose stricter performance requirements on these higher voltage facilities. For these reasons, Transmission Services generally ranks main grid facilities and equipment highest in terms of transmission asset criticality.

   Transmission lines are ranked based on average system loading and connected substations. Substation assets are ranked by taking into account such factors as

   - station bus voltages,
   - connection to generation,
   - load service,
   - VAR support,
   - status as transmission hub,
   - transformers,
   - remedial action schemes and
   - regional source lines.

   Control center system (cyber) assets are ranked based on the severity of the impact a software or equipment failure would have on operations if interrupted. The Federal Information Security Act Federal Information Processing Standard classification is used to determine the system criticality based on system information integrity, availability and confidentiality. It also identifies whether the asset is a NERC critical cyber asset.

2. *Delineate components of the lines, substations and other facilities that are more important from those that are less important.*

   Not all components of a highly ranked line or substation are critically important, and, conversely, not all components of a low ranked line or substation are unimportant. This step is accomplished through use of component-level ranking criteria developed by subject matter experts in each of the sustain programs. These component rankings are shown in Appendix E.

3. *Delineate components of the lines, substations, and other facilities that provide the greatest reduction to total economic cost.*

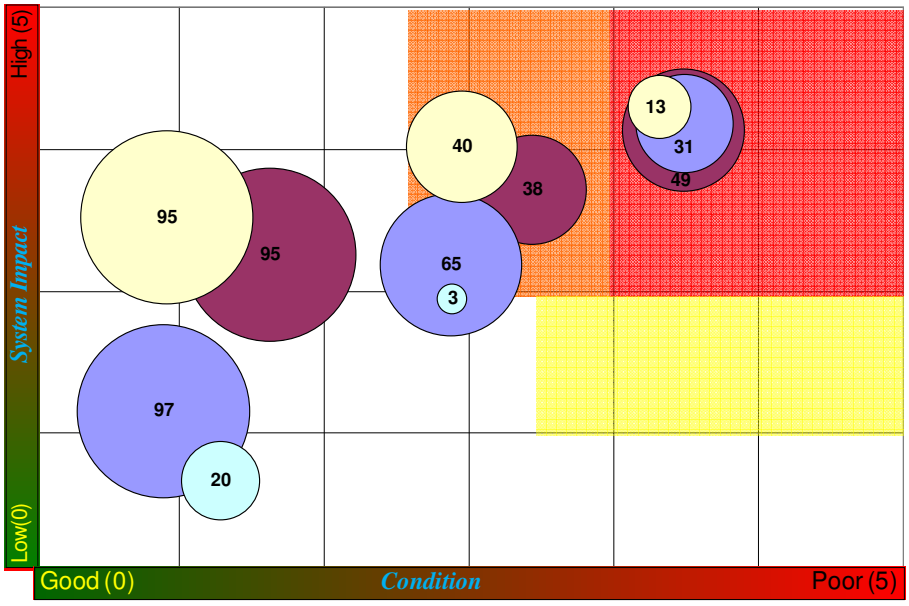
   Total economic cost is defined as the sum of all BPA ongoing costs (labor, materials, cost of inventory and the like) and all costs incurred as a result of planned and unplanned outages (customer societal value losses, fines, collateral damage and the like).

Taken together, these steps delineate the more important components of critical lines, substations and other facilities from the less critical.

The *health condition* of an asset (that is, the risk of operating failure, obsolescence, environmental damage, noncompliance or other "asset health" factors) is determined through inspections, historical and projected failure rates, maintenance and repair trends, and other health assessment techniques and sources. Asset health assessments are collected in the Transmission Asset System or other applications and reflected in asset management strategies for each of the sustain programs.

System impact rankings and asset health assessments are then combined in a risk assessment, as illustrated in Figure 23. The criticality of transmission equipment and facilities is captured on the "System Impact" (Y) axis. The most critical assets are represented by the very high impact end of the axis and the least critical assets are represented by the low end of the axis. The *health* of equipment and facilities is represented on the (*X)* axis of the risk chart.

**Figure 23 - Transmission Risk Chart**




Sustain projects associated with replacing assets that fall in the upper right quadrant of the risk chart (red zone) are assigned the highest priority. These projects represent the most important assets that are at greatest health risk. Projects involving the most important assets that are in marginal and deteriorating health are assigned second priority (orange zone). Projects involving assets that carry a medium criticality but are in poor health are assigned third priority (yellow zone). All other projects are assigned fourth priority.

Generally, there is no numerical scoring or subranking of projects within each of the four zones. Projects in the red zone, followed by projects in the orange zone, should receive priority attention in funding, resourcing, outage planning and materials.

### *Prioritization of expand projects*

Unlike sustain investments; there is not a calculated methodology for determining the level of funding for expand projects. The capital spending for expand program investment can rise and fall year to year depending on system capacity, flexibility and other needs.

Transmission Services proposes to prioritize expand investment in two steps.

- Segregate the expand projects that are mandatory from expand projects that are discretionary.
- Prioritize the discretionary investment using the agency-level criteria and process.

*Mandatory expansion projects are tentatively defined as investments that a law, appropriations act, regulation, tariff or contract requires be made.* Mandatory projects would be limited to investments that, if not made, would likely result in noncompliance. Specifically, mandatory projects would include projects that are required by

- federal statute or appropriations act,
- federal regulation (issued by FERC, NERC, EPA, OSHA and the like),
- executive orders and other executive branch directives,
- judicial orders or instructions,
- contracts that obligate BPA to an investment or
- specific load service obligations or tariff provisions.

Mandatory expansion projects would be assigned highest priority among expand projects.

Those expansion projects that do not meet the mandatory test are deemed to be discretionary and would be subject to priority ranking at the agency level using the criteria specified in section 4.5 Agency Overview: Prioritizing Projects.

### *Sequencing projects*

The highest priority projects are not always the first projects to be implemented. The actual sequencing and timing of projects is based not only on their prioritization but also on such "real world" factors as

- availability of skilled FTE;
- availability of outage time;
- procurement timelines;
- NEPA process timelines;
- contractual commitments;
- efficiencies in making replacements on a combined basis, such as a full line rebuild,
- regulatory directives (with hard deadlines); and
- funding availability and agency affordability.

Emergency or urgent situations take precedence. Emergency or urgent situations are caused by severe weather, sudden equipment failure or other unforeseen events for which investment must be made without delay in order to

- restore load service,
- avoid imminent unplanned outage or curtailment,
- mitigate environmental emergency
- mitigate safety or security emergency or
- avoid significant financial loss to the agency.

In no case will projects be canceled or deferred if the cancelation or deferral would cause a significant violation of reliability, security or other industry standards; tariff requirements; or other legal commitments and requirements.

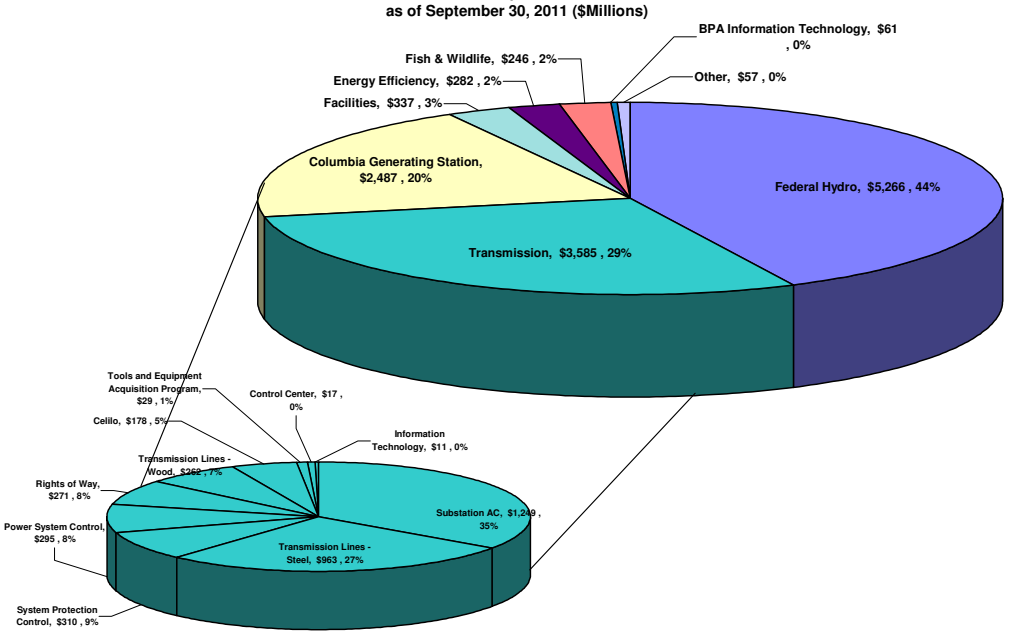
Transmission Services' list of priority projects for the 2012-2015 time frame is available online.

## 5.10 Costs

### *Historical investment costs*

Historical investment in the transmission assets that are in service today totals $6,119 million, or 29 percent of cumulative total investment funded by BPA. Net transmission plant, meaning historical investment less depreciation, totals $3,585 million. Of this net plant total, nearly half is attributable to station equipment and about one-third is attributable to towers, poles, conductors and other overhead line equipment.

**Figure 24** FEDERAL COLUMBIA RIVER POWER SYSTEM & THE COLUMBIA GENERATING STATION
Historical Investment Costs for Assets In-Service
After Depreciation
as of September 30, 2011 ($Millions)




Over the past 10 years, BPA investment in transmission has averaged $321 million per year. Approximately $100 million (31 percent) of this average was for replacements and $221 million (69 percent) was for expansion-related purposes as shown in Figure 25. The higher replacement and maintenance costs in recent years are due to an aging infrastructure, postponed replacement and maintenance work, and the need to reduce backlogs to ensure long-term system reliability and performance.

**Figure 25**

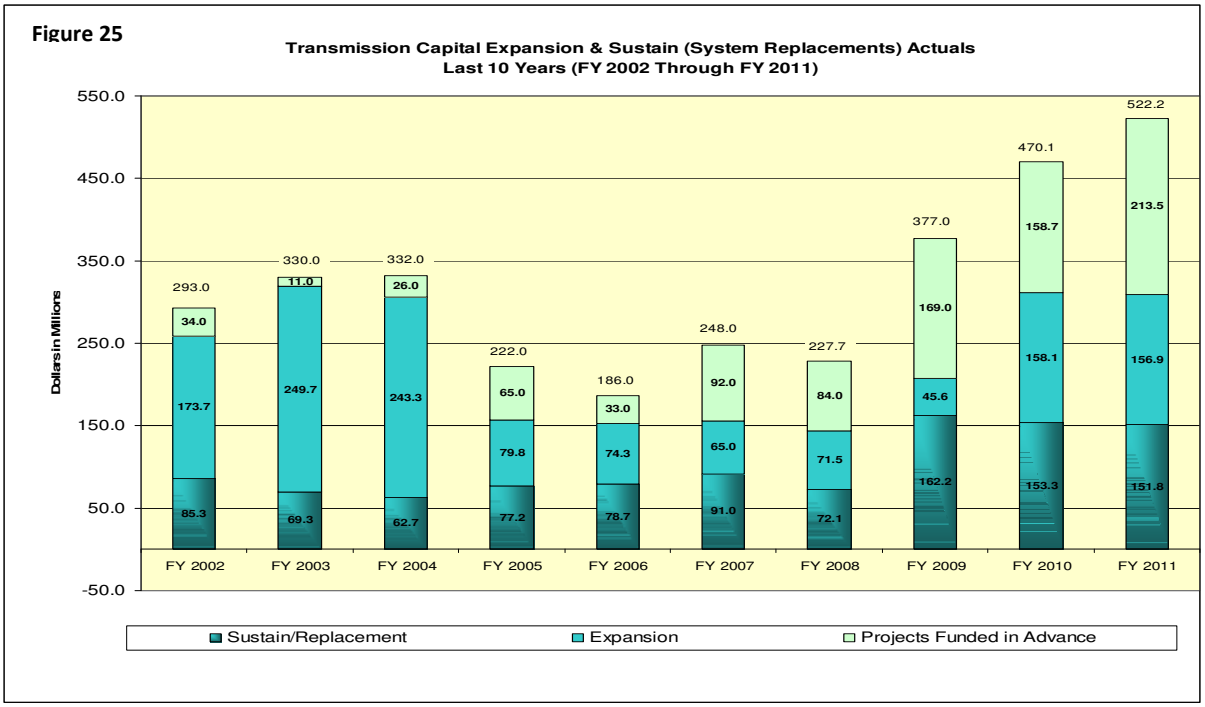
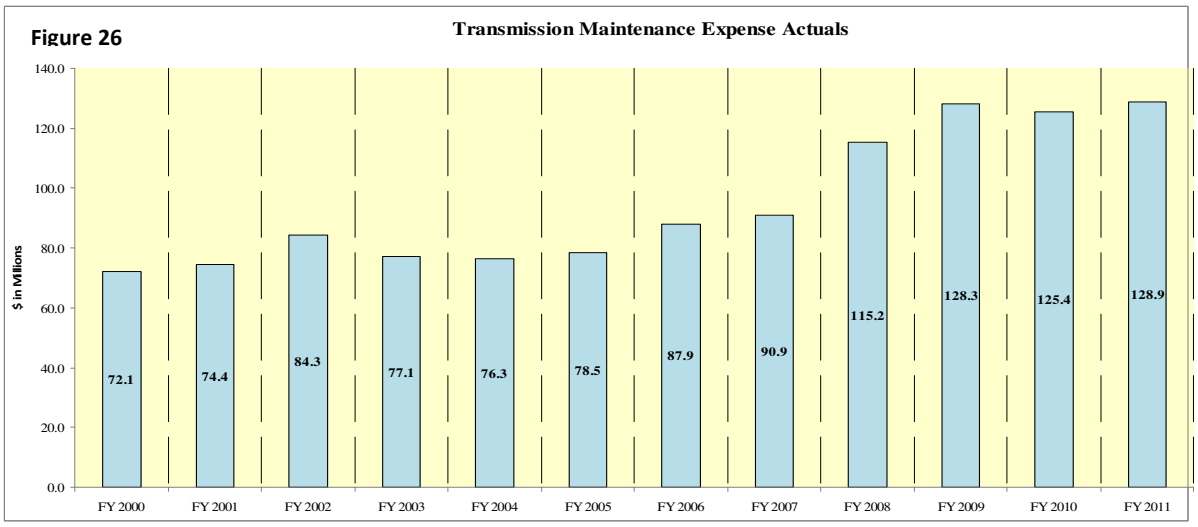



Figure 26 includes all costs charged to the Transmission capital program, including IT, Non-electric facilities, Security, and Environment. These are loaded costs that include overheads and Allowance for Funds Used During Construction (AFUDC). Projects Funded in Advance (PFIA) are projects where BPA owns or controls the assets, but the asset or asset additions are funded by customers in advance of construction. This category includes all customer financed projects including Master Lease projects.

Asset-related expenses, including depreciation and interest on capital investment and maintenance expense (shown in Figure 26), make up about 61 percent of BPA's transmission revenue requirement. If system operation, environmental and scheduling expenses are also factored in, this percentage increases to about 76 percent.

**Figure 26**



## Forecast capital costs

The planning forecast presented here represents the current estimate driven by known priority expansion and replacement projects. The annual forecasts take into account constraints in capital funding availability.

It should be noted that the individual sustain program strategies contain optimized replacement programs and funding levels that were developed to best mitigate the risks and, therefore, may not match the currently constrained capital investment levels. Each program is under review to determine a revised implementation plan that will align with capital availability, priorities and resource constraints.

**Figure 27**

| | Current rate period | | Next rate period | | 4-Year Total | | | | | | 10-Year Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | FY 2012 | FY 2013 | FY 2014 | FY 2015 | | FY 2016 | FY 2017 | FY 2018 | FY 2019 | FY 2020 | FY 2021 | |
| **Capital Investment** (excluding AFUDC and Corporate Overheads) | | | | | | | | | | | | |
| **Transmission** | | | | | | | | | | | | |
| Sustain Programs: * | | | | | | | | | | | | |
| AC Substations | 18.2 | 40.8 | 39.7 | 25.9 | 124.6 | 17.2 | 18.0 | 23.2 | 23.2 | 23.2 | 23.2 | 252.6 |
| DC Substations | 11.3 | 11.3 | 7.2 | 4.5 | 34.3 | - | - | - | - | - | - | 34.3 |
| Control Center | 3.8 | 7.3 | 7.4 | 7.6 | 26.1 | 7.7 | 7.8 | 7.0 | 7.0 | 7.0 | 7.0 | 69.6 |
| Power Systems Control and Telecom. | 22.1 | 85.1 | 70.0 | 59.0 | 236.2 | 47.7 | 29.6 | 37.3 | 37.3 | 37.3 | 37.3 | 462.7 |
| Rights of Way | 24.1 | 26.1 | 23.4 | 23.6 | 97.2 | 17.7 | 17.7 | 11.3 | 11.3 | 11.3 | 11.3 | 177.8 |
| System Protection and Control | 7.4 | 26.2 | 29.0 | 28.1 | 90.7 | 34.8 | 28.3 | 21.7 | 21.7 | 21.7 | 21.7 | 240.6 |
| Steel Lines | 32.7 | 28.4 | 16.5 | 12.6 | 90.2 | 12.9 | 13.1 | 11.5 | 11.5 | 11.5 | 11.5 | 162.2 |
| Wood Pole Lines | 29.1 | 43.5 | 59.0 | 40.1 | 171.7 | 38.1 | 40.9 | 36.0 | 36.0 | 36.0 | 36.0 | 394.7 |
| TEAP Tools | 0.9 | 1.0 | 1.0 | 1.0 | 3.9 | 1.1 | 1.0 | 1.1 | 1.0 | 1.1 | 1.1 | 10.3 |
| Subtotal | 149.6 | 269.7 | 253.2 | 202.4 | 874.9 | 177.2 | 156.4 | 149.1 | 149.0 | 149.1 | 149.1 | 1,804.8 |
| Expand Program: | | | | | | | | | | | | - |
| Main Grid | 216.1 | 158.3 | 112.6 | 116.8 | 603.8 | 189.6 | 160.0 | 163.0 | 43.0 | 74.0 | 194.0 | 1,427.4 |
| Area and Customer Service | 13.2 | 27.3 | 17.5 | 12.1 | 70.1 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 130.1 |
| Upgrades and Additions | 53.7 | 28.9 | 23.0 | 19.0 | 124.6 | 21.5 | 21.4 | 17.5 | 17.0 | 16.5 | 16.0 | 234.5 |
| Subtotal | 283.0 | 214.5 | 153.1 | 147.9 | 798.5 | 221.1 | 191.4 | 190.5 | 70.0 | 100.5 | 220.0 | 1,792.0 |
| PDCI (Celilo) Upgrade Project | 1.3 | 85.4 | 116.1 | 93.6 | 296.4 | 27.6 | - | - | - | - | - | 324.0 |
| Transmission Indirects (Capitalized) | 41.5 | 45.6 | 46.1 | 47.0 | 180.2 | 47.9 | 48.9 | 49.9 | 50.9 | 51.9 | 52.9 | 482.6 |
| Customer Service Projects | 45.2 | 45.0 | 35.0 | 25.0 | 150.2 | 25.0 | 25.0 | 32.0 | 32.0 | 32.0 | 32.0 | 328.2 |
| Total | 520.6 | 660.2 | 603.5 | 515.9 | 2,300.2 | 498.8 | 421.7 | 421.5 | 301.9 | 333.5 | 454.0 | 4,731.6 |

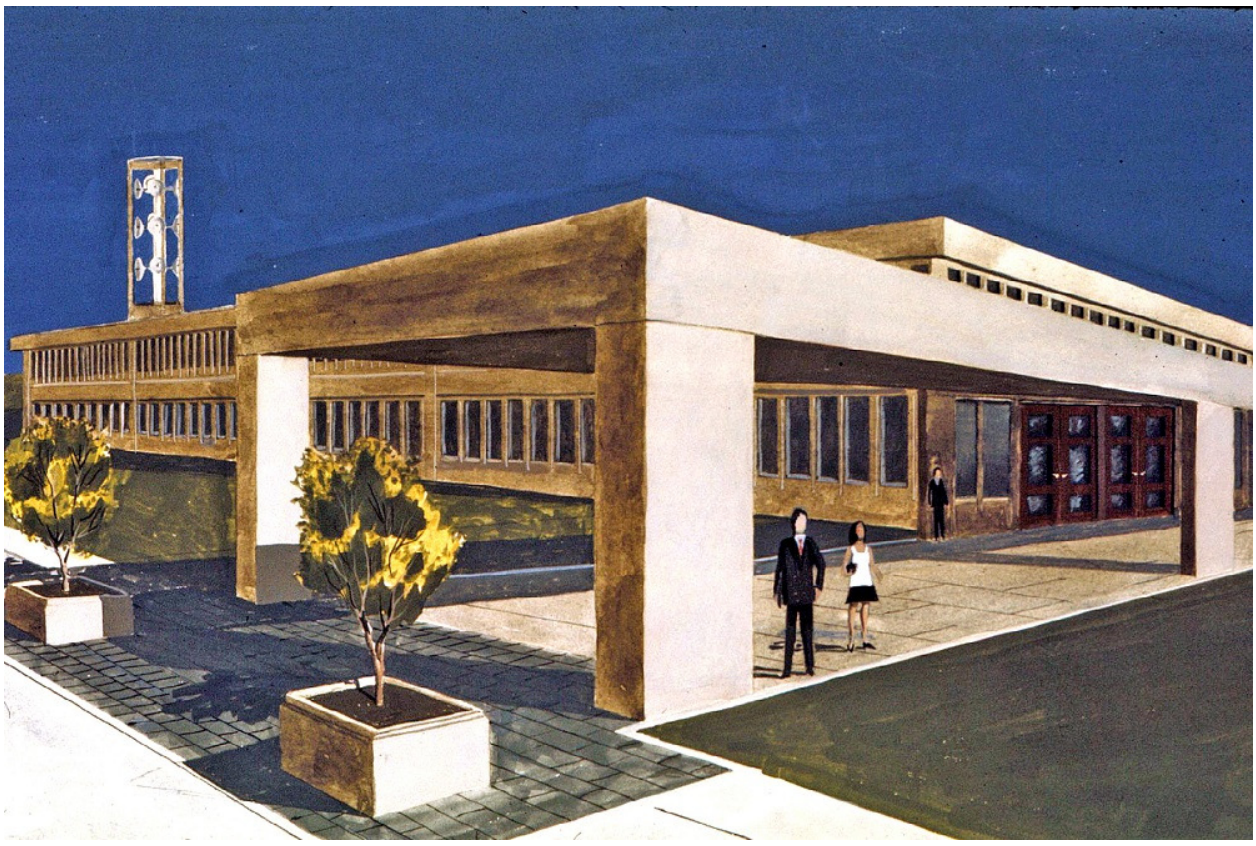
## Forecast maintenance costs

**Figure 28**

| | | Current rate period | | Next rate period | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Actuals FY 2011 | FY 2012 | FY 2013 | FY 2014 | FY 2015 | 4-Year Total | FY 2016 | FY 2017 | FY 2018 | FY 2019 | FY 2020 | FY 2021 | 10-Year Total |
| **Transmission** | | | | | | | | | | | | | |
| Joint Cost Maintenance | 0.1 | 0.1 | 0.1 | 0.0 | 0.0 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.4 |
| Power Systems Control Maintenance | 12.0 | 12.5 | 13.0 | 13.5 | 14.0 | 53.0 | 14.5 | 15.0 | 15.6 | 16.1 | 16.6 | 17.1 | 147.8 |
| Rights of Way Maintnenance | 10.4 | 11.9 | 13.5 | 15.0 | 16.6 | 57.1 | 18.1 | 19.7 | 21.2 | 22.8 | 24.4 | 25.9 | 189.2 |
| Vegetation Management | 11.8 | 13.4 | 14.9 | 16.5 | 18.0 | 62.7 | 19.6 | 21.1 | 22.7 | 24.2 | 25.8 | 27.3 | 203.3 |
| Substation Maintenance | 25.5 | 26.5 | 27.5 | 28.5 | 29.5 | 112.1 | 30.5 | 31.5 | 32.5 | 33.5 | 34.5 | 35.5 | 310.3 |
| System Maintenance Management | 5.3 | 5.1 | 5.0 | 4.8 | 4.6 | 19.5 | 4.5 | 4.3 | 4.1 | 4.0 | 3.8 | 3.7 | 43.9 |
| System Protection and Control Maint | 11.4 | 11.8 | 12.2 | 12.7 | 13.1 | 49.8 | 13.5 | 14.0 | 14.4 | 14.8 | 15.3 | 15.7 | 137.5 |
| Technical Training | 2.5 | 2.5 | 2.5 | 2.4 | 2.4 | 9.8 | 2.4 | 2.4 | 2.3 | 2.3 | 2.3 | 2.3 | 23.8 |
| Transmission Line Maintenance | 22.9 | 23.6 | 24.2 | 24.9 | 25.5 | 98.2 | 26.2 | 26.8 | 27.4 | 28.1 | 28.7 | 29.4 | 264.8 |
| Total | 101.9 | 107.4 | 112.9 | 118.4 | 123.9 | 462.4 | 129.4 | 134.9 | 140.4 | 145.9 | 151.4 | 156.9 | 1,321.0 |

# FACILITIES

# ASSET STRATEGY SUMMARY



# 6 FACILITIES

## 6.1 PURPOSE AND SCOPE

There is growing recognition across the world that infrastructure providers cannot just focus on meeting business needs through investment in asset creation without recognizing the long-term costs of ownership, operations and maintenance, and, finally, rehabilitation, replacement or retirement. This awareness has led to the evolution of the asset management standard that encompasses:

- Providing a defined level of service and monitoring performance.
- Managing the impacts of growth through demand management and infrastructure investment.
- Taking a life cycle approach to developing cost-effective management strategies to meet those defined levels of service.
- Identifying, assessing and managing risks.
- Having a long-term financial plan that identifies required expenditures and how it will be funded.

### *Facilities Asset Management at BPA*

Facilities Asset Management was formed in 2006 in response to the BPA Asset Management Enterprise Process Improvement Plan. Facilities Asset Management is responsible for planning and management oversight of nonelectric facilities as well as for site-development systems such as fences, parking lots, sidewalks and driveways.

Clarity about which assets are classified as nonelectric and about Facilities Asset Management's responsibilities continues to evolve. This lack of clarity has been identified as a gap in the current program. However, for the purpose of this document, nonelectric facilities are defined as:

***All site buildings, their associated mechanical, structural, and utility systems, surrounding grounds and other fixed improvements upon the land within the sites controlled by the agency. Components that directly generate, transmit, or control marketed/high voltage power or station service are excluded as are electrical support systems for the control centers, and the initial funding and construction of new facilities/upgrades driven by transmission system needs.****

*Currently, leased facilities such as the BPA Portland headquarters building are not part of the Facilities Asset Management program.

The majority of BPA's nonelectric facilities are operated and maintained by Transmission Services and directly and indirectly support Transmission's core business.

At the time the facilities asset category was created, nonelectric facilities, historically known as the nonelectric plant program, existed in a predominantly Transmission-centric culture. Asset development, maintenance and financial planning did not necessarily involve a detailed assessment of existing or future needs or impacts. Investment, re-investment and maintenance

plans were usually an exercise in fitting tasks or projects into available budgets with minimal strategic guidance or anticipation of potential changes in the operating environment. The resulting decisions were often to defer maintenance on nonelectric facilities in order to limit near-term costs and to target or redirect funding to critical electric transmission programs. In many cases, only the minimal repairs and emergency replacements necessary to keep the nonelectric facilities operational were performed. This way of doing business continued for over 10 years, and, as a result, the backlog of maintenance and repair grew significantly and drove facility reliability to unhealthy and, in some cases, unsafe levels.

The nonelectric facility portfolio currently consists of 1,013 buildings such as control houses, data centers, office buildings and storage facilities at 434 sites located across the agency service area of 300,000 square miles. The building portfolio has an estimated replacement cost of $750 million.

Facilities is currently inventorying its non-building assets such as land; fixed cranes; fences; pavements; water distribution, storm and sanitary sewer systems; and other site improvements. The inventory is scheduled to be complete in the FY 2013. Early indications are that the replacement cost for this component of the asset base is approximately $400 million. The replacement value of the entire nonelectric facility portfolio is roughly $1.15 billion.

## 6.2 Program Assets Criticality and Priority

The criticality, or importance, of facility assets depend on their role in the operation of the power marketing/delivery system and in ensuring business continuity. Facilities Asset Management has defined asset criticality by asset types rather than by individual sites. This provides more granularity and better targeting of limited resources. Five asset priority levels have been identified, as shown in Figure 29.

