2007 Pacific Northwest Loads & Resources Study

Operating Years 2008 through 2017

March 2007

BONNEVILLE POWER ADMINISTRATION

Department of Energy

Bonneville Power Administration
P.O. Box 3621
Portland, Oregon 97208-3621

POWER BUSINESS LINE

August 1, 2007

In reply refer to: PGPL-5

Dear Interested Parties:

This document is Bonneville Power Administration's (BPA) *"2007 Pacific Northwest Loads and Resources Study,"* commonly called the "White Book." The 2007 White Book is a snapshot as of March 31, 2007, of both the Federal system and Pacific Northwest (PNW) region loads and resources for Operating Year (OY) 2008 through 2017. This analysis incorporates BPA's estimates of PNW total retail loads, contract obligations, contract purchases, and resource capabilities. BPA compiles these estimates with annual data submittals provided by PNW Federal agencies, public agencies, cooperatives, U.S. Bureau of Reclamation (Bureau), U.S. Army Corps of Engineers (USACE), and investor-owned utilities (IOUs). These are combined to provide projections of the Federal system and the PNW region load and resource capabilities for the 10-year study horizon, operating years (OY) 2008 through 2017.

The White Book projections are used as input into BPA's long-range resource planning process to assist planning for adequate and reliable load service for the Federal system and the PNW region. This White Book includes scenarios using various resource levels for both the Federal system and the PNW region. The 2007 Pacific Northwest Loads and Resources Study is an update to the previous 2006 White Book.

Federal Firm Sales and Load Obligations

Federal system sales and load obligations are comprised of BPA's power sales contract (PSC) obligations to PNW Federal agency, public agency, cooperative, USBR, IOU, and DSI customers and other BPA firm contractual obligations.

BPA Power Sales Contract Obligations: BPA executed 5- or 10-year PSCs with Federal agency, public agency, public utility cooperative, USBR, IOU, and DSI customers that began October 1, 2001. The following sets forth BPA's PSC firm power load obligations projected for the 2007 White Book study period:

- BPA's Federal agency, public agency, cooperative, and USBR customers signed either 5- or 10-year PSCs. Some of the public agencies, and cooperatives signed up for the 10-year Slice Product. BPA's PSC and Slice obligations end September 30, 2011; however, this study assumes that BPA will meet these or similar obligations in agreements through OY 2017. BPA's total PSC load obligations are estimated to range from 7,402 aMW in OY 2008 to 8,060 aMW in OY 2017. In actual operation, BPA's obligations to serve these customers may be higher or lower than those shown in this analysis;
- The IOU's signed the 10-year Residential Purchase and Sales Agreement (RPSA) settling BPA's obligations under the Northwest Power Act to the IOUs. For the study horizon, this analysis assumes that any BPA's IOU RPSA contracts will provide only financial benefits and no power is delivered. In May 2007, the Ninth Circuit Court held the RPSA

settlement agreements inconsistent with Sections 5 and 7 of the Northwest Power Act in Portland General Electric v. BPA. BPA's reviewing approaches to address this inconsistency with regional parties. At this time, the ruling does not change any of BPA's forecasts for Federal system surplus/deficits since BPA did not assume IOU power deliveries through the study horizon. When decisions are made concerning this ruling, they will be reflected in future studies; and

- BPA's DSI customer PSC obligations for October 1, 2006, through September 30, 2011, follow the policies adopted in the Service to the DSI Record of Decision (ROD), dated June 30, 2005, and BPA's Supplemental DSI ROD, dated May 31, 2006. For BPA's DSI aluminum smelter customers, BPA elected to monetize the value of physical surplus power sales based on the customers' operating levels through September 30, 2011. For BPA's only non-aluminum DSI customer, Port Townsend Paper Corporation (PTPC), this study models PTCP's benefit as a BPA surplus power sale delivery of 17 aMW to Clallam County PUD for PTCP service through September 30, 2011. This delivery is shown as an Intra-regional transfer from BPA to Clallam County PUD and is not included as a DSI PSC load obligation. The contracts for service to the aluminum smelter DSIs and PTPC expire September 30, 2011. Post-September 30, 2011, this study assumes no BPA power deliveries to DSIs.

Table 1, shows BPA's Federal agency, public agency, cooperative, USBR, IOU, and DSI projected PSC load obligations.

Table 1

2007 White Book
BPA Power Sales Contract Load Obligations
Annual Energy in Average Megawatts

Operating Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
USBR	160	160	160	160	160	160	160	160	160	160
Federal Agency	130	140	143	144	146	147	148	149	151	152
Public Agency 1/	7,112	7,197	7,299	7,337	7,394	7,418	7,531	7,582	7,695	7,748
IOU Power Deliveries 2/	0	0	0	0	0	0	0	0	0	0
DSI Power Deliveries 3/	0	0	0	0	0	0	0	0	0	0
Total BPA PSC Load Obligations	7,402	7,497	7,602	7,641	7,700	7,725	7,839	7,891	8,006	8,060

1/ BPA's PSC net requirement load obligations that include full service, partial service, block, slice block, and slice resource contracts. BPA's PSC obligations are reduced for load reduction agreements and conservation augmentation.

2/ BPA's IOU RPSA settlement provided only financial benefits and assumes no power is deliveries for October 1, 2006, through September 30, 2011; and through the study horizon.

3/ BPA's DSI customers signed 5-year contracts beginning October 1, 2001, extending through September 30, 2006. For October 1, 2006, through September 30, 2011, this study incorporates the policies adopted in BPA's Supplemental DSI ROD, dated May 31, 2006. Instead, BPA is providing regional DSIs with monetary benefits that are dependent on their operating levels through September 30, 2011. This study additionally includes a BPA sale to Port Townsend Paper Corporation for 17 aMW of surplus firm power via a local preference customer through September 30, 2011. This delivery is shown as an Intra-regional transfer from BPA to a local preference customer for Port Townsend and is not shown specifically as a DSI PSC load obligation. Post-September 30, 2011, this study does not assume BPA power deliveries to DSIs.

Although these PSC obligations expire September 30, 2011, it is assumed that they will be replaced with similar contract obligations through OY 2017. Decisions and agreements for BPA's post-2011 PSC service and products may be reached through the Regional Dialogue process between BPA, its customers, and other regional stakeholders. Any decisions adopted from the Regional Dialogue discussions will be incorporated in future studies

Federal System Resources

BPA is the designated marketer of the hydro resources of the Federal system, which includes 31 dams owned and operated by the Bureau and USACE. BPA also markets the generation from: hydro projects owned by the City of Idaho Falls through September 30, 2011, and Lewis County Public Utility District; thermal generation from the Columbia Generating Station nuclear plant, operated by Energy Northwest, Inc.; and the output from several renewable power plants under power purchase contracts with BPA, primarily cogeneration and wind turbines. The hydro regulation study incorporates power and non-power requirements that BPA expects to be in effect during the study period, including those measures described by: 1) the National Oceanographic and Atmospheric Administration Fisheries (NOAA Fisheries) Biological Opinion, dated November 2004, as modified by Court-Ordered operations for 2006; 2) the U.S. Fish and Wildlife Service (USFWS) Biological Opinion, published December 2000; 3) operations described in the Northwest Power and Conservation Council's (Council) Fish and Wildlife Program; and 4) other fish mitigation measures. Estimates of hydro resources include projected hydro improvements expected to increase and preserve Federal hydro generation by:

- Replacing turbine runners to preserve and increase generation;
- Providing increased reliability by decreasing forced and planned outages; and
- Hydro system optimization and operational planning tools that maintain hydro generation efficiencies.

The Council, BPA, other Federal agencies, and other PNW entities will continue to evaluate ways to enhance conditions for fish and wildlife. Future proposals could include additional amendments to the Council's Columbia River Basin Fish and Wildlife Program, revision of the PNCA, renegotiation of Canadian Entitlement allocation agreements, and/or implementation of additional programs in support of the Endangered Species Act. The impacts of future proposals are unknown. These proposals, however, will most likely impact non-power requirements on the hydro system changing a combination of operating flexibility, the monthly shape and timing of streamflows, and the availability of operational Federal system capacity. Future studies will incorporate new known impacts.

Federal 1-Hour Operational Peaking Adjustment: The instantaneous capability of the Federal hydro projects overstates the amount of Federal hydro capacity actually available to meet firm load obligations, month after month, year after year. This is due to the fact that the Federal hydro system has more generating units than hydro fuel (water) available to operate all units on a continuous basis. This issue is addressed by applying an operational peaking adjustment reduction to the Federal hydro capacity to reflect the amount needed to meet the expected 1-hour peak load obligations for each month. This firm capacity calculation provides a better measure of the Federal system and PNW resource peaking capability actually available to meet expected peak load obligations for BPA planning purposes.

Federal 120-Hour Capacity Availability: BPA continues to investigate alternate methods to depict capacity availability for the Federal system and PNW region using BPA's short-term operational planning processes. BPA's short-term planning estimates the Federal system hydro peaking availability on a monthly 120-hour basis. The 120-hour capacity represents the Federal system hydro generating capability when averaged monthly over the top 6 HLHs per day, 5 days per week, and 4 weeks per month (6*5*4=120 hours). This analysis was completed for each of the 50-water conditions. Like the 1-hour operational peaking reduction, 120-hour peaking capacity curves were developed using HOSS hourly Federal hydro generation to obtain 120-hour peaking reductions.

Federal System Annual Firm Energy Surplus/Deficit

Table 2, is a summary of the Federal system annual firm energy surplus/deficits presented in the 2007 White Book, Exhibit 1, page 67. The analysis used the "Federal System Assumptions" detailed on page 17 of the study document. The Federal system is projected to have energy deficits throughout the study, higher than last year's study mainly due to higher load obligation estimates. In addition, monthly Federal system energy deficits may occur due to water and load variability. The monthly variation of the Federal system loads and resources is described in the 2007 White Book on page 27. BPA will most likely meet monthly and annual energy deficits using a combination of methods described below in the section on "Planning to Meet Federal Deficits".

Table 2

2007 White Book
Federal System Firm Energy Surplus/Deficit[1]
Using 1937-Critical Water Conditions
Annual Energy in Average Megawatts

Operating Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Obligations	8,474	8,483	8,681	8,682	8,503	8,490	8,589	8,629	8,725	8,760
Net Resources	8,364	8,227	8,416	8,283	8,263	8,110	8,259	8,104	8,246	8,081
Surplus/Deficit	-109	-256	-265	-399	-240	-381	-330	-525	-479	-679

Potential Variability of Federal System Resources and Annual Energy Surplus/Deficits

To show the potential variability of the Federal system resources and surplus/deficits, this study compares four different levels of Federal system generation. These levels of generating resources are based on the historical 50-water conditions (August 1928 through July 1978) and use the following water conditions: 1) the base case 1937-critical water; the average of 2) the bottom ten percent; 3) the middle 80 percent; and 4) the top ten percent and are shown on page 24 of the 2007 White Book document.

[1] Sums may not add due to rounding

Planning to Meet Federal System Deficits

The Federal system energy and capacity load and resource projections are considered conservative and assume hydro generation using 1937-critical water conditions, Federal non-hydro resources operating at expected generation levels, and Federal contract obligations and purchases delivered at maximum contract levels. The analysis includes Federal power purchases or new resources that were acquired as of March 31, 2007. Federal system deficits will be met by any combination of the following:

- Better than critical water conditions, which increases water flow and water storage thereby increasing the output of the Federal hydro system;
- Power purchases or the acquisition of generation from operating Independent Power Producer (IPP) projects;
- Market purchases to cover delay or termination of planned resource purchases under long-term contracts;
- Cost-effective conservation and load management programs that reduce BPA's load obligations;
- PSC load obligation variability due to current and future economic conditions; and
- Purchase of off-system storage and exchange agreements that allow for monthly seasonal shaping of Federal hydropower with other PNW entities or other west coast regions.

PNW Region Total Retail Load Forecast

The total retail load forecasts were estimated separately for each PNW entity and grouped into the following customer categories: Federal agency, public agency, cooperative, USBR, IOU, and DSI. The total retail load forecasts for the Federal agencies, USBR, cooperatives, and most public agencies were developed by BPA's Load Forecasting and Analysis group using linear trend methods, based on individual customer's historical annual energy consumption and their 2001 Power Sales Contracts' Exhibit C submittals. Similarly, the forecasts for the IOUs and some generating public agencies were developed from data submitted in the 2006-07 PNUCC submittals or load forecasts sent directly to BPA. DSI total retail load estimates were developed by BPA's Bulk Hub and were based on their current operating levels and future economic conditions. All total retail load forecasts were finalized on March 31, 2007.

2007 White Book and the Council Regional Total Retail Load Comparison: Table 3, page 6, shows a comparison of the non-DSI regional total retail loads for the 2007 White Book and the Council's Final Fifth Northwest Electric Power and Conservation Plan (May 2005) for OY 2008 through 2017. To provide consistency between the load forecasts for comparison purposes, the DSI load components were removed from both forecasts. The comparison of the non-DSI total retail load forecasts shows that the 2007 White Book projections are higher in all years of the study. The average difference over the 10-years of the study is 0.7 percent. The maximum difference is 1.3 percent (268 aMW) in OY 2017. This difference is considered minor and is mainly due to variations in modeling methods and the vintage of data used in the two forecasts.

Table 3

Non-DSI PNW Regional Firm Load Comparison
BPA's 2007 White Book Load Projections
and the Council's Fifth Power and Conservation Plan (May 2005)
Annual Energy in Average Megawatts

Operating Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
2007 White Book	20,906	21,301	21,599	21,883	22,145	22,418	22,691	22,997	23,284	23,595
Council Reg. Plan	20,759	21,033	21,331	21,632	21,941	22,245	22,565	22,906	23,247	23,587
Difference (aMW)	147	268	268	251	204	172	127	90	37	8
Difference (%)	0.7%	1.3%	1.2%	1.1%	0.9%	0.8%	0.6%	0.4%	0.2%	0.0%

The long-term non-DSI regional loads presented in the Council's Fifth Power Plan are higher than those presented in the Council Resource Adequacy Assessment mainly due to a differences in load growth assumptions—1.44 percent to 0.6 percent, respectively—and forecasting methodology differences.

PNW Region Annual Firm Energy Surplus/Deficit

Table 4 is a summary of the PNW region annual firm energy surplus/deficits presented in the 2007 White Book, Exhibit 18, page 97. This study used the "Regional Analysis Assumptions" detailed on page 35 of the study and 1937-critical water conditions. The PNW regional resource stack assumes that generation from all uncommitted IPP projects are available to meet regional loads unless otherwise specified. Using this resource stack, the region is expected to experience firm energy surpluses throughout the study horizon. If PNW IPP generation is not available to the region, energy deficits would most likely be met using a combination of methods described in the 2007 White Book on page 51.

Table 4

2007 White Book
PNW Regional Firm Energy Surplus/Deficit
Using 1937-Critical Water Conditions
Annual Energy in Average Megawatts

Operating Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Total Firm Loads	22,534	22,882	23,273	23,518	23,751	23,991	24,252	24,510	24,741	25,025
Net Resources	25,502	25,257	25,562	25,296	25,304	25,210	25,393	25,189	25,367	25,302
Surplus/Deficit[1]	2,968	2,375	2,289	1,778	1,553	1,218	1,142	680	626	277

[1] Sums may not add due to rounding.

Potential Variability of Regional Annual Energy Surplus/Deficit Projections Due to Water Conditions

To show the potential variability of the regional resources and surplus/deficits, this study compares four different levels of regional generation. These levels of generating resources are based on the historical 50-water conditions (August 1928 through July 1978), similar to that in the Federal Section, and use the following water conditions: 1) 1937-critical water; the average of 2) the bottom ten percent; 3) the middle 80 percent; and 4) the top ten percent and are shown on page 45 in the 2007 White Book document.

Potential Variability of Regional Annual Energy Surplus/Deficit Projections Due to IPP Generation Levels

This study assumes that all uncommitted IPP generation is available to the region, though only a portion of PNW IPP generating resources are specifically contracted for delivery to the PNW. This study presents regional surplus/deficit scenarios assuming different levels of IPP generation specifically dedicated to the PNW region and is presented on page 46 of the document. Table 5, on page 7, shows the potential variability of regional firm annual energy surplus/deficits due to the differing levels of IPP generation assumed delivered to the region—100 percent (up to 4,022 aMW), 75 percent (up to 3,016 aMW), 50 percent (up to 2,011 aMW), and 25 percent (up to 1,006 aMW). For OY 2008, regional surplus/deficit estimates can potentially vary up to just over 3,000 aMW, annually ranging from 2,968 aMW surplus to a deficit of -34 aMW due to differing possible IPP generation commitments to the PNW.

Table 5

2007 White Book
Potential Variability of Regional Firm Energy Surplus/Deficit
Utilizing Different Levels of IPP Generation Delivered to the Region
Annual Energy in Average Megawatts

Operating Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
S/D 100% PNW IPP Delivered (4,022 aMW)	2,968	2,375	2,289	1,778	1,553	1,218	1,142	680	626	277
S/D 75% PNW IPP Delivered (3,016 aMW)	1,967	1,363	1,283	772	541	206	130	-332	-380	-729
S/D 50% PNW IPP Delivered (2,011 aMW)	967	351	277	-235	-471	-806	-882	-1,344	-1,386	-1,735
S/D 25% PNW IPP Delivered (1,006 aMW)	-34	-661	-729	-1,241	-1,483	-1,818	-1,894	-2,356	-2,392	-2,741

Council's Regional Resource Adequacy Standard

The Council adopted a resource adequacy standard for the regional power supply based on recommendations from the Resource Adequacy Forum which included BPA and other PNW entities. The resource adequacy standard includes both a regional energy metric and a pilot capacity resource adequacy metric. At this time, these regional standards do not imply mandatory compliance or methods for enforcement. Rather, the Council's resource adequacy standard is meant to be a gauge used to assess whether the region's power supply capability is adequate to "keep the lights on".

The White Book study projects regional total retail loads, contracts, and resources to produce a regional load resource balance, The White Book analysis focuses on normal weather loads and critical water hydro conditions. This is a deterministic accounting approach for measuring the regional inventory for long-term planning. At this time, the Council's Regional Resource Adequacy metrics are not addressed in BPA's White Book analysis.

In contrast, the Council's Resource Adequacy Assessment (Council RA) uses a probabilistic analysis to determine the regional Loss of Load Probability (LOLP). The Council's RA LOLP process is complex, simulating hourly system operations by varying: variables such as hydro generation, temperature effects on total retail loads, and forced outages of regional resources. Since most PNW utilities do not have a LOLP model, the Council translates the LOLP results to a deterministic critical water load resource balance by incorporating a derived "LOLP planning adjustment." This helps facilitate a comparison approach with other deterministic regional planning entities such as BPA's White Book.

Council's Regional Resource Adequacy Standards: The Council's energy and capacity metrics are derived from a LOLP analysis that incorporates multiple: water conditions; total retail loads; hydro operating principles; resource availability—including forced outages; and generation dispatch. Hydro operations assume the ability to borrow water from future weeks or months to maximize generation over 50-hours for one week. The LOLP results are translated to a deterministic load resource balance.

The regional ***energy*** adequacy standard load resource balance incorporates critical hydro generation and a portion of uncommitted regional IPP resources. Thermal resource generation is based on project generation capability, rather than the project's actual operation. The energy adequacy standard includes a 1,500 aMW energy "planning adjustment" which was derived from the LOLP analysis. The planning adjustment is assumed to be comprised of out-of-region market purchases and hydro flexibility.

The initial pilot regional ***capacity*** adequacy standard includes a planning reserve margin for an extended period of hours for each month. The interim capacity planning reserve margin is 25% for winter and 19% for summer. These reserve margins are derived from the LOLP analysis. The Council's RA capacity standard has been reassessed and will be incorporated in future Council studies.

Both BPA and the Council's RA project regional load resource balances, although direct comparisons are difficult due to differences in base assumptions. For 2010, the projected regional annual energy surplus in the White Book is 2,300 aMW compared to the Council's RA estimate of 4,400 aMW—about 2,100 aMW more.

The difference is mainly due to the White Book's approximate 1,900 aMW higher total retail load (TRL) forecast. This difference can be enumerated as follows:

- 750 aMW higher due to BPA's 1.5 percent load growth estimate compared to Council's 0.6 percent;
- 500 aMW higher due to larger DSI and export estimates; and
- 650 aMW higher due to forecasting methodology differences.

The White Book total resources are lower by about 200 aMW. These differences are composed of:

- 370 aMW more hydro generation and imports due to the inclusion of hydro improvement upgrades and updated import estimates;
- 570 aMW less thermal generation because the Council assumes that all resources are run to maximize energy regardless of plant efficiency;
- 1,500 aMW more generation because uncommitted IPPs in the White Book are assumed 100 percent regionally available, where as the Council assumes only a portion of the IPP generation is available for PNW service; and
- 1,500 aMW less generation because the Council's RA includes a Planning Reserve Margin that is comprised of unspecified hydro resource flexibility and out-of-region contract purchases.

As the Council and BPA update load and contract data, these differences are expected to decrease.

2007 White Book Key Messages

For the Federal System:

- The Federal system is expected to have energy deficits through OY 2017—ranging from -109 aMW in 2008 to -679 aMW in OY 2017. Under average water conditions, the Federal system is projected to have energy surpluses through OY 2017—ranging from 1,554 aMW in OY 2008 to 987 aMW in OY 2017.
- The Federal system energy surplus/deficits may differ due to:
    - The actual level of PSC obligations for October 1, 2006, through September 30, 2011, which may be higher or lower than those used in this analysis;
    - Uncertainty of future potential BPA sales to DSI customers;
    - New or updates to contracts obligations or purchases through the Regional Dialogue process;
    - Changes in non-power requirements on Federal hydro projects; and
    - Actual level of Federal system hydro generation realized under current water conditions that can vary by up to 4,000 aMW annually.

For the PNW Region:

- The PNW region is expected to experience firm energy surpluses through the study horizon, using 1937-critical water conditions, assuming approximately 4,022 aMW of uncommitted IPP generation is available to serve PNW loads.
- Regional energy surplus/deficits may differ due to:
    - The actual level of total retail loads may be higher or lower than those used in this analysis;
    - New or updates to contracts obligations or purchases;
    - Changes in non-power requirements on Federal and non-Federal hydro projects;
    - Availability of fuel (i.e. natural gas, coal, wind, etc.) for other regional resources;
    - Actual level of regional hydro generation realized under current water conditions that can vary by up to 7,000 aMW annually; and
    - The actual amount of uncommitted IPP generation retained within the PNW region. This study assumes approximately 4,022 aMW of uncommitted PNW IPP generation as regional resources. While this assumption is reasonable from an electrical reliability standpoint, resulting regional surpluses may understate the potential for price volatility and overstate the availability of IPP generation for use within the PNW. The PNW region may have to compete with other western markets to secure uncommitted IPP generation to meet electricity demand. Using 1937-water conditions, regional energy surplus/deficits could potentially vary up to just over 3,000 aMW annually, depending on IPP generation contracted for or available to meet firm PNW loads.
- Federal system and regional energy deficits are projected for planning purposes and should not be seen as precursors of impending blackouts or other system disturbances.

Additional copies of this document can be obtained from BPA's Public Information Center, 1-800-622-4520. The 2007 Pacific Northwest Loads and Resources Study Technical Appendix presents regional loads, grouped by major PNW utility categories and detailed contract and resource information. The Technical Appendix is available only in electronic form. Both the Technical Appendix and this summary document are available on BPA's external website at: http://www.bpa.gov/power/whitebook2007.

Please send questions or additional comments to Tim Misley (503) 230-3942.

Sincerely,

/s/ Steven R. Oliver

Steven R. Oliver
Vice President, Generation Supply

Enclosure

2007 PACIFIC NORTHWEST LOADS AND RESOURCES STUDY

THE WHITE BOOK

BONNEVILLE POWER ADMINISTRATION
March 2007

Cover Picture:

Source: BPA Photo archive

Pictured is a transmission tower at the Celilo Converter Station which began service in 1970.

The Celilo Converter Station sits at the northern end of the 846-mile Pacific high-voltage direct-current Intertie. The Intertie ends at the Sylmar converter station in Los Angeles. Both stations convert alternating current (AC) into direct current and send it to the other station where it is converted back into AC, with less line losses than an all AC line. Due to technology and innovation changes, Celilo currently sends south up to 3,100 MW of direct current energy; more than double the capacity it sent when it was initially built in 1970.

ACKNOWLEDGMENTS

Preparation of the annual Pacific Northwest loads and resources study is a complex, multidisciplinary effort. BPA wishes to acknowledge the team—BPA staff and others—whose diligence and dedication result in a reliable, high quality document.

Bonneville Power Administration

Generation Supply: Regional Coordination Group

Requirements Marketing: Western Power Business Area Group
Eastern Power Business Area Group

Bulk Marketing and Transmission Services: Account Services Group

Office of General Counsel

Pacific Northwest Utilities Conference Committee

Northwest Power & Conservation Council

Reports Powered by:

Loads and Resources Information System

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Section 1: Introduction

Description of the White Book

The Pacific Northwest Loads and Resources Study (White Book), which is published annually by the Bonneville Power Administration (BPA), establishes one of the planning bases for supplying electricity to customers. The White Book contains projections of regional and Federal system load and resource capabilities, along with relevant definitions and explanations. The White Book also contains information obtained from formalized resource planning reports and data submittals including those from individual utilities, the Northwest Power and Conservation Council (Council), and the Pacific Northwest Utilities Conference Committee (PNUCC).

The White Book is not an operational planning guide, nor is it used for determining BPA revenues, although the database that generates the data for the White Book analysis contributes to the development of BPA's inventory and ratemaking processes. Operation of the Federal Columbia River Power System (FCRPS) is based on a set of criteria different from that used for resource planning decisions. Operational planning is dependent upon real-time or near-term knowledge of system conditions that include expectations of river flows and runoff, market opportunities, availability of reservoir storage, energy exchanges, and other factors affecting the dynamics of operating a power system.

The load resource balance of both the Federal system and the region is determined by comparing resource availability to an expected level of total retail electricity consumption. Resources include projected energy capability plus contract purchases. Loads include a forecast of retail obligations plus contract obligations. Surplus energy is available when resources are greater than loads. This surplus energy may be marketed to increase revenues. Energy deficits occur when resources are less than loads. These energy deficits will be met by any combination of the following: better-than-critical water conditions, demand-side management and conservation programs, permanent loss of loads due to economic conditions or closures, additional contract purchases, and/or the addition of new generating resources.

This study incorporates information on Pacific Northwest (PNW) regional retail loads, contract obligations, and contract resources and simulates the operation of the power system in the PNW. The simulated hydro operation incorporates plant characteristics, streamflows, and non-power requirements from the current Pacific Northwest Coordination Agreement (PNCA). Additional resource capability estimates were provided by BPA, PNW Federal agency, public agency, cooperative, U.S. Bureau of Reclamation (USBR), and investor-owned utility (IOU) customers furnished through annual PNUCC data submittals for 2006-07 and/or direct submittals to BPA.

The 2007 White Book is presented in two documents: 1) this summary document of Federal system and PNW region loads and resources, and 2) a technical appendix which presents regional loads, grouped by major PNW utility categories, and detailed contract and resource information. The technical appendix is available only in electronic form. Individual customer information for marketer contracts is not detailed due to confidentiality agreements. The 2007 White Book analysis updates the previous 2006 White Book.

This analysis shows projections of the Federal system and region's yearly average annual energy consumption and resource availability for the study period, OY 2008-2017. The study also presents projections of Federal system and region expected 1-hour monthly peak demand, monthly energy demand, monthly 1-hour peak generating capability, and monthly energy generation for OY 2008, 2012, and 2017. Also included is the monthly Federal system 120-hour peak generating capability and 120-hour peak surplus/deficit for OY 2008, 2012, and 2017. The 120-hour peaking capability methodology continues to be investigated for potential use in BPA's long-range capacity planning.

This document analyzes the PNW's projected loads and available generating resources in two parts: 1) the loads and resources of the Federal system, for which BPA is the marketing agency; and 2) the larger PNW regional power system loads and resources that include the Federal system as well other PNW entities. The "Federal System Analysis" is presented in Section 4, beginning on page 17. The analysis for the "Pacific Northwest Regional Analysis" is presented in Section 5, page 35. Section 6 presents a comparison of BPA's regional loads with the Northwest Power and Conservation Council beginning on page 53. Section 7, page 57, presents a potential approach to Federal system capacity planning that BPA is investigating which uses a 120-hour capacity analysis.

"The Administrator's Record of Decision (ROD)" for the 2007 White Book is contained in Section 11, page 131.

The glossary of terms and a list of acronyms are included in Section 12, page 137.

This document and the "*2007 Pacific Northwest Loads and Resources Study Technical Appendix"* are available on BPA's external website at http://www.bpa.gov/power/whitebook2007. Additional hard copies of this summary document are available from BPA's Public Information Center, toll-free, 1-800-622-4520.

Section 2: Background

Pacific Northwest Planning Area

The PNW regional planning area is defined by the 1980 Pacific Northwest Electric Power Planning and Conservation Act (Northwest Power Act), and includes Oregon, Washington, Idaho, and Montana west of the Continental Divide, as well as the portions of Nevada, Utah, and Wyoming that lie within the U.S. Columbia River drainage basin. The PNW planning area also includes the service areas of rural electric cooperative customers contiguous to but not in the geographic area described above that were served by BPA on the effective date of the Northwest Power Act, December 5, 1980. *16 U.S.C. §839(14).*

White Book Study Assumptions

This traditional loads and resources analysis for the Federal system and PNW region has been produced using a specific set of assumptions concerning contracts and non-hydro and hydro resources. The Federal system assumptions are detailed in "Section 4, Federal System Analysis", page 17. Regional assumptions are presented in "Section 5, Regional Analysis Assumptions", page 35.

Total Retail Load Forecast

For this study, the total retail loads were forecasted separately for each regional PNW customer. BPA's Load Forecasting and Analysis group estimated the total retail load for the Federal agency, cooperative, USBR, and most public agency customers using linear trend methods based on each of the customers' historical annual energy consumption as well as their 2001 Power Sales Contracts' (PSC) Exhibit C submittals. The forecasts for the IOUs and some generating public agency customers were developed by BPA's Hubs and incorporate data submitted to BPA through their PNUCC submittals or total retail load forecasts furnished directly to BPA. Direct Service Industries' (DSI) total retail load estimates were prepared by BPA's Bulk Hub for the study period. All total retail load forecasts are as of March 31, 2007.

Pacific Northwest Hydro and Thermal Resources

PNCA Hydro Operating Characteristics: Beginning in 1997, the PNCA agreement incorporated NOAA Fisheries and U.S Fish and Wildlife Service's Biological Opinions. These Biological Opinion requirements changed the shape of energy production by increasing flows in the spring and summer to aid in the downstream migration of juvenile salmon. A result of these requirements is that reservoirs are no longer fully drafted to meet firm loads in the fall and winter but are operated to retain as much water as possible yet still meet flood control requirements by mid-April. The additional water in storage going into the spring snowmelt runoff season results in additional flow in the river during the spring and summer. As a result, the ability to shift and shape hydro energy production to meet firm loads is greatly reduced. The PNCA agreement will remain in place through September 15, 2024.

The hydro regulation study used for this analysis simulates the operation of the hydro system in the PNW. The projected hydro regulation study data is the same used in the previous study, with the exception of updated hydro improvement estimates. Non-federal hydro projects use plant characteristics, streamflows, and non-power

requirements derived from the 2004 PNCA. Federal hydro projects incorporate these same characteristics, with the exception of non-power requirements, which were updated to reflect BPA's best estimate. The PNCA defines the planning and operation of sixteen U.S. Pacific Northwest utilities and other parties with generating facilities within the PNW region's hydroelectric system. The hydro regulation study incorporates power and non-power requirements that BPA expects to be in effect during the study period, including those measures described by: 1) the National Oceanographic and Atmospheric Administration Fisheries (NOAA Fisheries) Biological Opinion, dated November 2004, as modified by Court-Ordered operations for 2006; 2) the U.S. Fish and Wildlife Service (USFWS) Biological Opinion, published December 2000; 3) operations described in the Council's Fish and Wildlife Program; and 4) other fish mitigation measures. The hydro regulation study specifies hydroelectric project operations for fish, such as seasonal flow augmentation, minimum flow levels for fish, spill for juvenile fish passage, reservoir drawdown limitations, and turbine operation efficiency requirements. These measures include:

- Flow augmentation for juvenile fish migrations in the Snake and Columbia rivers in the spring and summer;
- Mandatory spill requirements at the Lower Snake and Columbia dams to provide for non-turbine passage routes for juvenile fish migrants;
- Additional flows for Kootenai River white sturgeon in the spring;
- Additional flows for Kootenai River and Flathead River Bull Trout;
- Detailed Operating Plan operation for Canadian Treaty reservoirs for Operating Year (OY)[1] 2006; and
- PNCA planning criteria for OY 2004.

The hydro regulation study uses hydro plant operating characteristics in combination with the power and non-power requirements to simulate the coordinated operation of the hydro system. These operating requirements include, but are not limited to, storage content limits determined by rule curves, maximum project draft rates determined by each project, and flow and spill objectives determined by the Biological Opinions as provided by the 2004 PNCA data submittals. Deviations from the PNCA data submittals may occur when specific operating decisions have been made subsequent to the date of submission in order to implement Biological Opinions.

To illustrate the monthly variability of the hydro system using PNCA plant characteristics, streamflows, and BPA's best estimate of non-power requirements, this document presents the Federal system and regional firm surpluses and deficits for OY 2008-2017 for 50-historical water conditions (August 1928 through July 1978). The results are shown in Exhibits 8 through 17, pages 83-92, for the Federal system, and in Exhibits 25 through 34, pages 113-122, for the region.

Hydro Energy: This study estimates the monthly energy capability of the Columbia River Basin's regulated and independent hydro projects, based on their average monthly river discharge that reflects river constraints and storage limitations. The generation from these hydro projects is estimated for each OY, by water year, for 1929 through 1978 historical water conditions. Water-year conditions span periods similar to OYs, in that the 12-month water year for 1937-water conditions spans

[1] Operating Year (OY) is the 12-month period August 1 through July 31. For example, OY 2008 is August 1, 2007, through July 31, 2008.

August 1936 through July 1937. This study uses one of the lowest water years, 1937-water conditions, to represent a period of adverse water conditions during which the hydro system would produce low amounts of hydro generation and estimates the Federal system's firm hydro energy capability using such conditions. This is called the "critical period".

Instantaneous Hydro Capacity: The estimated monthly instantaneous capacity of Columbia River Basin regulated and independent hydro projects are based on individual project full-gate-flow maximum generation at mid-month reservoir elevation using 1929 through 1978 historical water conditions. The instantaneous hydro capacity estimates, however, do not consider the ability of the hydro system to sustain generation levels needed to meet day to day and month to month hydro operations. This inability to sustain full hydro capacity is due to the fact that there are more hydro generating units than hydro fuel (water) available to operate all units on a continuous basis. For this reason, the Federal hydro capacity estimates are reduced by an operational peaking adjustment to better reflect BPA's actual ability to generate the hydropower needed to meet expected peak load obligations throughout each month.

Calculation of the Operational Peaking Adjustment: The operational peaking adjustment incorporates derived monthly relationships between the Federal system hydro energy and the Federal system hydro maximum sustained peak for each water condition developed by BPA's Hourly Operating and Scheduling Simulator (HOSS). The HOSS model simulates hourly Federal system generating resource operations that are needed to meet Federal system obligations for each of the 50 historical water conditions. Below are two separate HOSS operational peaking adjustment methodologies included in the study:

- **1-Hour Operational Peaking Adjustment**: The 1-Hour operational peaking adjustment is a reduction to the Federal system instantaneous hydro capacity. The result of this reduction is a better estimate of the Federal hydro system monthly maximum operational capacity available to meet BPA's 1-hour expected peak load for each of the 1929 through 1978 historical water conditions.
- **120-Hour Operational Peaking Adjustment:** The 120-Hour operational peaking adjustment is a reduction to the Federal system instantaneous hydro capacity and is used to synchronize BPA's short- and long range planning. The result of this reduction reflects a better estimate of the Federal hydro system monthly maximum operational capacity that is available to meet the 120-hour expected peak load for each of the 1929 through 1978 historical water conditions. The 120-hour capacity represents the Federal system hydro generating capability when averaged monthly over the top 6 HLHs per day, 5 days per week, and 4 weeks per month (6*5*4=120 hours). This analysis was completed for each of the 50-water conditions. A more detailed discussion is in Section 7: Federal System 120-Hour Capacity Planning for the Future, page 57

Both operational peaking adjustments take into account hydro maintenance, spinning reserves, and forced outage reserves, which are netted out for reporting purposes. Due to the change in calculating the operational peaking adjustments implemented in the 2004 study, Federal and regional capacity surplus/deficit values are not comparable with studies prior to the 2004 White Book.

Hydro Projects' Multiple-Use Planning: Federal hydro projects in the PNW have many uses in addition to power generation. The projects provide flood control, supply irrigation for farming, assist in river navigation, provide for reservoir recreation, and

contribute to municipal water supplies. In addition, operational constraints are in place to protect and enhance resident and anadromous fish and wildlife populations. Non-power reservoir operating requirements may reduce or increase hydropower production. BPA's resource planning takes into account all currently known non-power operating requirements when assessing regional hydro system capability.

The Council, BPA, other Federal agencies, and other PNW entities will continue to evaluate ways to enhance conditions for fish and wildlife. Future proposals could include additional amendments to the Council's Columbia River Basin Fish and Wildlife Program, revision of the PNCA, renegotiation of Canadian Entitlement allocation agreements, and/or implementation of additional programs in support of the Endangered Species Act. The impacts of future proposals are unknown. These proposals, however, will most likely impact non-power requirements on the hydro system, potentially changing a combination of operating flexibility, the monthly shape and timing of streamflows, and/or the availability of operational Federal system capacity. Future studies will incorporate any known new impacts.

Hydro Improvements: BPA has budgeted $1.1 billion over the next 6 to 8 years for maintaining and improving the reliability of the Federal hydro system. These improvements, which were revised for this study, are expected to increase and preserve Federal hydro generation by:

- Replacing turbine runners to preserve and increase generation;
- Providing increased reliability by decreasing forced and planned outages; and
- Hydro system optimization and operational planning tools that maintain hydro generation efficiencies.

Using *critical* water conditions, it is estimated that by OY 2008, the combination of these hydro improvements will annually preserve and create up to 137 average megawatts (aMW), of which 131 aMW are potential additional Federal hydro generation and the remaining 6 aMW are associated with preserving the existing level of hydro generation capability from degradation. In OY 2017, it is estimated that these improvements will annually preserve and create up to 253 aMW, of which 207 aMW are potential additional generation and the remaining 46 aMW, preserving hydro generation from degradation.

Using *average* water conditions, it is estimated that by OY 2008, the combination of these hydro improvements will annually preserve and create up to 233 aMW, of which 180 aMW are potential additional generation and the remaining 53 aMW, preserving hydro generation from degradation. In OY 2017, it is estimated that these improvements will annually preserve and create up to 678 aMW, of which 276 aMW are potential additional generation and the remaining 402 aMW, preserving hydro generation from degradation.

The total amount and timing of annual aMW actually realized over the next 6 to 8 years will be dependent on the timely completion of the scheduled installations, the success of the optimization changes, and hydrologic conditions. These estimated increases in generation are associated with the current level of fishery operations. If future fishery operations further decrease the flexibility of the hydro system operations and/or increase the amount of spill, the annual megawatt contribution of the hydro improvements realized will most likely be lower. Hydro improvement estimates will be updated in future studies when more information is available.

Non-Hydro Resources: The expected output of regional non-hydro resources is based on the energy and capacity capability information submitted to BPA by the project owners. These projects include: nuclear, coal, gas-fired, oil-fired, and renewable resources such as wind, geothermal, solar, and biomass projects. Total plant output was reduced to account for scheduled maintenance, spinning reserves, and forced outage reserves. Independent Power Producer (IPP) projects that have been built or that are in the process of construction have been added to the regional resource stack. IPP projects are assumed dedicated to meet PNW regional loads unless otherwise specified. The discussion of the Federal resources is in Section 4, page 21. Regional resources are discussed in Section 5, page 39.

Analysis of Federal System Firm Loads and Resources

In the PNW, BPA is the Federal power-marketing agency charged with marketing power and transmission to serve the firm electric load needs of its customers. BPA does not own generating resources. BPA's contractual customer load obligations, combined with the Federal and non-Federal resources from which BPA acquires the power it sells, are collectively called the "Federal system" in this study. BPA owns and operates the primary transmission grid, which includes more than 14,800 circuit miles of transmission lines above 115 kilovolts (high voltage) and 600 circuit miles below 115 kilovolts in the PNW.

The Federal system load obligations are comprised of BPA's sales to PNW Federal agency, public agency and cooperative, USBR, IOU, and DSI customers as well as other firm contractual obligations to deliver power. BPA sells Federal power at wholesale and has no retail customers.

BPA is the designated marketer of the generation from hydro resources of the Federal system, which includes 31 dams owned and operated by the USBR and the U.S. Army Corps of Engineers (USACE). BPA also markets the generation from: hydro projects owned by Idaho Falls Power, through September 30, 2011, and Lewis County Public Utility District (PUD); thermal generation from the Columbia Generating Station nuclear plant operated by Energy Northwest, Inc. (ENW); and the output from several renewable power plants (primarily cogeneration and wind turbines) under power purchase contracts. The expected energy generation production from wind turbines is included in the analysis; however, since wind power production is intermittent and cannot be guaranteed to be available to meet peak hour loads, no capacity contribution from wind generation is assumed. The Federal system analysis is shown in Section 4, beginning on page 17.

BPA Power Sales Contract Obligations

BPA signed either 5- or 10-year PSCs with its PNW customers that began October 1, 2001. The following is a description of some of the contractual uncertainties associated with specific customer classes:

- Federal agency, public agency, cooperative, and USBR customers signed either 5- or 10-year PSCs. Some of the public agencies, and cooperatives signed up for the 10-year Slice of the System Product (see "The Slice Product", page 8). BPA's PSC and Slice PSC obligations end September 30, 2011; however, this study assumes that BPA will meet these or similar regional load contract obligations through OY 2017. In actual operation, BPA's contract obligations to serve these customers may be higher or lower than those shown in this analysis;

- The IOU's signed the 10-year Residential Purchase and Sales Agreement (RPSA) settling BPA's obligations under the Northwest Power Act to the IOUs. For the study horizon, this analysis assumes that any BPA's IOU RPSA contracts will provide only financial benefits and no power is delivered. In May 2007, the Ninth Circuit Court held the RPSA settlement agreements inconsistent with Sections 5 and 7 of the Northwest Power Act in Portland General Electric v. BPA. BPA's reviewing approaches to address this inconsistency with regional parties. At this time, the ruling does not change any of BPA's forecasts for Federal system surplus/deficits since BPA did not assume IOU power deliveries through the study horizon. When decisions are made concerning this ruling, they will be reflected in future studies; and
- BPA's DSI customer PSC obligations for October 1, 2006, through September 30, 2011, follow the policies adopted in the Service to the DSI Record of Decision (ROD), dated June 30, 2005, and BPA's Supplemental DSI ROD, dated May 31, 2006. For BPA's DSI aluminum smelter customers, BPA elected to monetize the value of physical surplus power sales based on the customers' operating levels through September 30, 2011. For BPA's only non-aluminum DSI customer, Port Townsend Paper Corporation (PTPC), this study models PTCP's benefit as a BPA surplus power sale delivery of 17 aMW to Clallam County PUD for PTCP service through September 30, 2011. This delivery is shown as an Intra-regional transfer from BPA to Clallam County PUD and is not included as a DSI PSC load obligation. The contracts for service to the aluminum smelter DSIs and PTPC expire September 30, 2011. Post-September 30, 2011, this study assumes no BPA power deliveries to DSIs.

Although these PSC obligations expire September 30, 2011, it is assumed that they will be replaced with similar contract obligations through OY 2017. Decisions and agreements for BPA's post-2011 PSC service and products may be reached through the Regional Dialogue process between BPA, its customers, and other regional stakeholders. Any decisions adopted from the Regional Dialogue discussions will be incorporated in future studies.

The Slice Product

The Slice Product (Slice) is a public preference PSC product that provides both firm requirements power for firm and non-firm energy to a customer based on their net requirements load for the 10-year period October 1, 2001, through September 30, 2011. It differs from traditional PSC products in that it is comprised of the following components: 1) firm power deliveries based on the level and shape of the Slice System Resources stack; and 2) non-firm power deliveries on a monthly or seasonal basis based on actual generation of the Slice System Resources stack.

Slice Power Deliveries*:* Customers signed 10-year Slice contracts for power deliveries based on 22.63 percent of the Slice System Resources stack. The Slice System Resources stack is comprised of a set of specific Federal resources, net of a specific set of Federal obligations. This particular set of resources and obligations is used only for the Slice product and is not the same as the Federal system resource stack. The specific set of Federal resources that comprise the Slice System

Resources stack includes: the generation from Federal hydro projects that includes the Idaho Falls Power Bulb Turbines through September 30, 2011, Columbia Generating Station, Georgia Pacific Corporation's Wauna Mill, Federal Non-Utility Generation, and power deliveries from the Non-Federal Canadian Entitlement Return (CER) for Canada contracts. The specific set of Federal contract obligations, which are subtracted from the Slice System Resources stack for this purpose, includes but is not limited to deliveries for the CER to Canada (shown as an Export) and Federal pumping loads. The amount of Slice product available for delivery is dependent on the Federal system operating decisions, hydro production that varies by water conditions, and generation from non-hydro Federal resources.

Block Slice Contracts Deliveries*:* All Slice customers signed 10-year contracts for the Block Slice contract purchases having a 100 percent load factor for each month. Under the Slice Block contract, customers had the option for either a 5- or 10-year purchase option. Most Slice customers chose the 10-year Slice Block purchase option. This option allowed customers to increase their Block for the period October 1, 2006, through September 30, 2011, to cover load growth during the first 5-years of their Slice contract. The remaining Slice customers chose to purchase the same amount of Block for the latter 5-year period, October 1, 2006, through September 30, 2011, at BPA's current applicable rate.

Analysis of Regional Firm Loads and Resources

The PNW regional analysis includes the Federal system loads and resources, plus non-Federal regional loads, contractual obligations, and generating resources in the PNW region. The region has several groups that represent load sectors: Federal agencies, public agencies, cooperatives, USBR, IOUs, and DSIs. The regional hydro resources are owned and operated by various Federal entities, public agencies, cooperatives, and IOUs. The regional thermal generating resources, fueled by biomass, coal, natural gas, oil, or nuclear power, are owned and operated by various regional entities. The regional analysis is presented in Section 5, beginning on page 35.

Canadian Treaty Downstream Benefits

The Columbia River Treaty between the United States and Canada enhanced the use of storage in the Columbia River Basin with the construction of three large storage projects in Canada (Mica, Duncan, and Keenleyside). These Canadian Treaty projects provide downstream power benefits by increasing the firm power generating capability of U.S. hydro projects. Under the terms of the Treaty, the downstream power benefits are shared equally between the two countries. The Determination of Downstream Power Benefits analysis is performed annually and establishes the amount of benefits for each succeeding sixth year. The non-Federal mid-Columbia projects are Wells, Rocky Reach, Rock Island, Wanapum, and Priest Rapids. BPA and each of the non-Federal mid-Columbia participants are obligated to return their share of the downstream power benefits owed to Canada. This is called the Canadian Entitlement Return to Canada. The non-Federal Canadian Entitlement obligations are delivered to BPA, who, in turn, delivers both BPA's and the non-federal participants' obligations to Canada. The non-Federal entities' Canadian Entitlement obligation is included in each participating utility's loads and resources balance as a delivery to

BPA. BPA's delivery of the Canadian Entitlement Return obligation to Canada is presented in Table 1, below, and is considered a Federal export.

Table 1

Federal System Export of Canadian Entitlement to Canada
Energy and Capacity Obligations[1]
Energy in Average Megawatts

Operating Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Federal System	483	465	567	527	517	505	495	483	471	457

January Capacity in Megawatts

Operating Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Federal System	1,241	1,245	1,352	1,350	1,350	1,350	1,350	1,350	1,350	1,350

Table 2, below, depicts the Non-Federal entities share of Canadian Entitlement Return obligations for the mid-Columbia hydro projects that are delivered to BPA.

Table 2

Non-Federal Canadian Entitlement Return Obligations Delivered to BPA
Energy and Capacity Obligations[1]
Energy in Average Megawatts

Operating Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Public Agencies	56	57	65	68	69	68	68	67	66	65
Investor-Owned Utilities	65	65	63	61	60	59	58	57	57	56
Other Entities	10	10	10	11	10	10	10	10	10	10
Total Energy Obligation	**131**	**132**	**138**	**140**	**139**	**137**	**136**	**134**	**133**	**131**

January Capacity in Megawatts

Operating Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Public Agencies	98	96	116	119	119	117	115	115	114	111
Investor-Owned Utilities	113	112	102	106	105	103	101	100	99	97
Other Entities	17	17	18	19	18	18	18	18	18	17
Total Capacity Obligation	**228**	**225**	**236**	**244**	**242**	**238**	**234**	**233**	**231**	**225**

[1] Values are estimated for OY 2012 through 2017

Major Sources of Uncertainty

This study reflects several potential major changes in regional resources and power sales products that could affect regional and Federal loads and resources.

Loads and Resources Uncertainty: Future Federal system and regional firm surpluses/deficits are subject to a number of uncertainties over the 10-year study period. Some of these uncertainties include:

- Changes in loads or available resources resulting from deregulation of retail sales in the electric power industry;
- Federal system and regional water availability that affects hydro generation available to meet load obligations. See "Potential Variability of Federal System Resources", page 24, and "Potential Variability of Regional Resources", page 41;
- Volatility in short- and long-term electricity market prices;
- Deviation from forecasted loads due to changes in the economy;
- Failure of existing or contracted generating resources to operate at anticipated times and output levels;
- The availability of new and existing regional resources that can be purchased to serve firm loads in the PNW region;
- Implementation of decisions and agreements that may be reached through the Regional Dialogue process for BPA's future electrical service products post-2011;
- Additional changes to existing hydro system operation in response to programs developed to address the Endangered Species Act or other environmental considerations; and
- The success of BPA's future purchasing and marketing efforts that include: contract purchases, contract sales, demand-side management programs, conservation measures, and the purchase of the output of new or existing resources.

These uncertainties could affect both the size of projected surpluses or deficits and the times at which they occur.

Council's Regional Resource Adequacy Standard

The Council adopted a resource adequacy standard for the regional power supply based on recommendations from the Resource Adequacy Forum which included BPA and other PNW entities. The resource adequacy standard includes both a regional energy metric and a pilot capacity resource adequacy metric. At this time, these regional standards do not imply mandatory compliance or methods for enforcement. Rather, the Council's resource adequacy standard is meant to be a gauge used to assess whether the region's power supply capability is adequate to "keep the lights on".

The White Book study projects regional total retail loads, contracts, and resources to produce a regional load resource balance. The White Book analysis focuses on normal weather loads and critical water hydro conditions. This is a deterministic accounting approach for measuring the regional inventory for long-term planning. At this time, the Council's Regional Resource Adequacy metrics are not addressed in BPA's White Book analysis.

In contrast, the Council's Resource Adequacy Assessment (Council RA) uses a probabilistic analysis to determine the regional Loss of Load Probability (LOLP). The Council's RA LOLP process is complex, simulating hourly system operations by varying: variables such as hydro generation, temperature effects on total retail loads, and forced outages of regional resources. Since most PNW utilities do not have a LOLP model, the Council translates the LOLP results to a deterministic critical water load resource balance by incorporating a derived "LOLP planning adjustment." This helps facilitate a comparison approach with other deterministic regional planning entities such as BPA's White Book.

Council's Regional Resource Adequacy Standards: The Council's energy and capacity metrics are derived from a LOLP analysis that incorporates multiple: water conditions; total retail loads; hydro operating principles; resource availability—including forced outages; and generation dispatch. Hydro operations assume the ability to borrow water from future weeks or months to maximize generation over 50-hours for one week. The LOLP results are translated to a deterministic load resource balance.

The regional *energy* adequacy standard load resource balance incorporates critical hydro generation and a portion of uncommitted regional IPP resources. Thermal resource generation is based on project generation capability, rather than the project's actual operation. The energy adequacy standard includes a 1,500 aMW energy "planning adjustment" which was derived from the LOLP analysis. The planning adjustment is assumed to be comprised of out-of-region market purchases and hydro flexibility.

The initial pilot regional *capacity* adequacy standard includes a planning reserve margin for an extended period of hours for each month. The interim capacity planning reserve margin is 25% for winter and 19% for summer. These reserve margins are derived from the LOLP analysis. The Council's RA capacity standard has been reassessed and will be incorporated in future Council studies.

Both BPA and the Council's RA project regional load resource balances, although direct comparisons are difficult due to differences in base assumptions. For 2010, the projected regional annual energy surplus in the White Book is 2,300 aMW compared to the Council's RA estimate of 4,400 aMW—about 2,100 aMW more.

The difference is mainly due to the White Book's approximate 1,900 aMW higher total retail load (TRL) forecast. This difference can be enumerated as follows: 1) 750 aMW higher due to BPA's 1.5 percent load growth estimate compared to Council's 0.6 percent; 2) 500 aMW higher due to larger DSI and export estimates; and 3) 650 aMW higher due to forecasting methodology differences.

