

## Asset Strategy Performance Measures and End-stage Targets

System performance measures, or metrics, have been adopted by the agency to monitor the overall asset system performance in meeting the agency's long-term objectives in maintaining a safe, reliable and cost-effective system that responsibly serves the needs of our customers and the region. Several of these measures are included in the agency's annual balanced scorecard for managing performance. The measures are defined in detail on the following pages. Additional measures are being developed to assess BPA's effectiveness in meeting its business continuity objectives. These business continuity measures will be added to this strategy at a later date.

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 in the life-cycle strategies that follow.

Summary by Asset Category: System Performance Measures and End-stage Targets

<b>Federal Hydro Projects</b>		
	<b>System Performance Measures</b>	<b>End-stage Targets</b>
<b>System Reliability</b>	<p><b>Condition assessment rating</b></p> <p>hydroAMP equipment condition assessment rating (Scoring 0-10, with 10 = good and 0 = poor)</p> <p>Provides a condition assessment framework and rating process for hydroelectric plant equipment. The ratings are used as a basis to assess risks, maintenance management, and replacement of equipment assets.</p>	<p>Maintain an average condition rating of 7.0 or higher for power train equipment (Main Stem Columbia and Headwater/Lower Snake strategic classes)</p>
	<p><b>Forced outage factor</b></p> <p>Provides an indication of whether maintenance practices and investments in reliability improvements are sufficient to meet BPA's goals for a reliable power supply.</p>	<p>Achieve a 3-year rolling average forced outage factor of 2.0 percent or less by 2022 (Main Stem Columbia and Headwater/Lower Snake strategic classes)</p>
	<p><b>Lost generation risk</b></p> <p>Forced outages of generation units provide an indication of overall performance and asset health. Through investments in replacing and modernizing equipment along with performance of routine maintenance, risk of spilled water and lost generation are managed at an acceptable level.</p>	<p>Reduce hydro system lost generation risk to 300 aMW or less by 2022.</p>
<b>Low Rates</b>	<p><b>Energy cost of production</b></p> <p>Provides an indication of whether BPA is delivering a cost effective power supply.</p>	<p>Maintain annual interest, depreciation and O&amp;M expense costs for the hydro system of less than \$10 per MWh in 2012 dollars.</p>

Summary by Asset Category: System Performance Measures and End-stage Targets

System Reliability

<b>Transmission Services</b>	
<b>System Performance Measures</b>	<b>End-stage Targets</b>
<p><b>System Average Interruption Duration Index (SAIDI) - Average duration of automatic outage minutes by BPA line category.</b></p> <p>Provides an indication of BPA's success at minimizing the duration of unplanned transmission line outages</p>	<p>No control chart violations per year for line importance categories 1-2</p> <p>No more than 1 control chart violation per year for line importance categories 3-4</p>
<p><b>System Average Interruption Frequency Index (SAIFI) - Average number of automatic outages by BPA line category.</b></p> <p>Provides an indication of BPA's success at minimizing the number of unplanned transmission line outages</p>	<p>No chart violations per year for line importance categories 1-2</p> <p>No more than 1 control chart violation for line importance categories 3-4</p>
<p><b>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)</b></p>	<p>No outages to transmission lines of all voltage levels caused by vegetation growth</p>
<p><b>System Operating Limits (SOL) for BPA Paths, Interties, &amp; Flowgates</b></p> <p>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.</p>	<p>No end-stage target will be set for this metric during this planning cycle</p>
<p><b>Availability for service of BPA's most important transmission lines (Category 1 and 2)</b></p>	<p>BPA's most important transmission lines (Category 1 and 2) are available for service at least 98% of the time</p>

Summary by Asset Category: System Performance Measures and End-stage Targets

Environmental Stewardship

<b>Energy Efficiency</b>	
<b>System Performance Measures</b>	<b>End-stage Targets</b>
<p><b>Acquired the energy efficiency resource (aMW)</b></p> <p>Provides how successful public power has been in acquiring the energy efficiency (conservation) resource that offsets the need to build new generation to meet new and existing load growth.</p>	<p>For the period 2010 through 2014 acquire 504 aMW of energy conservation resource. Of this 504 aMW target, the 2012 EE Action Plan forecasts that 356 aMW will be programmatic savings which are capital funded.</p> <p>For the period beyond 2014 the target will be established in the 7<sup>th</sup> Power Plan. Targets are based on the availability of cost effective acquisition of energy conservation.</p>
<p><b>Cost of resource acquisition</b></p> <p>The capital cost to acquire the energy efficiency resource includes reimbursements for energy efficiency incentive payments and performance payments to customer utilities and third-party program implementation.</p>	<p>For the period 2010 through 2014 acquire the resource at less than or equal to \$1.9 million per aMW.</p>