**Figure 29 – Facilities Program Assets**

| Importance Level | Asset Grouping | Asset Type | | |
|---|---|---|---|---|
| 1 | Utility 1 | Control Center<br>Data Center | Control House<br>Microwave |  |
| 2 | Utility 2 | Control House<br>Control/Maintenance<br>Relay House | Microwave<br>Engine Generator<br>Buildings |  |
| 3 | Office, Maintenance and Special Purpose | Office - Guard Station<br>Storage - Fuel and Haz Mat<br>Maintenance HQ<br>Office - Business Critical | Storage - Special<br>Maintenance Shop<br>Administration<br>Meter Houses | |
| 4 | Storage | Other - Pump House<br>Office - Classroom / Training<br>Site Utility Storage<br>General | Material & Equipment<br>Vehicle<br>Transportation<br>Research |  |
| 5 | Other | Oil House<br>Other<br>Rental | Untanking Tower<br>Abandoned | |
| **Non-building asset types:** | | | | |
|  | | Pavement<br>Septic Systems<br>Storm Water Drains | Fences<br>Wells |  |

## *Building Systems criticality*

Just as each asset grouping has varying levels of prioritization, each system within an asset grouping poses a different risk to the operation of the building. The criticality of systems reflects the role that a system plays in keeping an asset functioning safely, efficiently and reliably.

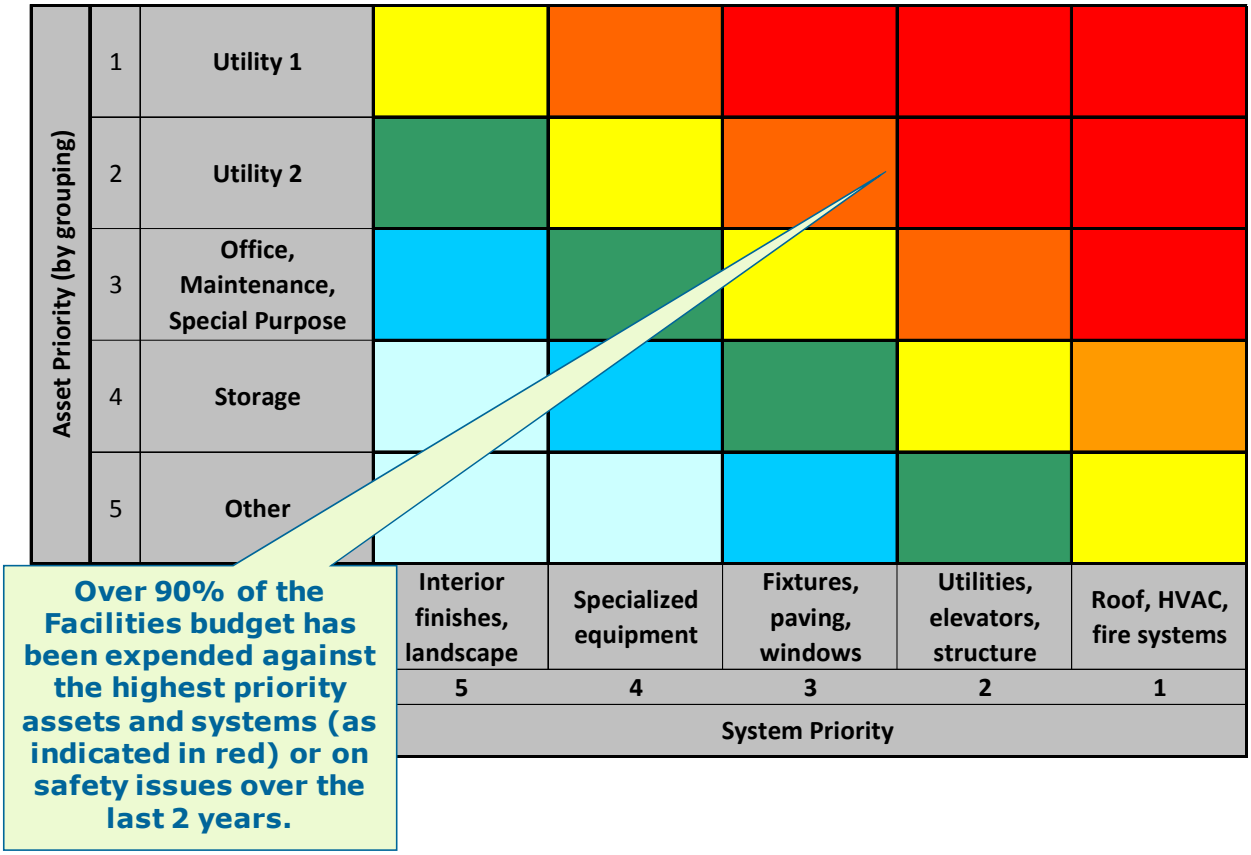
**Figure 30 – System Priorities by Category**

Blue area highlights examples of systems FAM would repair or replace as a high priority

| System Category | System Priority | | | | |
|---|---|---|---|---|---|
| | Priority 1 | Priority 2 | Priority 3 | Priority 4 | Priority 5 |
| Substructure, Shell, Interior Construction, Special Construction, & Finishes | Roof<br>Exterior Doors<br>Superstructure | Exterior Walls<br>Stairs | | Foundations | Interior Walls<br>Interior Finishes<br>Ceilings |
| Electrical, Plumbing, & Fire Protection | Domestic Water<br>Emergency Light & Power<br>Fire Protection | Branch Wiring<br>Lighting Equipment | Restroom Fixtures<br>Drinking Fountains | Roof Drainage | Natural Gas Distribution |
| Communication & Security | Security Alarm & Detection | Public Address | | | |
| Heating, Ventilation, & Air Conditioning | Heat/Cooling Units<br>Controls | Gas Supply | Air Distribution<br>Exhaust Fans | | |
| Equipment & Conveying Systems | | Elevators<br>Wheelchair Lifts | Warehouse Equipment | Kitchen Equipment<br>Central Vacuum | Vehicle Lifts<br>Power Washing |
| Site Development, Utilities, & Site Construction | Fences / Gates | Site Lighting<br>Water Supply | Parking Lots | Sidewalks | Landscape |

Asset and system importance, along with the condition or health of the asset, drives the primary prioritization methodology and is reflected in the actual allocation of funds expended over the last two-year period:

**Figure 31 – Facilities Risk Map**




## 6.3 The Strategy

The Facilities Asset Management strategy provides the guidance necessary to deliver a total solution for the nonelectric facilities asset portfolio that

- fully meets all operational performance requirements,
- is compliant with all regulatory and voluntary policies and
- is at the lowest cost practicable.

The scope of this program spans the entire life cycle of the assets (create/acquire, operate and maintain, renew/dispose).

Facilities Asset Management will create a cross-agency program that

- employs a tightly defined set of criteria for making asset-related investment decisions;
- aligns responsibilities and accountabilities;
- provides the guidance standards for asset planning, design, construction and care; and
- is tightly linked and aligned to the strategic objectives of the agency.

## 6.4 KEY ACCOMPLISHMENTS

Since the 2010 IPR, Facilities Asset Management has, through its strategic partners in Transmission Engineering and Transmission Services, invested over $30 million in repairing or replacing critical facilities in the BPA system. Facilities Asset Management has

- invested over $4.4 million in new or rehabilitated roofs;
- executed almost $2.5 million in HVAC system replacements, upgrades or repairs;
- completed seismic upgrades at 11 critical buildings at a cost of over $3.4 million;
- repaired and upgraded the entire switchyard storm drain system at Port Angeles, Wash; and
- executed over $2.8 million in roads and parking upgrades and repairs.

In the building replacement/additions area, Facilities Asset Management has invested over $19 million in capital construction projects that include

- a new heavy mechanical equipment maintenance shop in Spokane, Wash.;
- a complete modernization and asbestos remediation at the control house at Santiam Substation located near Salem, OR;
- a new water distribution system at the Covington Substation in Kent, Wash., that replaced a 70-year-old system; and
- a new helicopter hangar in Redmond, OR.

In addition to direct facilities work, Facilities Asset Management has made progress in improving the overall management of the program. Facilities Asset Management has

- created a design standard, or “guiding principles,” document that will drive the development and/or rehabilitation of BPA’s maintenance headquarters in a consistent, sustainable, economical and efficient manner;
- adopted the International Building Codes, which will result in a portfolio that is more consistent and more compliant;
- completed an assessment of current operations and maintenance practices; and
- developed a life safety manual that gives guidance in resolving egress issues in BPA’s unique buildings that building codes do not address.

## 6.5 OBJECTIVES

The overall long-term objective of the Facilities Asset Management group is to ***optimize,*** or fully leverage, the asset portfolio to provide reliable, sustainable nonelectric assets that fully meet current and future agency business needs and ensure performance and condition standards that comply with all applicable regulations while minimizing the life cycle costs.

The Internal Business Services organization has adopted long-term objectives and plans to initiate a benchmarking effort to establish key metrics that will enable BPA to track the performance of assets over time. BPA has not yet selected the specific measurements that will be adopted but has identified metrics for consideration and verification through a benchmarking process that will be completed by the end of this fiscal year.

The four long-term objectives are listed below with examples of milestones and performance metrics to be considered.

- **Systems are in place to assess the health and performance of assets**
  - Health: an inventory of the nonelectric facilities portfolio is completed.
  - Health: processes and resources are in place to inspect the condition of the nonelectric facilities portfolio once a year.
    - Metrics: Facility Condition Index, Systems Condition Index.
  - Performance: a facilities management information system is in place by FY 2014.
    - Metrics: cost of ownership, asset data, warranty recovery, workflow.
- **Investments are prioritized based on need, risk and return on investment**
  - Priority/risk: a method is currently in place today and will become more consistent and objective as the asset health information becomes more accurate and complete.
  - Need/return on investment: nonelectric facilities design standards and master material specifications are in place.
- **Industry standard operations and maintenance practices are executed**
  - Comprehensive preventive maintenance, workflow, planning and scheduling programs and resources are in place by FY 2015.
    - Metrics: percentage of emergency repairs, productivity rates, scheduled work completion, inventory performance.
- **Assets are sustainable and compliant**
  - Energy intensity reduced 30 percent (compared to 2003 baseline) by FY 2015.
  - Nonpotable water use reduced 20 percent (compared to 2010 baseline) by FY 2020.
  - Potable water use reduced 26 percent (compared to 2007 baseline) by FY 2020.
  - No adverse compliance findings (Occupational Safety and Health Act, Environmental Protection Agency, International Building Codes) by FY 2015.

## 6.6 KEY INVESTMENT DRIVERS

The internal and external forces that affect asset investment decision making include how assets are designed and constructed, how they are operated, how they are maintained and how they are decommissioned. Some of the key drivers are listed below.

**Expected levels of service:** Facilities Asset Management must understand and provide adequate resources in order to meet the agency's needs in terms of the service attributes of quality, reliability, responsiveness, timeliness, sustainability and cost.

**Business continuity:** Much of BPA's asset infrastructure was built before the seismic threat to the region was fully understood and before modern building codes were in place. As a result, many of BPA's most critical facilities are in danger of failing during a seismic event. This presents an unacceptable risk to operations and to the personnel who inhabit these structures and has driven a program of critical building seismic upgrades.

BPA expects that the recently reorganized departments of Continuity of Operations and of Security and Emergency Response will drive additions and changes to the facility infrastructure in the future.

**Historical requirements:** BPA, in conjunction with a historical consultant and state historic offices, has determined that buildings constructed before 1974 may be historically significant. This determination may drive certain design/construction requirements and could increase costs and significantly delay some projects.

**Functionally outdated assets:** Some facilities do not support modern operational needs. Facilities that were built for functions that are no longer applicable (for example, untanking towers, research and development test facilities and oil houses) have been inefficiently repurposed or abandoned and the resulting shortcomings must be addressed.

**Expansion:** Transmission's expansion investment program consists of capital projects required to increase capacity and improve reliability to meet load growth, meet generation interconnection and customer service requests, or provide congestion relief. Projects include minor facility upgrades, major transmission line work, communications system upgrades and substation additions. Transmission's projects will have an effect on the Facilities Asset Management program by creating more assets to operate and maintain and by driving changes to asset maintenance plans. New functions, such as bare handing, drive new facility additions and remodels in order to accommodate new crews and their equipment.

**Executive orders:** Executive orders 13423 and 13514 issued in 2007 and 2009, respectively, call for a "greening of the Federal Government." BPA has responded with a Sustainability Action Plan to meet the directives in these orders. Facilities Asset Management, in conjunction with its partners in operations, engineering and energy efficiency, is initiating activities aimed at reducing energy intensity, optimizing water resources, implementing sustainable building design and complying with federal guiding principles on new building construction.

**Security:** BPA's Critical Asset Security Plan provides the agency's strategy for the implementation of safeguards and security programs as they relate to protecting critical assets. This plan supports the implementation of the Department of Energy's Graded Security Policy, the North American Electric Reliability Corporation Critical Infrastructure Protection Standards and the Department of Homeland Security Presidential Directive-12.

These requirements result in the need to install and maintain high cost/high tech security equipment and to greatly limit personnel access in some areas.

**Building codes (life safety):** Buildings were originally designed and built to meet the codes in place at the time of construction. Most facilities were built before 1960, and many may not be compliant with current life safety, fire protection and seismic event codes. This represents an unacceptable risk to personnel and to the operation and preservation of these assets. Older buildings are not mandated to comply with modern codes unless they undergo a major remodeling. Unfortunately, this requirement was not consistently complied with in the past, which has resulted in some buildings that are technically noncompliant.

Another practice that has not been uncommon in the past is ad hoc facility modifications or remodels to change the use of an existing facility. Unfortunately, these activities frequently resulted in noncompliant, undocumented structures that sometimes were less than successful because they did not follow a comprehensive master use plan for a building/site or district.

While proactively resolving these issues or bringing existing facilities up to current code may, in some cases, be the right thing to do, the elements of risk/value and cost/benefit should be evaluated and prioritized before making such investments.

**Hazardous materials (life safety):** The agency needs to identify, manage and abate hazardous substances within existing facilities. Asbestos, lead, mercury and polychlorinated biphenyls are just a few of the known or suspected hazardous materials that may exist in some BPA facilities. These materials represent potential threats to the personnel working in and around the buildings.

## 6.7 GAPS, INITIATIVES AND RISKS TO ACHIEVING AGENCY OBJECTIVES

Note: A more complete discussion is contained in the Facility Asset Management Strategy sections 6 and 7.

### *Objective: Systems are in place to assess health and performance of assets.*

The asset inventory information and the asset condition and health data generated through previous efforts are currently inadequate. In order to properly fund and resource the program, it is critical to completely and clearly understand the condition, use and needs of each facility. One of the initiatives intended to bridge these gaps is a comprehensive facility condition assessment program called **MECA: Bi-Annual Work Planning and Scheduling**. This entails a clear understanding and record of the asset inventory and an annual inspection that drives simple repairs while identifying "red flags" for engineering-level assessment. The effort ultimately drives a programmatic approach to work planning. Another initiative called **Organizational Alignment** employs a rigorous methodology designed to identify the service levels, processes, capabilities and organizational structure that would best support achieving the long-term objectives of the program.

The risks to closing these gaps are the potential lack of funding, unreliable access to the resources necessary to gather condition information and to enter and maintain asset performance data, and the absence of a robust facilities management information system.

### *Objective: Investments are prioritized based on need, risk and return on investments.*

The execution of capital and expense work is inconsistent. **Integrated planning** is an initiative that will identify and coordinate projects that affect facility assets and is intended to reduce duplicated efforts, minimize operational impacts and leverage economies of scale by combining, or "bundling," work scopes. Implementing facility design standards and materials specifications will also have a positive affect on the portfolio. A consistent approach to design and construction will result in a portfolio that is cheaper and easier to operate and maintain.

### *Objective: Execute industry standard operations and maintenance practices.*

BPA is not yet approaching nonelectric facilities maintenance in a strategic, comprehensive and cohesive manner. The agency has not fully clarified operations and maintenance responsibilities or service level needs and expectations. In FY 2011, Facilities Asset Management sponsored an assessment of the nonelectric facility operations and maintenance program that calls for

operations and maintenance to be centralized and for the agency to adopt best maintenance practices.

**Best maintenance practices** is a multi-year initiative that will result in a staged implementation of leading operations and maintenance. The **Organizational Alignment** initiative is intended to provide the structure and resources to implement and sustain these practices while a robust **facility management information system** will track the health and performance of the assets and provide management with the information necessary to make better investment and maintenance decisions.

### *Objective: Assets are sustainable and energy efficient.*

Executive orders 13423 and 13514 and guidance received from the Department of Energy have resulted in a facilities sustainability action plan. The plan contains several objectives, including reducing energy intensity 30 percent by 2015 and reducing water use 20 percent by 2020.

Facilities Asset Management plans to bring in a resource efficiency manager to work with BPA's Sustainability Program along with various engineering and operations staff in BPA's Transmission and Corporate organizations to focus on areas identified as essential to achieving the agency's energy and sustainability goals.

Risks include a lack of accurate data (metering information, for example) and inadequate records of the energy reducing projects that have been implemented since 2003. Finally, the criterion for effectively integrating sustainability gains into the other priority drivers is still unclear.

## 6.8 Preferred Strategy

Facilities Asset Management has come a long way in its first four years. It has accomplished much and learned even more. The staff members now have a better understanding of and increased clarity about the state of the agency's asset management program and have identified and prioritized the actions needed to eventually achieve the agency's long-term objectives.

Each of the 16 initiatives in Figure 32 is designed to meet one or more of the asset program's four main objectives. Many of the initiatives have sub-elements and a range of alternatives and are described in complete detail in Section 7 of the Facility Asset Management Strategy.

**Figure 32**

This table shows the relationships between the various Objectives and the specific initiatives designed to achieve those objectives.

| | Objectives | | | |
|---|---|---|---|---|
| **FY12-FY22 Initiatives** | Systems are in place to assess health and performance of assets | Investments are prioritized based on need, risk and return on investment | Execute industry standard O&M practices | Assets are sustainable and compliant |
| Asset Program specific investment strategies | | ■ | | |
| Best Maintenance Practices | ■ | ■ | ■ | ■ |
| Capital governance | | ■ | | ■ |
| Continuity of Operations | ■ | ■ | | ■ |
| Design Standards and Materials Specification | | ■ | ■ | ■ |
| Facility Management Information System | ■ | ■ | ■ | ■ |
| Funding Options | | ■ | | |
| Hazardous Materials Management | ■ | | | ■ |
| Integrated Planning | | ■ | | |
| MECA Bi-annual Work Planning and Scheduling | ■ | ■ | ■ | ■ |
| Organizational Alignment | ■ | ■ | ■ | ■ |
| Project documentation and turnover | | ■ | ■ | |
| Repair, replace or decommission methodology | ■ | ■ | ■ | ■ |
| Resources | ■ | ■ | ■ | ■ |
| Service/reliability expectations | ■ | ■ | ■ | ■ |
| Space mgnt: utilization/remodel | ■ | ■ | | |

## 6.9 EXPENSE

**Figure 33 - Proposed Asset Related O&M Levels for Facilities ($ millions)**

| | | Current rate period | | Next rate period | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Actuals FY 2011 | FY 2012 | FY 2013 | FY 2014 | FY 2015 | 4-Year Total | FY 2016 | FY 2017 | FY 2018 | FY 2019 | FY 2020 | FY 2021 | 10-Year Total |
| **Facilities** | | | | | | | | | | | | | |
| Program Requirements | 15.1 | 12.5 | 13.2 | 14.5 | 14.7 | 54.9 | 14.9 | 15.3 | 15.6 | 15.8 | 19.9 | 20.4 | 156.8 |
| Base O&M | 8.4 | 8.6 | 8.8 | 9.3 | 9.1 | 35.8 | 9.2 | 9.4 | 9.6 | 9.7 | 10.0 | 10.1 | 93.8 |
| Facilities Seismic Hardening | | 2.0 | 2.0 | 2.0 | 2.0 | 8.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 20.0 |
| Move cost/O&M/Lease Costs for Bldg. Prjs. | | 2.8 | 2.1 | 2.2 | 2.3 | 9.4 | 2.5 | 2.5 | 2.5 | 2.6 | 2.6 | 2.6 | 24.7 |
| Total | 23.5 | 25.9 | 26.1 | 28.0 | 28.1 | 108.1 | 28.6 | 29.2 | 29.7 | 30.1 | 34.5 | 35.1 | 295.3 |

## 6.10 CAPITAL

**Figure 34 - Initial CIR Capital Plan for Facilities**

| | Actuals FY 2011 | FY 2012 | FY 2013 | FY 2014 | FY 2015 | FY 2016 | FY 2017 | FY 2018 | FY 2019 | FY 2020 | FY 2021 | 10-Yr Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Condition Assessment Projects** | 1.9 | 1.9 | 1.5 | 1.5 | 1.3 | 1.3 | 1.3 | 1.3 | 1.3 | 1.3 | 1.3 | 13.6 |
| **Miscellaneous New Building Projects** | 3.5 | - | - | 3.4 | 2.4 | 1.0 | 2.0 | 1.7 | 2.0 | 2.0 | 2.0 | 16.5 |
| **Hazardous Materials Abatement** | 0.8 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | - | - | - | - | 3.0 |
| **Asset Decommissioning** | | - | - | 0.6 | 0.5 | 0.6 | 0.5 | 0.4 | 0.2 | 0.3 | 0.2 | 3.3 |
| **Sustainable Investments** | | 0.4 | - | - | - | - | - | - | - | - | - | 0.4 |
| **Maintenance HQ Projects** | 0.0 | 3.0 | 7.5 | 13.0 | 11.5 | 13.5 | 17.5 | 10.0 | 10.0 | 10.0 | 10.0 | 106.0 |
| **Communications Building Replacements** | 1.4 | 3.0 | 1.8 | 4.1 | 1.1 | - | - | - | - | - | - | 10.0 |
| **Portland Vancouver Office Space Strategy** | 1.0 | | | | | 11.0 | 6.6 | 4.8 | 4.4 | 4.4 | 0.1 | 31.2 |
| **Headquarters Leasehold Improvements** | 1.9 | 2.2 | 2.2 | 2.3 | 2.3 | 2.4 | 2.4 | 2.5 | 2.5 | 2.6 | 2.6 | 24.1 |
| **Business Continuity** | 0.4 | 3.0 | 12.0 | - | - | - | - | - | - | - | - | 15.0 |
| **Total** | 11.0 | 14.0 | 25.5 | 25.3 | 19.6 | 30.2 | 30.8 | 20.7 | 20.3 | 20.5 | 16.2 | 223.0 |

**Figure 35 - Preferred Capital Plan for Facilities**

| | Actuals FY 2011 | FY 2012 | FY 2013 | FY 2014 | FY 2015 | FY 2016 | FY 2017 | FY 2018 | FY 2019 | FY 2020 | FY 2021 | 10-Yr Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Condition Assessment Projects** | 1.9 | 1.9 | 1.5 | 1.5 | 1.3 | 1.3 | 1.3 | 1.3 | 1.3 | 1.3 | 1.3 | 13.6 |
| **Miscellaneous New Building Projects** | 3.5 | - | - | 4.2 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 46.2 |
| **Hazardous Materials Abatement** | 0.8 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | - | - | - | - | 3.0 |
| **Asset Decommissioning** | | - | - | 0.6 | 0.5 | 0.6 | 0.5 | 0.4 | 0.2 | 0.3 | 0.2 | 3.3 |
| **Sustainable Investments** | | 0.4 | 1.5 | - | - | - | - | - | - | - | - | 1.9 |
| **Maintenance HQ Projects** | 0.0 | 4.0 | 21.0 | 11.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 106.0 |
| **Communications Building Replacements** | 1.4 | 3.0 | 3.0 | 3.0 | 1.0 | - | - | - | - | - | - | 10.0 |
| **Portland Vancouver Office Space Strategy** | 1.0 | | | 11.0 | 6.0 | .05 | | 4.8 | 4.4 | 4.4 | .1 | 31.2 |
| **Headquarters Leasehold Improvements** | 1.9 | 2.2 | 2.2 | 2.3 | 2.3 | 2.4 | 2.4 | 2.5 | 2.5 | 2.6 | 2.6 | 24.1 |
| **Business Continuity** | 0.4 | 3.0 | 12.0 | - | - | - | - | - | - | - | - | 15.0 |
| **Total** | 11.0 | 15.0 | 42.0 | 34.0 | 28.2 | 20.1 | 20.4 | 25.0 | 24.4 | 24.5 | 20.2 | 254.3 |

# SECURITY

# ASSET STRATEGY SUMMARY

# 7 SECURITY

## 7.1 INTRODUCTION

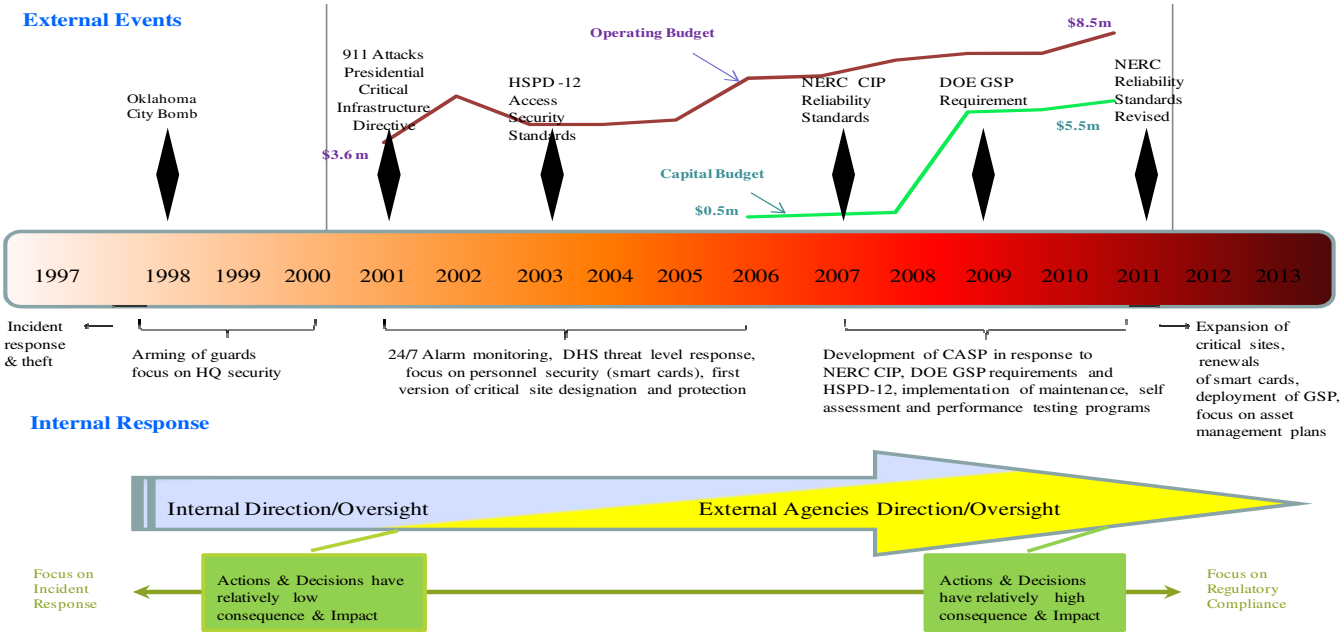
BPA is committed to managing its security system infrastructure and implementing security enhancement project plans through risk-informed processes while minimizing overall costs under prudent asset life-cycle management strategies. Consistent with the public's expectations, BPA protects its workforce, systems, information and facilities that are integral to accomplishing its mission while ensuring that its security system planning strategies do not pose undue risks or costs to the interests of customers and citizens of the Pacific Northwest.

The Office of Security and Continuity of Operation (OSCO) is accountable for the protection of BPA assets consisting of more than 300 facilities with a total estimated value of $4.5 billion dollars.[4] OSCO provides protection and security to employees and contractors as well as to thousands of visitors each year. OSCO is ultimately responsible for the design and efficacy of the security infrastructure that must comply with ever-evolving regulatory requirements while also meeting agency operational needs. Further, the proposed protection strategies must be included within the operations and maintenance scope of the Information Technology and Facilities Asset Management groups that are considered the "asset owners" of the individual components that make up the security system. Close to 100 facilities contain security systems that require ongoing maintenance to ensure performance and protection standards are in line with security policies and compliance requirements. This number continues to grow with new BPA infrastructure construction and the need for integrating the identification/categorization of new critical or high priority facilities that require protection.

