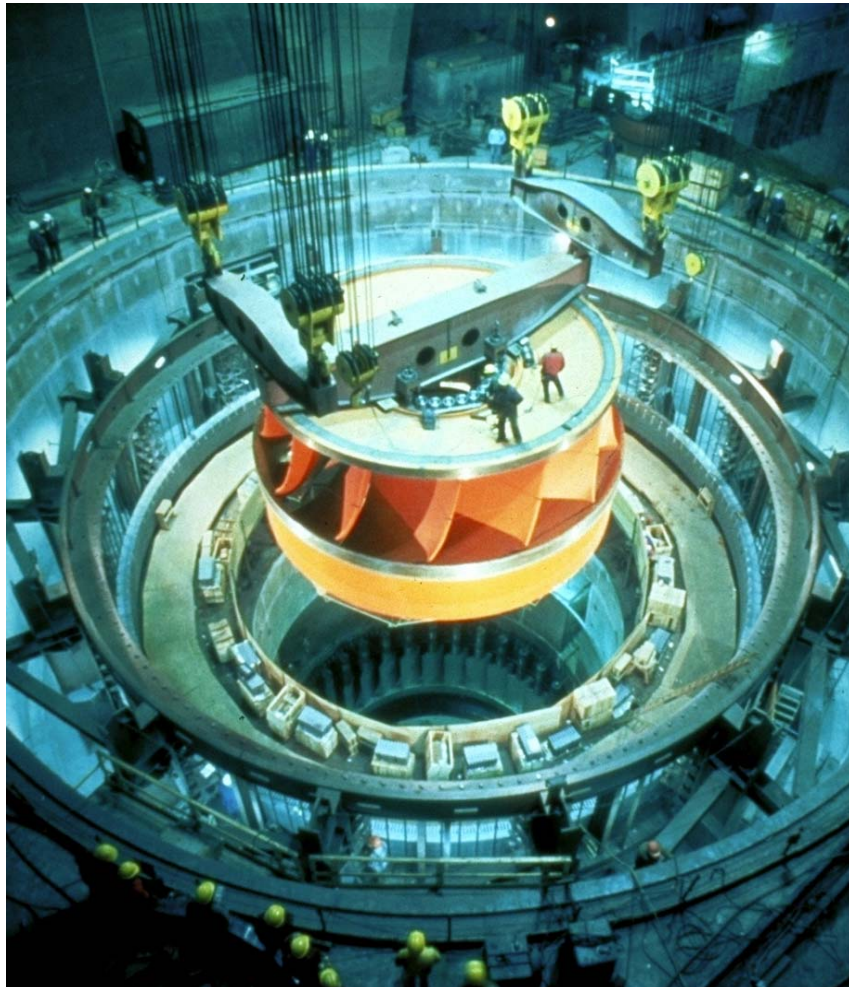


2006 Pacific Northwest Loads & Resources Study

Operating Years 2007 through 2016

March 2006



WP-07-E-PN-16-AT9





Department of Energy

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

POWER BUSINESS LINE

December 1, 2006

In reply refer to: PGPL-5

Dear Interested Parties:

Please note that the naming convention of this "*Pacific Northwest Loads and Resources Study*," commonly called the "White Book" has been revised to reflect the publishing year of the document and includes all data updates through March 31, 2006. Since the timing of this White Book publication is 2006, this year's White Book is now titled the "*2006 Pacific Northwest Loads and Resources Study*," or the 2006 White Book, rather than 2005. This change creates less confusion as to the vintage of the data. BPA did not skip a year of this document publication, rather just revised the naming convention.

This document is Bonneville Power Administration's (BPA) "*2006 Pacific Northwest Loads and Resources Study*," commonly called the "White Book." The 2006 White Book is a snapshot as of March 31, 2006, of the Pacific Northwest (PNW) region and the Federal system loads and resources for Operating Year (OY) 2007 through 2016. This analysis incorporates BPA's estimates of PNW total retail loads, contract obligations, contract purchases, and resource capabilities. BPA compiles these estimates with those 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) through annual data submittals. These combined projections provide projections of the PNW region and Federal system load and resource capabilities for the 10-year study horizon, operating years (OY) 2007 through 2016.