Summary by Asset Category: System Performance Measures and End-stage Targets

Environmental Stewardship

<b>Fish &amp; Wildlife</b>	
<b>System Performance Measures</b>	<b>End-stage Targets</b>
<p><b>Hatchery Asset Management</b></p> <p>Compliance with facility specific production goals and operating parameters.</p>	<p>Two end-stage targets by facility:</p> <ol style="list-style-type: none"> <li>1. Increased egg and juvenile production to cause increased population levels in focused ESUs.</li> <li>2. Increased eggs released, juvenal fish released and adult fish released from program, and augmentation, supplementation and research targets met.</li> </ol>
<p><b>Land Acquisition Asset Management</b></p> <p>Compliance with easement terms and management plan.</p>	<p>Wildlife crediting from land acquisitions accomplished mitigation obligations by facility/dam.</p>
<p><b>Passage</b></p> <p>Continued functionality for passage.</p>	<p>Passage facilities accomplish increased spawning habitat.</p>

Summary by Asset Category: System Performance Measures and End-stage Targets

<b>IT</b>	
<b>System Performance Measures</b>	
<b>End-stage Targets</b>	
<b>Low Rates</b>	<p><b>Personal computing device cost</b> – annual expense (labor and materials) to provide IT technical desktop/laptop support for personal computing devices divided by the number of desktops and laptops supported by BPA IT organization.</p>
	<p>Average cost per computing device is at or below FY2010 baseline through FY 2017.</p>
<b>System Reliability</b>	<p><b>Network latency</b> – measures the network wait time experienced by end users and systems accessing services using NJ maintain circuits.</p>
	<p>Achieve an acceptable (Green) level of network latency that is less than or equal to 2 times the established performance Baseline.</p>
	<p><b>Physical Windows Server Consolidation</b> – Ratio of virtual servers to physical servers compared to baseline established for FY 2010.</p>
	<p>By fiscal year-end 2013 achieve at least 55% virtualization of production and test servers. In the long-term achieve greater than 75% virtualization.</p>

## Summary by Asset Category: System Performance Measures and End-stage Targets

<b>Facilities</b>	
<b>System Performance Measures</b>	<b>End-stage Targets</b>
<p><b>*Facility Condition Indexes:</b> The facility condition index (FCI) is used to provide a benchmark to compare the relative condition of a group of facilities and is an indication of relative condition. The FCI is calculated by dividing the costs to remedy known defects (determined by Facility Condition Assessments) by the replacement value of the asset.</p>	Varies dependent on the criticality of the asset grouping
<p><b>*Cost of ownership:</b> One of the Agency Asset Management long term outcomes is the “lowest cost of ownership practicable. The methodology and metrics to measure this are yet to be determined. There are many acceptable ways of defining and tracking cost of ownership.</p>	Varies dependent on the criticality of the asset grouping
<p><b>*Reactionary vs. Planned Maintenance:</b> Planned maintenance and repairs are much more cost effective and less disruptive to operations. All maintenance to be charged to specific work orders that contain the necessary coding information.</p>	Less than 20 reactionary
<p><b>Energy Intensity:</b> 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.</p>	30% reduction over the 2003 baseline
<p><b>Potable Water Use:</b> 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. Facility 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.</p>	26% reduction over 2007 baseline

**NOTE:** as indicated on the FY12-FY22 Facilities Strategy and Summary documents, the Internal Business Services (IBS) 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. FAM 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.

\*This document will include several **possible** measures that **may or may not** be adopted later this year.

## Documentation of System Performance Measures and End-stage Targets

**Asset Category: Transmission Services**

<b>Measure:</b>	<b>System Average Interruption Duration Index (SAIDI) – Average duration of automatic outage minutes by BPA line category</b>
<b>Background:</b>	Maintaining system reliability is a critical BPA responsibility. This reliability measure is monitored to help minimize the duration of automatic (unplanned) line outages on the BPA system. SAIDI provides an indication of BPA's success at minimizing the duration of unplanned transmission line outages. SAIDI data is used in developing Transmission's asset management strategies and plans, and in its capital and expense planning levels.
<b>Methodology:</b>	<p>Reliability assessment is based on IEEE-standard measures of outage duration (SAIDI). Control chart techniques, closely mirroring transmission reliability methodology adopted by the California Independent System Operator (ISO), are used to establish allowable performance levels for each line importance category (1-4). Control charts are statistically-based graphs which illustrate the natural range of variability in performance, based on the most recent 10 years of historical data (FY 1998 – FY 2007). In general, the Control Limit is calculated as the 3-standard deviation band, and the Warning Limit as the 2-standard deviation band, based on historical line performance. Actual SAIDI results from the past year are then compared to the control chart limits to gauge the adequacy of system reliability and to determine control chart violations.</p> <p>Control chart violations are defined as follows:</p> <ul style="list-style-type: none"> <li>• Latest fiscal year above the Upper Control Limit (short-term degradation)</li> <li>• 2 of last 3 fiscal years above the Upper Warning Limit (mid-term degradation)</li> <li>• Continuous worsening trend in the last six fiscal years (long-term degradation)</li> </ul>
<b>End-stage Targets:</b>	<p>No control chart violations for line importance categories 1 and 2.</p> <p>No more than 1 control chart violations per year for line importance categories 3 and 4.</p>
<b>Inclusions/ Exclusions:</b>	<ul style="list-style-type: none"> <li>• Reliability monitoring is based on automatic (unplanned) outages to transmission lines (not points-of-delivery)</li> <li>• Duration of any single outage is capped at 4,320 minutes (72 hours)</li> <li>• Momentary outages are excluded</li> <li>• Outages to lines with all or part non-federal ownership are excluded</li> <li>• Outages in the year in which a line may have been energized or retired are excluded (i.e., line must have "full year" availability)</li> <li>• Outages with a cause attributed to a foreign utility are excluded</li> <li>•</li> </ul>
<b>Responsibility for Monitoring &amp; Reporting:</b>	Transmission Technical Operations (TOT)