Keeping a balance among risk-based protection programs, compliance-driven initiatives and costs has been a growing challenge for BPA. Capital enhancements are dominated by methodologies prescribed by regulatory entities, leaving little room for risk-informed protection strategies developed through security risk assessments, surveys or in response to reported security incidents.

[4] Asset value is based on FY 2010 financials excluding generation facilities which are outside the scope of the security program

**Figure 36 – Evolution of Security**




## 7.2 PURPOSE AND SCOPE OF STRATEGY

The purpose of BPA's Security Infrastructure Asset Management Strategy is to integrate management, prioritization and resourcing strategies that support BPA and stakeholder interests while ensuring that the design, installation and maintenance of physical and personnel security systems for BPA's critical infrastructure are consistent with requirements, guidelines, provisions and principles prescribed by the North American Electric Reliability Corporation , Federal Energy Regulatory Commission, U.S. Department of Energy and U.S. Department of Homeland Security as outlined in presidential decision directives.

Security will accomplish its objectives of *compliance, life safety assurance, critical infrastructure protection* and *performance assurance* through a prioritized deployment of both initial security system installation and subsequent life-cycle maintenance to address the ever changing security threats and compliance requirements. It will do so while balancing sound business and asset management principles.

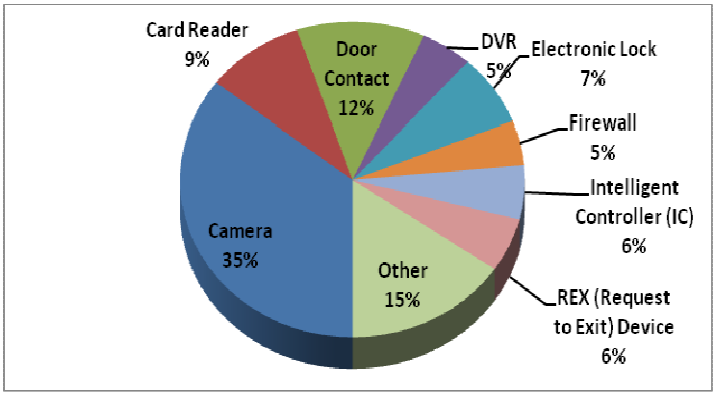
BPA defines a *security asset* as material, equipment, software or hardware that is used for the primary purpose of providing security. These assets, or components, make up systems that collectively provide various levels of physical and personnel security as demonstrated in Figure 37.

**Figure 37 - Systems and Component Overview**

| Systems | Purpose | Asset Types Include | |
|---|---|---|---|
| ***Protective Barrier*** | Provide a physical barrier between adversary and target. Protective barriers delay an adversary's attempts to gain entry or cause damage to critical components. | • Fence<br>• Gate<br>• Padlock | • Chains<br>• Barbed wire<br>• Door |
| ***Access Control*** | Allow for logging and monitoring access, as well as for securing sites as they are less prone to forced entry. | • Card reader<br>• Door contact | • Electronic locks<br>• Magnetic lock |
| ***Intrusion Detection*** | Provide warning of pending intrusion and notification of an intrusion by unauthorized people. | • Motion detectors<br>• Fence detection systems | • Motion sensing cameras |
| ***Surveillance*** | Allow for the real-time viewing of activity as well as the ability to review activity in the past to assess alarms related to inputs. | • Fixed cameras<br>• PTZ cameras | • DVR/NVR<br>• Protective covers, domes |
| ***Lighting*** | Address a security need, whether after dark camera operation or to illuminate an area of security concern. | • Entrance or gates<br>• Camera lights | • Perimeter lights |
| ***Early Intrusion Detection*** | Extend the intrusion detection system that includes the capability to detect activity outside the perimeter of the facility and provide early warning of potentially malevolent activity. | • High definition (HD), infrared (IR), motion detection (MD) video surveillance | • Seismic detection<br>• Exterior MD<br>• Outward facing lighting |
| ***IT Support Systems*** | Support security systems and information. | • Servers<br>Network | • Applications<br>• Database |
| ***Access Credentials*** | Ensure that only authorized individuals have access to BPA facilities, information, and assets. | • Local site security only (LSSO) badge | • Smart Cards |
| ***Access Credential Production*** | Support record storage and production requirements for access credentials. | • Printing station<br>• Electriever file system | • Light activation station<br>• Fingerprint station |
| ***Screening*** | Ensure that contraband such as weapons, firearms, controlled substances are not brought into BPA facilities. | • X ray machines | • Metal detectors |
| ***ER Equipment*** | Provide supplies and materials that outfit first responders and building wardens with the tools to do their jobs during emergencies. | • Warden supplies (e.g. flashlights) | • First responder supplies |

BPA has undergone several waves of security enhancements that have resulted in the deployment of physical security assets. Figure 38 depicts the array of physical security components currently being operated and maintained. Criticality of a system or component is determined by the impact of its failure on maintaining security compliance and security system effectiveness. Currently, approximately 780 components have been identified as critical for maintaining security compliance and security system effectiveness. Currently, 20 percent of total critical components are past their manufacturer's recommended service life. By FY 2015, 100 percent will reach their mean-time-to-failure as the majority have an estimated service life of five years and were installed in FY 2009.

**Figure 38 - Physical Security System Components Overview by Type**
*(Percentage based on total number of inventoried components)*




## 7.3 KEY ACCOMPLISHMENTS AND HISTORIC BACKDROP

BPA has made great strides in strengthening its security posture by initiating several operational excellence initiatives, which include:

- organizational realignment supporting a newly developed security strategy,
- process redesign to support security's capital program,
- resurrection of an IT support team dedicated to meeting ongoing security needs as the agency transitions from mechanical and analog systems to digital and information-based systems and
- improved security asset inventory tracking system that allows for better trending and maintenance planning.

These initiatives are providing long-term benefits but required a temporary delay in starting the Tier 2[5] critical infrastructure protection projects. This resulted in Security capital spending coming in under the FY 2010 and FY 2011 forecasts.

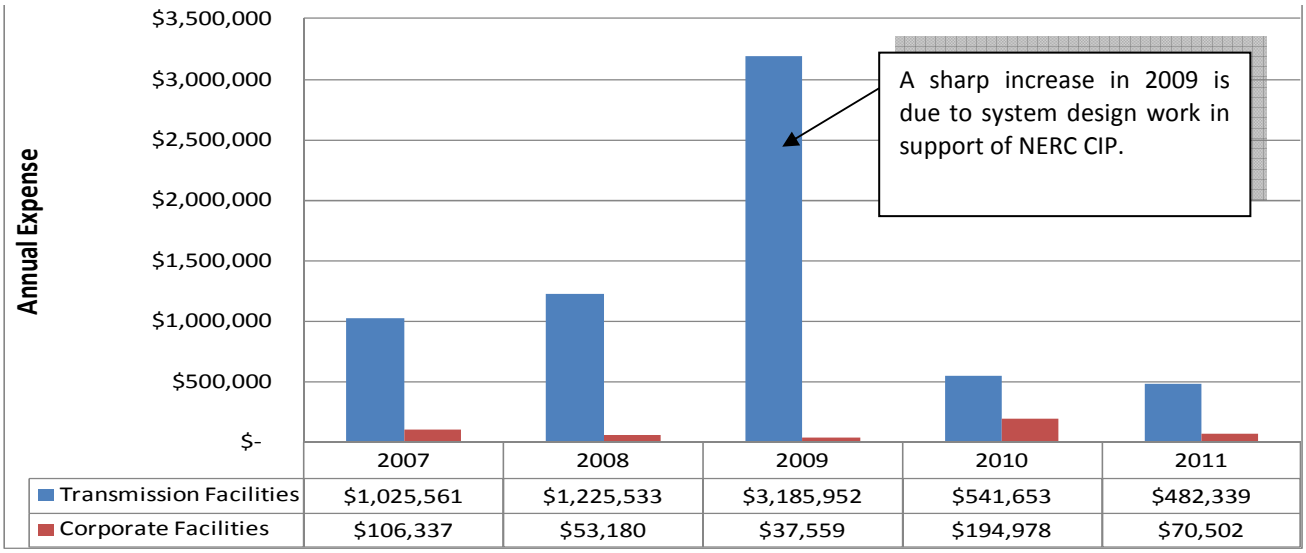
Prior to 2011, physical security system maintenance costs covered within OSCO's security budget were limited to repairs and replacements completed in the Portland headquarters, Van Mall and Ross Complex facilities. Substation security maintenance was managed by Transmission Services. In 2011, maintenance funding was transferred from Transmission Services to OSCO in support of security system performance testing and security system maintenance activities for the field sites. This change better aligns the security subject matter

[5] Tier 2 is a designation of level of criticality of the site in accordance with DOE's graded security policy in which Tier 1 is most critical and Tier 4 is essential.

expertise with direct oversight of the security maintenance, design, performance testing and vendor activities supporting a complex and ever-evolving security system.

Figure 39 provides historic maintenance costs paid collectively by OSCO and Transmission for maintaining physical security systems.

**Figure 39 - Historic Physical Security System Maintenance**




| | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|
| Transmission Facilities | $1,025,561 | $1,225,533 | $3,185,952 | $541,653 | $482,339 |
| Corporate Facilities | $106,337 | $53,180 | $37,559 | $194,978 | $70,502 |

## 7.4 DRIVERS AND INITIATIVES

The drivers behind the asset strategy protection requirements are identified in the following BPA plans and policies:

- **Critical Asset Security Plan.**This plan integrates all security compliance requirements (from NERC, Homeland Security and DOE, for example) related to protection of critical infrastructure into a comprehensive implementation strategy.
- ***System Performance Assurance, Component Testing and Preventative Maintenance Program (SPAP).*** In accordance with DOE Order 473.3, the purpose of BPA's performance testing program is to ensure that security systems are tested and maintained on a regular basis with corrective maintenance addressed commensurate with the level of criticality and location of the system.

Seven initiatives for meeting the strategic objectives are summarized in Figure 40.

**Figure 40 - Strategic Initiatives**

| Drivers | Objectives | | | Initiatives | 10 years Cost |
|---|---|---|---|---|---|
| *BPA Critical Asset Security Plan (CASP)* | *Compliance* | *Life Safety* | *Critical Infrastructure Protection* | **1. Protection of Critical Transmission Assets**<br>Installation of security systems at most critical transmission substations with a Tier 2[6] protection level. | **Cap**: Total cost for Tier 2s est. $36.4 M<br>**Exp**: $0.135 M per site every 5 years |
| | | | | **2. NERC CIP Requirements**<br>Installation of security enhancements required by NERC CIP for the protection of Critical Cyber Assets (CCAs). | **Cap**: $18.7 M through Version 5 |
| | | | | **3. Protection of Essential (Tier 4) Assets**<br>Improvment or enhancement of security systems at essential sites, as well as addressing repeated security incidents. | **Cap**: $3.50 M |
| *BPA System Performance Assurance, Testing and Preventative Maintenance Program (SPAP)* | | | *System Performance Assurance* | **4. Performance Testing & Preventative Maintenance**<br>Annual assessment of security systems through performance tests, leading to repair or replacement of components that may impact performance or compliance. | **Exp**: $0.84 M |
| | | | | **5. Replacement and Renewal Program**<br>Replacement of critical components in anticipation of failure[7]. Replacement upon failure of non-critical components. Strategic phase-out of components no longer technological viable (e.g., analog to digital conversion). | **Exp**: $3.90 M<br>(Can capitalize $1.90 M if funding is available) |
| | | | | **6. System Reliability Projects**<br>Assessment of security system reliability through projects designed to close gaps identified by technical team assessments of the security infrastructure (e.g. uninterruptable power systems). | **Exp**: $0.40 M |
| *BPA PIV and PRA Policy* | | | *Critical Infrastructure Protection* | **7. Access Credentials (Smart Cards)**<br>Continual assessment of forecasts and plans for fluctuations in Smart Card activity, with focus on risk mitigation and uninterrupted access of cleared workforce. | **Exp**: $3.93 M |

[6] Tier 2 is a designation of level of criticality of the site in accordance with DOE's graded security policy in which Tier 1 is most critical and Tier 4 is essential.
[7] Life cycle based on manufacturer recommendations and fail rates.

## 7.5 RISKS

Each initiative identified in Figure 40 targets specific risks. Forgoing these initiatives or delaying implementation exposes the agency to an array of consequences identified in Figure 41.

**Figure 41 - Risks of Forgoing Implementation**

| |
|---|
| **1. Protection of Critical Transmission Assets**<br>Continual exposure to "medium risk"[8] of a terrorist attack that, if actualized, could result in the loss of critical transmission facilities with a) an extreme consequence to the bulk electric system, b) major economic impact to regional customers and economy and c) severe, observable impact and orders for substantial corrective action, including some mandatory changes in BPA operation or administration. |
| **2. NERC CIP Requirements**<br>Risk of unauthorized access to critical cyber assets as well as findings by regulatory entities within one year leading to possible financial sanctions, mandated policy changes and public criticism. |
| **3. Protection of Essential (Tier 4) Assets**<br>Inability to replace or update obsolete security systems compromising protection of essential facilities such as the Portland headquarters building. Increased exposure to criminal activity. Historically, this costs the agency $270,000 per year[9] on the low range, as well as risks system reliability through the possibility of collateral damage to transmission equipment during an incident such as vandalism or theft. |
| **4. Performance Testing & Preventative Maintenance**<br>Lack of awareness of failing or faulty security systems and equipment leading to a) compromised protection of critical infrastructure, b) strain on limited resources to support O&M activity, c) noncompliance with DOE orders and d) criticism by regulatory entities due to unplanned outages of critical security systems. |
| **5. Replacement and Renewal Program**<br>Failing or faulty security systems and equipment leading to a) compromised protection of critical infrastructure, b) strain on limited resources to support O&M activity and c) criticism by regulatory entities due to unplanned outages of critical security systems. |
| **6. System Reliability Projects**<br>Gaps in current systems and processes preventing or delaying implementation of O&M projects to address weaknesses in the current security infrastructure. This can result in a) compromised protection of critical infrastructure and b) criticism by regulatory entities due to failure of critical security system. |
| **7. Access Cridentials (Smart Cards)**<br>Exposure of BPA people, critical assets, facilities and information to access by individuals with intent to harm or misuse them. Risk of being non-compliant with HSPD-12 and NERC CIP resulting in severe, observable impact and orders for substantial corrective action, including some mandatory changes in BPA operation or administration. |

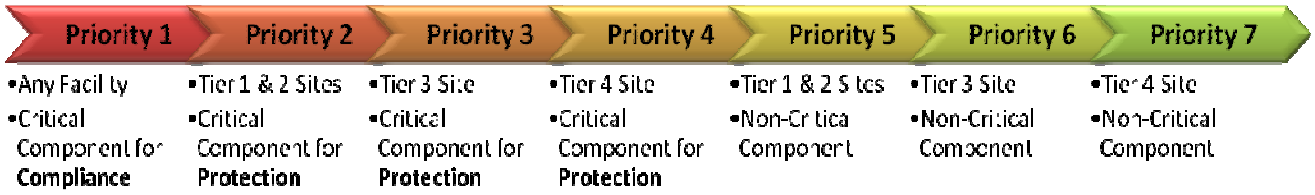
[8] DHS has assessed critical national infrastructure assets, including high voltage transmission facilities such as BPAs, at "Medium Risk" of terrorist attack, meaning there is credible information suggesting sites such as these are of interest to both international and domestic terrorist groups.

[9] Annual loss of $270,000 is calculated using total reported loss of $2.2 million in eight years. Loss value excludes labor.

## 7.6 PRIORITIZATION

Initiatives are prioritized so that, once all mandated compliance obligations are met, the focus is on risk-driven protection. Within each initiative, priorities for both new installations and existing system maintenance are determined by the level of criticality of the facility as well as by the criticality of the protection system or component.[10] Currently, all initiatives for the FY 2012 to FY 2021 period are driven by compliance and are considered high priority by the prioritization schema shown in Figure 42.

**Figure 42 - Priority Matrix**




### *Baseline Capital Plan for FY 2012 - FY 2021*

With the increasing cost of NERC Critical Infrastructure Protection compliance, the initial CIR capital forecast through FY 2015 is insufficient to meet minimum requirements. This is primarily due to NERC CIP Version 5, which is estimated to cost in the range of $9.3 to $12.5 million with a mandatory implementation date as early as January 1, 2015. Within current funding, the capital program includes the following:

- Initiative 1 - Implementation of Tier 2 protection at most critical transmission substations.
- Initiative 2 – Implementation of NERC CIP versions 2 through 5 required security system enhancements.
- Initiative 3 – Protection of non-transmission and Tier 4 transmission sites
- Initiative 5 – Capitalized renewal of critical components no longer technologically viable or at risk of failure due to exceeding life cycle.

Figure 43 shows the capital strategy that meets initial CIR capital investment targets over 10 years and stays within the annual forecast through FY 2015. Initial CIR funding levels will not allow BPA to meet the Jan. 1, 2015, NERC compliance deadline.

**Figure 43 - CIR Initial Proposed Capital Scenario ($ thousands)**

| | FY 2010 IPR Budget | 4,190 | 4,948 | 4,947 | 4,942 | 5,700 | 5,699 | 6,232 | 5,443 | 5,445 | 5,436 | 52,982 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Initiative | FY | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | Total |
| 1 | Tier 2 Critical Site Protection | 2,900 | - | - | - | 3,377 | 4,153 | 5,897 | 6,103 | 4,152 | 5,673 | 32,255 |
| 1 | Tier 3 Critical Site Protection | - | - | - | - | - | - | - | - | - | | 0 |
| 2 | NERC CIP Version 2 & 3 at 17 sites | 450 | - | - | - | - | - | - | - | - | - | 450 |
| 2 | NERC CIP Version 2 & 3 at 36 sites | 840 | 800 | - | - | - | - | - | - | - | - | 1,640 |
| 2 | NERC CIP Version 4 at 33 sites | - | 4,148 | | - | - | - | - | - | - | - | 4,148 |
| 2 | NERC CIP Version 5* | - | - | 4,947 | 4,942 | 2,600 | - | - | - | - | - | 12,489 |
| 3 | Non-Transmission & Tier 4 Sites Protection | - | - | - | - | - | 1,000 | - | - | - | - | 1,000 |
| 5 | Capital update of failing systems | - | - | - | - | - | - | - | - | 1,000 | - | 1,000 |
| | TOTAL CAPITAL | 4,190 | 4,948 | 4,947 | 4,942 | 5,977 | 5,153 | 5,897 | 6,103 | 5,152 | 5,673 | 52,982 |
| | | | | | | | | | | | | |
| | Delta between budget and project estimates | 0 | 0 | 0 | 0 | 277 | -546 | -335 | 660 | -293 | 237 | 0 |

[10] Criticality of a system or component is determined by the impact of its failure on maintaining security compliance (e.g., NERC CIP, HSPD-12, etc.) and security system effectiveness (e.g., identified by the SPAP).

The scenario shown in Figure 43 requires suspending protection of critical transmission assets for three years, forgoing protection of essential (Tier 4) assets and using expense to maintain failing systems for the next nine years, which increases the maintenance forecast by $1.9 million. Under this funding model, BPA is exposed to risks identified under initiatives 1, 3 and 5 in Figure 40. Furthermore, preliminary analysis suggests that implementing requirements under NERC CIP Version 5 yields very low return on investment when considering security risk reduction[11] as compared to the financial investment.[12] In contrast, Tier 2 critical site protection results in a significant risk reduction at the treated site based on the level of investment. In essence, compliance is jeopardizing protection. A detailed comparison of risk reduction for various security treatments is covered in the Appendix of the Security Infrastructure Asset Management Strategy.

## 7.7 PREFERRED CAPITAL PLAN FOR FY 2012 - FY 2021

To meet compliance obligations and achieve its primary mission of protection, OSCO prefers an alternative scenario identified in Figure 44. This scenario requires reshaping the base over 10 years and adding another $10 million dollars to the initial CIR capital investment levels.

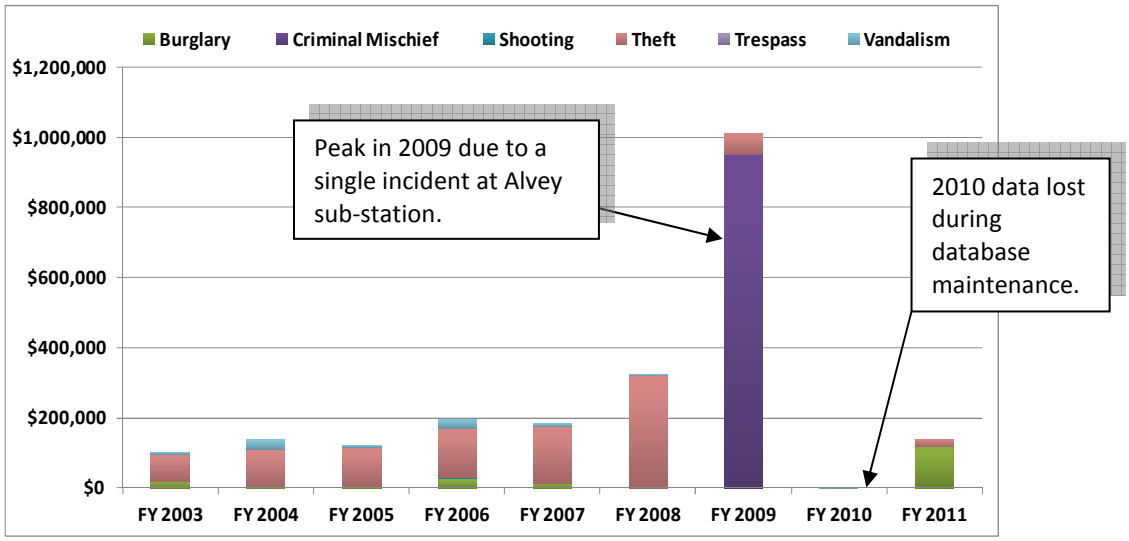
**Figure 44 - Preferred Capital Investment Levels ($ thousands)**

| | FY 2010 IPR Budget | 4,190 | 4,948 | 4,947 | 4,942 | 5,700 | 5,699 | 6,232 | 5,443 | 5,445 | 5,436 | 52,982 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Initiative | FY | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | Total |
| 1 | Tier 2 Critical Site Protection | 2,900 | 3,377 | 4,153 | 3,200 | 5,887 | 7,070 | 5,710 | 4,145 | - | - | 36,442 |
| 1 | Tier 3 Critical Site Protection | - | - | - | - | - | - | - | - | 1,000 | 1,000 | 2,000 |
| 2 | NERC CIP Version 2 & 3 at 17 sites | 450 | - | - | - | - | - | - | - | - | - | 450 |
| 2 | NERC CIP Version 2 &3 at 36 sites | 840 | 800 | - | - | - | - | - | - | - | - | 1,640 |
| 2 | NERC CIP Version 4 at 33 sites | - | 4,125 | - | - | - | - | - | - | - | - | 4,125 |
| 2 | NERC CIP Version 5 | - | - | 12,500 | - | - | - | - | - | - | - | 12,500 |
| 3 | Non-Transmission and Tier 4 Sites Protection | - | 500 | 500 | - | 500 | 500 | 500 | 500 | - | 500 | 3,500 |
| 5 | Capital update of failing systems | - | - | - | 900 | - | - | - | - | 1,000 | - | 1,900 |
| | TOTAL CAPITAL | 4,190 | 8,802 | 17,153 | 4,100 | 6,387 | 7,570 | 6,210 | 4,645 | 2,000 | 1,500 | 62,557 |
| | | | | | | | | | | | | |
| | Delta between budget and project estimates | 0 | 3,854 | 12,206 | -842 | 687 | 1,871 | -22 | -798 | -3,445 | -3,936 | 9,575 |

This additional investment is expected to yield a return on investment at an estimated $2 million over a 10-year period due to reduction in criminal activity and restored productivity. Figure 45 shows that, over eight years, BPA has lost $2.2 million in material costs because of criminal activity. These crime statistics reported to OSCO do not include the cost of labor.

[11] Risk reduction is measured by the difference in the risk rating before and after system deployment using a streamlined Risk Assessment Methodology for Transmission (RAM-T).
[12] ROI is calculated based on normalized risk rating for various adversary types divided by average cost per site.

**Figure 45 - Total Material Loss Since 2003 by Incident Type**
*Excludes cost associated with labor, loss of load or lost productivity*




## 7.8 SUMMARY

NERC CIP has overshadowed all other capital initiatives. NERC CIP Version 5 meets compliance requirements yet provides no measurable security risk reduction. Protection of critical and essential facilities meets both compliance and protection requirements while reducing expense by $2 million and preventing losses from criminal activity.

# FEDERAL HYDRO
# ASSET STRATEGY SUMMARY

# 8 FEDERAL HYDRO

The FCRPS is a partnership between the U.S. Army Corps of Engineers, the U.S. Bureau of Reclamation and the Bonneville Power Administration. FCRPS power-related assets are financed through direct funding agreements between BPA and the Corps and between BPA and Reclamation. Through direct funding, BPA spends over $400 million annually on FCRPS investments and operations and maintenance programs. The FCRPS is mandated to provide low-cost reliable power and effective resource stewardship to the Pacific Northwest. It delivers power worth nearly $4 billion annually to the people of the Pacific Northwest in addition to providing flood protection and mitigation and enhancement of fish and wildlife.

## 8.1 FCRPS HYDRO SYSTEM

The FCRPS comprises 31 hydroelectric plants – 21 operated by the Corps and 10 by Reclamation. The FCRPS has an overall capacity of 22,060 megawatts and, in an average water year, produces 76 million megawatt-hours of electricity.

Within the hydro asset category, the plants are grouped into four strategic classes depending on the role they play in the system.

- Main stem Columbia: plants that provide the majority of power, ancillary services and nonpower benefits to the Pacific Northwest.
- Headwater/lower Snake: plants that support services provided by Main stem Columbia plants.
- Area support: plants that do not support the region as a whole but provide key power and nonpower benefits to an area of the Pacific Northwest.
- Local support: plants that primarily provide services to a local area only.

**Figure 46 - FCRPS Hydro System**

| Plant | ID | Units | MW Capacity | aMW Energy | Strategic Class | Operator |
|---|---|---|---|---|---|---|
| Grand Coulee | GCL | 24 | 6,735 | 2,497 | Main Stem Columbia | Reclamation |
| Chief Joseph | CHJ | 27 | 2,614 | 1,387 | Main Stem Columbia | Corps |
| McNary | MCN | 14 | 1,120 | 575 | Main Stem Columbia | Corps |
| John Day | JDA | 16 | 2,480 | 991 | Main Stem Columbia | Corps |
| The Dalles | TDA | 22 | 2,052 | 773 | Main Stem Columbia | Corps |
| Bonneville | BON | 18 | 1,195 | 513 | Main Stem Columbia | Corps |
| Dworshak | DWR | 3 | 465 | 214 | Headwater/Lower Snake | Corps |
| Lower Granite | LWG | 6 | 930 | 272 | Headwater/Lower Snake | Corps |
| Little Goose | LGS | 6 | 930 | 263 | Headwater/Lower Snake | Corps |
| Lower Monumental | LMN | 6 | 930 | 278 | Headwater/Lower Snake | Corps |
| Ice Harbor | IHR | 6 | 693 | 211 | Headwater/Lower Snake | Corps |
| Libby | LIB | 5 | 605 | 238 | Headwater/Lower Snake | Corps |
| Hungry Horse | HGH | 4 | 428 | 113 | Headwater/Lower Snake | Reclamation |
| Albeni Falls | ALF | 3 | 49 | 24 | Area Support | Corps |
| Detroit | DET | 2 | 115 | 46 | Area Support | Corps |
| Big Cliff | BCL | 1 | 21 | 13 | Area Support | Corps |
| Green Peter | GPR | 2 | 92 | 30 | Area Support | Corps |
| Foster | FOS | 2 | 23 | 12 | Area Support | Corps |
| Lookout Point | LOP | 3 | 138 | 37 | Area Support | Corps |
| Dexter | DEX | 1 | 17 | 10 | Area Support | Corps |
| Cougar | CGR | 2 | 28 | 17 | Area Support | Corps |
| Hills Creek | HCR | 2 | 34 | 18 | Area Support | Corps |
| Lost Creek | LOS | 2 | 56 | 36 | Area Support | Corps |
| Palisades | PAL | 4 | 177 | 74 | Area Support | Reclamation |
| Minidoka | MIN | 4 | 28 | 22 | Local Support | Reclamation |
| Anderson Ranch | AND | 2 | 40 | 18 | Local Support | Reclamation |
| Boise Diversion | BDD | 3 | 3 | 2 | Local Support | Reclamation |
| Black Canyon | BCD | 2 | 10 | 9 | Local Support | Reclamation |
| Roza | ROZ | 1 | 13 | 10 | Local Support | Reclamation |
| Chandler | CDR | 2 | 12 | 9 | Local Support | Reclamation |
| Green Springs | GSP | 1 | 17 | 6 | Local Support | Reclamation |
| **Total** | | **196** | **22,060** | **8,716** | | |

## 8.2 PRODUCTS AND SERVICES

The FCRPS provides seven generation products and services.