The White Book total resources are lower by about 200 aMW. These differences are composed of: 1) 370 aMW more hydro generation and imports due to the inclusion of hydro improvement upgrades and updated import estimates; 2) 570 aMW less thermal generation because the Council assumes that all resources are run to maximize energy regardless of plant efficiency; 3) 1,500 aMW more generation because uncommitted IPPs in the White Book are assumed 100 percent regionally available, where as the Council assumes only a portion of the IPP generation is available for PNW service; and 4) 1,500 aMW less generation because the Council's RA includes a Planning Reserve Margin that is comprised of unspecified hydro resource flexibility and out-of-region contract purchases. As the Council and BPA update load and contract data, these differences are expected to decrease.

Section 3: Changes in the 2007 Pacific Northwest Loads and Resources Study

This section describes the major data updates and changes in the assumptions for the 2007 White Book analysis compared to the 2006 White Book. Specific resource and contract changes are detailed in the 2007 Pacific Northwest Loads and Resources Study Technical Appendix. The 2007 Technical Appendix will be available on BPA's external website at http://www.bpa.gov/power/whitebook2007. The 2007 Technical Appendix presents auxiliary tables (A-tables) that contain aggregate information summarized by customer type.

Federal Firm Sales and Obligations

The 2007 White Book analysis reflects the following Federal system contract and obligation changes compared to the 2006 study:

- BPA PSC updates:
    - Federal agency, public agency, cooperative, and USBR PSC obligations were updated using linear trend methods based on historical power consumption under their PSCs. Though all of these PSC contract obligations actually expire September 30, 2011, this study assumes that BPA will meet these net requirement obligations with similar agreements through OY 2017;
    - Federal public agency and cooperative Slice customer obligations were revised for this study using methods described in "The Slice Product", page 8. Though these Slice obligations actually expire September 30, 2011, this study assumes that BPA will meet similar Slice obligations with agreements through OY 2017;
    - For the period October 1, 2006, through September 30, 2011, this study assumed that BPA's IOU RPSA settlement contracts or their replacement contracts provide only financial benefits and no power is delivered. This assumption continues throughout the study horizon; and
    - BPA's DSI obligations incorporate the policies adopted in BPA's Supplemental DSI ROD, dated May 31, 2006, and reflect monetary benefits only and no power is delivered. These benefits are dependent on their operating levels through September 30, 2011.
- Updated Federal system contract sales.

Federal Resource Stack

The 2007 White Book analysis reflects the following Federal system resource stack changes compared to the 2006 study:

- Resource Updates:
    - Regulated hydro: The hydro regulation study was updated to incorporate BPA's most recent estimate of power, non-power requirements, and hydro improvements expected to be in effect during the study period;

- Independent hydro: Generation forecasts for the Willamette projects operated by the USACE were updated; Acquisition contracts for the output from the Elwha (8.6 aMW) and Glines Canyon (15.0 aMW) hydro projects continues through September 30, 2009. The actual removal date of these projects is provided by the U.S. National Park Service; BPA acquired the output from the Idaho Falls Power Bulb Turbine projects (18.5 aMW) from October 1, 2006, through September 30, 2011. The study assumes that ownership returns to Idaho Falls Power beginning October 1, 2011, and remains a regional resource; and

- Updated Federal system contract purchases.

Future studies will reflect new information as it becomes available.

PNW Total Retail Load

The 2007 White Book utilizes updated customer-by-customer regional retail load forecasts. The forecasts are based on a combination of their historical electrical load consumption, submittals provided for the 2001 PSCs, and/or their 2006-07 PNUCC data submittals. If available, the information and growth trends were verified with Federal Energy Regulatory Commission (FERC) filings. Below highlights the methods used to arrive at the load forecasts. The forecasts reflect applicable load reduction agreements and were aggregated together for each of the following customer classes.

- Total Retail Load Updates:
  - Federal agency, public agency, cooperative, and USBR retail load forecasts were developed by BPA using linear trend methods that incorporate historical retail load data and their 2001 PSCs' Exhibit C submittals. Some public agency customer loads were developed from their 2006-07 PNUCC data submittals;
  - IOU retail load forecasts were developed by BPA using data provided in their 2006-07 PNUCC data submittals; and
  - DSI retail load estimates were updated by BPA and are based on their current levels of operation and future economic conditions.
- Updated PNW regional export contracts.

PNW Regional Resource Stack

In addition to the Federal system resource stack updates presented on page 13, the 2007 White Book analysis reflects the following regional resource changes compared to the 2006 study:

- Regional resources additions:
  - Independent Hydro: Ashton (4.5 aMW), East Side (2.0 aMW), Grace (23.3 aMW), Last Chance (0.9 aMW), Oneida (6.3 aMW), Paris (0.3 aMW), Soda Point Project (3.0 aMW), and West Side (0.4 aMW);
  - Small Thermal & Miscellaneous Resources: Corette Peaking Unit;
  - Combustion Turbines: Danskin 2 (3.0 aMW), Longview Fibre CT (35.9 aMW), Mint Farm Energy Center (287.8 aMW), and Satsop (584.8 aMW);

- Wind Projects: Biglow Canyon (36.9 aMW), Hopkins Ridge (31.2 aMW), Horseshoe Bend wind (2.5 aMW), Klondike III (44.0 aMW), Leaning Juniper (25.2 aMW), Marengo Wind Project (32.0 aMW), and Telocaset (22.9 aMW);
- Cogeneration: Georgia Pacific Toledo (16.0 aMW), Sierra Pacific Aberdeen (14.2 aMW), SP Newsprint Cogeneration (104 aMW), Weyerhaeuser Albany (45.0 aMW), and Weyerhaeuser Longview (35.4 aMW);
- NUG Hydro: Little Mac (1.1 aMW), Mora Canal Drop (1.9 aMW), Orchard Avenue (0.4 aMW), and Sahko (0.5 aMW);
- NUG Cogeneration: Evergreen Biopower Cogeneration (8.0 aMW); and
- NUG Renewable Resources: Big Horn (50.2 aMW), Chinook Wind (0.1 aMW), Dry Creek Landfill (3.0 aMW), Hidden Hollow Landfill (3.2 aMW), Raft River Geothermal Project (10.8 aMW), VanderHaak Dairy (0.2 aMW), and Wolverine Creek (16.2 aMW).

- Regional resource removal:
  - Combustion Turbine: The closures of Randolph Road Diesel Farm peaking units beginning February 1, 2007; and Weyehaeuser Pulp Mill (Cosmopolis) beginning October 1, 2006;
- Updated PNW regional import contracts; and
- Several generating projects were reclassified within the study--these changes had no effect on the regional generation totals
  - Grays Harbor Paper (5.0 aMW) from NUG Small Thermal and Miscellaneous to Cogeneration;
  - Hopkins Ridge (34.1 aMW), Wild Horse Wind Power Project (56.9 aMW) from NUG Renewables to Renewables;
  - Fossil Gulch Wind Project (2.6 aMW) from Renewables to NUG Renewables;

Future studies will reflect new information as it becomes available.

Federal System 120-Hour Capacity Planning for the Future

BPA is presently exploring alternative methods to better portray capacity availability, duration, and adequacy to meet loads for the White Book and other planning processes. Section 7, page 57, presents BPA's estimated 120-Hour peak capacity availability for long-range planning in the White Book.

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Section 4: Federal System Analysis

Federal System Assumptions

The Federal system loads and resources analysis is based on Federal resources, Federal contracts, and Federal power sales contract obligations as of March 31, 2007. The assumptions used for the Federal system analysis are as follows:

- Forecasted Federal load obligations reflect normal weather conditions;
- Regulated hydro generation estimates incorporate PNCA plant characteristics, streamflows, BPA's best estimate of non-power requirements, and hydro improvements. The estimated output for independent hydro and other generating projects are provided to BPA by the project owners;
- BPA's Federal agency, public agency, cooperative, and USBR PSC obligations, that expire September 30, 2011, continue to be met by BPA with similar contract obligations through OY 2017;
- BPA's public agency and cooperative Slice obligations, that expire September 30, 2011, continue to be met by BPA with similar Slice contract obligations through OY 2017;
- For the period October 1, 2007, through September 30, 2011, BPA's IOU RPSA settlement contracts or their replacement contracts reflect only financial benefits and no power is delivered. This assumption continues through OY 2017;
- BPA's DSI PSC obligations incorporate the policies adopted in BPA's Supplemental DSI ROD, dated May 31, 2006. Aluminum smelter customers' benefits were monetized through September 30, 2011, resulting in no power deliveries. Non-aluminum customer benefit was modeled as a BPA surplus power sale delivery of 17 aMW to Clallam County PUD for PTPC service through September 30, 2011. This delivery is shown as an Intra-regional transfer from BPA to Clallam County PUD and is not included as a DSI PSC load obligation. Post-September 30, 2011, this study assumes no BPA PSC deliveries to DSI customers:
- All existing Federal contractual arrangements not included under BPA's regional net requirements power sales contracts expire by the terms of their agreements and are not renewed;
- Federal power sales and capacity/energy exchange agreements with the cities of Burbank, Glendale, and Pasadena are shown as capacity/energy exchanges until they expire on April 15, 2008;
- Federal surplus capacity sale contract with PacifiCorp expires August 31, 2011;
- Firm hydro energy and capacity estimates are based on 1937-critical water conditions, unless otherwise specified;
- Federal hydro capacity is reduced, by an operational peaking adjustment, to better estimate the monthly maximum operational capability that is available to meet the 1-hour expected peak load, for each of the 1929 through 1978 historical water conditions; and
- Transmission losses are treated as a resource reduction.

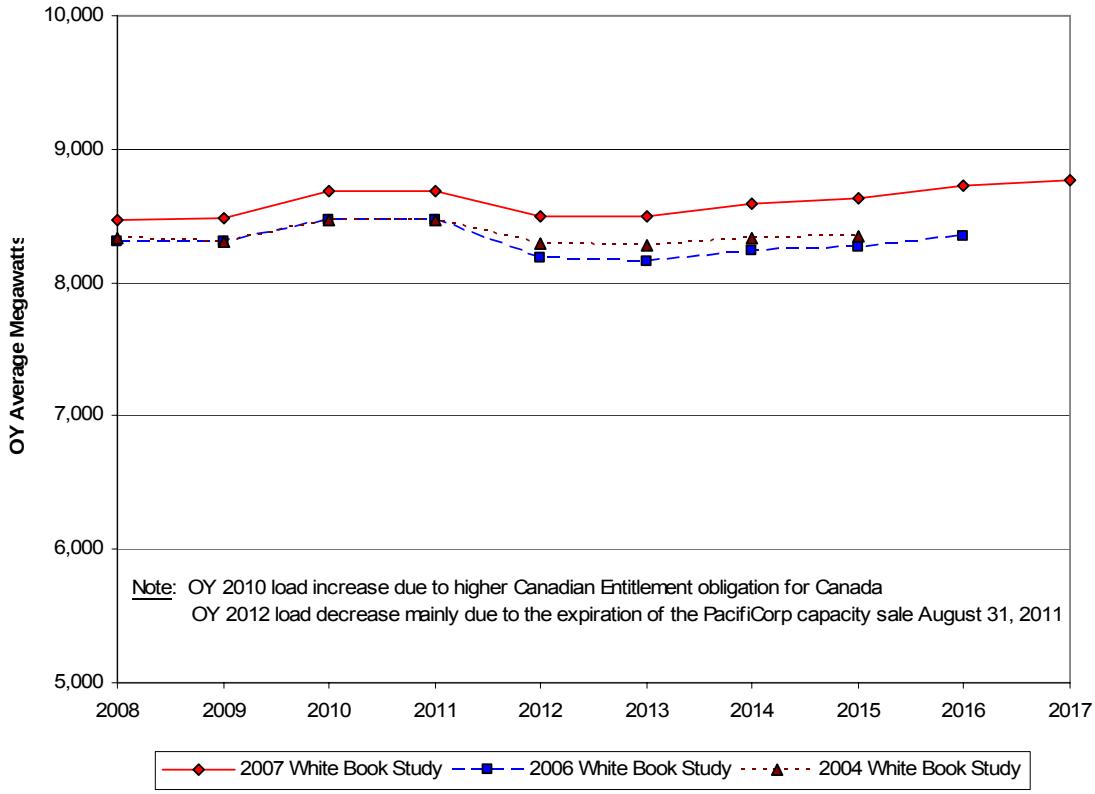
Annual Federal Firm Energy Load Obligations

In this study, the annual Federal system firm energy load obligations incorporate the preceding "Federal System Assumptions" and include BPA's forecasted 2001 PSC obligations for PNW Federal agencies, public agencies, cooperatives, USBR, IOUs, and DSIs, including "The Slice Product" discussed on page 8. The forecast assumes that PNW Federal agencies, public agencies, cooperatives, and the USBR purchase power from BPA under their PSCs to meet net regional firm energy loads not served by their own resources. The Federal obligations also include contracted Federal deliveries within the PNW region and export contracts delivered outside the PNW. The methods and assumptions used to complete this year's Federal power sales contract obligations are based on the forecasts of individual entity's total retail load discussed in "Total Retail Load Forecast", page 3.

Figure 1, below, illustrates the differences between the forecasted 2007 White Book annual Federal system energy load obligations for OY 2008 through 2017 and the previous 2006 and 2004 studies. The expected higher Federal load obligations for OY 2008 through 2017 reflect a long-term increase of up to 350 aMW in BPA's public PSC obligations. The annual Federal firm energy load obligations for OY 2008 through 2017 are presented in Exhibit 1, page 67.

Figure 1

Annual Federal Firm Energy Load Obligations
For OY 2008 through 2017 [1]



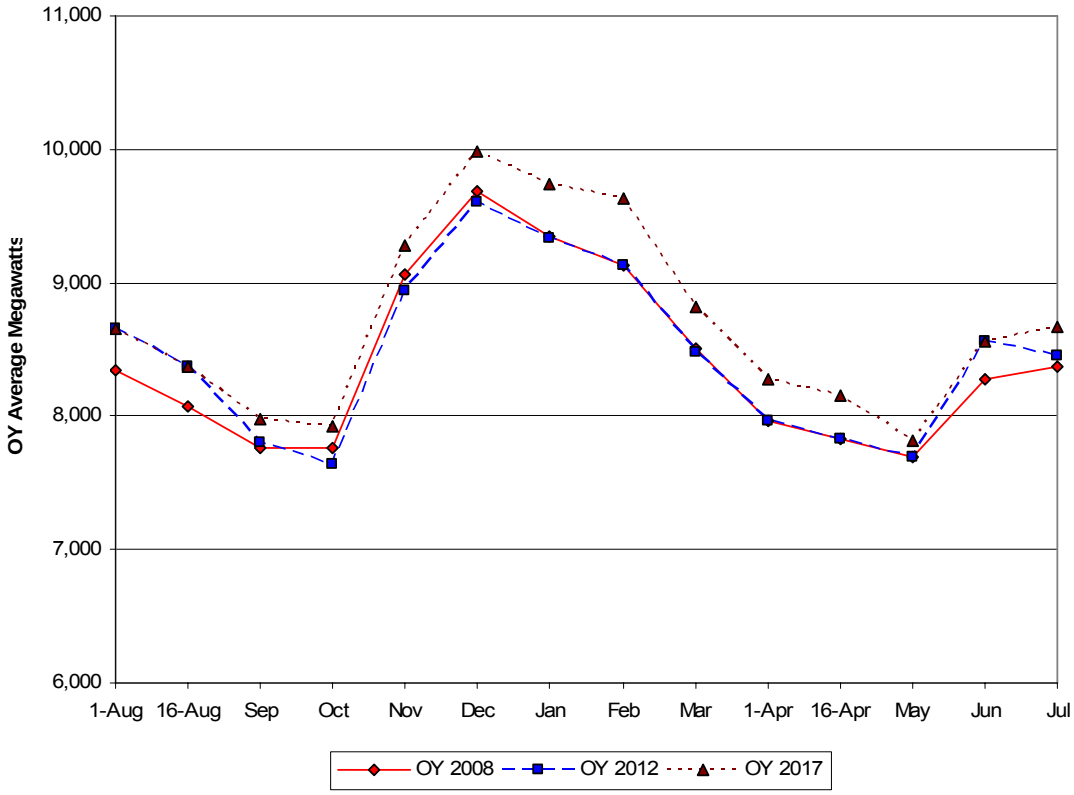
[1] 2006 White Book projections were published through OY 2016. 2004 White Book projections were published through OY 2015.

Monthly Federal Firm Energy Load Obligations

Figure 2, below, illustrates the monthly Federal firm energy load obligations for OY 2008, 2012, and 2017 and incorporates the same load components detailed in the sections on "Federal System Assumptions" and the "Annual Federal Firm Energy Load Obligations" presented on page 17.

Figure 2

Monthly Federal Firm Energy Load Obligations
For OY 2008, 2012, and 2017



The monthly Federal firm energy load obligations for OY 2008, 2012, and 2017, assuming 1937-critical water conditions, are shown in Exhibits 2 through 4, pages 71-73.

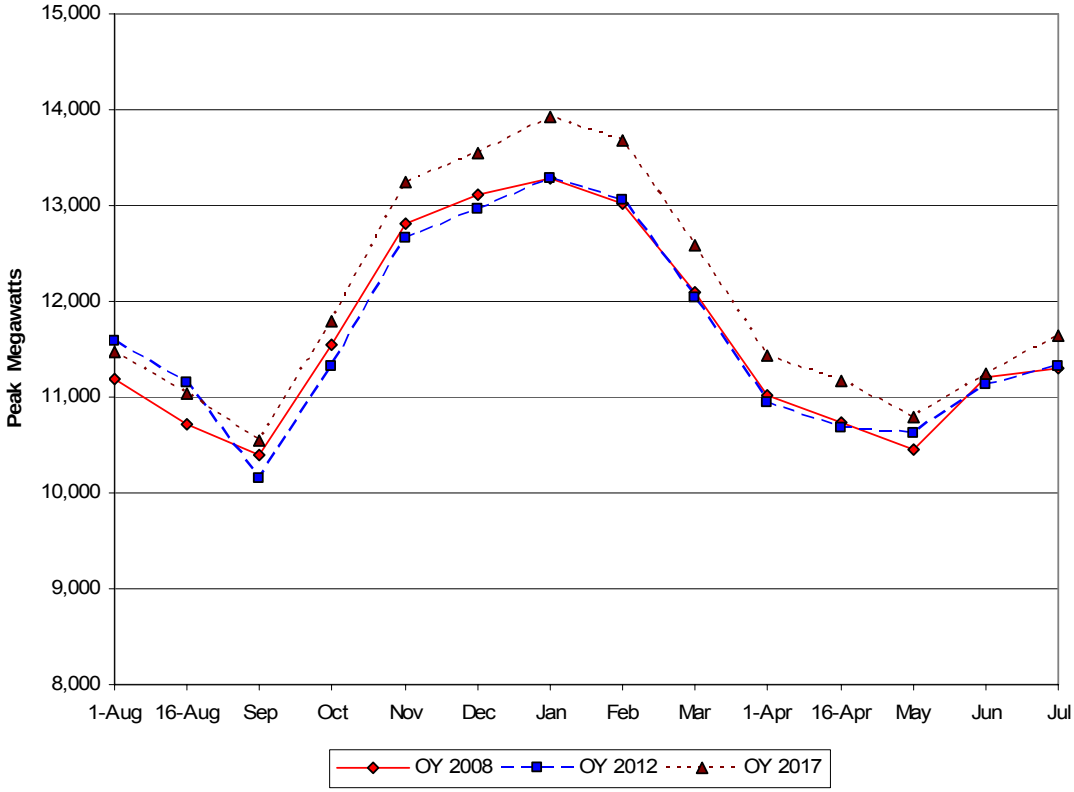
Monthly Federal Firm 1-Hour Peak Load Obligations

Figure 3, page 20, illustrates the monthly Federal firm 1-hour peak load obligations for OY 2008, 2012, and 2017. The figure shows the expected 1-hour monthly maximum demand using BPA's 2007 White Book Study load obligations. The forecast assumes that PNW Federal agencies, public agencies, cooperatives, and the USBR purchase capacity from BPA under their PSCs to meet regional peak loads not served by their own resources with the exception of the Slice product customers. Federal peak load obligations include BPA's exports and intra-regional

contract sales. The peak load obligations assume normal weather conditions and a 50-percent probability that the actual peak load obligations could be exceeded. The peak load projections are reduced by a 1-hour diversity component to address the fact that all electrical peak demands do not occur simultaneously throughout the region.

Figure 3

Monthly Federal Firm 1-Hour Peak Load Obligations
For OY 2008, 2012, and 2017



The monthly Federal firm peak loads are presented in Exhibits 5 through 7, pages 77-79.

Federal Firm Resources

Table 3, below, summarizes the Federal system firm energy resources and contract purchases available to BPA to meet Federal load obligations for OY 2008. Federal system energy resources are comprised of approximately 81 percent hydropower, 12 percent from one nuclear power plant, and over 7 percent from BPA's contracts and small thermal and renewable resources.

Table 3

Federal Firm Total Resources for OY 2008[1]
Based on 1937-Critical Water Conditions

Project Type	1-Hour Operational Peaking Capacity (January Peak MW)	Percent of Operational Peaking Capacity	Firm Energy (OY in aMW)	Percent of Firm Energy
Hydro	12,475	89.5%	6,949	80.7%
Nuclear	1,150	8.3%	1,030	12.0%
Contracts/Small Thermal Resources	309	2.2%	628	7.3%
Total Federal Firm Resources	**13,934**	**100.0%**	**8,607**	**100.0%**

The Federal system hydro resources from which BPA markets power are detailed in Table 4, page 22. BPA also markets power purchased from non-Federally owned resources. In addition, BPA's capacity/energy exchange contracts provide marketable energy to BPA as payment for the capacity BPA delivers. Table 5, page 23, shows the non-Federally owned resources, return energy associated with BPA's existing capacity/energy exchanges, contractual resources, and other BPA hydro-related contracts. Some hydro projects, presented in Table 4 and Table 5, have winter operating characteristics that may create lower expected January capacity than the annual firm energy generation.

Combined, these resources represent BPA's available firm resources. A detailed listing of Federal generating resources is in BPA's *"2007 Pacific Northwest Loads and Resources Study Technical Appendix"* and is available on BPA's external website at http://www.bpa.gov/power/whitebook2007.

[1] Federal firm resource estimates are before adjustments for reserves, maintenance, and transmission losses.

Table 4

Federal System Hydro Projects
Capacity and Energy Based on OY 2008

Project	Initial Year of Service	Number of Units	Nameplate Rating (MW)	OY 2008	
				Instantaneous Generating Capacity[1] (Peak MW)	Firm Energy[2] (aMW)
U.S. Bureau of Reclamation Hydro Projects					
Grand Coulee	1941	27	6,465	6,026	1,946
Grand Coulee Pump Gen.	1973	6	314	300	0
Hungry Horse	1952	4	428	361	83
Palisades	1957	4	176	122	66
Anderson Ranch	1950	2	27	36	16
Green Springs	1960	1	17	19	6
Minidoka	1909	4	28	26	16
Roza	1958	1	11	4	8
Black Canyon	1925	2	10	9	8
Chandler	1956	2	12	10	9
Total USBR Projects		**53**	**7,488**	**6,913**	**2,158**
U.S. Army Corps of Engineers Hydro Projects					
Chief Joseph	1955	27	2,458	2,535	1,084
John Day	1968	16	2,160	2484	819
The Dalles[3]	1957	24	1,808	2074	619
Bonneville	1938	20	1,093	1047	384
McNary	1953	14	980	1127	495
Lower Granite	1975	6	810	930	165
Lower Monumental	1969	6	810	922	153
Little Goose	1970	6	810	928	180
Ice Harbor	1961	6	603	693	169
Libby	1975	5	525	579	173
Dworshak	1974	3	400	445	146
Lookout Point	1954	3	120	17	35
Detroit	1953	2	100	100	41
Green Peter	1967	2	80	20	27
Lost Creek	1975	2	49	18	30
Albeni Falls	1955	3	43	22	25
Hills Creek	1962	2	30	5	18
Cougar	1964	2	25	4	16
Foster	1968	2	20	4	12
Big Cliff	1954	1	18	5	11
Dexter	1955	1	15	3	10
Total Corp of Engineer Projects		**153**	**12,957**	**13,962**	**4,612**
Total USBR and USACE Projects		**206**	**20,445**	**20,875**	**6,770**

[1] This is the maximum hydro generation using optimum conditions for January 2008 assuming 1937-critical water conditions and does not reflect operational peaking reductions.
[2] Firm energy is a 12-month annual average for OY 2008 assuming 1937-water conditions.
[3] Though not purchased by Bonneville, The Dalles Fishway has two units that produce approximately 5 MWs of both peak and energy which are not included in this table.

Table 5

Non-Federally Owned BPA Resources and Contracts
Capacity and Energy Based on OY 2008

Project	Type	Operator	Date in Service	OY 2008	
				Capacity[1] (Peak MW)	Firm Energy (aMW)
Existing Non-Federally Owned BPA Resources					
Columbia Generating Station	Nuclear	ENW	1984	1,150	1030
Cowlitz Falls	Hydro	Lewis County PUD	1994	13	26
Idaho Falls Bulb Turbines	Hydro	Idaho Falls Power	1982	18	19
Dworshak/Clearwater Small Hydro	Hydro	State of Idaho DWR	2000	3	3
Glines Canyon[2]	Hydro	US Parks Service	1927	16	15
Elwha Hydro[2]	Hydro	US Parks Service	1910	13	9
Boise River Diversion	Hydro	USBR	1912	0	1
Georgia Pacific Paper Wauna	Cogen.	Georgia Pacific	1996	32	23
Foote Creek 1[3]	Wind	Foote Creek 1, LLC	1999	0	6
Foote Creek 2[3]	Wind	Foote Creek 2, LLC	1999	0	1
Foote Creek 4[3]	Wind	Foote Creek 4, LLC	2000	0	6
Stateline Wind Project[3]	Wind	PPM, FLP	2001	0	22
Condon Wind Project[3]	Wind	Condon Wind Project, LLC	2002	0	10
Klondike Phase 1[3]	Wind	NW Wind Power	2001	0	7
Fourmile Hill Geothermal	Geo.	Calpine	2009[4]	0	0
Ashland Solar Project	Solar	Ashland, Oregon	2000	0	0.003
Total Non-Federally Owned BPA Resources				**1,245**	**1,178**
Firm Contracts					
Canadian Entitlement for Canada (non-Federal)				228	131
Canadian Imports				1	1
Pacific Southwest Imports				0	44
Inland Southwest Imports				45	60
Eastern Imports				189	94
Intra-Regional Transfers In (Pacific Northwest Purchases)				10	329
Total BPA Firm Contracted Resources				473	659
Total Non-Federally Owned BPA Resource Contracts				**1,718**	**1,837**

[1] This is the maximum generation using optimum conditions for January 2008. Hydro projects assume 1937-critical water conditions.

[2] Elwha and Glines Canyon generation acquisition contracts are scheduled to expire September 30, 2009, with the eventual removal of the projects.

[3] Since wind projects cannot predictably meet peak loads, BPA does not recognize a peaking capacity credit for wind.

[4] Fourmile Hill is assumed to be operational October 1, 2009. It is anticipated to have a January peak of 50 MW and annual energy of 50 aMW. There is potential for termination of the contract with Calpine for this resource purchase due to project delays making the completion date uncertain. Future studies will reflect new information on this project as it becomes available.

Potential Variability of Federal System Resources

To illustrate the potential variability of Federal system resources, this study compares different scenarios using varying levels of Federal system generation based on differing water conditions. Table 6, below, compares the estimated annual Federal system resources under four scenarios using: 1) 1937-critical water conditions (the base case of this study); and the averages of 2) the bottom ten percent; 3) the middle 80 percent; and 4) the top ten percent of the historical 50-water year conditions (1929 through 1978).

Table 6

Potential Variability of Total Federal Net Resource Projections[1]
Utilizing Different Levels of Water Conditions
Energy in Average Megawatts

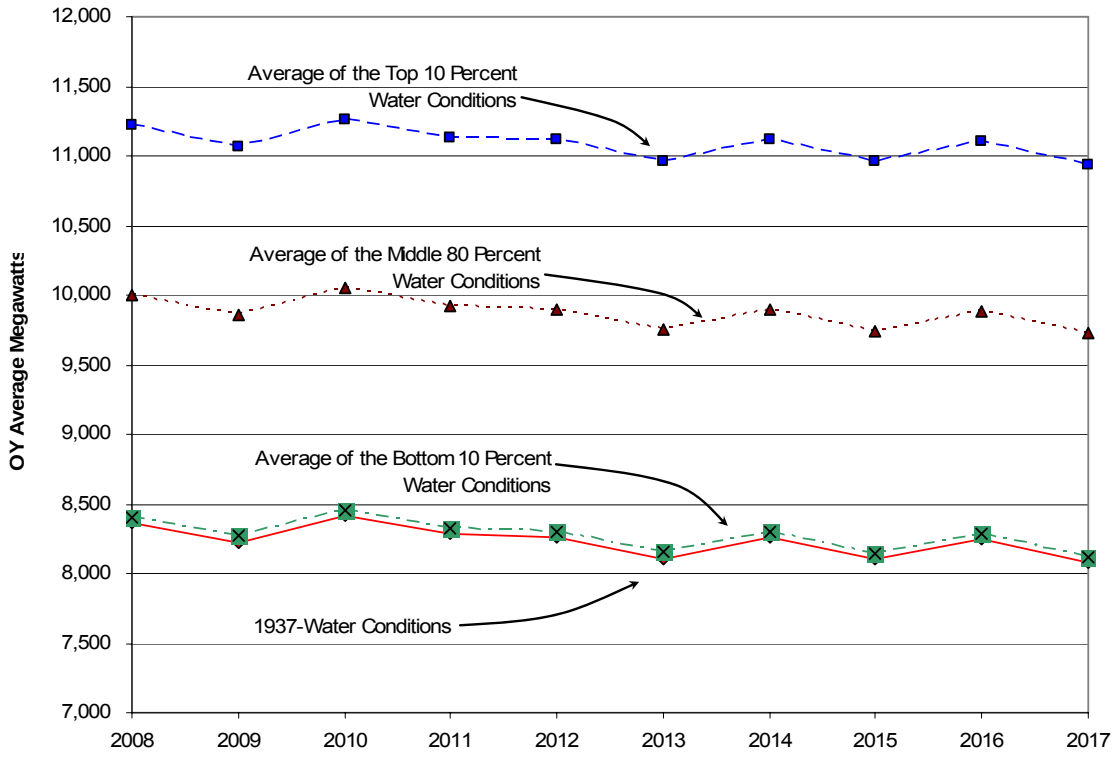
Operating Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
1937-Critical Water Conditions	8,364	8,227	8,416	8,283	8,263	8,110	8,259	8,104	8,246	8,081
Average Bottom 10% Water Conditions	8,406	8,268	8,459	8,325	8,305	8,152	8,301	8,145	8,288	8,123
Average Middle 80% Water Conditions	10,002	9,854	10,046	9,917	9,900	9,750	9,900	9,744	9,887	9,722
Average Top 10% Water Conditions	11,215	11,060	11,256	11,129	11,115	10,967	11,117	10,962	11,104	10,940

[1] Total Federal net resource estimates include adjustments for reserves, maintenance, and transmission losses.

Figure 4, below, illustrates the four scenarios for the annual Federal system resources.

Figure 4

Potential Variability of Total Federal Net Resource Projections[1]
Utilizing Differing Water Conditions



Annual Federal Firm Energy Surplus/Deficit Projections

The projections for annual Federal firm energy surplus/deficits for OY 2008 through 2017 are presented in Table 7 on page 26. The Federal system is projected to have energy deficits throughout the study period ranging from -109 aMW in OY 2008 with the deficit increasing to -679 aMW by OY 2017. BPA will most likely meet these deficits using a combination of methods described in "Planning to meet Federal System Deficits", page 34.

[1] Total Federal net resource estimates include adjustments for reserves, maintenance, and transmission losses.

Table 7

Annual Federal Firm Energy Surplus/Deficit Projections
Using 1937-Critical Water Conditions
Energy in Average Megawatts

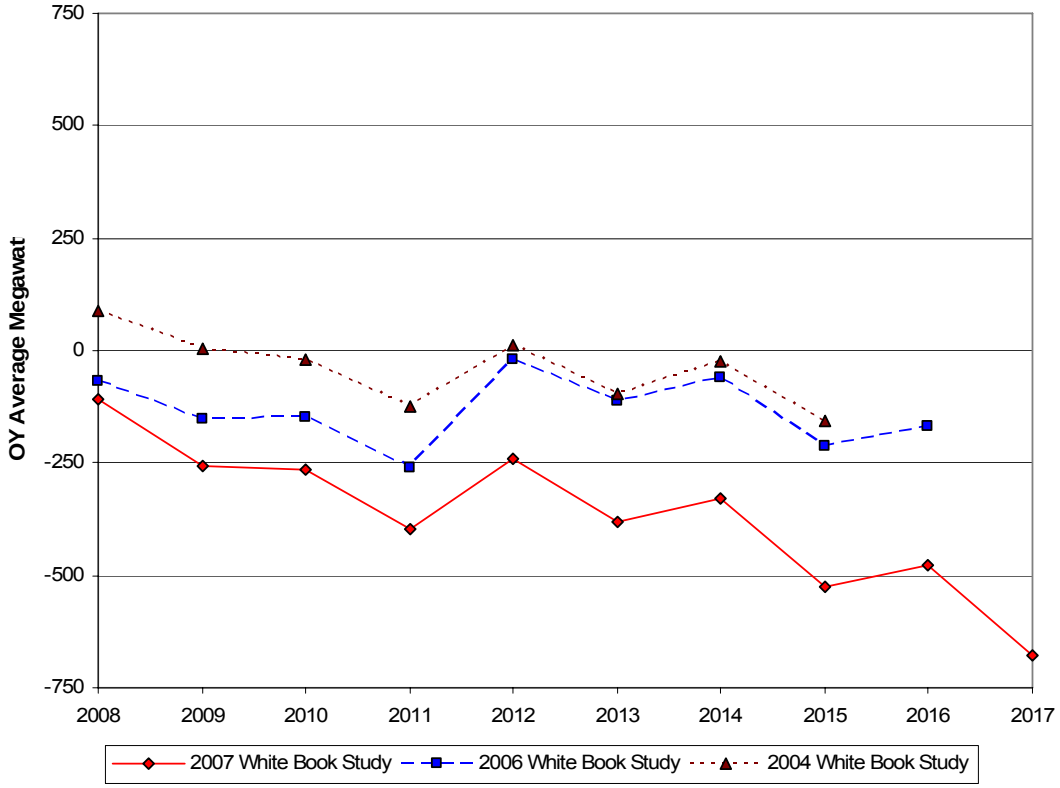
Operating Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Federal Surplus/Deficit	-109	-256	-265	-399	-240	-381	-330	-525	-479	-679

Reduced Federal system energy deficits between 2011 and 2012 are due to the following: 1) Expiration of the Hungry Horse and Port Townsend power deliveries; 2) Expiration of the Idaho Falls Power Bulb turbines generation acquisition; and 3) Columbia Generating Station returning from a maintenance outage in 2011.

Figure 5, below, illustrates how the 2007 White Book Federal energy surplus/deficits compare to the previous 2006 and 2004 studies.

Figure 5

Annual Federal Firm Energy Surplus/Deficit Projections[1]
Assuming Existing Loads, Resources, Contracts,
and Normal Weather Conditions



[1] 2006 White Book projections were published through OY 2016. 2004 White Book projections were published through OY 2015.

The components of the annual Federal energy loads and resources balance using 1937-critical water conditions for OY 2008 through 2017 are presented in Exhibit 1, page 67.

Potential Variability of Annual Federal Energy Surplus/Deficit Projections

To illustrate the potential variability of annual Federal system energy surplus/deficits, this study compares different scenarios using varying levels of Federal system generation based on water conditions, under normal weather conditions. Table 8, below, compares the annual Federal system surplus/deficits under four scenarios using resources utilizing: 1) 1937-critical water conditions (the base case of this study); and the averages of 2) the bottom ten percent; 3) the middle 80 percent; and 4) the top ten percent of the historical 50-water year conditions (1929 through 1978).

Table 8

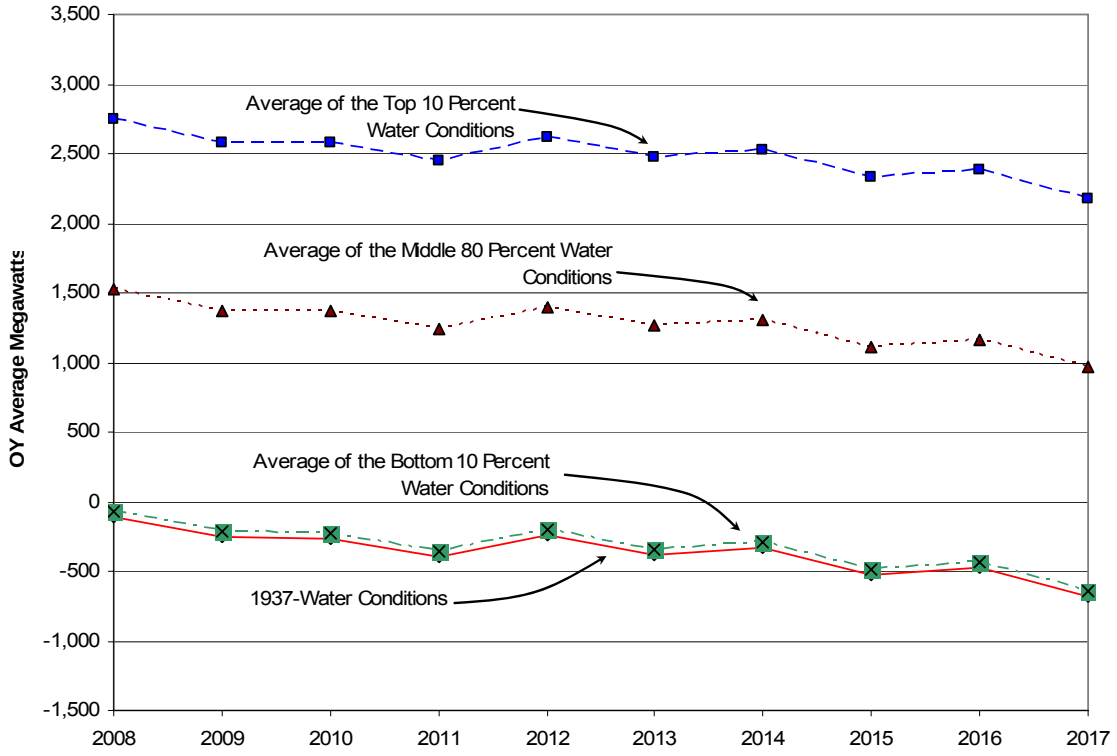
Potential Variability of Annual Federal Energy Surplus/Deficit
Utilizing Differing Water Conditions

Operating Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
1937-Critical Water Conditions	-109	-256	-265	-399	-240	-381	-330	-525	-479	-679
Average Bottom 10% Water Conditions	-67	-215	-223	-357	-198	-339	-288	-484	-437	-637
Average Middle 80% Water Conditions	1,528	1,371	1,364	1,235	1,397	1,260	1,311	1,115	1,162	962
Average Top 10% Water Conditions	2,742	2,577	2,574	2,447	2,612	2,477	2,528	2,333	2,379	2,179

Figure 6, below, graphically compares the annual Federal system surplus/deficits under four scenarios

Figure 6

Potential Variability of Annual Federal Energy Surplus/Deficit Projections
Utilizing Differing Water Conditions
For OY 2008 through 2017

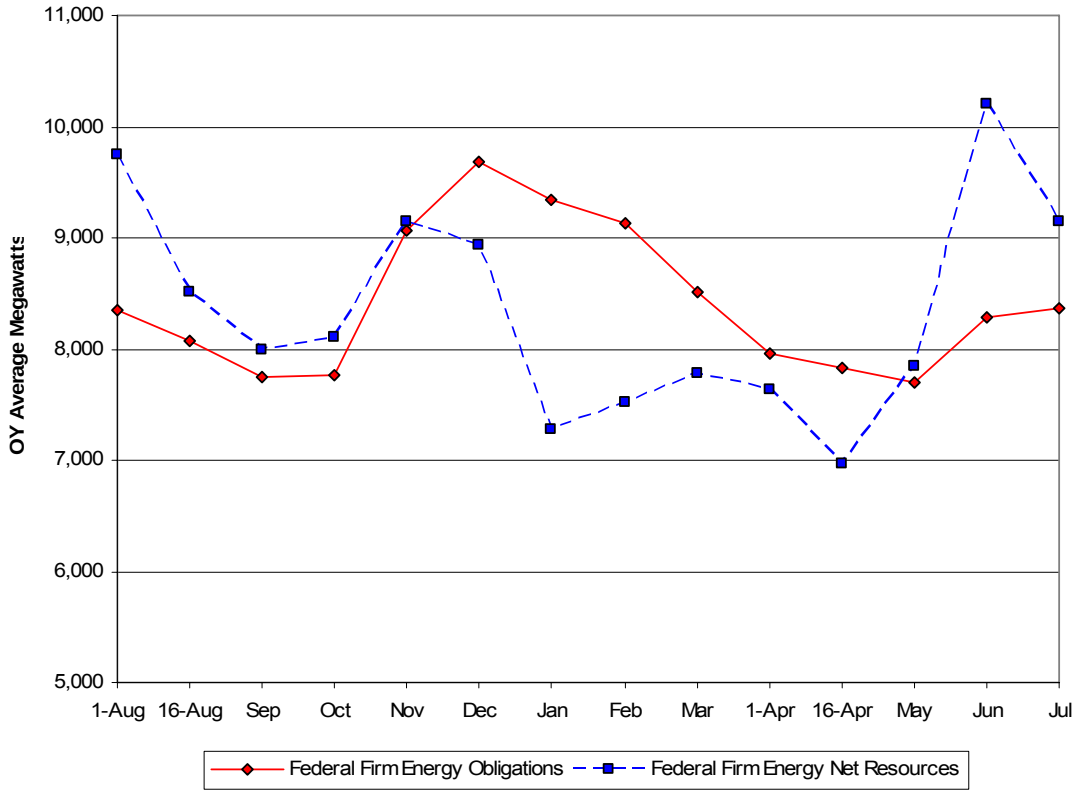


Monthly Federal Firm Energy Surplus/Deficit Projections

Figure 7, below, illustrates the monthly Federal system firm energy loads and net resources for OY 2008. This figure shows an example of the monthly timing of Federal system surpluses and deficits using current Biological Opinion flow requirements. Exhibits 2 through 4, pages 69-71, show the monthly variability of the components of the Federal System loads and net resources using 1937-critical water conditions for OY 2008, 2012, and 2017.

Figure 7

OY 2008 Monthly Federal Firm Energy Loads and Net Resources
Using 1937-Critical Water Conditions



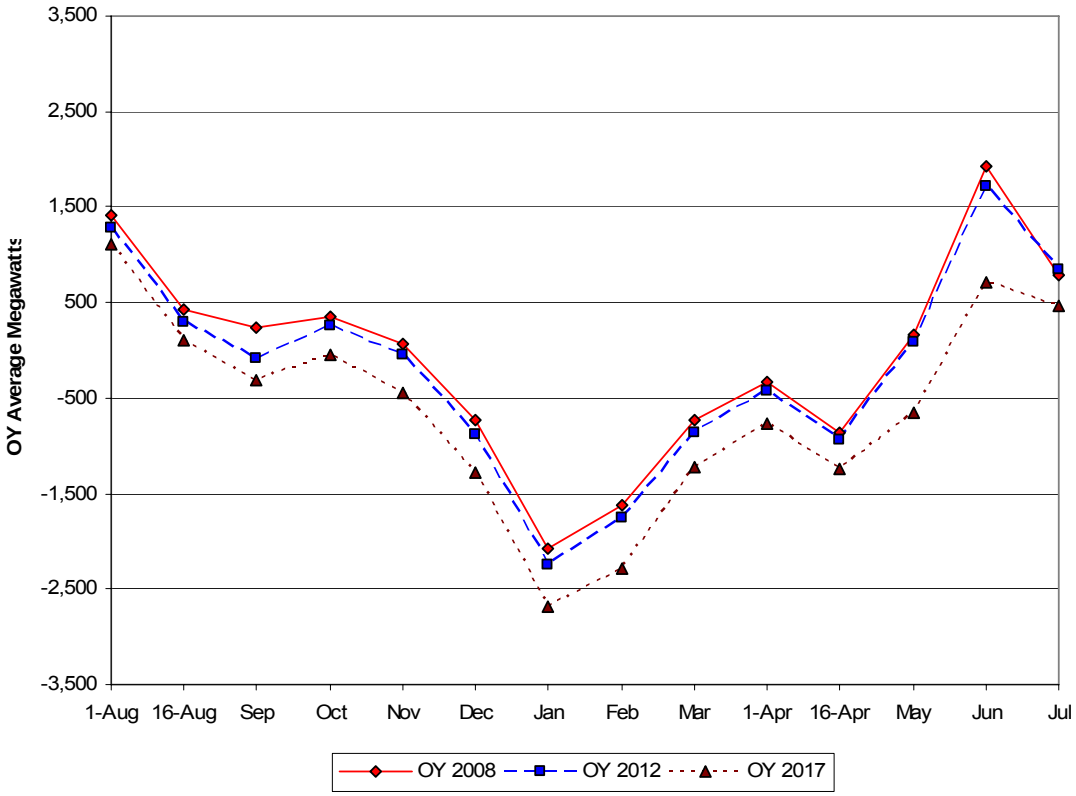
Using critical water conditions, Federal hydro resources are generally operated at lower power production levels during January through March to allow the reservoirs to store water for release in the spring to assist fish passage.

In addition to the monthly variability of the Federal surplus/deficit using critical water conditions, the Federal surplus/deficit can also vary greatly depending on water conditions in the PNW. Exhibits 8 through 17, pages 83-92, illustrate the Federal firm energy surplus/deficit projections using the 50-water years of record.

Figure 8, below, shows the monthly Federal firm energy surplus/deficit projections for OY 2008, 2012, and 2017.

Figure 8

Monthly Federal Firm Energy Surplus/Deficit Projections
Using 1937-Critical Water Conditions
For OY 2008, 2012, and 2017

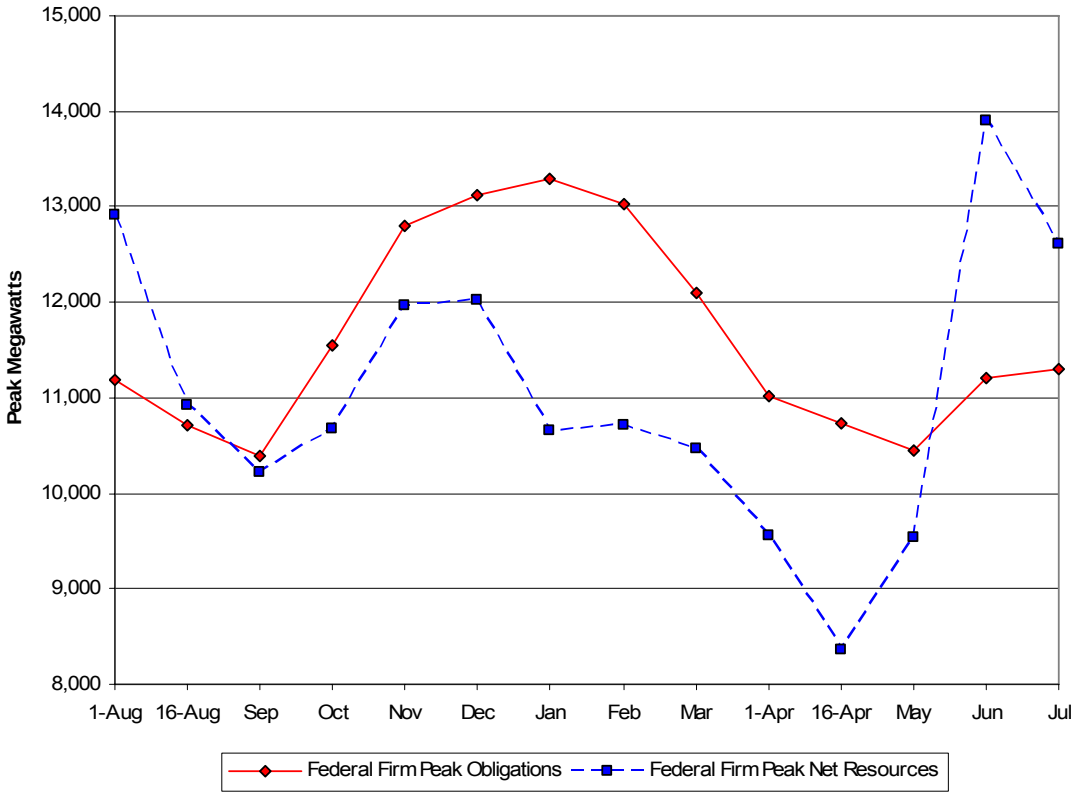


Federal Firm Monthly 1-Hour Capacity Surplus/Deficit Projections

Figure 9, below, illustrates the monthly 1-hour Federal system peak loads and net resources for OY 2008. The projections assume 1937-critical water conditions, normal weather conditions, and a 50-percent probability that the actual peak loads will be exceeded. The peak load projections are reduced by a 1-hour diversity component to address the fact that all electrical peak demands do not occur simultaneously throughout the region. In addition, the Federal hydro capacity is reduced by an operational peaking adjustment to estimate the monthly maximum operational capability that is available to meet the 1-hour expected peak load. This figure illustrates an example of how the timing and magnitude of the Federal system capacity surpluses and deficits could potentially occur within any one operating year using 1937-critical water conditions.

Figure 9

OY 2008 Monthly 1-Hour Federal Capacity Loads and Net Resources Using 1937-Critical Water Conditions



BPA's surplus firm capacity values take into account the following Federal system hydrologic constraints:

- An operational peaking adjustment that reduced the maximum Federal hydro capacity estimate to meet the 1-hour expected peak load in any given month;
- Limitations on moving water between projects, including upstream storage;

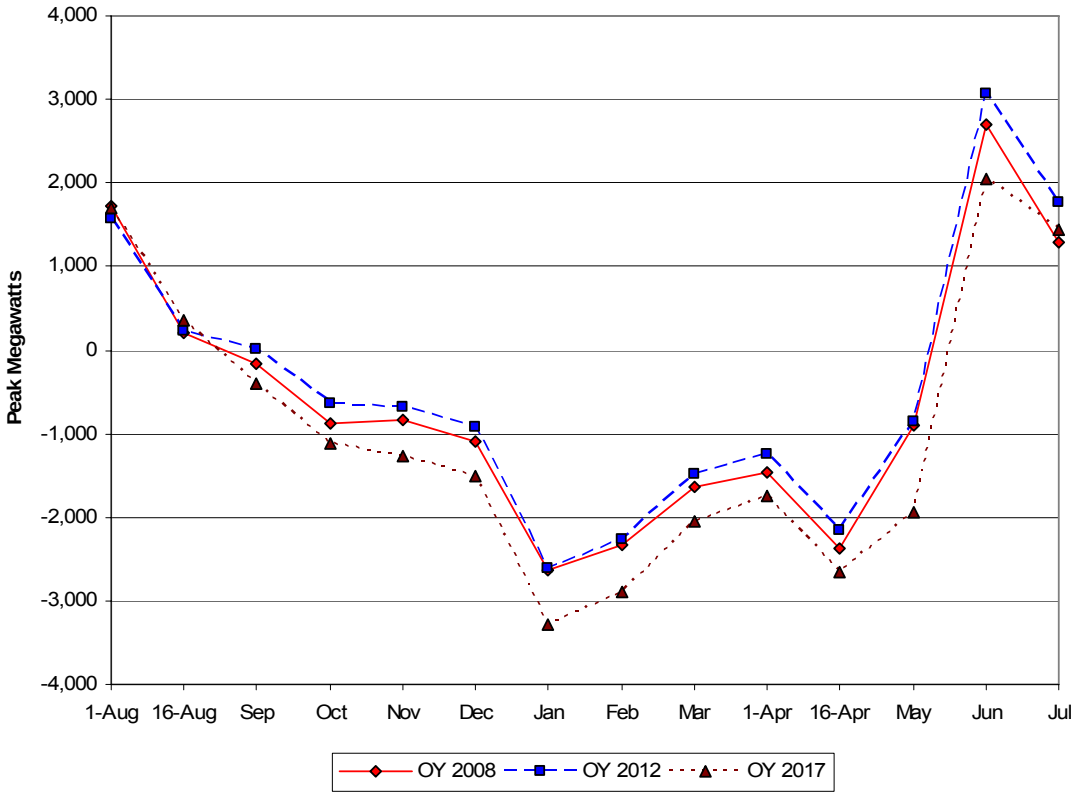
- Pondage limitations due to hydraulic imbalance from reservoir to reservoir;
- Fish and Biological Opinion requirements from the NOAA Fisheries Biological Opinion, dated December 2004, the 2004 Biological Opinion Remand Process and the U.S. Fish and Wildlife Service's 2000 Biological Opinion; and
- Navigation and recreation constraints, including restrictions on the rate of rise or fall of tailwater and forebay elevations.