## Documentation of System Performance Measures and End-stage Targets

**Asset Category: Transmission Services**

<b>Measure:</b>	<b>System Average Interruption Frequency Index (SAIFI) – Average number of automatic outages by BPA line category</b>
<b>Background:</b>	Maintaining system reliability is a critical BPA responsibility. This reliability measure is monitored to help minimize the frequency of automatic (unplanned) line outages on the BPA system. SAIFI provides an indication of BPA's success at minimizing the number of unplanned transmission line outages. SAIFI data is used in developing Transmission's asset management strategies and plans, and in its capital and expense planning levels.
<b>Methodology:</b>	<p>Reliability assessment is based on IEEE-standard measures of outage frequency (SAIFI). Control chart techniques, closely mirroring transmission reliability methodology adopted by the California Independent System Operator (ISO), are used to establish allowable performance levels for each line importance category (1-4). Control charts are statistically-based graphs which illustrate the natural range of variability in performance, based on the most recent 10 years of historical data (FY 1998 – FY 2007). In general, the Control Limit is calculated as the 3-standard deviation band, and the Warning Limit as the 2-standard deviation band, based on historical line performance. Actual SAIFI results from the past year are then compared to the control chart limits to gauge the adequacy of system reliability and to determine control chart violations.</p> <p>Control chart violations are defined as follows:</p> <ul style="list-style-type: none"> <li>• Latest fiscal year above the Upper Control Limit (short-term degradation)</li> <li>• 2 of last 3 fiscal years above the Upper Warning Limit (mid-term degradation)</li> <li>• Continuous worsening trend in the last six fiscal years (long-term degradation)</li> </ul>
<b>End-stage Targets:</b>	<p>No control chart violations for line importance categories 1 and 2.</p> <p>No more than 1 control chart violations per year for line importance categories 3 and 4.</p>
<b>Inclusions/ Exclusions:</b>	<ul style="list-style-type: none"> <li>• Reliability monitoring is based on automatic (unplanned) outages to transmission lines (not points-of-delivery)</li> <li>• Duration of any single outage is capped at 4,320 minutes (72 hours)</li> <li>• Momentary outages are excluded</li> <li>• Outages to lines with all or part non-federal ownership are excluded</li> <li>• Outages in the year in which a line may have been energized or retired are excluded (i.e., line must have "full year" availability)</li> <li>• Outages with a cause attributed to a foreign utility are excluded</li> </ul>
<b>Responsibility for Monitoring &amp; Reporting:</b>	Transmission Technical Operations (TOT)

## Documentation of System Performance Measures and End-stage Targets

**Asset Category: Transmission Services**

<b>Measure:</b>	<p><b>Frequency of Line Outages caused by Vegetation Growth</b> – Report the number of outages caused by vegetation growing into the conductor or within flashover distance to the conductor on transmission lines of 200 kV or higher and lower voltage lines designated by the Regional Reliability Organization (RRO) as critical lines to maintaining transmission system reliability.</p> <p>WECC vegetation outage reporting classifies these as Category 1 – Grow-ins: outages caused by vegetation growing into lines from vegetation inside/or outside of the right-of-way.</p>
<b>Background:</b>	<p>Maintaining system availability is a critical BPA responsibility. A vegetation growth caused outage measure is monitored to help minimize the amount of time that transmission lines are out of service due to a tree related incident. Cause of outage observed in the field is documented and captured in the outage management system. Outage cause data is used in determining Transmission’s expense planning for vegetation management.</p>
<b>Methodology:</b>	<ul style="list-style-type: none"> <li>• Outage database (OARS) is the repository of information related to WECC Vegetation Growth Outages.</li> <li>• Outages that have a ‘TREE’ cause appearing in the Dispatcher Cause or Field Cause or Fault Location or Comment columns are investigated by TF.</li> <li>• Vegetation related Transmission line outages are classified as follows:             <ul style="list-style-type: none"> <li>• Category 1 – grow-ins, from inside/or outside of the right-of-way</li> <li>• Category 2 – fall-ins, from inside the right-of-way</li> <li>• Category 3 – fall-ins, from outside the right-of-way</li> </ul> </li> <li>• Mandatory reporting to WECC of vegetation outages.</li> </ul>
<b>End-stage Targets:</b>	<p>No outages to transmission lines of 200 kV or greater and for RRO designated lines caused by vegetation growth.</p>
<b>Inclusions/ Exclusions:</b>	<ul style="list-style-type: none"> <li>• Applies primarily to lines 200 kV or greater with the exception of lower voltage lines that are designated RRO.</li> <li>• WECC reporting includes tree falling from inside and outside of the right-of-way. For purposes of this measure, only category 1 vegetation outages apply. Category 2 and 3 are excluded.</li> <li>• Excludes vegetation related outages that result from natural disasters</li> <li>• Excludes vegetation related outages that are due to human or animal activity such as logging, vehicle contact, etc.</li> </ul>
<b>Responsibility for Monitoring &amp; Reporting:</b>	<p>Technical Operations (TOT) monitors for Transmission Field Services (TF) the OARS database for potentially reportable outages. TF is responsible for reporting. (Currently prepared by TOT, but will transition to TF)</p>