- Power generation and delivery
- Electricity production (megawatt-hours)
- Peak electricity capacity (megawatts)
- Spinning and nonspinning reserves
- Load following
- Voltage support
- System restoration (for example, black start)

### *Nonpower purposes*

The FCRPS projects have mandates that extend beyond power production. Projects can provide one or several of the purposes listed below.

- Flood damage reduction – use reservoir storage to shape natural water flows to reduce impacts to communities, farmland and industry located along rivers.
- Navigation – provide an inland waterway through a series of locks on the Columbia and Snake rivers.
- Irrigation – increase the acreage of arable land in the Pacific Northwest through the storage and diversion of water.
- Recreation – provide economic and social benefits by facilitating access to reservoirs and by making available parks and recreation areas.
- Municipal and industrial water supply
- Water quality
- Fish and wildlife – protect, mitigate and enhance fish and wildlife, including related spawning grounds and habitat, of the Columbia River and its tributaries.

**Figure 47 - Value of Strategic Class by Purpose**

| Purpose | Main Stem Columbia | Headwater/Lower Snake | Area Support | Local Support |
|---|---|---|---|---|
| **Power** | Provides 76% of energy and capacity, and 30% of storage from the FCRPS. Provides nearly all the reserves and other ancillary services for supporting the 500 KV grid. | Provides 20% of energy and capacity, and 50% of storage from the FCRPS. Provides supplementary ancillary services for supporting the 500 KV grid. | Provides 3% of energy and capacity, and 18% of storage from the FCRPS. Provides voltage support to specific areas of the regional transmission grid | Provides 1% of energy and capacity, and 2% of storage from the FCRPS. Provides limited voltage support to local areas of the Pacific Northwest. |
| **Flood Damage Reduction** | Seasonal flood reduction and water management storage affecting significant parts of the Columbia River basin. | Seasonal flood reduction and water management storage affecting significant parts of the Columbia River basin. | Provides flood reduction benefits primarily in the Willamette Valley, but does not contribute significantly to the flood reduction capability of the overall Columbia River basin. | Provides flood reduction benefits in a local area |
| **Navigation** | Provides navigation for the lower Columbia River from below Cascade Locks to the Tri-Cities | Provides navigation for the lower Snake River from the Tri-Cities to Lewiston, ID | None | None |
| **Irrigation** | Primary source of irrigation for the Columbia River Basin | None | None | Primary source of irrigation within a specific region |
| **Recreation** | Significant recreation for boating and camping. Includes several "destination" recreation sites and numerous local sites. | Major recreation for boating and camping. Includes several "destination" and local sites. | Major recreation for boating and camping. Includes several "destination" and local sites. | Some boating and camping at local sites. |

## 8.3 LOGIC AND SCOPE

**The FCRPS hydro asset strategy focuses on meeting three goals:**

- low-cost power,
- power reliability, and
- trusted stewardship.

**The strategy is implemented through a set of direct funding agreements that:**

- ensure that safety and environmental requirements are met;
- meet FCRPS commitments for fish and wildlife and cultural resource programs;
- meet BPA's business continuity needs for a reliable supply of low-cost generation by ensuring power generating assets are properly operated, inspected and maintained;
- mitigate the risk of power generation component failures by replacing or refurbishing equipment and purchasing spares when warranted;
- increase the efficiency and/or capability of power facilities where economically feasible; and
- fund a portion of high priority multipurpose projects in accordance with BPA's direct funding agreements with the Corps and Reclamation.

**The 2014 strategy consists of two directly funded programs.**

- The operations and maintenance program provides core funding for maintenance, operations and minor equipment replacements and is largely driven by the staffing needs of each facility. O&M program forecasts used in this strategy are for the purpose of calculating life cycle costs only. Impacts associated with higher or lower O&M program levels are not analyzed.
- The large capital program consists primarily of large, discrete investment needs for equipment replacement or refurbishment, largely driven by equipment condition and risk. Investments target electrical and mechanical systems, not civil features for dam safety, which are typically funded through appropriations, a share of which is reimbursed by BPA. The strategy addresses condition, risk and system cost impacts associated with various capital program levels.

## 8.4 RELATIVE COST OF UNAVAILABILITY

The criticality of a hydro asset is based largely on the quantity of energy produced, particularly at peak periods, and the financial impact of a loss of generation. Assets in the Main stem Columbia and headwater/lower Snake strategic classes provide more than 96 percent of the system's energy and capacity.

Five plants – Grand Coulee, McNary, Chief Joseph, John Day and Dworshak – are considered particularly critical to the power system based on the significant financial impact of a generating unit outage at these facilities.

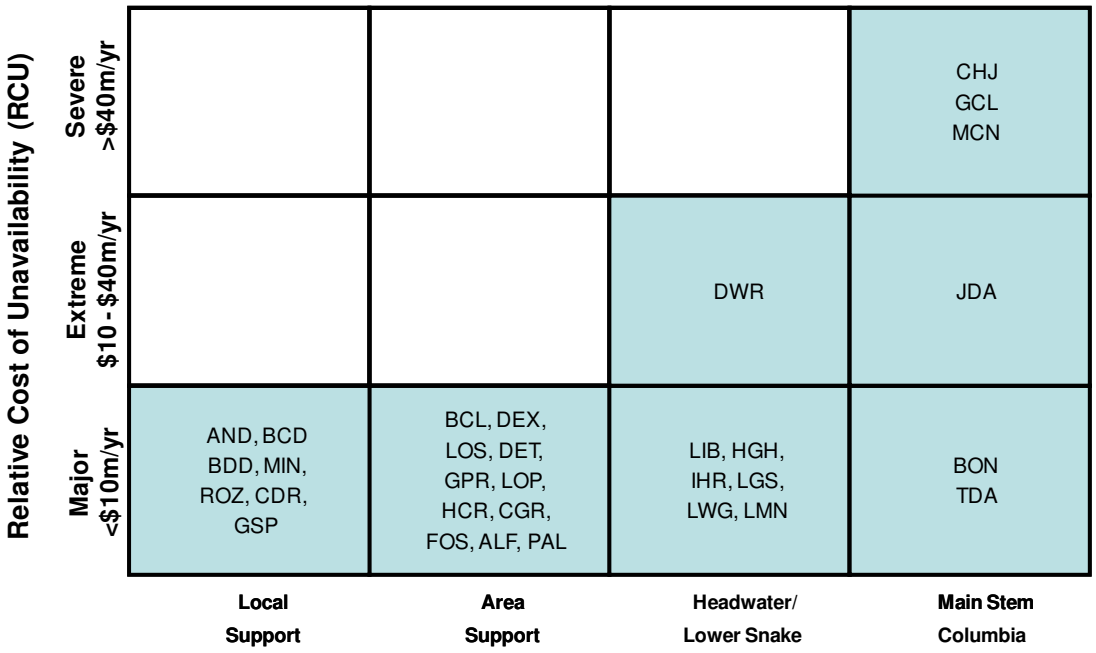
Figure 48 groups FCRPS hydro plants by their strategic class and relative cost of unavailability (RCU) to the power system. The RCU is the annual cost of replacing lost generation from the

least-used generating unit or first 20 percent of lost plant availability, whichever is larger. No costs are included for replacing lost capacity, ancillary services or non-power benefits.

Major RCU is up to $10 million per year and is based on BPA's long-term forward price forecast and average water conditions. Extreme RCU ranges from $10 to $40 million annually, while severe RCU exceeds $40 million per year. No value is included for avoided $CO^2$ emissions.

Figure 48 shows that Grand Coulee, McNary, Chief Joseph, John Day and Dworshak are the plants with the highest RCU.

**Figure 48 - FCRPS Hydro Plant Classification**




## 8.5 CONDITION OVERVIEW

The FCRPS manages 196 generating units in 31 hydro plants, plus 16 additional station service, fish and pump turbine units. It considers thousands of equipment components in maintenance and investment planning.

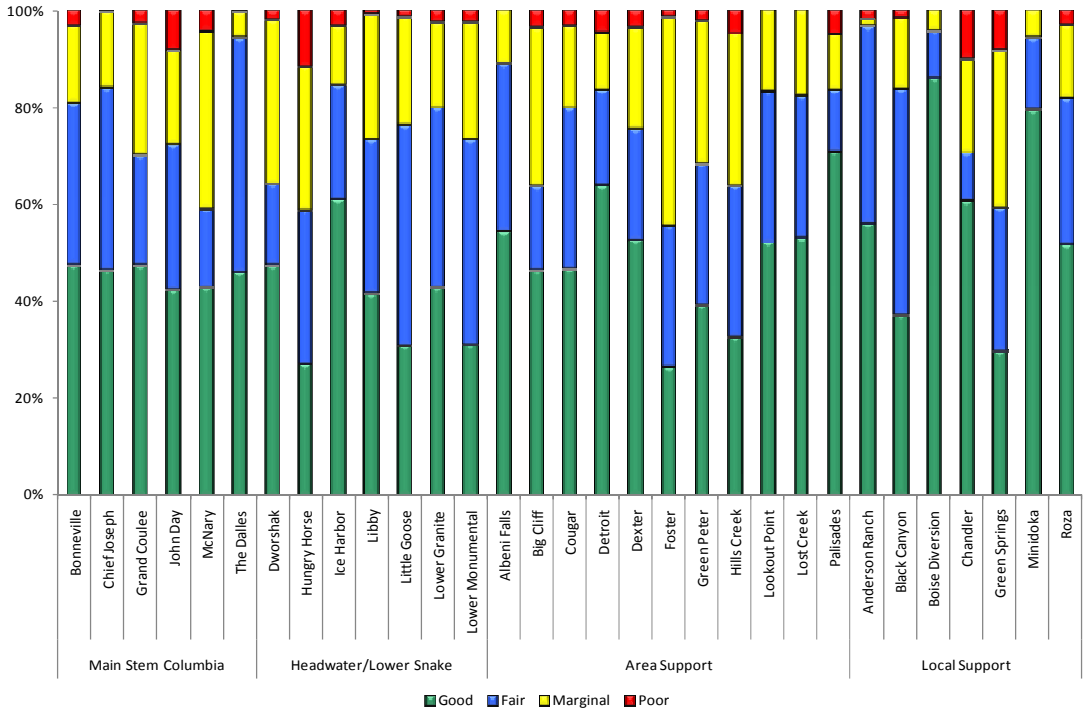
Component condition is a key driver of maintenance and investment needs. Routine maintenance activities identify and address deficiencies prior to their posing threats to equipment reliability. Even with effective maintenance programs, condition will eventually deteriorate to the point at which inadequate reliability will warrant re-investment.

There are few redundant, or spare, components in hydroelectric generating facilities so it is important that the condition of major components be understood and managed.

The FCRPS hydro program uses hydroAMP to assess the condition of seven power train components: unit transformers, generator windings, generator rotors, exciters, governors, unit

breakers and turbine runners. Condition of other equipment is assessed using a simplified framework based on hydroAMP.

**Figure 49 - Current Condition by Plant: Average for All Equipment**




## 8.6 RISK ASSESSMENT

Loss of hydro plant equipment can lead to a number of negative consequences. The consequences include

- economic losses as a result of the need to replace components;
- economic losses as a result of the need to purchase replacement power to meet contractual obligations or lost opportunities to sell power to the market;
- safety issues should the catastrophic failure of a component cause injury or death;
- environmental impacts such as off-site oil release;
- regulatory violations through an inability to meet preferred unit operation, temperature controls or total dissolved gas limits;
- operational and transmission support impacts such as unplanned spill or inability to provide reserves, voltage support or capacity at peak periods; and
- other stakeholder impacts such as lost pumping ability for Reclamation's irrigation customers.

The risk of equipment failure is assessed using two tools.

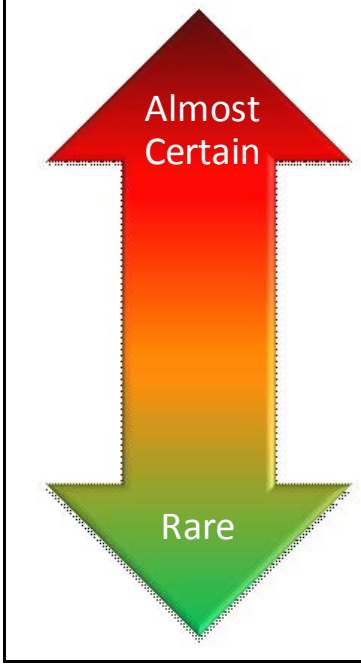
- Risk maps for safety, environmental and financial risk.
- Lost generation risk.

Common to both tools is the economic consequence of component failure, which is the value of the generation that would be lost from the time a piece of equipment fails – taking the generation out of service – until it is repaired or replaced and the unit is returned to service. Direct costs to repair or replace the unit are not considered here but are used later in evaluating the risk treatment. Economic losses are calculated for each plant and component using a "Value of Availability" model, which is based on hydro regulation studies and a forecast of forward energy prices, along with standardized assumptions of repair times with and without available spares.

### *Risk: condition index versus likelihood of failure*

The hydro program correlates a condition rating with the likelihood of equipment failing to perform as expected. An equipment component with a low condition rating has a higher likelihood of failure than one with a higher rating. The correlation is shown in Figure 50.

**Figure 50 - Condition versues likelihood of failure**

| Likelihood | Condition Index | Description |
|---|---|---|
|   | 0 to 0.9 | Poor |
| | 1 to 1.9 | |
| | 2 to 2.9 | |
| | 3 to 3.9 | Marginal |
| | 4 to 4.9 | |
| | 5 to 5.9 | |
| | 6 to 6.9 | Fair |
| | 7 to 7.9 | |
| | 8 to 8.9 | Good |
| | 9 to 10 | |

## 8.7 RISK MAPS

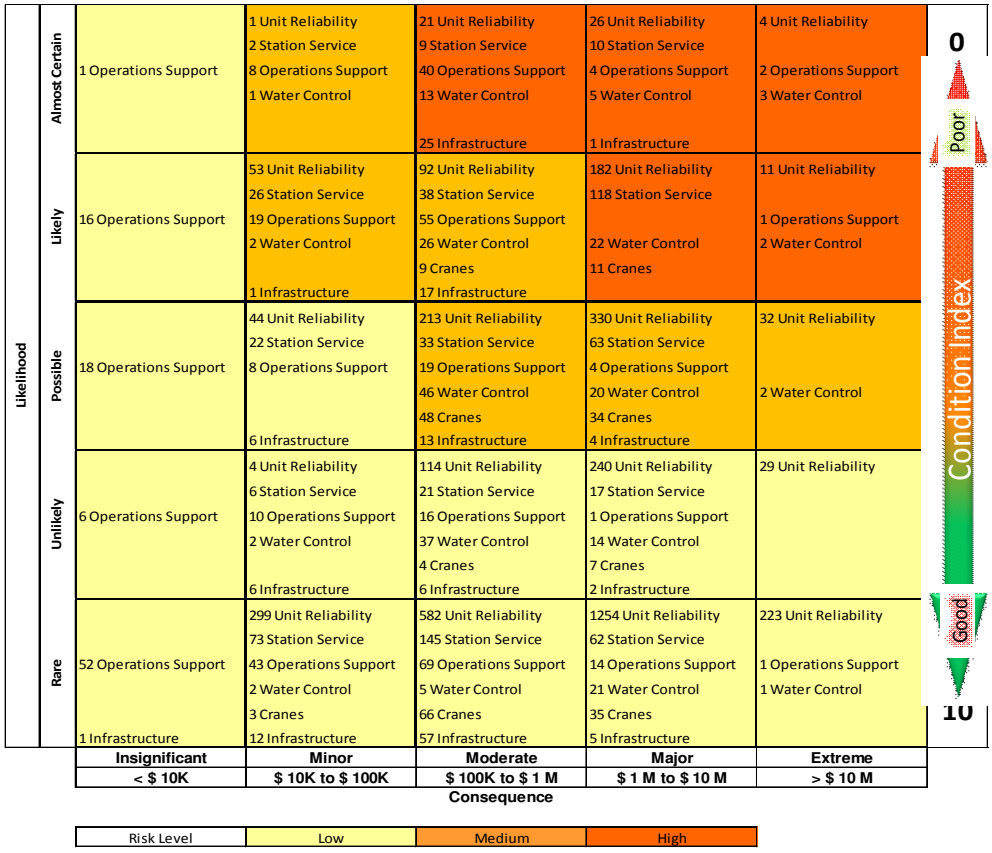
Using these inputs, the risk map (Figure 51) provides a view of risk by mapping the likelihood of failure for specific equipment components against the associated consequence of that failure causing a loss of generation availability. The risk map is segmented into a five-by-five grid. The

risk map is further segmented into three levels of risk: high, medium and low. For a specific component, the likelihood and consequence of failure are established in the risk map as follows:

- The five likelihood ratings shown in the previous figure are directly used as likelihoods in the risk map with "Almost Certain" being the highest likelihood and "Rare" being the lowest.
- Calculated economic consequences due to lost generation are segmented into five levels, with consequences characterized as "Insignificant" if they are less than $10,000 to "Extreme" if they exceed $10 million.

Figure 51 is a consolidated risk map for all power train components in the FCRPS based on the current assessment of condition and lost generation value. The number preceding each equipment type listed in the map corresponds to the number of equipment items.

**Figure 51 – FCRPS Risk Map: Current State**




Similar risk maps are used for mapping safety and environmental risk. The same likelihood scale used for financial risk is used to map risks for safety and to the environment. Consequence scales differ for each, with safety consequences ranging from "No or minor injury" to "Multiple fatalities" and environmental consequences ranging from "No impact" to "Detrimental or catastrophic off-site impact."

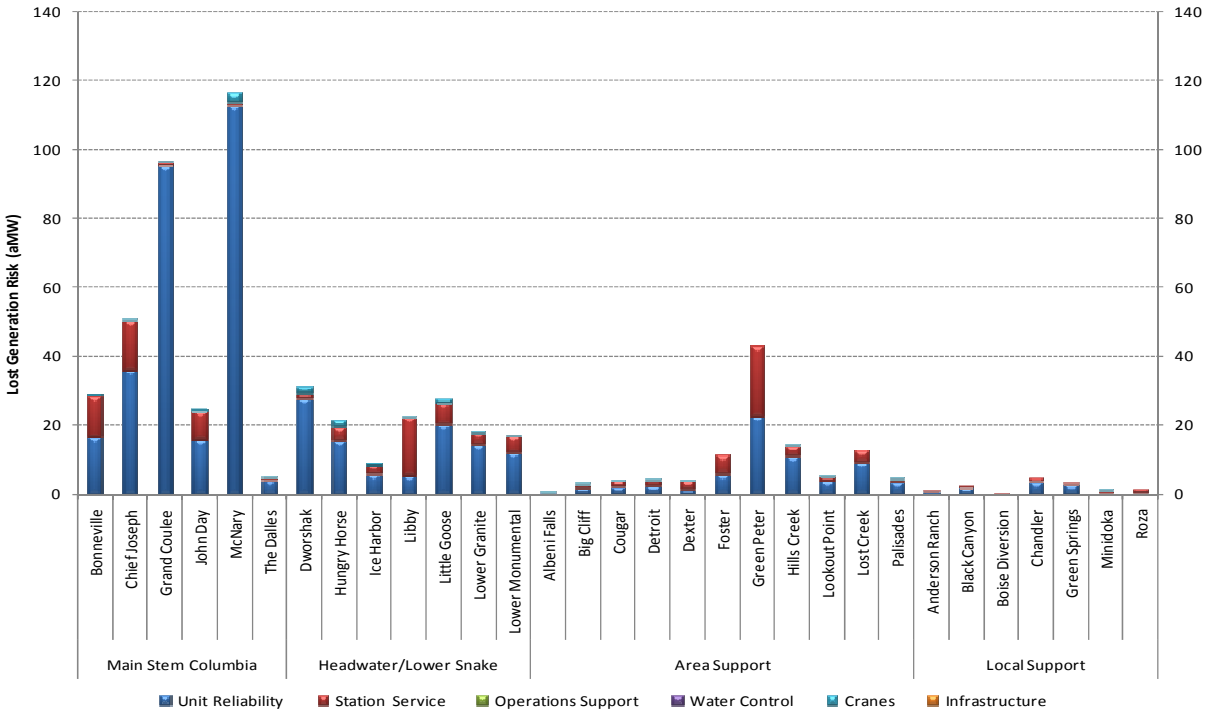
## 8.8 LOST GENERATION RISK

Failure likelihood and consequence information is further evaluated to quantify the expected value of lost generation as lost generation risk. Equipment condition correlates to a probability of failure for each component. These probabilities are multiplied by the lost generation consequence for each component to calculate the lost generation risk (LGR), that is, the replacement power cost risk associated with a run-to-failure strategy. The current LGR for the system is about 587 aMW, about 15 percent higher than in the 2012 asset strategy presented in the 2012 IPR (508 aMW), primarily a result of lower condition ratings for non-hydroAMP equipment. The Main stem Columbia class (321 aMW) makes up 55 percent of current LGR. McNary alone has 116 aMW of LGR, driven by several factors.

- Generally poor condition of generator stators, turbines, governors and exciters.
- Many pieces of equipment at risk.
- Position as a hydraulic bottleneck on the lower river, which results in high lost generation in the event of an outage.

Grand Coulee has 96 aMW of LGR, attributable mostly to the condition of generator windings, transformers, exciters and, in the third power plant, turbines. Chief Joseph has 50 aMW of LGR driven mostly by the condition of turbines, governors and exciters. Most other plants have LGR of less than 30 aMW.

**Figure 52** **Current Lost Generation Risk by Plant**




## 8.9 HYDRO INVESTMENT PLAN

This 2014 strategy takes a risk-based approach to identifying the optimum time for making new investments, which is consistent with the approach used for the 2012 strategy.

The strategy is consistent with BPA's asset management policy, which states:

BPA will invest in, maintain and operate assets to

- meet reliability standards, availability requirements, regional adequacy guidelines, efficiency needs, environmental requirements, safety and security standards, and other requirements; and
- minimize the life cycle costs of assets when practical.

### *Costs considered in the strategy*

The Hydro Investment Plan covers forecast O&M, the committed investment program and new investments to maintain and improve the reliability of electrical and mechanical plant equipment. Because O&M costs are primarily labor related and the currently committed investment program is already vetted and underway, the focus of the Hydro Investment Plan is on new investments not yet decided upon. The O&M program forecast and risk-based approach to identifying new capital investments assures that investments will reasonably cover the costs necessary to address business continuity requirements, including acquiring spare parts for critical equipment. This strategy improves the coverage of water control features over that identified in the 2012 strategy.

### *Costs not considered in the strategy*

John W. Keys III Pump Generating Plant is a pump storage facility that is part of the Grand Coulee Project. Pump-generating units 7-8 and 9-12 were commissioned in 1973 and 1983-84, respectively. The plant is near the end of its life. Much of the unit and balance-of-plant equipment is worn or becoming obsolete. Capital costs for modernization are estimated at $200 million to $300 million. Studies to support Keys modernization are underway, and a decision on whether to proceed is expected by summer 2012.

No costs are included for additional generating units at Libby, John Day or Dworshak.

Fish facilities funded under the CRFM program are aging. Initial costs of these facilities are funded under appropriations that BPA reimburses. Costs for repairs and replacements of these facilities are not covered in this strategy.

The agency also excluded the costs of rebuilding or replacing dam safety civil features. These costs are typically funded through appropriations, a share of which BPA reimburses. For the FY 2012-2021 period of this strategy, excluding dam safety costs is not expected to materially affect the forecast of funding needed to maintain a reliable system. However, as the hydro system continues to age, funding needs for dam safety will require more explicit attention in future strategies.

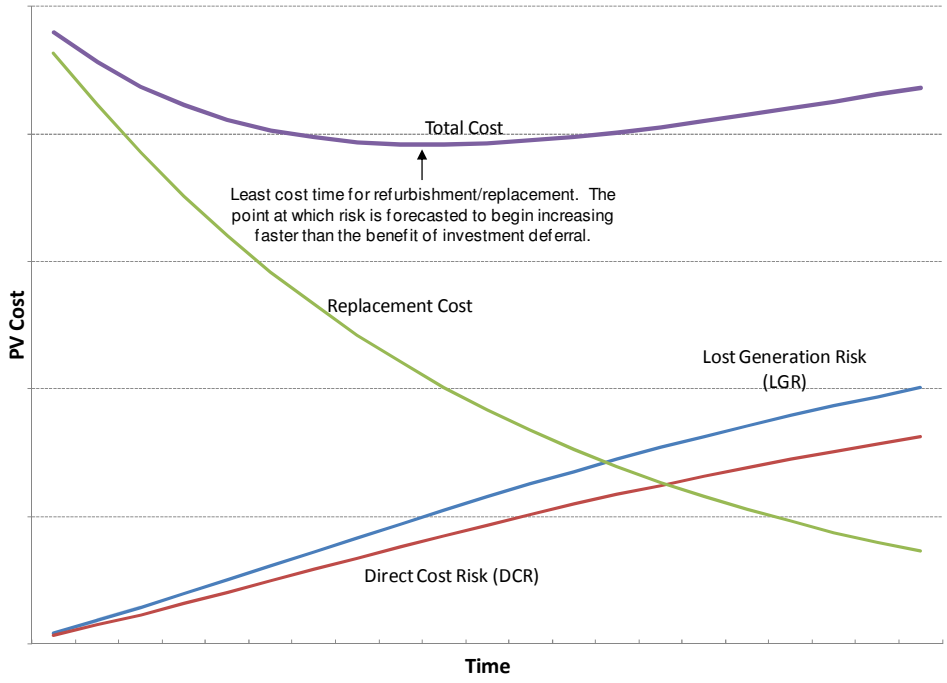
## 8.10 PRIORITIZING INVESTMENTS

Without corrective action (intervention), equipment condition degrades over time. As equipment condition degrades, the likelihood (and risk) of equipment failing to perform as expected increases. Three factors influencing the economics of risk intervention are outlined in Figure 53. All curves in the diagram show the present value of costs over time.

- *Replacement cost*. Typically, the longer the replacement can be deferred, the lower the present value of its cost.
- *Direct cost risk*. If equipment fails during the deferral period, intervention costs may be incrementally higher for collateral damage and for planning, procurement and scheduling inefficiencies (overtime, emergency hiring, contract premiums and the like). This cost risk increases as equipment condition degrades over time.
- *Lost generation risk*. Equipment failure may also result in longer outages and, thus, more lost generation than if equipment is replaced on a planned basis. Lost generation risk also increases as equipment condition degrades over time.

The total cost is the present value sum of replacement and risk costs. The cost minimum on this curve is the point at which financial risk is forecast to begin growing faster than the benefit of investment deferral and represents the optimum time to forecast replacement to minimize lifecycle cost. This algorithm is used to prioritize the forecast of new investments.

**Figure 53 - Optimum Time to Forecast Equipment Replacement**



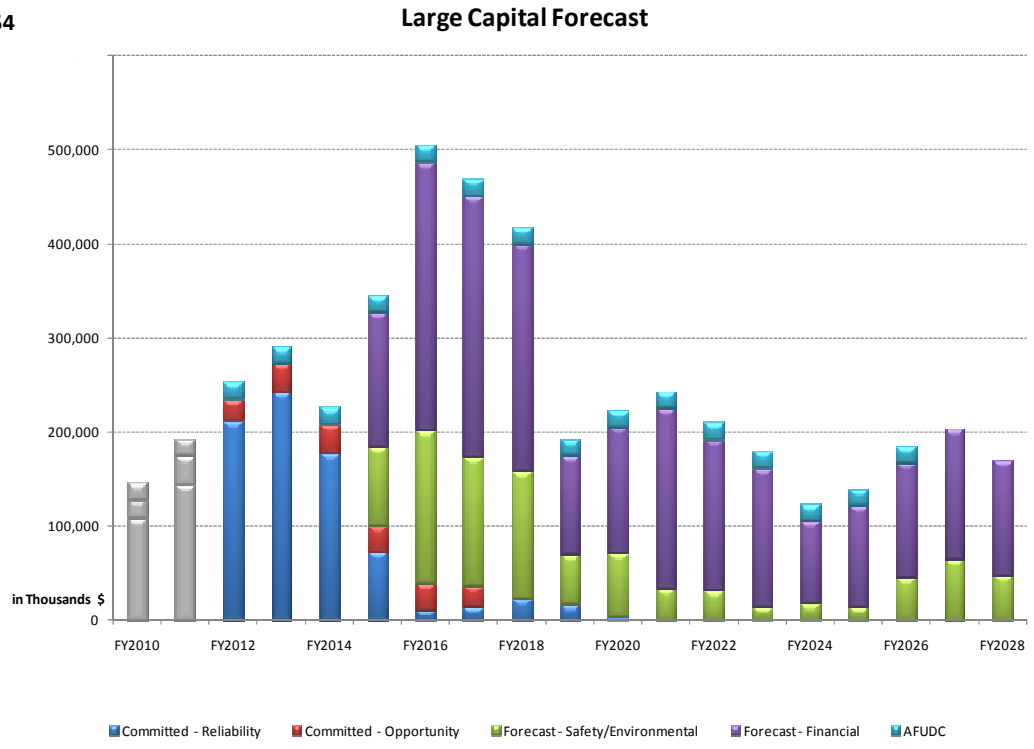

## *Least cost case*

The "least cost case" is the total cost for all equipment modeled if replaced at their cost minima. To determine the least cost case, each equipment component is evaluated in yearly time steps and forecast for refurbishment/replacement if it meets either of the following criteria:

- If its condition places it into a high risk category for safety or environment.
- If financial risk costs are increasing faster than investment deferral benefits, that is, the equipment component is at the cost minimum.