The Federal operational peaking adjustment will be updated for future studies to incorporate revisions in non-power hydro requirements and changes in BPA contracts.

Figure 10, below, illustrates the 1-hour Federal firm capacity surplus/deficit projections for OY 2008, 2012, and 2017.

Figure 10

Monthly 1-Hour Federal Capacity Surplus/Deficit Projections
Using 1937-Critical Water Conditions
For OY 2008, 2012, and 2017



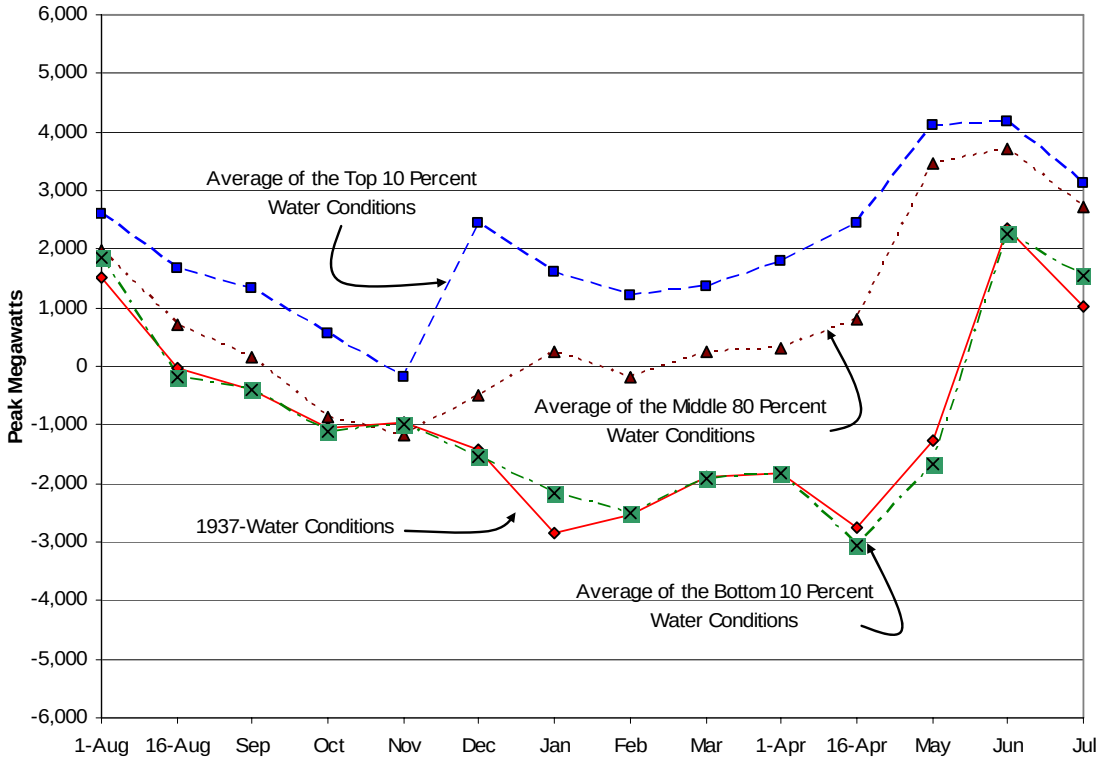
The 1-hour Federal capacity surplus/deficit projections, assuming normal weather conditions and 1937-critical water conditions for OY 2008, 2012, and 2017, are shown in Exhibits 5 through 7, pages 77-79.

Potential Variability of Federal 1-Hour Capacity Surplus/Deficit Projections

To illustrate the potential variability of 1-hour Federal system capacity surplus/deficits, this study compares different scenarios using varying levels of Federal system generation based on water conditions and normal weather loads. Figure 11, below, compares the 1-hour Federal system capacity surplus/deficits for OY 2008 under four scenarios: resources using: 1) 1937-critical water conditions (the base case of this study); the averages of 2) the bottom ten percent; 3) the middle 80 percent; and 4) the top ten percent of the historical 50-water year conditions (1929 through 1978). As the Federal system experiences better water conditions, the availability of 1-hour capacity surpluses increases—especially in the January through May time period.

Figure 11

Potential Variability of 1-Hour Capacity Federal Surplus/Deficit Projections Utilizing Differing Water Conditions For OY 2008



Planning to Meet Federal System Deficits

The Federal system energy and capacity load resource projections use the "Federal System Assumptions" presented on page 17 and are considered conservative. This analysis assumes Federal system hydro generation using 1937-critical water conditions, Federal non-hydro resources operating at expected generation levels, and Federal contract obligations, and purchases delivered at full contract levels. Federal system deficits will be met by any combination of the following:

- Better than critical water conditions, which increases water flow and water storage thereby increasing the output of the Federal hydro system;
- Power purchases or the acquisition of generation from operating IPP projects;
- Market purchases to cover the delay or termination of long-term resource purchase contracts;
- Cost-effective conservation and load management programs that reduce BPA's load obligations;
- PSC net requirement load obligation variability due to current and future economic conditions; and
- Purchase of off-system storage and exchange agreements that allow for monthly seasonal shaping of Federal hydropower with other PNW entities or other west coast regions.

As the Federal system contracts for additional power purchases or generation from new or existing resources, those amounts will be incorporated into future studies.

Section 5: Pacific Northwest Regional Analysis

Regional Analysis Assumptions

This regional loads and resources analysis is based on regional loads, resources, and contracts that were finalized as of March 31, 2007. Study assumptions for the regional analysis are as follows:

- Total retail load forecasts reflect normal weather conditions;
- Regulated hydro generation estimates incorporate PNCA plant characteristics, streamflows, BPA's best estimate of non-power requirements, and hydro improvements. The estimated output for independent hydro and other generating projects are provided to BPA by the project owners;
- All existing regional import and export contracts expire by the terms of their agreements and are not renewed;
- Federal system power sales and capacity/energy exchange agreements with the cities of Burbank, Glendale, and Pasadena are shown as capacity/energy exchanges until they expire on April 15, 2008;
- Uncommitted PNW IPP generation is included in the regional resource stack and is assumed available to meet regional load unless otherwise specified;
- There is no substantial operational change in non-Federal hydro licensing for regional hydro resources;
- Firm hydro energy and capacity estimates are based on 1937-critical water conditions, unless otherwise specified;
- Federal hydro capacity is reduced by an operational peaking adjustment to better estimate the monthly maximum operational capability available to meet the 1-hour expected peak load, for each of the 1929 through 1978 historical water conditions; and
- Transmission losses are treated as a resource reduction.

Annual Regional Firm Energy Load Projections

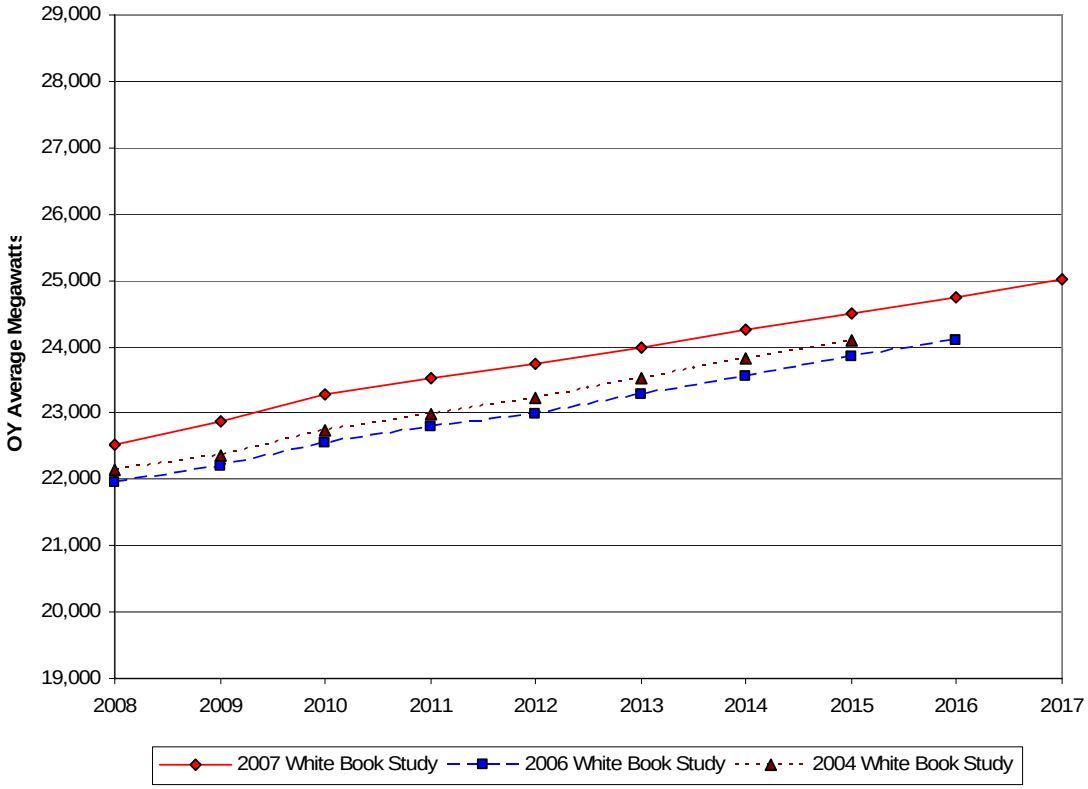
BPA's 2007 White Book annual regional firm energy load projections are comprised of two components:

- Total retail load consumption which is based on the individual entity's total retail load forecast as discussed in "Total Retail Load Forecast", page 3; plus
- Reported long-term and multi-year export contracts made by PNW entities, including BPA.

Figure 12, below, graphically illustrates how the 2007 White Book regional firm energy load projections compare to the previous 2006 and 2004 studies. The differences reflect updates in the regional total retail load forecasts and export contracts for the Federal agencies, public agencies, cooperatives, USBR, IOUs, and DSIs.

Figure 12

Annual Regional Firm Energy Load Projections[1]
Including Exports
For OY 2008 through 2017



For this study, the PNW region is defined by the Northwest Power Act and is consistent with that used by the Council and PNUCC. For forecasting and reporting purposes, other entities may have different definitions of the PNW region making direct comparisons impossible. For example, load forecasts or data provided by the Northwest Power Pool (Power Pool), tends to be much higher than those presented here due to their use of a larger PNW regional area which also includes British Columbia and Alberta, Canada, and Sierra Pacific Power located in the state of Nevada.

[1] 2006 White Book projections were published through OY 2016. 2004 White Book projections were published through OY 2015.

Table 9, below, compares the relative size of regional firm loads by customer class for OY 2008.

Table 9

Annual Regional Firm Energy Load by Customer Class

For OY 2008

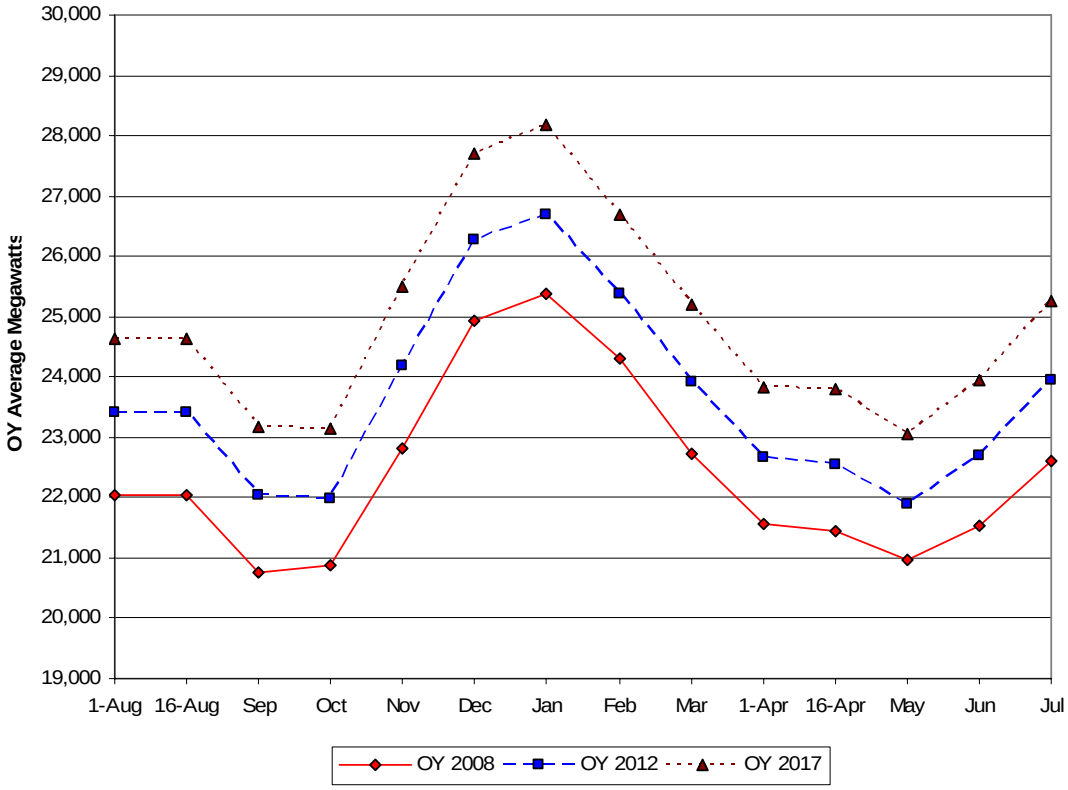
Customer Class	Firm Energy (OY in aMW)	Firm Energy (Percent of Total)
Investor-Owned Entities	11,349	50.4%
Public Entities	8,949	39.7%
Exports	998	4.4%
Direct Service Industries	630	2.8%
Federal and Other Entities	608	2.7%
Total Regional Firm Load	**22,534**	**100.0%**

The annual regional firm energy loads are presented in Exhibit 18, page 97, and monthly firm energy loads for OY 2008, 2012, and 2017 are presented in Exhibits 19 through 21, pages 101-103.

Figure 13, below, graphically illustrates the monthly Regional firm energy load projections for OY 2008, 2012, and 2017.

Figure 13

Monthly Regional Firm Energy Load Obligations
For OY 2008, 2012, 2017



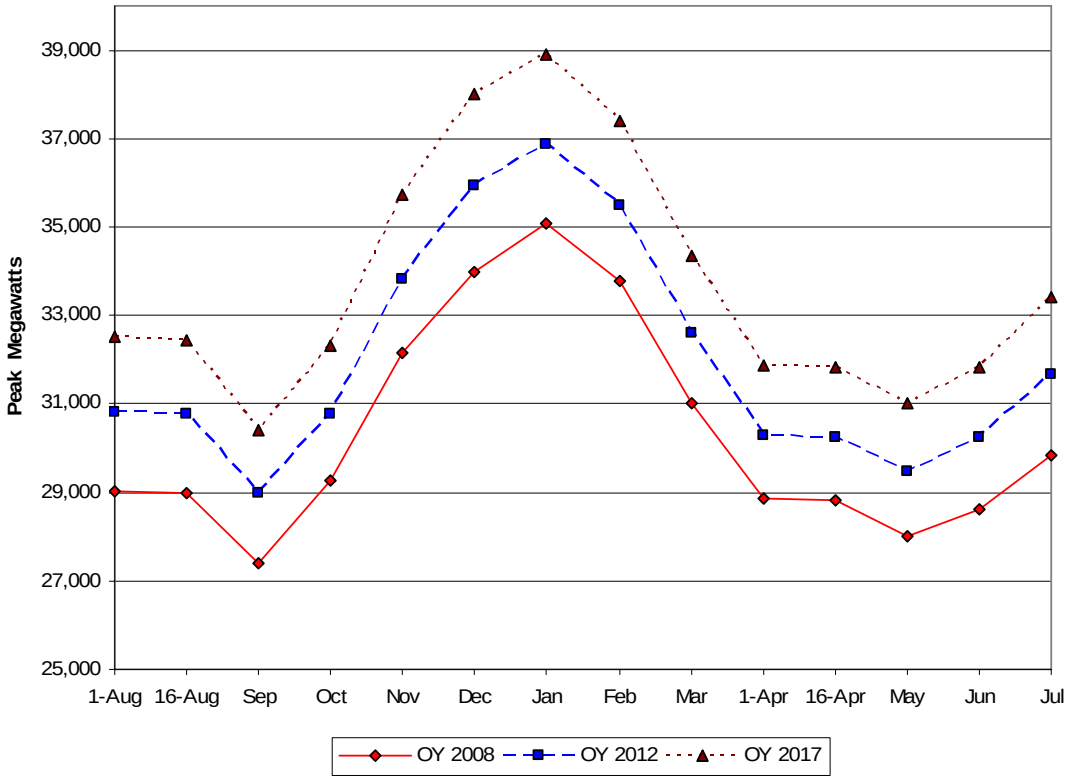
Monthly Regional Firm 1-Hour Peak Load Projections

BPA's 2007 White Book total retail load peaks are based on the individual entity forecasts of expected 1-hour monthly peak demand. The peak load estimates are based on normal weather conditions using a 50-percent probability that the forecasted peak load will be exceeded. In addition, the projected regional peak loads include export contracts made by PNW utilities, including those in the Federal system. The peak load projections are reduced by a 1-hour diversity component to address the fact that all electrical peak demands do not occur simultaneously throughout the region.

Figure 14, below, illustrates the monthly regional 1-hour firm peak loads for OY 2008, 2012, and 2017.

Figure 14

Monthly Regional Firm 1-Hour Peak Load Projections
For OY 2008, 2012, and 2017



The monthly regional firm 1-hour peak loads are presented in Exhibits 22 through 24, pages 107-109.

Regional Firm Resources

Hydro resources represent a smaller share of the total regional resource stack than that of the Federal system. This is because regional entities own the majority of non-hydro resources such as thermal resources, which are primarily comprised of coal, gas, and oil-fired projects and ENW's Columbia Generating Station nuclear plant. New generating projects are included when they have been placed into operation or are in the actual construction process. The projects are detailed in "Changes in the 2007 Pacific Northwest Loads and Resources Study", page 13.

Table 10, below, summarizes the PNW regional resource capacity and energy by generation type for OY 2008.

Table 10

Total Regional Firm Resources for OY 2008[1]
Based on 1937-Critical Water Conditions

Project Type	1-Hour Operational Peaking Capacity (January Peak MW)	Percent of Operational Peaking Capacity	Firm Energy (OY in aMW)	Percent of Firm Energy
Hydro	23,790[2]	57.3%	11,797	45.0%
Coal	5,871	14.1%	5,178	19.7%
Combustion Turbines	5,154	12.4%	3,227	12.3%
Cogeneration	2,481	6.0%	2,191	8.3%
Imports	1,777	4.3%	1,201	4.6%
Nuclear	1,150	2.8%	1,030	3.9%
Non-Utility Generation	1,171	2.8%	1,309	5.0%
Miscellaneous	134	0.3%	321	1.2%
Total Firm Resources	**41,528**	**100.0%**	**26,254**	**100.0%**

[1] Regional firm resource estimates before adjustments for reserves, maintenance, and transmission losses.

[2] The hydroelectric capacity is reduced by an operational peaking adjustment, to estimate the monthly maximum operational capability that is available to meet the 1-hour expected peak load, for the 1937-critical water conditions. For January 2008, the reduction is -8,659 peak MW.

Potential Variability of Regional Resources

To illustrate the potential variability of regional resources, this study compares different scenarios using varying levels of regional hydro generation based on water conditions. Table 11, below, compares the expected annual regional resources under four scenarios using: 1) 1937-critical water conditions as the base case; and the averages of 2) the bottom ten percent; 3) the middle 80 percent; and 4) the top ten percent of the historical 50-water year conditions (1929 through 1978). For OY 2008, regional resource estimates can potentially vary up to about 6,000 aMW, ranging from an estimated 25,502 to 31,773 aMW, due to potential hydro variability.

Table 11

Potential Variability of Total Regional Net Resource Projections[1]
Utilizing Different Levels of Water Conditions
Energy in Average Megawatts

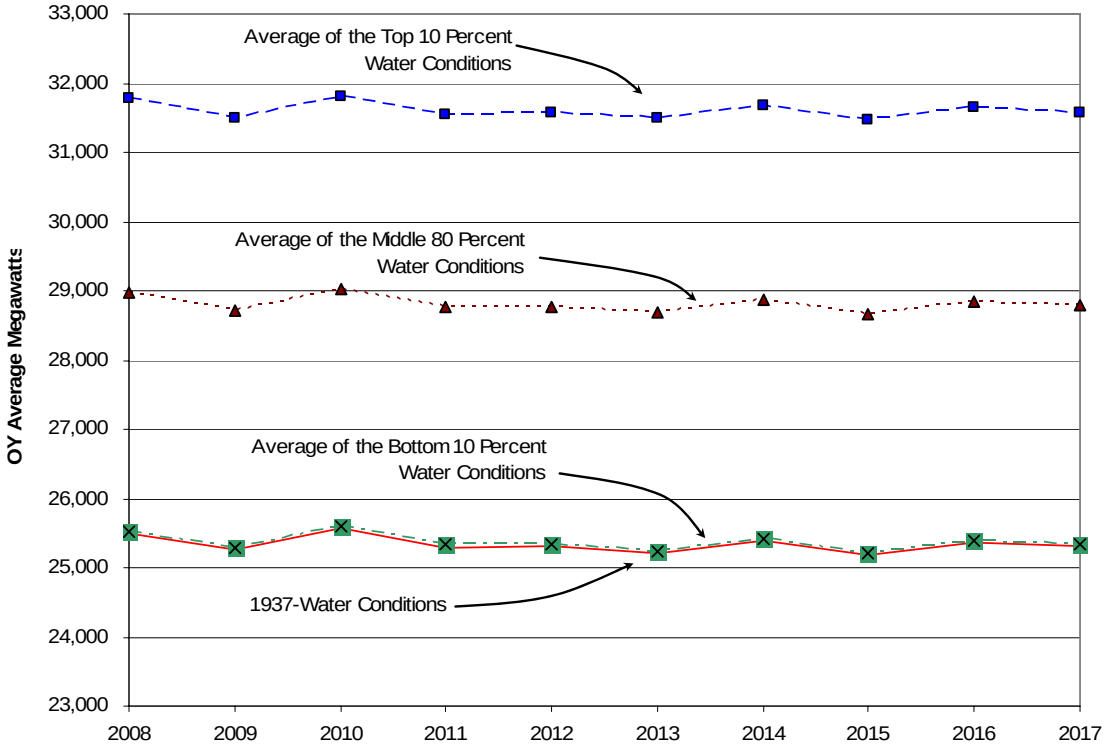
Operating Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
1937-Critical Water Conditions	25,502	25,257	25,562	25,296	25,304	25,210	25,393	25,189	25,367	25,302
Average of Bottom 10% Water Conditions	25,532	25,285	25,590	25,326	25,333	25,238	25,422	25,218	25,395	25,331
Average of Middle 80% Water Conditions	28,979	28,720	29,028	28,765	28,779	28,690	28,874	28,670	28,847	28,783
Average of Top 10% Water Conditions	31,773	31,503	31,817	31,554	31,574	31,488	31,672	31,468	31,645	31,581

[1] Total regional net resource estimates include adjustments for reserves, maintenance, and transmission losses.

Figure 15, below, graphically compares the potential annual regional net resources under the four scenarios.

Figure 15

Potential Variability of Total Regional Net Resource Projections[1]
Utilizing Different Levels of Water Conditions



[1] Total regional net resource estimates include adjustments for reserves, maintenance, and transmission losses.

Annual Regional Firm Energy Surplus/Deficit Projections

The annual regional firm energy surplus/deficit projections for OY 2008 through 2017, assuming 1937-critical water conditions, are presented below in Table 12. The PNW regional resource stack assumes that all regional IPP generation is available to the region. The region is expected to be in firm energy surplus through OY 2017 with surpluses ranging from 2,968 aMW in OY 2008, declining to 277 aMW by OY 2017. The changes in the regional energy surplus/deficit levels from the previous study are mainly due to revisions to regional load forecasts, new generating resources, as well as changes in the timing of the completion of new generating resources.

Table 12

Regional Firm Energy Surplus/Deficit Projections
Using 1937-Critical Water Conditions
Energy in Average Megawatts

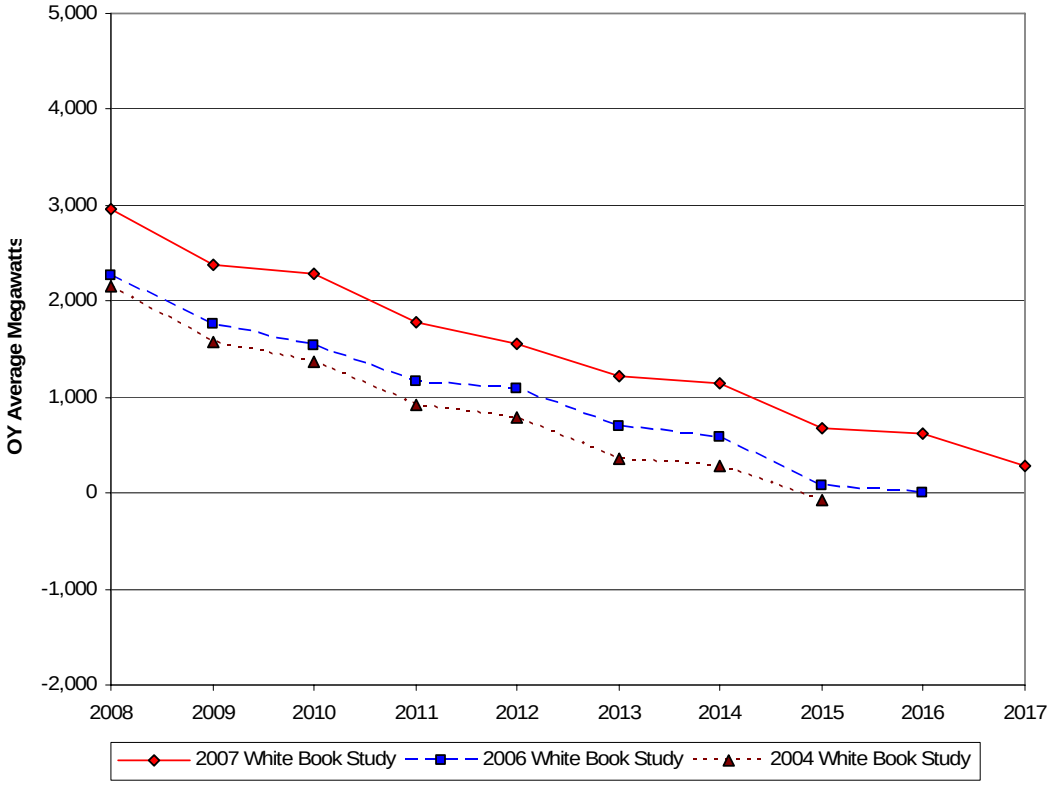
Operating Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Regional Surplus/Deficit	2,968	2,375	2,289	1,778	1,553	1,218	1,142	680	626	277

The Council has recently adopted a regional energy adequacy standard and a pilot capacity standard. BPA is currently working with the Council and other regional parties to develop guidelines for applying these regional standards to individual entities, such as BPA, for future application for regional planning.

Figure 16, below, graphically illustrates how the 2007 White Book regional energy surplus/deficits compares to the previous 2006 and 2004 studies. The 2007 study shows larger regional energy surpluses—especially when compared to the 2004 study—mainly due to the addition of IPP generation within the PNW.

Figure 16

Annual Regional Firm Energy Surplus/Deficit Projections[1]
Using 1937-Critical Water Conditions
For OY 2008 through 2017



Components that make up the regional energy surplus/deficits for OY 2008 through 2017 are presented in Exhibit 18, page 97. Monthly firm energy loads and resources balances for OY 2008, 2012, and 2017 are presented in Exhibits 19 through 21, pages 101-103. In addition to the monthly variability of the regional energy surplus/deficit, the region's surplus/deficit can vary greatly depending on water conditions in the PNW. Exhibits 25 through 34, pages 113-122, contain the regional firm energy surplus/deficit projections under the historical 50-water years of record (OYs 1929 through 1978).

[1] 2006 White Book projections were published through OY 2016. 2004 White Book projections were published through OY 2015.

Potential Variability of Annual Regional Energy Surplus/Deficit Projections

Potential Variability Due to Water Conditions: To show the potential variability of regional surplus/deficits, this study compares the surplus/deficits using four different levels of regional generation based on different levels of water conditions. These scenarios include: 1) 1937-critical water conditions as the base case; and the averages of 2) the bottom ten percent: 3) the middle 80 percent; and 4) the top ten percent of the historical 50-water year conditions. Table 13, below, presents the range of estimated regional surplus/deficits assuming the four differing levels of regional hydro generation. For OY 2008, regional surplus/deficit estimates can potentially vary up to 6,271 aMW, annually ranging from approximately 2,970 to 9,239 aMW, due to possible hydro variability.

Table 13

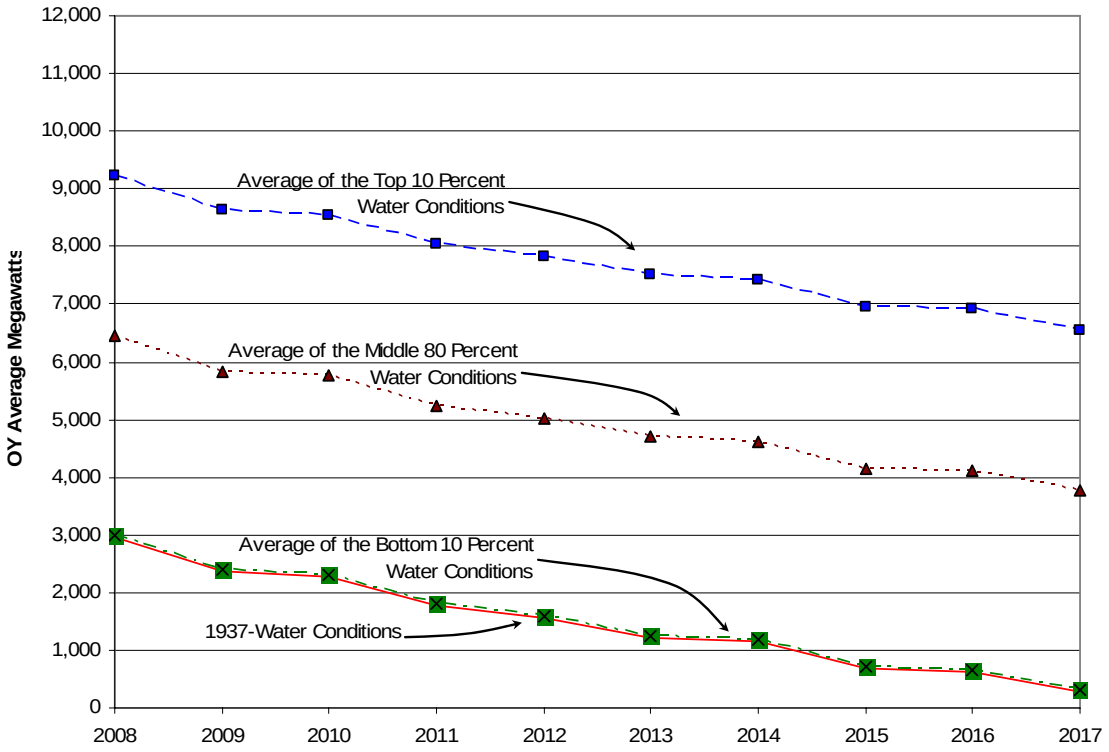
Potential Variability of Annual Regional Firm Energy Surplus/Deficit
Based on Different Levels of Water Conditions
Energy in Average Megawatts

Operating Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
1937-Critical Water Conditions	2,968	2,375	2,289	1,778	1,553	1,218	1,142	680	626	277
Average Bottom 10% Water Conditions	2,998	2,403	2,317	1,807	1,581	1,247	1,170	708	655	306
Average Middle 80% Water Conditions	6,445	5,838	5,755	5,247	5,028	4,698	4,622	4,160	4,107	3,758
Average Top 10% Water Conditions	9,239	8,622	8,543	8,036	7,822	7,496	7,420	6,958	6,905	6,556

Figure 17, below, illustrates the range of estimated regional surplus/deficits assuming differing levels of regional hydro generation discussed on page 45.

Figure 17

Potential Variability of Annual Regional Firm Energy Surplus/Deficit
Based on Different Levels of Water Conditions
For OY 2008 through 2017



Potential Variability Due to IPP Generation Amounts Delivered to the Region: This study assumes approximately 4,581 peak MW with an associated energy capability of 4,022 aMW of uncommitted PNW IPP generation as regional resources. though potentially these resources may not be available when needed to serve PNW regional loads. While this assumption is reasonable from an electrical reliability standpoint, resulting regional surpluses may understate the potential for price volatility and overstate the availability of IPP generation for use within the PNW. The PNW region may have to compete with other western markets to secure uncommitted IPP generation to meet electricity demand. Table 14, page 46, details the peak annual energy of expected regional uncommitted IPP projects as well as their fuel type. Annual generation projections may change due to variations in maintenance schedules. The 2006 White Book estimated about 3,360 aMW of uncommitted IPP generation. Since last year's study, the following projects were purchased or have been found to be consumed within the region and are no longer considered uncommitted IPPs: Goldendale Energy Center (224 aMW), was purchased by Puget Sound Energy; and SP Newsprint (25 aMW).

This analysis included the following new uncommitted IPP projects: 88.7 percent of Klondike 3 wind project (58 aMW), Mint Farm Energy Center (262 aMW); and Satsop (585 aMW).

Table 14

Expected PNW Uncommitted IPP Projects
As of March 31, 2007

Project	Peak (MW)	Energy (aMW)	Fuel Type
Big Hannaford	248	224	Natural Gas
Centralia #1	670	577	Coal
Centralia #2	670	626	Coal
Chehalis Generating Facility CCCT	520	417	Natural Gas
Emmett Biomass Project	18	10	Wood Waste
Hermiston Power Project	630	568	Natural Gas
Klamath Cogeneration Project	484	436	Natural Gas
Klamath Peaking Unit	100	14	Natural Gas
Klondike 3 (88.7%)[1]	0	58	Wind
Lancaster Power Project (Rathdrum)	270	244	Natural Gas
Metro Westpoint	1.2	1.2	Methane
Mint Farm Energy Center	320	262	Natural Gas
Satsop	650	585	Natural Gas
Total Uncommitted IPP Generation	**4,581**	**4,022**	

[1] Klondike 3 is expected to begin operation December 1, 2007. The total project is comprised of units totaling 221 MW with an expected output of 65 aMW annually. The owner has sold 25 MW or about 11.3 percent within the region, thereby leaving 88.7 percent uncommitted to the region. Table 14 reflects 88.7 percent of the full expected output of Klondike 3.

Table 15, below, shows the potential variability of the PNW region annual firm energy surplus/deficits by assuming four differing levels of IPP generation delivered to the region. For OY 2008, the surplus/deficit is estimated to be 2,968 aMW if 100 percent of the IPP generation is delivered to the region, 1,967 aMW at 75 percent, 967 aMW at 50 percent, and 25 percent results in a -34 aMW deficit for the region. For OY 2008, regional surplus/deficit estimates can potentially vary up to just over 3,000 aMW, annually ranging from 2,968 aMW surplus to a deficit of -34 aMW due to differing possible IPP generation commitments to the PNW.

Table 15

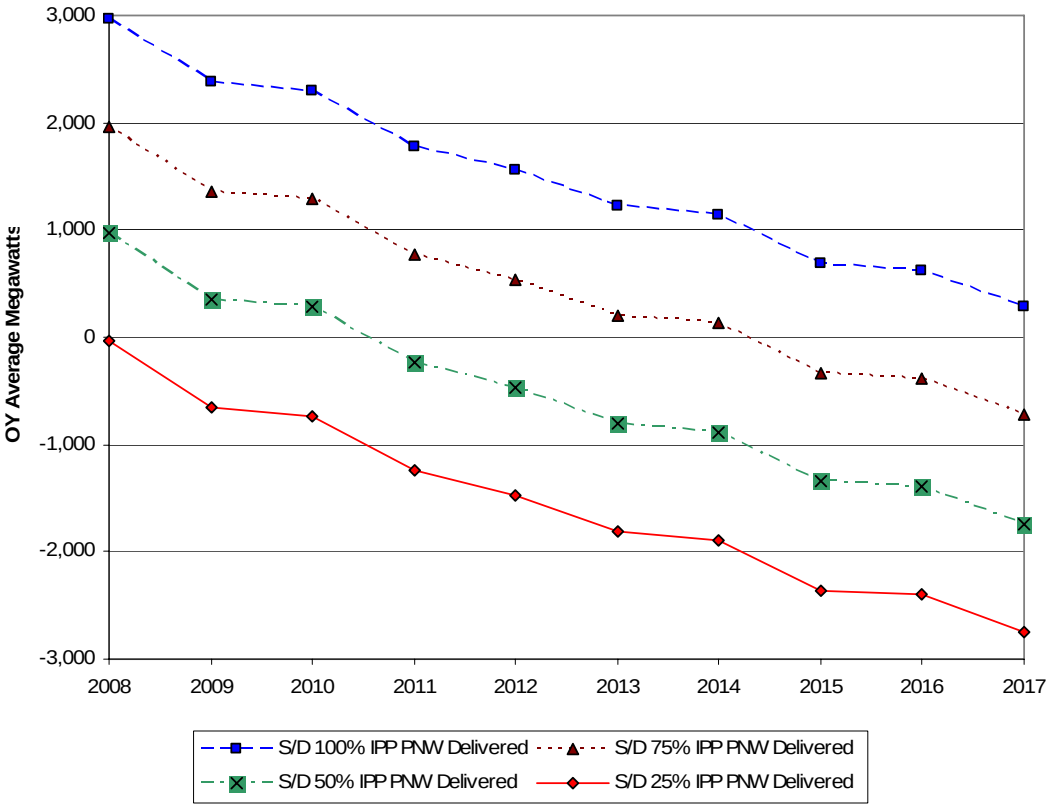
Potential Variability of PNW Region Annual Firm Energy Surplus/Deficit
Based on Different Levels of IPP Generation Delivered to the Region
Using 1937-Critical Water Conditions
Energy in Average Megawatts

Operating Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
S/D 100% IPP PNW Delivered (Up to 4,022 aMW)	2,968	2,375	2,289	1,778	1,553	1,218	1,142	680	626	277
S/D 75% IPP PNW Delivered (Up to 3,016 aMW)	1,967	1,363	1,283	772	541	206	130	-332	-380	-729
S/D 50% IPP PNW Delivered (Up to 2,011 aMW)	967	351	277	-235	-471	-806	-882	-1,344	-1,386	-1,735
S/D 25% IPP PNW Delivered (Up to 1,006 aMW)	-34	-661	-729	-1,241	-1,483	-1,818	-1,894	-2,356	-2,392	-2,741

Figure 18, below, graphically illustrates the potential variability of regional surplus/deficits by assuming the four differing levels of potential IPP generation delivered to the region—100 percent, 75 percent, 50 percent, and 25 percent.

Figure 18

Potential Variability of Annual Regional Firm Energy Surplus/Deficit Based on Different Levels of IPP Generation Delivered to the Region Using 1937-Critical Water Conditions



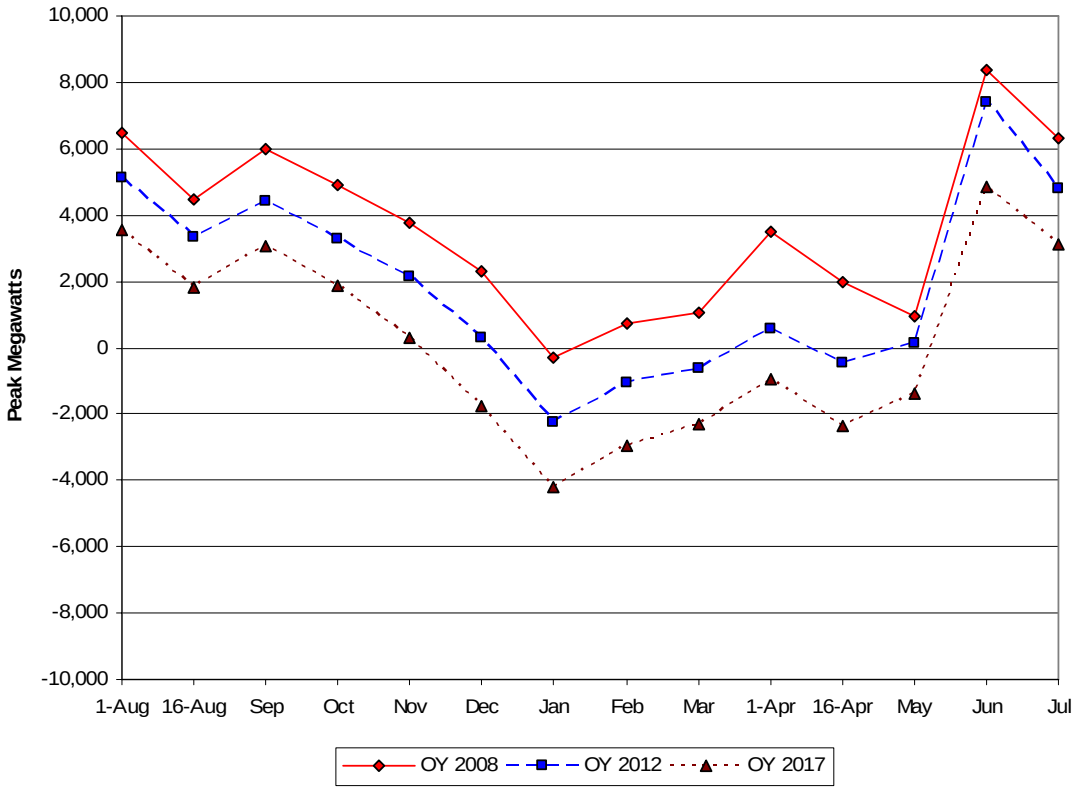
Monthly Regional Firm 1-Hour Capacity Surplus/Deficit Projections

Figure 19, below, graphically illustrates the monthly regional 1-hour capacity surplus/deficit projections for OY 2008, 2012, and 2017. The projections assume 1937-critical water conditions, normal weather conditions, and a 50-percent probability that the actual peak loads will be exceeded. The peak load projections were reduced by a 1-hour diversity component to address the fact that all electrical peak demands do not occur simultaneously throughout the region. The study assumes 4,685 peak MW of uncommitted PNW IPP generation in OY 2008 as regional resources though potentially these resource may not be available when needed to serve PNW regional loads. (See Table 14, "Expected PNW Uncommitted IPP Projects" page 47.) In addition, the hydro instantaneous capacity is reduced by a 1-hour operational peaking adjustment to better estimate the monthly maximum operational capability that is available to meet the 1-hour expected peak load. See

Section 2, "Hydro 1-Hour Operational Peaking Adjustment", page 5. Regional surplus firm capacity values take into account hydrologic constraints detailed in Section 4, "Federal Firm Monthly 1-Hour Capacity Surplus/Deficit Projections", page 31.

Figure 19

Monthly Regional Firm 1-Hour Capacity Surplus/Deficit Projections
Using 1937-Critical Water Conditions
For OY 2008, 2012, and 2017



Regional 1-hour capacity surplus/deficit projections, assuming normal weather conditions and 1937-critical water conditions for OY 2008, 2012, and 2017, are shown in Exhibits 22 through 24, pages 107-109.

Potential Variability of PNW Region 1-Hour Capacity Surplus/Deficit Projections

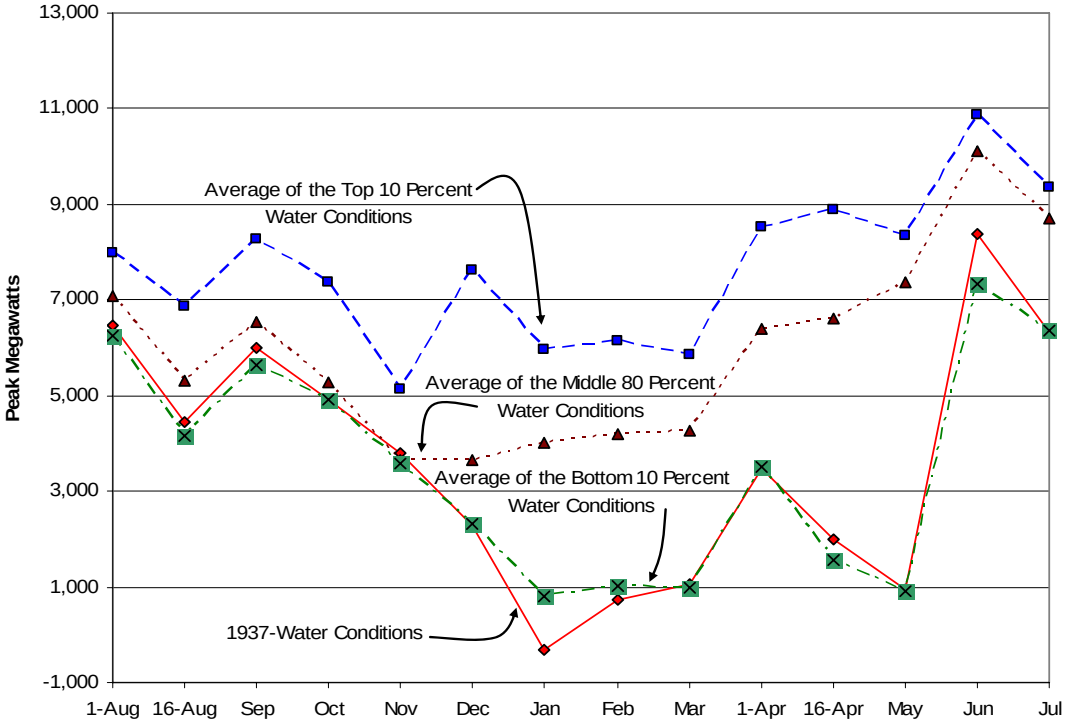
To illustrate the potential variability of 1-hour PNW region capacity surplus/deficits, this study compares different scenarios using varying levels of regional generation based on water conditions and normal weather loads. Figure 20, below, compares the 1-hour regional system capacity surplus/deficits under four scenarios: resources using: 1) 1937-critical water conditions (the base case of this study); the averages of 2) the bottom ten percent; 3) the middle 80 percent; and 4) the top ten percent of the historical 50-water year conditions (1929 through 1978). As the region experiences

better water conditions, the availability of 1-hour capacity surpluses increases—especially in the December through May time period.

Figure 20

Monthly Potential Variability of 1-Hour Capacity PNW Regional Firm Surplus/Deficit Projections

Utilizing Differing Water Conditions for OY 2008



Planning to Meet Regional Deficits

The regional energy and capacity load resource projections use the "Regional Analysis Assumptions" presented on page 35 and are considered conservative with the exception of the treatment of IPP resources. This analysis assumes regional hydro generation using 1937-critical water conditions, non-hydro resources operating at expected generation levels, and contract obligations and purchases delivered at maximum contract levels. IPP plants are assumed to be available to meet regional loads unless otherwise contracted. However, regional surpluses may understate the potential for price volatility because the PNW region may have to compete with other western markets to secure these sources of supply. Even though the regional analysis shows annual average surpluses through OY 2017, there is potential for monthly energy deficits within any year. Regional deficits will be met by any combination of the following:

- Better than critical water conditions, which increases water flow and water storage thereby increasing the output of the regional hydro system;
- Power purchases or the acquisition of generation from additional operating IPP projects;

- Cost-effective conservation and load management programs that reduce total retail loads;
- Total retail load variability due to current and future economic conditions;
- DSI long-term load levels are forecasted to range from 630 aMW to 668 aMW throughout the study. Actual DSI load levels could be different, based on electricity prices, aluminum commodity prices, and closures; and
- Purchase of off-system storage and exchange agreements with other regions that allow for monthly seasonal shaping of regional hydropower.

As the region executes new contracts for additional power purchases or generation from new or existing resources, those amounts will be included in future analyses.

Section 6: Northwest Power and Conservation Council Comparison

Non-DSI Regional Load Comparison: 2007 White Book to Council

The following compares the non-DSI regional firm total retail loads between BPA's 2007 White Book and the Northwest Power and Conservation Council's Final Fifth Northwest Electric Power and Conservation Plan (May 2005). To provide consistency for this comparison, the regional DSI load component was removed from both forecasts. It should be noted that the regional total retail loads do not include regional exports, which are a separate component of load obligations to the PNW region.

2007 White Book Non-DSI Total Retail Load Forecast: The 2007 White Book total retail load projections were initially estimated separately, for each individual entity and then grouped into the following categories: Federal agencies, public agencies, cooperatives, USBR, and IOUs. The total retail load forecasts were finalized on March 31, 2007.

The total retail load forecasts for the Federal agencies, public agencies, cooperatives, and USBR were developed using any combination of the following:

- Linear trending based on historical power consumption;
- Data obtained from the individual entity's 2001 power sales contracts' Exhibit C submittals;
- Public retail load forecasts sent directly to BPA through their PNUCC submittals; and
- IOU retail load forecasts were developed from both data submitted in their PNUCC submittals and load forecasts sent directly to BPA.

Council Non-DSI Total Retail Load Forecast: The Council's final Fifth Northwest Electric Power and Conservation Plan (May 2005) assumed that non-DSI electricity demand would recover from the economic recession of early 2000, but that demand would still be lower than the Fourth Power Plan forecast. The expected lower level of demand was partially due to permanent effects of higher electricity prices which are assumed to dampen the effects of the economic recovery, as well as, due to lasting efficiency improvements achieved during the electricity crisis the region experienced during late 2000 and 2001.

Comparison of the Non-DSI Total Retail Load Forecast: The differences between the Council and 2007 White Book non-DSI load forecasts average 0.7 percent over the 10 years of the study. The maximum difference expected is 1.3 percent (268 aMW) in OY 2009, with the difference declining to 0% by OY 2017. The differences are considered minor and are mainly due to variations in modeling methods and the vintage of data used in the two forecasts.

Table 15, below, compares the non-DSI regional firm total retail loads between BPA's 2007 White Book and the Council's Fifth Northwest Electric Power and Conservation Plan (May 2005).

Table 15

Non-DSI PNW Regional Firm Total Retail Load Comparison
BPA's 2007 White Book Load Projections and
the Council's Fifth Northwest Electric Power and Conservation Plan (May 2005)
Annual Energy in Average Megawatts

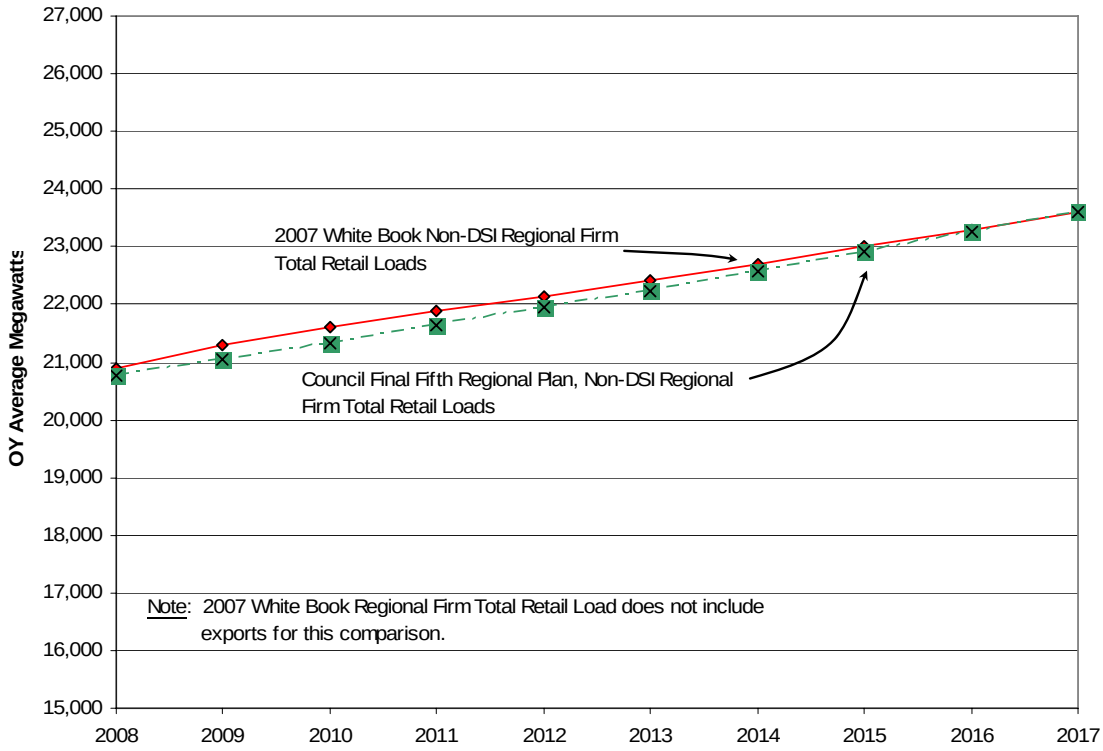
Operating Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
2007 White Book										
Regional Firm Loads	21,536	21,939	22,237	22,521	22,808	23,086	23,359	23,665	23,952	24,263
Less Regional DSI Loads	630	638	638	638	663	668	668	668	668	668
Non-DSI Regional Firm Loads	20,906	21,301	21,599	21,883	22,145	22,418	22,691	22,997	23,284	23,595
Council's Fifth Northwest Electric Power and Conservation Plan (May 2005)										
Non-DSI Regional Firm Loads	20,759	21,033	21,331	21,632	21,941	22,245	22,565	22,906	23,247	23,587
Comparison: 2007 White Book – Council										
Difference	147	268	268	251	204	172	127	90	37	8
Percent Difference	0.7%	1.3%	1.2%	1.1%	0.9%	0.8%	0.6%	0.4%	0.2%	0.0%

The long-term non-DSI regional loads presented in the Council's Fifth Power Plan are higher than those presented in the Council Resource Adequacy Assessment mainly due to a differences in load growth assumptions—1.44 percent to 0.6 percent, respectively—and forecasting methodology differences.