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 under various resource levels for both the Federal system and the PNW region. The 2006 Pacific Northwest Loads and Resources Study is an update to the previous 2004 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 2006 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 2016. BPA's total PSC load obligations are estimated to range from 7,176 aMW in OY 2007 to 7,631 aMW in OY 2016. 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). As a result of negotiations in 2001, IOU RPSA settlement firm power deliveries were reduced in exchange for financial considerations resulting in a net IOU RPSA settlement power delivery of 258 aMW, per month, through September 30, 2006, or a 43 aMW annual average for the partial year. For the period October 1, 2006, through September 30, 2011, this study assumes that BPA's IOU RPSA settlement contracts provide only financial benefits and no firm power is delivered. This assumption is consistent with the amendments made to the RPSA contracts by BPA and the IOUs on May 28, 2004; and
- BPA's DSI customers signed 5-year contracts effective from October 1, 2001, through September 30, 2006. BPA's DSI load obligations reflect signed load reduction agreements, contract terminations, and closures through March 31, 2006. BPA's DSI load obligations are estimated to be up to 265 aMW, per month, through September 30, 2006, resulting in a 44 aMW annual average for the partial year OY 2007. For October 1, 2006, through September 30, 2011, this study incorporates the policies adopted in BPA's Supplemental DSI ROD, dated May 31, 2006.

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

Table 1
2006 White Book
BPA Power Sales Contract Load Obligations
Annual Energy in Average Megawatts

Operating Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
USBR	160	160	160	160	160	160	160	160	160	160
Federal Agency	123	129	139	141	142	142	143	144	145	147
Public Agency ^{1/}	6,893	6,982	7,026	7,088	7,125	7,079	7,084	7,181	7,229	7,324
DSI ^{2/}	44	0	0	0	0	0	0	0	0	0
IOU Power Deliveries ^{3/}	64	0	0	0	0	0	0	0	0	0
Less Power Purchase Program ^{4/}	-21	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Net IOU Power Deliveries ^{5/}	43	0	0	0	0	0	0	0	0	0

^{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 DSI customers signed 5-year contracts beginning October 1, 2001, extending through September 30, 2006, and reflect load reduction agreements and contract terminations as of March 31, 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.

^{3/} BPA's IOU RPSA settlement power deliveries were reduced through September 30, 2006. For October 1, 2006, through September 30, 2011, BPA's IOU RPSA settlement contracts assume only financial benefits and no power is delivered.

^{4/} In addition to the IOU RPSA settlement, some of the IOUs reduced BPA's obligations utilizing power purchase programs through September 30, 2006. Under these programs, BPA purchased power back from some of the IOUs through September 30, 2006. These contracts are shown as BPA purchases in Intra-Regional Transfers and reduce BPA's actual IOU power deliveries.

^{5/} BPA's net IOU PSC power deliveries, under the RPSA settlement reduced for BPA power purchase programs.

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, 2006, 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 and to make the turbine operations more fish friendly;
- Providing increased reliability by decreasing forced and planned outages; and
- Implementing hydro system optimization and operational planning tools to increase generation efficiency as part of Federal operating decisions for the system.
- The Council, BPA, other Federal agencies, and other PNW entities will continue to evaluate ways to enhance 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 is also looking at additional 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 ($6 \times 5 \times 4 = 120$ 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 2006 White Book, page 65. The analysis used the "Federal System Assumptions" detailed on page 17 of the study document. The Federal system is projected to have minimal energy deficits throughout the study due to lower Federal hydro generation estimates related to the incorporation of changing or additional power and non-power hydro operating requirements from last year's study. 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 2006 White Book on page 29. BPA will most likely meet monthly and annual energy deficits using a combination of methods described below in the Federal System Resource Adequacy.

Table 2
2006 White Book
Federal System Firm Energy Surplus/Deficit
Using 1937-Critical Water Conditions
Annual Energy in Average Megawatts

Operating Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Obligations	8,383	8,304	8,310	8,467	8,466	8,184	8,151	8,234	8,271	8,348
Resources	8,359	8,238	8,158	8,319	8,206	8,163	8,040	8,172	8,056	8,181
Surplus/Deficit	-24	-66	-152	-148	-260	-21	-111	-62	-215	-167

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: the base case 1937-critical water; the average of the bottom ten percent; the middle 80 percent; and the top ten percent and are shown on page 24 of the 2006 White Book document.