## Documentation of System Performance Measures and End-stage Targets

**Asset Category: Transmission Services**

<b>Measure:</b>	<b>System Operating Limit (SOL) for BPA Paths, Interties, &amp; Flowgates</b> – number of minutes that actual path flows are near, at or above System Operating Limit. Monitored for 21 separate directional paths, interties and flowgates.
<b>Background:</b>	On-going monthly analysis comparing System Operating Limit (SOL) with Actual Path Flows for 21 separate directional paths, interties, & flowgates, based on 1-minute SCADA data. Selected elements are Transmission Business Key Performance Indicators and NERC/WECC Compliance reporting elements. Note terminology update from “OTC” (Operational Transfer Capacity) to “SOL” (System Operating Limit), per national standards.
<b>Methodology:</b>	For 21 separate directional paths, compare the actual path flow to the System Operating Limit (SOL) for that path, at 1-minute increments. Calculate the number of minutes where actual flows were within 20% of SOL, 10% of SOL, and Over SOL. Report this by month, by path, in minutes and percentage of total time. For excursion periods Over SOL, compare the consecutive minutes vs. the reliability limits (20 minutes or 30 minutes, varies by path) to determine if a NERC/WECC violation occurred.
<b>End-stage Targets:</b>	No end stage target will be set for this metric during this planning cycle.
<b>Inclusions/ Exclusions:</b>	This metric indicates: <ul style="list-style-type: none"> <li>• Utilization levels/patterns for existing line assets.</li> <li>• Congestion areas for which capacity expansion may merit consideration.</li> </ul>
<b>Responsibility for Monitoring &amp; Reporting:</b>	Transmission Technical Operations (TOT)

## Documentation of System Performance Measures and End-stage Targets

**Asset Category: Transmission**

<b>Measure:</b>	<b>Percent Availability for Service of BPA’s transmission lines</b> – total hours less average planned and unplanned outage duration.
<b>Background:</b>	Maintaining system availability is a critical BPA responsibility. Availability measures are monitored to help minimize the amount of time the most important lines on the system are out of service for maintenance, construction, and related “planned” activities, thus maximizing the commercial availability of the grid. Availability data are used in Transmission’s capital and expense planning, maintenance, and operations processes.
<b>Methodology:</b>	<p>Control chart techniques are used to establish allowable performance levels for system availability. Control charts are statistically-based graphs which illustrate the natural range of variability in performance, based on the most recent 5 years of historical data (FY05-FY09). In general, the Control Limit is calculated as the 3-standard deviation band, and the Warning Limit as the 2-standard deviation band, based on historical line availability, for lines of importance ranks 1-4. Actual Availability for the current year is then compared to the lower limit of availability to determine if it falls below the violation limits.</p> <p>Control chart violations are defined as follows:</p> <ul style="list-style-type: none"> <li>• Latest fiscal year below the Lower Control Limit (short-term degradation)</li> <li>• 2 of last 3 fiscal years below the Lower Warning Limit (mid-term degradation)</li> <li>• Continuous worsening trend in the last six fiscal years (long-term degradation)</li> </ul>
<b>End-stage Targets:</b>	Line importance categories 1 and 2 are available for service at least 98% of the time.
<b>Inclusions/ Exclusions:</b>	<p>The following outage inclusion/exclusion rules apply:</p> <ul style="list-style-type: none"> <li>• Momentary outages are excluded</li> <li>• Outages to lines with all or part non-federal ownership are excluded</li> <li>• Outages in the year in which a line may have been energized or retired are excluded (i.e., line must have “full year” availability)</li> <li>• Outages to the four Big Eddy-Celilo feeder lines are excluded</li> <li>• Outages with cause codes 6,5,0 (Voltage Control, Foreign Request, Normally Out) are excluded</li> </ul>
<b>Responsibility for Monitoring &amp; Reporting:</b>	Transmission Technical Operations (TOT)