Figure 21, below, graphically illustrates the expected non-DSI regional firm total retail loads from BPA's 2007 White Book and the Northwest Power and Conservation Council's Fifth Northwest Electric Power and Conservation Plan (May 2005).

Figure 21

Comparison of Non-DSI Regional Firm Total Retail Loads
BPA 2007 White Book Load Projections and the
Council's Fifth Northwest Electric Power and Conservation Plan (May 2005)



Comparison of Resource Stack Assumptions: 2007 White Book to Council

A comparison of the resource assumptions between the 2007 White Book and the Council's Fifth Northwest Electric Power and Conservation Plan is listed below.

2007 White Book Resource Stack Assumptions: The 2007 White Book resource stack assumptions were estimated on a unit basis. Revisions to current thermal plant operations are based on submittals by utilities either to the PNUCC or data submitted directly to BPA for the purpose of this study. Resources listed in this study represent plants that have been placed into operation or are currently in the construction process. The capacity and energy values have been estimated through information provided by PNUCC or through conversations with the plant managers.

Council Resource Stack Assumptions: The Council's near-term regional resource stack assumptions for its wholesale power price forecast are based on projects under construction, similar to the process utilized by BPA. The treatment of new resources by the Council and BPA differ in the following manner: 1) BPA adds plants to the resources based on the operator's/developer's best estimate of completion; and 2) the Council estimates operation dates for new resources based on economic competitiveness as estimated by the AURORA™ Electric Market Model. Therefore, the Council may delay an announced operational date of a future plant based on the perceived need for the plant as determined by their model.

Comparison of the Resource Stack: The following compares the different assumptions used for BPA's 2007 White Book and the Council's estimation in constructing their new resource stack.

- The 2007 White Book resource stack is more current. BPA's resource stack was updated to include new resources through March 31, 2007, whereas the Council's Final Fifth Power Plan resources were published in May 2005. There are a number of newly developed resources that the Council's plan does not contain due to its vintage. These differences are known and largely encompass BPA's inclusion of the Mint Farm Energy Center (262 aMW) and Satsop (585 aMW) generating resources.
- BPA includes only Pennsylvania Power & Light Company's (PP&L Montana) resources that are dedicated to serve Northwestern Energy's (formally Montana Power Company) western Montana loads. The Council includes most of PPL Montana's generation in their regional resource stack, regardless of whether they are dedicated to serve PNW regional loads. BPA will review the status of these resources in future studies.
- In addition, BPA and the Council treat the wind projects differently. At this time, BPA only recognizes the average energy generation projection for wind projects and does not recognize a peaking capacity credit for wind projects to be able to predictably meet peaking loads. The Council models wind projects as predictable, shaped energy resources and credits wind with a capacity equivalent to the installed wind capacity times a capacity factor.

These resource stack differences are generally based on the timing and treatment of new regional resources.

The Council's Biennial Monitoring Report on the Fifth Power Plan: In the Council's Biennial Monitoring Report on the Fifth Power Plan, dated January 5, 2007, they discuss how the regional economy, especially the energy intensive industrial sectors, has not recovered as quickly as was assumed in the Fifth Power Plan. The continued high and volatile energy prices, along with the focus on climate change, have caused aggressive conservation activity, new Federal energy policies, and more attention to renewable resource requirements at both the state and utility level. They note that the energy supply surplus in the region has increased with more new generation capacity than what was expected at the time of the Fifth Power Plan, especially wind, in conjunction with the slower than expected demand growth.

Section 7: Federal System 120-Hour Capacity Planning for the Future

The installed capacity at Federal projects is greater than the available fuel supply (water), particularly in low water scenarios. Traditionally, the over-installed hydro capability coupled with historic flexibility in hydro operation made capacity considerations a lower concern within the region for studies. Because of these factors, planning for the FCRPS has historically been focused on providing sufficient hydro energy over time rather than meeting capacity or sustained capacity needs.

BPA's objective is to provide the best value for customers and constituents with the finite capabilities of the FCRPS. In order to achieve this, there needs to be a common understanding of the challenges and opportunities to provide different capacity services to and define the choices available to the region with regard to system capacity.

BPA recently revised its Federal system hydro 1-hour operational peaking adjustment and continues to investigate additional methods of estimating capacity, duration of capacity, and how to properly account for capacity within the interconnected hydro system due to:

- Changes in complex power and non-power requirements specifying flows that limit ramping, peaking, and storage capability--effectively de-rating hydro system capacity;
- Increasing demands for re-dispatch capability due to electricity deregulation and heavy use of the transmission system grid;
- Increasing needs for integration services for non-dispatchable intermittent resources, such as wind, that can result in reduced hydro flexibility to serve firm load; and
- Increased regulatory and customer interest to understand capacity, its uses, and capacity availability in the PNW. This is due to the development of resource adequacy standards, nationally and within the region, the Regional Dialogue process and the application of the Slice product.

BPA has capacity planning tools that feed into the White Book, short-term planning operations, and reliability. The planned availability of fuel, as well as the duration of use of the planned energy or capacity, is situational. For that reason, BPA uses the following multiple tools to assist in its evaluation of capacity.

- White Book Capacity Planning: Current White Book estimates an operational peaking capacity. Using relationships between the Federal system hydro energy and the capacity developed by HOSS, the operational peaking capacity estimates the 1-hour maximum generation that meets a typical hourly load shape for any given month. This method does not borrow water from future months, rather maximizes HLH hydro system generation using HLH and LLH marketing and within month hydro flexibility.
- Short-Term Operations Capacity Planning: BPA short-term operation planning uses a 120-hour peak to estimate capacity availability for the short-term. The 120-hour peak generation estimates the average of the top 6 hours of HLH

Federal generation over weekdays in any given month using the HOSS model. This method does not borrow water from future months, rather maximizes HLH hydro system generation using HLH and LLH marketing and within month hydro flexibility. The 120-hours are associated with the following:

- 6 hours/day*5 days/week*4 weeks/month (6*5*4=120).

- Capacity Reliability and Adequacy Planning: Capacity availability for reliability and adequacy is different than planning for short- and long-term capacity needs. Reliability and adequacy planning is to maintain a stable electric system when it is stressed, such as during an extreme weather event or loss of a large resource. In order to maintain system stability, reliability methods may borrow water from future months, not meet normal non-power requirements when appropriate, and make significant purchases to assure an adequate supply of power. The Council recently adopted a regional energy adequacy standard and a pilot capacity adequacy standard. BPA will continue to work with the Council and regional parties to further test and develop a capacity reliability and adequacy standard. Currently, BPA's short- and long-term power planning inventory does not use these same capacity reliability and adequacy measures because it would not be prudent to operate under these measures on a month-by-month continuous basis. Short- and long-term planning typically uses normal weather conditions and does not borrow water from future months. BPA will continue to analyze the role of reliability and adequacy standards for BPA planning.

Federal System 120-Hour Capacity Analysis: While this process is still under evaluation, this is an example of how the Federal firm 120-hour peak capacity surplus/deficit could be utilized for BPA's long-range planning. BPA's instantaneous peak loads are reduced by a 120-hour diversity factor. BPA's resource capabilities are reduced using a 120-hour operational peaking adjustment. The following details the methods used in this process.

- BPA 120-Hour Load Obligation Estimates: BPA's load consist of its PSCs, and other contract obligations not defined under BPA's PSCs, such as contract sales to utilities, marketers and power commitments under international treaty. Of these load obligations, only the PSCs have wide variation between their non-coincidental and coincidental components, thus requiring a diversity factor to reduce the non-coincidental peak to coincide with the time of BPA's system peak. The White Book analysis typically shows non-coincidental expected capacity loads reduced by a 1-hour peak diversity factor. The diversity factor adjusts loads by a "time of day" factor for the month to reduce non-coincidental peak loads to coincide with BPA's system peak. For each month, the sum of BPA's non-coincidental PSC maximum deliveries was compared to the sum of BPA's coincidental peak deliveries at the time of BPA's system peak for the average of the top 120-hours. The 5-year average of these monthly coincidental to non-coincidental ratios comprises the diversity factors. The use of actual hourly PSC sales allows for the development of both the 1-hour and 120-hour diversity factors. Additional hourly diversity factors can be developed using this methodology.
- BPA 120-Hour Generation Estimates: BPA markets power from generating resources that include specific Federal and non-Federal hydro projects, contracted generating projects, BPA hydro-related contracts, and BPA contract purchases. The output of these projects along with contract purchases comprise BPA's generating resource stack. The Federal system maximum generating

capabilities for non-hydro projects in the White Book are estimated for each project assuming 100 percent availability and reflect project maintenance schedules. The Federal system maximum hydro generating capabilities are estimated using mid-month reservoir elevations and are not specifically reduced for hydro maintenance. Due to the fact that Federal system hydro has more machine capability than available fuel (water)--especially under low water conditions--only the hydro portion of the system capability is reduced to reflect a 120-hour capacity availability. This 120-hour reduction is shown as an operation peaking adjustment similar to the 1-hour operation peaking adjustment in this study. The methodology for calculating the 1-hour and 120-hour operational peaking reduction is presented below:

- 120-Hour Operational Peaking Reduction: The 120-hour operational peaking reduction represents a reduction to the Federal system hydro resources to estimate the peaking availability of the Federal hydro system generation when averaged monthly over the top 6 HLH hours/day, 5 days/week, and 4 weeks/month capacity. This is termed 120-hour capacity. The 120-hour capacity curves were developed using HOSS hourly Federal hydro generation estimates to obtain monthly relationships between the monthly Federal system hydro energy generation to the amount of available 120-hour hydro capacity. This analysis assumes typical hourly load obligations and does not borrow water from future months, rather maximizes HLH hydro system generation using HLH and LLH marketing; and within month hydro flexibility.

  This compares to the 1-hour operational peaking reduction that represents a reduction to the Federal system hydro resources in order to estimate the peaking availability of the hydro system to meet the monthly 1-hour peak demand. In a similar manner to the above analysis, 1-hour operational capacity curves were developed using HOSS hourly Federal hydro generation to obtain monthly relationships between the Federal hydro energy generation to the amount of 1-hour maximum Federal hydro generation. This analysis assumed typical hourly load obligations and does not borrow water from future months, rather maximizes HLH hydro system generation using HLH and LLH marketing and within month hydro flexibility.

Using hourly HOSS relationships of Federal hydro energy to available Federal hydro capacity, different time-spans of capacity availability can be calculated. Thus methods used in BPA's short-term planning can be easily integrated into BPA's long-term planning. The duration of such a planning methodology can be set to different levels of duration and probability to ensure an adequate supply of power to meet future capacity needs.

The Federal system 120-hour load obligations and resources are illustrated below in Figure 22. Similar to the 1-hour Federal system analysis, BPA tends to have capacity deficits in the January through May time period using 1937-critical water conditions. (See Section 4, "Federal Firm Monthly 1-Hour Capacity Surplus/Deficit Projections", Figure 9, page 31.) BPA would meet these deficits using methods described in Section 4, "Planning to Meet Federal System Deficits", page 34.

Figure 22

OY 2008 Monthly Federal Firm 120-Hour Capacity Loads and Resources Using 1937-Critical Water Conditions

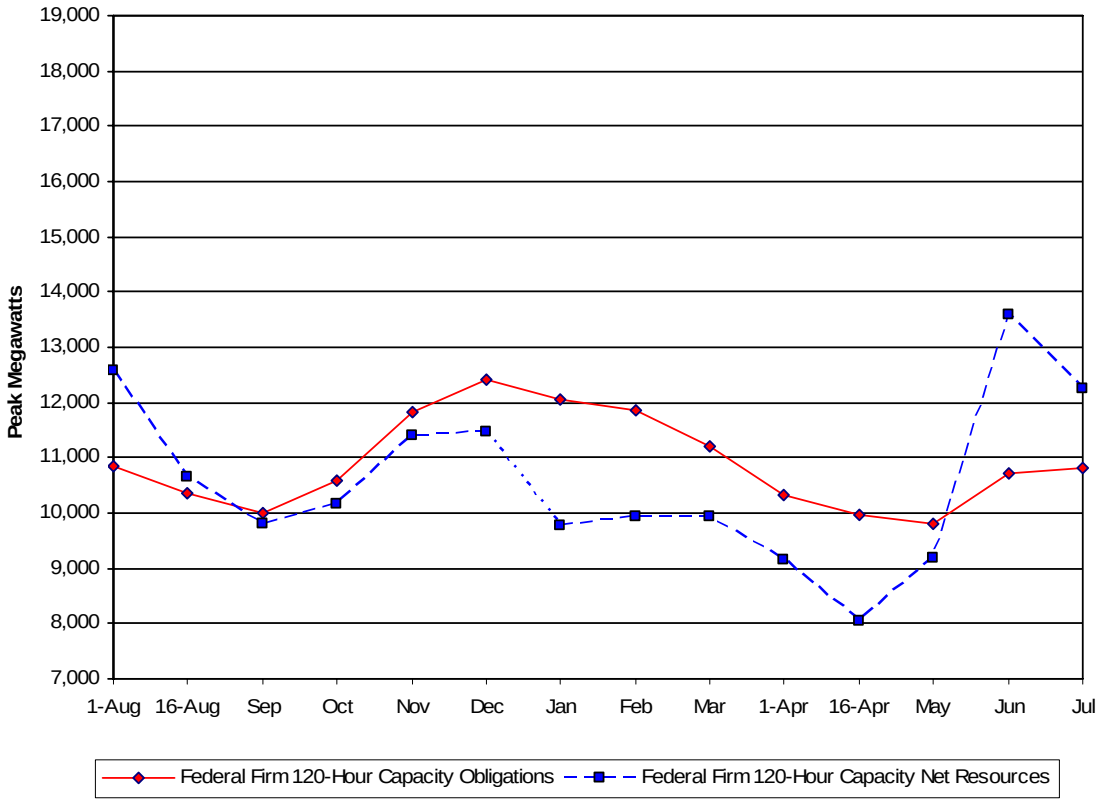
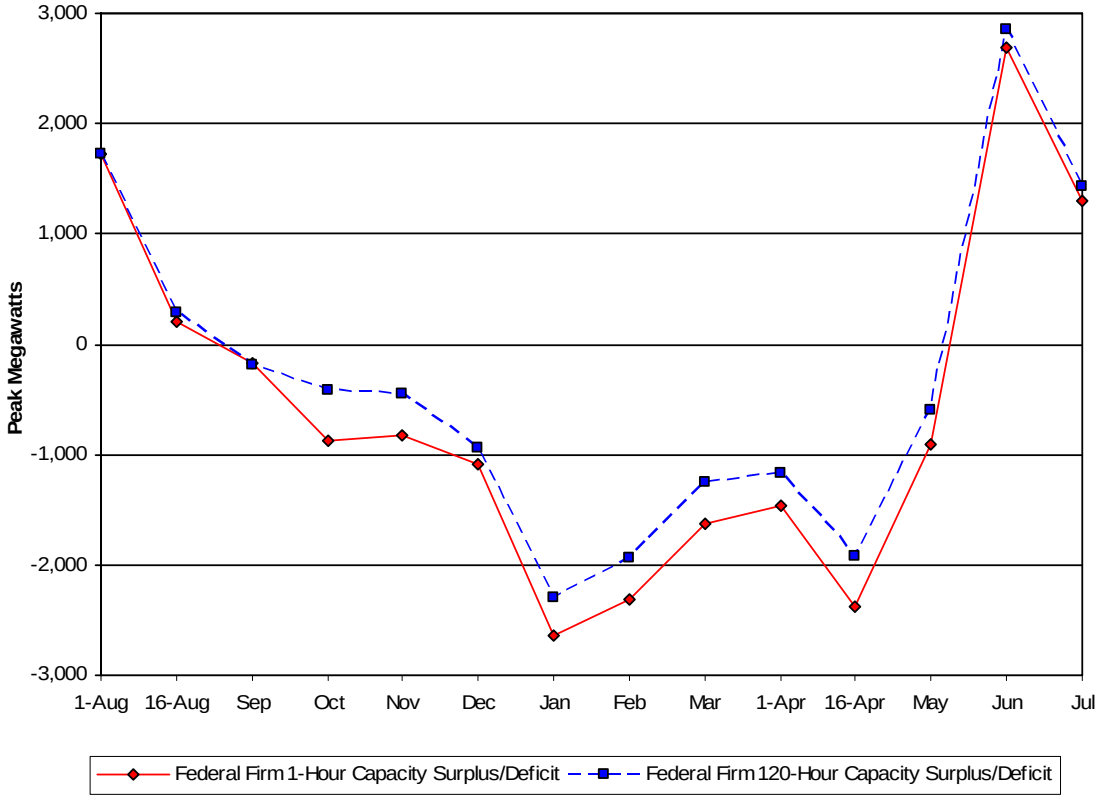


Figure 23, below, compares the Federal system 120-hour and 1-hour capacity surplus/deficits for OY 2008. The 120-hour Federal system capacity surpluses are generally larger and capacity deficits are generally smaller. This is mainly due to the fact that under low water conditions, the 120-hour Federal surplus/deficits include more hourly observations than those presented in a 1-hour study.

Figure 23

OY 2008 Monthly Federal Firm Capacity Comparison of 120-Hour and 1-Hour Capacity Surplus/Deficits Using 1937-Critical Water Conditions

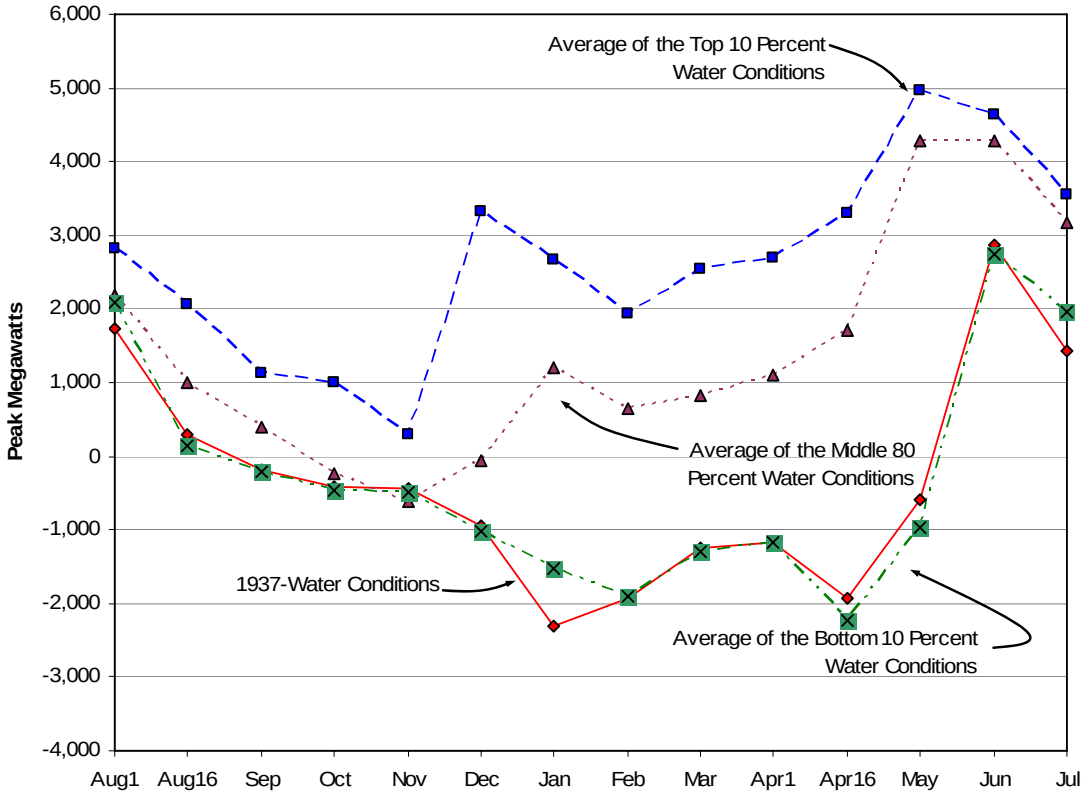


Potential Variability of Federal System 120-Hour Capacity Surplus/Deficit Projections

To illustrate the potential variability of 120-hour Federal system capacity surplus/deficits, this study compares different scenarios using varying levels of Federal system generation based on water conditions and normal weather loads. Figure 24, below, compares the 120-hour Federal system capacity surplus/deficits under four scenarios: 1) resources using 1937-critical water conditions (the base case of this study); the averages of 2) the bottom ten percent; 3) the middle 80 percent; and 4) the top ten percent of the historical 50-water year conditions (1929 through 1978). Similar to the 1-hour Federal system analysis, as the Federal system experiences better water conditions, the availability of 120-hour capacity surpluses increases—especially in the January through May time period. (See Section 4, "Potential Variability of Federal System 1-Hour Capacity Surplus/Deficit Projections", Figure 11, page 33.)

Figure 24

Potential Variability of 120-Hour Capacity Federal Surplus/Deficit Projections
Utilizing Differing Water Conditions
For OY 2008



Section 8: Federal System Exhibits

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Exhibit 1

Federal System Annual Energy Analysis Using 1937-Water Conditions for 10 Operating Years

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Exhibit 1: OY 2008 through 2017 Annual Energy

Loads and Resources - Federal System
PNW Loads and Resource Study
2008 - 2017 Operating Years
1937 Water Year
[43] 2007 White Book (Final)

3/31/2007

Energy (aMW)	2008 Avg.	2009 Avg.	2010 Avg.	2011 Avg.	2012 Avg.	2013 Avg.	2014 Avg.	2015 Avg.	2016 Avg.	2017 Avg.
Non-Utility Obligations										
Fed. Agencies 2002 PSC	130	140	143	144	146	147	148	149	151	152
USBR 2002 PSC	160	160	160	160	160	160	160	160	160	160
DSI 2002 PSC	0	0	0	0	0	0	0	0	0	0
Total Firm Non-Utility Obligations	291	301	304	305	306	307	308	310	311	313
Transfers Out										
NGP 2002 PSC	3122	3205	3266	3315	3363	3407	3455	3503	3549	3592
GPU 2002 PSC	2360	2376	2390	2398	2371	2380	2410	2444	2475	2515
NGP 2002 Slice PSC	612	606	616	609	622	612	625	614	627	615
GPU 2002 Slice PSC	1018	1010	1027	1015	1037	1019	1041	1022	1044	1025
IOU 2002 PSC	0	0	0	0	0	0	0	0	0	0
Exports	648	598	692	653	601	581	571	558	540	522
Regional Transfers (Out)	424	387	387	387	202	184	178	178	178	178
Federal Diversity	0	0	0	0	0	0	0	0	0	0
Total Transfers Out	8183	8182	8378	8377	8197	8183	8280	8319	8414	8448
Total Firm Obligations	8474	8483	8681	8682	8503	8490	8589	8629	8725	8760
Hydro Resources										
Regulated Hydro	6444	6512	6538	6553	6568	6583	6585	6585	6585	6585
Independent Hydro	374	374	374	374	359	356	356	356	356	356
Operational Peaking Adj.	0	0	0	0	0	0	0	0	0	0
Non-Fed CER (Canada)	131	132	138	140	139	137	136	134	133	131
Total Hydro Resources	6949	7018	7050	7068	7066	7076	7077	7075	7074	7072
Other Resources										
Small Thermal & Misc.	0	0	0	0	0	0	0	0	0	0
Combustion Turbines	0	0	0	0	0	0	0	0	0	0
Renewables	23	23	23	23	23	23	23	23	23	23
Cogeneration	0	0	0	0	0	0	0	0	0	0
Imports	199	184	183	175	175	175	175	175	171	155
Regional Transfers (In)	329	285	276	276	105	90	90	84	84	84
Large Thermal	1030	878	1030	878	1030	878	1030	878	1030	878
Non-Utility Generation	77	78	98	104	104	104	104	104	104	104
Augmentation Purchases	0	0	0	0	0	0	0	0	0	0
Augmentation Resources	0	0	0	0	0	0	0	0	0	0
Total Other Resources	1658	1447	1610	1456	1437	1270	1422	1263	1412	1244
Total Resources	8607	8466	8661	8524	8503	8345	8499	8339	8486	8316
Reserves & Maintenance										
Hydro Reserves	0	0	0	0	0	0	0	0	0	0
Small Thermal & Misc. Reserves	0	0	0	0	0	0	0	0	0	0
Contract Reserves	0	0	0	0	0	0	0	0	0	0
Large Thermal Reserves	0	0	0	0	0	0	0	0	0	0
Federal Hydro Maint.	0	0	0	0	0	0	0	0	0	0
Spinning Reserves	0	0	0	0	0	0	0	0	0	0
Federal Trans. Losses	-243	-239	-244	-240	-240	-235	-240	-235	-239	-235
Total Reserves, Maintenance & Losses	-243	-239	-244	-240	-240	-235	-240	-235	-239	-235
Total Net Resources	8364	8227	8416	8283	8263	8110	8259	8104	8246	8081
Total Firm Surplus/Deficit	-109	-256	-265	-399	-240	-381	-330	-525	-479	-679

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Exhibits 2 - 4

Federal System Monthly Energy Analysis Using the 2007 White Book Load Forecast for 1937-Water Conditions

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Exhibit 2: OY 2008 Monthly Energy

Loads and Resources - Federal System
PNW Loads and Resource Study
2007 - 2008 Operating Year
1937 Water Year
[43] 2007 White Book (Final)

3/31/2007

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
Non-Utility Obligations															
Fed. Agencies 2002 PSC	123	123	112	120	138	150	153	147	135	120	120	116	118	128	130
USBR 2002 PSC	252	259	219	94	14	31	70	79	50	206	242	290	287	310	160
DSI 2002 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Firm Non-Utility Obligations	376	383	331	215	153	182	223	226	185	326	362	406	404	438	291
Transfers Out															
NGP 2002 PSC	3004	3004	2725	2823	3201	3555	3605	3454	3112	2931	2924	2895	3011	3151	3122
GPU 2002 PSC	2043	2044	2171	2128	2599	2852	2874	2805	2650	2232	2226	2005	1910	2048	2360
NGP 2002 Slice PSC	726	619	566	591	674	656	517	543	571	544	490	578	768	685	612
GPU 2002 Slice PSC	1208	1031	943	984	1122	1092	861	904	951	907	816	963	1280	1140	1018
IOU 2002 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exports	670	671	664	636	631	644	641	639	628	642	634	662	662	660	648
Regional Transfers (Out)	318	319	355	383	686	699	622	559	411	379	379	184	244	243	424
Federal Diversity	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Transfers Out	7970	7688	7425	7544	8913	9498	9121	8904	8323	7635	7468	7287	7875	7928	8183
Total Firm Obligations	8345	8070	7756	7759	9066	9680	9344	9130	8508	7961	7831	7693	8279	8366	8474
Hydro Resources															
Regulated Hydro	7889	6617	5947	6159	7139	7021	5425	5734	5931	5643	4952	5857	8131	7428	6444
Independent Hydro	413	404	390	341	283	201	157	173	259	401	468	686	722	433	374
Operational Peaking Adj.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Non-Fed CER (Canada)	132	132	132	132	132	132	132	132	132	130	130	130	130	130	131
Total Hydro Resources	8434	7152	6468	6632	7554	7354	5714	6039	6322	6174	5550	6673	8983	7991	6949
Other Resources															
Small Thermal & Misc.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Combustion Turbines	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Renewables	20	20	21	22	25	26	27	27	26	25	25	22	12	20	23
Cogeneration	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Imports	134	134	165	200	268	326	299	254	225	225	173	83	101	132	199
Regional Transfers (In)	346	347	479	403	449	385	334	315	300	295	295	177	296	169	329
Large Thermal	1030	1030	1030	1030	1030	1030	1030	1030	1030	1030	1030	1030	1030	1030	1030
Non-Utility Generation	71	69	53	62	79	80	76	70	97	100	100	95	81	68	77
Augmentation Purchases	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Augmentation Resources	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Other Resources	1602	1600	1748	1717	1851	1847	1767	1695	1677	1675	1624	1406	1520	1419	1658
Total Resources	10035	8752	8216	8349	9405	9201	7481	7734	7999	7849	7174	8079	10503	9410	8607
Reserves & Maintenance															
Hydro Reserves	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Thermal & Misc. Reserves	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Contract Reserves	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Large Thermal Reserves	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Federal Hydro Maint.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Spinning Reserves	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Federal Trans. Losses	-283	-247	-232	-235	-265	-259	-211	-218	-226	-221	-202	-228	-296	-265	-243
Total Reserves, Maintenance & Losses	-283	-247	-232	-235	-265	-259	-211	-218	-226	-221	-202	-228	-296	-265	-243
Total Net Resources	9752	8505	7985	8114	9140	8942	7270	7516	7774	7628	6972	7852	10207	9145	8364
Total Firm Surplus/Deficit	1407	435	229	355	74	-738	-2074	-1614	-734	-333	-859	159	1928	779	-109

Exhibit 3: OY 2012 Monthly Energy

Loads and Resources - Federal System
PNW Loads and Resource Study
2011 - 2012 Operating Year
1937 Water Year
[43] 2007 White Book (Final)

3/31/2007

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
Non-Utility Obligations															
Fed. Agencies 2002 PSC	142	142	129	134	155	168	171	163	150	134	133	129	131	142	146
USBR 2002 PSC	252	259	219	94	14	31	70	79	50	206	242	290	287	310	160
DSI 2002 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Firm Non-Utility Obligations	395	402	348	229	169	199	241	242	201	339	376	419	417	452	306
Transfers Out															
NGP 2002 PSC	3255	3254	2957	3041	3453	3832	3883	3717	3351	3150	3142	3108	3230	3385	3363
GPU 2002 PSC	2111	2111	2254	2100	2575	2819	2858	2791	2612	2205	2198	1976	2127	2033	2371
NGP 2002 Slice PSC	756	648	571	595	680	662	521	549	575	554	500	588	789	711	622
GPU 2002 Slice PSC	1259	1078	952	991	1132	1102	868	914	958	923	833	979	1314	1184	1037
IOU 2002 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exports	661	661	656	578	570	571	570	570	569	598	598	626	626	614	601
Regional Transfers (Out)	214	214	59	108	363	418	391	347	217	190	188	0.1	53	67	202
Federal Diversity	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Transfers Out	8256	7967	7449	7413	8773	9402	9092	8887	8283	7619	7460	7277	8138	7994	8197
Total Firm Obligations	8651	8368	7797	7641	8942	9601	9333	9129	8483	7959	7836	7696	8555	8447	8503
Hydro Resources															
Regulated Hydro	8235	6935	5985	6212	7207	7084	5471	5797	5979	5753	5068	5971	8376	7741	6568
Independent Hydro	413	404	390	321	265	186	139	156	244	384	451	665	701	412	359
Operational Peaking Adj.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Non-Fed CER (Canada)	139	139	139	139	139	139	139	139	139	138	138	138	138	138	139
Total Hydro Resources	8788	7478	6513	6673	7611	7409	5750	6092	6362	6274	5657	6774	9215	8291	7066
Other Resources															
Small Thermal & Misc.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Combustion Turbines	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Renewables	20	20	21	22	25	26	27	27	26	25	25	22	12	20	23
Cogeneration	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Imports	105	104	137	169	239	293	268	223	193	196	168	76	94	125	175
Regional Transfers (In)	184	184	135	135	135	112	112	112	112	112	112	0	112	0	105
Large Thermal	1030	1030	1030	1030	1030	1030	1030	1030	1030	1030	1030	1030	1030	1030	1030
Non-Utility Generation	97	96	97	101	105	103	100	97	124	108	108	106	106	102	104
Augmentation Purchases	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Augmentation Resources	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Other Resources	1435	1435	1420	1457	1534	1564	1537	1489	1485	1472	1444	1234	1355	1277	1437
Total Resources	10223	8914	7934	8130	9145	8973	7287	7581	7847	7746	7101	8008	10570	9567	8503
Reserves & Maintenance															
Hydro Reserves	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Thermal & Misc. Reserves	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Contract Reserves	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Large Thermal Reserves	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Federal Hydro Maint.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Spinning Reserves	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Federal Trans. Losses	-288	-251	-224	-229	-258	-253	-205	-214	-221	-218	-200	-226	-298	-270	-240
Total Reserves, Maintenance & Losses	-288	-251	-224	-229	-258	-253	-205	-214	-221	-218	-200	-226	-298	-270	-240
Total Net Resources	9935	8662	7710	7901	8888	8720	7081	7367	7626	7528	6900	7782	10272	9298	8263
Total Firm Surplus/Deficit	1284	294	-87	259	-54	-881	-2252	-1761	-857	-431	-935	86	1717	851	-240

Exhibit 4: OY 2017 Monthly Energy

Loads and Resources - Federal System
PNW Loads and Resource Study
2016 - 2017 Operating Year
1937 Water Year
[43] 2007 White Book (Final)

3/31/2007

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
Non-Utility Obligations															
Fed. Agencies 2002 PSC	150	150	134	141	162	173	178	171	156	139	139	134	136	151	152
USBR 2002 PSC	252	259	219	94	14	31	70	79	50	206	242	290	287	310	160
DSI 2002 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Firm Non-Utility Obligations	403	410	353	235	176	205	248	250	207	345	381	424	423	461	313
Transfers Out															
NGP 2002 PSC	3492	3491	3178	3233	3675	4077	4146	4013	3579	3361	3353	3313	3439	3603	3592
GPU 2002 PSC	2179	2179	2333	2232	2734	2994	3039	3034	2764	2351	2344	2104	2256	2166	2515
NGP 2002 Slice PSC	763	653	576	601	686	667	527	554	581	559	505	541	710	703	615
GPU 2002 Slice PSC	1270	1088	959	1000	1142	1111	877	923	967	931	842	901	1182	1171	1025
IOU 2002 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exports	538	538	537	507	507	508	508	507	507	535	535	537	537	532	522
Regional Transfers (Out)	13	13	42	108	363	418	391	347	217	188	190	0.1	18	34	178
Federal Diversity	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Transfers Out	8253	7961	7625	7682	9107	9775	9488	9377	8614	7926	7769	7396	8143	8209	8448
Total Firm Obligations	8656	8371	7979	7917	9283	9980	9736	9628	8821	8271	8150	7820	8565	8669	8760
Hydro Resources															
Regulated Hydro	8279	6971	6008	6226	7224	7100	5483	5809	5991	5765	5080	5982	8394	7759	6585
Independent Hydro	394	385	370	321	265	186	139	156	244	384	451	665	701	412	356
Operational Peaking Adj.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Non-Fed CER (Canada)	132	132	132	132	132	132	132	132	132	130	130	130	130	130	131
Total Hydro Resources	8805	7487	6510	6679	7621	7417	5754	6097	6367	6279	5661	6777	9226	8301	7072
Other Resources															
Small Thermal & Misc.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Combustion Turbines	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Renewables	20	20	21	22	25	26	27	27	26	25	25	22	12	20	23
Cogeneration	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Imports	89	89	118	154	207	261	235	191	163	166	166	76	94	110	155
Regional Transfers (In)	0	0	112	112	112	112	112	112	112	112	112	0	112	0	84
Large Thermal	1030	1030	1030	1030	1030	1030	1030	1030	1030	1030	1030	399	0	864	878
Non-Utility Generation	97	96	97	101	105	103	100	97	124	108	108	106	106	102	104
Augmentation Purchases	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Augmentation Resources	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Other Resources	1236	1235	1378	1420	1479	1532	1504	1457	1455	1441	1441	603	325	1096	1244
Total Resources	10041	8723	7888	8099	9101	8950	7258	7554	7823	7720	7103	7380	9551	9397	8316
Reserves & Maintenance															
Hydro Reserves	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Thermal & Misc. Reserves	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Contract Reserves	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Large Thermal Reserves	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Federal Hydro Maint.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Spinning Reserves	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Federal Trans. Losses	-283	-246	-222	-228	-257	-252	-205	-213	-221	-218	-200	-208	-269	-265	-235
Total Reserves, Maintenance & Losses	-283	-246	-222	-228	-257	-252	-205	-213	-221	-218	-200	-208	-269	-265	-235
Total Net Resources	9757	8477	7665	7870	8844	8697	7053	7341	7602	7502	6902	7172	9281	9132	8081
Total Firm Surplus/Deficit	1102	106	-313	-47	-439	-1283	-2682	-2287	-1219	-769	-1248	-648	716	462	-679

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Exhibits 5 – 7

Federal System Monthly 1-Hour Capacity Analysis
Using the 2007 White Book Load Forecast for 1937-Water Conditions

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Exhibit 5: OY 2008 Monthly 1-Hour Capacity

Loads and Resources - Federal System
PNW Loads and Resource Study
2007 - 2008 Operating Year
1937 Water Year
[43] 2007 White Book (Final)

3/31/2007

Capacity (MW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul
Non-Utility Obligations														
Fed. Agencies 2002 PSC	247	247	189	233	242	227	256	241	228	212	212	203	224	217
USBR 2002 PSC	220	227	205	36	0.3	0.3	0.3	0.3	28	226	262	288	260	269
DSI 2002 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Firm Non-Utility Obligations	467	474	395	269	242	228	256	242	256	439	475	491	484	486
Transfers Out														
NGP 2002 PSC	3897	3897	3674	4274	4557	4731	5016	4820	4405	4108	4108	3922	3912	4101
GPU 2002 PSC	2370	2370	2515	2911	3429	3770	3811	3795	3500	2921	2921	2622	2316	2409
NGP 2002 Slice PSC	967	797	737	792	901	904	795	803	783	690	584	689	1060	949
GPU 2002 Slice PSC	1610	1327	1228	1319	1500	1505	1324	1337	1305	1149	973	1147	1766	1580
IOU 2002 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exports	1572	1572	1569	1546	1471	1488	1484	1484	1474	1478	1453	1517	1518	1530
Regional Transfers (Out)	730	730	759	775	999	1053	952	908	791	764	764	592	645	660
Federal Diversity	-423	-455	-482	-337	-294	-560	-350	-362	-413	-522	-542	-527	-501	-405
Total Transfers Out	10723	10238	9999	11280	12563	12890	13031	12785	11845	10587	10260	9963	10716	10824
Total Firm Obligations	11190	10712	10394	11549	12805	13118	13287	13027	12101	11026	10735	10454	11200	11310
Hydro Resources														
Regulated Hydro	20201	20085	20437	20530	20742	20502	20473	20422	20063	19278	18958	19621	20385	20519
Independent Hydro	645	659	654	682	671	494	432	487	647	701	821	864	860	634
Operational Peaking Adj.	-4365	-6888	-7978	-7601	-6518	-6925	-8659	-8083	-8079	-8202	-9553	-8931	-5157	-5304
Non-Fed CER (Canada)	228	228	228	228	228	228	228	228	228	225	225	225	225	225
Total Hydro Resources	16709	14084	13341	13839	15124	14299	12475	13054	12859	12003	10452	11779	16313	16075
Other Resources														
Small Thermal & Misc.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Combustion Turbines	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Renewables	25	25	25	27	29	30	32	31	30	29	29	27	26	24
Cogeneration	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Imports	89	89	118	154	207	261	235	191	163	166	166	76	94	110
Regional Transfers (In)	184	184	196	108	108	85	10	10	10	10	10	10	10	10
Large Thermal	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150
Non-Utility Generation	34	34	17	32	41	32	32	32	32	32	32	49	32	29
Augmentation Purchases	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Augmentation Resources	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Other Resources	1481	1481	1507	1472	1534	1559	1459	1414	1385	1387	1387	1312	1312	1323
Total Resources	18190	15565	14848	15310	16658	15858	13934	14469	14245	13389	11839	13091	17625	17397
Reserves & Maintenance														
Hydro Reserves	-1042	-1037	-1055	-1061	-1071	-1050	-1045	-1045	-1035	-999	-989	-1024	-1062	-1058
Small Thermal & Misc. Reserves	-2.9	-2.9	-2.1	-3.0	-3.5	-3.1	-3.2	-3.2	-3.1	-3.1	-3.1	-3.8	-2.9	-2.7
Contract Reserves	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Large Thermal Reserves	-172	-172	-172	-172	-172	-172	-172	-172	-172	-172	-172	-172	-172	-172
Federal Hydro Maint.	-3263	-2761	-2770	-2752	-2705	-1866	-1408	-1883	-1915	-2061	-1805	-1756	-1635	-2785
Spinning Reserves	-345	-292	-272	-285	-318	-319	-285	-288	-282	-258	-226	-260	-375	-340
Federal Trans. Losses	-448	-379	-354	-370	-415	-417	-369	-371	-363	-331	-290	-331	-482	-437
Total Reserves, Maintenance & Losses	-5273	-4643	-4625	-4643	-4685	-3828	-3283	-3763	-3771	-3826	-3485	-3548	-3729	-4794
Total Net Resources	12917	10921	10223	10668	11973	12030	10651	10706	10473	9564	8354	9544	13895	12603
Total Firm Surplus/Deficit	1726	209	-171	-881	-832	-1088	-2637	-2321	-1628	-1462	-2381	-910	2695	1293

Exhibit 6: OY 2012 Monthly 1-Hour Capacity

Loads and Resources - Federal System
PNW Loads and Resource Study
2011 - 2012 Operating Year
1937 Water Year
[43] 2007 White Book (Final)

3/31/2007

Capacity (MW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul
Non-Utility Obligations														
Fed. Agencies 2002 PSC	306	306	221	262	274	255	291	273	257	238	238	225	253	244
USBR 2002 PSC	220	227	205	36	0.3	0.3	0.3	0.3	28	226	262	288	260	269
DSI 2002 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Firm Non-Utility Obligations	526	533	426	299	274	256	291	274	285	464	500	513	513	514
Transfers Out														
NGP 2002 PSC	4256	4256	4013	4709	5016	5206	5518	5310	4859	4530	4530	4331	4312	4513
GPU 2002 PSC	2476	2476	2689	3042	3600	3893	3971	3992	3633	3042	3042	2981	2409	2521
NGP 2002 Slice PSC	996	843	739	794	903	905	789	804	784	695	592	703	1081	983
GPU 2002 Slice PSC	1659	1404	1230	1322	1503	1507	1315	1338	1305	1157	986	1171	1800	1637
IOU 2002 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exports	1581	1581	1576	1466	1420	1421	1419	1420	1419	1448	1448	1511	1512	1513
Regional Transfers (Out)	605	605	59	108	325	379	353	309	199	172	172	0.1	53	68
Federal Diversity	-512	-551	-588	-422	-375	-608	-381	-394	-448	-564	-585	-591	-541	-437
Total Transfers Out	11061	10614	9717	11019	12392	12702	12985	12778	11751	10480	10185	10106	10626	10798
Total Firm Obligations	11587	11147	10144	11318	12666	12957	13276	13052	12036	10944	10685	10618	11139	11312
Hydro Resources														
Regulated Hydro	20411	20296	20437	20530	20742	20502	20473	20422	20063	19278	18958	19621	20385	20520
Independent Hydro	645	659	654	662	653	479	414	470	632	684	804	843	839	613
Operational Peaking Adj.	-4147	-6460	-7910	-7511	-6428	-6847	-8659	-8010	-8012	-8069	-9385	-8687	-4833	-4807
Non-Fed CER (Canada)	242	242	242	242	242	242	242	242	242	238	238	238	238	238
Total Hydro Resources	17151	14736	13423	13923	15210	14376	12471	13124	12925	12131	10615	12016	16629	16564
Other Resources														
Small Thermal & Misc.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Combustion Turbines	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Renewables	25	25	25	27	29	30	32	31	30	29	29	27	26	24
Cogeneration	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Imports	89	89	118	154	207	261	235	191	163	166	166	76	94	110
Regional Transfers (In)	0	0	23	23	23	0	0	0	0	0	0	0	0	0
Large Thermal	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150
Non-Utility Generation	53	53	53	53	53	53	53	53	53	53	53	53	53	53
Augmentation Purchases	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Augmentation Resources	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Other Resources	1316	1316	1369	1407	1461	1495	1470	1425	1396	1398	1398	1306	1323	1337
Total Resources	18467	16053	14792	15330	16671	15871	13940	14549	14321	13529	12013	13322	17952	17901
Reserves & Maintenance														
Hydro Reserves	-1053	-1048	-1055	-1060	-1070	-1049	-1044	-1045	-1035	-998	-988	-1023	-1061	-1057
Small Thermal & Misc. Reserves	-3.9	-3.9	-3.9	-4	-4.1	-4.2	-4.2	-4.2	-4.2	-4.1	-4.1	-4	-3.9	-3.8
Contract Reserves	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Large Thermal Reserves	-172	-172	-172	-172	-172	-172	-172	-172	-172	-172	-172	-172	-172	-172
Federal Hydro Maint.	-3263	-2761	-2770	-2752	-2705	-1866	-1408	-1883	-1915	-2061	-1805	-1756	-1635	-2785
Spinning Reserves	-355	-308	-275	-287	-320	-321	-285	-290	-284	-262	-230	-266	-383	-353
Federal Trans. Losses	-456	-394	-352	-370	-415	-417	-369	-374	-366	-336	-295	-338	-492	-453
Total Reserves, Maintenance & Losses	-5304	-4686	-4627	-4645	-4687	-3831	-3283	-3768	-3776	-3834	-3495	-3560	-3748	-4824
Total Net Resources	13163	11366	10165	10684	11983	12040	10657	10781	10545	9695	8518	9762	14204	13077
Total Firm Surplus/Deficit	1576	220	21	-633	-683	-917	-2619	-2270	-1491	-1249	-2167	-856	3065	1766

Exhibit 7: OY 2017 Monthly 1-Hour Capacity

Loads and Resources - Federal System
PNW Loads and Resource Study
2016 - 2017 Operating Year
1937 Water Year
[43] 2007 White Book (Final)

3/31/2007

Capacity (MW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul
Non-Utility Obligations														
Fed. Agencies 2002 PSC	314	314	229	270	282	263	300	283	267	246	246	233	260	253
USBR 2002 PSC	220	227	205	36	0.3	0.3	0.3	0.3	28	226	262	288	260	269
DSI 2002 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Firm Non-Utility Obligations	534	541	434	306	282	263	301	283	294	472	508	521	521	522
Transfers Out														
NGP 2002 PSC	4669	4669	4419	5029	5360	5557	5901	5685	5199	4842	4842	4624	4597	4813
GPU 2002 PSC	2719	2719	2893	3284	3871	4195	4279	4289	3897	3279	3279	3189	2589	2699
NGP 2002 Slice PSC	997	846	739	794	903	905	788	803	784	695	592	626	1004	984
GPU 2002 Slice PSC	1661	1408	1231	1322	1504	1507	1313	1338	1305	1157	986	1043	1672	1639
IOU 2002 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exports	1437	1437	1435	1405	1404	1406	1404	1404	1404	1433	1433	1434	1435	1425
Regional Transfers (Out)	13	13	42	108	325	379	353	309	199	172	172	0.1	18	34
Federal Diversity	-557	-600	-640	-459	-408	-664	-416	-431	-489	-613	-636	-640	-586	-473
Total Transfers Out	10938	10491	10119	11483	12959	13285	13621	13398	12299	10964	10668	10277	10729	11121
Total Firm Obligations	11472	11031	10553	11789	13241	13548	13922	13681	12594	11436	11176	10798	11250	11643
Hydro Resources														
Regulated Hydro	20411	20296	20437	20530	20742	20502	20473	20422	20063	19278	18958	19621	20385	20520
Independent Hydro	626	640	634	662	653	479	414	470	632	684	804	843	839	613
Operational Peaking Adj.	-4097	-6394	-7868	-7489	-6405	-6827	-8659	-7997	-7995	-8054	-9368	-8663	-4809	-4779
Non-Fed CER (Canada)	225	225	225	225	225	225	225	225	225	223	223	223	223	223
Total Hydro Resources	17165	14767	13428	13928	15216	14379	12454	13121	12925	12131	10617	12025	16637	16577
Other Resources														
Small Thermal & Misc.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Combustion Turbines	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Renewables	25	25	25	27	29	30	32	31	30	29	29	27	26	24
Cogeneration	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Imports	89	89	118	154	207	261	235	191	163	166	166	76	94	110
Regional Transfers (In)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Large Thermal	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	0	0	1150
Non-Utility Generation	53	53	53	53	53	53	53	53	53	53	53	53	53	53
Augmentation Purchases	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Augmentation Resources	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Other Resources	1316	1316	1346	1384	1438	1495	1470	1425	1396	1398	1398	156	173	1337
Total Resources	18481	16083	14774	15312	16654	15874	13923	14546	14322	13529	12015	12181	16810	17914
Reserves & Maintenance														
Hydro Reserves	-1052	-1047	-1054	-1060	-1070	-1049	-1044	-1045	-1035	-998	-988	-1023	-1061	-1057
Small Thermal & Misc. Reserves	-3.9	-3.9	-3.9	-4	-4.1	-4.2	-4.2	-4.2	-4.2	-4.1	-4.1	-4	-3.9	-3.8
Contract Reserves	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Large Thermal Reserves	-172	-172	-172	-172	-172	-172	-172	-172	-172	-172	-172	0	0	-172
Federal Hydro Maint.	-3263	-2761	-2770	-2752	-2705	-1866	-1408	-1883	-1915	-2061	-1805	-1756	-1635	-2785
Spinning Reserves	-356	-309	-275	-288	-321	-322	-285	-290	-284	-262	-231	-232	-349	-353
Federal Trans. Losses	-457	-395	-352	-370	-415	-417	-369	-374	-366	-336	-295	-307	-461	-454
Total Reserves, Maintenance & Losses	-5304	-4688	-4626	-4645	-4687	-3831	-3283	-3768	-3776	-3834	-3496	-3323	-3511	-4825
Total Net Resources	13177	11396	10148	10667	11966	12043	10641	10778	10545	9695	8519	8858	13299	13089
Total Firm Surplus/Deficit	1705	364	-405	-1122	-1274	-1505	-3281	-2903	-2048	-1742	-2657	-1940	2049	1446

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Exhibits 8 – 17

Federal System Energy Surpluses and Deficits Using the 2007 White Book Load Forecast for 50-Historical Water Conditions

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Exhibit 8: OY 2008 Monthly 50-WY Energy

Federal Surplus/Deficit - 50 Water Year
PNW Loads and Resource Study
2007 - 2008 Operating Year
[43] 2007 White Book (Final)