Federal System Resource Adequacy

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, 2006. 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 Eastern and Western Power Business Line Area Hubs 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 2005 PNUCC submittals or load forecasts sent directly to BPA. DSI total retail load estimates were based on their current PSCs with BPA through September 30, 2006, and forecasts developed from BPA's Bulk Hub for the remainder of the study period. All total retail load forecasts were finalized on March 31, 2006.

2006 White Book and the Council Regional Total Retail Load Comparison: Table 3 shows a comparison of the non-DSI regional total retail loads for the 2006 White Book and the Council's Final Fifth Northwest Electric Power and Conservation Plan (May 2005) for OY 2007 through 2016. 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 2006 White Book projections are slightly lower in all years of the study. The average difference over the 10-years of the study is -1.6 percent. The maximum difference is -1.9 percent (-437 aMW) in OY 2016. 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 2006 White Book Load Projections
and the Council's Final Fifth Power and Conservation Plan
Annual Energy in Average Megawatts**

Operating Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
2006 White Book	20,165	20,473	20,763	21,033	21,314	21,558	21,880	22,188	22,506	22,810
Council Reg. Plan	20,497	20,759	21,033	21,331	21,632	21,941	22,245	22,565	22,906	23,247
Difference (aMW)	-332	-286	-271	-299	-318	-383	-366	-377	-400	-437
Difference (%)	-1.6%	-1.4%	-1.3%	-1.4%	-1.5%	-1.8%	-1.7%	-1.7%	-1.8%	-1.9%

PNW Region Annual Firm Energy Surplus/Deficit

Table 4 is a summary of the PNW region annual firm energy surplus/deficits presented in the 2006 White Book, page 95. 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 through 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 2006 White Book on page 50.

Table 4
2006 White Book
PNW Regional Firm Energy Surplus/Deficit
Using 1937-Critical Water Conditions
Annual Energy in Average Megawatts

Operating Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Total Firm Loads	21,640	21,967	22,190	22,553	22,796	22,986	23,270	23,564	23,847	24,108
Net Resources	23,667	24,229	23,943	24,096	23,952	24,067	23,967	24,154	23,917	24,114
Surplus/Deficit ¹	2,028	2,262	1,753	1,542	1,156	1,081	697	590	70	5

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: 1937-critical water; the average of the bottom ten percent; the middle 80 percent; and the top ten percent and are shown on page 40 and 44, respectively, in the 2006 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 45 of the document. Table 5 shows the potential variability of regional firm annual energy surplus/deficits due to the differing levels of IPP generation assumed delivered to the region—25 percent (840 aMW), 50 percent (1,680 aMW), 75 percent (2,520 aMW), and 100 percent (3,366 aMW). For OY 2007, regional surplus/deficit estimates can potentially vary up to 2,500 aMW, annually ranging from an approximate 2,000 aMW surplus to approximately -500 aMW deficit, due to differing possible IPP generation commitments to the PNW.

¹ Sums may not add due to rounding.

Table 5
2006 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	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
S/D 100% PNW IPP Delivered (3,366 aMW)	2,028	2,262	1,753	1,542	1,156	1,081	697	590	70	5
S/D 75% PNW IPP Delivered (2,520 aMW)	1,188	1,422	913	702	316	241	-143	-250	-770	-835
S/D 50% PNW IPP Delivered (1,680 aMW)	348	582	73	-138	-524	-599	-983	-1,090	-1,610	-1,675
S/D 25% PNW IPP Delivered (840 aMW)	-492	-258	-767	-978	-1,364	-1,439	-1,823	-1,930	-2,450	-2,515

2006 White Book Key Messages

For the Federal System:

- The Federal system is expected to have minimal energy deficits throughout the study horizon.
- BPA energy surplus/deficits may differ due to:
 - o 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;
 - o Uncertainty of future BPA sales to DSI customers;
 - o New or updates to contracts obligations or purchases through the Regional Dialogue process;
 - o Changes in non-power requirements on Federal hydro projects; and
 - o Actual level of Federal system hydro generation realized under current water conditions that can vary by up to 3,900 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 all uncommitted IPP generation is available to serve PNW loads.
- Regional energy surplus/deficits may differ due to:
 - o The actual level of total retail loads may be higher or lower than those used in this analysis;
 - o New or updates to contracts obligations or purchases;
 - o Changes in non-power requirements on Federal and non-Federal hydro projects;
 - o Availability of fuel (i.e. natural gas, coal, wind, etc.) for other regional resources;
 - o Actual level of regional hydro generation realized under current water conditions that can vary by up to 6,800 aMW annually; and
 - o The actual amount of uncommitted IPP generation retained within the PNW region. This study assumes approximately 3,360 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 3,360 aMW, 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 2006 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/whitebook2006>.