## Documentation of System Performance Measures and End-stage Targets

**Asset Category: Federal Hydro**

<b>Measure:</b>	<b>Condition Assessment Rating</b> – hydroAMP equipment condition assessment rating (Scoring 0-10, with 10 = good and 0 = poor).
<b>Background:</b>	<p>The Hydropower Asset Management Program (hydroAMP) is the process by which condition assessments are made for critical hydroelectric generation equipment. The structured two-tiered framework is designed to streamline and improve the assessment and documentation of the condition of hydroelectric equipment within and among hydro plants in order to enhance asset management and investment decision-making.</p> <p>Condition Indices, the quantitative outputs of the hydroAMP equipment condition assessment process, can assist managers and other personnel involved in making decisions on repair, rehabilitation, or replacement when faced with competing demands and limited resources.</p>
<b>Methodology:</b>	<p>A two-tiered objective approach for assessing equipment condition and risk of failure for hydropower equipment is used:</p> <p><b>Tier 1</b> of the condition assessment process incorporates the results of tests, measurements, and inspections that are normally obtained during routine operation and maintenance activities into a set of condition indicators. These condition indicators are weighted and summed to compute an equipment Condition Index.</p> <p><b>Tier 2</b> of the assessment relies on more in-depth, non-routine test results and inspections requiring specialized knowledge to refine the equipment Condition Index score from the Tier 1 assessment.</p>
<b>End-stage Targets:</b>	Maintain an average condition rating of 7.0 or higher for power train equipment through 2017.
<b>Inclusions/ Exclusions:</b>	<p>The following condition assessment inclusion/exclusion rules apply:</p> <ul style="list-style-type: none"> <li>• Applies to Main stem Columbia River and Headwater/Lower Snake strategic classes only</li> </ul>
<b>Responsibility for Monitoring &amp; Reporting:</b>	Federal Columbia River Power System (FCRPS): partnership between the U.S. Army Corps of Engineers (USACE), the U.S. Bureau of Reclamation (USBR), and the Bonneville Power Administration (BPA)

## Documentation of System Performance Measures and End-stage Targets

**Asset Category: Federal Hydro**

<b>Measure:</b>	<b>Forced Outage Factor – percentage of time units are out of service due to forced outages</b>
<b>Background:</b>	<p>North American Electric Reliability Corporation (NERC) was created to ensure reliability of the bulk power system in North America.</p> <p>NERC manages a Generating Availability Data System (GADS) of statistical data pertaining to operational performance of generating stations. GADS data is used to calculate industry standard metrics for unit reliability of the fleet of generating units. Generating plant owners use the metrics to compare the performance of their plants with those of the industry as a whole. Forced Outage Factor (FOF) is one metric that is tracked closely by many generating plant owners.</p>
<b>Methodology:</b>	<p>Power plant operational data is tracked and reported in BPA’s outage database, and then used to calculate various performance metrics included in FCRPS hydro performance reports. Each year, the hydro program reports annual forced outage results in an end-of-year performance report.</p> <p>FOF = # hours forced out of service / # period hours, megawatt weighted.</p>
<b>End-stage Targets:</b>	<b>Achieve a 3-year rolling average FOF of 2.0 percent or less by 2022</b>
<b>Inclusions/ Exclusions:</b>	<p>The following inclusion/exclusion rules apply:</p> <ul style="list-style-type: none"> <li>• Applies to Main stem Columbia River and Headwater/Lower Snake strategic classes only</li> </ul>
<b>Responsibility for Monitoring &amp; Reporting:</b>	Federal Columbia River Power System (FCRPS): partnership between the U.S. Army Corps of Engineers (USACE), the U.S. Bureau of Reclamation (USBR), and the Bonneville Power Administration (BPA)

## Documentation of System Performance Measures and End-stage Targets

**Asset Category: Federal Hydro**

<b>Measure:</b>	<b>Lost Generation Risk</b> – The risk of losing hydro generation due to units forced out of service, measured in aMW.
<b>Background:</b>	Generating power at hydro plants requires that both generating units and stream flows are available. When stream flow capacity exceeds plant turbine capacity, flows must be directed over spillways in order to pass water through the plant. Lost generation risk estimates an expected value of lost energy from water that is directed around turbines and over spillways when generating units are forced out of service due to equipment condition.
<b>Methodology:</b>	<p>This is a four step process:</p> <ol style="list-style-type: none"> <li>1. Hydro regulation studies are used to determine the amount of energy that can be generated by each plant on the system assuming 90 percent availability. Generation amounts were calculated for HLH and LLH periods by month for 50 water years. Next, hydro regulation studies were run at lower levels of unit availability to determine the amount of energy that could be generated if the plants were less reliable. The difference is the generation from an increment of plant availability. The incremental generation produced by the “least used” unit was calculated for each plant on the system. This is the amount of generation deemed to be at risk in the event of equipment failure. Although a distinct possibility, no consideration is given to multiple and simultaneous equipment failures that have increasingly higher lost generation consequences.</li> <li>2. When equipment fails, repair or replacement typically takes longer than if work is done on a proactive, basis. For instance, a transformer can take three or more years to procure and, absent having a spare available, a failure would take a generating unit(s) out of service for three years or longer. Replacing a transformer on a planned basis typically requires an outage of three months or less. So, the incremental outage duration for a failed transformer can be 2.75 years if no spare is available</li> </ol> <p>The annual generation at risk for each plant in 1) above is then multiplied by the expected additional outage in years for each equipment type to determine the amount of lost generation for that plant when the equipment fails.</p> <ol style="list-style-type: none"> <li>3. A regression analysis was performed on the hydroAMP database to establish a correlation between a condition index and equipment “effective age”. The results were then used to map the hydroAMP condition index and effective age to a survivor curve for that equipment. Survivor curves are derived from industry data and show the relationship between equipment age and the percentage of the equipment population that has failed or been retired. Mapping the hydroAMP results to the survivor curve yields a failure probability for equipment with a given condition index and effective age.</li> <li>4. For each piece of equipment modeled, lost generation in 2) above is multiplied by the failure probability in 3) above to derive Lost Generation Risk (LGR). LGR for the system is the sum of LGR for each piece of equipment.</li> </ol>
<b>End-stage Targets:</b>	<b>Reduce hydro system lost generation risk to 300 aMW or less by 2022.</b>
<b>Inclusions/ Exclusions:</b>	The following inclusion/exclusion rules apply: <ul style="list-style-type: none"> <li>• Applies only to Main stem Columbia and Headwater/Lower Snake projects</li> </ul>
<b>Responsibility for Monitoring &amp; Reporting:</b>	Federal Columbia River Power System: partnership between the Army Corps of Engineers, the Bureau of Reclamation, and Bonneville Power Administration