3/31/2007

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1929 Federal Surplus/Deficit	2596	-188	316	19	54	-1060	-566	-1815	-473	-548	-1102	-327	2950	1186	55
1930 Federal Surplus/Deficit	860	201	195	405	158	-630	-2078	-838	-540	-105	-620	-335	1785	1619	-7.5
1931 Federal Surplus/Deficit	1430	510	46	391	77	-1157	-2020	-1827	-739	106	-1228	-337	1745	1326	-174
1932 Federal Surplus/Deficit	1213	612	311	121	-50	-1012	-1968	-2025	610	3121	3913	5322	3987	2635	1030
1933 Federal Surplus/Deficit	1033	1335	697	389	-310	-209	2959	1252	103	970	1744	3417	3205	2051	1341
1934 Federal Surplus/Deficit	2782	2162	924	1063	1314	4554	2726	2801	2762	3142	3909	5024	1456	1781	2534
1935 Federal Surplus/Deficit	618	52	-0.6	138	-420	-892	2173	2873	-659	649	1880	2670	3349	2550	1115
1936 Federal Surplus/Deficit	2222	272	303	261	15	-761	-1432	-1679	-559	187	3320	5874	3688	1314	835
1937 Federal Surplus/Deficit	1407	435	229	355	74	-738	-2074	-1614	-734	-333	-859	159	1928	779	-109
1938 Federal Surplus/Deficit	1156	258	197	449	-164	-569	2410	-56	1789	2397	3285	5781	4352	2316	1671
1939 Federal Surplus/Deficit	494	307	697	465	3.7	-735	348	-1639	8.2	898	1773	3573	1486	1741	640
1940 Federal Surplus/Deficit	1759	508	161	482	-43	-539	-150	-801	1890	1288	3087	2993	2053	1167	878
1941 Federal Surplus/Deficit	404	-89	119	456	-215	-447	197	-1688	-784	-130	-925	1211	1914	904	108
1942 Federal Surplus/Deficit	427	378	668	254	-333	981	2518	-124	-1250	222	1216	2823	4411	3303	1198
1943 Federal Surplus/Deficit	2490	1348	233	327	-178	-644	2007	1980	2684	3397	3954	5580	4250	2907	2062
1944 Federal Surplus/Deficit	2646	888	335	288	-19	-762	19	-1726	-1203	-855	-1544	-344	844	777	-102
1945 Federal Surplus/Deficit	482	146	249	176	-28	-1268	-1927	-1305	-875	-645	-1182	2791	4379	1455	254
1946 Federal Surplus/Deficit	732	425	159	155	-29	-603	1148	338	3038	3095	4186	6063	3952	3016	1788
1947 Federal Surplus/Deficit	2545	915	720	116	-63	2204	2942	2696	3252	1720	2420	5377	4157	3136	2361
1948 Federal Surplus/Deficit	1764	132	525	2462	639	1258	3867	375	1657	1403	3997	6388	5839	2924	2465
1949 Federal Surplus/Deficit	2953	2619	910	533	-96	-536	281	-119	3484	2300	4238	5811	4039	525	1741
1950 Federal Surplus/Deficit	491	-320	-38	299	-173	-916	934	3217	4123	3602	3775	5071	3034	2495	1818
1951 Federal Surplus/Deficit	2400	1498	747	1216	1055	2914	3433	2938	2811	3686	4057	6005	4105	2989	2836
1952 Federal Surplus/Deficit	2961	1501	674	1886	-18	1237	2650	1365	1431	4089	4430	6099	4587	2250	2388
1953 Federal Surplus/Deficit	1765	121	378	307	66	-960	80	1899	-30	255	1661	4467	3947	2857	1243
1954 Federal Surplus/Deficit	2503	1144	606	474	-7.8	454	1263	2893	1773	2716	2853	5677	3200	2255	1933
1955 Federal Surplus/Deficit	3920	3514	2845	651	131	539	94	-1465	-1022	277	1203	2477	3125	1964	1150
1956 Federal Surplus/Deficit	3020	2697	284	835	568	2701	3380	1725	3857	3832	3419	5831	3063	2819	2629
1957 Federal Surplus/Deficit	2900	1381	637	674	-142	64	1342	-641	1494	3439	3455	6290	3658	2180	1762
1958 Federal Surplus/Deficit	951	204	356	307	-39	-817	161	1473	1801	1477	3617	6065	4160	2051	1554
1959 Federal Surplus/Deficit	949	574	484	280	164	1639	3345	2995	1857	2583	2455	4491	3563	2701	2067
1960 Federal Surplus/Deficit	2861	1182	2904	2918	1603	2269	3283	-608	1347	3021	4158	3614	3959	2440	2445
1961 Federal Surplus/Deficit	1906	-9.6	545	371	-125	-161	1592	2314	2158	2831	2022	4957	3287	2456	1731
1962 Federal Surplus/Deficit	1490	903	199	361	89	-742	1215	-416	-596	3442	3952	4394	4004	2823	1352
1963 Federal Surplus/Deficit	2013	848	325	836	342	1718	2737	376	-332	594	760	4310	4556	2743	1643
1964 Federal Surplus/Deficit	2648	994	686	138	25	-585	823	-373	-853	1603	2242	3405	3396	2299	1059
1965 Federal Surplus/Deficit	2963	2149	1140	1232	11	2645	3415	3703	3334	2557	4244	5839	4340	2499	2843
1966 Federal Surplus/Deficit	2847	1584	683	748	-61	208	2752	-602	-720	3680	2359	3041	3370	2743	1450
1967 Federal Surplus/Deficit	2911	619	241	211	-72	-492	3494	3656	740	1050	466	3690	3250	2758	1667
1968 Federal Surplus/Deficit	3060	966	732	455	-183	-333	1910	2112	1519	-711	210	2798	3844	3246	1489
1969 Federal Surplus/Deficit	3046	1778	1646	1280	691	1315	3603	3020	1106	3680	3863	5956	3777	3009	2632
1970 Federal Surplus/Deficit	1990	448	448	433	22	-644	1373	835	320	92	1113	4251	4300	2294	1288
1971 Federal Surplus/Deficit	783	45	151	261	353	-743	3030	2990	2644	3418	4270	6032	3393	2676	2087
1972 Federal Surplus/Deficit	3757	2844	937	670	28	128	3521	3697	3225	2621	3182	5915	3838	2266	2535
1973 Federal Surplus/Deficit	3988	3105	1405	700	-96	418	2360	-1466	-876	-945	-969	1117	1755	1241	762
1974 Federal Surplus/Deficit	981	-104	-341	155	-463	1431	2912	2858	4133	3587	3878	6013	3800	1903	2214
1975 Federal Surplus/Deficit	3491	2939	831	-74	-28	-587	2095	946	2417	890	1924	4501	3914	2497	1761
1976 Federal Surplus/Deficit	1334	960	802	1299	971	3796	3383	2977	1937	3960	4149	6183	4152	2508	2767
1977 Federal Surplus/Deficit	3532	3687	3610	540	-80	-776	246	-1850	-1564	-1301	-1729	-59	583	429	264
1978 Federal Surplus/Deficit	775	395	-1.5	-104	-252	-504	1408	830	2095	3223	1910	3929	3561	3297	1451
-Ranked Averages-															
Top Ten Percent	2553	1816	924	1172	659	2674	3443	2873	2609	3543	3946	5963	3887	2765	2742
Middle Eighty Percent	1964	999	654	534	28	66	1568	748	1106	1739	2350	4331	3515	2265	1528
Bottom Ten Percent	1788	369	224	292	69	-869	-1344	-1564	-738	-347	-1071	-237	1851	1137	-67

Exhibit 9: OY 2009 Monthly 50-WY Energy

Federal Surplus/Deficit - 50 Water Year
PNW Loads and Resource Study
2008 - 2009 Operating Year
[43] 2007 White Book (Final)

3/31/2007

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1929 Federal Surplus/Deficit	2498	-315	146	-18	6.8	-1121	-628	-1940	-533	-544	-1078	-702	2294	1146	-89
1930 Federal Surplus/Deficit	743	76	25	369	112	-690	-2143	-961	-600	-100	-597	-709	1114	1567	-155
1931 Federal Surplus/Deficit	1318	389	-124	355	31	-1218	-2086	-1951	-799	111	-1204	-710	1051	1205	-328
1932 Federal Surplus/Deficit	1100	493	142	84	-97	-1073	-2034	-2151	549	3130	3899	4960	3196	2593	873
1933 Federal Surplus/Deficit	920	1225	528	352	-359	-269	2909	1142	44	977	1773	3053	2415	1827	1174
1934 Federal Surplus/Deficit	2690	2063	755	1028	1271	4507	2683	2706	2710	3112	3893	4669	729	1674	2384
1935 Federal Surplus/Deficit	503	-70	-170	101	-469	-954	2120	2772	-719	655	1912	2304	2687	2491	972
1936 Federal Surplus/Deficit	2125	154	134	224	-32	-821	-1497	-1803	-619	191	3297	5516	3027	1261	689
1937 Federal Surplus/Deficit	1297	315	59	318	28	-798	-2139	-1737	-794	-328	-835	-216	1256	725	-256
1938 Federal Surplus/Deficit	1044	137	28	412	-212	-631	2356	-175	1733	2405	3315	5421	3558	2284	1519
1939 Federal Surplus/Deficit	376	186	528	429	-44	-796	289	-1764	-52	903	1802	3210	808	1686	494
1940 Federal Surplus/Deficit	1652	389	-8.7	446	-90	-599	-210	-923	1836	1295	3122	2628	1383	1111	734
1941 Federal Surplus/Deficit	286	-213	-51	419	-263	-507	137	-1814	-845	-125	-900	844	1249	860	-37
1942 Federal Surplus/Deficit	309	260	498	216	-382	923	2465	-242	-1312	225	1243	2458	3619	3261	1044
1943 Federal Surplus/Deficit	2392	1238	63	290	-227	-707	1950	1866	2629	3364	3935	5221	3455	2683	1891
1944 Federal Surplus/Deficit	2552	774	165	251	-68	-824	-40	-1851	-1265	-852	-1521	-717	173	736	-247
1945 Federal Surplus/Deficit	362	23	80	140	-75	-1330	-1993	-1430	-936	-641	-1159	2423	3587	1420	98
1946 Federal Surplus/Deficit	616	305	-11	117	-77	-666	1089	221	2986	3104	4217	5653	3160	2970	1630
1947 Federal Surplus/Deficit	2448	801	550	77	-111	2149	2889	2587	3201	1729	2451	4972	3507	3091	2219
1948 Federal Surplus/Deficit	1660	9.9	355	2431	593	1202	3816	256	1602	1410	4031	5977	5144	2704	2303
1949 Federal Surplus/Deficit	2861	2524	740	496	-144	-597	222	-239	3432	2308	4220	5397	3245	485	1583
1950 Federal Surplus/Deficit	374	-447	-208	262	-221	-979	876	3112	4073	3612	3808	4709	2244	2274	1651
1951 Federal Surplus/Deficit	2305	1392	577	1181	1008	2861	3385	2839	2757	3652	4039	5595	3311	2767	2665
1952 Federal Surplus/Deficit	2869	1394	504	1853	-67	1180	2597	1251	1376	4052	4409	5691	3794	2223	2230
1953 Federal Surplus/Deficit	1660	-0.2	208	270	19	-1021	18	1785	-90	260	1691	4105	3156	2638	1075
1954 Federal Surplus/Deficit	2405	1033	436	437	-56	395	1206	2787	1718	2725	2883	5317	2407	2032	1767
1955 Federal Surplus/Deficit	3748	3427	2677	615	84	482	35	-1588	-1082	284	1233	2110	2336	1738	979
1956 Federal Surplus/Deficit	2929	2600	114	799	521	2648	3333	1611	3806	3797	3403	5422	2272	2596	2457
1957 Federal Surplus/Deficit	2807	1272	467	637	-190	3.6	1286	-764	1436	3449	3488	5879	2871	2140	1606
1958 Federal Surplus/Deficit	836	81	186	270	-86	-879	101	1358	1747	1484	3649	5652	3371	2011	1396
1959 Federal Surplus/Deficit	834	456	314	243	116	1584	3297	2890	1802	2593	2488	4129	2775	2482	1901
1960 Federal Surplus/Deficit	2768	1070	2736	2888	1560	2216	3233	-730	1291	2995	4143	3250	3167	2385	2290
1961 Federal Surplus/Deficit	1804	-133	375	334	-173	-220	1538	2204	2104	2843	2055	4598	2499	2396	1578
1962 Federal Surplus/Deficit	1379	786	29	324	41	-803	1158	-537	-656	3453	3939	4032	3353	2778	1208
1963 Federal Surplus/Deficit	1911	733	156	799	294	1663	2685	254	-392	601	790	3948	3838	2703	1497
1964 Federal Surplus/Deficit	2550	879	517	100	-23	-646	766	-491	-914	1608	2274	3038	2606	2076	890
1965 Federal Surplus/Deficit	2871	2047	971	1197	-36	2591	3367	3597	3281	2566	4225	5442	3543	2486	2691
1966 Federal Surplus/Deficit	2755	1479	513	712	-109	149	2700	-722	-781	3695	2393	2677	2702	2679	1307
1967 Federal Surplus/Deficit	2816	499	72	174	-120	-553	3444	3556	683	1058	494	3324	2461	2536	1501
1968 Federal Surplus/Deficit	2968	852	563	418	-231	-393	1855	2000	1463	-708	216	2432	3052	3026	1321
1969 Federal Surplus/Deficit	2954	1674	1477	1245	645	1260	3555	2915	1048	3647	3846	5547	2987	2963	2475
1970 Federal Surplus/Deficit	1884	327	278	396	-25	-705	1314	717	261	98	1144	3887	3505	2274	1136
1971 Federal Surplus/Deficit	667	-80	-19	224	306	-805	2974	2893	2590	3427	4304	5622	2605	2455	1917
1972 Federal Surplus/Deficit	3671	2748	767	633	-21	68	3470	3595	3177	2591	3215	5503	3137	2043	2374
1973 Federal Surplus/Deficit	3829	3014	1236	663	-144	359	2306	-1591	-937	-941	-943	747	1085	1188	616
1974 Federal Surplus/Deficit	865	-231	-511	118	-513	1373	2868	2762	4082	3554	3860	5601	3066	1676	2046
1975 Federal Surplus/Deficit	3406	2845	662	-113	-76	-649	2040	832	2363	896	1954	4136	3118	2273	1595
1976 Federal Surplus/Deficit	1226	848	633	1264	926	3746	3334	2871	1881	3926	4182	5771	3356	2287	2597
1977 Federal Surplus/Deficit	3361	3515	3443	503	-128	-837	188	-1975	-1626	-1334	-1733	-449	-119	304	101
1978 Federal Surplus/Deficit	657	275	-171	-141	-300	-569	1350	712	2040	3234	1941	3564	2911	3073	1294
-Ranked Averages-															
Top Ten Percent	2457	1712	754	1137	613	2621	3395	2767	2555	3518	3939	5555	3094	2620	2577
Middle Eighty Percent	1854	883	485	497	-20	6.2	1512	633	1049	1739	2369	3955	2768	2145	1371
Bottom Ten Percent	1681	248	54	255	22	-930	-1407	-1688	-798	-343	-1047	-611	1178	1076	-215

Exhibit 10: OY 2010 Monthly 50-WY Energy

Federal Surplus/Deficit - 50 Water Year
PNW Loads and Resource Study
2009 - 2010 Operating Year
[43] 2007 White Book (Final)

3/31/2007

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1929 Federal Surplus/Deficit	2551	-304	19	-133	-132	-1272	-777	-2085	-671	-696	-1230	-447	2945	1233	-97
1930 Federal Surplus/Deficit	783	87	-102	255	-26	-841	-2295	-1105	-738	-252	-749	-453	1766	1655	-162
1931 Federal Surplus/Deficit	1334	400	-252	241	-107	-1368	-2238	-2096	-937	-41	-1356	-454	1704	1293	-337
1932 Federal Surplus/Deficit	1035	421	15	-30	-235	-1224	-2186	-2296	410	2980	3754	5223	3851	2682	859
1933 Federal Surplus/Deficit	961	1229	401	238	-499	-419	2764	1003	-94	825	1624	3314	3072	1919	1168
1934 Federal Surplus/Deficit	2728	2074	628	915	1133	4363	2541	2572	2576	2967	3748	4934	1381	1763	2380
1935 Federal Surplus/Deficit	456	-125	-298	-13	-609	-1105	1975	2637	-857	503	1764	2565	3340	2580	960
1936 Federal Surplus/Deficit	2115	134	6.4	110	-170	-971	-1649	-1948	-757	39	3148	5779	3682	1348	679
1937 Federal Surplus/Deficit	1319	330	-69	204	-111	-948	-2291	-1882	-932	-480	-987	40	1907	811	-265
1938 Federal Surplus/Deficit	1020	93	-100	298	-351	-782	2210	-318	1597	2255	3167	5685	4211	2372	1507
1939 Federal Surplus/Deficit	433	234	401	314	-182	-947	141	-1909	-190	751	1652	3471	1460	1774	489
1940 Federal Surplus/Deficit	1617	341	-137	332	-229	-749	-359	-1067	1699	1143	2976	2888	2036	1199	721
1941 Federal Surplus/Deficit	268	-249	-179	305	-402	-657	-12	-1959	-983	-277	-1051	1103	1900	947	-49
1942 Federal Surplus/Deficit	357	305	371	101	-522	773	2319	-385	-1451	71	1093	2719	4274	3351	1039
1943 Federal Surplus/Deficit	2437	1261	-65	175	-366	-859	1803	1725	2493	3217	3788	5486	4109	2771	1885
1944 Federal Surplus/Deficit	2609	830	36	136	-207	-975	-189	-1997	-1404	-1004	-1674	-461	824	822	-253
1945 Federal Surplus/Deficit	407	40	-48	25	-214	-1481	-2146	-1575	-1075	-794	-1312	2681	4241	1506	91
1946 Federal Surplus/Deficit	668	333	-140	2.6	-216	-817	940	79	2851	2954	4069	5918	3815	3059	1625
1947 Federal Surplus/Deficit	2495	848	423	-38	-251	2000	2743	2447	3067	1578	2303	5235	4161	3181	2215
1948 Federal Surplus/Deficit	1711	66	228	2319	454	1054	3671	112	1466	1260	3884	6242	5802	2795	2300
1949 Federal Surplus/Deficit	2913	2569	613	382	-283	-748	74	-383	3297	2157	4074	5659	3899	570	1578
1950 Federal Surplus/Deficit	426	-411	-337	147	-360	-1131	728	2974	3940	3463	3661	4972	2901	2364	1647
1951 Federal Surplus/Deficit	2363	1440	450	1067	870	2714	3241	2703	2622	3503	3894	5860	3964	2857	2662
1952 Federal Surplus/Deficit	2916	1444	377	1740	-206	1031	2451	1110	1240	3902	4261	5956	4448	2310	2227
1953 Federal Surplus/Deficit	1714	57	80	156	-119	-1172	-133	1644	-228	109	1542	4367	3813	2729	1071
1954 Federal Surplus/Deficit	2457	1085	308	323	-195	245	1059	2649	1583	2575	2735	5581	3064	2123	1764
1955 Federal Surplus/Deficit	3637	3469	2557	500	-55	333	-113	-1733	-1220	132	1084	2369	2993	1829	968
1956 Federal Surplus/Deficit	2975	2622	-15	685	382	2500	3189	1470	3672	3649	3259	5687	2929	2687	2453
1957 Federal Surplus/Deficit	2857	1326	339	523	-330	-147	1139	-908	1299	3299	3340	6143	3529	2228	1602
1958 Federal Surplus/Deficit	894	133	58	155	-225	-1031	-48	1217	1611	1333	3500	5915	4027	2099	1392
1959 Federal Surplus/Deficit	894	511	186	128	-24	1435	3153	2753	1666	2443	2341	4392	3431	2573	1899
1960 Federal Surplus/Deficit	2812	1120	2616	2777	1422	2069	3089	-875	1155	2851	3998	3512	3822	2474	2288
1961 Federal Surplus/Deficit	1849	-98	248	220	-312	-370	1392	2064	1969	2694	1907	4862	3157	2485	1574
1962 Federal Surplus/Deficit	1364	764	-98	209	-97	-954	1011	-682	-794	3303	3795	4294	4006	2867	1198
1963 Federal Surplus/Deficit	1961	775	28	685	155	1514	2540	110	-529	450	641	4209	4492	2792	1492
1964 Federal Surplus/Deficit	2599	928	390	-15	-162	-797	618	-633	-1053	1456	2126	3299	3262	2167	886
1965 Federal Surplus/Deficit	2923	2097	845	1084	-175	2442	3224	3458	3146	2416	4077	5706	4198	2573	2688
1966 Federal Surplus/Deficit	2811	1538	385	597	-248	-0.3	2556	-866	-919	3547	2247	2938	3356	2769	1303
1967 Federal Surplus/Deficit	2795	480	-56	60	-259	-704	3300	3420	546	908	346	3585	3118	2628	1492
1968 Federal Surplus/Deficit	3012	891	436	304	-371	-543	1708	1860	1328	-861	67	2693	3708	3117	1316
1969 Federal Surplus/Deficit	2998	1729	1354	1132	507	1111	3411	2777	911	3500	3701	5812	3643	3052	2473
1970 Federal Surplus/Deficit	1937	368	150	282	-163	-855	1165	574	124	-54	996	4147	4159	2362	1131
1971 Federal Surplus/Deficit	728	-28	-148	109	167	-956	2827	2759	2454	3277	4158	5886	3262	2545	1914
1972 Federal Surplus/Deficit	3723	2795	641	518	-160	-82	3325	3457	3044	2446	3068	5768	3793	2134	2371
1973 Federal Surplus/Deficit	3717	3058	1111	549	-284	209	2160	-1736	-1076	-1094	-1094	1006	1737	1275	604
1974 Federal Surplus/Deficit	870	-242	-641	3.8	-654	1224	2726	2629	3948	3406	3715	5865	3722	1767	2039
1975 Federal Surplus/Deficit	3460	2893	535	-228	-214	-800	1893	690	2227	745	1806	4398	3774	2365	1591
1976 Federal Surplus/Deficit	1296	915	506	1150	787	3599	3190	2733	1744	3778	4036	6035	4009	2379	2595
1977 Federal Surplus/Deficit	3256	3405	3326	389	-267	-988	40	-2120	-1765	-1487	-1885	-191	532	390	83
1978 Federal Surplus/Deficit	589	216	-299	-256	-440	-722	1201	569	1905	3086	1793	3825	3563	3163	1279
-Ranked Averages-															
Top Ten Percent	2511	1761	628	1024	474	2473	3251	2628	2419	3369	3793	5820	3749	2710	2574
Middle Eighty Percent	1872	901	358	383	-159	-144	1365	492	913	1589	2221	4217	3423	2234	1364
Bottom Ten Percent	1719	269	-74	140	-116	-1081	-1558	-1833	-937	-495	-1199	-355	1829	1163	-223

Exhibit 11: OY 2011 Monthly 50-WY Energy

Federal Surplus/Deficit - 50 Water Year
PNW Loads and Resource Study
2010 - 2011 Operating Year
[43] 2007 White Book (Final)

3/31/2007

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1929 Federal Surplus/Deficit	2542	-315	28	-150	-157	-1308	-811	-2120	-696	-719	-1248	-912	2162	1067	-231
1930 Federal Surplus/Deficit	771	76	-93	241	-50	-876	-2333	-1139	-762	-275	-767	-919	985	1493	-296
1931 Federal Surplus/Deficit	1323	389	-243	226	-132	-1403	-2276	-2131	-962	-63	-1375	-919	925	1131	-471
1932 Federal Surplus/Deficit	1023	411	25	-45	-261	-1259	-2225	-2331	385	2961	3752	4772	3077	2521	728
1933 Federal Surplus/Deficit	949	1219	411	223	-527	-454	2741	978	-116	804	1611	2860	2299	1764	1039
1934 Federal Surplus/Deficit	2719	2066	638	901	1110	4338	2520	2555	2560	2959	3744	4487	600	1602	2255
1935 Federal Surplus/Deficit	444	-137	-289	-28	-637	-1141	1950	2617	-881	482	1755	2110	2561	2421	830
1936 Federal Surplus/Deficit	2105	122	16	95	-195	-1005	-1686	-1983	-782	17	3134	5330	2904	1185	547
1937 Federal Surplus/Deficit	1308	319	-60	189	-135	-982	-2329	-1916	-956	-502	-1005	-424	1124	646	-399
1938 Federal Surplus/Deficit	1008	82	-91	284	-378	-819	2184	-350	1577	2235	3157	5238	3433	2210	1377
1939 Federal Surplus/Deficit	420	223	411	299	-208	-983	110	-1944	-215	729	1639	3018	678	1612	357
1940 Federal Surplus/Deficit	1606	330	-128	318	-254	-784	-393	-1102	1679	1122	2969	2432	1255	1035	589
1941 Federal Surplus/Deficit	255	-261	-170	290	-429	-693	-44	-1995	-1009	-299	-1069	644	1118	782	-183
1942 Federal Surplus/Deficit	343	294	380	85	-550	739	2293	-415	-1477	47	1077	2262	3497	3192	907
1943 Federal Surplus/Deficit	2427	1251	-56	160	-394	-897	1773	1695	2473	3205	3781	5038	3331	2610	1755
1944 Federal Surplus/Deficit	2599	819	45	119	-234	-1011	-221	-2032	-1429	-1028	-1694	-925	38	656	-387
1945 Federal Surplus/Deficit	394	29	-39	9.8	-239	-1517	-2185	-1610	-1099	-817	-1331	2222	3464	1341	-43
1946 Federal Surplus/Deficit	655	322	-131	-13	-243	-855	907	48	2833	2937	4061	5470	3039	2899	1495
1947 Federal Surplus/Deficit	2485	838	432	-56	-278	1968	2716	2421	3053	1560	2293	4784	3383	3022	2086
1948 Federal Surplus/Deficit	1700	54	237	2310	429	1022	3647	80	1446	1240	3877	5794	5029	2639	2172
1949 Federal Surplus/Deficit	2903	2561	623	366	-310	-784	43	-415	3280	2137	4069	5207	3121	403	1447
1950 Federal Surplus/Deficit	413	-424	-328	131	-387	-1168	698	2950	3926	3447	3654	4523	2128	2206	1519
1951 Federal Surplus/Deficit	2352	1431	459	1052	844	2686	3219	2684	2604	3489	3890	5412	3186	2700	2536
1952 Federal Surplus/Deficit	2907	1435	386	1728	-234	999	2425	1082	1222	3884	4251	5509	3671	2148	2098
1953 Federal Surplus/Deficit	1703	45	89	141	-144	-1207	-168	1616	-252	87	1530	3916	3040	2572	940
1954 Federal Surplus/Deficit	2447	1075	318	308	-221	211	1029	2626	1565	2556	2725	5133	2291	1966	1636
1955 Federal Surplus/Deficit	3630	3463	2571	486	-81	301	-145	-1767	-1245	110	1071	1911	2220	1674	839
1956 Federal Surplus/Deficit	2966	2615	-5.6	671	356	2471	3167	1441	3657	3635	3257	5240	2156	2531	2327
1957 Federal Surplus/Deficit	2847	1316	348	508	-357	-182	1111	-942	1276	3281	3332	5694	2757	2066	1472
1958 Federal Surplus/Deficit	882	121	67	139	-251	-1068	-81	1188	1593	1314	3490	5464	3253	1936	1262
1959 Federal Surplus/Deficit	881	500	196	112	-51	1403	3131	2729	1647	2427	2334	3944	2659	2418	1772
1960 Federal Surplus/Deficit	2803	1110	2629	2767	1399	2040	3065	-909	1134	2844	3995	3059	3046	2314	2160
1961 Federal Surplus/Deficit	1839	-110	258	205	-340	-404	1365	2038	1950	2679	1898	4414	2385	2325	1446
1962 Federal Surplus/Deficit	1353	754	-89	194	-123	-990	981	-715	-819	3285	3794	3843	3226	2708	1067
1963 Federal Surplus/Deficit	1950	765	37	669	129	1484	2516	75	-553	429	629	3756	3714	2631	1362
1964 Federal Surplus/Deficit	2589	918	400	-31	-188	-832	589	-663	-1077	1434	2116	2844	2489	2012	756
1965 Federal Surplus/Deficit	2913	2089	855	1071	-201	2411	3202	3433	3129	2398	4069	5258	3420	2410	2560
1966 Federal Surplus/Deficit	2802	1529	394	583	-274	-34	2531	-898	-945	3533	2239	2484	2578	2611	1174
1967 Federal Surplus/Deficit	2786	469	-47	44	-285	-739	3276	3400	524	890	334	3132	2345	2474	1364
1968 Federal Surplus/Deficit	3003	881	446	288	-398	-578	1681	1832	1308	-884	55	2238	2933	2962	1187
1969 Federal Surplus/Deficit	2989	1720	1365	1119	481	1080	3388	2754	889	3488	3698	5365	2871	2893	2346
1970 Federal Surplus/Deficit	1926	357	160	266	-189	-890	1133	543	101	-76	983	3692	3381	2199	999
1971 Federal Surplus/Deficit	715	-40	-140	94	141	-993	2797	2740	2434	3259	4153	5438	2488	2388	1786
1972 Federal Surplus/Deficit	3715	2788	650	503	-188	-117	3299	3435	3032	2437	3060	5320	3020	1977	2244
1973 Federal Surplus/Deficit	3710	3051	1121	534	-311	174	2133	-1772	-1101	-1117	-1111	545	955	1111	471
1974 Federal Surplus/Deficit	858	-253	-633	-12	-684	1191	2705	2612	3933	3394	3713	5417	2948	1611	1912
1975 Federal Surplus/Deficit	3451	2886	545	-245	-240	-837	1864	660	2209	725	1796	3945	2998	2211	1462
1976 Federal Surplus/Deficit	1284	905	515	1136	762	3571	3167	2710	1722	3764	4029	5587	3228	2223	2468
1977 Federal Surplus/Deficit	3250	3401	3341	374	-294	-1024	9.1	-2156	-1791	-1511	-1906	-652	-251	226	-50
1978 Federal Surplus/Deficit	578	205	-290	-272	-467	-761	1169	537	1887	3072	1783	3372	2781	3003	1148
-Ranked Averages-															
Top Ten Percent	2501	1752	638	1010	448	2444	3229	2604	2400	3355	3789	5372	2972	2551	2447
Middle Eighty Percent	1862	891	367	368	-185	-179	1337	462	892	1570	2211	3765	2646	2075	1235
Bottom Ten Percent	1708	258	-65	125	-142	-1116	-1594	-1868	-961	-518	-1218	-820	1047	998	-357

Exhibit 12: OY 2012 Monthly 50-WY Energy

Federal Surplus/Deficit - 50 Water Year
PNW Loads and Resource Study
2011 - 2012 Operating Year
[43] 2007 White Book (Final)

3/31/2007

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1929 Federal Surplus/Deficit	2521	-341	0.8	-77	-76	-1212	-733	-1967	-599	-650	-1180	-403	2757	1273	-72
1930 Federal Surplus/Deficit	745	50	-120	315	32	-780	-2256	-983	-665	-207	-702	-410	1580	1701	-137
1931 Federal Surplus/Deficit	1299	365	-271	302	-53	-1307	-2197	-1976	-864	6.8	-1306	-409	1521	1339	-311
1932 Federal Surplus/Deficit	1000	388	-0.2	31	-178	-1159	-2148	-2178	480	3036	3836	5295	3678	2731	890
1933 Federal Surplus/Deficit	923	1197	385	294	-448	-356	2833	1139	-19	876	1684	3381	2900	1979	1202
1934 Federal Surplus/Deficit	2700	2048	612	971	1192	4449	2613	2725	2663	3044	3828	5012	1194	1812	2421
1935 Federal Surplus/Deficit	418	-162	-316	52	-550	-1041	2040	2785	-784	554	1834	2629	3157	2634	994
1936 Federal Surplus/Deficit	2084	97	-11	173	-108	-906	-1606	-1830	-684	87	3207	5856	3502	1392	710
1937 Federal Surplus/Deficit	1284	294	-87	259	-54	-881	-2252	-1761	-857	-431	-935	86	1717	851	-240
1938 Federal Surplus/Deficit	984	57	-118	355	-298	-721	2274	-192	1676	2308	3233	5764	4032	2419	1540
1939 Federal Surplus/Deficit	392	197	385	373	-127	-887	191	-1791	-120	797	1709	3539	1271	1820	517
1940 Federal Surplus/Deficit	1584	306	-155	392	-176	-686	-311	-948	1778	1190	3045	2950	1850	1242	750
1941 Federal Surplus/Deficit	227	-287	-197	365	-349	-594	39	-1842	-914	-228	-998	1159	1711	987	-23
1942 Federal Surplus/Deficit	316	269	353	159	-470	840	2381	-259	-1381	117	1150	2781	4095	3404	1069
1943 Federal Surplus/Deficit	2406	1229	-84	233	-315	-799	1859	1853	2572	3287	3862	5566	3930	2821	1919
1944 Federal Surplus/Deficit	2577	795	17	190	-156	-916	-141	-1882	-1332	-960	-1627	-413	631	861	-229
1945 Federal Surplus/Deficit	367	2.9	-66	83	-156	-1419	-2111	-1455	-1004	-748	-1263	2737	4064	1548	117
1946 Federal Surplus/Deficit	628	297	-159	58	-165	-761	987	202	2933	3012	4138	5998	3640	3110	1657
1947 Federal Surplus/Deficit	2464	814	406	14	-199	2067	2800	2581	3154	1633	2368	5309	3982	3234	2249
1948 Federal Surplus/Deficit	1677	28	210	2388	510	1121	3734	233	1546	1310	3954	6323	5633	2853	2336
1949 Federal Surplus/Deficit	2883	2543	597	441	-230	-689	124	-260	3381	2207	4147	5733	3720	607	1609
1950 Federal Surplus/Deficit	385	-452	-357	206	-307	-1074	779	3113	4029	3525	3734	5048	2732	2420	1682
1951 Federal Surplus/Deficit	2330	1409	432	1122	922	2788	3308	2848	2704	3566	3972	5942	3784	2914	2700
1952 Federal Surplus/Deficit	2888	1413	359	1802	-157	1098	2510	1239	1321	3958	4328	6039	4271	2355	2261
1953 Federal Surplus/Deficit	1680	19	62	214	-63	-1111	-91	1774	-159	156	1602	4438	3644	2785	1102
1954 Federal Surplus/Deficit	2426	1052	291	381	-139	309	1114	2788	1666	2630	2800	5660	2894	2180	1800
1955 Federal Surplus/Deficit	3614	3448	2551	560	2.1	400	-63	-1613	-1149	179	1142	2428	2824	1889	1002
1956 Federal Surplus/Deficit	2945	2597	-33	746	437	2572	3256	1598	3759	3714	3343	5769	2760	2745	2492
1957 Federal Surplus/Deficit	2827	1293	321	581	-278	-87	1194	-790	1371	3355	3409	6223	3361	2274	1634
1958 Federal Surplus/Deficit	855	95	40	212	-169	-973	-2	1343	1694	1387	3566	5989	3855	2144	1424
1959 Federal Surplus/Deficit	855	476	169	185	31	1505	3224	2892	1748	2502	2412	4468	3262	2633	1937
1960 Federal Surplus/Deficit	2783	1088	2609	2846	1482	2141	3154	-755	1234	2925	4075	3579	3645	2524	2325
1961 Federal Surplus/Deficit	1816	-136	231	280	-260	-304	1452	2200	2053	2758	1977	4939	2987	2535	1610
1962 Federal Surplus/Deficit	1329	731	-117	271	-41	-891	1066	-561	-722	3356	3875	4368	3822	2920	1230
1963 Federal Surplus/Deficit	1928	741	10	743	207	1583	2605	228	-455	500	702	4277	4316	2841	1524
1964 Federal Surplus/Deficit	2569	894	374	39	-106	-732	674	-506	-982	1502	2189	3365	3093	2227	919
1965 Federal Surplus/Deficit	2893	2069	829	1147	-120	2511	3293	3592	3230	2474	4149	5786	4019	2619	2725
1966 Federal Surplus/Deficit	2783	1507	367	652	-197	64	2618	-745	-850	3608	2314	3005	3176	2823	1335
1967 Federal Surplus/Deficit	2768	445	-74	117	-203	-642	3369	3566	622	966	411	3654	2950	2691	1529
1968 Federal Surplus/Deficit	2985	858	420	359	-319	-483	1765	1988	1406	-818	127	2758	3536	3179	1349
1969 Federal Surplus/Deficit	2971	1700	1341	1192	560	1180	3477	2915	985	3567	3779	5895	3475	3104	2511
1970 Federal Surplus/Deficit	1904	332	133	346	-101	-789	1218	701	200	-3.8	1060	4211	3978	2406	1162
1971 Federal Surplus/Deficit	689	-66	-168	166	222	-899	2880	2905	2533	3330	4231	5967	3091	2600	1949
1972 Federal Surplus/Deficit	3698	2771	624	576	-109	-21	3386	3597	3138	2522	3141	5849	3625	2190	2410
1973 Federal Surplus/Deficit	3694	3035	1096	609	-232	273	2220	-1619	-1006	-1046	-1040	1059	1549	1318	632
1974 Federal Surplus/Deficit	833	-280	-662	62	-607	1289	2794	2779	4035	3475	3798	5946	3553	1826	2077
1975 Federal Surplus/Deficit	3432	2870	519	-176	-160	-740	1952	817	2310	796	1871	4468	3598	2427	1625
1976 Federal Surplus/Deficit	1257	880	488	1210	844	3674	3257	2870	1819	3843	4110	6115	3825	2438	2632
1977 Federal Surplus/Deficit	3234	3387	3323	445	-217	-929	90	-2005	-1695	-1442	-1839	-137	344	431	110
1978 Federal Surplus/Deficit	553	181	-317	-200	-386	-670	1249	691	1987	3149	1859	3896	3377	3214	1309
-Ranked Averages-															
Top Ten Percent	2479	1731	612	1083	528	2545	3318	2765	2499	3433	3871	5901	3573	2764	2612
Middle Eighty Percent	1839	868	341	441	-104	-81	1421	620	990	1644	2287	4288	3246	2286	1397
Bottom Ten Percent	1685	233	-92	198	-62	-1019	-1516	-1714	-864	-448	-1150	-310	1641	1205	-198

Exhibit 13: OY 2013 Monthly 50-WY Energy

Federal Surplus/Deficit - 50 Water Year
PNW Loads and Resource Study
2012 - 2013 Operating Year
[43] 2007 White Book (Final)

3/31/2007

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1929 Federal Surplus/Deficit	2582	-288	39	-85	-89	-1228	-785	-2126	-637	-689	-1217	-960	1953	1170	-213
1930 Federal Surplus/Deficit	800	104	-81	309	20	-795	-2312	-1142	-703	-246	-739	-967	778	1600	-278
1931 Federal Surplus/Deficit	1357	420	-233	296	-65	-1322	-2254	-2136	-902	-33	-1344	-966	721	1238	-452
1932 Federal Surplus/Deficit	1058	445	40	24	-190	-1175	-2205	-2338	442	3000	3813	4750	2882	2631	752
1933 Federal Surplus/Deficit	979	1255	422	287	-463	-371	2790	987	-55	838	1652	2835	2106	1885	1065
1934 Federal Surplus/Deficit	2762	2108	650	966	1182	4443	2571	2580	2633	3018	3803	4471	392	1713	2287
1935 Federal Surplus/Deficit	483	-99	-268	46	-565	-1057	1995	2637	-821	515	1805	2081	2356	2535	858
1936 Federal Surplus/Deficit	2146	153	32	166	-120	-920	-1662	-1989	-722	47	3174	5313	2703	1290	571
1937 Federal Surplus/Deficit	1343	350	-51	253	-66	-896	-2308	-1920	-895	-470	-972	-471	913	747	-381
1938 Federal Surplus/Deficit	1041	112	-80	349	-312	-738	2228	-349	1642	2271	3203	5223	3233	2319	1402
1939 Federal Surplus/Deficit	446	251	425	366	-140	-903	141	-1950	-158	759	1675	2992	468	1719	377
1940 Federal Surplus/Deficit	1643	361	-114	386	-188	-701	-363	-1107	1743	1151	3017	2400	1049	1141	611
1941 Federal Surplus/Deficit	282	-233	-159	359	-363	-609	-12	-2003	-953	-267	-1034	608	908	884	-164
1942 Federal Surplus/Deficit	371	324	393	152	-484	826	2335	-415	-1421	76	1114	2231	3297	3306	930
1943 Federal Surplus/Deficit	2466	1286	-44	226	-329	-818	1809	1698	2538	3258	3835	5024	3131	2721	1782
1944 Federal Surplus/Deficit	2636	850	53	182	-170	-933	-192	-2042	-1372	-1001	-1666	-970	-175	757	-371
1945 Federal Surplus/Deficit	422	57	-25	76	-169	-1435	-2168	-1615	-1042	-788	-1301	2185	3265	1445	-24
1946 Federal Surplus/Deficit	683	352	-120	50	-179	-779	936	46	2901	2978	4109	5456	2843	3011	1519
1947 Federal Surplus/Deficit	2524	870	447	5.8	-213	2055	2753	2428	3124	1597	2339	4764	3183	3136	2112
1948 Federal Surplus/Deficit	1736	82	249	2386	498	1109	3689	75	1512	1274	3927	5782	4838	2758	2200
1949 Federal Surplus/Deficit	2946	2607	637	434	-244	-705	74	-417	3350	2170	4121	5187	2921	501	1472
1950 Federal Surplus/Deficit	440	-399	-317	199	-321	-1091	729	2963	4001	3491	3707	4505	1938	2323	1546
1951 Federal Surplus/Deficit	2390	1467	471	1116	910	2779	3265	2701	2671	3534	3948	5400	2985	2817	2565
1952 Federal Surplus/Deficit	2951	1472	398	1798	-171	1085	2463	1085	1288	3923	4298	5497	3472	2254	2124
1953 Federal Surplus/Deficit	1738	72	101	207	-75	-1126	-144	1619	-197	117	1570	3893	2850	2689	964
1954 Federal Surplus/Deficit	2486	1109	331	374	-152	295	1066	2638	1634	2595	2770	5119	2099	2084	1664
1955 Federal Surplus/Deficit	3679	3511	2597	554	-10	387	-114	-1773	-1187	140	1109	1877	2030	1796	865
1956 Federal Surplus/Deficit	3006	2658	5.3	740	424	2561	3214	1443	3729	3683	3320	5227	1965	2649	2358
1957 Federal Surplus/Deficit	2890	1352	360	574	-291	-102	1147	-949	1335	3320	3380	5680	2567	2174	1497
1958 Federal Surplus/Deficit	911	148	78	204	-182	-990	-54	1188	1662	1350	3536	5444	3059	2043	1285
1959 Federal Surplus/Deficit	910	531	208	178	17	1493	3182	2742	1715	2468	2385	3926	2468	2539	1801
1960 Federal Surplus/Deficit	2844	1144	2656	2845	1471	2131	3111	-914	1199	2899	4051	3033	2848	2425	2189
1961 Federal Surplus/Deficit	1877	-82	268	274	-274	-318	1405	2047	2020	2725	1947	4398	2192	2437	1474
1962 Federal Surplus/Deficit	1387	787	-78	264	-53	-907	1017	-719	-760	3321	3853	3823	3021	2821	1092
1963 Federal Surplus/Deficit	1987	797	49	736	194	1572	2560	69	-493	462	669	3730	3517	2742	1386
1964 Federal Surplus/Deficit	2630	951	416	32	-119	-748	625	-662	-1020	1463	2159	2816	2299	2132	781
1965 Federal Surplus/Deficit	2954	2129	870	1142	-133	2499	3251	3441	3198	2439	4121	5244	3221	2518	2589
1966 Federal Surplus/Deficit	2844	1565	403	645	-210	50	2574	-903	-889	3577	2286	2457	2377	2726	1197
1967 Federal Surplus/Deficit	2830	501	-35	111	-215	-657	3325	3418	586	931	380	3107	2155	2597	1393
1968 Federal Surplus/Deficit	3048	915	460	352	-333	-498	1717	1834	1372	-858	95	2209	2740	3084	1212
1969 Federal Surplus/Deficit	3036	1760	1383	1187	547	1168	3435	2765	949	3537	3755	5354	2681	3006	2377
1970 Federal Surplus/Deficit	1973	396	181	339	-113	-804	1167	544	164	-43	1028	3663	3179	2305	1025
1971 Federal Surplus/Deficit	744	-12	-131	158	209	-916	2831	2759	2499	3295	4205	5426	2295	2504	1812
1972 Federal Surplus/Deficit	3761	2833	664	569	-123	-36	3341	3448	3111	2496	3113	5308	2830	2093	2275
1973 Federal Surplus/Deficit	3758	3098	1136	602	-246	258	2174	-1779	-1045	-1087	-1077	506	747	1216	493
1974 Federal Surplus/Deficit	889	-227	-625	55	-623	1275	2752	2634	4005	3445	3774	5405	2758	1732	1942
1975 Federal Surplus/Deficit	3494	2932	556	-184	-173	-757	1904	662	2276	759	1841	3923	2802	2333	1488
1976 Federal Surplus/Deficit	1313	936	527	1204	832	3665	3214	2719	1784	3812	4083	5574	3024	2342	2496
1977 Federal Surplus/Deficit	3299	3452	3369	438	-231	-945	41	-2165	-1735	-1483	-1878	-690	-460	328	-30
1978 Federal Surplus/Deficit	610	237	-278	-207	-400	-689	1198	534	1954	3117	1829	3350	2575	3116	1171
-Ranked Averages-															
Top Ten Percent	2540	1790	651	1078	516	2534	3276	2614	2466	3401	3845	5360	2775	2666	2477
Middle Eighty Percent	1899	925	381	435	-118	-95	1373	465	955	1608	2257	3743	2448	2187	1260
Bottom Ten Percent	1744	288	-54	191	-74	-1035	-1570	-1873	-902	-488	-1188	-867	838	1102	-339

Exhibit 14: OY 2014 Monthly 50-WY Energy

Federal Surplus/Deficit - 50 Water Year
PNW Loads and Resource Study
2013 - 2014 Operating Year
[43] 2007 White Book (Final)

3/31/2007

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1929 Federal Surplus/Deficit	2557	-320	7.1	-155	-171	-1318	-876	-2209	-714	-762	-1290	-502	2694	1208	-162
1930 Federal Surplus/Deficit	769	73	-114	239	-62	-885	-2402	-1224	-780	-319	-812	-509	1519	1638	-227
1931 Federal Surplus/Deficit	1328	390	-265	226	-147	-1412	-2344	-2218	-979	-105	-1416	-508	1462	1277	-401
1932 Federal Surplus/Deficit	1029	416	9.5	-45	-272	-1265	-2295	-2420	364	2928	3741	5209	3623	2670	803
1933 Federal Surplus/Deficit	948	1227	391	217	-545	-460	2700	905	-133	765	1580	3293	2847	1924	1116
1934 Federal Surplus/Deficit	2737	2083	619	896	1100	4353	2481	2498	2555	2945	3731	4929	1133	1751	2339
1935 Federal Surplus/Deficit	452	-130	-301	-24	-647	-1147	1905	2555	-899	443	1732	2540	3098	2574	909
1936 Federal Surplus/Deficit	2120	122	0.4	96	-202	-1010	-1752	-2072	-800	-25	3101	5771	3444	1329	622
1937 Federal Surplus/Deficit	1315	320	-83	183	-148	-986	-2398	-2003	-972	-542	-1045	-12	1654	786	-330
1938 Federal Surplus/Deficit	1012	81	-112	279	-394	-828	2138	-431	1564	2198	3131	5681	3974	2357	1453
1939 Federal Surplus/Deficit	414	219	394	296	-222	-993	51	-2033	-235	686	1603	3450	1209	1757	428
1940 Federal Surplus/Deficit	1615	331	-147	316	-270	-791	-453	-1190	1666	1079	2945	2859	1790	1179	662
1941 Federal Surplus/Deficit	250	-265	-192	289	-445	-699	-102	-2085	-1030	-340	-1107	1066	1649	922	-113
1942 Federal Surplus/Deficit	339	293	361	82	-566	736	2245	-498	-1498	3.1	1042	2690	4038	3345	981
1943 Federal Surplus/Deficit	2440	1257	-77	157	-411	-907	1719	1616	2461	3185	3762	5483	3872	2759	1833
1944 Federal Surplus/Deficit	2609	820	19	112	-252	-1023	-283	-2124	-1449	-1073	-1738	-511	566	795	-320
1945 Federal Surplus/Deficit	390	25	-57	6.3	-251	-1525	-2258	-1698	-1119	-860	-1374	2643	4006	1483	27
1946 Federal Surplus/Deficit	652	321	-153	-20	-261	-869	846	-37	2824	2905	4037	5915	3584	3050	1570
1947 Federal Surplus/Deficit	2498	840	415	-64	-295	1965	2663	2346	3047	1524	2266	5223	3924	3174	2164
1948 Federal Surplus/Deficit	1707	50	216	2316	415	1019	3599	-7.3	1434	1201	3855	6240	5579	2796	2251
1949 Federal Surplus/Deficit	2921	2582	605	364	-326	-795	-16	-500	3272	2097	4049	5646	3662	540	1523
1950 Federal Surplus/Deficit	407	-433	-351	129	-403	-1181	639	2881	3923	3418	3635	4963	2679	2362	1596
1951 Federal Surplus/Deficit	2362	1438	439	1046	828	2689	3175	2619	2594	3461	3876	5859	3726	2855	2617
1952 Federal Surplus/Deficit	2925	1444	366	1729	-253	995	2373	1002	1211	3851	4226	5956	4213	2293	2176
1953 Federal Surplus/Deficit	1710	40	68	137	-157	-1216	-234	1537	-274	45	1498	4351	3591	2727	1015
1954 Federal Surplus/Deficit	2459	1080	299	304	-234	205	976	2556	1556	2522	2698	5577	2840	2122	1715
1955 Federal Surplus/Deficit	3657	3489	2572	484	-92	297	-204	-1855	-1264	67	1037	2335	2771	1834	917
1956 Federal Surplus/Deficit	2980	2634	-27	670	342	2471	3124	1361	3652	3610	3248	5686	2707	2688	2409
1957 Federal Surplus/Deficit	2865	1323	327	504	-374	-192	1056	-1031	1257	3248	3308	6138	3308	2212	1548
1958 Federal Surplus/Deficit	880	116	46	134	-264	-1080	-144	1106	1584	1278	3463	5903	3800	2081	1336
1959 Federal Surplus/Deficit	879	500	176	108	-65	1403	3092	2660	1637	2395	2312	4384	3209	2578	1852
1960 Federal Surplus/Deficit	2819	1115	2630	2775	1389	2041	3020	-996	1121	2826	3978	3491	3589	2464	2241
1961 Federal Surplus/Deficit	1850	-114	236	204	-356	-408	1315	1965	1943	2652	1875	4856	2933	2475	1525
1962 Federal Surplus/Deficit	1358	758	-111	195	-136	-997	927	-801	-838	3249	3780	4281	3762	2859	1143
1963 Federal Surplus/Deficit	1959	768	16	666	112	1482	2470	-13	-570	390	597	4188	4258	2780	1437
1964 Federal Surplus/Deficit	2605	921	384	-38	-201	-838	535	-744	-1098	1390	2086	3275	3040	2171	832
1965 Federal Surplus/Deficit	2929	2103	839	1072	-215	2409	3161	3358	3121	2367	4048	5703	3962	2556	2641
1966 Federal Surplus/Deficit	2819	1537	371	575	-292	-40	2484	-985	-966	3504	2214	2916	3119	2765	1249
1967 Federal Surplus/Deficit	2806	471	-67	41	-298	-747	3235	3336	509	858	307	3565	2897	2635	1444
1968 Federal Surplus/Deficit	3024	886	429	282	-415	-588	1627	1752	1295	-930	22	2668	3481	3123	1263
1969 Federal Surplus/Deficit	3012	1734	1354	1117	465	1078	3345	2683	871	3465	3682	5812	3422	3045	2428
1970 Federal Surplus/Deficit	1945	365	149	269	-195	-894	1076	461	86	-115	955	4121	3920	2343	1076
1971 Federal Surplus/Deficit	713	-45	-165	89	127	-1006	2741	2676	2421	3222	4133	5884	3036	2542	1863
1972 Federal Surplus/Deficit	3738	2809	632	499	-205	-126	3251	3366	3034	2424	3040	5766	3571	2131	2327
1973 Federal Surplus/Deficit	3736	3075	1106	533	-328	168	2083	-1861	-1122	-1159	-1149	965	1488	1255	545
1974 Federal Surplus/Deficit	859	-259	-659	-15	-705	1185	2662	2551	3928	3372	3702	5863	3499	1770	1993
1975 Federal Surplus/Deficit	3470	2909	525	-254	-255	-847	1814	579	2199	687	1769	4381	3543	2372	1539
1976 Federal Surplus/Deficit	1282	905	495	1134	750	3575	3124	2637	1706	3739	4011	6032	3765	2381	2547
1977 Federal Surplus/Deficit	3277	3431	3345	368	-313	-1035	-50	-2248	-1812	-1556	-1951	-232	281	367	23
1978 Federal Surplus/Deficit	580	207	-311	-277	-482	-779	1108	451	1877	3045	1756	3808	3316	3155	1222
-Ranked Averages-															
Top Ten Percent	2513	1763	620	1008	434	2445	3186	2532	2389	3328	3773	5818	3516	2705	2528
Middle Eighty Percent	1872	896	350	365	-200	-185	1283	382	878	1535	2185	4201	3189	2226	1311
Bottom Ten Percent	1716	256	-87	121	-156	-1125	-1661	-1956	-979	-560	-1260	-408	1579	1141	-288

Exhibit 15: OY 2015 Monthly 50-WY Energy

Federal Surplus/Deficit - 50 Water Year
PNW Loads and Resource Study
2014 - 2015 Operating Year
[43] 2007 White Book (Final)