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

2006 PACIFIC NORTHWEST LOADS AND RESOURCES STUDY

THE WHITE BOOK

BONNEVILLE POWER ADMINISTRATION
March 2006

Cover Picture:

Source: BPA Photo archive

Pictured is the impeller installation of a generator turbine at Grand Coulee Dam, which has been in service since September 28, 1941.

Grand Coulee Dam is a large hydroelectric dam located on the Columbia River in Central Washington and is the largest concrete structure in the United States and the third largest hydroelectric facility in the world. With its 24 generators providing up to 6.5 million kilowatts of power, it is a major provider of electrical power to the Northwest.

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

Naming Convention Revision for the White Book Document

The naming convention of this “*Pacific Northwest Loads and Resources Study*,” commonly called the “White Book” has been revised to reflect the publishing year of the document and includes all data updates through March 31, 2006. Since the timing of this White Book publication is 2006, this year’s White Book is now titled the “*2006 Pacific Northwest Loads and Resources Study*,” or the 2006 White Book, rather than 2005. This change creates less confusion as to the vintage of the data. BPA did not skip a year of this document publication, rather just revised the naming convention.

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 could 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. This loads and resources analysis 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 2005 and/or direct submittals to BPA.

The 2006 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 2006 White Book analysis updates the 2004 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 2007-2016. 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 2007, 2011, and 2016. BPA is investigating a new approach in capacity planning depicting the monthly Federal system 120-hour peak generating capability and 120-hour peak surplus/deficit for OY 2007, 2011, and 2016.

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 51. Section 7, page 55, 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 2006 White Book is contained in Section 11, page 129.

The glossary of terms and a list of acronyms are included in Section 12, page 135.

This document and the *"2006 Pacific Northwest Loads and Resources Study Technical Appendix"* are available on BPA's external website at <http://www.bpa.gov/power/whitebook2006>.

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, Montana west of the Continental Divide, and 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 PNW entity. The Hubs for BPA’s Eastern and Western Power Business Line Areas 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 IOU and some generating public agency customers were developed from data submitted in their PNUCC submittals or total retail load forecasts furnished to BPA. Direct Service Industries’ (DSI) total retail load estimates are based on their current PSCs with BPA through September 30, 2006, and forecasts from BPA’s Bulk Hub throughout the study period. All total retail load forecasts are as of March 31, 2006.

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 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. 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 2007-2016 for 50-historical water conditions (August 1928 through July 1978). The results are shown in Exhibits 8 through 17, pages 81-90, for the Federal system, and in Exhibits 25 through 34, pages 111-120, 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 August 1936 through July 1937. This study uses one of the lowest water years, 1937-water

¹ Operating Year (OY) is the 12-month period August 1 through July 31. For example, OY 2007 is August 1, 2006, through July 31, 2007.

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".

Hydro 1-Hour Operational Capacity: The study estimates the monthly instantaneous capacity of Columbia River Basin regulated and independent hydro projects based on their full-gate-flow maximum generation at its mid-month reservoir elevation using 1929 through 1978 historical water conditions. The hydro generation reflects river constraints and storage limitations, within any water condition, that may limit the release of water to achieve maximum capacity. BPA assumes 1937-water levels to estimate the regional hydro capacity because that year approximates a peaking capability that is consistent with the reliability criteria set forth in the PNCA.

The instantaneous capability of the Federal hydro projects, however, 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. An operational peaking adjustment reduction is made to the Federal hydro capacity estimates to better reflect BPA's ability to meet expected peak load obligations throughout each month.

The operational peaking adjustment was developed using a series of Hourly Operating and Scheduling Simulator (HOSS) studies. 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. The HOSS model maximized Federal system hydro generation by selling surplus energy in better than average water conditions. In low water conditions, HOSS maximized hydro generation and purchased energy to meet the monthly peak load demands.

The HOSS studies produced an hourly matrix of Federal system hydro generation by month, by water condition. Monthly relationships between the Federal system hydro energy and the Federal hydro maximum 1-hour generation were developed for each water condition. This method estimates the 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.