## Documentation of System Performance Measures and End-stage Targets

**Asset Category: Federal Hydro**

<b>Measure:</b>	<b>Energy Cost Of Production</b> – Cost of producing a unit of energy or power.
<b>Background:</b>	The principle behind energy cost of production is to determine the total cost of producing a single unit of something, in this case, a MWh of power.
<b>Methodology:</b>	Each plant’s operation and maintenance expenses plus interest and depreciation are tracked and reported annually by BPA in financial statements. The sum of these costs is divided by average system output measured in MWh to calculate an energy cost of production.
<b>End-stage Targets:</b>	Maintain an energy cost of production of less than \$10 per MWh in 2012 dollars through 2022.
<b>Inclusions/ Exclusions:</b>	The following inclusion/exclusion rules apply: <ul style="list-style-type: none"> <li>• Includes costs and average generation output for 31 FCRPS hydro plants</li> </ul>
<b>Responsibility for Monitoring &amp; Reporting:</b>	Federal Columbia River Power System (FCRPS): partnership between the U.S. Army Corps of Engineers (USACE), the U.S. Bureau of Reclamation (USBR), and the Bonneville Power Administration (BPA)



## Documentation of System Performance Measures and End-stage Targets

**Asset Category: Information Technology (IT)**

<b>Measure:</b>	<b>Personal computing device cost</b> – annual expense (labor and materials) to provide IT technical desktop/laptop support for personal computing devices divided by the number of desktops and laptops supported by BPA IT organization.
<b>Background:</b>	BPA is implementing a number of initiatives that will impact the cost of maintaining a personal computing device (e.g. desktop, laptop, etc.). These initiatives include moving from a target for personal computing devices of 80% laptop to 20% laptops; introducing virtual desktop infrastructure (application streaming, thin clients, etc.); leveraging automation for the deployment and maintenance of personal computing devices; and adopting Microsoft Operations Framework (MOF) to improve support processes and efficiencies. The objective is to drive the average costs of a personal computing device below the FY2010 average plus inflation; however, refreshing BPA’s personal computing fleet in FY2011 through FY2012 may see a rise in the average cost before a drop is realized.
<b>Methodology:</b>	Review and validate BPA’s cost calculation against industry standards. Adjust values and methodology to conform to industry best practices in capturing this metric. Establish baseline using existing data. Collect and report on average personal computing device cost quarterly.
<b>End-stage Targets:</b>	Average cost per computing device is at or below FY2010 baseline through FY 2017
<b>Inclusions/ Exclusions:</b>	The following inclusion/exclusion rules apply: <ul style="list-style-type: none"> <li>• Devices included all physical devices: laptops, desktops, zero clients, tough books.</li> <li>• Devices excluded: tablets and smart phones</li> <li>• Included cost of base image software (Office Suite, browser, Client Access Licenses, etc.) running on included devices.</li> <li>• Included: Labor to support and maintain included devices and software.</li> <li>• Included cost of server, storage, software, and labor to maintain thin clients (virtual desktop infrastructure)</li> <li>• Include, cost of call center.</li> <li>• Excluded: Personal computing devices dedicated to Critical Business Systems</li> </ul>
<b>Responsibility for Monitoring &amp; Reporting:</b>	NJRH Manager, IT Help Desk

## Documentation of System Performance Measures and End-stage Targets

**Asset Category: Information Technology (IT)**

<b>Measure:</b>	<b>Network latency</b> – measures the network wait time experienced by end users and systems accessing services using NJ maintain circuits.
<b>Background:</b>	BPA maintains several key circuits and links that are important to the communication, operation, and data transfer that enable BPA to perform its business functions securely and reliably. The latency of these circuits impact user experiences and system performance.
<b>Methodology:</b>	Periodically generate a 100-packet 'ping' between Circuit endpoint devices, collecting the Min/Avg/Max RTT and total packet drops. This data will then be used to calculate Latency.
<b>End-stage Targets:</b>	Acceptable(Green): $\leq 2 \times \text{Baseline}$ Elevated(Yellow): $> 2 \times \text{Baseline}$ and $< 100\text{ms}$ Excessive(Red): $\geq 100 \text{ ms}$
<b>Inclusions/ Exclusions:</b>	The following inclusion/exclusion rules apply: <ul style="list-style-type: none"> <li>• Excluded: network latency external to BPA (e.g. internet sites beyond BPA firewalls and gateway routers)</li> <li>• Included; BPA leased circuits and field sites.</li> </ul>
<b>Responsibility for Monitoring &amp; Reporting:</b>	NJNN Manager