3/31/2007

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1929 Federal Surplus/Deficit	2487	-392	-83	-246	-270	-1409	-966	-2302	-790	-833	-1361	-966	1856	937	-357
1930 Federal Surplus/Deficit	700	0.1	-204	148	-161	-977	-2493	-1317	-857	-390	-883	-973	681	1367	-423
1931 Federal Surplus/Deficit	1259	317	-355	135	-246	-1503	-2435	-2312	-1056	-176	-1488	-972	623	1005	-597
1932 Federal Surplus/Deficit	960	343	-80	-136	-371	-1356	-2385	-2514	288	2857	3669	4744	2785	2399	607
1933 Federal Surplus/Deficit	878	1154	301	126	-644	-552	2609	811	-209	694	1508	2829	2009	1652	921
1934 Federal Surplus/Deficit	2667	2010	529	806	1001	4261	2391	2405	2479	2874	3659	4465	295	1480	2143
1935 Federal Surplus/Deficit	382	-203	-391	-115	-746	-1239	1815	2462	-975	371	1661	2075	2259	2303	713
1936 Federal Surplus/Deficit	2050	49	-90	5.4	-301	-1102	-1843	-2165	-876	-97	3030	5307	2606	1057	426
1937 Federal Surplus/Deficit	1245	247	-173	92	-247	-1078	-2488	-2096	-1049	-614	-1116	-477	816	514	-525
1938 Federal Surplus/Deficit	942	8.2	-202	189	-493	-919	2047	-524	1488	2127	3059	5217	3135	2086	1258
1939 Federal Surplus/Deficit	344	146	304	205	-321	-1085	-40	-2126	-312	615	1531	2986	371	1486	232
1940 Federal Surplus/Deficit	1546	258	-237	225	-369	-882	-543	-1283	1590	1007	2873	2394	951	908	466
1941 Federal Surplus/Deficit	180	-338	-282	198	-544	-791	-193	-2178	-1106	-411	-1178	602	811	651	-309
1942 Federal Surplus/Deficit	269	220	271	-8.7	-665	644	2154	-591	-1575	-68	971	2225	3200	3073	785
1943 Federal Surplus/Deficit	2370	1184	-167	66	-510	-999	1629	1522	2384	3114	3691	5018	3034	2488	1637
1944 Federal Surplus/Deficit	2539	747	-71	22	-351	-1114	-373	-2218	-1525	-1144	-1810	-975	-272	524	-516
1945 Federal Surplus/Deficit	321	-47	-147	-84	-350	-1617	-2349	-1791	-1196	-932	-1445	2179	3168	1212	-169
1946 Federal Surplus/Deficit	582	248	-243	-110	-360	-960	755	-130	2747	2834	3965	5451	2746	2779	1374
1947 Federal Surplus/Deficit	2428	767	325	-155	-394	1873	2572	2253	2971	1453	2195	4758	3086	2903	1968
1948 Federal Surplus/Deficit	1638	-23	126	2226	316	927	3509	-101	1358	1130	3783	5776	4741	2525	2056
1949 Federal Surplus/Deficit	2851	2509	515	273	-425	-887	-107	-593	3196	2026	3977	5181	2824	269	1327
1950 Federal Surplus/Deficit	338	-506	-441	39	-502	-1272	549	2788	3847	3347	3563	4499	1841	2091	1401
1951 Federal Surplus/Deficit	2293	1366	349	955	729	2597	3085	2526	2518	3390	3804	5395	2887	2584	2421
1952 Federal Surplus/Deficit	2856	1371	276	1638	-352	904	2283	909	1135	3780	4154	5492	3375	2021	1980
1953 Federal Surplus/Deficit	1641	-33	-22	46	-256	-1308	-325	1444	-351	-26	1426	3887	2753	2456	819
1954 Federal Surplus/Deficit	2390	1007	209	214	-333	113	885	2462	1480	2451	2626	5113	2002	1851	1519
1955 Federal Surplus/Deficit	3587	3416	2482	394	-191	206	-295	-1948	-1340	-3.7	965	1871	1932	1563	721
1956 Federal Surplus/Deficit	2911	2561	-117	579	243	2380	3034	1268	3575	3539	3176	5221	1868	2416	2213
1957 Federal Surplus/Deficit	2795	1250	237	414	-473	-284	966	-1125	1181	3176	3236	5674	2470	1941	1353
1958 Federal Surplus/Deficit	810	43	-44	44	-363	-1172	-235	1012	1508	1206	3392	5438	2962	1810	1141
1959 Federal Surplus/Deficit	810	427	86	17	-164	1312	3002	2567	1561	2324	2241	3920	2371	2306	1656
1960 Federal Surplus/Deficit	2749	1042	2540	2684	1290	1950	2930	-1089	1045	2755	3907	3027	2751	2192	2046
1961 Federal Surplus/Deficit	1780	-187	146	113	-455	-500	1225	1872	1866	2581	1803	4392	2095	2204	1329
1962 Federal Surplus/Deficit	1288	685	-201	104	-235	-1088	837	-895	-914	3177	3709	3817	2924	2588	947
1963 Federal Surplus/Deficit	1889	695	-74	575	13	1390	2379	-107	-647	318	525	3724	3419	2509	1241
1964 Federal Surplus/Deficit	2535	848	294	-129	-300	-929	445	-838	-1174	1319	2015	2811	2202	1899	637
1965 Federal Surplus/Deficit	2859	2030	749	982	-314	2318	3070	3265	3045	2296	3977	5238	3124	2285	2445
1966 Federal Surplus/Deficit	2750	1464	281	485	-391	-132	2393	-1078	-1043	3433	2143	2451	2280	2493	1053
1967 Federal Surplus/Deficit	2736	398	-157	-50	-397	-839	3145	3243	433	787	236	3101	2058	2364	1248
1968 Federal Surplus/Deficit	2955	813	339	192	-515	-679	1537	1659	1218	-1002	-49	2203	2643	2852	1067
1969 Federal Surplus/Deficit	2942	1661	1264	1026	366	987	3254	2589	795	3393	3611	5348	2584	2774	2233
1970 Federal Surplus/Deficit	1876	292	59	178	-294	-985	986	368	10.0	-187	884	3657	3082	2072	880
1971 Federal Surplus/Deficit	643	-117	-255	-2.2	28	-1098	2650	2583	2345	3151	4061	5420	2198	2271	1668
1972 Federal Surplus/Deficit	3669	2736	542	408	-304	-218	3160	3272	2957	2352	2969	5302	2733	1860	2131
1973 Federal Surplus/Deficit	3666	3002	1016	442	-427	76	1993	-1955	-1198	-1231	-1220	500	649	983	349
1974 Federal Surplus/Deficit	789	-332	-749	-106	-805	1094	2571	2458	3852	3301	3631	5399	2661	1499	1797
1975 Federal Surplus/Deficit	3400	2836	435	-345	-354	-939	1723	486	2123	615	1697	3917	2705	2101	1344
1976 Federal Surplus/Deficit	1213	832	405	1043	651	3484	3033	2544	1630	3668	3939	5568	2927	2109	2352
1977 Federal Surplus/Deficit	3207	3358	3256	277	-412	-1126	-140	-2341	-1888	-1627	-2022	-696	-557	95	-173
1978 Federal Surplus/Deficit	511	134	-401	-368	-581	-871	1017	358	1801	2973	1685	3344	2477	2883	1026
-Ranked Averages-															
Top Ten Percent	2443	1690	530	917	335	2353	3095	2438	2313	3257	3701	5354	2678	2434	2333
Middle Eighty Percent	1802	823	260	274	-299	-277	1193	289	801	1464	2113	3737	2351	1954	1115
Bottom Ten Percent	1646	184	-177	30	-255	-1216	-1751	-2049	-1055	-632	-1332	-873	741	870	-484

Exhibit 16: OY 2016 Monthly 50-WY Energy

Federal Surplus/Deficit - 50 Water Year
PNW Loads and Resource Study
2015 - 2016 Operating Year
[43] 2007 White Book (Final)

3/31/2007

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1929 Federal Surplus/Deficit	2418	-463	-154	-323	-360	-1508	-1063	-2281	-878	-910	-1437	-611	2585	1060	-311
1930 Federal Surplus/Deficit	631	-71	-274	71	-251	-1075	-2590	-1296	-944	-467	-960	-618	1410	1490	-376
1931 Federal Surplus/Deficit	1190	246	-426	58	-336	-1602	-2532	-2290	-1143	-254	-1564	-617	1352	1128	-550
1932 Federal Surplus/Deficit	891	272	-151	-213	-461	-1455	-2482	-2492	200	2780	3593	5099	3514	2521	654
1933 Federal Surplus/Deficit	810	1083	230	49	-734	-651	2512	833	-297	617	1432	3183	2738	1775	968
1934 Federal Surplus/Deficit	2598	1939	458	729	911	4163	2293	2426	2391	2797	3583	4820	1024	1603	2190
1935 Federal Surplus/Deficit	313	-274	-461	-192	-836	-1337	1718	2483	-1063	294	1584	2430	2988	2425	760
1936 Federal Surplus/Deficit	1981	-22	-160	-72	-391	-1200	-1940	-2144	-964	-174	2954	5662	3335	1180	473
1937 Federal Surplus/Deficit	1176	176	-244	15	-337	-1176	-2586	-2075	-1136	-691	-1193	-122	1545	637	-479
1938 Federal Surplus/Deficit	873	-63	-273	112	-583	-1018	1950	-503	1400	2050	2983	5572	3864	2209	1304
1939 Federal Surplus/Deficit	275	75	233	128	-411	-1183	-137	-2105	-399	538	1455	3340	1100	1609	279
1940 Federal Surplus/Deficit	1477	187	-307	148	-459	-981	-641	-1262	1502	930	2797	2749	1680	1031	513
1941 Federal Surplus/Deficit	112	-409	-353	121	-634	-889	-290	-2157	-1194	-488	-1255	957	1540	774	-262
1942 Federal Surplus/Deficit	201	149	200	-86	-755	546	2057	-570	-1662	-145	894	2580	3929	3196	832
1943 Federal Surplus/Deficit	2301	1113	-237	-11	-600	-1098	1532	1544	2297	3037	3615	5373	3763	2611	1684
1944 Federal Surplus/Deficit	2470	676	-141	-55	-441	-1213	-470	-2196	-1613	-1221	-1886	-621	457	647	-469
1945 Federal Surplus/Deficit	252	-118	-218	-161	-440	-1715	-2446	-1770	-1283	-1009	-1521	2534	3897	1335	-122
1946 Federal Surplus/Deficit	513	177	-314	-187	-450	-1059	658	-109	2660	2757	3889	5805	3475	2901	1421
1947 Federal Surplus/Deficit	2360	696	254	-232	-484	1775	2475	2274	2883	1376	2119	5113	3815	3026	2015
1948 Federal Surplus/Deficit	1569	-94	55	2148	227	829	3411	-79	1270	1053	3707	6130	5470	2648	2102
1949 Federal Surplus/Deficit	2782	2438	445	196	-515	-985	-204	-572	3108	1949	3901	5536	3553	391	1374
1950 Federal Surplus/Deficit	269	-577	-512	-39	-592	-1371	451	2809	3759	3270	3487	4854	2570	2213	1447
1951 Federal Surplus/Deficit	2224	1295	278	878	639	2499	2987	2547	2430	3313	3728	5749	3616	2707	2468
1952 Federal Surplus/Deficit	2787	1300	205	1561	-442	805	2185	930	1047	3703	4078	5846	4104	2144	2027
1953 Federal Surplus/Deficit	1572	-103	-92	-31	-346	-1406	-422	1465	-438	-103	1350	4242	3482	2579	866
1954 Federal Surplus/Deficit	2321	936	138	137	-423	15	788	2484	1392	2374	2550	5468	2731	1974	1566
1955 Federal Surplus/Deficit	3518	3346	2411	317	-281	107	-392	-1927	-1428	-81	889	2226	2661	1686	768
1956 Federal Surplus/Deficit	2842	2490	-188	502	153	2281	2936	1289	3488	3462	3100	5576	2597	2539	2260
1957 Federal Surplus/Deficit	2726	1179	167	337	-562	-382	869	-1103	1093	3099	3160	6029	3199	2064	1399
1958 Federal Surplus/Deficit	741	-27	-115	-33	-453	-1270	-332	1034	1420	1129	3315	5793	3691	1933	1187
1959 Federal Surplus/Deficit	741	357	15	-60	-254	1213	2904	2588	1473	2247	2164	4275	3100	2429	1703
1960 Federal Surplus/Deficit	2681	972	2469	2607	1200	1851	2833	-1068	957	2678	3830	3382	3480	2315	2092
1961 Federal Surplus/Deficit	1711	-258	75	36	-545	-598	1127	1893	1779	2504	1727	4746	2824	2327	1376
1962 Federal Surplus/Deficit	1219	614	-271	27	-325	-1187	739	-873	-1002	3100	3632	4172	3653	2711	994
1963 Federal Surplus/Deficit	1820	624	-144	498	-77	1292	2282	-85	-734	241	449	4078	4149	2632	1288
1964 Federal Surplus/Deficit	2466	777	223	-206	-390	-1028	347	-816	-1262	1242	1939	3165	2931	2022	683
1965 Federal Surplus/Deficit	2790	1959	678	905	-404	2219	2973	3286	2957	2219	3901	5593	3853	2408	2492
1966 Federal Surplus/Deficit	2681	1393	210	408	-481	-230	2296	-1057	-1131	3356	2066	2806	3009	2616	1100
1967 Federal Surplus/Deficit	2667	327	-228	-127	-486	-937	3048	3264	345	710	159	3456	2787	2487	1295
1968 Federal Surplus/Deficit	2886	742	268	114	-604	-778	1439	1680	1130	-1079	-125	2558	3372	2974	1114
1969 Federal Surplus/Deficit	2874	1590	1194	949	276	888	3157	2611	707	3316	3534	5702	3313	2897	2279
1970 Federal Surplus/Deficit	1807	222	-12	101	-384	-1084	889	389	-78	-264	807	4012	3811	2195	927
1971 Federal Surplus/Deficit	574	-188	-326	-79	-62	-1196	2553	2604	2257	3074	3985	5775	2927	2394	1714
1972 Federal Surplus/Deficit	3600	2666	472	331	-394	-316	3063	3294	2870	2275	2893	5656	3462	1983	2178
1973 Federal Surplus/Deficit	3597	2931	945	365	-517	-22	1896	-1933	-1286	-1308	-1297	855	1378	1106	396
1974 Federal Surplus/Deficit	721	-403	-820	-183	-894	995	2474	2479	3764	3224	3554	5754	3390	1622	1844
1975 Federal Surplus/Deficit	3331	2765	364	-422	-444	-1037	1626	507	2035	538	1621	4271	3434	2223	1391
1976 Federal Surplus/Deficit	1144	761	334	966	561	3385	2936	2565	1542	3591	3863	5922	3656	2232	2398
1977 Federal Surplus/Deficit	3138	3288	3185	200	-502	-1225	-237	-2320	-1976	-1704	-2099	-342	172	218	-126
1978 Federal Surplus/Deficit	442	64	-472	-445	-671	-969	920	379	1713	2896	1608	3698	3206	3006	1073
-Ranked Averages-															
Top Ten Percent	2375	1619	459	840	245	2254	2998	2460	2225	3180	3625	5709	3407	2557	2379
Middle Eighty Percent	1733	752	189	197	-389	-375	1095	310	714	1387	2037	4091	3080	2077	1162
Bottom Ten Percent	1577	113	-248	-47	-345	-1315	-1848	-2028	-1143	-709	-1408	-518	1470	992	-437

Exhibit 17: OY 2017 Monthly 50-WY Energy

Federal Surplus/Deficit - 50 Water Year
PNW Loads and Resource Study
2016 - 2017 Operating Year
[43] 2007 White Book (Final)

3/31/2007

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1929 Federal Surplus/Deficit	2344	-533	-223	-385	-462	-1615	-1160	-2493	-961	-988	-1493	-1137	1757	885	-511
1930 Federal Surplus/Deficit	556	-141	-344	8.6	-353	-1182	-2687	-1508	-1027	-545	-1015	-1144	581	1315	-576
1931 Federal Surplus/Deficit	1115	176	-495	-4	-439	-1709	-2629	-2502	-1226	-332	-1619	-1144	524	953	-750
1932 Federal Surplus/Deficit	816	202	-220	-275	-564	-1562	-2579	-2705	118	2701	3537	4573	2686	2347	454
1933 Federal Surplus/Deficit	735	1013	161	-13	-836	-757	2416	620	-379	539	1376	2657	1910	1600	767
1934 Federal Surplus/Deficit	2524	1869	389	666	808	4056	2197	2214	2309	2719	3527	4294	196	1428	1990
1935 Federal Surplus/Deficit	239	-344	-531	-254	-938	-1444	1621	2271	-1145	216	1529	1904	2160	2251	560
1936 Federal Surplus/Deficit	1907	-92	-230	-134	-493	-1307	-2037	-2356	-1046	-252	2898	5136	2506	1005	273
1937 Federal Surplus/Deficit	1102	106	-313	-47	-439	-1283	-2682	-2287	-1219	-769	-1248	-648	716	462	-679
1938 Federal Surplus/Deficit	799	-133	-342	49	-685	-1124	1854	-715	1318	1972	2927	5046	3036	2034	1104
1939 Federal Surplus/Deficit	201	5	164	66	-513	-1290	-234	-2317	-482	459	1399	2814	271	1434	79
1940 Federal Surplus/Deficit	1402	117	-376	86	-562	-1087	-737	-1474	1419	852	2742	2223	852	856	313
1941 Federal Surplus/Deficit	37	-479	-422	59	-737	-996	-386	-2369	-1277	-566	-1310	430	711	599	-462
1942 Federal Surplus/Deficit	126	79	131	-148	-858	439	1960	-782	-1745	-223	839	2054	3101	3022	632
1943 Federal Surplus/Deficit	2227	1043	-306	-74	-702	-1204	1435	1332	2214	2959	3559	4847	2934	2436	1484
1944 Federal Surplus/Deficit	2396	606	-211	-118	-543	-1320	-567	-2408	-1695	-1300	-1942	-1147	-371	472	-669
1945 Federal Surplus/Deficit	177	-188	-287	-224	-542	-1822	-2542	-1982	-1366	-1087	-1577	2008	3069	1160	-322
1946 Federal Surplus/Deficit	439	107	-383	-250	-552	-1166	561	-321	2577	2679	3834	5279	2647	2727	1221
1947 Federal Surplus/Deficit	2285	626	185	-294	-586	1668	2379	2062	2801	1298	2063	4587	2987	2851	1814
1948 Federal Surplus/Deficit	1494	-164	-14	2086	124	722	3315	-291	1188	974	3651	5604	4642	2473	1902
1949 Federal Surplus/Deficit	2708	2368	375	134	-617	-1092	-300	-784	3026	1871	3846	5010	2725	217	1174
1950 Federal Surplus/Deficit	194	-647	-581	-101	-695	-1477	355	2597	3677	3192	3431	4328	1741	2039	1247
1951 Federal Surplus/Deficit	2149	1225	209	816	536	2392	2891	2335	2348	3235	3672	5223	2788	2532	2268
1952 Federal Surplus/Deficit	2712	1230	136	1499	-545	698	2089	718	965	3624	4022	5320	3276	1970	1827
1953 Federal Surplus/Deficit	1497	-173	-161	-93	-448	-1513	-519	1253	-521	-182	1295	3716	2653	2404	666
1954 Federal Surplus/Deficit	2246	866	69	74	-526	-92	692	2271	1310	2295	2494	4941	1903	1799	1366
1955 Federal Surplus/Deficit	3444	3276	2342	254	-384	0.5	-488	-2139	-1511	-159	834	1700	1833	1511	568
1956 Federal Surplus/Deficit	2767	2420	-257	440	50	2175	2840	1077	3405	3383	3045	5050	1769	2364	2060
1957 Federal Surplus/Deficit	2652	1109	97	274	-665	-489	772	-1316	1011	3021	3104	5503	2371	1889	1199
1958 Federal Surplus/Deficit	667	-97	-184	-96	-555	-1377	-428	822	1338	1051	3260	5267	2863	1758	987
1959 Federal Surplus/Deficit	666	287	-54	-122	-357	1106	2808	2376	1391	2169	2109	3748	2271	2254	1503
1960 Federal Surplus/Deficit	2606	901	2400	2545	1098	1744	2736	-1280	875	2600	3775	2856	2652	2140	1892
1961 Federal Surplus/Deficit	1637	-328	6.2	-26	-648	-705	1031	1681	1696	2426	1672	4220	1996	2152	1176
1962 Federal Surplus/Deficit	1145	544	-341	-36	-427	-1293	643	-1085	-1084	3022	3577	3646	2824	2536	794
1963 Federal Surplus/Deficit	1746	554	-214	436	-179	1185	2185	-297	-817	163	393	3552	3320	2457	1088
1964 Federal Surplus/Deficit	2392	707	154	-268	-493	-1134	251	-1028	-1344	1164	1883	2639	2103	1847	483
1965 Federal Surplus/Deficit	2716	1889	609	842	-507	2112	2876	3074	2874	2140	3845	5067	3025	2233	2292
1966 Federal Surplus/Deficit	2606	1323	141	345	-584	-337	2199	-1269	-1213	3278	2011	2280	2181	2441	899
1967 Federal Surplus/Deficit	2593	257	-297	-189	-589	-1044	2951	3052	262	632	104	2930	1959	2312	1095
1968 Federal Surplus/Deficit	2812	672	199	52	-707	-885	1343	1468	1048	-1157	-181	2032	2544	2800	914
1969 Federal Surplus/Deficit	2799	1520	1125	887	174	781	3060	2399	625	3238	3479	5176	2484	2722	2079
1970 Federal Surplus/Deficit	1732	152	-81	39	-487	-1190	792	177	-160	-342	752	3485	2983	2020	727
1971 Federal Surplus/Deficit	500	-258	-395	-142	-165	-1303	2457	2392	2175	2996	3929	5249	2099	2219	1514
1972 Federal Surplus/Deficit	3525	2596	402	269	-497	-423	2966	3082	2787	2197	2837	5130	2634	1808	1978
1973 Federal Surplus/Deficit	3523	2861	876	303	-620	-129	1799	-2145	-1369	-1386	-1352	329	550	931	196
1974 Federal Surplus/Deficit	646	-473	-889	-245	-997	889	2377	2267	3681	3146	3499	5228	2562	1447	1644
1975 Federal Surplus/Deficit	3257	2695	295	-484	-546	-1144	1530	295	1952	460	1565	3745	2605	2049	1190
1976 Federal Surplus/Deficit	1069	691	265	904	458	3278	2839	2353	1460	3513	3807	5396	2828	2057	2198
1977 Federal Surplus/Deficit	3064	3217	3116	138	-605	-1331	-334	-2532	-2059	-1782	-2154	-868	-656	43	-326
1978 Federal Surplus/Deficit	367	-6.5	-541	-507	-773	-1076	823	167	1630	2818	1553	3172	2378	2831	873
-Ranked Averages-															
Top Ten Percent	2300	1549	390	778	142	2148	2901	2248	2142	3102	3570	5183	2579	2382	2179
Middle Eighty Percent	1659	682	120	135	-491	-482	999	98	631	1309	1981	3565	2252	1902	962
Bottom Ten Percent	1503	43	-317	-109	-447	-1422	-1945	-2240	-1226	-787	-1463	-1044	641	818	-637

Section 9: Pacific Northwest Regional Exhibits

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Exhibit 18

Regional Annual Energy Analysis Using 1937-Water Conditions for 10 Operating Years

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Exhibit 18: OY 2008 through 2017 Annual Energy

Loads and Resources - Pacific Northwest Region
PNW Loads and Resource Study
2008 - 2017 Operating Years
1937 Water Year
[43] 2007 White Book (Final)

3/31/2007

Energy (aMW)	2008 Avg.	2009 Avg.	2010 Avg.	2011 Avg.	2012 Avg.	2013 Avg.	2014 Avg.	2015 Avg.	2016 Avg.	2017 Avg.
Firm Regional Loads										
Regional Firm Loads	21536	21939	22237	22521	22808	23086	23359	23665	23952	24263
Exports	998	943	1036	997	943	906	892	845	789	762
Federal Diversity	0	0	0	0	0	0	0	0	0	0
Total Firm Regional Loads	22534	22882	23273	23518	23751	23991	24252	24510	24741	25025
Non-Firm Regional Loads										
Regional Non-Firm Loads	11	11	11	11	11	11	11	11	11	11
Total Non-Firm Regional Loads	11	11	11	11	11	11	11	11	11	11
Total Loads	22545	22893	23284	23529	23762	24002	24262	24520	24751	25036
Hydro Resources										
Regulated Hydro	10722	10791	10817	10832	10847	10861	10864	10864	10864	10864
Independent Hydro	1075	1069	1069	1064	1070	1071	1073	1074	1074	1074
Operational Peaking Adjustment	0	0	0	0	0	0	0	0	0	0
Total Hydro Resources	11797	11859	11886	11896	11917	11933	11937	11938	11938	11938
Other Resources										
Small Thermal & Misc.	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Combustion Turbines	3227	3248	3250	3257	3234	3238	3241	3240	3240	3240
Renewables	321	353	357	356	356	356	358	357	354	355
Cogeneration	2191	2204	2198	2208	2184	2200	2189	2200	2184	2200
Imports	1201	1063	1039	924	851	857	864	872	876	868
Large Thermal	6208	5929	6221	6028	6134	5995	6178	5950	6147	6071
Non-Utility Generation	1309	1344	1366	1374	1374	1375	1375	1375	1375	1375
Resource Acquisition	0	0	0	0	0	0	0	0	0	0
Total Other Resources	14457	14143	14430	14147	14134	14020	14205	13994	14177	14110
Total Resources	26254	26002	26316	26042	26050	25953	26142	25932	26115	26049
Reserves & Maintenance										
Hydro Reserves	0	0	0	0	0	0	0	0	0	0
Small Thermal & Misc. Reserves	0	0	0	0	0	0	0	0	0	0
Contract Reserves	0	0	0	0	0	0	0	0	0	0
Large Thermal Reserves	0	0	0	0	0	0	0	0	0	0
Regional Hydro Maintenance	-12	-12	-12	-12	-12	-12	-12	-12	-12	-12
Spinning Reserves	0	0	0	0	0	0	0	0	0	0
Regional Transmission Losses	-740	-733	-742	-734	-734	-732	-737	-731	-736	-734
Total Reserves, Maintenance & Losses	-752	-745	-754	-746	-746	-744	-749	-743	-748	-746
Total Net Resources	25502	25257	25562	25296	25304	25209	25393	25189	25367	25302
Surplus/Deficits										
Firm Surplus/Deficit	2968	2375	2289	1778	1553	1218	1142	680	626	277
Total Surplus/Deficit	2957	2364	2278	1767	1542	1207	1131	669	616	267

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Exhibits 19 – 21

Regional Monthly Energy Analysis Using the 2007 BPA White Book Load Forecast for 1937-Water Conditions

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Exhibit 19: OY 2008 Monthly Energy

Loads and Resources - Pacific Northwest Region
PNW Loads and Resource Study
2007 - 2008 Operating Year
1937 Water Year
[43] 2007 White Book (Final)

3/31/2007

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
Firm Regional Loads															
Regional Firm Loads	20796	20793	19550	19925	21913	23973	24439	23362	21748	20610	20598	20187	20514	21425	21536
Exports	1248	1249	1210	950	905	956	950	942	967	952	851	770	1005	1168	998
Federal Diversity	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Firm Regional Loads	22044	22042	20760	20875	22818	24929	25389	24303	22715	21561	21449	20957	21519	22593	22534
Non-Firm Regional Loads															
Regional Non-Firm Loads	0	0	14	0	0	0	3.5	23	54	34	34	0	0	0	11
Total Non-Firm Regional Loads	0	0	14	0	0	0	3.5	23	54	34	34	0	0	0	11
Total Loads	22044	22042	20775	20875	22818	24929	25392	24326	22769	21595	21483	20957	21519	22593	22545
Hydro Resources															
Regulated Hydro	11844	10151	9564	10174	11765	12169	9699	9210	9764	10165	9052	9835	14001	11879	10722
Independent Hydro	1008	1004	984	956	905	974	765	779	958	1214	1283	1578	1605	1141	1075
Operational Peaking Adjustment	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Hydro Resources	12853	11155	10548	11131	12670	13143	10464	9989	10722	11379	10335	11413	15606	13020	11797
Other Resources															
Small Thermal & Misc.	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0.2
Combustion Turbines	3154	3155	3495	3461	3487	3498	3510	3489	3089	3188	3188	1901	2994	3457	3227
Renewables	218	219	219	248	260	284	261	266	474	386	386	411	413	411	321
Cogeneration	2263	2262	2264	2279	2290	2291	2304	2295	1657	2281	2285	1854	2265	2252	2191
Imports	1136	1108	993	1086	1372	1541	1415	1412	1161	1102	1069	1016	1090	1115	1201
Large Thermal	6418	6418	6418	6418	6315	6384	6418	6418	6418	6252	5683	4809	6093	6418	6208
Non-Utility Generation	1322	1319	1243	1185	1183	1177	1212	1179	1364	1320	1329	1410	1581	1526	1309
Resource Acquisition	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Other Resources	14512	14481	14631	14677	14907	15175	15122	15060	14164	14529	13939	11400	14437	15180	14457
Total Resources	27364	25636	25180	25808	27578	28318	25586	25048	24886	25908	24274	22813	30043	28200	26254
Reserves & Maintenance															
Hydro Reserves	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Thermal & Misc. Reserves	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Contract Reserves	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Large Thermal Reserves	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Regional Hydro Maintenance	-30	-25	-8.6	-9	-3.8	0	0	0	-5.2	-7.4	-7.6	-20	-14	-49	-12
Spinning Reserves	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Regional Transmission Losses	-771	-722	-710	-728	-778	-799	-722	-706	-702	-730	-684	-643	-847	-794	-740
Total Reserves, Maintenance & Losses	-801	-747	-718	-737	-781	-799	-722	-706	-707	-738	-692	-663	-861	-843	-752
Total Net Resources	26564	24889	24461	25071	26796	27519	24864	24342	24179	25171	23582	22151	29182	27357	25502
Surplus/Deficits															
Firm Surplus/Deficit	4519	2848	3701	4196	3978	2591	-524	38	1464	3609	2133	1194	7662	4764	2968
Total Surplus/Deficit	4519	2848	3687	4196	3978	2591	-528	15	1410	3575	2100	1194	7662	4764	2957

Exhibit 20: OY 2012 Monthly Energy

Loads and Resources - Pacific Northwest Region
PNW Loads and Resource Study
2011 - 2012 Operating Year
1937 Water Year
[43] 2007 White Book (Final)

3/31/2007

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
Firm Regional Loads															
Regional Firm Loads	22191	22186	20880	21081	23330	25396	25820	24506	23004	21755	21741	21145	21745	22855	22808
Exports	1215	1216	1165	889	845	883	879	873	908	908	811	734	959	1108	943
Federal Diversity	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Firm Regional Loads	23406	23402	22045	21970	24175	26278	26698	25378	23912	22663	22552	21879	22705	23963	23751
Non-Firm Regional Loads															
Regional Non-Firm Loads	0	0	14	0	0	0	3.5	23	54	34	34	0	0	0	11
Total Non-Firm Regional Loads	0	0	14	0	0	0	3.5	23	54	34	34	0	0	0	11
Total Loads	23406	23402	22059	21970	24175	26278	26702	25401	23967	22696	22586	21879	22705	23963	23762
Hydro Resources															
Regulated Hydro	12191	10470	9602	10227	11833	12231	9745	9273	9812	10275	9168	9949	14246	12192	10847
Independent Hydro	1008	994	984	959	907	962	753	766	945	1202	1272	1569	1610	1146	1070
Operational Peaking Adjustment	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Hydro Resources	13199	11464	10586	11187	12740	13193	10498	10039	10757	11477	10440	11517	15856	13338	11917
Other Resources															
Small Thermal & Misc.	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0.2
Combustion Turbines	3500	3501	3543	3466	3507	3518	3526	3505	2912	2802	2907	1988	3011	3473	3234
Renewables	370	370	352	335	325	284	261	266	474	386	386	421	391	411	356
Cogeneration	2263	2262	2271	2279	2297	2291	2304	2295	1657	2281	2285	1754	2265	2252	2184
Imports	710	682	677	728	1001	1177	1051	1002	796	739	731	686	799	863	851
Large Thermal	6418	6418	6418	6355	6404	6418	6418	6418	6284	5203	5164	4630	6241	6425	6134
Non-Utility Generation	1425	1424	1362	1298	1315	1270	1261	1227	1399	1336	1345	1422	1608	1561	1374
Resource Acquisition	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Other Resources	14686	14657	14624	14461	14850	14958	14822	14713	13522	12746	12817	10901	14315	14986	14134
Total Resources	27885	26120	25210	25648	27590	28151	25320	24752	24279	24223	23257	22418	30171	28324	26050
Reserves & Maintenance															
Hydro Reserves	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Thermal & Misc. Reserves	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Contract Reserves	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Large Thermal Reserves	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Regional Hydro Maintenance	-30	-25	-8.6	-9	-3.8	0	0	0	-5.2	-7.4	-7.6	-20	-14	-49	-12
Spinning Reserves	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Regional Transmission Losses	-786	-736	-711	-723	-778	-794	-714	-698	-685	-683	-656	-632	-850	-797	-734
Total Reserves, Maintenance & Losses	-816	-760	-719	-732	-782	-794	-714	-698	-690	-690	-663	-652	-865	-847	-746
Total Net Resources	27070	25360	24491	24916	26808	27357	24606	24054	23589	23533	22594	21767	29306	27477	25304
Surplus/Deficits															
Firm Surplus/Deficit	3664	1958	2446	2946	2633	1079	-2093	-1324	-323	870	42	-112	6601	3514	1553
Total Surplus/Deficit	3664	1958	2431	2946	2633	1079	-2096	-1347	-377	836	7.9	-112	6601	3514	1542

Exhibit 21: OY 2017 Monthly Energy

Loads and Resources - Pacific Northwest Region
PNW Loads and Resource Study
2016 - 2017 Operating Year
1937 Water Year
[43] 2007 White Book (Final)

3/31/2007

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
Firm Regional Loads															
Regional Firm Loads	23706	23700	22257	22430	24786	27001	27477	26013	24466	23111	23094	22446	23125	24349	24263
Exports	924	925	923	714	704	700	696	691	725	725	717	602	825	917	762
Federal Diversity	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Firm Regional Loads	24630	24625	23179	23144	25490	27701	28173	26704	25191	23836	23811	23048	23951	25266	25025
Non-Firm Regional Loads															
Regional Non-Firm Loads	0	0	14	0	0	0	3.5	23	54	34	34	0	0	0	11
Total Non-Firm Regional Loads	0	0	14	0	0	0	3.5	23	54	34	34	0	0	0	11
Total Loads	24630	24625	23194	23144	25490	27701	28177	26727	25246	23870	23845	23048	23951	25266	25036
Hydro Resources															
Regulated Hydro	12235	10505	9626	10241	11850	12247	9757	9285	9824	10287	9180	9960	14265	12211	10864
Independent Hydro	1017	1013	991	961	911	966	756	768	947	1205	1275	1572	1612	1149	1074
Operational Peaking Adjustment	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Hydro Resources	13252	11518	10617	11202	12761	13213	10513	10053	10771	11492	10455	11531	15877	13359	11938
Other Resources															
Small Thermal & Misc.	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0.2
Combustion Turbines	3504	3504	3544	3503	3522	3534	3543	3521	2928	2816	2922	1901	3026	3488	3240
Renewables	370	370	352	335	310	284	261	268	474	386	386	421	391	411	355
Cogeneration	2263	2262	2271	2279	2297	2291	2304	2295	1657	2281	2285	1940	2265	2252	2200
Imports	733	706	695	749	997	1176	1057	1010	802	741	764	728	843	894	868
Large Thermal	6429	6429	6429	6389	6429	6429	6417	6429	6326	5289	4859	4970	5270	6263	6071
Non-Utility Generation	1425	1425	1363	1298	1316	1272	1262	1233	1401	1337	1347	1423	1609	1561	1375
Resource Acquisition	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Other Resources	14724	14695	14654	14552	14872	14985	14845	14756	13588	12849	12562	11383	13405	14871	14110
Total Resources	27976	26214	25271	25755	27633	28198	25358	24809	24359	24341	23016	22914	29282	28230	26049
Reserves & Maintenance															
Hydro Reserves	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Thermal & Misc. Reserves	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Contract Reserves	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Large Thermal Reserves	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Regional Hydro Maintenance	-30	-25	-8.6	-9	-3.8	0	0	0	-5.2	-7.4	-7.6	-20	-14	-49	-12
Spinning Reserves	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Regional Transmission Losses	-788	-739	-712	-726	-779	-795	-715	-700	-687	-686	-649	-646	-825	-795	-734
Total Reserves, Maintenance & Losses	-818	-763	-721	-735	-783	-795	-715	-700	-692	-694	-656	-666	-840	-844	-746
Total Net Resources	27158	25451	24550	25020	26850	27403	24643	24110	23667	23647	22360	22249	28442	27386	25302
Surplus/Deficits															
Firm Surplus/Deficit	2527	825	1371	1876	1360	-298	-3531	-2594	-1524	-189	-1451	-799	4491	2121	277
Total Surplus/Deficit	2527	825	1356	1876	1360	-298	-3534	-2617	-1578	-223	-1485	-799	4491	2121	267

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Exhibits 22 – 24

Regional Monthly 1-Hour Capacity Analysis
Using the 2007 BPA White Book Load Forecast for 1937-Water Conditions

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Exhibit 22: OY 2008 Monthly 1-Hour Capacity

Loads and Resources - Pacific Northwest Region
PNW Loads and Resource Study
2007 - 2008 Operating Year
1937 Water Year
[43] 2007 White Book (Final)

3/31/2007

Capacity (MW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul
Firm Regional Loads														
Regional Firm Loads	27079	27073	25511	27640	30632	32729	33614	32350	29593	27565	27576	26767	26840	27951
Exports	2363	2363	2367	1949	1800	1811	1804	1798	1824	1800	1774	1754	2293	2297
Federal Diversity	-423	-455	-482	-337	-294	-560	-350	-362	-413	-522	-542	-527	-501	-405
Total Firm Regional Loads	29019	28981	27397	29252	32138	33980	35068	33786	31004	28842	28809	27994	28632	29843
Non-Firm Regional Loads														
Regional Non-Firm Loads	0	0	14	0	0	0	3.5	23	54	34	34	0	0	0
Total Non-Firm Regional Loads	0	0	14	0	0	0	3.5	23	54	34	34	0	0	0
Total Loads	29019	28981	27411	29252	32138	33980	35072	33809	31059	28876	28843	27994	28632	29843
Hydro Resources														
Regulated Hydro	30914	30744	31381	31173	31406	31166	30908	30705	30202	29623	29417	29479	31178	31165
Independent Hydro	1697	1681	1774	1786	1767	1621	1542	1593	1786	1866	2007	2112	2081	1749
Operational Peaking Adjustment	-4365	-6888	-7978	-7601	-6518	-6925	-8659	-8083	-8079	-8202	-9553	-8931	-5157	-5304
Total Hydro Resources	28246	25536	25176	25359	26655	25863	23790	24215	23909	23287	21872	22659	28102	27610
Other Resources														
Small Thermal & Misc.	30	30	30	30	30	30	32	30	30	30	30	30	30	30
Combustion Turbines	4772	4772	5103	5122	5140	5151	5154	5147	4224	4755	4755	3247	4650	5253
Renewables	94	94	95	97	98	100	102	101	100	99	99	97	95	94
Cogeneration	2456	2456	2462	2469	2479	2462	2481	2478	1843	2469	2469	2177	2462	2438
Imports	1350	1317	1161	1242	1668	1833	1777	1825	1359	1236	1250	1237	1375	1336
Large Thermal	7020	7020	7020	7020	6894	7020	7020	7020	7020	7020	6436	5082	6337	7020
Non-Utility Generation	1379	1377	1294	1238	1184	1176	1171	1185	1162	1195	1204	1246	1488	1476
Resource Acquisition	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Other Resources	17101	17066	17165	17218	17493	17773	17737	17786	15739	16804	16243	13116	16437	17647
Total Resources	45347	42603	42342	42577	44148	43635	41528	42001	39648	40091	38114	35775	44539	45256
Reserves & Maintenance														
Hydro Reserves	-1631	-1621	-1658	-1648	-1659	-1639	-1622	-1615	-1599	-1574	-1571	-1580	-1663	-1646
Small Thermal & Misc. Reserves	-437	-436	-449	-448	-447	-446	-447	-447	-368	-427	-428	-340	-436	-465
Contract Reserves	-65	-60	-50	-57	-51	-66	-54	-60	-45	-45	-47	-64	-76	-69
Large Thermal Reserves	-1053	-1053	-1053	-1053	-1034	-1053	-1053	-1053	-1053	-1053	-965	-762	-951	-1053
Regional Hydro Maintenance	-4595	-4032	-3787	-3208	-2935	-2037	-1561	-2286	-2626	-2751	-2483	-2360	-2202	-3720
Spinning Reserves	-861	-808	-800	-823	-858	-868	-832	-826	-787	-792	-750	-733	-914	-883
Regional Transmission Losses	-1230	-1159	-1157	-1184	-1245	-1257	-1205	-1196	-1111	-1121	-1068	-1003	-1283	-1254
Total Reserves, Maintenance & Losses	-9870	-9169	-8955	-8420	-8227	-7368	-6775	-7484	-7590	-7763	-7312	-6841	-7524	-9089
Total Net Resources	35477	33434	33387	34156	35921	36268	34753	34517	32057	32329	30803	28934	37015	36168
Surplus/Deficits														
Firm Surplus/Deficit	6458	4453	5990	4904	3783	2287	-315	731	1053	3486	1994	940	8383	6325
Total Surplus/Deficit	6458	4453	5976	4904	3783	2287	-319	708	999	3453	1960	940	8383	6325

Exhibit 23: OY 2012 Monthly 1-Hour Capacity

Loads and Resources - Pacific Northwest Region
PNW Loads and Resource Study
2011 - 2012 Operating Year
1937 Water Year
[43] 2007 White Book (Final)

3/31/2007

Capacity (MW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul
Firm Regional Loads														
Regional Firm Loads	28999	28991	27220	29311	32453	34809	35519	34138	31288	29063	29074	28318	28510	29854
Exports	2335	2336	2338	1870	1748	1744	1739	1734	1770	1770	1769	1748	2257	2251
Federal Diversity	-512	-551	-588	-422	-375	-608	-381	-394	-448	-564	-585	-591	-541	-437
Total Firm Regional Loads	30822	30777	28970	30759	33826	35945	36877	35478	32610	30268	30259	29476	30225	31668
Non-Firm Regional Loads														
Regional Non-Firm Loads	0	0	14	0	0	0	3.5	23	54	34	34	0	0	0
Total Non-Firm Regional Loads	0	0	14	0	0	0	3.5	23	54	34	34	0	0	0
Total Loads	30822	30777	28985	30759	33826	35945	36881	35501	32664	30302	30293	29476	30225	31668
Hydro Resources														
Regulated Hydro	31124	30954	31381	31173	31405	31166	30907	30705	30201	29623	29417	29479	31178	31165
Independent Hydro	1671	1655	1748	1788	1768	1608	1528	1579	1772	1852	1995	2101	2084	1753
Operational Peaking Adjustment	-4147	-6460	-7910	-7511	-6428	-6847	-8659	-8010	-8012	-8069	-9385	-8687	-4833	-4807
Total Hydro Resources	28648	26149	25218	25450	26746	25927	23777	24274	23962	23406	22026	22893	28430	28112
Other Resources														
Small Thermal & Misc.	30	30	30	30	30	30	32	30	30	30	30	30	30	30
Combustion Turbines	5259	5259	5272	5296	5317	5329	5334	5325	4400	4421	4421	3662	4650	5253
Renewables	94	94	95	97	98	100	102	101	100	99	99	46	95	94
Cogeneration	2456	2456	2462	2469	2479	2462	2481	2478	1843	2469	2469	1951	2462	2438
Imports	920	886	872	913	1326	1505	1456	1458	1025	902	917	913	1075	1072
Large Thermal	7020	7020	7020	6894	7020	7020	7020	7020	7020	5696	5696	5820	7020	7020
Non-Utility Generation	1426	1425	1358	1274	1220	1206	1200	1214	1192	1225	1234	1252	1509	1501
Resource Acquisition	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Other Resources	17207	17171	17110	16973	17490	17653	17625	17627	15611	14841	14865	13675	16842	17408
Total Resources	45855	43320	42328	42423	44236	43579	41402	41901	39573	38247	36892	36568	45272	45520
Reserves & Maintenance														
Hydro Reserves	-1640	-1630	-1656	-1648	-1659	-1639	-1622	-1614	-1599	-1574	-1571	-1579	-1663	-1646
Small Thermal & Misc. Reserves	-463	-463	-461	-458	-457	-456	-457	-457	-378	-412	-413	-347	-437	-466
Contract Reserves	-24	-19	-19	-20	-26	-35	-32	-32	-22	-21	-23	-28	-34	-26
Large Thermal Reserves	-1053	-1053	-1053	-1034	-1053	-1053	-1053	-1053	-1053	-854	-854	-873	-1053	-1053
Regional Hydro Maintenance	-4595	-4032	-3787	-3208	-2935	-2037	-1561	-2286	-2626	-2751	-2483	-2360	-2202	-3720
Spinning Reserves	-879	-831	-812	-827	-869	-871	-830	-825	-787	-752	-724	-753	-935	-888
Regional Transmission Losses	-1246	-1182	-1157	-1180	-1247	-1256	-1201	-1194	-1109	-1068	-1033	-1026	-1305	-1264
Total Reserves, Maintenance & Losses	-9901	-9211	-8946	-8375	-8246	-7348	-6756	-7461	-7574	-7432	-7101	-6966	-7629	-9062
Total Net Resources	35954	34109	33382	34048	35989	36232	34645	34440	31999	30815	29791	29602	37643	36457
Surplus/Deficits														
Firm Surplus/Deficit	5132	3333	4412	3288	2163	287	-2232	-1038	-611	546	-468	126	7417	4789
Total Surplus/Deficit	5132	3333	4398	3288	2163	287	-2235	-1061	-665	513	-501	126	7417	4789

Exhibit 24: OY 2017 Monthly 1-Hour Capacity

Loads and Resources - Pacific Northwest Region
PNW Loads and Resource Study
2016 - 2017 Operating Year
1937 Water Year
[43] 2007 White Book (Final)

3/31/2007

Capacity (MW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul
Firm Regional Loads														
Regional Firm Loads	31069	31061	29065	31141	34510	37066	37696	36235	33208	30837	30847	30173	30388	31914
Exports	1991	1992	1997	1638	1613	1609	1604	1600	1634	1634	1634	1501	2010	1992
Federal Diversity	-557	-600	-640	-459	-408	-664	-416	-431	-489	-613	-636	-640	-586	-473
Total Firm Regional Loads	32503	32453	30422	32320	35715	38011	38884	37404	34354	31857	31846	31034	31812	33434
Non-Firm Regional Loads														
Regional Non-Firm Loads	0	0	14	0	0	0	3.5	23	54	34	34	0	0	0
Total Non-Firm Regional Loads	0	0	14	0	0	0	3.5	23	54	34	34	0	0	0
Total Loads	32503	32453	30436	32320	35715	38011	38887	37427	34408	31891	31879	31034	31812	33434
Hydro Resources														
Regulated Hydro	31124	30954	31381	31174	31406	31166	30908	30705	30202	29623	29418	29479	31178	31166
Independent Hydro	1705	1690	1782	1792	1773	1612	1532	1584	1777	1856	1999	2105	2089	1758
Operational Peaking Adjustment	-4097	-6394	-7868	-7489	-6405	-6827	-8659	-7997	-7995	-8054	-9368	-8663	-4809	-4779
Total Hydro Resources	28732	26250	25295	25477	26773	25952	23781	24292	23984	23425	22048	22921	28458	28144
Other Resources														
Small Thermal & Misc.	30	30	30	30	30	30	32	30	30	30	30	30	30	30
Combustion Turbines	5259	5259	5272	5296	5317	5329	5334	5325	4400	4421	4421	3419	4650	5253
Renewables	94	94	95	97	98	100	102	101	100	99	99	46	95	94
Cogeneration	2456	2456	2462	2469	2479	2462	2481	2478	1843	2469	2469	2238	2462	2438
Imports	971	936	918	960	1345	1527	1476	1479	1067	943	961	966	1134	1131
Large Thermal	7020	7020	7020	7020	7020	7020	7020	7020	7020	5766	5236	5717	5717	7020
Non-Utility Generation	1427	1425	1359	1275	1220	1207	1202	1215	1193	1226	1235	1253	1511	1501
Resource Acquisition	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Other Resources	17258	17221	17156	17147	17510	17676	17646	17649	15655	14954	14451	13670	15599	17467
Total Resources	45990	43472	42451	42625	44283	43627	41427	41941	39638	38379	36499	36591	44056	45611
Reserves & Maintenance														
Hydro Reserves	-1641	-1632	-1658	-1648	-1659	-1639	-1622	-1614	-1599	-1574	-1571	-1579	-1663	-1646
Small Thermal & Misc. Reserves	-463	-463	-461	-458	-457	-456	-457	-457	-378	-412	-413	-349	-437	-466
Contract Reserves	-28	-23	-23	-24	-30	-40	-36	-36	-25	-25	-27	-32	-39	-31
Large Thermal Reserves	-1053	-1053	-1053	-1053	-1053	-1053	-1053	-1053	-1053	-865	-785	-858	-858	-1053
Regional Hydro Maintenance	-4595	-4032	-3787	-3208	-2935	-2037	-1561	-2286	-2626	-2751	-2483	-2360	-2202	-3720
Spinning Reserves	-881	-833	-813	-831	-870	-872	-830	-825	-787	-768	-724	-732	-897	-889
Regional Transmission Losses	-1251	-1187	-1161	-1186	-1249	-1257	-1202	-1195	-1111	-1071	-1022	-1028	-1272	-1267
Total Reserves, Maintenance & Losses	-9912	-9223	-8956	-8409	-8253	-7354	-6762	-7467	-7580	-7466	-7025	-6938	-7367	-9071
Total Net Resources	36078	34248	33495	34216	36030	36273	34665	34474	32058	30913	29474	29653	36689	36541
Surplus/Deficits														
Firm Surplus/Deficit	3575	1795	3073	1895	315	-1738	-4218	-2930	-2296	-944	-2371	-1381	4877	3107
Total Surplus/Deficit	3575	1795	3058	1895	315	-1738	-4222	-2953	-2350	-978	-2405	-1381	4877	3107

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Exhibits 25 – 34

Regional Energy Surpluses and Deficits for 50-Historical Water Conditions

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Exhibit 25: OY 2008 Monthly 50-WY Energy

Regional Surplus/Deficit - 50 Water Year
PNW Loads and Resource Study
2007 - 2008 Operating Year
[43] 2007 White Book (Final)

3/31/2007

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1929 Regional Surplus/Deficit	7228	2198	4174	4099	4556	1414	2149	554	1920	2792	2410	905	8702	5489	3440
1930 Regional Surplus/Deficit	3974	2378	3537	4284	4015	2337	76	2240	1772	3787	2675	340	6305	5570	3074
1931 Regional Surplus/Deficit	4477	2857	3330	4279	4054	598	155	880	1487	3480	1907	-253	6249	5208	2696
1932 Regional Surplus/Deficit	3564	2773	3557	3694	3919	1386	496	154	4450	9750	11291	10375	11903	8309	5161
1933 Regional Surplus/Deficit	4089	4581	4506	4422	4725	3562	9033	5493	3334	5802	6309	7043	12238	9679	6202
1934 Regional Surplus/Deficit	7772	6370	5224	6623	7761	12571	10683	10343	8993	11040	10884	10069	6414	6026	8562
1935 Regional Surplus/Deficit	3260	2544	2992	4179	4695	2335	7903	9284	1897	4652	6785	5960	10228	8236	5527
1936 Regional Surplus/Deficit	6137	2709	3880	4163	4022	2632	769	869	1572	4115	9287	11171	10633	5337	4681
1937 Regional Surplus/Deficit	4519	2848	3687	4196	3978	2591	-528	15	1410	3575	2100	1194	7662	4764	2957
1938 Regional Surplus/Deficit	4004	2427	3602	4618	4808	3024	8422	3703	6417	8045	9999	11851	12102	7802	6549
1939 Regional Surplus/Deficit	4003	2597	4325	4513	4203	2194	4638	1053	3189	5902	6816	7553	6642	6162	4511
1940 Regional Surplus/Deficit	5038	2825	3504	4536	4035	2651	3453	2732	6709	6338	8864	5748	6745	5193	4736
1941 Regional Surplus/Deficit	3005	1864	3155	4174	3546	2385	3348	1313	1202	3337	1484	2458	6482	4489	3117
1942 Regional Surplus/Deficit	2823	2285	4183	4013	3227	5404	7253	3597	301	4282	5780	5643	11755	9265	5185
1943 Regional Surplus/Deficit	6535	4452	3723	4236	4617	2874	7504	7805	8066	12304	11724	11562	12371	10144	7534
1944 Regional Surplus/Deficit	7341	4052	4087	4458	4340	3127	3004	876	381	2528	955	129	4882	4376	3091
1945 Regional Surplus/Deficit	2940	2047	3449	3627	3714	1254	320	1181	1158	2667	2066	5972	11643	6003	3598
1946 Regional Surplus/Deficit	4248	2712	3471	4202	4795	2927	6512	4706	9076	9987	11284	12599	11816	9318	6962
1947 Regional Surplus/Deficit	6824	3998	4740	4218	4851	8057	9279	9433	9607	7922	8633	10441	11435	8953	7892
1948 Regional Surplus/Deficit	5389	2592	4444	9434	6498	5969	10673	4576	5865	6971	10749	12584	15723	9644	8188
1949 Regional Surplus/Deficit	8025	7375	5292	5149	4709	2569	3946	3914	9727	8602	11510	11949	11727	4784	6793
1950 Regional Surplus/Deficit	4078	2322	3171	4546	4979	2485	5981	9943	11482	11474	11220	10305	12275	9862	7465
1951 Regional Surplus/Deficit	7370	5685	5027	6984	7768	10353	11175	11507	9091	11931	11714	12334	11823	9638	9504
1952 Regional Surplus/Deficit	7730	5129	4976	8353	5149	6054	8930	6864	5814	11450	11700	12671	12430	7610	8071
1953 Regional Surplus/Deficit	5501	2523	4129	4283	4231	1453	4993	7862	3268	4596	6546	9459	12518	9923	5975
1954 Regional Surplus/Deficit	7034	4630	4605	4949	4898	5120	6798	9520	6901	9575	9059	11261	11677	9868	7562
1955 Regional Surplus/Deficit	9808	9103	8994	5398	5498	4798	3485	1684	901	4717	5240	5125	11717	9738	5981
1956 Regional Surplus/Deficit	8101	7151	4083	6412	6757	9274	11364	7617	10751	12077	11592	12453	12640	9808	9218
1957 Regional Surplus/Deficit	7763	5123	4784	5764	4711	4442	6343	3436	6465	10436	9681	12719	12212	7150	7044
1958 Regional Surplus/Deficit	3982	2647	4094	4463	4290	2913	4347	7075	6518	7140	9900	12169	11991	6930	6385
1959 Regional Surplus/Deficit	3900	3357	4327	4496	5610	7107	10554	9575	6657	9530	8505	9179	11752	9595	7625
1960 Regional Surplus/Deficit	7442	4523	9377	10367	8495	8113	9238	3272	5894	11938	11436	7577	11611	8139	8313
1961 Regional Surplus/Deficit	5854	2413	4435	4568	4917	3194	7249	8642	7310	9356	6915	9591	11399	7746	6777
1962 Regional Surplus/Deficit	4707	3729	3686	4600	4678	2511	6156	3213	1780	10737	11783	9090	11076	8414	5890
1963 Regional Surplus/Deficit	6023	3845	4059	5638	5843	7307	8581	5408	2412	5505	5056	8520	11976	8256	6518
1964 Regional Surplus/Deficit	6794	3944	4657	4245	5104	2766	5717	2942	1533	7087	7390	7309	12715	9724	5777
1965 Regional Surplus/Deficit	8006	6427	5755	6418	4943	8936	11275	11498	9486	9107	11878	11842	12409	8361	9053
1966 Regional Surplus/Deficit	7647	5449	4869	5486	4587	3815	9032	2593	2144	11444	7846	6668	9958	8658	6167
1967 Regional Surplus/Deficit	7237	3307	3895	4330	4648	3312	10640	10713	4550	6727	4736	8113	12443	9669	6943
1968 Regional Surplus/Deficit	7624	3899	4735	5312	4682	3255	7942	8574	6696	2850	3744	5884	11698	9526	6447
1969 Regional Surplus/Deficit	7584	5831	6826	6960	6676	6290	10973	9621	5382	12043	11560	12657	11824	8854	8714
1970 Regional Surplus/Deficit	5571	2912	4406	4927	4710	2543	6763	5578	3819	4450	5335	8992	12475	7506	5904
1971 Regional Surplus/Deficit	3961	2122	3760	4473	5253	3134	9872	11348	8748	10666	11462	12451	12581	10173	7992
1972 Regional Surplus/Deficit	9473	7525	5291	5558	5138	3975	10947	11580	11806	12117	10476	12306	13399	9869	9139
1973 Regional Surplus/Deficit	9807	8104	6261	5346	4628	5053	8502	1161	1560	2209	2882	2797	6649	5348	4900
1974 Regional Surplus/Deficit	3742	2151	2461	4005	3948	6770	11509	11596	11720	11953	11598	12289	13444	9935	8533
1975 Regional Surplus/Deficit	9049	7837	5126	3750	4636	3155	8437	5549	7478	5731	7001	9753	12609	10261	7130
1976 Regional Surplus/Deficit	5094	4689	5174	6862	7344	11819	11322	9776	7048	12199	11403	12628	12288	9760	9226
1977 Regional Surplus/Deficit	9984	9990	10244	4909	4236	2496	3417	718	240	1375	153	604	3977	3479	3756
1978 Regional Surplus/Deficit	3197	2230	2839	3075	3787	2725	6523	5315	7091	10232	7430	8805	10237	9675	5968
-Ranked Averages-															
Top Ten Percent	7609	6296	5066	6447	6390	8871	11216	10396	9637	11486	11413	12312	12512	9487	9228
Middle Eighty Percent	5947	4040	4644	4999	4883	4041	6875	5540	5216	7610	8064	8885	11133	8160	6434
Bottom Ten Percent	4663	2800	3559	4278	3987	2208	1211	1065	1250	3341	1824	774	6316	4881	2987