This methodology for calculating firm hydro capacity provides a better measure of the Federal system and PNW resource peaking capability for BPA planning purposes. The operational peaking adjustment takes into account hydro maintenance, spinning reserves, and forced outage reserves, which are netted out for reporting purposes. Due to the operational peaking adjustment change implemented in the 2004 study, Federal and regional capacity surplus/deficit values are not comparable with studies prior to the 2004 White Book.

Hydro 120-Hour Capacity Availability: BPA is looking at additional 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 ($6 \times 5 \times 4 = 120$ 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. This is discussed further in Section 7: Potential Capacity Planning for the Future, page 55.

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 presently known non-power operating requirements in assessing regional hydro system capability.

The Council, BPA, other Federal agencies, and other PNW entities will continue to evaluate ways to enhance 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 the availability of operational Federal system capacity. Future studies will incorporate any known new impacts.

Hydro Improvements: BPA has budgeted \$1.2 billion over the next 7 to 9 years for maintaining and improving the reliability of the Federal hydro system. These improvements were revised for this study and are expected to increase and preserve Federal hydro generation by:

- Replacing turbine runners to preserve and increase generation and to make the turbine operations more fish friendly;
- Providing increased reliability by decreasing forced and planned outages; and
- Implementing hydro system optimization and operational planning tools to increase generation efficiency as part of Federal operating decisions for the system.

Using critical water conditions, it is estimated that by OY 2007, the combination of these hydro improvements will annually preserve and create up to 98 average megawatts (aMW), of which 77 aMW are potential additional Federal hydro generation and the remaining 21 aMW are associated with preserving the existing level of hydro generation capability from degradation. In OY 2016, it is estimated that these improvements will annually preserve and create up to 246 aMW, of which 170 aMW are potential additional generation and the remaining 76 aMW, preserving hydro generation from degradation.

Using average water conditions, it is estimated that by OY 2007, the combination of these hydro improvements will annually preserve and create up to 286 aMW, of which 107 aMW are potential additional generation and the remaining 179 aMW, preserving hydro generation from degradation. In OY 2016, it is estimated that these improvements will annually preserve and create up to 941 aMW, of which 229 aMW are potential additional generation and the remaining 712 aMW, preserving hydro generation from degradation.

The total amount and timing of annual aMW actually realized over the next 7 to 9 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.

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 38.

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 the City of Idaho Falls, through September 30, 2006, 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 with BPA. 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 2016. 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. As a result of negotiations in 2001, the IOU RPSA firm power deliveries were reduced in exchange for financial considerations resulting in a net IOU RPSA settlement power delivery of 258 aMW, per month, through September 30, 2006, or a 43 aMW annual average for the partial year of OY 2007. For the period October 1, 2006, throughout the study horizon, this study assumes that BPA’s IOU RPSA settlement contracts provide only financial benefits and no power is delivered. This assumption is consistent with the amendments made to the RPSA contracts by BPA and the IOUs on May 28, 2004; and
- BPA’s DSI customers signed 5-year power sales contracts effective from October 1, 2001, through September 30, 2006. For August 1, 2006, through September 30, 2006, BPA’s DSI load obligations reflect load reduction agreements, contract terminations, and curtailments and are estimated to be 265 aMW, monthly, resulting in a 44 aMW annual average for the partial year of OY 2007. For October 1, 2006, through September 30, 2011, this study incorporates 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. Beginning October 1, 2006, this study assumes that BPA will offer Port Townsend Paper Corporation 17 aMW of surplus firm power via a local preference customer. 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. Actual DSI load obligations may differ from those presented in this study due to additional purchases or curtailments caused by changes in economic conditions.

Decisions and agreements may be reached through the Regional Dialogue process between BPA and its customers and other regional stakeholders on the nature of BPA’s electrical service products post-2006. 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, 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 Obligations¹
Energy in Average Megawatts**

Operating Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Federal System	488	483	465	567	527	517	505	495	483	471

January Capacity in Megawatts

Operating Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Federal System	1,244	1,241	1,245	1,352	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 Obligations¹
Energy in Average Megawatts**

Operating Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Public Agencies	58	56	57	65	69	68	68	67	67	66
Investor-Owned Utilities	66	65	65	63	61	60	59	58	57	57
Other Entities	10	10	10	10	10	10	10	11	10	10
Total Energy Obligation	134	131	132	138	140	140	137	136	134	133

January Capacity in Megawatts

Operating Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Public Agencies	100	98	96	116	119	119	117	115	115	114
Investor-Owned Utilities	116	113	112	102	106	105	103	101	100	99
Other Entities	18	17	17	18	19	18	18	18	18	18
Total Capacity Obligation	234	228	225	236	244	242	238	234	233	231

¹ Values are estimated for OY 2012 through 2016

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 40;
- 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.