Once the equipment component is selected for investment, its condition resets to 10 at the end of the investment period. Its condition then begins to degrade at the identified degradation rate. The least cost case does not reflect limitations of resource and scheduling constraints and is, therefore, a theoretical but unrealistic plan. But it is useful for determining the costs associated with various constraints and informing discussions about whether it makes sense to mitigate them. Figure 54 shows the resulting prioritized investment funding level for the least cost case.

**Figure 54**




## *Modeling funding constraints*

To model funding constraints, an additional step is introduced into the modeling approach. An annual funding limitation is defined, then the prioritization proceeds as follows:

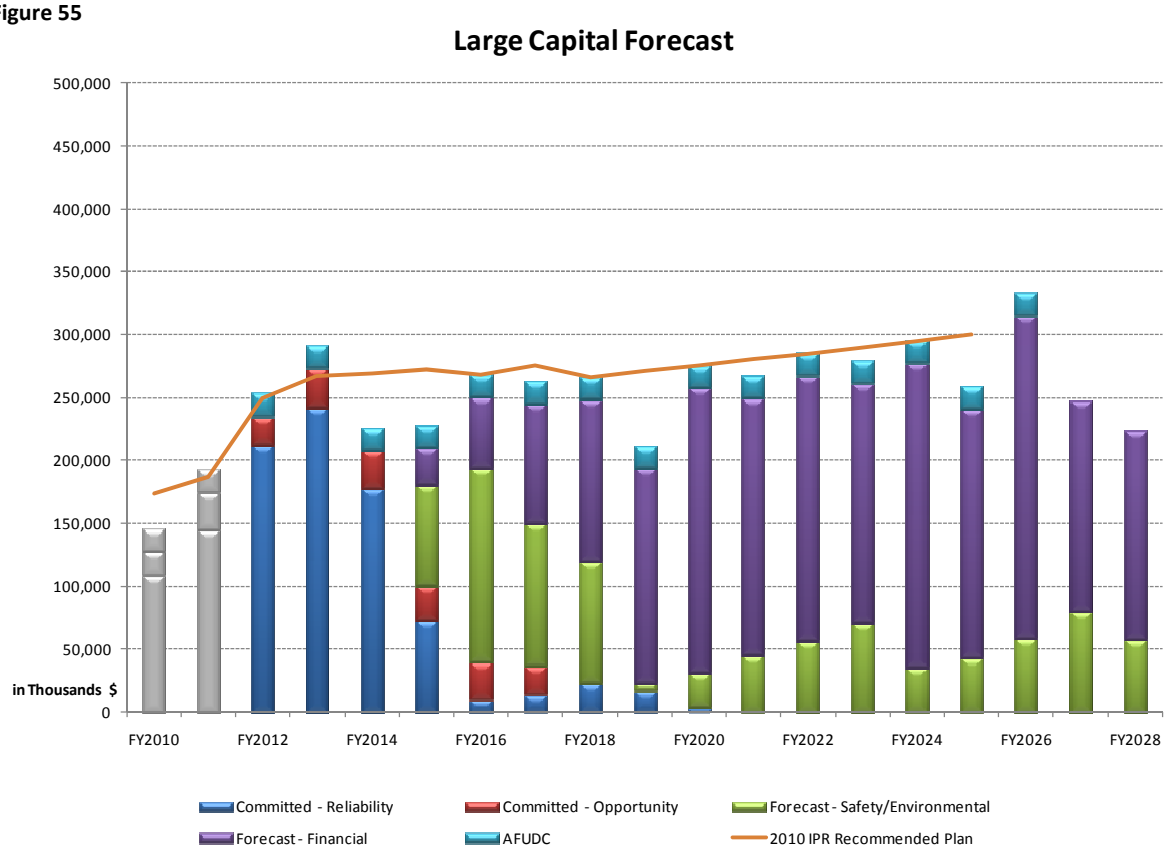
- Committed projects proceed as scheduled.
- High risk safety and environmental projects are selected as previously described.
- Financial-risk-driven projects are selected as described until an annual funding limitation is reached, after which investment in equipment in which financial risk is increasing the least is deferred until the following year, at which time it is re-evaluated using the same prioritization logic.

When funding constraints are applied, total cost for the system (system cost) increases because new investments are deferred past their cost minima. Modeling funding constraints in this strategy has little effect on the FY 2012-2015 program. Nearly all available funding is committed during this period so there is limited ability to turn these projects off without significant

negative financial consequences. Funding constraints modeled in this strategy affect the number of projects that can be undertaken 5 to 15 years into the future to mitigate forecast growth in risk.

Figure 55 shows the prioritized modeling results when they are constrained to the 2010 Recommended Investment Plan level.

**Figure 55**




## *Other funding constraints*

Consistent with work done for BPA's "Access to Capital" effort, the agency looks at the effects of additional funding constraints in this strategy. Figures 56 and 57 show the impact of 10 and 20 percent capital funding reduction relative to the recommended plan level from the 2010 IPR. While the Keys pump generating plant is not evaluated in this strategy, the effect of funding Keys within proposed spending limits is relatively close to the effect of incremental 10 percent capital reductions. Funding Keys within the 2010 Recommended Investment Plan forecast has roughly the same effect on other investments as a 10 percent reduction in funding availability.

**Figure 56 - 10% Reduction in Funding**

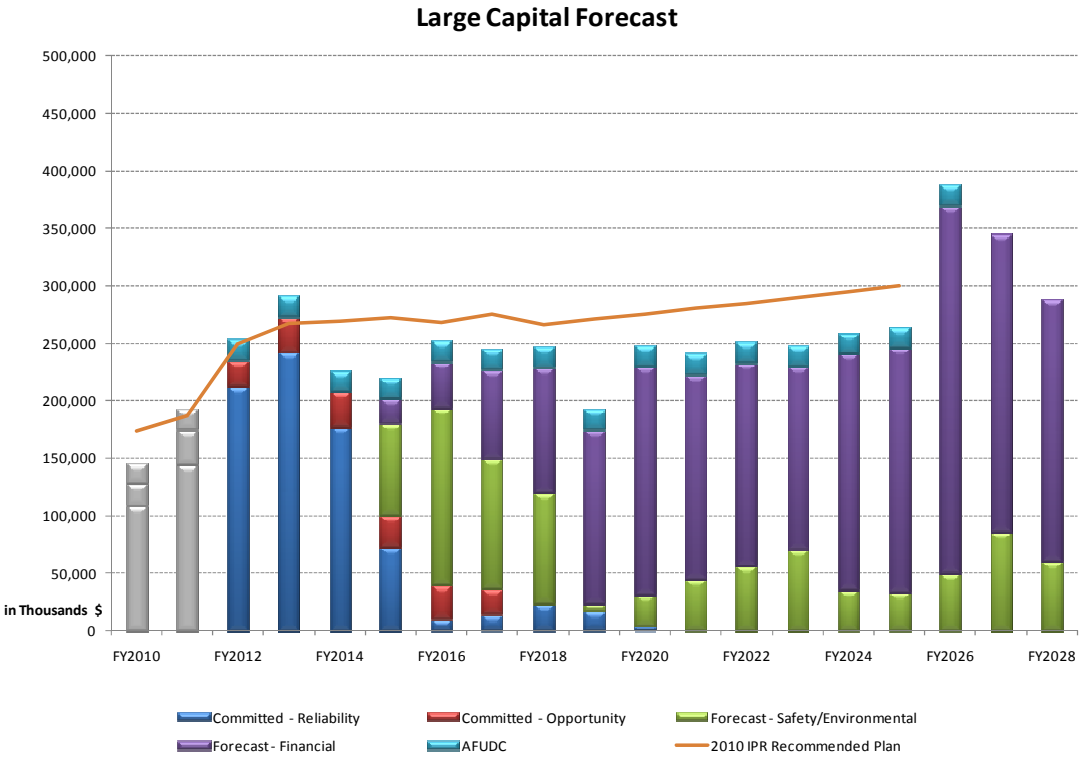
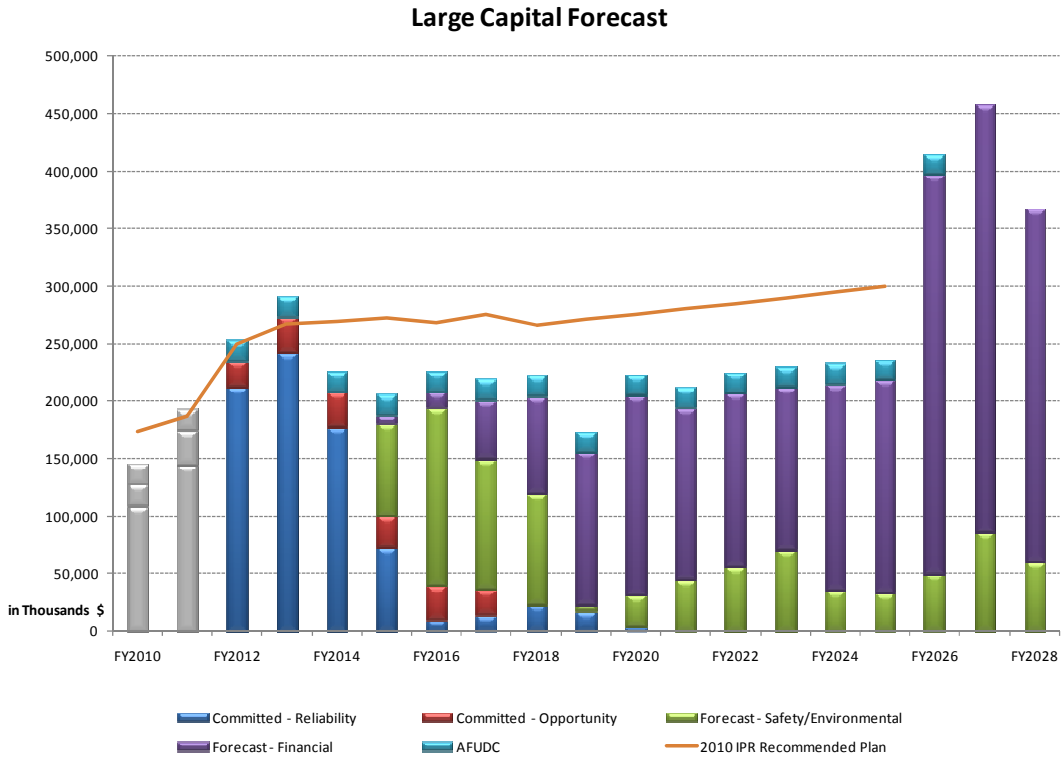


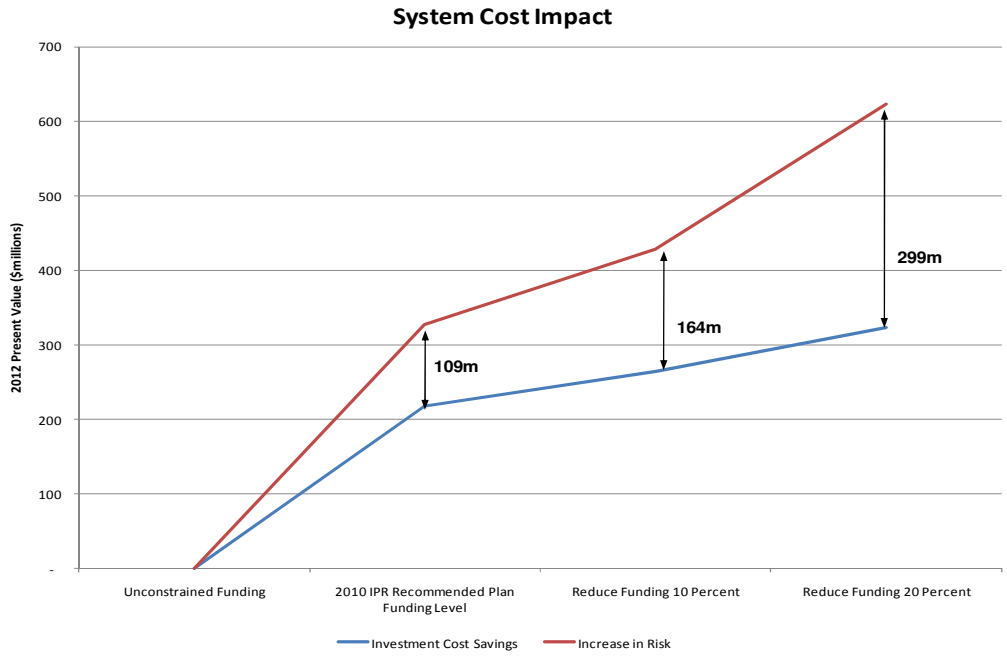

**Figure 57 - 20% Reduction in Funding**



### *System cost effects of funding constraints*

The 2010 Recommended Investment Plan level yields a stable program level both during and after the constrained funding period and identifies a scheduling and resource staffing capability that can be sustained for a decade or more. The net present value of additional capital reduction scenarios is increasingly negative (higher system cost) because funding constraints cause more investments to be deferred beyond their cost minima, that is, investment deferral benefits are less than the increase in financial risk costs. Higher capital reduction scenarios also result in higher program need beyond the constrained funding period, which would require a significant increase in resources. The strategy does not estimate a cost for inefficiencies associated with ramping up these resources. Figure 58 shows the system cost impact of various capital spending reduction scenarios relative to the least cost case (no funding constraints).

**Figure 58**



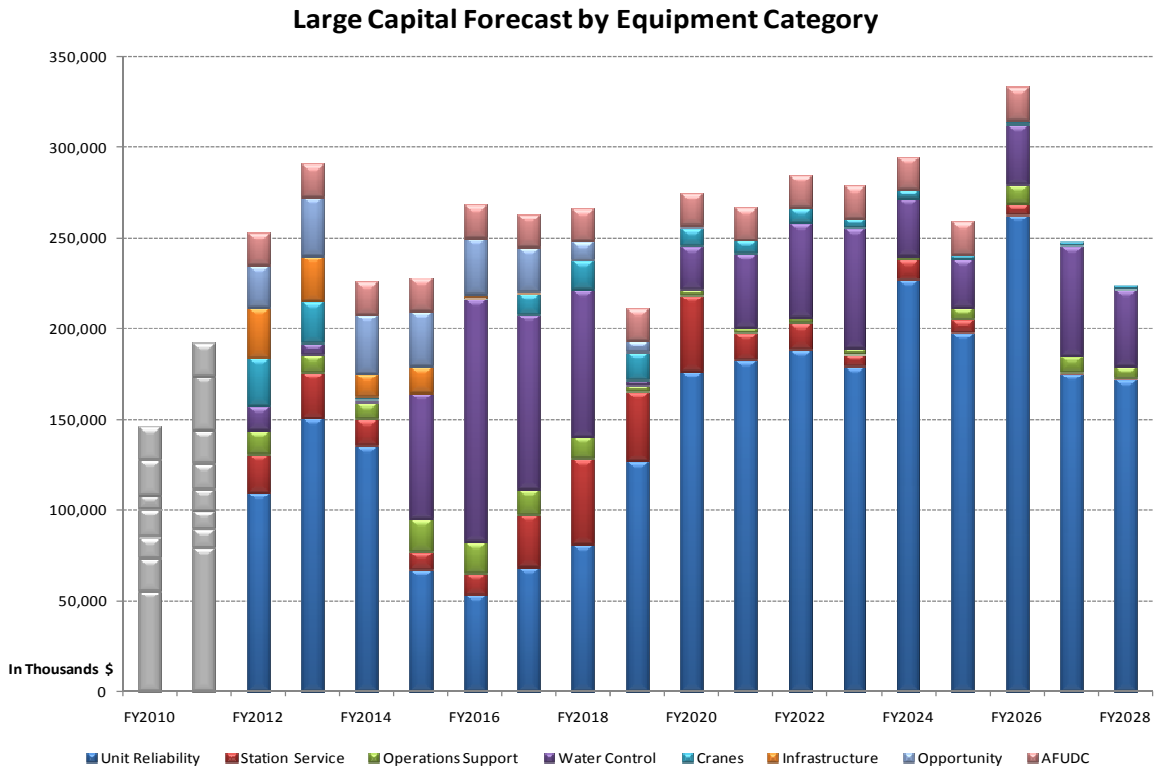

## 8.11 2012 Preferred Investment Plan

At a 12 percent discount rate, the 2010 Recommended Investment Plan identified a relatively stable capital program level of about $250 million per year both during and after the constrained funding period and a scheduling and staffing resource capability that could be sustained for a decade or more. The plan excluded costs for modernizing the Keys pump generating plant and other uncommitted economic opportunity investments.

At a 6 percent discount rate, a stable capital program level is closer to $400 million per year.

The rationale for the 2010 recommended plan large capital program level is still valid today given Bonneville's use of a 12 percent discount rate. The plan provides a stable program level for at least 15 years and is less costly in the long run than are scenarios that further reduce funding.

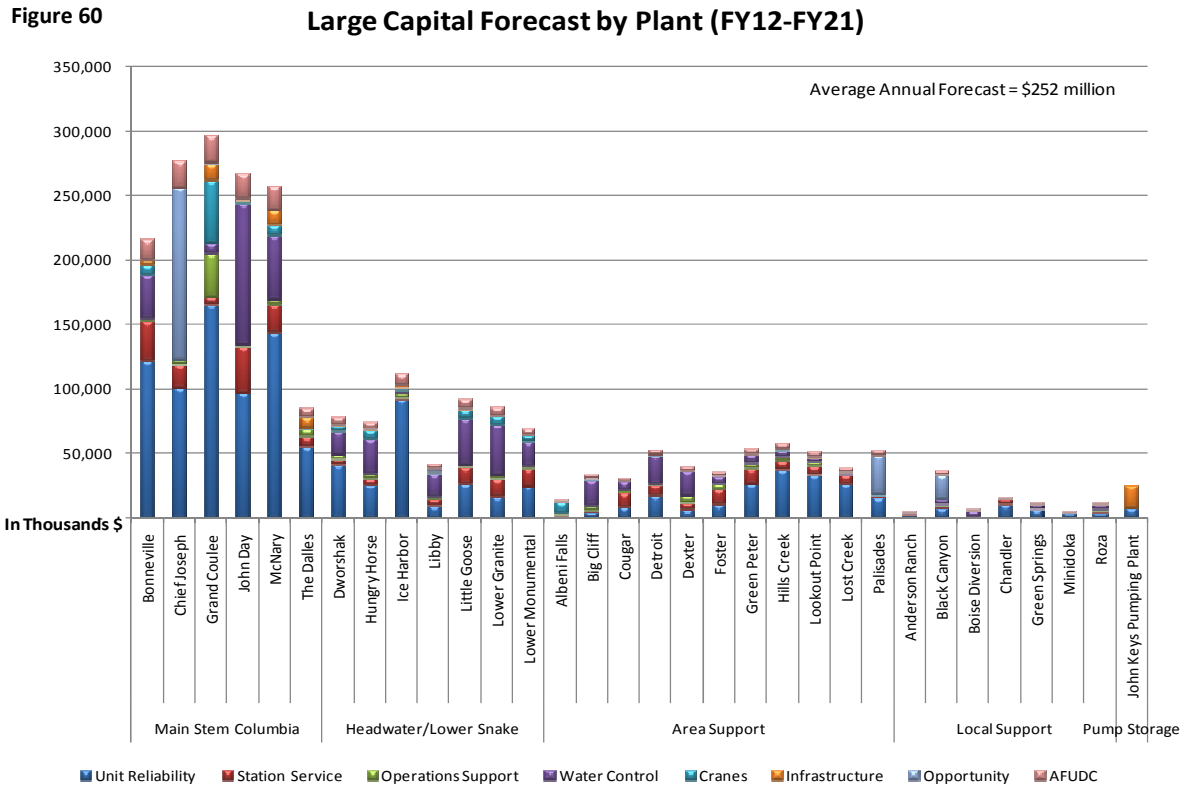
**Figure 59 - Preferred Capital Plan**




## *Condition impacts of the preferred plan*

The average condition of equipment in FY 2022 is forecast to be similar to the average condition today except in the local support class, where average condition declines.

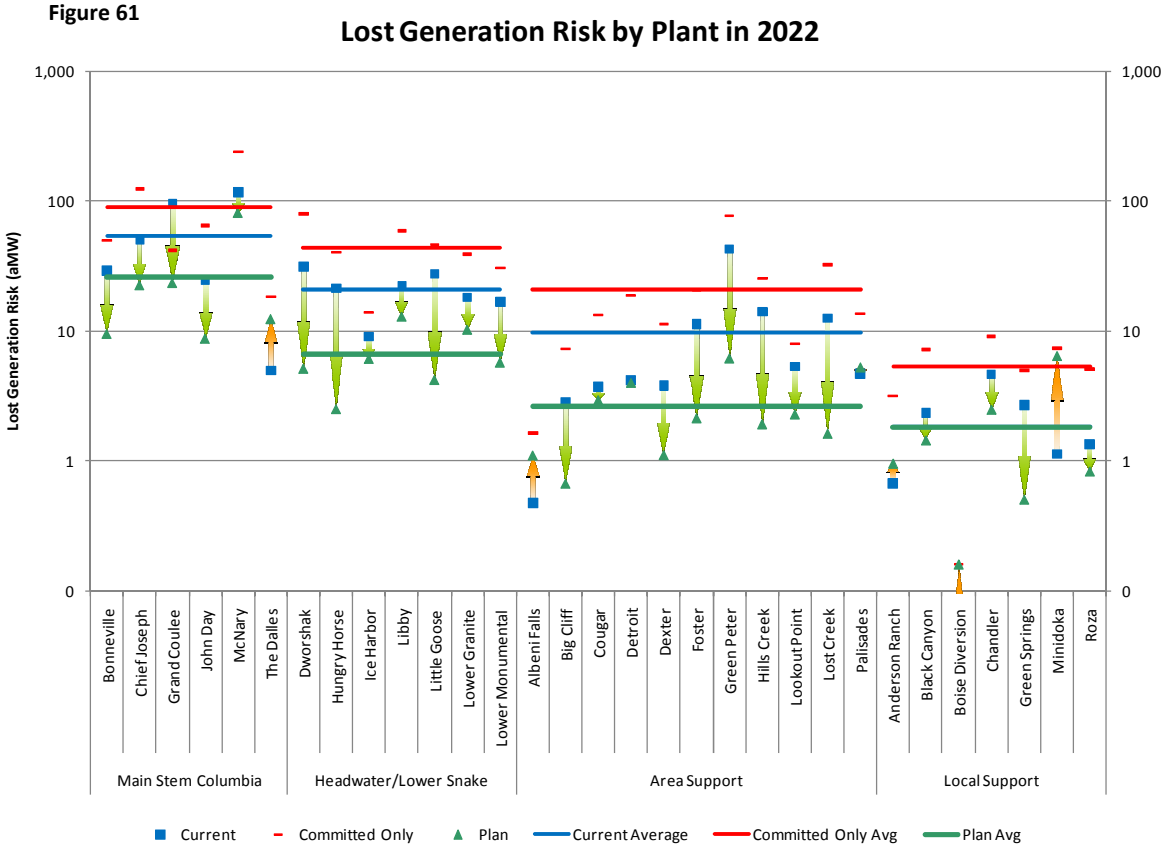
**Figure 60**



## *Lost generation risk*

- LGR is forecast to decline from 587 aMW today to 247 aMW in FY 2022. In FY 2022, McNary will still have 80 aMW of LGR associated primarily with the condition of turbine runners. Runner replacements for the McNary turbine program are scheduled to begin in FY 2020. LGR in future years should decline.
- Grand Coulee and Chief Joseph have forecast LGR of about 20 aMW. Most other plants are forecast to have LGR of less than 10 aMW.

**Figure 61**




## *Levelized cost*

- Levelized costs are calculated for each plant and the system using incremental O&M and capital costs forecast for the FY 2012–2021 period. The present value of these costs is divided by the present value of energy expected to be generated by each plant and the system to derive the levelized incremental cost of the preferred plan.
- Levelized incremental costs for all plants except Boise Diversion (which has a disproportionally high allocation of O&M costs) are below the value of power generated by the facility. Levelized incremental costs for the FCRPS program under the preferred plan are about $6.50/MWh in 2012 dollars, about 11 percent of the value of power generated by the system.
- When sunk costs for outstanding debt obligations are added, the fully allocated cost of the hydro system is about $10/MWh in 2012 dollars.

Figure 62

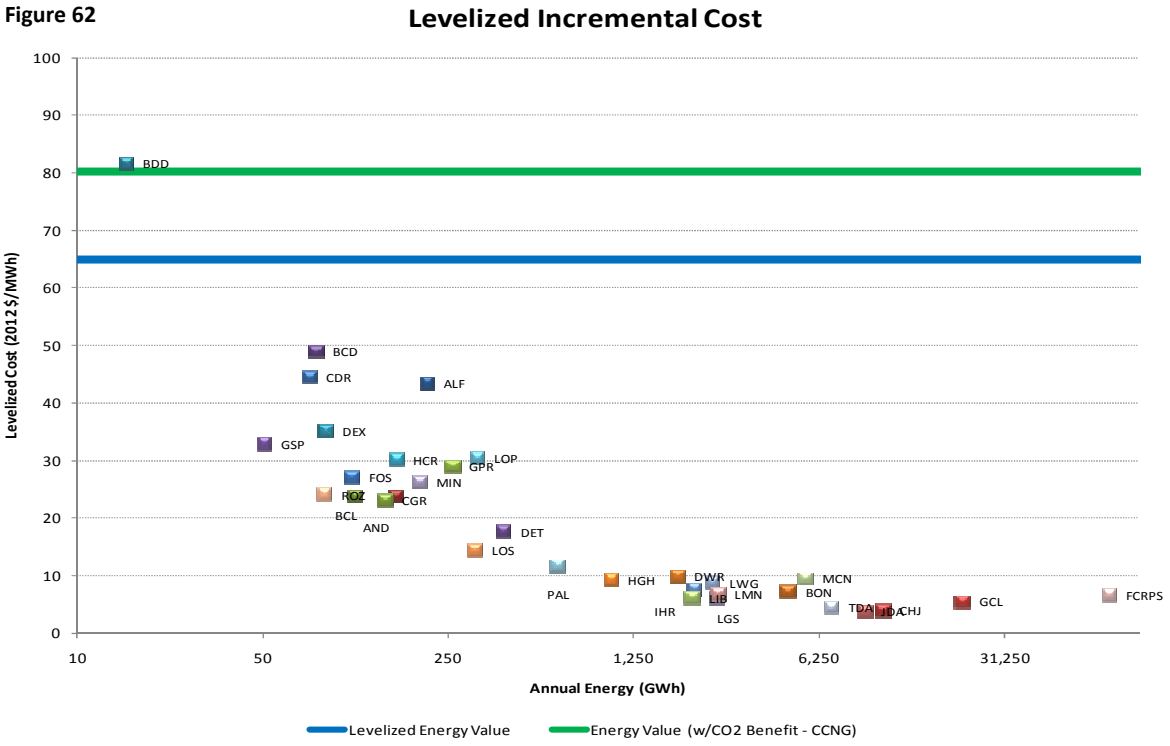
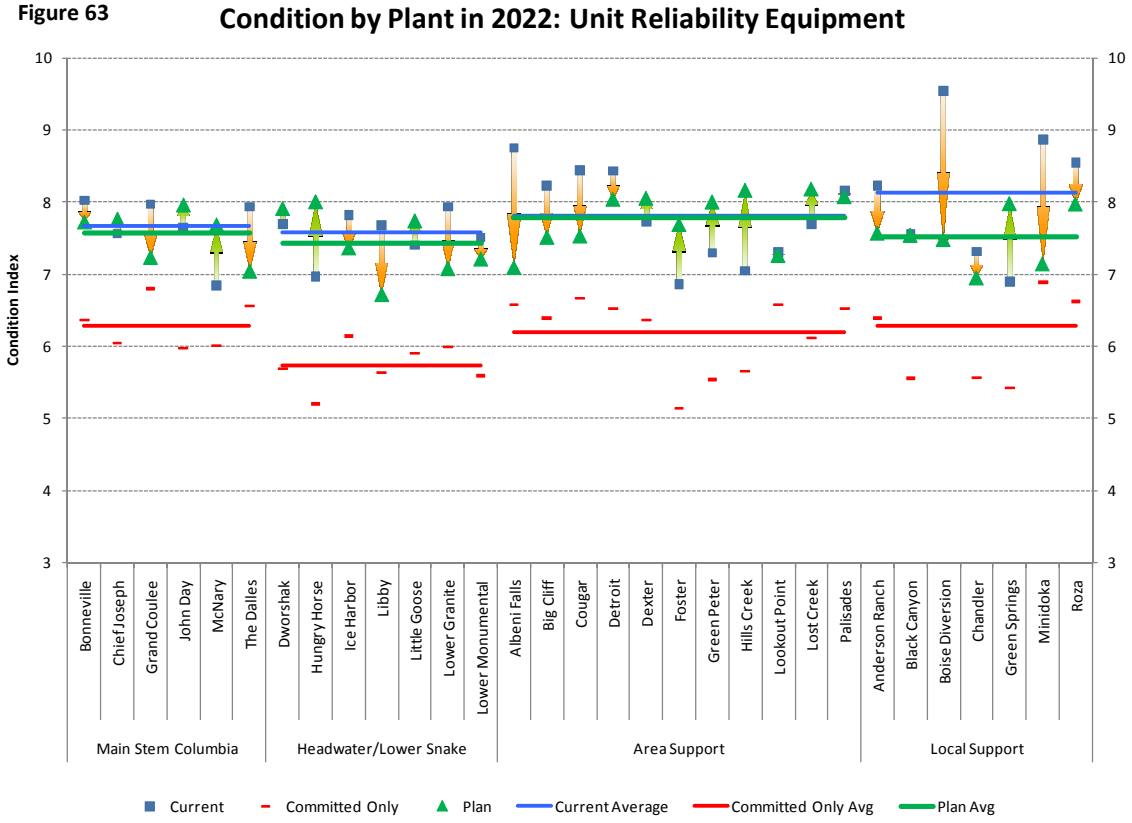



Figure 63



## 8.12 SUMMARY

The approach to creating this draft FY 2014 strategy is consistent with the FY 2012 strategy developed for the 2010 IPR.