Exhibit 26: OY 2009 Monthly 50-WY Energy

Regional Surplus/Deficit - 50 Water Year
PNW Loads and Resource Study
2008 - 2009 Operating Year
[43] 2007 White Book (Final)

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Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1929 Regional Surplus/Deficit	7306	2419	4067	3721	4330	925	1668	-56	1318	1186	1286	43	7137	4944	2850
1930 Regional Surplus/Deficit	4027	2602	3431	3909	3791	1849	-409	1633	1171	2181	1551	-520	4721	5009	2480
1931 Regional Surplus/Deficit	4537	3087	3223	3903	3829	110	-331	271	885	1875	783	-1113	4635	4558	2093
1932 Regional Surplus/Deficit	3622	3004	3450	3318	3694	897	9	-457	3847	8151	10119	9531	10165	7761	4555
1933 Regional Surplus/Deficit	4146	4824	4400	4045	4496	3075	8567	4903	2734	4200	5192	6195	10501	8897	5583
1934 Regional Surplus/Deficit	7858	6627	5118	6249	7539	12100	10227	9772	8402	9390	9709	9233	4758	5395	7965
1935 Regional Surplus/Deficit	3315	2772	2885	3802	4466	1846	7434	8706	1296	3049	5672	5110	8656	7666	4939
1936 Regional Surplus/Deficit	6215	2941	3774	3787	3797	2145	284	260	971	2510	8104	10331	9063	4776	4089
1937 Regional Surplus/Deficit	4582	3079	3580	3820	3753	2103	-1013	-592	808	1970	976	333	6077	4200	2364
1938 Regional Surplus/Deficit	4064	2657	3496	4242	4581	2534	7952	3101	5821	6444	8884	11009	10358	7267	5949
1939 Regional Surplus/Deficit	4056	2825	4218	4137	3977	1705	4161	444	2588	4298	5700	6706	5050	5597	3919
1940 Regional Surplus/Deficit	5105	3057	3397	4160	3810	2163	2974	2125	6114	4735	7755	4898	5162	4628	4147
1941 Regional Surplus/Deficit	3056	2088	3048	3798	3319	1897	2871	702	600	1733	363	1605	4906	3939	2525
1942 Regional Surplus/Deficit	2874	2518	4076	3636	2998	4919	6784	2995	-303	2675	4660	4794	10015	8718	4583
1943 Regional Surplus/Deficit	6612	4695	3616	3860	4389	2382	7030	7209	7472	10651	10546	10721	10627	9361	6910
1944 Regional Surplus/Deficit	7424	4290	3980	4080	4112	2637	2526	266	-222	921	-170	-730	3298	3829	2501
1945 Regional Surplus/Deficit	2990	2274	3342	3250	3488	764	-166	571	555	1061	941	5119	9903	5464	2994
1946 Regional Surplus/Deficit	4302	2943	3364	3825	4568	2436	6035	4106	8484	8388	10170	11692	10074	8765	6354
1947 Regional Surplus/Deficit	6903	4235	4633	3839	4623	7575	8810	8844	9017	6322	7518	9541	9877	8401	7304
1948 Regional Surplus/Deficit	5459	2820	4337	9065	6273	5486	10208	3974	5270	5370	9638	11676	14107	8865	7575
1949 Regional Surplus/Deficit	8110	7638	5186	4772	4482	2080	3470	3310	9135	7001	10333	11036	9984	4238	6186
1950 Regional Surplus/Deficit	4131	2543	3064	4169	4751	1995	5506	9359	10894	9877	10108	9460	10538	9082	6846
1951 Regional Surplus/Deficit	7452	5934	4921	6609	7543	9875	10711	10930	8497	10276	10537	11427	10079	8858	8879
1952 Regional Surplus/Deficit	7815	5375	4869	7981	4921	5571	8460	6269	5219	9792	10519	11766	10689	7080	7465
1953 Regional Surplus/Deficit	5570	2751	4022	3906	4006	964	4511	7267	2667	2992	5431	8613	10779	9147	5355
1954 Regional Surplus/Deficit	7111	4872	4498	4572	4672	4634	6324	8935	6306	7975	7943	10419	9936	9085	6944
1955 Regional Surplus/Deficit	9790	9376	8890	5022	5272	4315	3008	1076	300	3114	4125	4273	9980	8952	5358
1956 Regional Surplus/Deficit	8189	7412	3976	6037	6531	8795	10901	7021	10162	10421	10417	11547	10902	9026	8593
1957 Regional Surplus/Deficit	7847	5368	4678	5388	4484	3954	5870	2829	5866	8838	8569	11811	10479	6605	6439
1958 Regional Surplus/Deficit	4039	2874	3987	4086	4064	2423	3868	6478	5925	5539	8786	11257	10254	6385	5779
1959 Regional Surplus/Deficit	3956	3590	4220	4119	5383	6625	10090	8991	6063	7932	7392	8334	10017	8817	7008
1960 Regional Surplus/Deficit	7527	4764	9272	9999	8274	7635	8772	2666	5299	10292	10262	6730	9871	7575	7710
1961 Regional Surplus/Deficit	5927	2638	4329	4191	4690	2708	6778	8052	6716	7761	5803	8750	9665	7175	6177
1962 Regional Surplus/Deficit	4768	3963	3580	4224	4451	2022	5681	2608	1179	9140	10611	8244	9519	7862	5301
1963 Regional Surplus/Deficit	6095	4081	3953	5262	5617	6825	8113	4802	1812	3903	3940	7674	10330	7711	5926
1964 Regional Surplus/Deficit	6871	4182	4551	3867	4877	2277	5242	2341	931	5484	6277	6458	10977	8942	5156
1965 Regional Surplus/Deficit	8091	6681	5649	6045	4717	8456	10813	10912	8895	7508	10698	10952	10663	7850	8453
1966 Regional Surplus/Deficit	7732	5699	4762	5110	4360	3330	8564	1989	1541	9852	6736	5820	8378	8081	5579
1967 Regional Surplus/Deficit	7318	3538	3788	3953	4422	2824	10174	10136	3952	5126	3619	7262	10707	8888	6326
1968 Regional Surplus/Deficit	7710	4137	4628	4936	4454	2767	7470	7981	6101	1244	2597	5034	9958	8747	5827
1969 Regional Surplus/Deficit	7669	6082	6720	6586	6451	5808	10509	9036	4784	10390	10384	11752	10086	8300	8108
1970 Regional Surplus/Deficit	5639	3140	4299	4550	4484	2055	6286	4977	3219	2846	4221	8143	10731	6986	5305
1971 Regional Surplus/Deficit	4014	2345	3653	4096	5027	2644	9399	10775	8154	9066	10351	11544	10845	9393	7368
1972 Regional Surplus/Deficit	9567	7786	5185	5181	4910	3489	10479	10999	11220	10467	9364	11397	11777	9087	8526
1973 Regional Surplus/Deficit	9806	8371	6155	4969	4401	4567	8032	551	957	602	1761	1942	5065	4786	4308
1974 Regional Surplus/Deficit	3796	2372	2354	3628	3718	6286	11052	11025	11131	10298	10421	11379	11778	9148	7912
1975 Regional Surplus/Deficit	9143	8101	5020	3371	4409	2665	7964	4952	6885	4128	5887	8905	10864	9479	6512
1976 Regional Surplus/Deficit	5159	4929	5067	6488	7120	11344	10858	9191	6452	10544	10292	11718	10543	8980	8602
1977 Regional Surplus/Deficit	9967	10154	10140	4533	4009	2008	2940	108	-363	-279	-1007	-277	2354	2823	3141
1978 Regional Surplus/Deficit	3250	2461	2732	2697	3559	2233	6048	4714	6497	8635	6315	7957	8681	8892	5362
-Ranked Averages-															
Top Ten Percent	7692	6548	4959	6072	6164	8392	10752	9811	9045	9843	10262	11408	10793	8760	8611
Middle Eighty Percent	6011	4276	4538	4623	4657	3554	6403	4943	4619	5999	6932	8022	9448	7517	5828
Bottom Ten Percent	4725	3029	3452	3902	3761	1719	729	456	649	1736	701	-85	4728	4307	2393

Exhibit 27: OY 2010 Monthly 50-WY Energy

Regional Surplus/Deficit - 50 Water Year
PNW Loads and Resource Study
2009 - 2010 Operating Year
[43] 2007 White Book (Final)

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Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1929 Regional Surplus/Deficit	7131	2016	3509	3448	3910	419	1255	-362	913	1116	1030	1171	8412	4859	2765
1930 Regional Surplus/Deficit	3836	2199	2872	3637	3371	1343	-825	1328	766	2111	1295	608	5997	4924	2395
1931 Regional Surplus/Deficit	4314	2683	2664	3630	3409	-395	-747	-36	480	1805	527	15	5913	4474	2006
1932 Regional Surplus/Deficit	3295	2493	2893	3045	3273	391	-407	-764	3441	8084	9872	10668	11446	7679	4461
1933 Regional Surplus/Deficit	3957	4411	3843	3773	4074	2570	8161	4604	2330	4131	4939	7330	11783	8818	5500
1934 Regional Surplus/Deficit	7664	6225	4561	5978	7120	11602	9824	9480	8002	9329	9462	10374	6034	5311	7885
1935 Regional Surplus/Deficit	3012	2282	2326	3530	4044	1340	7027	8411	890	2979	5421	6245	9934	7584	4848
1936 Regional Surplus/Deficit	5959	2497	3215	3514	3376	1640	-131	-46	565	2440	7850	11469	10342	4692	4001
1937 Regional Surplus/Deficit	4367	2679	3020	3548	3333	1598	-1429	-898	403	1901	720	1461	7353	4115	2278
1938 Regional Surplus/Deficit	3789	2181	2937	3970	4160	2027	7544	2796	5418	6376	8632	12149	11636	7184	5859
1939 Regional Surplus/Deficit	3886	2470	3661	3864	3556	1199	3750	137	2182	4229	5446	7842	6325	5514	3837
1940 Regional Surplus/Deficit	4816	2576	2838	3888	3389	1658	2562	1819	5712	4666	7506	6033	6439	4544	4055
1941 Regional Surplus/Deficit	2790	1624	2488	3525	2898	1392	2459	394	194	1663	107	2738	6181	3853	2435
1942 Regional Surplus/Deficit	2692	2159	3518	3362	2576	4414	6376	2692	-709	2604	4406	5928	11295	8637	4501
1943 Regional Surplus/Deficit	6427	4307	3056	3587	3967	1875	6620	6907	7069	10588	10296	11860	11906	9278	6828
1944 Regional Surplus/Deficit	7254	3944	3420	3807	3691	2131	2114	-42	-628	850	-428	399	4572	3743	2418
1945 Regional Surplus/Deficit	2805	1878	2784	2977	3068	258	-583	264	150	990	684	6251	11182	5379	2909
1946 Regional Surplus/Deficit	4126	2561	2804	3552	4147	1929	5623	3803	8082	8321	9919	12832	11354	8683	6273
1947 Regional Surplus/Deficit	6719	3879	4075	3565	4202	7072	8401	8544	8617	6254	7267	10679	11156	8320	7224
1948 Regional Surplus/Deficit	5281	2474	3778	8796	5853	4984	9801	3669	4868	5302	9389	12816	15391	8787	7497
1949 Regional Surplus/Deficit	7934	7278	4628	4499	4061	1574	3059	3005	8734	6932	10085	12172	11263	4151	6105
1950 Regional Surplus/Deficit	3955	2171	2503	3896	4330	1488	5095	9061	10495	9810	9858	10598	11820	9001	6765
1951 Regional Surplus/Deficit	7283	5579	4362	6337	7123	9374	10306	10636	8096	10211	10290	12566	11357	8778	8801
1952 Regional Surplus/Deficit	7633	5023	4311	7710	4499	5068	8052	5968	4817	9724	10267	12907	11968	6996	7385
1953 Regional Surplus/Deficit	5395	2407	3463	3633	3586	459	4097	6965	2262	2923	5178	9750	12061	9067	5275
1954 Regional Surplus/Deficit	6935	4521	3939	4299	4251	4130	5914	8638	5905	7908	7692	11558	11218	9006	6865
1955 Regional Surplus/Deficit	9403	9013	8341	4749	4852	3812	2596	770	-106	3044	3872	5406	11263	8873	5269
1956 Regional Surplus/Deficit	8005	7022	3416	5765	6111	8293	10496	6719	9761	10356	10170	12687	12183	8947	8513
1957 Regional Surplus/Deficit	7668	5019	4119	5115	4062	3448	5460	2523	5462	8771	8318	12950	11763	6522	6359
1958 Regional Surplus/Deficit	3870	2523	3428	3812	3643	1916	3456	6175	5523	5470	8534	12395	11536	6301	5699
1959 Regional Surplus/Deficit	3790	3244	3662	3845	4961	6122	9685	8693	5660	7865	7143	9473	11300	8739	6930
1960 Regional Surplus/Deficit	7340	4412	8723	9730	7855	7134	8366	2360	4896	10233	10015	7866	11151	7493	7631
1961 Regional Surplus/Deficit	5742	2266	3771	3918	4269	2204	6370	7752	6315	7695	5552	9889	10948	7093	6096
1962 Regional Surplus/Deficit	4506	3517	3021	3951	4031	1516	5271	2302	774	9073	10366	9381	10796	7780	5213
1963 Regional Surplus/Deficit	5917	3717	3394	4989	5196	6323	7706	4495	1407	3834	3688	8810	11609	7629	5845
1964 Regional Surplus/Deficit	6691	3827	3993	3594	4456	1772	4832	2038	525	5414	6025	7592	12259	8863	5075
1965 Regional Surplus/Deficit	7915	6327	5092	5774	4297	7953	10408	10613	8494	7440	10448	12091	11941	7766	8374
1966 Regional Surplus/Deficit	7562	5357	4203	4838	3939	2825	8157	1684	1135	9788	6487	6955	9657	8000	5499
1967 Regional Surplus/Deficit	7047	3096	3229	3680	4001	2318	9768	9841	3548	5059	3366	8398	11990	8810	6239
1968 Regional Surplus/Deficit	7523	3770	4071	4663	4032	2262	7061	7679	5698	1173	2345	6169	11238	8668	5746
1969 Regional Surplus/Deficit	7483	5735	6166	6315	6031	5306	10103	8739	4380	10326	10137	12892	11369	8218	8030
1970 Regional Surplus/Deficit	5464	2776	3741	4278	4064	1550	5874	4673	2815	2777	3969	9278	12010	6902	5223
1971 Regional Surplus/Deficit	3850	1994	3093	3823	4606	2138	8989	10482	7751	8998	10103	12683	12127	9313	7290
1972 Regional Surplus/Deficit	9390	7429	4628	4908	4489	2984	10072	10702	10822	10406	9114	12536	13059	9008	8448
1973 Regional Surplus/Deficit	9417	8010	5599	4697	3979	4062	7623	243	551	532	1506	3074	6341	4702	4217
1974 Regional Surplus/Deficit	3559	1941	1792	3355	3295	5783	10649	10732	10731	10234	10174	12518	13059	9069	7828
1975 Regional Surplus/Deficit	8969	7745	4463	3097	3989	2159	7555	4650	6483	4060	5635	10041	12144	9401	6432
1976 Regional Surplus/Deficit	5006	4598	4509	6216	6700	10843	10452	8894	6048	10480	10043	12858	11820	8902	8525
1977 Regional Surplus/Deficit	9588	9594	9596	4260	3588	1502	2529	-199	-770	-350	-1264	855	3629	2738	3043
1978 Regional Surplus/Deficit	2919	1966	2173	2424	3137	1724	5636	4409	6095	8570	6064	9093	9957	8810	5268
-Ranked Averages-															
Top Ten Percent	7520	6191	4402	5800	5744	7890	10347	9513	8644	9779	10013	12548	12072	8680	8532
Middle Eighty Percent	5793	3883	3980	4350	4236	3049	5993	4641	4215	5932	6681	9159	10728	7435	5744
Bottom Ten Percent	4512	2626	2893	3629	3340	1214	314	149	243	1666	444	1044	6003	4222	2306

Exhibit 28: OY 2011 Monthly 50-WY Energy

Regional Surplus/Deficit - 50 Water Year
PNW Loads and Resource Study
2010 - 2011 Operating Year
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Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1929 Regional Surplus/Deficit	6860	1733	3309	3233	3600	296	826	-762	583	1242	630	7.4	6466	4270	2255
1930 Regional Surplus/Deficit	3561	1916	2672	3426	3066	1220	-1259	921	434	2233	889	-553	4058	4343	1886
1931 Regional Surplus/Deficit	4040	2401	2464	3419	3102	-516	-1184	-438	148	1925	125	-1152	3977	3894	1497
1932 Regional Surplus/Deficit	3022	2212	2694	2833	2965	269	-845	-1166	3102	8217	9489	9516	9502	7094	3953
1933 Regional Surplus/Deficit	3682	4130	3643	3558	3743	2440	7742	4212	2000	4256	4549	6181	9843	8231	4992
1934 Regional Surplus/Deficit	7393	5946	4362	5756	6805	11470	9393	9098	7673	9460	9072	9234	4095	4734	7380
1935 Regional Surplus/Deficit	2737	1999	2126	3315	3723	1209	6603	8026	558	3103	5032	5094	7989	7006	4340
1936 Regional Surplus/Deficit	5687	2215	3016	3303	3070	1520	-568	-446	233	2559	7460	10311	8394	4110	3492
1937 Regional Surplus/Deficit	4094	2397	2820	3337	3028	1476	-1863	-1296	74	2023	318	295	5397	3519	1767
1938 Regional Surplus/Deficit	3515	1899	2737	3758	3842	1895	7119	2397	5092	6497	8235	11003	9688	6603	5351
1939 Regional Surplus/Deficit	3610	2187	3462	3651	3246	1071	3320	-264	1850	4348	5048	6689	4382	4926	3327
1940 Regional Surplus/Deficit	4544	2294	2638	3677	3081	1530	2128	1414	5381	4786	7118	4878	4504	3962	3547
1941 Regional Surplus/Deficit	2514	1341	2288	3314	2589	1267	2030	-7.1	-137	1787	-288	1585	4245	3270	1927
1942 Regional Surplus/Deficit	2417	1876	3318	3142	2258	4283	5954	2295	-1042	2723	4006	4775	9358	8058	3993
1943 Regional Surplus/Deficit	6155	4026	2856	3376	3649	1743	6194	6509	6741	10723	9897	10714	9955	8685	6318
1944 Regional Surplus/Deficit	6982	3662	3219	3591	3382	2007	1687	-443	-961	971	-829	-759	2629	3150	1908
1945 Regional Surplus/Deficit	2529	1595	2584	2765	2760	134	-1023	-140	-182	1114	283	5086	9244	4795	2399
1946 Regional Surplus/Deficit	3850	2278	2604	3338	3836	1797	5190	3405	7759	8448	9530	11684	9408	8098	5764
1947 Regional Surplus/Deficit	6448	3597	3875	3346	3884	6934	7980	8148	8295	6383	6866	9529	9218	7744	6717
1948 Regional Surplus/Deficit	5009	2191	3578	8575	5537	4861	9382	3268	4539	5430	9001	11673	13447	8205	6990
1949 Regional Surplus/Deficit	7663	7000	4429	4282	3749	1449	2633	2607	8410	7054	9706	11014	9315	3557	5596
1950 Regional Surplus/Deficit	3679	1887	2302	3680	4010	1358	4667	8672	10170	9938	9467	9450	9878	8405	6256
1951 Regional Surplus/Deficit	7011	5298	4163	6117	6801	9246	9889	10243	7770	10339	9902	11416	9413	8202	8295
1952 Regional Surplus/Deficit	7362	4743	4111	7494	4184	4945	7635	5573	4492	9859	9874	11758	10022	6410	6879
1953 Regional Surplus/Deficit	5122	2123	3263	3422	3280	338	3654	6566	1927	3046	4784	8600	10131	8478	4766
1954 Regional Surplus/Deficit	6663	4240	3739	4085	3937	3997	5486	8249	5576	8033	7297	10414	9276	8414	6357
1955 Regional Surplus/Deficit	9135	8737	8147	4534	4540	3691	2167	369	-436	3168	3477	4254	9325	8288	4761
1956 Regional Surplus/Deficit	7734	6745	3216	5542	5788	8162	10081	6326	9440	10483	9783	11534	10238	8354	8004
1957 Regional Surplus/Deficit	7397	4738	3919	4899	3750	3318	5037	2121	5129	8896	7926	11800	9830	5939	5852
1958 Regional Surplus/Deficit	3595	2240	3228	3599	3334	1788	3022	5775	5199	5595	8141	11248	9599	5715	5191
1959 Regional Surplus/Deficit	3515	2962	3462	3631	4641	5997	9267	8306	5335	7996	6745	8329	9372	8163	6426
1960 Regional Surplus/Deficit	7069	4131	8528	9509	7532	7013	7951	1954	4568	10382	9620	6713	9210	6914	7124
1961 Regional Surplus/Deficit	5470	1983	3571	3704	3948	2080	5942	7350	5984	7823	5159	8746	9008	6508	5588
1962 Regional Surplus/Deficit	4232	3236	2821	3736	3720	1388	4838	1899	442	9195	9989	8230	8854	7200	4704
1963 Regional Surplus/Deficit	5644	3436	3194	4775	4874	6198	7288	4085	1070	3958	3292	7660	9673	7053	5336
1964 Regional Surplus/Deficit	6420	3546	3794	3381	4145	1646	4402	1642	194	5538	5635	6443	10316	8273	4567
1965 Regional Surplus/Deficit	7644	6049	4894	5559	3985	7819	9984	10218	8169	7555	10063	10948	10001	7178	7868
1966 Regional Surplus/Deficit	7291	5077	4003	4626	3624	2704	7741	1286	804	9918	6095	5800	7719	7423	4993
1967 Regional Surplus/Deficit	6777	2814	3030	3466	3689	2188	9348	9455	3217	5187	2972	7245	10050	8234	5733
1968 Regional Surplus/Deficit	7252	3488	3872	4441	3713	2131	6631	7272	5369	1294	1953	5021	9304	8098	5237
1969 Regional Surplus/Deficit	7213	5455	5968	6095	5710	5184	9684	8354	4053	10459	9751	11736	9428	7639	7524
1970 Regional Surplus/Deficit	5191	2493	3541	4063	3754	1426	5439	4269	2483	2900	3575	8127	10065	6320	4714
1971 Regional Surplus/Deficit	3575	1711	2892	3609	4292	2010	8563	10095	7424	9128	9708	11536	10185	8720	6782
1972 Regional Surplus/Deficit	9121	7152	4429	4695	4175	2859	9654	10311	10489	10543	8711	11381	11116	8417	7941
1973 Regional Surplus/Deficit	9149	7734	5401	4484	3667	3929	7198	-161	220	656	1108	1918	4400	4116	3708
1974 Regional Surplus/Deficit	3285	1657	1591	3141	2973	5656	10226	10352	10409	10367	9789	11371	11115	8477	7322
1975 Regional Surplus/Deficit	8699	7468	4264	2883	3680	2028	7122	4250	6155	4188	5246	8889	10202	8813	5924
1976 Regional Surplus/Deficit	4731	4317	4310	6003	6386	10715	10025	8504	5720	10613	9645	11713	9873	8318	8018
1977 Regional Surplus/Deficit	9321	9320	9403	4047	3277	1380	2103	-600	-1103	-230	-1667	-301	1685	2153	2535
1978 Regional Surplus/Deficit	2645	1685	1973	2209	2828	1572	5205	4011	5771	8702	5670	7944	8011	8231	4759
-Ranked Averages-															
Top Ten Percent	7248	5912	4202	5583	5427	7760	9927	9120	8318	9907	9621	11399	10128	8094	8025
Middle Eighty Percent	5521	3602	3781	4135	3921	2922	5566	4244	3886	6058	6288	8008	8787	6852	5236
Bottom Ten Percent	4238	2343	2693	3417	3033	1091	-118	-253	-89	1788	43	-117	4061	3635	1797

Exhibit 29: OY 2012 Monthly 50-WY Energy

Regional Surplus/Deficit - 50 Water Year
PNW Loads and Resource Study
2011 - 2012 Operating Year
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Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1929 Regional Surplus/Deficit	6435	1292	2919	2842	3207	-104	597	-814	130	51	316	-403	7662	4259	2029
1930 Regional Surplus/Deficit	3128	1485	2285	3035	2672	822	-1493	879	-15	1049	580	-967	5250	4331	1660
1931 Regional Surplus/Deficit	3616	1968	2075	3029	2709	-916	-1416	-487	-302	741	-184	-1558	5173	3882	1272
1932 Regional Surplus/Deficit	2597	1782	2308	2443	2572	-130	-1076	-1215	2656	7028	9199	9127	10718	7090	3733
1933 Regional Surplus/Deficit	3246	3701	3250	3170	3367	2050	7528	4175	1551	3069	4243	5783	11058	8244	4776
1934 Regional Surplus/Deficit	6963	5518	3967	5379	6425	11108	9196	9072	7240	8299	8786	8843	5289	4723	7169
1935 Regional Surplus/Deficit	2305	1570	1739	2928	3337	816	6390	7996	108	1915	4729	4695	9193	6999	4122
1936 Regional Surplus/Deficit	5260	1773	2628	2911	2676	1120	-798	-497	-218	1376	7148	9930	9605	4096	3269
1937 Regional Surplus/Deficit	3664	1958	2431	2946	2633	1079	-2096	-1347	-377	836	7.9	-112	6601	3514	1542
1938 Regional Surplus/Deficit	3090	1462	2348	3368	3455	1501	6904	2353	4646	5318	7938	10614	10897	6592	5132
1939 Regional Surplus/Deficit	3175	1756	3070	3260	2853	676	3099	-314	1399	3165	4745	6295	5577	4921	3105
1940 Regional Surplus/Deficit	4120	1859	2249	3287	2688	1137	1905	1369	4938	3602	6822	4480	5696	3948	3325
1941 Regional Surplus/Deficit	2080	910	1899	2922	2193	870	1805	-59	-591	598	-601	1178	5432	3253	1700
1942 Regional Surplus/Deficit	1987	1445	2927	2756	1867	3896	5736	2250	-1496	1533	3698	4371	10560	8053	3771
1943 Regional Surplus/Deficit	5730	3600	2463	2983	3261	1346	5971	6469	6297	9549	9610	10325	11164	8688	6101
1944 Regional Surplus/Deficit	6551	3230	2822	3201	2986	1607	1461	-494	-1414	-219	-1144	-1172	3816	3141	1680
1945 Regional Surplus/Deficit	2084	1153	2193	2375	2366	-266	-1253	-188	-634	-75	-31	4686	10445	4779	2172
1946 Regional Surplus/Deficit	3416	1848	2207	2947	3443	1401	4969	3361	7317	7269	9229	11298	10621	8097	5545
1947 Regional Surplus/Deficit	6017	3154	3486	2956	3495	6558	7759	8113	7858	5199	6577	9140	10418	7736	6499
1948 Regional Surplus/Deficit	4579	1749	3188	8206	5151	4471	9165	3224	4096	4246	8703	11281	14663	8209	6774
1949 Regional Surplus/Deficit	7235	6577	4035	3894	3356	1050	2408	2560	7969	5874	9403	10627	10526	3547	5376
1950 Regional Surplus/Deficit	3239	1439	1911	3291	3624	962	4445	8637	9738	8760	9171	9060	11095	8419	6040
1951 Regional Surplus/Deficit	6576	4865	3767	5735	6419	8869	9676	10221	7328	9165	9611	11032	10619	8196	8081
1952 Regional Surplus/Deficit	6937	4316	3717	7114	3793	4554	7412	5532	4050	8670	9575	11372	11228	6401	6660
1953 Regional Surplus/Deficit	4691	1680	2873	3028	2885	-63	3436	6530	1479	1860	4479	8206	11332	8487	4546
1954 Regional Surplus/Deficit	6232	3807	3344	3695	3547	3612	5267	8213	5138	6853	6997	10024	10490	8427	6142
1955 Regional Surplus/Deficit	8707	8310	7758	4146	4150	3298	1943	321	-888	1980	3170	3846	10539	8299	4541
1956 Regional Surplus/Deficit	7304	6320	2819	5164	5408	7786	9867	6282	9000	9311	9497	11153	11455	8368	7793
1957 Regional Surplus/Deficit	6966	4305	3522	4511	3356	2926	4816	2074	4684	7717	7628	11411	11038	5929	5631
1958 Regional Surplus/Deficit	3161	1798	2838	3206	2940	1390	2800	5738	4756	4413	7840	10852	10804	5706	4970
1959 Regional Surplus/Deficit	3080	2522	3072	3240	4255	5609	9056	8270	4891	6814	6457	7937	10575	8164	6209
1960 Regional Surplus/Deficit	6641	3699	8133	9140	7159	6627	7732	1910	4122	9205	9338	6318	10418	6905	6909
1961 Regional Surplus/Deficit	5040	1540	3182	3315	3563	1685	5729	7321	5546	6648	4862	8355	10224	6506	5372
1962 Regional Surplus/Deficit	3800	2807	2425	3346	3328	993	4624	1855	-8.7	8018	9693	7838	10054	7193	4484
1963 Regional Surplus/Deficit	5211	3003	2800	4384	4492	5812	7070	4045	625	2773	2986	7260	10872	7041	5116
1964 Regional Surplus/Deficit	5993	3116	3401	2989	3752	1250	4184	1598	-258	4349	5331	6041	11532	8286	4347
1965 Regional Surplus/Deficit	7211	5619	4498	5177	3593	7442	9779	10186	7728	6388	9759	10556	11204	7171	7652
1966 Regional Surplus/Deficit	6864	4646	3610	4235	3235	2308	7522	1239	350	8744	5798	5407	8920	7418	4772
1967 Regional Surplus/Deficit	6353	2374	2641	3077	3297	1796	9136	9425	2772	4005	2669	6849	11263	8236	5516
1968 Regional Surplus/Deficit	6828	3059	3479	4058	3326	1740	6418	7245	4928	105	1649	4619	10510	8093	5020
1969 Regional Surplus/Deficit	6787	5026	5574	5717	5329	4794	9473	8316	3604	9286	9458	11358	10642	7634	7310
1970 Regional Surplus/Deficit	4764	2055	3151	3673	3362	1029	5220	4229	2036	1713	3270	7726	11272	6307	4492
1971 Regional Surplus/Deficit	3142	1280	2495	3217	3903	1612	8342	10070	6979	7944	9420	11149	11396	8732	6566
1972 Regional Surplus/Deficit	8693	6726	4034	4303	3782	2462	9436	10281	10070	9376	8426	11002	12332	8427	7728
1973 Regional Surplus/Deficit	8722	7307	5006	4093	3273	3541	6982	-209	-234	-536	794	1511	5595	4105	3484
1974 Regional Surplus/Deficit	2853	1225	1198	2750	2582	5266	10021	10323	9970	9194	9498	10984	12332	8493	7109
1975 Regional Surplus/Deficit	8268	7042	3869	2489	3286	1633	6910	4211	5713	3000	4940	8494	11411	8827	5706
1976 Regional Surplus/Deficit	4292	3882	3915	5613	5999	10340	9821	8469	5272	9435	9357	11325	11077	8324	7803
1977 Regional Surplus/Deficit	8892	8894	9019	3657	2883	979	1879	-651	-1557	-1417	-1980	-710	2880	2139	2309
1978 Regional Surplus/Deficit	2219	1246	1581	1818	2431	1191	4982	3966	5326	7525	5369	7546	9210	8224	4538
-Ranked Averages-															
Top Ten Percent	6815	5482	3807	5198	5040	7380	9716	9088	7880	8735	9330	11013	11338	8097	7811
Middle Eighty Percent	5091	3168	3389	3747	3532	2529	5347	4203	3441	4876	5988	7614	9993	6849	5017
Bottom Ten Percent	3808	1910	2302	3026	2639	692	-348	-301	-540	601	-268	-526	5254	3624	1571

Exhibit 30: OY 2013 Monthly 50-WY Energy

Regional Surplus/Deficit - 50 Water Year
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Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1929 Regional Surplus/Deficit	6210	1067	2726	2747	3009	-411	307	-1335	-141	-159	-462	-583	6695	3986	1694
1930 Regional Surplus/Deficit	2897	1251	2090	2943	2474	515	-1787	358	-285	839	-198	-1147	4284	4061	1325
1931 Regional Surplus/Deficit	3382	1739	1880	2937	2511	-1223	-1711	-1009	-572	531	-962	-1737	4210	3612	937
1932 Regional Surplus/Deficit	2364	1554	2115	2350	2373	-438	-1371	-1736	2385	6822	8440	8964	9761	6822	3401
1933 Regional Surplus/Deficit	3018	3475	3064	3077	3166	1743	7251	3664	1283	2862	3472	5617	10102	7983	4447
1934 Regional Surplus/Deficit	6746	5299	3783	5288	6229	10813	8920	8569	6979	8107	8026	8684	4324	4455	6844
1935 Regional Surplus/Deficit	2073	1335	1544	2835	3136	507	6111	7491	-162	1706	3963	4528	8230	6733	3791
1936 Regional Surplus/Deficit	5036	1551	2434	2818	2478	814	-1092	-1019	-488	1166	6376	9769	8644	3825	2937
1937 Regional Surplus/Deficit	3435	1734	2237	2853	2436	773	-2391	-1868	-647	627	-769	-291	5633	3241	1207
1938 Regional Surplus/Deficit	2855	1236	2154	3275	3255	1191	6623	1835	4380	5112	7171	10455	9935	6323	4801
1939 Regional Surplus/Deficit	2941	1521	2881	3167	2654	368	2812	-836	1129	2956	3973	6129	4610	4651	2772
1940 Regional Surplus/Deficit	3888	1633	2054	3194	2490	830	1616	848	4672	3394	6058	4310	4731	3677	2992
1941 Regional Surplus/Deficit	1847	675	1703	2829	1993	563	1517	-581	-862	388	-1378	1006	4465	2980	1365
1942 Regional Surplus/Deficit	1749	1214	2735	2662	1666	3590	5455	1733	-1768	1321	2923	4201	9600	7787	3439
1943 Regional Surplus/Deficit	5503	3369	2271	2890	3060	1035	5685	5954	6032	9352	8845	10166	10203	8420	5771
1944 Regional Surplus/Deficit	6327	3000	2633	3106	2786	1298	1173	-1016	-1685	-430	-1923	-1351	2846	2867	1345
1945 Regional Surplus/Deficit	1862	930	2002	2282	2168	-574	-1549	-710	-904	-286	-809	4513	9484	4506	1839
1946 Regional Surplus/Deficit	3184	1615	2019	2852	3243	1091	4681	2844	7055	7066	8463	11139	9662	7830	5215
1947 Regional Surplus/Deficit	5796	2936	3292	2861	3295	6255	7477	7600	7599	4994	5809	8977	9457	7471	6171
1948 Regional Surplus/Deficit	4352	1525	2995	8119	4952	4167	8886	2705	3831	4040	7939	11122	13707	7947	6447
1949 Regional Surplus/Deficit	7013	6354	3848	3801	3155	741	2122	2041	7707	5667	8641	10463	9564	3271	5046
1950 Regional Surplus/Deficit	3011	1216	1716	3197	3424	652	4159	8128	9480	8558	8406	8898	10139	8155	5712
1951 Regional Surplus/Deficit	6356	4643	3580	5643	6221	8570	9400	9715	7065	8964	8851	10873	9658	7932	7755
1952 Regional Surplus/Deficit	6714	4087	3528	7025	3592	4250	7130	5018	3787	8466	8807	11213	10267	6131	6332
1953 Regional Surplus/Deficit	4465	1457	2678	2935	2687	-370	3145	6015	1209	1652	3709	8043	10377	8223	4215
1954 Regional Surplus/Deficit	6011	3580	3156	3602	3347	3306	4983	7704	4875	6648	6229	9864	9535	8164	5814
1955 Regional Surplus/Deficit	8495	8096	7580	4054	3951	2994	1655	-200	-1159	1772	2399	3675	9583	8038	4213
1956 Regional Surplus/Deficit	7083	6099	2632	5072	5209	7485	9591	5767	8740	9112	8739	10994	10499	8105	7468
1957 Regional Surplus/Deficit	6747	4080	3335	4418	3156	2618	4532	1554	4416	7513	6861	11251	10083	5660	5302
1958 Regional Surplus/Deficit	2930	1573	2643	3112	2741	1081	2511	5222	4493	4207	7072	10689	9847	5436	4639
1959 Regional Surplus/Deficit	2849	2299	2877	3146	4055	5306	8780	7760	4627	6612	5693	7777	9620	7903	5881
1960 Regional Surplus/Deficit	6420	3471	7961	9053	6963	6327	7454	1389	3855	9013	8578	6153	9460	6638	6583
1961 Regional Surplus/Deficit	4815	1315	2989	3222	3362	1379	5447	6808	5282	6447	4095	8196	9269	6239	5044
1962 Regional Surplus/Deficit	3574	2578	2237	3253	3129	685	4340	1335	-279	7814	8935	7675	9091	6927	4153
1963 Regional Surplus/Deficit	4988	2776	2611	4291	4292	5510	6791	3524	356	2565	2215	7094	9910	6773	4785
1964 Regional Surplus/Deficit	5771	2886	3213	2895	3553	942	3900	1082	-529	4140	4563	5873	10576	8024	4017
1965 Regional Surplus/Deficit	6994	5399	4315	5087	3394	7139	9503	9675	7467	6184	8993	10397	10244	6901	7325
1966 Regional Surplus/Deficit	6643	4420	3420	4142	3035	2003	7243	720	79	8544	5033	5240	7959	7153	4443
1967 Regional Surplus/Deficit	6131	2153	2447	2983	3098	1488	8859	8920	2505	3800	1899	6683	10307	7976	5188
1968 Regional Surplus/Deficit	6608	2831	3293	3965	3125	1433	6135	6731	4663	-105	878	4451	9553	7832	4691
1969 Regional Surplus/Deficit	6568	4802	5395	5627	5131	4492	9197	7807	3336	9089	8697	11199	9687	7368	6985
1970 Regional Surplus/Deficit	4537	1831	2960	3579	3163	722	4933	3711	1768	1503	2499	7559	10310	6037	4161
1971 Regional Surplus/Deficit	2909	1045	2306	3123	3704	1302	8057	9566	6714	7739	8658	10990	10439	8468	6237
1972 Regional Surplus/Deficit	8478	6508	3848	4209	3581	2155	9156	9772	9814	9183	7661	10843	11377	8163	7403
1973 Regional Surplus/Deficit	8509	7091	4823	4000	3072	3234	6700	-732	-505	-747	18	1337	4629	3834	3152
1974 Regional Surplus/Deficit	2623	990	1003	2657	2379	4962	9745	9821	9710	8997	8740	10825	11376	8232	6782
1975 Regional Surplus/Deficit	8052	6826	3683	2394	3087	1324	6626	3695	5450	2793	4172	8330	10453	8566	5377
1976 Regional Surplus/Deficit	4066	3655	3727	5521	5801	10041	9544	7960	5005	9235	8593	11166	10113	8061	7476
1977 Regional Surplus/Deficit	8680	8682	8843	3563	2682	671	1593	-1174	-1829	-1629	-2760	-884	1913	1866	1978
1978 Regional Surplus/Deficit	1984	1024	1389	1724	2230	879	4694	3448	5063	7326	4602	7381	8245	7958	4206
-Ranked Averages-															
Top Ten Percent	6596	5261	3620	5106	4841	7078	9439	8578	7618	8535	8567	10854	10378	7832	7485
Middle Eighty Percent	4866	2943	3200	3654	3332	2223	5064	3688	3174	4671	5221	7449	9033	6582	4687
Bottom Ten Percent	3578	1680	2108	2933	2440	385	-640	-823	-810	391	-1046	-704	4288	3352	1236

Exhibit 31: OY 2014 Monthly 50-WY Energy

Regional Surplus/Deficit - 50 Water Year
PNW Loads and Resource Study
2013 - 2014 Operating Year
[43] 2007 White Book (Final)

3/31/2007

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1929 Regional Surplus/Deficit	6050	898	2576	2533	2816	-616	58	-1569	-212	-132	318	-700	7140	3818	1618
1930 Regional Surplus/Deficit	2730	1082	1940	2728	2282	310	-2037	125	-356	866	582	-1264	4730	3893	1248
1931 Regional Surplus/Deficit	3218	1572	1730	2722	2318	-1428	-1961	-1242	-643	557	-182	-1854	4655	3444	860
1932 Regional Surplus/Deficit	2199	1389	1967	2135	2181	-642	-1621	-1970	2313	6849	9219	8847	10206	6654	3325
1933 Regional Surplus/Deficit	2851	3310	2915	2863	2974	1538	7001	3431	1212	2888	4252	5499	10548	7815	4370
1934 Regional Surplus/Deficit	6586	5138	3635	5073	6037	10609	8670	8336	6908	8133	8805	8567	4769	4287	6768
1935 Regional Surplus/Deficit	1906	1167	1394	2620	2943	303	5861	7258	-233	1732	4742	4411	8675	6565	3714
1936 Regional Surplus/Deficit	4875	1382	2285	2603	2285	610	-1342	-1252	-560	1192	7156	9652	9089	3657	2861
1937 Regional Surplus/Deficit	3270	1566	2087	2638	2243	568	-2640	-2101	-719	654	11	-408	6079	3073	1131
1938 Regional Surplus/Deficit	2690	1068	2005	3061	3063	987	6374	1602	4309	5138	7950	10338	10381	6155	4725
1939 Regional Surplus/Deficit	2772	1352	2733	2953	2462	163	2562	-1069	1057	2983	4752	6012	5056	4483	2695
1940 Regional Surplus/Deficit	3725	1465	1904	2980	2297	626	1366	614	4601	3420	6837	4193	5177	3509	2916
1941 Regional Surplus/Deficit	1678	505	1552	2614	1801	358	1267	-815	-934	415	-598	889	4911	2812	1288
1942 Regional Surplus/Deficit	1581	1045	2586	2447	1473	3385	5205	1499	-1840	1347	3703	4084	10045	7619	3362
1943 Regional Surplus/Deficit	5342	3204	2121	2675	2868	830	5435	5720	5960	9378	9625	10049	10648	8252	5695
1944 Regional Surplus/Deficit	6165	2833	2482	2891	2594	1094	923	-1249	-1757	-404	-1143	-1468	3292	2699	1269
1945 Regional Surplus/Deficit	1694	761	1852	2067	1975	-779	-1799	-943	-976	-259	-29	4396	9930	4338	1762
1946 Regional Surplus/Deficit	3016	1447	1868	2638	3050	887	4431	2611	6984	7093	9242	11022	10108	7662	5138
1947 Regional Surplus/Deficit	5635	2769	3143	2646	3102	6050	7227	7367	7527	5020	6589	8860	9902	7302	6095
1948 Regional Surplus/Deficit	4188	1355	2845	7904	4760	3963	8636	2471	3760	4066	8719	11005	14153	7779	6370
1949 Regional Surplus/Deficit	6852	6194	3700	3586	2963	537	1872	1808	7636	5694	9421	10346	10010	3103	4970
1950 Regional Surplus/Deficit	2842	1045	1565	2982	3232	447	3909	7894	9409	8585	9186	8781	10585	7987	5635
1951 Regional Surplus/Deficit	6194	4478	3431	5428	6028	8366	9150	9482	6994	8991	9631	10756	10104	7764	7679
1952 Regional Surplus/Deficit	6554	3922	3379	6810	3399	4045	6880	4785	3715	8493	9587	11096	10713	5963	6255
1953 Regional Surplus/Deficit	4301	1287	2528	2721	2494	-575	2895	5782	1137	1678	4489	7926	10823	8055	4139
1954 Regional Surplus/Deficit	5849	3415	3006	3387	3155	3102	4733	7471	4803	6675	7009	9747	9981	7996	5738
1955 Regional Surplus/Deficit	8339	7939	7440	3839	3758	2790	1405	-434	-1230	1798	3178	3558	10029	7870	4138
1956 Regional Surplus/Deficit	6923	5940	2482	4857	5017	7281	9341	5533	8669	9138	9519	10877	10945	7937	7391
1957 Regional Surplus/Deficit	6587	3915	3185	4203	2963	2414	4283	1320	4344	7539	7641	11134	10528	5491	5226
1958 Regional Surplus/Deficit	2762	1403	2493	2898	2548	877	2261	4989	4421	4233	7851	10572	10292	5268	4562
1959 Regional Surplus/Deficit	2681	2131	2728	2931	3862	5101	8531	7527	4555	6638	6473	7660	10065	7735	5805
1960 Regional Surplus/Deficit	6260	3305	7820	8839	6770	6122	7204	1156	3784	9039	9358	6036	9905	6470	6507
1961 Regional Surplus/Deficit	4652	1145	2840	3007	3170	1175	5197	6575	5211	6473	4875	8079	9714	6071	4968
1962 Regional Surplus/Deficit	3409	2411	2087	3038	2936	481	4090	1101	-350	7840	9714	7558	9536	6759	4077
1963 Regional Surplus/Deficit	4825	2610	2461	4077	4100	5305	6541	3290	284	2592	2995	6976	10356	6605	4709
1964 Regional Surplus/Deficit	5610	2720	3064	2680	3360	738	3650	848	-600	4167	5343	5756	11022	7856	3941
1965 Regional Surplus/Deficit	6834	5237	4168	4873	3201	6935	9253	9441	7395	6210	9773	10280	10689	6733	7250
1966 Regional Surplus/Deficit	6483	4255	3271	3928	2842	1798	6993	487	7.1	8570	5813	5123	8405	6985	4367
1967 Regional Surplus/Deficit	5973	1985	2298	2769	2906	1283	8609	8687	2434	3827	2679	6566	10753	7808	5112
1968 Regional Surplus/Deficit	6450	2665	3145	3750	2933	1229	5885	6497	4592	-79	1658	4334	9998	7664	4614
1969 Regional Surplus/Deficit	6410	4640	5250	5412	4938	4287	8947	7574	3265	9115	9477	11082	10132	7200	6909
1970 Regional Surplus/Deficit	4374	1662	2811	3364	2971	517	4683	3478	1696	1530	3279	7442	10756	5869	4084
1971 Regional Surplus/Deficit	2742	875	2154	2908	3511	1098	7807	9333	6642	7766	9438	10873	10885	8299	6160
1972 Regional Surplus/Deficit	8321	6349	3699	3994	3389	1951	8906	9539	9742	9210	8441	10726	11823	7995	7327
1973 Regional Surplus/Deficit	8353	6933	4676	3785	2880	3029	6450	-965	-577	-721	798	1220	5074	3666	3077
1974 Regional Surplus/Deficit	2457	820	851	2442	2186	4757	9495	9588	9639	9023	9519	10707	11822	8064	6705
1975 Regional Surplus/Deficit	7893	6667	3535	2179	2895	1119	6376	3461	5378	2819	4952	8213	10898	8398	5302
1976 Regional Surplus/Deficit	3899	3487	3578	5307	5609	9837	9294	7726	4933	9261	9372	11048	10559	7893	7399
1977 Regional Surplus/Deficit	8525	8527	8705	3348	2490	466	1343	-1407	-1901	-1602	-1980	-1001	2358	1698	1903
1978 Regional Surplus/Deficit	1818	857	1240	1509	2038	674	4444	3214	4991	7352	5381	7264	8690	7790	4130
-Ranked Averages-															
Top Ten Percent	6434	5098	3472	4892	4649	6874	9189	8344	7547	8562	9347	10737	10824	7664	7409
Middle Eighty Percent	4703	2777	3052	3440	3140	2018	4814	3454	3102	4697	6000	7332	9479	6414	4611
Bottom Ten Percent	3412	1512	1958	2719	2248	181	-890	-1056	-882	417	-266	-821	4733	3184	1159

Exhibit 32: OY 2015 Monthly 50-WY Energy

Regional Surplus/Deficit - 50 Water Year
PNW Loads and Resource Study
2014 - 2015 Operating Year
[43] 2007 White Book (Final)