## Documentation of System Performance Measures and End-stage Targets

**Asset Category: Information Technology (IT)**

<b>Measure:</b>	<b>Physical Windows Server Consolidation</b> – Ratio of virtual servers to physical servers compared to baseline established for FY 2010.
<b>Background:</b>	Historically projects at BPA have procured development, test, and production servers to host new systems. This practice has led to BPA supporting over 1100 servers, many of these servers running at less than 20% CPU utilization – far below industry recommendations – resulting in unnecessary high cost to support BPA’s systems. With improved server hardware technology and the adoption of virtualization, the number of physical server can be substantially reduced, resulting in lower hardware costs, license costs, power consumption, and cooling cost. BPA is beginning the process of moving to virtual servers. This process will see a net increase in servers in FY2011 and possibly FY2012 as new servers hosts are put in place to allow the migration to virtual servers and retirement of existing servers.
<b>Methodology:</b>	Quarterly report on the ratio of virtual to physical windows production and test servers. Ratio will exclude physical domain controllers (2 physical servers for each domain) and field servers. [N.B. If decision is made to host non-critical business systems at an Alternative Data Center, the decision could delay achieving targets.]
<b>End-stage Targets:</b>	Q4 FY2013 Green > 75% virtualization of Production and Test servers Yellow >55% <75% virtualization of Production and Test servers Red <55% virtualization of Production and Test servers
<b>Inclusions/ Exclusions:</b>	The following inclusion/exclusion rules apply: <ul style="list-style-type: none"> <li>• Two physical domain controllers are required at each site and will not be include in the calculating the ratio of virtualization</li> <li>• Only servers in the Production and Test domains are included in the virtualization</li> <li>• Development and build servers are excluded from the virtualization calculation.</li> <li>• Network firewall devices are excluded from the virtualization calculation.</li> <li>• Specialized appliances are excluded from the virtualization calculation</li> </ul>
<b>Responsibility for Monitoring &amp; Reporting:</b>	NJND Manager

## Documentation of System Performance Measures and End-stage Targets

**Asset Category: Facilities**

<b>Measure:</b>	<b>Energy Intensity</b>
<b>Background:</b>	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. Facility 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.
<b>Methodology:</b>	<p>Develop, validate and adopt a more rigorous and accurate methodology of estimating energy usage in the various building categories and by load type (i.e., transmission process load, HVAC load, lighting load, etc)</p> <p>Determine revised 2003 energy intensity baseline as of 2010.</p> <p>Determine which buildings or loads should be included and excluded from the BPA portfolio. Prepare supporting documentation which justifies why certain buildings or loads should be exempt from the BPA portfolio.</p> <p>Roll out Cozy Toes Program in BPA Headquarters to gain an estimated 3 percent energy savings and affect more efficient energy use in the building.</p> <p>Integrate energy auditing into the FAM methodology of assessing building condition.</p> <p>Based on a priority scheme equation – (Return on Investment and Criticality of Equipment), integrate the recommendations of the energy audits conducted in 2010 and thereafter, with the annual FAM Work plans to achieve energy reductions. Track energy reduction measures through the FAM Work Order system and report reductions made from the 2010 baseline on a quarterly basis.</p> <p>Coordinate with the annual FAM work plan development process to identify opportunities to select more sustainable solutions based on the same priority scheme equation – (Return on Investment and Criticality of Equipment)</p> <p>Based on the findings and the methodology defined above, project the energy intensity for 2015. Make adjustments to the Action Plan as needed.</p> <p>Coordinate the development of energy savings measures into design specifications, and include a metering strategy for electrical energy, steam and gas.</p>
<b>End-stage Targets:</b>	Reduce energy intensity by 30 percent by 2015 (against 2003 baseline targeting 3% yearly). Energy intensity is defined as energy use by sq ft. of building area.
<b>Inclusions/ Exclusions:</b>	<p>The following inclusion/exclusion rules apply:</p> <ul style="list-style-type: none"> <li>• To be determined. Some process (transmission loads and/or some buildings may be exempted</li> </ul>
<b>Responsibility for Monitoring &amp; Reporting:</b>	FAM

## Documentation of System Performance Measures and End-stage Targets

**Asset Category: Facilities**

<b>Measure:</b>	<b>Potable Water Use</b>
<b>Background:</b>	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. Facility 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.
<b>Methodology:</b>	<ol style="list-style-type: none"> <li>1. Research re-utilization techniques to determine ways to reduce potable water use.</li> <li>2. Evaluate and recommend opportunities to install low-flush toilets at larger facilities, water-saving devices such as sink aerators, hands-free faucets, waterless urinals, recycling of grey water by Q4 FY2012</li> </ol>
<b>End-stage Targets:</b>	Reduce potable water consumption by 26% by F2020 (from 2007 baseline, targeting 2% a year).
<b>Inclusions/ Exclusions:</b>	<p>The following inclusion/exclusion rules apply:</p> <ul style="list-style-type: none"> <li>• To be determined</li> </ul>
<b>Responsibility for Monitoring &amp; Reporting:</b>	FAM