The strategy identifies the condition and risk implications of the currently committed hydro investment program and of the new investments prioritized around minimizing life cycle cost. It represents a reasonable level and timing of future investment to ensure adequate business continuity and to maintain the production capability of the FCRPS hydro system at a cost-effective level of reliability.

The strategy includes electrical and mechanical equipment on hydropower-specific and joint-use features but excludes costs for large dam safety civil features and repairs and replacements of aging hatchery and fish passage facilities constructed for CRFM and the Lower Snake Compensation Plan. The strategy also excludes an evaluation of specific issues that may result in new strategic initiatives (for example, capacity expansion opportunities, pumped storage and automation). Studies required for these issues are detailed and unique. If and when those studies develop, they will be summarized and reflected in future strategies.

The 2012 Preferred Investment Plan for large capital in this strategy is unchanged from the 2010 Recommended Investment Plan presented in the 2010 IPR process. A large capital program level of about $250 million per year provides a stable program that can be efficiently resourced for at least 15 years without accumulating a high level of risk. This program level is less costly in the long run than scenarios that further reduce funding.

The Preferred Plan does not include costs for modernization of John W. Keys Pump Generating Plant or other uncommitted economic opportunity investments (for example, additional units at Dworshak, Libby or John Day).

The plan maintains an average hydroAMP condition rating for unit reliability equipment above a score of 7 (scale of 10) and reduces lost generation risk to less than 300 aMW within a decade. Under this plan, the 20-year levelized fully allocated cost of the hydro system is forecast to be $10 per MWh (FY 2012 dollars). The levelized incremental cost of the 2012 Preferred Investment Plan is about $6.50/MWh (FY 2012 dollars)

**Figure 64 - Asset Related Proposed O&M Levels –** *In support of the 2012 Preferred Capital Investment Plan*

| | 2012 | 2013 | 2014 | 2015 | 2012 - 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2012 - 2021 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Main Stem Columbia** | **205,731** | **229,870** | **236,486** | **240,062** | **912,149** | **252,485** | **248,137** | **259,236** | **267,013** | **275,023** | **283,274** | **2,497,316** |
| Routine Expense | 169,402 | 175,901 | 181,725 | 187,577 | 714,604 | 193,746 | 199,539 | 205,525 | 211,691 | 218,042 | 224,583 | 1,967,731 |
| Non Routine Expense (NREX) | 30,667 | 48,673 | 48,934 | 46,715 | 174,989 | 53,137 | 42,831 | 48,058 | 49,500 | 50,985 | 52,514 | 472,014 |
| Small Capital | 5,662 | 5,296 | 5,827 | 5,770 | 22,555 | 5,602 | 5,767 | 5,652 | 5,822 | 5,997 | 6,177 | 57,572 |
| **Headwater/Lower Snake** | **81,090** | **82,270** | **84,482** | **87,000** | **334,843** | **85,625** | **90,883** | **93,057** | **95,849** | **98,725** | **101,686** | **900,669** |
| Routine Expense | 68,713 | 71,283 | 73,459 | 75,708 | 289,163 | 78,024 | 80,361 | 82,772 | 85,255 | 87,813 | 90,448 | 793,837 |
| Non Routine Expense (NREX) | 8,437 | 6,322 | 6,939 | 6,905 | 28,603 | 3,032 | 5,819 | 5,803 | 5,978 | 6,157 | 6,342 | 61,733 |
| Small Capital | 3,940 | 4,665 | 4,085 | 4,388 | 17,077 | 4,569 | 4,703 | 4,482 | 4,616 | 4,755 | 4,897 | 45,099 |
| **Area Support** | **36,719** | **36,831** | **37,560** | **38,746** | **149,857** | **39,050** | **41,264** | **41,818** | **43,073** | **44,365** | **45,696** | **405,122** |
| Routine Expense | 31,042 | 32,127 | 33,086 | 34,078 | 130,332 | 35,103 | 36,153 | 37,237 | 38,355 | 39,505 | 40,690 | 357,376 |
| Non Routine Expense (NREX) | 3,281 | 2,236 | 1,795 | 2,050 | 9,362 | 1,253 | 2,339 | 1,934 | 1,993 | 2,052 | 2,114 | 21,047 |
| Small Capital | 2,396 | 2,468 | 2,680 | 2,619 | 10,162 | 2,694 | 2,772 | 2,646 | 2,726 | 2,808 | 2,892 | 26,700 |
| **Local Support** | **13,441** | **14,773** | **15,155** | **15,135** | **58,504** | **15,141** | **15,577** | **16,276** | **16,764** | **17,267** | **17,785** | **157,314** |
| Routine Expense | 11,651 | 11,978 | 12,315 | 12,665 | 48,609 | 13,021 | 13,392 | 13,794 | 14,208 | 14,634 | 15,073 | 132,730 |
| Non Routine Expense (NREX) | 920 | 1,390 | 2,465 | 1,865 | 6,640 | 1,205 | 1,242 | 1,633 | 1,682 | 1,733 | 1,785 | 15,921 |
| Small Capital | 870 | 1,405 | 375 | 605 | 3,255 | 915 | 943 | 849 | 874 | 900 | 927 | 8,663 |
| **Grand Total** | **336,981** | **363,744** | **373,684** | **380,943** | **1,455,352** | **392,301** | **395,861** | **410,387** | **422,699** | **435,380** | **448,441** | **3,960,421** |

**Figure 65 - Proposed Capital Investment Levels -** *2012 Preferred Investment Plan*

| | 2012 | 2013 | 2014 | 2015 | 2012 - 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2012 - 2021 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Main Stem Columbia** | **156,617** | **173,571** | **125,373** | **111,876** | **567,437** | **127,662** | **129,948** | **118,706** | **105,224** | **128,007** | **120,151** | **1,297,135** |
| Cranes | 15,870 | 10,462 | 107 | | 26,439 | 221 | 10,525 | 13,839 | 11,394 | 3,271 | 1,861 | 67,550 |
| Infrastructure | 22,230 | 14,750 | 1,607 | 141 | 38,729 | 39 | | | | | | 38,768 |
| Operations Support | 8,853 | 8,169 | 7,781 | 11,205 | 36,008 | 3,758 | 3,248 | 3,286 | 1,695 | 2,063 | 1,133 | 51,192 |
| Opportunity | 19,168 | 25,040 | 25,175 | 21,949 | 91,331 | 23,494 | 18,523 | | | | | 133,348 |
| Station Service | 15,558 | 21,491 | 14,538 | 5,185 | 56,771 | 3,344 | 10,006 | 17,292 | 13,352 | 13,275 | 4,314 | 118,355 |
| Unit Reliability | 74,108 | 93,520 | 76,063 | 37,134 | 280,825 | 26,933 | 38,299 | 44,139 | 78,781 | 107,441 | 109,072 | 685,490 |
| Water Control | 830 | 140 | 103 | 36,261 | 37,334 | 69,873 | 49,348 | 40,150 | | 1,957 | 3,771 | 202,433 |
| **Headwater/Lower Snake** | **34,965** | **36,283** | **37,757** | **41,415** | **150,420** | **67,827** | **63,940** | **68,636** | **40,158** | **60,181** | **58,981** | **510,144** |
| Cranes | 9,464 | 5,678 | | 131 | 15,274 | 252 | 1,279 | 2,266 | 3,791 | 5,637 | 4,163 | 32,662 |
| Infrastructure | 2,708 | 443 | 800 | | 3,952 | | | | | | | 3,952 |
| Operations Support | 3,015 | 661 | 1,288 | 1,697 | 6,661 | 3,571 | 3,446 | 3,363 | 1,091 | 852 | 1,041 | 20,025 |
| Opportunity | 26 | 368 | | | 394 | 271 | 677 | 843 | 564 | 574 | | 3,324 |
| Station Service | 4,837 | 3,526 | | 1,387 | 9,751 | 2,674 | 8,810 | 14,874 | 10,151 | 9,073 | 995 | 56,326 |
| Unit Reliability | 13,934 | 25,607 | 35,669 | 14,548 | 89,758 | 15,484 | 17,540 | 21,102 | 24,561 | 33,492 | 32,447 | 234,384 |
| Water Control | 980 | | | 23,652 | 24,632 | 45,575 | 32,188 | 26,188 | | 10,553 | 20,335 | 159,470 |
| **Area Support** | **33,578** | **46,790** | **29,918** | **36,179** | **146,464** | **46,966** | **43,709** | **43,678** | **34,075** | **55,045** | **54,195** | **424,133** |
| Cranes | 882 | 6,594 | 1,722 | | 9,198 | | | | 520 | 1,125 | 1,400 | 12,242 |
| Infrastructure | 206 | 367 | | | 574 | | | | | | | 574 |
| Operations Support | 366 | 847 | | 4,670 | 5,882 | 9,105 | 6,684 | 5,552 | 285 | 298 | 419 | 28,226 |
| Opportunity | 3,107 | 5,834 | 5,926 | 6,047 | 20,914 | 5,667 | 4,163 | | | | | 30,744 |
| Station Service | 1,193 | 140 | | 3,090 | 4,423 | 5,955 | 9,048 | 12,750 | 12,672 | 17,155 | 8,602 | 70,604 |
| Unit Reliability | 16,239 | 27,572 | 21,905 | 14,168 | 79,884 | 10,427 | 10,633 | 12,409 | 17,856 | 27,522 | 30,802 | 189,533 |
| Water Control | 11,585 | 5,436 | 364 | 8,206 | 25,590 | 15,812 | 13,182 | 12,967 | 2,741 | 8,945 | 12,973 | 92,210 |
| **Local Support** | **2,141** | **2,804** | **1,672** | **4,461** | **11,079** | **4,826** | **6,576** | **16,931** | **13,871** | **13,647** | **15,541** | **82,471** |
| Infrastructure | | | | | - | | | | | | | - |
| Operations Support | 598 | | | 209 | 807 | 527 | 548 | 447 | 170 | 27 | 74 | 2,600 |
| Opportunity | 670 | | | 1,197 | 1,867 | 679 | 873 | 9,432 | 5,734 | 889 | | 19,474 |
| Station Service | | | | 17 | 17 | 33 | 1,152 | 2,194 | 2,239 | 2,605 | 1,260 | 9,500 |
| Unit Reliability | 842 | 2,261 | 568 | 1,540 | 5,210 | 700 | 1,964 | 3,199 | 5,727 | 8,180 | 10,457 | 35,437 |
| Water Control | 32 | 543 | 1,104 | 1,498 | 3,177 | 2,887 | 2,039 | 1,659 | | 1,946 | 3,750 | 15,459 |
| **Pump Storage** | **4,280** | **3,110** | **6,213** | **9,279** | **22,881** | **1,631** | **501** | **38** | | | | **25,051** |
| Infrastructure | 322 | 1,164 | 4,547 | 9,279 | 15,312 | 1,631 | 501 | 38 | | | | 17,483 |
| Unit Reliability | 3,957 | 1,946 | 1,666 | | 7,569 | | | | | | | 7,569 |
| **Grand Total** | **231,580** | **262,557** | **200,933** | **203,211** | **898,280** | **248,912** | **244,675** | **247,990** | **193,328** | **256,881** | **248,868** | **2,338,934** |

# ENERGY EFFICIENCY

# ASSET STRATEGY SUMMARY

# 9 ENERGY EFFICIENCY

## 9.1 STRATEGIC PRIORITY

***BPA is pursuing energy efficiency as one of six strategic priorities. Advance energy efficiency: Meet 85 percent of the load growth of regional public utilities through energy efficiency and conservation over 20 years.***

Energy efficiency is BPA's priority resource for meeting its customers' load growth. Energy efficiency is the lowest cost and least risk resource in the Pacific Northwest. It also

- reduces customer utilities' load and load growth and eliminates or defers the need for new generation and transmission infrastructure,
- supports U.S. energy independence by reducing the need for imported fuel and
- contributes to climate change mitigation and adaptation efforts because it has a negligible carbon footprint.

Energy efficiency efforts have already enabled the Pacific Northwest to capture over 4.2 gigawatts in cumulative energy savings since 1980, enough to power four cities the size of Seattle for a year.

As reaffirmed in a recent public process, BPA and public power customers are committed to capturing energy efficiency benefits for the Pacific Northwest as set out in the agency's long-term strategic objective for energy efficiency: *"BPA and public power cooperatively accomplish public power's share of regionally cost-effective energy efficiency and demand management."*

Together, the agency and public power aim to meet 85 percent of public power's 20-year load growth with energy efficiency, a goal consistent with the Northwest Power and Conservation Council's Sixth Power Plan targets (www.nwcouncil.org). According to the Plan, the population of the Pacific Northwest will increase from about 13 million in 2010 to about 16.7 million by 2030. Load is projected to increase from 21,000 average megawatts to 28,000 aMW. The implication is that the region will invest in energy efficiency rather than new generation facilities for 85 percent, or 5,900 aMW, of the expected load growth.

BPA's new tiered rate design, now in effect through the Long-Term Regional Dialogue contracts established the foundation for accomplishing the 85 percent load growth target. Preference customers can extend the value of their allocation of low-cost Tier 1 power from BPA by investing in energy efficiency, which reduces their load and defers their need to purchase more costly Tier 2 power or make other resource acquisitions. To meet the 85 percent target, BPA is pursuing energy saving strategies in three areas.

### *Utility program savings (programmatic savings)*

Utility programs will represent the bulk of the savings through efforts that emphasize three areas.

- *Infrastructure support*, which includes developing policies to encourage energy efficiency, improving the region's ability to achieve energy efficiency through regional programs,

reaching out and engaging with customer utilities and other energy efficiency project implementation stakeholders, conducting research and evaluations, and providing technical support for project implementation.

- *Acquisition funding and support,* which is provided in the form of incentive dollars to help customers achieve cost-effective energy efficiency.
- *Innovation,* which continues to develop new ways to save energy at the lowest possible cost.

### *Market transformation savings*

Market transformation savings will leverage the regional market's power to accelerate innovation and adopt energy efficient products, services and practices. Examples include collaborating with manufacturers to integrate energy efficiency into their product designs and with architects and builders to promote early adoption of energy efficient designs and practices. BPA partners with and is the major funder of the Northwest Energy Efficiency Alliance, which promotes market transformation.

### *Nonprogrammatic savings*

Nonprogrammatic savings will target energy efficiency that occurs through codes and standards as well as through opportunities outside utility programs or market transformation efforts. For instance, thousands of compact fluorescent light bulbs are purchased and installed in the region without utility financial incentives, making them extremely cost effective. BPA will track and account for these savings because they count toward public power's target.

**Figure 66 - 6th Power Plan Savings Summary (aMW)**

| Savings by funding source | 2010 Actual | 2011 Estimated | 2012 Projected | 2013 Projected | 2014 Projected | Total Savings |
|---|---|---|---|---|---|---|
| **BPA Funded Programmatic Savings** | 57 | 105 | 46 | 42 | 39 | **289** |
| **Utility Self Funded Savings** | 23 | 2 | 16 | 14 | 13 | **68** |
| **Norpac** | 0 | 1 | 6 | 0 | 5 | **12** |
| **Market Transformation (NEEA)** | 11 | 11 | 8 | 8 | 8 | **46** |
| **Non-Programmatic** | 15 | 14 | 14 | 14 | 13 | **70** |
| **Carryover** | 0 | 0 | 11 | 11 | 11 | **34** |
| **Total Annual Savings** | **106** | **132** | **102** | **89** | **89** | **518** |
| **Total Reported 6th Plan Savings*** | **103** | **128** | **98** | **86** | **89** | **504** |
| **Self- Funded % of Total** | 29% | 2% | 25% | 25% | 25% | 19% |

*Savings toward the 6th Plan targets count 1 year measure life savings once, in 2014, although savings are achieved annually and count toward annual targets (e.g., Scientific Irrigation Scheduling).

## 9.2 PURPOSE AND SCOPE OF ASSET STRATEGY

This plan covers the capital expenditures BPA will use to acquire energy efficiency (conservation) in partnership with its public power customer utilities. The vast majority of these funds are used in energy efficiency incentive programs that reimburse customer utilities and third-party program implementers. BPA is currently investing in two software tools that, when fully developed, will enable the agency to report and track customer utility savings and expenditures. Other energy efficiency targets, such as staffing, marketing, evaluation, research and funding for the Northwest Energy Efficiency Alliance, are expenses rather than capital investments.

This asset strategy is somewhat different from other BPA asset strategies because the physical assets are acquired, owned, operated and maintained by residential, industrial, commercial or other end users. From BPA's perspective as a funding entity, the asset acquired is the energy efficiency resource – the electric energy savings. BPA treats its expenditures as a regulatory asset; neither BPA nor the customer utility owns the asset. BPA pays for the savings based on criteria explained below and has an extensive acceptance and oversight process to ensure the investment is achieving real reductions in electricity usage.

## 9.3 BACKGROUND

As BPA and public power planned to meet the aggressive energy efficiency targets in the Sixth Power Plan, the agency developed an Action Plan for Energy Efficiency 2010 – 2014. The Sixth Power Plan, adopted in February 2010, calls for the region to acquire 1,200 aMW of efficiency between FY 2010 and FY 2014. Public power's share of that target is 504 aMW (42 percent), a significant increase over past targets and a much higher target than the savings achieved in any previous five-year period. The annual targets for FY 2010 and FY 2011 were 80 and 99 aMW, respectively, for programmatic savings and market transformation.

The ambitious target in the Council's plan requires BPA and its customers to expand existing methods as well as to identify and develop new ways to acquire energy efficiency. The portfolio of programs, offerings and activities outlined in the agency's Action Plan are designed to facilitate meeting public power's share of the Council's target. The Action Plan will help guide BPA's program decisions and its evaluation of progress toward the target. BPA will continue to collaborate with its customers and other stakeholders to update the Action Plan as conditions warrant.

Since the development of the Action Plan in 2010, public power and BPA have been very successful in meeting the annual targets within the Sixth Power Plan. In FY 2010 public power achieved over 90 aMW, and in FY 2011 that number was 118 aMW of programmatic and market transformation savings at a cost of approximately $1.7 million per aMW. This is less than the $2.1 million per aMW that was forecast in the Energy Efficiency Plan. If nonprogrammatic savings are included (assumed to be approximately 14 aMW per year), BPA and public power are collectively well on track to meeting public power's 504 aMW target. An updated Action Plan reflects the successes of the past two fiscal years and responds to the ever-changing energy efficiency landscape.

## 9.4 ASSET MANAGEMENT OBJECTIVES

The Long-Term Regional Dialogue Policy sets BPA's overarching energy efficiency goal of acquiring public power's share of all cost-effective conservation using the Council's Power Plan as the basis for setting the conservation target. These savings are to be achieved at the lowest possible cost to BPA and the region. BPA collects enough in rates to achieve 75 percent of public power's share of the programmatic target. Customer utilities are expected to self-fund the other 25 percent of the target. This helps keep BPA's wholesale rate low while allowing for local control and flexibility in implementing local utility programs and providing more assurance that the target will be met.

Capital funds are essential for Energy Efficiency, working in collaboration with public power customers, to achieve its organizational objective and, perhaps more important, for the agency to meet its energy savings commitment.

To facilitate savings acquisition, Energy Efficiency capital is split between covering the costs for energy efficiency incentives paid to utility customers and BPA-managed program implementation. Covering program implementation costs with capital funds allows the region to reach implementation economies of scale across a wide variety of service territories, which lowers the overall regional cost of acquiring savings. The Energy Smart Grocer program is an example of capital funds paying for program implementation. The program allows utilities to use one regional implementer to acquire energy savings at grocery stores rather than having each utility run its own program or contract individually with an implementer.

Capital funds BPA uses to invest in electric energy savings are considered an investment in a "regulatory asset." Neither BPA nor the utilities owns the "asset," be it a new efficient heat pump or high efficiency commercial lighting, but the funds providing the equipment are considered an asset because of the regulatory requirements placed on BPA to acquire conservation. Only savings that are "cost effective" fall within the boundaries of being a regulatory asset. Cost effective is defined as having a benefit/cost ratio greater than 1.0, which means the present value of the benefits (energy savings plus non energy benefits) over the lifetime of a given measure is equal to or greater than the measure's total incremental cost. BPA works very closely with the Council's Regional Technical Forum, a technical advisory committee, to evaluate the savings and costs for specific measures. This independent/peer review and coordination provides a robust review of savings estimates. These savings and costs determine the cost effectiveness of specific measures/technologies.

Energy efficiency investments are amortized over 12 years, which is the average measure life as defined in the Sixth Power Plan.[13] The benefit of amortizing energy efficiency investments is to lessen the upward pressure on power rates while allowing public power to achieve its ambitious savings target. Amortization also allows energy efficiency to be evaluated and treated similarly to other capital investments. The Pacific Northwest Electric Power Planning and Conservation Act of 1980 established conservation as a resource, resulting in energy efficiency being funded similarly to other capitalized generating resources.

## 9.5 KEY DRIVERS

A host of drivers influences BPA's Energy Efficiency capital investments. First and foremost, the Northwest Power and Conservation Act considers energy efficiency a priority resource. The Act specifically calls for the Northwest Power and Conservation Council to create power plans and for BPA to act consistently with those plans. The most recent, the Sixth Power Plan, calls for the region to cover 85 percent of load growth with energy efficiency savings. Therefore, BPA's strategic objective is to act consistently with the plan and ensure public power's share of the regional target is met. Energy efficiency is expected to play a critical role in meeting future load growth because it is the lowest-cost resource available to the region. In addition to being the

[13] Measure life is the median effective useful life of an energy savings technology.

lowest-cost resource, energy efficiency also reduces the load BPA is obligated to serve. Reducing load is a key driver behind energy efficiency investments.

Other drivers for the agency's acquisition of energy efficiency include

- reducing BPA utility customers' exposure to higher costs for serving above high water mark loads;
- reducing overall regional electricity consumption, which helps reduce the need for and costs of acquiring power and further reduces the need for new transmission and distribution investments; and
- reducing the amount of carbon emissions that would be emitted by generating electricity to serve load growth not otherwise reduced because of energy efficiency savings.

## 9.6 KEY RISKS

The agency faces several risks to achieving its energy efficiency strategic objective of meeting public power's share of the regional savings target.

- *The costs of acquiring energy efficiency end up being more than the agency has planned*. Energy Efficiency estimates the cost of acquiring savings for each of the five years of the Sixth Power Plan. If actual costs are more than projected costs, there might not be enough funding to reach annual savings targets, which would increase the possibility of missing the five-year savings target. To mitigate this risk, costs are managed at both the measure and portfolio levels. BPA sets reimbursement rates at levels that represent the greatest value to the system as well as help move the market for a particular measure or technology. This allows some control on the uptake of a measure, although that is ultimately controlled by customer utility programs.

- *Utility customers do not adequately self-fund.* BPA has planned to pay for 75 percent of public power's programmatic savings targets for FY 2012 through FY 2014. Utility customers are expected to pay directly for, or "self-fund," the remaining 25 percent. This self-funding provides customers with a degree of local control and autonomy. Although this self-funding split was agreed to during the post-2011 public process, it poses a risk to BPA's energy efficiency objective if customers do not self-fund enough efficiency to reach the 25 percent self-funding target. Inadequate self-funding could result from a variety of reasons, including customers facing flat or declining loads. In spite of low load growth, utilities indicate to BPA staff that they continue to be committed to self-funding 25 percent of the programmatic savings target.

  Customers in Washington that are subject to Initiative 937 have an additional incentive in the form of a financial penalty from the state if they do not meet all cost-effective energy efficiency targeted for their service territories. Customers subject to I-937 represent a significant portion of BPA's load, which creates a sizable opportunity to achieve energy efficiency and helps mitigate the self-funding risk.

- *The timing of BPA's energy efficiency target setting does not align with the Council's timing for regional target setting.* BPA's IPR and rate setting necessitate that Energy Efficiency's

proposed spending targets be set before regional savings targets stipulated by the Council are known. For example, the FY 2014-2015 IPR and rate case schedules will result in Energy Efficiency spending levels being set for the first year of the Seventh Power Plan prior to the FY 2015-2019 targets being available from the Council, estimated to be sometime around December 2014/January 2015. However, as was the case with the release of the Sixth Power Plan, BPA can revise out-year spending levels appropriately to meet the targets.

- Utility customers may be hampered in their ability to implement programs and acquire savings if contractor infrastructure is compromised during a "conservation roller coaster." The roller coaster refers to spending that fluctuates significantly from one year to the next.

## 9.7 STRATEGY

In March 2010, BPA closed out a two-year public process to lay out the foundational policies of BPA's energy efficiency program beginning Oct. 1, 2011 ("post-2011"). During this process, utility customers and regional stakeholders provided input on alternative energy efficiency program strategies that BPA could pursue post-2011. The resulting strategy, defined in the *"Post-2011 Policy Framework,"* supports allocating capital funding to customers on a Tier One Cost Allocator basis and assuming customers self-fund 25 percent of public power's programmatic savings target. More information relating to the post-2011 public process and resulting documents is available online.

BPA has pledged to stakeholders that, before the end of FY 2014, the agency will review the post-2011 policy framework, giving particular attention to the overall percentage of self-funding. During this review, BPA will analyze prior self-funding levels to determine if the 25 percent level should be increased, decreased or maintained. Until this review is complete, BPA will implement its post-2011 policy as it stands.

## 9.8 PRIORITIZATION PROCESS

More than two-thirds of the capital funding made available to Energy Efficiency for acquiring energy efficiency savings is allocated to utility customers via Energy Conservation Agreements. Therefore, customers, not BPA, have direct control over the timing and specific use of these funds, which are known as Energy Efficiency Incentive funds. EEI funds must be spent in a particular rate period on cost-effective energy efficiency savings that count toward public power's share of the regional target. Utilities must follow the Energy Efficiency Implementation Manual in order to be reimbursed. Energy Efficiency Contracts Administration provides receipt and acceptance as well as oversight on the savings acquisition and spending. Detailed information on measures and projects that are claimed toward the target are retained in the Energy Efficiency Database, an internal resource used for reference and future program design.