3/31/2007

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1929 Regional Surplus/Deficit	5774	627	2314	2280	2536	-933	-180	-1748	-499	-531	-570	-1906	6040	3313	1156
1930 Regional Surplus/Deficit	2454	812	1678	2476	2002	-7	-2274	-54	-643	467	-305	-2470	3629	3389	787
1931 Regional Surplus/Deficit	2942	1301	1468	2470	2038	-1745	-2198	-1421	-930	158	-1070	-3060	3555	2940	398
1932 Regional Surplus/Deficit	1924	1118	1706	1883	1901	-960	-1858	-2149	2026	6450	8332	7641	9106	6149	2863
1933 Regional Surplus/Deficit	2575	3040	2653	2610	2694	1221	6764	3251	925	2489	3364	4293	9447	7310	3909
1934 Regional Surplus/Deficit	6311	4867	3373	4821	5757	10292	8433	8156	6621	7734	7918	7361	3669	3782	6307
1935 Regional Surplus/Deficit	1630	896	1133	2368	2663	-14	5624	7078	-520	1333	3855	3204	7575	6060	3252
1936 Regional Surplus/Deficit	4599	1112	2023	2351	2005	292	-1579	-1431	-846	793	6268	8446	7989	3152	2399
1937 Regional Surplus/Deficit	2995	1296	1825	2386	1963	251	-2878	-2281	-1005	255	-877	-1615	4979	2568	669
1938 Regional Surplus/Deficit	2415	797	1743	2808	2783	669	6136	1423	4022	4739	7063	9131	9280	5651	4263
1939 Regional Surplus/Deficit	2497	1082	2471	2701	2182	-154	2325	-1249	770	2584	3865	4805	3955	3978	2233
1940 Regional Surplus/Deficit	3449	1195	1642	2727	2017	308	1129	435	4314	3021	5950	2987	4076	3004	2454
1941 Regional Surplus/Deficit	1403	234	1291	2362	1521	41	1030	-994	-1221	15	-1486	-318	3811	2307	826
1942 Regional Surplus/Deficit	1305	775	2324	2195	1193	3068	4968	1320	-2127	948	2815	2878	8945	7115	2900
1943 Regional Surplus/Deficit	5066	2933	1859	2423	2588	513	5198	5541	5673	8979	8738	8843	9548	7747	5233
1944 Regional Surplus/Deficit	5889	2562	2220	2639	2314	776	686	-1429	-2044	-803	-2031	-2674	2191	2195	807
1945 Regional Surplus/Deficit	1418	490	1590	1815	1695	-1096	-2036	-1122	-1263	-658	-917	3190	8830	3833	1300
1946 Regional Surplus/Deficit	2740	1176	1606	2386	2770	569	4194	2431	6697	6694	8355	9815	9007	7158	4676
1947 Regional Surplus/Deficit	5359	2499	2881	2394	2822	5733	6990	7188	7240	4621	5701	7654	8802	6798	5633
1948 Regional Surplus/Deficit	3913	1085	2583	7652	4480	3646	8399	2292	3473	3667	7831	9798	13053	7274	5908
1949 Regional Surplus/Deficit	6577	5923	3438	3334	2683	220	1635	1629	7349	5295	8533	9139	8909	2598	4508
1950 Regional Surplus/Deficit	2566	774	1303	2730	2952	130	3672	7715	9122	8186	8299	7575	9485	7482	5173
1951 Regional Surplus/Deficit	5918	4208	3169	5176	5748	8048	8913	9303	6707	8592	8743	9549	9003	7259	7217
1952 Regional Surplus/Deficit	6278	3652	3117	6558	3119	3728	6643	4605	3428	8094	8700	9890	9612	5458	5793
1953 Regional Surplus/Deficit	4026	1017	2266	2468	2214	-892	2658	5603	851	1279	3601	6719	9722	7550	3677
1954 Regional Surplus/Deficit	5573	3144	2744	3135	2875	2785	4496	7291	4516	6276	6121	8541	8880	7491	5276
1955 Regional Surplus/Deficit	8064	7669	7178	3587	3478	2472	1168	-613	-1517	1399	2291	2351	8929	7366	3676
1956 Regional Surplus/Deficit	6647	5669	2220	4605	4737	6963	9104	5354	8382	8739	8631	9670	9844	7432	6930
1957 Regional Surplus/Deficit	6312	3644	2923	3951	2684	2097	4045	1141	4057	7140	6754	9927	9428	4987	4764
1958 Regional Surplus/Deficit	2487	1133	2231	2646	2268	559	2024	4809	4134	3834	6964	9366	9192	4763	4100
1959 Regional Surplus/Deficit	2406	1860	2466	2679	3582	4784	8294	7348	4268	6239	5585	6454	8965	7230	5343
1960 Regional Surplus/Deficit	5984	3035	7558	8587	6490	5805	6967	977	3497	8640	8470	4829	8805	5965	6045
1961 Regional Surplus/Deficit	4376	875	2578	2755	2890	858	4960	6395	4924	6074	3987	6872	8614	5567	4506
1962 Regional Surplus/Deficit	3133	2141	1825	2786	2656	164	3853	922	-637	7441	8827	6352	8436	6254	3615
1963 Regional Surplus/Deficit	4550	2339	2199	3824	3820	4988	6304	3111	-2.7	2193	2107	5770	9255	6100	4247
1964 Regional Surplus/Deficit	5335	2449	2803	2428	3080	420	3413	669	-887	3768	4455	4550	9922	7351	3479
1965 Regional Surplus/Deficit	6558	4966	3906	4620	2922	6617	9016	9262	7108	5811	8885	9074	9589	6228	6788
1966 Regional Surplus/Deficit	6207	3985	3009	3675	2562	1481	6756	308	-280	8171	4925	3916	7304	6480	3905
1967 Regional Surplus/Deficit	5697	1715	2036	2516	2626	966	8372	8507	2147	3428	1792	5360	9653	7303	4650
1968 Regional Surplus/Deficit	6174	2394	2883	3498	2653	911	5648	6318	4305	-478	770	3127	8898	7159	4153
1969 Regional Surplus/Deficit	6134	4369	4988	5160	4658	3970	8710	7394	2978	8716	8590	9876	9032	6695	6447
1970 Regional Surplus/Deficit	4099	1392	2549	3112	2691	200	4446	3298	1409	1131	2391	6235	9656	5364	3622
1971 Regional Surplus/Deficit	2466	605	1892	2656	3231	780	7570	9153	6356	7367	8550	9666	9784	7795	5698
1972 Regional Surplus/Deficit	8046	6079	3437	3742	3109	1633	8669	9360	9456	8810	7553	9519	10722	7490	6865
1973 Regional Surplus/Deficit	8077	6663	4414	3533	2600	2712	6213	-1144	-863	-1120	-90	14	3974	3161	2615
1974 Regional Surplus/Deficit	2181	549	589	2190	1906	4440	9258	9408	9352	8624	8632	9501	10722	7559	6243
1975 Regional Surplus/Deficit	7618	6397	3273	1927	2615	802	6139	3282	5091	2420	4064	7006	9798	7893	4840
1976 Regional Surplus/Deficit	3624	3216	3316	5054	5329	9519	9057	7547	4647	8862	8485	9842	9458	7388	6938
1977 Regional Surplus/Deficit	8249	8256	8443	3096	2210	149	1106	-1586	-2188	-2002	-2868	-2208	1258	1193	1441
1978 Regional Surplus/Deficit	1543	587	978	1257	1758	357	4207	3035	4705	6953	4494	6057	7590	7285	3668
-Ranked Averages-															
Top Ten Percent	6159	4828	3210	4640	4369	6556	8952	8165	7260	8163	8459	9531	9723	7159	6947
Middle Eighty Percent	4427	2506	2790	3188	2860	1701	4577	3275	2815	4298	5113	6126	8379	5909	4149
Bottom Ten Percent	3137	1241	1696	2467	1968	-137	-1127	-1236	-1169	18	-1154	-2027	3633	2680	697

Exhibit 33: OY 2016 Monthly 50-WY Energy

Regional Surplus/Deficit - 50 Water Year
PNW Loads and Resource Study
2015 - 2016 Operating Year
[43] 2007 White Book (Final)

3/31/2007

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1929 Regional Surplus/Deficit	5574	427	2094	2051	2259	-1176	-527	-1659	-840	-1215	-1274	-550	6525	3296	1102
1930 Regional Surplus/Deficit	2254	612	1458	2246	1725	-249	-2622	35	-984	-217	-1009	-1114	4115	3371	733
1931 Regional Surplus/Deficit	2743	1101	1247	2240	1761	-1987	-2546	-1332	-1271	-525	-1774	-1704	4040	2922	345
1932 Regional Surplus/Deficit	1724	918	1485	1654	1624	-1202	-2206	-2060	1685	5766	7628	8997	9591	6132	2810
1933 Regional Surplus/Deficit	2376	2840	2433	2381	2416	978	6416	3340	584	1806	2660	5649	9933	7293	3855
1934 Regional Surplus/Deficit	6111	4667	3152	4591	5480	10049	8085	8245	6280	7050	7214	8717	4154	3765	6253
1935 Regional Surplus/Deficit	1431	696	912	2138	2386	-257	5276	7167	-861	650	3151	4560	8060	6043	3199
1936 Regional Surplus/Deficit	4399	911	1802	2121	1728	50	-1927	-1342	-1188	110	5564	9802	8474	3134	2346
1937 Regional Surplus/Deficit	2795	1095	1604	2156	1686	8.2	-3225	-2192	-1346	-429	-1581	-258	5464	2550	616
1938 Regional Surplus/Deficit	2215	597	1522	2579	2505	427	5789	1512	3681	4056	6359	10488	9765	5633	4209
1939 Regional Surplus/Deficit	2297	881	2251	2471	1904	-396	1978	-1160	429	1900	3161	6162	4441	3961	2180
1940 Regional Surplus/Deficit	3250	995	1422	2498	1740	66	781	524	3973	2338	5246	4343	4561	2987	2401
1941 Regional Surplus/Deficit	1203	34	1070	2132	1243	-202	682	-905	-1562	-668	-2190	1038	4296	2290	773
1942 Regional Surplus/Deficit	1106	575	2103	1966	916	2825	4621	1409	-2468	265	2111	4234	9430	7097	2847
1943 Regional Surplus/Deficit	4867	2733	1638	2194	2310	270	4851	5630	5332	8296	8034	10199	10033	7730	5179
1944 Regional Surplus/Deficit	5689	2362	1999	2410	2036	534	338	-1340	-2385	-1486	-2735	-1318	2677	2177	754
1945 Regional Surplus/Deficit	1219	290	1370	1585	1418	-1339	-2384	-1033	-1604	-1342	-1621	4546	9315	3815	1247
1946 Regional Surplus/Deficit	2541	976	1385	2156	2493	327	3846	2520	6356	6010	7651	11172	9493	7140	4623
1947 Regional Surplus/Deficit	5160	2299	2660	2165	2545	5491	6643	7277	6899	3938	4997	9010	9287	6780	5579
1948 Regional Surplus/Deficit	3713	885	2363	7423	4203	3403	8052	2381	3132	2984	7127	11155	13538	7257	5855
1949 Regional Surplus/Deficit	6377	5723	3217	3104	2405	-23	1287	1718	7008	4611	7829	10495	9394	2581	4455
1950 Regional Surplus/Deficit	2367	574	1082	2501	2674	-112	3324	7804	8781	7502	7595	8931	9970	7464	5120
1951 Regional Surplus/Deficit	5719	4008	2949	4946	5471	7806	8565	9392	6366	7908	8039	10906	9488	7241	7164
1952 Regional Surplus/Deficit	6078	3452	2897	6328	2842	3485	6296	4694	3087	7410	7996	11246	10098	5441	5740
1953 Regional Surplus/Deficit	3826	816	2046	2239	1937	-1135	2311	5691	510	596	2897	8076	10207	7533	3624
1954 Regional Surplus/Deficit	5374	2944	2524	2905	2597	2542	4148	7380	4175	5592	5417	9897	9365	7474	5223
1955 Regional Surplus/Deficit	7864	7469	6957	3358	3201	2230	821	-524	-1858	715	1587	3708	9414	7348	3623
1956 Regional Surplus/Deficit	6447	5469	1999	4376	4459	6721	8756	5443	8041	8055	7927	11026	10330	7415	6876
1957 Regional Surplus/Deficit	6112	3444	2703	3721	2406	1854	3698	1230	3716	6457	6049	11283	9913	4969	4710
1958 Regional Surplus/Deficit	2287	932	2011	2416	1991	317	1676	4898	3793	3151	6260	10722	9677	4745	4047
1959 Regional Surplus/Deficit	2206	1660	2245	2449	3305	4542	7946	7437	3927	5556	4881	7810	9450	7213	5290
1960 Regional Surplus/Deficit	5785	2835	7337	8357	6213	5562	6619	1066	3156	7957	7766	6186	9290	5948	5992
1961 Regional Surplus/Deficit	4177	675	2357	2525	2612	615	4613	6484	4583	5390	3283	8229	9099	5549	4452
1962 Regional Surplus/Deficit	2934	1941	1604	2556	2379	-79	3505	1011	-978	6758	8123	7708	8921	6236	3562
1963 Regional Surplus/Deficit	4350	2139	1979	3595	3542	4745	5957	3200	-344	1509	1403	7126	9741	6083	4194
1964 Regional Surplus/Deficit	5135	2249	2582	2198	2803	178	3065	758	-1228	3084	3751	5906	10407	7334	3426
1965 Regional Surplus/Deficit	6358	4766	3685	4391	2644	6375	8668	9351	6767	5128	8181	10430	10074	6211	6734
1966 Regional Surplus/Deficit	6008	3785	2788	3446	2285	1238	6408	397	-621	7488	4221	5273	7789	6463	3851
1967 Regional Surplus/Deficit	5498	1515	1815	2287	2348	723	8024	8596	1806	2744	1088	6716	10138	7285	4597
1968 Regional Surplus/Deficit	5974	2194	2662	3268	2376	669	5300	6407	3964	-1162	66	4484	9383	7142	4099
1969 Regional Surplus/Deficit	5935	4169	4767	4930	4381	3727	8362	7483	2637	8033	7886	11232	9517	6677	6394
1970 Regional Surplus/Deficit	3899	1192	2328	2883	2413	-43	4098	3387	1068	447	1687	7591	10141	5347	3569
1971 Regional Surplus/Deficit	2266	404	1672	2427	2954	538	7222	9242	6014	6683	7846	11022	10270	7777	5645
1972 Regional Surplus/Deficit	7846	5879	3217	3512	2831	1391	8321	9449	9115	8127	6849	10875	11208	7473	6812
1973 Regional Surplus/Deficit	7878	6463	4193	3303	2323	2469	5865	-1056	-1205	-1804	-794	1370	4459	3144	2562
1974 Regional Surplus/Deficit	1981	349	369	1960	1629	4197	8910	9497	9011	7941	7928	10857	11207	7542	6190
1975 Regional Surplus/Deficit	7418	6197	3052	1698	2337	559	5791	3371	4750	1736	3360	8363	10283	7876	4786
1976 Regional Surplus/Deficit	3424	3016	3095	4825	5051	9277	8709	7636	4305	8179	7781	11198	9943	7371	6884
1977 Regional Surplus/Deficit	8049	8056	8223	2867	1933	-93	758	-1497	-2529	-2685	-3572	-851	1743	1176	1388
1978 Regional Surplus/Deficit	1343	387	757	1028	1480	114	3859	3124	4364	6270	3790	7413	8075	7268	3615
-Ranked Averages-															
Top Ten Percent	5959	4628	2989	4410	4091	6314	8604	8254	6919	7479	7755	10887	10209	7142	6894
Middle Eighty Percent	4228	2306	2569	2958	2582	1458	4229	3364	2474	3615	4409	7482	8864	5892	4096
Bottom Ten Percent	2937	1041	1476	2237	1690	-379	-1474	-1147	-1510	-665	-1858	-671	4118	2662	644

Exhibit 34: OY 2017 Monthly 50-WY Energy

Regional Surplus/Deficit - 50 Water Year
PNW Loads and Resource Study
2016 - 2017 Operating Year
[43] 2007 White Book (Final)

3/31/2007

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1929 Regional Surplus/Deficit	5307	157	1846	1770	1933	-1482	-836	-2085	-1072	-1009	-1178	-1091	5552	2866	753
1930 Regional Surplus/Deficit	1987	341	1210	1965	1399	-556	-2931	-391	-1216	-11	-914	-1655	3142	2941	384
1931 Regional Surplus/Deficit	2475	831	1000	1959	1435	-2294	-2855	-1758	-1503	-320	-1678	-2245	3068	2492	-3.8
1932 Regional Surplus/Deficit	1457	648	1237	1373	1298	-1509	-2515	-2486	1453	5972	7724	8456	8619	5702	2461
1933 Regional Surplus/Deficit	2108	2569	2185	2100	2091	672	6107	2915	352	2012	2756	5109	8960	6863	3506
1934 Regional Surplus/Deficit	5844	4397	2905	4310	5154	9743	7776	7820	6048	7256	7310	8176	3182	3335	5904
1935 Regional Surplus/Deficit	1163	426	664	1858	2060	-563	4967	6742	-1093	856	3246	4020	7088	5613	2850
1936 Regional Surplus/Deficit	4132	641	1555	1841	1402	-257	-2235	-1768	-1419	316	5660	9261	7502	2705	1997
1937 Regional Surplus/Deficit	2527	825	1356	1876	1360	-298	-3534	-2617	-1578	-223	-1485	-799	4491	2121	267
1938 Regional Surplus/Deficit	1948	327	1274	2298	2180	121	5480	1086	3449	4261	6455	9947	8793	5203	3860
1939 Regional Surplus/Deficit	2029	611	2003	2190	1579	-703	1669	-1585	197	2106	3256	5621	3468	3531	1831
1940 Regional Surplus/Deficit	2982	724	1174	2217	1414	-240	472	98	3741	2543	5342	3802	3589	2557	2052
1941 Regional Surplus/Deficit	935	-236	822	1852	918	-508	374	-1331	-1794	-462	-2094	498	3323	1860	424
1942 Regional Surplus/Deficit	838	305	1856	1685	590	2519	4312	983	-2700	471	2207	3693	8458	6667	2498
1943 Regional Surplus/Deficit	4599	2463	1391	1913	1985	-36	4542	5204	5100	8502	8129	9658	9061	7300	4830
1944 Regional Surplus/Deficit	5422	2092	1752	2129	1711	227	30	-1765	-2617	-1281	-2639	-1859	1704	1747	405
1945 Regional Surplus/Deficit	951	20	1122	1304	1092	-1645	-2693	-1459	-1836	-1136	-1525	4005	8342	3386	898
1946 Regional Surplus/Deficit	2273	706	1138	1875	2167	20	3537	2095	6124	6216	7747	10631	8520	6710	4274
1947 Regional Surplus/Deficit	4892	2029	2413	1884	2219	5184	6334	6851	6667	4144	5093	8469	8315	6350	5230
1948 Regional Surplus/Deficit	3445	614	2115	7142	3877	3097	7743	1955	2900	3190	7223	10614	12565	6827	5506
1949 Regional Surplus/Deficit	6109	5453	2970	2824	2080	-329	978	1292	6776	4817	7925	9955	8422	2151	4106
1950 Regional Surplus/Deficit	2099	304	835	2220	2349	-419	3016	7378	8549	7708	7690	8391	8997	7035	4771
1951 Regional Surplus/Deficit	5451	3738	2701	4666	5145	7499	8256	8966	6134	8114	8135	10365	8516	6812	6815
1952 Regional Surplus/Deficit	5811	3181	2649	6048	2516	3179	5987	4269	2855	7616	8091	10705	9125	5011	5391
1953 Regional Surplus/Deficit	3559	546	1798	1958	1611	-1441	2002	5266	278	802	2993	7535	9235	7103	3275
1954 Regional Surplus/Deficit	5106	2674	2276	2624	2272	2236	3839	6955	3943	5798	5513	9357	8393	7044	4874
1955 Regional Surplus/Deficit	7597	7199	6710	3077	2875	1923	512	-950	-2090	921	1682	3167	8441	6918	3274
1956 Regional Surplus/Deficit	6180	5199	1752	4095	4134	6414	8448	5017	7809	8261	8023	10486	9357	6985	6527
1957 Regional Surplus/Deficit	5844	3174	2455	3441	2081	1548	3389	804	3484	6662	6145	10743	8941	4539	4361
1958 Regional Surplus/Deficit	2020	662	1763	2135	1665	11	1367	4473	3561	3357	6356	10181	8705	4316	3698
1959 Regional Surplus/Deficit	1939	1390	1998	2169	2979	4235	7637	7011	3695	5762	4977	7269	8478	6783	4941
1960 Regional Surplus/Deficit	5517	2565	7090	8076	5887	5256	6311	640	2924	8163	7862	5645	8318	5518	5643
1961 Regional Surplus/Deficit	3909	405	2110	2244	2287	309	4304	6059	4351	5596	3379	7688	8127	5119	4103
1962 Regional Surplus/Deficit	2666	1671	1357	2275	2053	-385	3196	585	-1210	6964	8219	7167	7949	5807	3213
1963 Regional Surplus/Deficit	4083	1869	1731	3314	3217	4439	5648	2774	-576	1715	1499	6586	8768	5653	3845
1964 Regional Surplus/Deficit	4868	1979	2334	1917	2477	-128	2756	332	-1460	3290	3847	5365	9434	6904	3077
1965 Regional Surplus/Deficit	6091	4496	3438	4110	2319	6069	8360	8925	6535	5333	8277	9889	9101	5781	6385
1966 Regional Surplus/Deficit	5740	3514	2540	3165	1959	932	6099	-29	-853	7694	4317	4732	6817	6033	3502
1967 Regional Surplus/Deficit	5230	1245	1568	2006	2023	417	7715	8170	1574	2950	1183	6175	9165	6856	4248
1968 Regional Surplus/Deficit	5707	1924	2415	2988	2050	363	4992	5981	3732	-956	162	3943	8411	6712	3750
1969 Regional Surplus/Deficit	5667	3899	4520	4650	4055	3421	8054	7057	2405	8239	7981	10691	8545	6248	6045
1970 Regional Surplus/Deficit	3632	922	2081	2602	2088	-349	3789	2962	836	653	1783	7051	9168	4917	3220
1971 Regional Surplus/Deficit	1999	134	1424	2146	2628	231	6914	8817	5783	6889	7942	10482	9297	7347	5296
1972 Regional Surplus/Deficit	7579	5608	2969	3232	2506	1085	8013	9023	8883	8333	6945	10335	10235	7043	6463
1973 Regional Surplus/Deficit	7610	6193	3946	3023	1997	2163	5556	-1481	-1437	-1598	-698	829	3487	2714	2213
1974 Regional Surplus/Deficit	1714	79	121	1679	1303	3891	8601	9071	8779	8146	8023	10317	10234	7112	5841
1975 Regional Surplus/Deficit	7151	5927	2805	1417	2012	253	5483	2945	4518	1942	3456	7822	9311	7446	4437
1976 Regional Surplus/Deficit	3156	2746	2848	4544	4726	8971	8400	7210	4074	8385	7876	10658	8971	6941	6535
1977 Regional Surplus/Deficit	7782	7786	7975	2586	1607	-400	449	-1923	-2761	-2479	-3476	-1392	770	746	1039
1978 Regional Surplus/Deficit	1076	116	510	747	1155	-192	3550	2698	4132	6475	3885	6873	7103	6838	3266
-Ranked Averages-															
Top Ten Percent	5692	4357	2741	4129	3766	6008	8295	7828	6687	7685	7851	10346	9236	6712	6545
Middle Eighty Percent	3960	2036	2321	2677	2257	1152	3920	2938	2242	3821	4505	6941	7891	5462	3747
Bottom Ten Percent	2669	771	1228	1956	1365	-686	-1783	-1573	-1742	-459	-1762	-1212	3146	2232	295

Section 10: Potential Federal System 120-Hour Capacity Surplus/Deficits

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Exhibits 35 – 37

Federal System Monthly 120-Hour Capacity Analysis Using the 2007 White Book Load Forecast for 1937-Water Conditions

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Exhibit 35: OY 2008 Monthly 120-Hour Capacity

Loads and Resources - Federal System
PNW Loads and Resource Study
2007 - 2008 Operating Year
1937 Water Year
[43] 2007 White Book (Final)

3/31/2007

Capacity 120 (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul
Non-Utility Obligations														
Fed. Agencies 2002 PSC	247	247	189	233	242	227	256	241	228	212	212	203	224	217
USBR 2002 PSC	220	227	205	36	0.3	0.3	0.3	0.3	28	226	262	288	260	269
DSI 2002 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Firm Non-Utility Obligations	467	474	395	269	242	228	256	242	256	439	475	491	484	486
Transfers Out														
NGP 2002 PSC	3897	3897	3674	4274	4557	4731	5016	4820	4405	4108	4108	3922	3912	4101
GPU 2002 PSC	2370	2370	2515	2911	3429	3770	3811	3795	3500	2921	2921	2622	2316	2409
NGP 2002 Slice PSC	938	775	701	749	851	856	719	737	739	654	558	660	1034	920
GPU 2002 Slice PSC	1563	1290	1167	1247	1418	1425	1198	1227	1230	1090	930	1099	1722	1533
IOU 2002 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exports	1572	1572	1569	1546	1471	1488	1484	1484	1474	1478	1453	1517	1518	1530
Regional Transfers (Out)	730	730	759	775	999	1053	952	908	791	764	764	592	645	660
Federal Diversity	-679	-736	-795	-1197	-1129	-1149	-1371	-1346	-1197	-1141	-1232	-1113	-901	-809
Total Transfers Out	10391	9898	9590	10306	11597	12173	11809	11624	10942	9874	9501	9298	10246	10344
Total Firm Obligations	10858	10373	9985	10574	11839	12400	12065	11866	11198	10312	9976	9789	10730	10830
Hydro Resources														
Regulated Hydro	20201	20085	20437	20530	20742	20502	20473	20422	20063	19278	18958	19621	20385	20519
Independent Hydro	645	659	654	682	671	494	432	487	647	701	821	864	860	634
Operational Peaking Adj.	-4720	-7164	-8432	-8140	-7135	-7525	-9601	-8912	-8636	-8645	-9875	-9296	-5485	-5661
Non-Fed CER (Canada)	228	228	228	228	228	228	228	228	228	225	225	225	225	225
Total Hydro Resources	16354	13808	12888	13300	14507	13699	11532	12225	12302	11559	10129	11414	15985	15717
Other Resources														
Small Thermal & Misc.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Combustion Turbines	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Renewables	25	25	25	27	29	30	32	31	30	29	29	27	26	24
Cogeneration	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Imports	89	89	118	154	207	261	235	191	163	166	166	76	94	110
Regional Transfers (In)	184	184	196	108	108	85	10	10	10	10	10	10	10	10
Large Thermal	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150
Non-Utility Generation	34	34	17	32	41	32	32	32	32	32	32	49	32	29
Augmentation Purchases	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Augmentation Resources	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Other Resources	1481	1481	1507	1472	1534	1559	1459	1414	1385	1387	1387	1312	1312	1323
Total Resources	17834	15289	14395	14772	16041	15258	12991	13640	13687	12946	11516	12726	17297	17040
Reserves & Maintenance														
Hydro Reserves	-1042	-1037	-1055	-1061	-1071	-1050	-1045	-1045	-1035	-999	-989	-1024	-1062	-1058
Small Thermal & Misc. Reserves	-2.9	-2.9	-2.1	-3.0	-3.5	-3.1	-3.2	-3.2	-3.1	-3.1	-3.1	-3.8	-2.9	-2.7
Contract Reserves	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Large Thermal Reserves	-172	-172	-172	-172	-172	-172	-172	-172	-172	-172	-172	-172	-172	-172
Federal Hydro Maint.	-3263	-2761	-2770	-2752	-2705	-1866	-1408	-1883	-1915	-2061	-1805	-1756	-1635	-2785
Spinning Reserves	-336	-285	-261	-272	-303	-304	-262	-267	-268	-247	-218	-251	-367	-331
Federal Trans. Losses	-436	-370	-340	-352	-395	-397	-338	-344	-345	-317	-279	-319	-471	-425
Total Reserves, Maintenance & Losses	-5253	-4627	-4599	-4611	-4650	-3793	-3228	-3715	-3739	-3800	-3466	-3527	-3710	-4774
Total Net Resources	12582	10662	9796	10161	11391	11465	9763	9924	9948	9146	8050	9200	13587	12266
Total Firm Surplus/Deficit	1724	289	-189	-414	-448	-936	-2303	-1941	-1250	-1166	-1926	-589	2856	1436

Exhibit 36: OY 2012 Monthly 120-Hour Capacity

Loads and Resources - Federal System
PNW Loads and Resource Study
2011 - 2012 Operating Year
1937 Water Year
[43] 2007 White Book (Final)

3/31/2007

Capacity 120 (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul
Non-Utility Obligations														
Fed. Agencies 2002 PSC	306	306	221	262	274	255	291	273	257	238	238	225	253	244
USBR 2002 PSC	220	227	205	36	0.3	0.3	0.3	0.3	28	226	262	288	260	269
DSI 2002 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Firm Non-Utility Obligations	526	533	426	299	274	256	291	274	285	464	500	513	513	514
Transfers Out														
NGP 2002 PSC	4256	4256	4013	4709	5016	5206	5518	5310	4859	4530	4530	4331	4312	4513
GPU 2002 PSC	2476	2476	2689	3042	3600	3893	3971	3992	3633	3042	3042	2981	2409	2521
NGP 2002 Slice PSC	968	816	702	750	852	856	714	738	738	660	566	673	1055	954
GPU 2002 Slice PSC	1612	1359	1169	1248	1420	1425	1189	1228	1230	1100	943	1121	1756	1589
IOU 2002 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exports	1581	1581	1576	1466	1420	1421	1419	1420	1419	1448	1448	1511	1512	1513
Regional Transfers (Out)	605	605	59	108	325	379	353	309	199	172	172	0.1	53	68
Federal Diversity	-823	-891	-969	-1497	-1437	-1249	-1492	-1465	-1300	-1233	-1330	-1250	-973	-873
Total Transfers Out	10675	10203	9239	9827	11196	11931	11673	11531	10778	9719	9371	9368	10124	10285
Total Firm Obligations	11201	10735	9665	10125	11470	12186	11964	11805	11063	10183	9871	9881	10637	10799
Hydro Resources														
Regulated Hydro	20411	20296	20437	20530	20742	20502	20473	20422	20063	19278	18958	19621	20385	20520
Independent Hydro	645	659	654	662	653	479	414	470	632	684	804	843	839	613
Operational Peaking Adj.	-4500	-6795	-8369	-8062	-7054	-7459	-9601	-8837	-8577	-8502	-9708	-9056	-5159	-5170
Non-Fed CER (Canada)	242	242	242	242	242	242	242	242	242	238	238	238	238	238
Total Hydro Resources	16798	14401	12964	13372	14584	13764	11528	12298	12360	11698	10293	11646	16303	16201
Other Resources														
Small Thermal & Misc.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Combustion Turbines	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Renewables	25	25	25	27	29	30	32	31	30	29	29	27	26	24
Cogeneration	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Imports	89	89	118	154	207	261	235	191	163	166	166	76	94	110
Regional Transfers (In)	0	0	23	23	23	0	0	0	0	0	0	0	0	0
Large Thermal	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150
Non-Utility Generation	53	53	53	53	53	53	53	53	53	53	53	53	53	53
Augmentation Purchases	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Augmentation Resources	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Other Resources	1316	1316	1369	1407	1461	1495	1470	1425	1396	1398	1398	1306	1323	1337
Total Resources	18115	15718	14333	14779	16045	15259	12998	13723	13756	13096	11690	12953	17625	17537
Reserves & Maintenance														
Hydro Reserves	-1053	-1048	-1055	-1060	-1070	-1049	-1044	-1045	-1035	-998	-988	-1023	-1061	-1057
Small Thermal & Misc. Reserves	-3.9	-3.9	-3.9	-4	-4.1	-4.2	-4.2	-4.2	-4.2	-4.1	-4.1	-4	-3.9	-3.8
Contract Reserves	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Large Thermal Reserves	-172	-172	-172	-172	-172	-172	-172	-172	-172	-172	-172	-172	-172	-172
Federal Hydro Maint.	-3263	-2761	-2770	-2752	-2705	-1866	-1408	-1883	-1915	-2061	-1805	-1756	-1635	-2785
Spinning Reserves	-347	-299	-263	-274	-305	-306	-262	-269	-270	-251	-222	-256	-375	-344
Federal Trans. Losses	-445	-383	-337	-352	-395	-397	-339	-347	-347	-322	-285	-326	-482	-441
Total Reserves, Maintenance & Losses	-5284	-4667	-4601	-4614	-4651	-3795	-3229	-3720	-3743	-3809	-3476	-3539	-3729	-4803
Total Net Resources	12831	11051	9732	10165	11394	11463	9769	10003	10013	9287	8214	9414	13896	12735
Total Firm Surplus/Deficit	1630	315	67	40	-77	-723	-2196	-1802	-1051	-896	-1657	-467	3259	1936

Exhibit 37: OY 2017 Monthly 120-Hour Capacity

Loads and Resources - Federal System
PNW Loads and Resource Study
2016 - 2017 Operating Year
1937 Water Year
[43] 2007 White Book (Final)

3/31/2007

Capacity 120 (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul
Non-Utility Obligations														
Fed. Agencies 2002 PSC	314	314	229	270	282	263	300	283	267	246	246	233	260	253
USBR 2002 PSC	220	227	205	36	0.3	0.3	0.3	0.3	28	226	262	288	260	269
DSI 2002 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Firm Non-Utility Obligations	534	541	434	306	282	263	301	283	294	472	508	521	521	522
Transfers Out														
NGP 2002 PSC	4669	4669	4419	5029	5360	5557	5901	5685	5199	4842	4842	4624	4597	4813
GPU 2002 PSC	2719	2719	2893	3284	3871	4195	4279	4289	3897	3279	3279	3189	2589	2699
NGP 2002 Slice PSC	969	818	702	750	853	856	713	737	738	660	566	597	978	955
GPU 2002 Slice PSC	1614	1363	1169	1249	1420	1425	1187	1228	1230	1100	943	994	1629	1591
IOU 2002 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exports	1437	1437	1435	1405	1404	1406	1404	1404	1404	1433	1433	1434	1435	1425
Regional Transfers (Out)	13	13	42	108	325	379	353	309	199	172	172	0.1	18	34
Federal Diversity	-896	-970	-1055	-1628	-1566	-1363	-1628	-1601	-1419	-1340	-1446	-1353	-1053	-944
Total Transfers Out	10524	10048	9606	10195	11667	12455	12208	12051	11248	10145	9789	9485	10192	10572
Total Firm Obligations	11058	10589	10040	10501	11949	12718	12508	12335	11543	10617	10298	10006	10713	11094
Hydro Resources														
Regulated Hydro	20411	20296	20437	20530	20742	20502	20473	20422	20063	19278	18958	19621	20385	20520
Independent Hydro	626	640	634	662	653	479	414	470	632	684	804	843	839	613
Operational Peaking Adj.	-4450	-6735	-8330	-8042	-7033	-7442	-9601	-8822	-8562	-8486	-9690	-9033	-5135	-5143
Non-Fed CER (Canada)	225	225	225	225	225	225	225	225	225	223	223	223	223	223
Total Hydro Resources	16813	14426	12966	13375	14587	13764	11511	12295	12358	11699	10295	11654	16311	16213
Other Resources														
Small Thermal & Misc.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Combustion Turbines	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Renewables	25	25	25	27	29	30	32	31	30	29	29	27	26	24
Cogeneration	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Imports	89	89	118	154	207	261	235	191	163	166	166	76	94	110
Regional Transfers (In)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Large Thermal	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	0	0	1150
Non-Utility Generation	53	53	53	53	53	53	53	53	53	53	53	53	53	53
Augmentation Purchases	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Augmentation Resources	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Other Resources	1316	1316	1346	1384	1438	1495	1470	1425	1396	1398	1398	156	173	1337
Total Resources	18129	15743	14312	14759	16026	15259	12981	13721	13754	13097	11693	11811	16484	17550
Reserves & Maintenance														
Hydro Reserves	-1052	-1047	-1054	-1060	-1070	-1049	-1044	-1045	-1035	-998	-988	-1023	-1061	-1057
Small Thermal & Misc. Reserves	-3.9	-3.9	-3.9	-4	-4.1	-4.2	-4.2	-4.2	-4.2	-4.1	-4.1	-4	-3.9	-3.8
Contract Reserves	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Large Thermal Reserves	-172	-172	-172	-172	-172	-172	-172	-172	-172	-172	-172	0	0	-172
Federal Hydro Maint.	-3263	-2761	-2770	-2752	-2705	-1866	-1408	-1883	-1915	-2061	-1805	-1756	-1635	-2785
Spinning Reserves	-347	-300	-264	-274	-305	-306	-262	-269	-270	-251	-223	-223	-341	-344
Federal Trans. Losses	-445	-384	-337	-352	-394	-397	-338	-347	-347	-322	-285	-295	-450	-442
Total Reserves, Maintenance & Losses	-5284	-4668	-4600	-4613	-4651	-3796	-3228	-3720	-3744	-3809	-3477	-3301	-3492	-4804
Total Net Resources	12845	11074	9712	10145	11375	11463	9752	10000	10011	9288	8216	8509	12992	12746
Total Firm Surplus/Deficit	1787	486	-328	-356	-574	-1255	-2756	-2334	-1532	-1329	-2082	-1496	2279	1652

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Section 11: Administrator's Record of Decision on the 2007 Pacific Northwest Loads and Resources Study

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Section 11: Administrator's Record of Decision on the 2007 Pacific Northwest Loads and Resources Study (The White Book)

I. Introduction

The 2007 Pacific Northwest Loads and Resources Study (White Book) establishes the Bonneville Power Administration's (BPA) long range planning basis for supplying electric power to BPA customers. The White Book is not an operational planning guide, nor is it used for BPA rate setting purposes under section 7(i) of the Northwest Power Act. The White Book includes projected Federal system and regional loads and resources with detailed technical appendices. The White Book compiles loads, contracts, and resource capability estimates for Pacific Northwest (PNW) public agency, public utility, cooperative, U.S. Bureau of Reclamation (USBR), investor-owned utility (IOU), and direct service industrial (DSI) customers. The estimates are obtained from (1) forecasts prepared by BPA; (2) direct submittals to BPA; (3) annual data submittals to the Pacific Northwest Utilities Conference Committee; and (4) data submittals to the Pacific Northwest Coordination Agreement (PNCA) Operating Committee. Hydro estimates are produced using BPA's hydro regulator to forecast PNW hydroelectric energy production by project. BPA uses the White Book to project potential Federal system and regional load and resource estimates over the planning period.

The White Book's long-range planning basis for supplying electric power remains important as a valuable planning document for both BPA and the PNW region. BPA will continue to update it and make it publicly available. This 2007 White Book updates the 2006 White Book and represents projections of Federal system and regional load and resource capabilities to be used as inputs to BPA's resource planning process.

II. Statutory Background

With the passage of the Northwest Power Act in December 1980, Congress directed BPA to assure the Pacific Northwest an adequate, efficient, economic, and reliable power supply. *16 U.S.C. §839(2).* In order to carry out this mandate, BPA was directed by Congress to offer new power sales contracts (PSCs) to its regional firm power customers and to plan and acquire firm resources sufficient to meet these firm power loads. *16 U.S.C. §839c(g).* These initial contracts had provisions that, under certain conditions, allowed purchasers to add or remove their non-Federal firm resources. Notably, the load and resources, as determined in the White Book, was referenced within such provisions. In 2001, BPA executed new 10-year take or pay Subscription PSCs with its customers. These contracts modified the terms of additions or removal of customers' resources and expire on September 30, 2011.

Section 5(b)(1) of the Northwest Power Act obligates BPA to serve, in accordance with the terms of contracts, the net firm power load requirements of utilities in the PNW including Federal agencies, public agencies, public utility cooperatives, and IOUs. Section 5(d) authorizes BPA to serve up to a defined amount of the firm power load requirements of its existing DSI customers. *16 U.S.C. §839c(b)(1) and (d*). Under section 5(b)(1), BPA is to offer to sell firm power from the Federal system to meet the firm regional loads of a customer in excess of its firm resources, if any, which the

customer must dedicate to use or has dedicated to use for service of its own regional firm loads. *16 U.S.C. §839c(b)(1)(A) and (B)*. BPA is also to provide electric power for those firm loads that were served by a customer's dedicated resource if the Administrator determines that a customer's dedicated resource is no longer available to serve its loads due to obsolescence, retirement, loss of the resource, or loss of contractual rights. BPA's obligation to supply firm power to its Northwest customers may be adjusted by a determination made under section 9(c) of the Northwest Power Act or section 3(d) of the Northwest Preference Act, regarding a customer's sale or disposition of firm power outside the Pacific Northwest region. 16 U.S.C. 839f(c); 837b(d).

Section 6(a)(2) of the Northwest Power Act obligates BPA to acquire sufficient resources, on a planning basis, to meet its firm load obligations, including its section 5(b)(1) and 5(d) contract obligations. BPA's obligations to provide firm electric power to its utility customers' for their regional firm loads and its contract obligations to provide firm power to its DSI customers comprise the largest portion of BPA's firm power contract obligations. *16 U.S.C. §839c(b)(1) and (d)*.

III. BPA's Utility Power Sales Contract Obligations

BPA executed 5- or 10-year PSCs with Federal agency, public agency, public utility cooperative, USBR, IOU, and DSI customers that began October 1, 2001. The following sets forth BPA's PSC firm power load obligations projected for the 2007 White Book study period:

- BPA's Federal agency, public agency, cooperative, and USBR customers signed either 5- or 10-year PSCs. Some of the public agencies, and cooperatives signed up for the 10-year Slice Product. BPA's PSC and Slice obligations end September 30, 2011; however, this study assumes that BPA will meet these or similar load obligations under agreements through OY 2017. BPA's total public utility load obligations are estimated to range from 7,402 aMW in OY 2008 to 8,060 aMW in OY 2017. In actual operation, BPA's obligations to serve these customers may be higher or lower than those shown in this analysis;

- The IOU's signed the 10-year Residential Purchase and Sales Agreement (RPSA) settling BPA's obligations under Section 5(c) of the Northwest Power Act to the IOUs. 16 U.S.C. §839c(c)(1). For the study horizon, this analysis assumes that any BPA IOU RPSA contracts will provide only financial benefits and no power is delivered. In May 2007, the Ninth Circuit Court held the RPSA settlement agreements inconsistent with Sections 5 and 7 of the Northwest Power Act in Portland General Electric v. BPA. BPA's reviewing approaches to address this inconsistency with regional parties. At this time, the ruling does not change any of BPA's forecasts for Federal system surplus/deficits since BPA did not assume IOU power deliveries through the study horizon. When decisions are made concerning this ruling, they will be reflected in future studies; and

- BPA's DSI customer PSC obligations for October 1, 2006, through September 30, 2011, follow the policies adopted in BPA's *"Service to Direct Service Industrial (DSI) Customers for Fiscal Years 2007-2011, Administrator's Record of Decision"*, published June 30, 2005, and the "*Supplement to Administrator's Record of Decision on Bonneville Power Administration's Service to Direct Service Industrial (DSI) Customers for Fiscal Years 2007-2011"*, (Supplemental DSI ROD) dated May 31, 2006. For BPA's DSI aluminum smelter customers, BPA elected to monetize the value of physical surplus power sales

based on the customers' operating levels through September 30, 2011. For BPA's only non-aluminum DSI customer, Port Townsend Paper Corporation (PTPC), this study models PTCP's benefit as a BPA surplus power sale delivery of 17 aMW to Clallam County PUD for PTCP service through September 30, 2011. This delivery is shown as an Intra-regional transfer from BPA to Clallam County PUD and is not included as a DSI PSC load obligation. The contracts for service to the aluminum smelter DSIs and PTPC expire September 30, 2011. Post-September 30, 2011, this study assumes no BPA power deliveries to DSIs.

Although these PSC obligations expire September 30, 2011, it is assumed that they will be replaced with similar contract obligations through OY 2017. Decisions and agreements for BPA's post-2011 PSC service and products may be reached through the Regional Dialogue process between BPA, its customers, and other regional stakeholders. Any decisions adopted from the Regional Dialogue discussions will be incorporated in future studies.

IV. Excess Federal Power

This 2007 White Book is not a recalculation of or change in BPA's earlier published calculations of the amount of excess Federal power that may be sold by BPA under Public Law (P.L.) 104-46, *§508(a) and (b).* However, this White Book does provide a calculation of surplus firm power under section 5(f) of the Northwest Power Act. Surplus firm power is the amount of firm power in excess of BPA's total firm load obligations under subsections 5(b), (c), and (d) of the Northwest Power Act. *16 U.S.C. §839c(b); (c); and (d)*. This surplus power, if any, may be sold as either excess Federal power under P.L. 104-46, consistent with BPA's calculations of excess Federal power, or as surplus power under P.L. 88-552, section 5(f) and 9(c) of the Northwest Power Act. *16 U.S.C. §837(a); 16 U.S.C. §839c(f) and 16 U.S.C. §839f(c)*. To the extent that BPA has annual amounts of planned firm power that is surplus to its firm contract obligations, BPA may market all or a portion of that surplus power as excess Federal power. The duration of these sales will be as stated in BPA's Excess Federal Power Policy. For purposes of this White Book, a sale of excess Federal power with delivery occurring for a year or more is considered a firm obligation of BPA and is included as a firm obligation in Federal loads.

V. Federal System Obligation and Resource Updates

The 2007 White Book reflects Federal system load obligations, resources, and contracts that were finalized as of March 31, 2007. Changes to the Federal system obligations are as follows:

- Updated Federal agency, public agency, cooperative, and USBR PSC obligation forecasts;
- Revised Federal public agency and cooperative Slice customer obligations;
- DSI load obligations were changed to incorporate the policies adopted in BPA's Supplemental DSI ROD; and
- Updated Federal system contract sales.

The 2007 White Book also includes the following changes to the Federal system resource projections:

- The hydro regulation study was BPA's most recent estimate of power, non-power requirements, and hydro improvements expected to be in effect during the study period;
- Acquisition contracts for the output from the Elwha and Glines Canyon hydro projects continues through September 30, 2009;
- BPA acquired the output from the Idaho Falls Power Bulb Turbine hydro projects from October 1, 2006, through September 30, 2011; and
- Federal system contract purchases were updated.

Future studies will reflect new information as it becomes available.

VI. CONCLUSION:

For the foregoing reasons the methodology and the assumptions in the 2007 White Book are adopted and approved.

Issued in Portland, Oregon on August 1, 2007.

/s/ Stephen J. Wright

Stephen J. Wright
Administrator and Chief Executive Officer

Section 12: Glossary and Acronyms

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Glossary

Average Megawatts (aMW) – A unit of electrical consumption or production over a year. It is equivalent to the energy produced by the continuous use of 1 megawatt of capacity served over a period of 1 year. One average megawatt is equivalent to 8,760 megawatt hours or 8.76 gigawatt hours.

Bonneville Power Administration (BPA) – BPA is a Federal power marketing agency (PMA), responsible for acquiring and delivering power to meet contractual obligations and electrical needs of its customers.

Canadian Entitlement Return (CER) for Canada – The public agencies' obligation to return the Canadian Entitlement allocation to Canada under the Columbia River Treaty that began April 1, 1998.

Capacity – The maximum power that an electrical system or machine such as a hydro powered or thermal powered generating plant can produce under specified conditions, or that a power transmission line can carry.

Capacity Factor – The ratio of the average load on a machine or piece of equipment over a given period to maximum power rating of the machine or equipment.

Cogeneration – The sequential production of more than one form of energy, such as heat and electricity. Large industrial plants often are sources of electricity co-generated as a byproduct of a heating process.

Conservation – Any reduction in electrical power as a result of increases in the efficiency of energy end use, production, or distribution.

Critical Period – That portion of the historical streamflow record during which the recorded streamflows, combined with all available reservoir storage, produced the least amount of energy.

Dedicated Resources – Generating resources owned by a utility and used to serve its firm loads. These resources are declared in each utility's power sales contract with BPA.

Direct Service Industry(s) (DSI) – An industrial customer or group of industrial customers that purchase electric power directly from BPA. Most DSIs are aluminum and other primary metal smelting plants.

Energy Load – The demand for power averaged over a specified period of time.

Export – Electricity generated in the Pacific Northwest that is sold to another region, such as California.

Federal Columbia River Power System (FCRPS) – The FCRPS consists of 31 Federal hydroelectric projects constructed and operated by the U.S. Army Corps of Engineers (USACE), U.S. Bureau of Reclamation (USBR).

Federal System – The Federal system is a combination of BPA's customer loads and contractual obligations, transmission facilities, and resources from which BPA acquires the power it sells. The resources include plants operated by the U.S. Army Corps of Engineers (USACE), U.S. Bureau of Reclamation (USBR), and hydroelectric projects owned by the city of Idaho Falls, Lewis County PUC, and Energy Northwest (ENW). BPA markets the thermal generation from the Columbia Generating Station, operated by ENW.

Firm Capacity – Maximum on-peak electrical energy that is considered assured to meet all contractual peak load requirements over a defined period for a customer or customer group.

Firm Energy – Electric power that is considered assured to the customer to meet all contractual energy load requirements over a defined period for a customer or customer group.

Fiscal Year – In this study, fiscal year (FY) is the 12-month period October 1 to September 30. For example, FY 2008 is October 1, 2007, through September 30, 2008.

Forced Outage Reserve – Capacity that is held in reserve, for use in case a generating unit malfunctions.

Forebay – The portion of the reservoir at a hydroelectric plant that is immediately upstream of the generating station.

Historical Water Conditions (50 Water Year) – The unregulated streamflow database of the 50 years from August 1928 through July 1978.

Hydroregulation – A study simulating operation of the Pacific Northwest electric power system that incorporates the historical streamflow record, monthly loads, thermal and other non-hydro resources, hydroelectric plant data for each project, and the constraints limiting each project's operation.

Independent Hydro – The output from hydropower plants that are not part of the regulated system. These plants are generally run-of-river. Examples are Cowlitz Falls or other small hydro plants whose output is used to serve load in the utility service territory in which it is located.

Import – Electricity that comes to the Pacific Northwest from another region. Examples would be purchases within the region from Canada, California, or western Montana.

Intra-regional Transfer – Sales of power between two parties within the Pacific Northwest region. Sales from an IOU to a public utility within the region are intraregional transfers, such as firm power sales from BPA to PNW entities.

Investor-Owned Utility (IOU) – A privately owned utility organized under State law as a corporation to provide electric power service and earn a profit for its stockholders.

Load Diversity – An adjustment applied to peak loads to reflect the fact that all peaking electrical demands do not occur simultaneously across the region.

Megawatt (MW) – A unit of electrical power equal to 1 million watts or 1,000 kilowatts.

Non-firm Energy – Electrical power produced by the hydro system that is available with water conditions better than those of the critical period without appreciably jeopardizing reservoir refill. It is available in varying amounts depending upon season and weather conditions.

Non-firm Energy Load – Load served by additional hydro energy available in "better-than-critical period" water conditions or can be interrupted in the event of a power deficiency on the supplying system.

Non-utility Generation – A **g**enerating project that is not owned by a utility, rather the project is owned by a third party, such as an independent power producer. The project output could be sold short- or long-term in the market.

Operational Peaking Adjustment – Federal hydro system monthly maximum operational capacity that is available to meet the 1-hour expected peak load for each of the 1929 through 1978 historical water conditions.

Operating Year – For this study, operating year (OY) is the 12-month period August 1 through July 31. For example, OY 2008 is August 1, 2007, through July 31, 2008.

Peak Load – The maximum demand for power during a specified period of time. There are usually two peaks to load each day (morning and evening, driven by residential patterns), six peaks to the week (Monday through Saturday, during "working hours"), and one or two months-long peaks to the year depending upon heating and/or cooling needs. The pattern of peak loads is called its "shape."

Power Sales Contract Obligation – Capacity and energy the Federal system is required to provide to Federal agencies, public agencies, cooperatives, USBR, IOUs, and DSIs under their 1981 or 2001 power sales contracts with BPA.

Publicly Owned Utility - One of several types of not-for-profit utilities created by a group of voters, and can be a municipal utility, a public utility district, a cooperative, a mutual company, or a rural electric association.

Region – The geographic area defined by the Pacific Northwest Electric Power Planning and Conservation Act. It includes Oregon; Washington; Idaho; Montana west of the Continental Divide; portions of Nevada, Utah, and Wyoming that lie within the Columbia River drainage basin; and any rural electric cooperative customer not in the geographic area described above but served by BPA on the effective date of the Northwest Power Planning Act.

Regional Total Retail Load - The sum of all total retail load consumed in the PNW region as defined in the 1980 Pacific Northwest Electric Power Planning and Conservation Act.

Regulated Hydro – Hydropower plants that are part of the Columbia River hydro system that is operated jointly by BPA, the USACE, and the Bureau. Most of these are part of the mainstem system on the Columbia and Snake Rivers.

Renewable Resources – Resources that use solar, wind, hydro, geothermal, biomass, or a similar source of energy that is converted into electricity.

Resource Acquisitions – Conservation or generating resources acquired in order to meet projected firm energy deficits.

Slice of the System Product - A public-preference 10-year power sales contract product based on the customer's net requirements that provides firm and secondary energy using a fixed percentage of the output generated by the Federal system Slice resources.

Spill – Electrical energy that cannot be accepted into the system and must either be sold or spilled due to constraints and limitations of hydro projects.

Spinning Reserves – Reserve generating capacity maintained for immediate response to meet load variations. This provides a regulating margin for controlling the automatic generation and frequency of power in the region and Federal system.

Surplus Firm Capacity – The maximum amount of assured electrical energy above the firm energy loads served by the power system.

Sustained Peak – The peaking capacity necessary to sustain a load for a given period of time.

Thermal Resources – Resources that burn coal, natural gas, or oil, or use nuclear fission to create heat which is then converted into electricity.

White Book Document Acronyms

aMW	Average megawatt
BiOp	Biological Opinion
BPA	Bonneville Power Administration
CER	Canadian Entitlement Return
Council	Northwest Power and Conservation Council
DSI	Direct Service Industry (Industries)
ENW	Energy Northwest, Inc. (formerly Washington Public Power Supply System)
FCRPS	Federal Columbia River Power System
FERC	Federal Energy Regulatory Commission
FPS	Federal Power System
FY	Fiscal Year
HOSS	Hourly Operating and Scheduling Simulator
IOU	Investor-owned utility
IPP	Independent Power Producer
LOLP	Loss of Load Probability
MW	Megawatt
MSR	MSR Public Power Agency, whose members include the Modesto Irrigation District and the cities of Santa Clara and Redding, California
NOAA	National Oceanographic and Atmospheric Administration
NUG	Non-utility generating resources
OY	Operating Year
PGE	Portland General Electric
PNCA	Pacific Northwest Coordination Agreement
PNUCC	Pacific Northwest Utilities Conference Committee
PNW	Pacific Northwest
PP&L	PacifiCorp Power and Light Company
PSC	Power Sales Contract
PUD	Public Utility District
RPSA	Residential Purchase and Sales Agreement
ROD	Record of Decision
USACE	U.S. Army Corps of Engineers
USBR	U.S. Bureau of Reclamation