## Documentation of System Performance Measures and End-stage Targets

**Asset Category: Fish & Wildlife**

<b>Measure:</b>	<b>Hatchery Asset Management:</b> Compliance with facility specific production goals and operating parameters.
<b>Background:</b>	
<b>Methodology:</b>	Hatchery Operators Annually report metrics in PISCES.
<b>End-stage Targets:</b>	Two end-stage targets by facility: <ol style="list-style-type: none"> <li>1. Increased egg and juvenile production to cause increased population levels in focused ESUs.</li> <li>2. Increased eggs released, juvenile fish released and adult fish released from program, and augmentation, supplementation and research targets met.</li> </ol>
<b>Inclusions/ Exclusions:</b>	N/A
<b>Responsibility for Monitoring &amp; Reporting:</b>	Fish and Wildlife: KEW

## Documentation of System Performance Measures and End-stage Targets

**Asset Category:** *Fish & Wildlife*

<b>Measure:</b>	<b>Land Acquisition Asset Management:</b> Compliance with easement terms and management plan.
<b>Background:</b>	
<b>Methodology:</b>	Annual reporting of compliance with easement terms and management plan.
<b>End-stage Targets:</b>	Wildlife crediting from land acquisitions accomplished mitigation obligations by facility/dam.
<b>Inclusions/ Exclusions:</b>	N/A
<b>Responsibility for Monitoring &amp; Reporting:</b>	Fish and Wildlife: KEW

## Documentation of System Performance Measures and End-stage Targets

**Asset Category: Fish & Wildlife**

<b>Measure:</b>	<b>Passage:</b> Continued functionality for passage.
<b>Background:</b>	
<b>Methodology:</b>	Annual report in PISCES of miles of newly accessed stream.
<b>End-stage Targets:</b>	Passage facilities accomplish increased spawning habitat.
<b>Inclusions/ Exclusions:</b>	N/A
<b>Responsibility for Monitoring &amp; Reporting:</b>	Fish and Wildlife: KEW



## Documentation of System Performance Measures and End-stage Targets

**Asset Category: Energy Efficiency**

<b>Measure:</b>	<b><i>Acquired the energy efficiency resource (aMW).</i></b>
<b>Background:</b>	Provides how successful public power has been in acquiring the energy efficiency (conservation) resource that offsets the need to build new generation to meet new and existing load growth. The Long-term Regional Dialogue Policy directs that BPA and public power will cooperatively accomplish public power's share of regionally cost-effective energy efficiency as defined by the Council's Power Plan.
<b>Methodology:</b>	Savings target achievement for programmatic savings is calculated by summing what is reported to BPA through EE Central by customer utilities. The savings numbers are based on first-years savings of a measure or project and do not reflect how long the measure will be in place. The measure-life does help determine how much BPA is willing to pay for any given measure or project. The savings to count toward the target include both BPA-funded and utility self-funded savings.
<b>End-stage Targets:</b>	For the period 2010 through 2014 acquire 504 aMW of energy conservation resource.  For the period beyond 2014 the target will be established by the Council's 7th Power Plan. Targets based on availability of cost effective acquisition of energy conservation.
<b>Inclusions/ Exclusions:</b>	The following outage inclusion/exclusion rules apply: <ul style="list-style-type: none"> <li>• The target includes cost-effective savings that comply with Energy Efficiency's Implementation Manual.</li> <li>• The public power target is only public utilities that BPA served (i.e. excludes Chelan, Douglas PUD)</li> <li>• Capital funding is used for programmatic savings that count toward the target. Expense funds are used for market transformation and non-programmatic savings that count toward the target.</li> </ul>
<b>Responsibility for Monitoring &amp; Reporting:</b>	PEH – Energy Efficiency

## Documentation of System Performance Measures and End-stage Targets

**Asset Category: Energy Efficiency**

<b>Measure:</b>	<b><i>Cost of resource acquisition</i></b>
<b>Background:</b>	The capital cost to acquire the energy efficiency resource includes reimbursements for energy efficiency incentive payments and performance payments to customer utilities and third-party program implementation.
<b>Methodology:</b>	Cost targets (\$/aMW) for programmatic savings include reimbursements for energy efficiency incentive payments to customer utilities and third-party program implementation. They do not include any expense costs.
<b>End-stage Targets:</b>	For the period 2010 through 2014 acquire less than or equal to \$1.9 million per aMW
<b>Inclusions/ Exclusions:</b>	<p>The following outage inclusion/exclusion rules apply:</p> <ul style="list-style-type: none"> <li>• The \$/aMW cost for programmatic savings includes reimbursement to utilities through the Energy Efficiency Incentive (EEI), performance payments and third party implementation costs.</li> <li>• Expense costs such as acquisition expense, market transformation and cost of staff are not included in this metric.</li> </ul>
<b>Responsibility for Monitoring &amp; Reporting:</b>	PEH – Energy Efficiency