Energy Efficiency uses the portion of its capital spending not allocated to customers via the EEI mechanism to cover the costs of delivering regional programs. Energy Efficiency prioritizes the portion of the capital spending over which it retains control by directing it to regional programs that meet a market need or offer a program opportunity. Energy Smart Grocer is a program that fills a niche need and has proven to be a successful delivery mechanism across BPA's service territory while meeting the diverse needs within the agency's customer base. Energy

Smart Industrial is a successful program that captures available energy efficiency that was not being fully tapped.

## 9.9 Costs

BPA Energy Efficiency's cost of acquisition is based on a) the amount of savings from measures/projects (which is a function of the number of measures/projects) implemented by utilities and paid for by BPA and b) the amount that BPA offers in reimbursements for each measure/project.

The Action Plan determines how the public power savings target will be met. The Action Plan breaks down the overall savings target into programmatic, nonprogrammatic and market transformation savings goals. The programmatic target is further broken down into savings targets by sector (residential, commercial, industrial and agricultural). For example, over the five-year period of the Sixth Power Plan, the Action Plan (of March 2012) indicated that 143 aMW of savings would be achieved by the residential sector, which comprises a multitude of individual energy efficiency measures.

**Figure 67 - Total Annually Reported Programmatic Savings (aMW)**

| | 2010 Actual | 2011 Estimated | 2012 Projected | 2013 Projected | 2014 Projected | 2010-2014 **Total** |
|---|---|---|---|---|---|---|
| **Portfolio** | **80** | **107** | **62** | **56** | **51** | **356** |
| **By Sector** | | | | | | |
| Residential | 31 | 39 | 28 | 25 | 21 | **143** |
| Commercial | 24 | 26 | 18 | 15 | 11 | **94** |
| Industrial | 14 | 30 | 7 | 7 | 8 | **67** |
| Agriculture | 8 | 9 | 5 | 5 | 5 | **32** |
| DSEI | 0 | 1 | 1 | 2 | 2 | **5** |
| Federal | 3 | 3 | 3 | 3 | 3 | **15** |

*DSEI – Distribution System Efficiency

For individual measures, BPA determines reimbursements individually based on four key factors.

- The incremental measure cost (as determined by the Regional Technical Forum).
- The levelized cost of the proposed reimbursement over the lifetime of the measure.
- the first-year cost per kilowatt-hour of the proposed reimbursement.
- The market situation of the measure (for example, the measure is new and needs additional incentives to encourage participation).

BPA pays up to the incremental cost for measures and does not allow the levelized cost of reimbursements to exceed the avoided cost of energy efficiency (defined in the Power Plan). In addition, the goal is to balance the portfolio's overall reimbursements to the budget-defined goal, which is stated in millions per first-year aMW. This is the budget-based cost metric and does not necessarily include the value of the savings over the lifetime of the measure. For custom projects, BPA pays a dollar-per-kWh value based on verified savings on completed projects.

As an example, calculating the total cost of the savings from the residential sector involves BPA multiplying a measure's reimbursement amount (for example, $100) by the number of that measure (for example, 1,000) expected to be installed and reported to BPA over the five years of the Council Plan. This calculation is then repeated for all the measures falling within the residential sector target. Rolling these costs up to the sector level provides the overall cost for the residential sector. This bottom-up calculation is then performed for the other sectors, including the costs of expected custom projects, and then rolled up to the programmatic level. This provides BPA with an overall cost estimate, expressed as a dollar figure per average megawatt ($/aMW) that represents the reimbursement amount divided by the first-year energy savings. Because energy efficiency is a regulatory asset, there are no maintenance costs. In addition, the capital cost includes payments to third-party program implementation contractors and performance payments to utilities.

The above analysis helps provide the agency with an understanding of the overall expected capital cost to achieve the savings target. It does not cover the total amount the agency will spend on energy efficiency, which also includes expenses such as research, market transformation costs and internal labor. The total capital planned spending for Energy Efficiency for FY 2010 through FY 2014 is $459 million.

Because the savings targets for the Seventh Power Plan are not yet known, BPA has made an assumption that the capital needs for FY 2015 through FY 2021 will be similar to those under the Sixth Power Plan. The capital forecasts for FY 2015 through FY 2021 were determined by taking the average annual capital spending from FY 2010 through FY 2014 and increasing it by an inflation factor. As the targets from the Seventh Plan are known, BPA expects forecast spending will be adjusted to meet the targets.

**Figure 68 - 10-year Energy Efficiency Capital Costs ($ millions)**

| | Current rate period | | Next rate period | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | FY 2012 | FY 2013 | FY 2014 | FY 2015 | 4-Year Total | FY 2016 | FY 2017 | FY 2018 | FY 2019 | FY 2020 | FY 2021 | 10-Year Total |
| **Capital Investment** (excluding AFUDC and Corporate Overheads) | | | | | | | | | | | | |
| **Energy Efficiency** | | | | | | | | | | | | |
| Energy Efficiency Incentive | 73.3 | 56.3 | 52.6 | 64.4 | 246.6 | 66.3 | 68.3 | 70.4 | 72.5 | 74.7 | 76.9 | 675.8 |
| BPA Managed Program Budget | 15.7 | 18.9 | 22.6 | 27.6 | 84.8 | 28.4 | 29.3 | 30.2 | 31.1 | 32.0 | 33.0 | 268.7 |
| Total | 89.0 | 75.2 | 75.2 | 92.0 | 331.4 | 94.8 | 97.6 | 100.5 | 103.6 | 106.7 | 109.9 | 944.4 |

The investments made with capital funding for energy efficiency are used to acquire the most cost-effective resource in the Pacific Northwest. Additionally, energy efficiency significantly contributes to several critical policy goals that help keep the cost of electric power to end users as low as possible:

- Meet 85 percent of the load growth of regional public utilities through energy efficiency and conservation over 20 years.
- BPA and public power cooperatively accomplish public power's share of regionally cost-effective energy efficiency and demand management.

# FISH AND WILDLIFE

# ASSET STRATEGY SUMMARY

# 10 FISH AND WILDLIFE

## 10.1 PURPOSE AND SCOPE

BPA is responsible for the protection, mitigation and enhancement of fish and wildlife affected by the construction and operation of the FCRPS. BPA is guided in its program implementation by the Northwest Power and Conservation Council's Fish and Wildlife Program and the associated biological opinions that regulate the operation of the FCRPS. Capital dollars in the program are used for construction of new hatcheries, construction of fish screens and passage devices in tributaries (not at FCRPS dams) and land acquisitions for wildlife and resident fish.

## 10.2 BACKGROUND

Under its Fish and Wildlife Program, the Council provides selection and funding recommendations for hatchery and fish facility construction and for land acquisitions. The program is informed by the Council's public and scientific review procedures. Once BPA receives the Council's recommendations, the agency selects projects for funding and develops its capital spending plan. A National Environmental Policy Act public process is often required for fish and wildlife capital investments.

BPA does not take title to or own the facility or land when it funds construction or acquires land. The entity or sponsor (usually a tribe, state or other federal agency) to which BPA has provided funds takes title on a permanent basis together with ownership responsibilities (for example, paying property taxes). Maintenance responsibility usually remains with BPA and is met through its expense budget. BPA's goal is to maximize asset value consistent with sound business practices and management/resource objectives.

In land purchases, BPA secures the property's asset value through a conservation easement. The conservation easement gives BPA enforcement rights on the property *in perpetuity* to ensure the natural resource values (wildlife benefits) are forever protected. The easement is coupled with a property management plan. For hatchery assets, owners and operators develop asset management plans that identify how the asset will be maintained to ensure its value is sustained year after year.

## 10.3 ASSET MANAGEMENT OBJECTIVES

BPA gives highest priority to fish and wildlife capital investments that are BiOp projects, actions under the Columbia Basin Fish Accords and part of other long-term agreements.

**Hatchery and fish facility assets**: Hatcheries produce fish for harvest, to support treaty trust responsibilities and to increase adult fish returns that contribute toward recovery of species listed as threatened or endangered under Endangered Species Act. These objectives are met through specific fish production targets and facility management plans and are supported by monitoring and evaluation.

**Land assets**: Land acquisitions provide mitigation for wildlife and resident fish losses that have been identified through Council processes. Land assets are managed according to the terms of

conservation easements as well as according to property-specific asset management plans designed to sustain, restore and enhance the habitat.

**Fish passage:** Fish passage objectives include improving access to habitat for fish rearing and spawning and reducing loss of fish at irrigation diversions. BPA's goal is to preserve the functionality of fish passage over time.

## 10.4 Key Drivers

The following are key drivers determining the level of capital investment in BPA's fish and wildlife program.

- Columbia Basin Fish Accords and other long-term agreements for wildlife and resident fish mitigation
- Accord and BiOp commitments for construction of hatcheries to increase adult fish returns to contribute to rebuilding weak stocks and provide opportunity for harvest.
- Accord and BiOp commitments for fish passage improvements in tributaries as off-site mitigation for FCRPS dams

Recent accomplishments include the nearly complete Chief Joseph Hatchery, which is designed to rebuild upper Columbia salmon and steelhead runs and support tribal fisheries, and passage improvements that have opened up approximately 700 miles of habitat formerly blocked by barriers.

## 10.5 Key Risks

Many uncertainties and risks affect the fish and wildlife program.

For wildlife land acquisitions, it is often difficult to find willing sellers in priority locations (associated with FCRPS dams). Local governmental units often object to land purchases when those purchases will remove property from the tax roles (for example, moving land into a tribal trust status).

The risks associated with meeting hatchery objectives include identifying a location that has adequate water supplies, securing environmental permits, finding brood stock and locating acclimation facilities.

Risks to fish passage projects include local government and private landowner practices, permitting requirements and road development that create barriers to potential healthy habitat.

In addition, risks include everything from operational failures, to natural events such as fire and weather, to court ordered harvest rules, to ocean conditions.

## 10.6 Strategy Direction

The following capital strategies mitigate the impacts of the FCRPS dams and are implemented through the Fish and Wildlife Program, biological opinions, Fish Accords and other long-term agreements.

Hatchery production is used to increase adult returns for harvest and to aid in conserving and rebuilding reduced fish runs. Hatchery actions must take into account Endangered Species Act requirements and various biological opinions. Hatcheries are constructed for salmon and steelhead as well as for other fish such as white sturgeon. BPA will continue working with sponsors through the Northwest Power and Conservation Council's program to fund hatchery projects.

For fish passage, the agency is improving access to important habitat to increase spawning and productivity. Key locations are identified and prioritized based on biological objectives under the Endangered Species Act and are reviewed through the Council process.

Land acquisition priorities are based on wildlife and other resource objectives and criteria and are evaluated through the Council process.

## 10.7 Costs – Capital and Expense

BPA's operations and maintenance responsibility is growing because of the need to maintain past investments. Operations and maintenance are met through expense rather than capital funding. For land acquisitions, BPA is piloting the use of up-front endowment funds for operations and maintenance instead of relying on ongoing expense funding.

BPA proposed capital spending of $26.9 million for land acquisition in FY 2012. The proposed hatchery capital spending is $24.2 million, and the spending is $8.7 million. The total FY 2012 planned capital investment for fish passage improvements is $59.8 million.

**Figure 69 - Capital Forecast Allocation for FY 2012 ($ millions)**

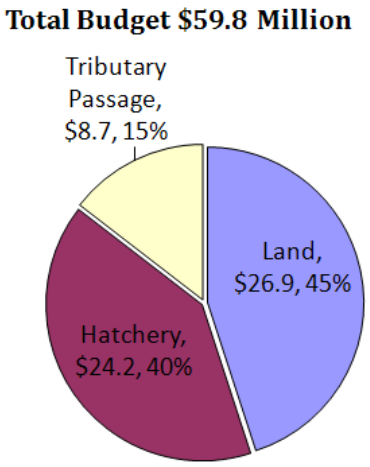



**Figure 70 - Fish and Wildlife 10 year proposed capital investment levels ($ millions)**

| | Current rate period | | Next rate period | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | FY 2012 | FY 2013 | FY 2014 | FY 2015 | 4-Year Total | FY 2016 | FY 2017 | FY 2018 | FY 2019 | FY 2020 | FY 2021 | 10-Year Total |
| **Capital Investment** (excluding AFUDC and Corporate Overheads) | | | | | | | | | | | | |
| **Fish and Wildlife** | | | | | | | | | | | | |
| Land Acquisition | 26.9 | 28.2 | 25.3 | 17.6 | 97.9 | 15.4 | 12.9 | 12.0 | 18.8 | 18.9 | 18.3 | 194.3 |
| Hatchery and Fish Facilities | 24.2 | 28.2 | 25.3 | 17.6 | 95.3 | 15.4 | 12.9 | 12.0 | 18.8 | 18.9 | 18.3 | 191.7 |
| Passage | 8.7 | 10.8 | 9.7 | 6.7 | 35.8 | 5.9 | 4.9 | 4.6 | 7.2 | 7.2 | 7.0 | 72.6 |
| Total | 59.8 | 67.1 | 60.3 | 41.8 | 229.0 | 36.6 | 30.8 | 28.6 | 44.8 | 45.0 | 43.6 | 458.5 |

Note – Proposed capital investments per category, per year are subject to change.

# INFORMATION TECHNOLOGY ASSET STRATEGY SUMMARY

# 11 INFORMATION TECHNOLOGY

## 11.1 SCOPE

The Information Technology Asset Strategy covers technology that comprises

- 1.7 percent ($112 million) of the agency's plant-in-service total capital assets,
- 5.0 percent ($47 million) of the agency's planned 2012 fiscal year capital spending and
- 3.2 percent ($67.5 million) of the agency's planned FY 2012 expense spending.

These assets include telecommunications components, circuits, servers, storage devices, desktop systems, printers, copiers, faxes, phone systems, software and "software as a service." This asset strategy does not cover technology assets residing on the grid network.

## 11.2 GOALS AND OBJECTIVES

Our Information Technology Asset Strategy optimizes resources and balances the individual business units' needs with overarching agency objectives while controlling cost.

### *Information Technology Asset Goals*

- Enable the agency to reliably and securely use IT resources to effectively and efficiently perform work while maximizing use of IT resources.
- Optimize total cost of ownership by balancing the costs of new investments for upgrades and replacements with operations and maintenance costs.
- Balance individual business unit immediate requirements with agency strategic objectives by delivering flexible and extensible assets that meet current objectives and can be leveraged to meet future strategic business objectives, resulting in reduced future delivery times and least total cost of ownership.
- Securely maintain and operate assets in accordance with federal and industry regulations and laws.
- Institutionalize operational excellence through the adoption of maturity models to continuously improve processes, practices and service delivery; maximize the value of IT assets; and reduce the cost of operations and maintenance.
- Become a strategic partner, advising and assisting business units and the agency in leveraging technology to meet and achieve their objectives.

## 11.3 APPROACH TO INFORMATION TECHNOLOGY ASSET STRATEGY

Figure 71 shows that IT assets have been divided into four major portfolios and a project work plan. The project work plan contains the projects that create assets (software system, networks, data center and the like) that are placed into production under one of the four asset portfolios. Each asset portfolio has its own asset plan. These individual asset plans are reviewed and used to create an overall IT asset strategy. The four asset portfolios are:

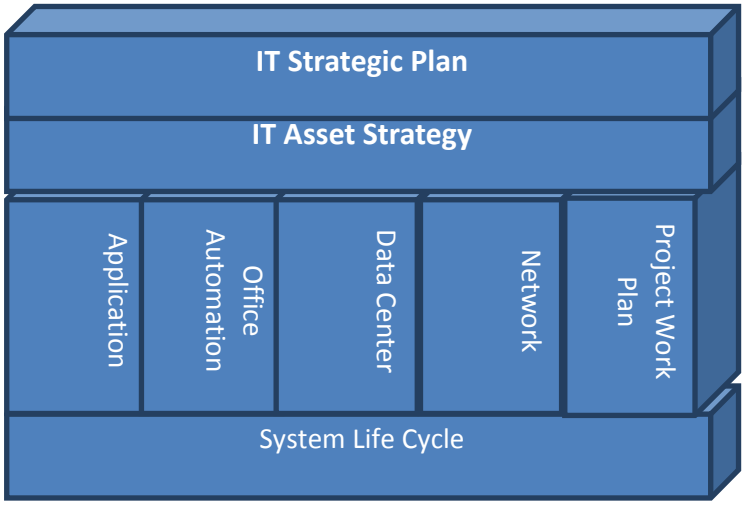



**Figure 71 - Strategy and Asset Management Stack**

- **Office automation** – Includes desktops, laptops, printers and desktop software.
- **Data center** – Includes servers (such as infrastructure servers and application servers), operating systems, database management systems and management tools.
- **Network** – Includes data, voice and video networks.
- **Application** – Includes the subportfolios for critical business systems, business systems, general purpose systems and general tasks systems.

The office automation, network, and datacenter portfolios collectively form the information technology infrastructure that supports both users and systems. The term 'infrastructure' will be used periodically in this strategy to refer collectively to these three portfolios.

## 11.4 PERFORMANCE OBJECTIVES

BPA centralized information technology in FY 2005. The new IT organization was mandated to improve the efficiency and effectiveness of management practices and to reduce and contain the cost of information technology. The overarching strategy has been to drive costs out of infrastructure through a combination of

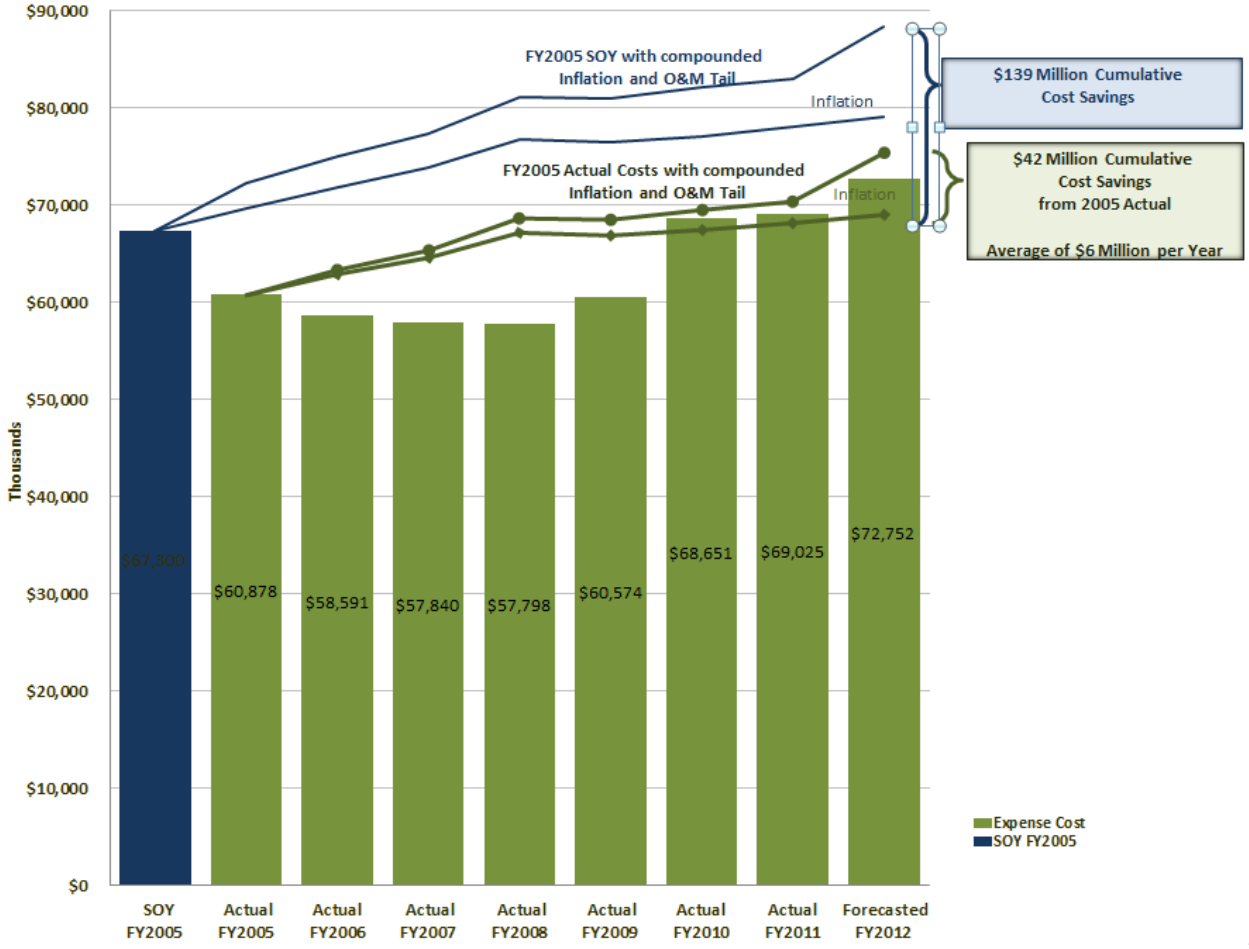
- reducing cost and complexity through standardization,
- implementing new technologies,
- adopting new refresh strategies,
- increasing automation of information technology tasks and
- adopting continuous process improvement.

Figure 72 shows that this strategy has been successful in managing support and maintenance costs. The costs of new service contracts and labor to support new application systems have been offset through efficiency gains. Indeed, the strategy has saved the agency $42 million from FY 2005 through FY 2012.

The savings have been achieved largely by implementing new technologies and revamping refresh strategies. IT's strategy is positioned to achieve additional savings through two major projects – data center modernization and desktop modernization. These projects will enable better cost control by automating infrastructure tasks and delivering a highly standardized and reliable data center environment that leverages and maximizes server virtualization.

As a result of capital investments in the data center and virtual desktops, IT currently projects that that costs will continue to be contained for the office automation and data center portfolios. These costs are expected to grow at rates below the rate of inflation over the FY 2012 through FY 2017 period. IT projects that network portfolio costs will grow at the rate of inflation during this same period.

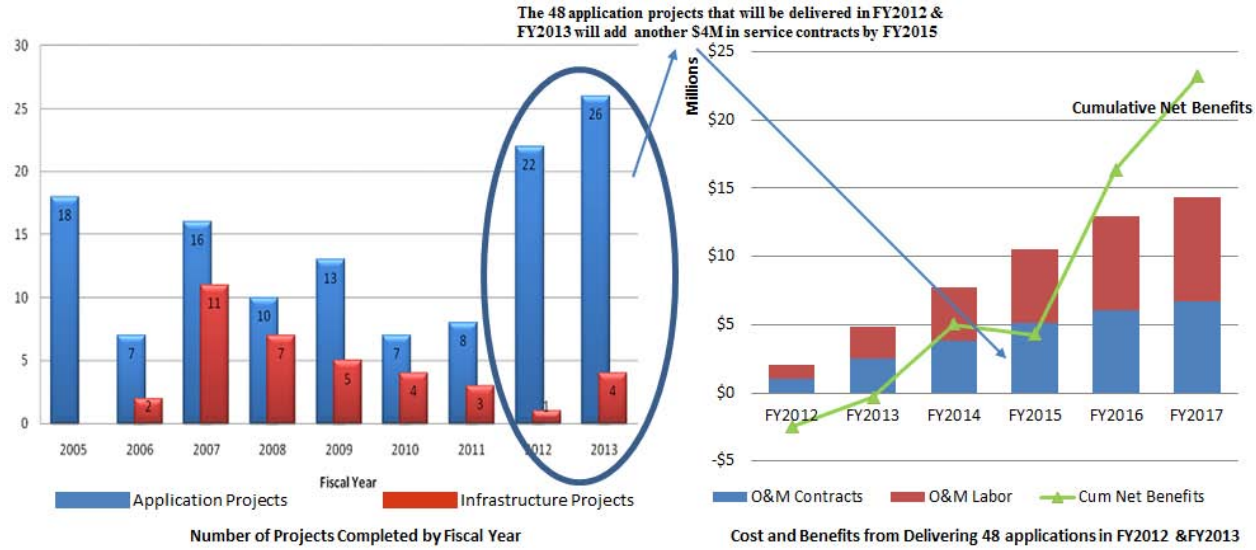
**Figure 72 - IT Performance**




## 11.5 STATUS OF INFORMATION TECHNOLOGY ASSETS

Figure 73 shows a rapid increase in the number of systems being put into production. IT is delivering on the agency's Transmission Process Improvement Program and Regional Enterprise Value programs (systems to support new regional contracts) as well as on other high value initiatives such as Slice and real-time operations dispatch and scheduling replacement systems. The number of application projects delivered into production will jump to over 20 per year beginning in FY 2012.

**Figure 73 - Impact of FY 2012 Project Work**




These new systems will deliver a number of benefits (see example in figure 73) by enabling the agency to achieve efficiencies and effectively meet evolving business needs. These new systems require new service contracts covering software licenses and labor requirements to support their operation and maintenance.

The rate at which service contracts for new systems continue to grow annually is outpacing IT's ability to achieve offsetting cost reductions through infrastructure efficiencies. This despite IT's strategy of delaying and restructuring the refresh of infrastructure assets.

## *Infrastructure*

Infrastructure assets are refreshed based on a combination of industry best practices and BPA's desire to optimize value in its investment. As a rule, BPA maintains hardware one to two years beyond industry recommendations. Although this approach increases the risk of hardware failure in the later years of operations, in a practical sense this has not had an adverse impact on BPA's environment. Critical systems are redundant by design, which reduces the risk of operational disruptions in the event of a failure. The increases in replacement costs from hardware failure in the years leading up to a refresh cycle are offset by lower operating costs provided by maintaining environmental stability. This allows BPA to optimize the value of its investments, keeping the overall total cost of ownership lower than it would be by strict adherence to industry recommendations. Figure 74 shows the refresh rates for BPA's major infrastructure assets.

**Figure 74**

| Infrastructure Category | Refresh Rate | Last Major Refresh Date |
|---|---|---|
| Servers | 5 years | FY 2006[14] |
| Storage (SANs and Fabric) | 5 years | FY 2009[15] |
| Desktop | 5 years | FY 2006[16] |
| Laptop | 5 years | FY 2006 |
| Thin Clients | 7-10 years | Deploy in FY 2012 |
| Network Printers | 5 years | Repair on Failure |
| Network | 7 years | FY 2003 |
| Cable Plant | 14 years | FY 2009 Headquarters<br>FY 2010 Ross Complex |

[14] Only added needed capacity servers in 2007 and 2008.
[15] 2009/2010 was last major refresh of SANs but have been adding new technology to meet storage growth requirements.
[16] Only replacing units that fail since 2007; however, number has increased due to delay in deploying Windows 7.

Prior to FY 2009, BPA engaged in an annual refresh rate for its infrastructure assets. For example, the target for refreshing the agency's fleet of workstations was about 20 percent per year. To help offset the cost of rising service contracts and labor, however, BPA stopped short of meeting its refresh targets. Currently, 50 percent of personal computing devices, 40 percent of storage devices and 25 percent of production servers are beyond their scheduled replacement target. As a result, IT has re-examined its approach to infrastructure refreshes.

IT has adopted a strategy of comprehensive fleet replacement (server, desktop, network and the like). Under this strategy, instead of replacing 20 percent of desktops annually, IT will replace the entire fleet of personal computing devices once every five years. As part of the desktop fleet refresh, IT will implement new operating systems and upgrade the base image components (that is, Office suite, Web browser and the like). This wholesale, comprehensive approach to refreshes offers the following benefits over the phased approach.

- Reduces disruption to the operational environment.
- Maintains a highly homogenous and standardized environment that reduces operation costs.
- Maximizes hardware discounts through high volume purchases.
- Optimizes total cost of ownership of infrastructure assets.

Drawbacks to this approach include delays in taking advantage of hardware innovations. Hardware devices do fail between refresh cycles, with the failure rate increasing toward the end of the refresh cycle. However, the benefits outweigh the drawbacks, leading to an overall lower-cost environment.

Storage area network equipment is an exception to the wholesale refresh paradigm because of the scale of change needed to rehost all data on new equipment in a short time period. IT is looking at introducing a combination of hierarchical storage and cloud-based storage to reduce its total storage cost.

Through its refresh strategy, IT is able to minimize disruptions and reduce costs from modernization efforts, allowing capital to be targeted more effectively to meet business needs. The major infrastructure modernization efforts are listed in the IT Asset Strategy in the Information Technology Asset Overview section.

## 11.6 IT CHALLENGES

IT has taken steps to control the agency's information technology costs through managing the costs of infrastructure assets; however, IT is facing stiff challenges from a number of key drivers.

- Increased adoption of cloud-based services – software as a service, platform as a service and infrastructure as a service. These services may, in many cases, be operationally and economically preferable to software applications that BPA develops or acquires, but their costs can't be capitalized, which puts added pressure on support and maintenance costs.
- The recent ramp up in the delivery of new applications requires additional contract services and labor to support the new systems.

Figure 75, shows the increasing trend toward software as a service. This trend toward cloud-based solutions will require a shift from what would normally be capital to expense. This shift is difficult to estimate accurately, as IT is unable to forecast which projects may find cloud services the most effective solution in terms both of meeting business requirements and of total cost of ownership. IT has, however, identified some potential cloud candidates:

- Talent acquisition
- Ecommerce phase II
- Aircraft services
- Security operation center
- Archiving as a service
- Disaster recovery
- Email/collaboration
- Projects/development environments
- Hosted telephone service
- Single sign on

**Figure 75 - Impact of SaaS Solutions Expense Budget**


Should these solutions prove to provide the best value to BPA, then IT will require less capital and more expense funding. This underscores the need to start managing expense and capital in unison to be able to shape and blend spending levels. Under current fixed capital and expense forecast, these solutions present a potential risk to the Information Technology asset strategy.

## 11.7 EMERGING DRIVERS/RISKS

A number of potentially emerging business and regulatory drivers could affect the IT capital and expense forecast. Figure 76 summarizes the major emerging drivers and their potential costs. Some of the drivers, such as North American Electric Reliability Corporation Critical Infrastructure Protection Version 5 regulations, may be absorbed within the current information technology forecast; however, if more of these drivers materialize, then it will become harder to absorb the new costs.

**Figure 76 - Cost Exposures, Potential Emerging Business and Regulatory Budget Drivers**

| | FY2012 | FY2013 | FY2014 | FY2015 | FY2016 | FY2017 |
|---|---|---|---|---|---|---|
| **NERC CIP**<br>• Physical Access Control (expense)<br>• System Changes (capital) | $900K | $1,500K<br>$5,000K | $700K<br>5,000K | $700K | $800K | 8900K |
| **Security Operation Center** (on premise solution)<br>• Implementation (capital)<br>• Operations (expense) | | $1,500K<br>$2,140K | $2,200K | $2,300K | $2,400K | $2,500K |
| **Potential Expense Drivers** (SaaS/PaaS/IaaS)<br>• Project Implementation | $600K-<br>$1,000K | $800K-<br>$1,100K | $900K-<br>$1,200K | $1,000K-<br>$1,400K | $1,200K-<br>$1,600K | $1,300K-<br>$1,700K |

The requirement to strictly align capitalization rules with federal regulation is an additional driver that is putting pressure on Information Technology resources. This requires that expense funds are used for a project's initiation and planning phases. Also, the cost of individual servers has switched from capital to expense because of the drop in the cost of servers.

## 11.8 KEY ACCOMPLISHMENTS

The Information Technology Asset Strategy has delivered sufficient new capabilities and services to meet business needs and to reduce the cost of infrastructure operations.

### *Application Portfolio*

Figure 73 shows the number of systems delivered as a result of IT's project work plan. The increased capital spending is resulting in a large influx of new systems, particularly in the FY 2012-2013 time frame. These systems are delivering new key services and capabilities to meet the agency's critical business needs. A partial listing of these delivered major systems includes:

- New systems delivered to support Regional Dialogue Contracts (REV)
  - Customer Portal
  - Customer Billing (Phase 1 & 2)
  - Customer Contracts
  - Rates Analysis Model
  - Regional Dialogue Scheduling System
  - Loads Obligation & Resource Analyzer
- Transmission Process Improvement Program (TPIP)
  - Work Planning and Analysis
  - Transmission Asset System
- New systems to replace real time operations dispatch and scheduling system
- Systems to support NERC available transmission capability implementations
- Electronic official personnel file
- Pisces tracking of biological opinions and Columbia Basin Fish Accords projects

### *Infrastructure*

In FY 2009, IT initiated two major infrastructure projects – data center modernization and desktop modernization. The data center modernization project has provided enhancements and capabilities in support of the REV systems and critical business systems. These include:

- New standardized hardware.
- Certified baselines, conforming to National Institute of Standards and Technology guidance, using the latest server operating systems, Windows Server 2008.
- Virtualization, allowing optimal usage of server resources and lower cost of operations.
- Automation of server provisioning using certified baselines.
- Configuration monitoring and alerting, ensuring servers are maintained in certified baselines.
- Enhanced monitoring and alerting.

## 11.9 Costs

Figure 77 shows the proposed Information Technology capital investment levels and corresponding asset related O&M levels in Figure 78. The 2010 IPR expense and capital levels are shown in Figure 79. IT needs to reshape the capital and expense spending levels. This reshaping increases the total spending level (capital plus expense) for FY 2012 through FY 2015 by $25.6 million while decreasing capital by $9.6 million and increasing expense by $35.7 million. However, when considering the proposed spending over FY 2012 through FY 2021, the increase totals $32.4 million. The total capital spending is reduced by $45 million while the expense is increased by $77.4 million. This reshaping is needed to meet the expected upward pressures on IT expense.

**Figure 77 - Information Technology Proposed Capital Investment Levels ($ millions)**

| | Current rate period | | Next rate period | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | FY 2012 | FY 2013 | FY 2014 | FY 2015 | 4-Year Total | FY 2016 | FY 2017 | FY 2018 | FY 2019 | FY 2020 | FY 2021 | 10-Year Total |
| **Capital Investment** (excluding AFUDC and Corporate Overheads) | | | | | | | | | | | | |
| **Information Technology** | | | | | | | | | | | | |
| Office Automation | 5.0 | 0.9 | 0.4 | - | 6.3 | - | - | - | - | - | - | 6.3 |
| Datacenter | 8.0 | 10.0 | 14.2 | 14.0 | 46.2 | 11.6 | 14.0 | 12.0 | 11.0 | 19.0 | 14.0 | 127.8 |
| Network | 4.4 | 8.1 | 2.9 | 1.0 | 16.4 | 2.0 | 2.0 | 5.0 | 2.0 | 2.0 | 2.0 | 31.4 |
| Applications | 25.5 | 22.0 | 22.0 | 22.0 | 91.5 | 22.0 | 22.0 | 22.0 | 22.0 | 22.0 | 22.0 | 223.5 |
| Total | 42.9 | 41.0 | 39.5 | 37.0 | 160.4 | 35.6 | 38.0 | 39.0 | 35.0 | 43.0 | 38.0 | 389.0 |

**Figure 78 - Information Technology Proposed Asset Related O&M Expense ($ millions, nominal)**

| | | Current rate period | | Next rate period | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Actuals FY 2011 | FY 2012 | FY 2013 | FY 2014 | FY 2015 | 4-Year Total | FY 2016 | FY 2017 | FY 2018 | FY 2019 | FY 2020 | FY 2021 | 10-Year Total |
| **Information Technology** | | | | | | | | | | | | | |
| Office Automation | 10.8 | 13.3 | 11.0 | 10.4 | 11.7 | 46.4 | 12.9 | 11.0 | 11.4 | 11.7 | 12.1 | 13.8 | 119.3 |
| Datacenter | 17.5 | 13.8 | 14.4 | 14.8 | 15.3 | 58.3 | 15.7 | 16.2 | 16.7 | 17.2 | 17.7 | 18.2 | 160.0 |
| Network | 4.2 | 5.7 | 6.1 | 6.3 | 6.5 | 24.6 | 6.6 | 6.8 | 6.9 | 7.0 | 7.2 | 7.3 | 66.4 |
| Applications | 23.4 | 26.6 | 30.0 | 33.6 | 33.8 | 124.0 | 32.6 | 33.6 | 32.7 | 31.9 | 34.5 | 31.0 | 320.3 |
| Capital Project Planning | 7.6 | 7.8 | 4.2 | 3.4 | 4.4 | 19.8 | 4.4 | 4.4 | 4.4 | 4.4 | 4.4 | 4.4 | 46.2 |
| Expense Projects | 0.7 | 1.8 | 2.5 | 2.0 | 2.9 | 9.2 | 3.5 | 3.8 | 4.1 | 4.4 | 4.7 | 5.0 | 34.7 |
| Cyber Security | 1.7 | 1.8 | 3.7 | 3.7 | 3.8 | 13.0 | 3.7 | 3.7 | 3.8 | 3.8 | 3.9 | 4.0 | 35.9 |
| Governance | 2.2 | 1.8 | 5.0 | 5.0 | 5.0 | 16.8 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 46.8 |
| Total | 68.1 | 72.6 | 76.9 | 79.2 | 83.4 | 312.1 | 84.4 | 84.5 | 85.0 | 85.4 | 89.5 | 88.7 | 829.6 |

| | Current rate period | | Next rate period | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | FY 2012 | FY 2013 | FY 2014 | FY 2015 | 4-Year Total | FY 2016 | FY 2017 | FY 2018 | FY 2019 | FY 2020 | FY 2021 | 10-Year Total |
| IT Asset Related O&M | 72.6 | 76.9 | 79.2 | 83.4 | 312.1 | 84.4 | 84.5 | 85.0 | 85.4 | 89.5 | 88.7 | 829.6 |
| IT Capital | 42.9 | 41.0 | 39.5 | 37.0 | 160.4 | 35.6 | 38.0 | 39.0 | 35.0 | 43.0 | 38.0 | 389.0 |
| Total IT Capital & O&M | 115.5 | 117.9 | 118.7 | 120.4 | 472.5 | 120.0 | 122.5 | 124.0 | 120.4 | 132.5 | 126.7 | 1,218.6 |

**Figure 79 - 2010 IPR Forecast Expense and Capital ($ millions)**

| | Actuals FY 2011 | FY 2012 | FY 2013 | FY 2014 | FY 2015 | 4 Year Total | FY 2016 | FY 2017 | FY 2018 | FY 2019 | FY 2020 | FY 2021 | 10 Year Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| IPR Capital | 39.2 | 47 | 40 | 41 | 42 | 170 | 43 | 44 | 44 | 44 | 44 | 45 | 434 |
| IPR Expense | 68.1 | 67.8 | 68.6 | 70.2 | 71.7 | 278.3 | 75.1 | 76.9 | 78.4 | 80.0 | 81.6 | 83.2 | 753.5 |
| IPR Total | 107.3 | 111.6 | 108.6 | 111.2 | 113.7 | 448.3 | 118.1 | 120.9 | 122.4 | 124.0 | 125.6 | 128.2 | 1187.5 |

# ACCESS TO CAPITAL

# 12 ACCESS TO CAPITAL

## 12.1 OVERVIEW

Recalculating the availability of Treasury borrowing authority with the updated capital investment levels in this document reveals that FY 2016 still appears to be the year that borrowing authority runs out, absent other actions.

This insight reinforces the need for the agency to continue developing strategies to sustain funding for identified capital investments and to avoid a possible borrowing authority shortfall soon after the end of the next rate period. As the agency sets rates for the FY 2014-2015 rate period, it needs to embed assumptions not only about capital spending but also about capital funding sources. To that end, BPA continues to develop and expand alternative non-Treasury financing sources to meet this challenge.

It is important to restate BPA's goals regarding access to capital. Since many of BPA's capital projects span multiple years, one goal is to maintain access to Treasury borrowing authority on a rolling 10-year basis using a mix of federal and nonfederal sources of capital for future investments. This includes reserving $750 million of the Treasury borrowing authority for the Treasury line of credit, which provides risk mitigation in lieu of holding equivalent financial reserves.

Another goal is to ensure capital financing requirements are met at least overall cost. There is no easy solution when it comes to implementing new nonfederal financing tools because all the tools have advantages and disadvantages. Some of the alternatives the agency has considered include

- lease financing for Transmission capital,
- third-party conservation financing,
- customer prepayment program for power and
- revenue financing or other ways to recover capital-related costs through current rates.

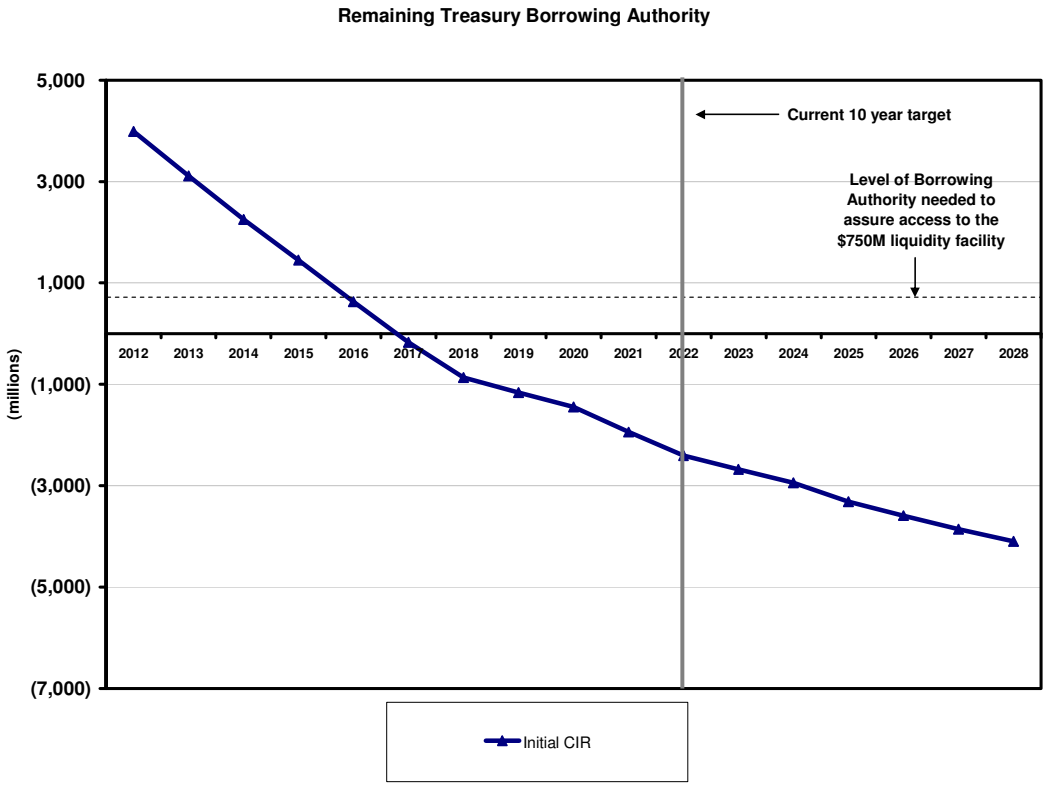
BPA described the status of existing funding tools and the potential for new or expanded alternatives at recent workshops. Presentations illustrated the possible impact on borrowing authority of certain individual funding tools as well as combinations of those tools. Staff also analyzed a variation suggested by customers and discussed the results. At the Nov. 18, 2011, workshop, staff mentioned that they had suspended further work on third-party financing for conservation investments but continued to aggressively seek opportunities to lease-finance transmission investments when possible. In addition, BPA and a customer work team refined and held further discussions on the details of the power prepayment program. Additional workshops and opportunities to participate in developing solutions and to comment on proposed funding tools are planned for this spring and summer.

## *Proposed Capital Program*

BPA has developed a base case capital investment scenario and has analyzed the effect it has on the availability of Treasury borrowing authority and debt service costs.

Figure 80 displays the remaining Treasury borrowing authority associated with the base capital investment levels, which is consistent with the 10 percent reduction scenario presented during the 2011 Strategic Capital Discussions. Borrowing authority is projected to be depleted to the line of credit point ($750 million remaining) during FY 2016, which is virtually the same as the depletion point from the base case used in the fall 2011 analysis. The analysis assumes all future investments are funded with borrowing authority except for a small amount of transmission reserve financing in each year and does not reflect the ongoing lease financing program.

**Figure 80**




The relationships of the major debt service components associated with the base case are depicted in Figures 81 and 82.

**Figure 81**

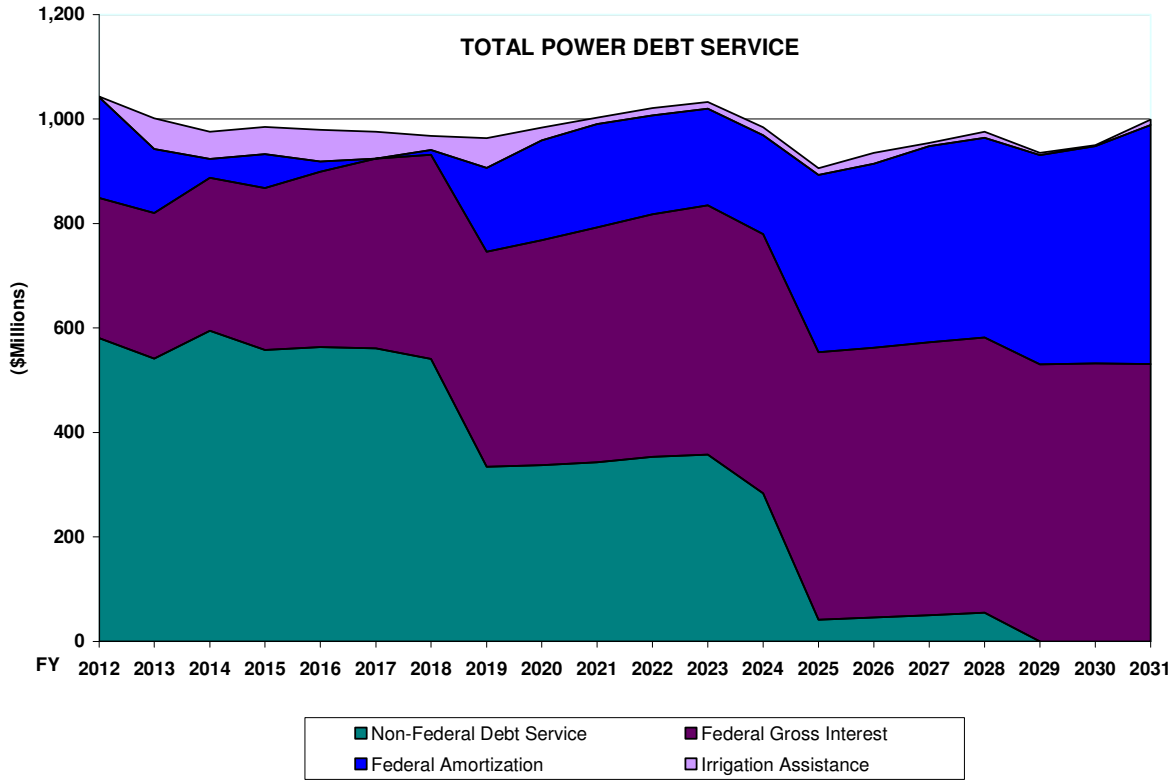
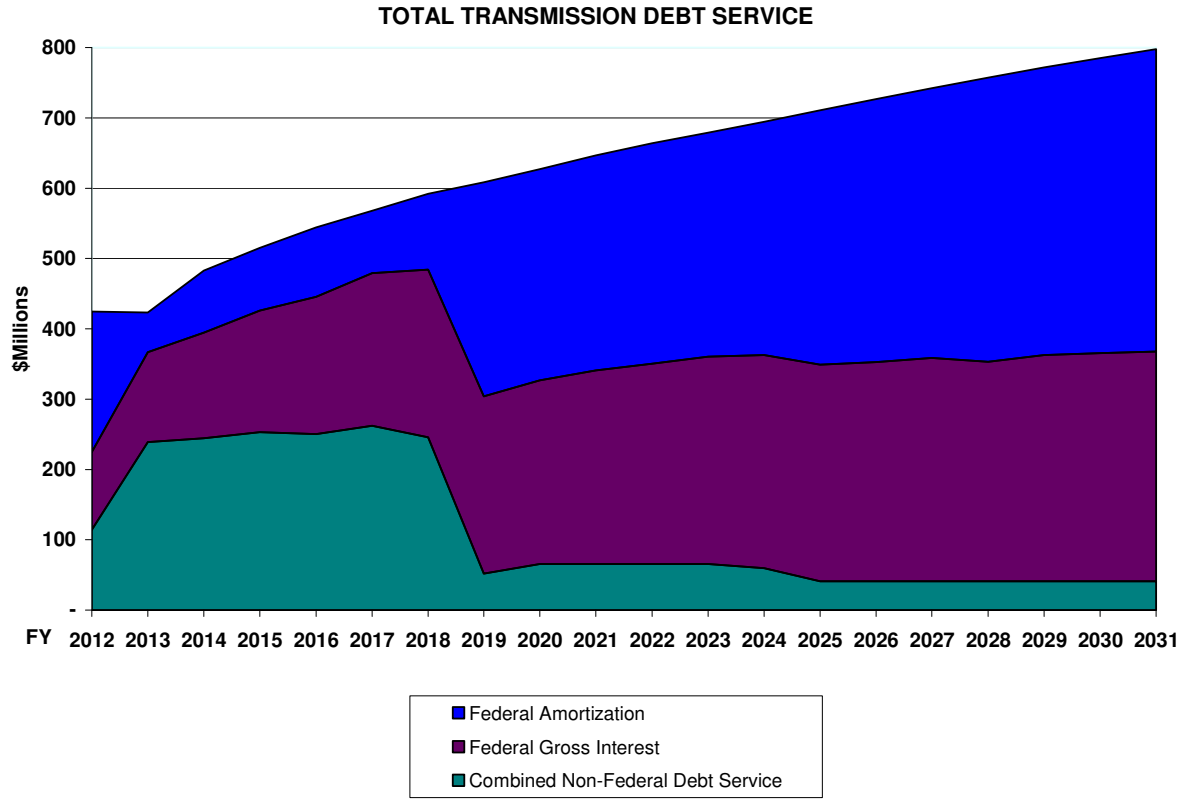


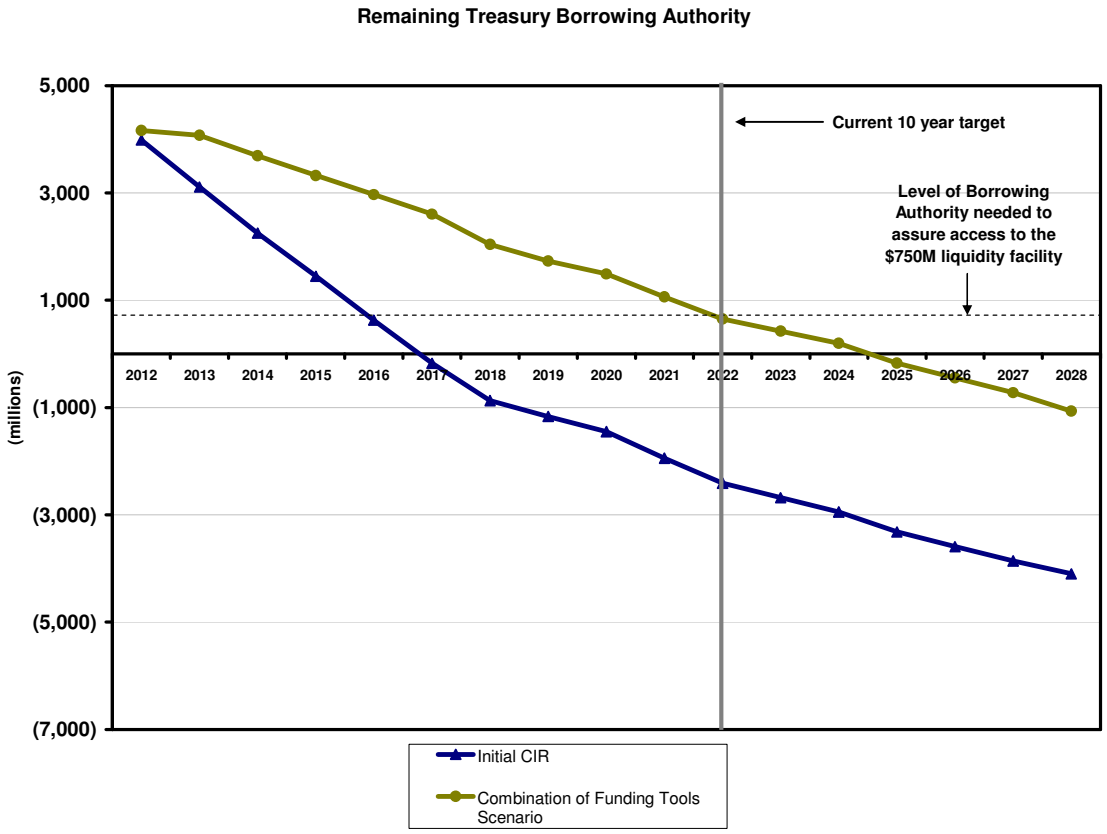

**Figure 82**



## *Combination of Funding Tools*

During the 2011 Strategic Capital Discussions, BPA identified a scenario that successfully extended access to Treasury borrowing authority to the 10-year target through use of a broad set of financing tools. This scenario was updated using the new base capital investment levels presented in the March 8 workshop material. For the current analysis, $300 million of Transmission cash reserves were used to fund capital investments, and 30 percent of Transmission's capital program was lease financed (changes from $400 million and 25 percent from the scenario presented Nov. 18, 2011). The current analysis also assumes Power would develop a $1.7 billion prepayment program. Although those actions add quite a bit of additional financing, the plan required $37 million of revenue financing for Power and $61 million for Transmission in 2022 to meet the 10-year goal. This combination of tools provides assurance that adequate Treasury borrowing authority would be available for 10 years given the base capital investment levels.

**Figure 83**



## 12.2 Individual Funding Tools Update

### *Prepayment of Power Bills*

BPA established a regional team to review the details of the power prepayment program. The team consists of customer utilities, industry representatives and representatives of other interested groups in an effort to have participation from varied interests and stakeholders. The goal of the team is to develop a prepayment program and key aspects of program participation by April 1, 2012. The team has held four meetings to date with a fifth scheduled for late March. At the earlier meetings, BPA distributed a draft term sheet and two alternative participation processes for discussion.

The prepayment program will correspond with the CIR and IPR and an outreach communication will be made with the region in April. A subsequent comment period, coordinated with the CIR and IPR processes will follow. The first prepayment solicitation is targeted for June to early July of 2012 so the results can be reflected in the November 2012 initial rate proposal for FY 2014-2015 rates.

### *Lease Financing*

The lease financing program is BPA's primary existing alternative financing source. While the program is limited to funding the Transmission capital program, not all Transmission capital projects meet the criteria for the program. On average, BPA has been able to lease finance 25 percent of Transmission's capital program to date. BPA plans to expand and maximize the use of the lease financing program through FY 2012 and into the future.

BPA continuously monitors credit availability for the lease financing program. The line of credit capacity is currently sufficient to meet the expected Transmission program funding requirements for eligible projects. Although slightly higher than Treasury borrowing, borrowing costs through the lease financing program are significantly lower than other alternatives.

### *Cash Tools: Anticipated Accumulation of Cash/Reserves Financing/Revenue Financing*

BPA has several cash tools that could be used to extend access to Treasury borrowing authority. First, BPA estimates that reserves attributed to Power could grow by as much as $1.1 billion from FY 2014 through FY 2024. This increase would occur because the revenue requirement could generate more cash than is needed to cover cash requirements for federal debt repayment and irrigation assistance. These funds could be used to finance capital investments. Second, financial reserves attributed to Transmission are probably greater than the amount needed to mitigate risk. The exact amount is not known but it could be notable. These funds could be used to pay for capital investments. Third, BPA could include an explicit adder to rates for both business units to generate cash to finance capital investments. The amounts would vary over time and differ between business units.

### Challenges

There is no one perfect alternative financing tool to add to Treasury borrowing authority to solve BPA's access to capital problem. In all likelihood, it will only be through a combination of tools that BPA will be able to achieve the target for ensuring capital financing over a rolling 10-year period.

Because it often takes two to three years to fully implement new financing mechanisms, BPA will aggressively continue developing the alternative financing tools discussed for prepayments, expanded lease financing and, possibly cash tools. Development remains focused on agency asset strategies and associated spending expectations.

## 12.3 Next Steps

The discussion on funding BPA's capital program will become more refined as long-term capital needs are determined and funding assumptions are applied in the initial rate proposal. BPA intends to keep customers and interested parties informed and engaged through external publications, comment periods and continuing technical workshops.

# 13 Conclusion

The complete draft asset strategies are located online. BPA requests your comments by May 4, 2012 in order to inform proposed spending levels for the 2012 IPR. In addition, BPA will offer workshops the week of April 16 to follow up on any requests for additional information or questions pertaining to this report or draft asset strategies. Please submit any requests for information or questions online or via email to comments@bpa.gov by March 23, 2012.

# 14 FINANCIAL DISCLOSURE

This information has been made publicly available by BPA on March 8, 2012, and contains information not reported in agency financial statements.