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Section 3: Changes in the 2006 Pacific Northwest Loads and Resources Study

This section describes the major data updates and changes in the assumptions for the 2006 White Book analysis compared to the 2004 White Book. Specific resource and contract changes are detailed in the 2006 Pacific Northwest Loads and Resources Study Technical Appendix. The 2006 Technical Appendix will be available on BPA's external website at <http://www.bpa.gov/power/whitebook2006>. The 2006 Technical Appendix presents auxiliary tables (A-tables) that contain aggregate information summarized by customer type.

Federal Firm Sales and Obligations

The 2006 White Book analysis reflects the following Federal system contract and obligation changes compared to the 2004 study:

- 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 2016;
- 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 2016;
- For the period October 1, 2006, through September 30, 2011, this study assumed that BPA's IOU RPSA settlement contracts provide only financial benefits and no power is delivered throughout the study horizon. This assumption is consistent with the amendments made to the RPSA contracts by BPA and the IOUs on May 28, 2004;
- BPA's DSI load obligations were updated to reflect signed load reduction agreements, contract terminations, and closures through March 31, 2006. DSI service estimates for October 1, 2006, through September 30, 2011, incorporate the policies adopted in BPA's Supplemental DSI ROD, dated May 31, 2006; and
- Updated Federal system contract sales.

Federal Resource Stack

The 2006 White Book analysis reflects the following Federal system resource stack changes compared to the 2004 study:

- Regulated hydro resource updates: The hydro regulation study was updated to incorporate BPA's most recent estimate of power and non-power requirements expected to be in effect during the study period;
- Independent hydro resource updates: Acquisition contracts for the output from the Elwah (8.6 aMW) and Glines Canyon (15.0 aMW) hydro projects were extended from July 31, 2006, to September 30, 2009. The actual removal date of these projects is provided by the U.S. National Park Service;

- NUG renewable resource update: Estimated start date for the Fourmile Hill Geothermal plant (50 aMW) was revised from October 1, 2007, to October 1, 2009. There is potential for contract termination of this resource purchase due to project delays, thus making the completion date uncertain;
- Independent hydro resource removal: Bonneville Fishway project (22 aMW) was removed as a Federal resource to avoid double counting of the generation, which was previously included in the regulated hydro Bonneville Dam generation estimates;
- NUG hydro resource removal: Hellroaring (Big) Creek hydro project (0.2 aMW) generation changed from a Federal Independent Hydro resource to Mission Valley and remains a regional resource;
- Independent hydro resource ownership change: Output from the Idaho Falls Bulb Turbine projects (18.5 aMW) changed from a Federal Independent Hydro resource to the City of Idaho Falls due to the expiration of BPA's acquisition contract September 30, 2006. The project 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 2006 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 2005 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.

- 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 2005 PNUCC data submittals;
- IOU retail load forecasts were developed by BPA using data provided in their 2005 PNUCC data submittals;
- DSI retail load estimates were updated by BPA and are based on their current PSCs with BPA; and
- Updated PNW regional export contracts.

PNW Regional Resource Stack Changes

In addition to the Federal system resource stack updates presented on page 13, the 2006 White Book analysis reflects the following regional resource changes compared to the 2004 study:

- NUG hydro resource additions: Albany (0.3 aMW), Boulder Creek (0.2 aMW), and Rocky Brook (0.25 aMW);
- NUG cogeneration additions: Haleywest Cogeneration (4.1 aMW) and Potlatch (52.7 aMW);
- NUG renewable resource addition: Pine Products (0.01 aMW);
- NUG wind project additions: Eurys Combine Hill (12.7 aMW), Hopkins Ridge (31.2 aMW), Klondike Phase 2 (19.9 aMW), Wild Horse (39.0 aMW) and beginning OY 2008, White Creek (23.5 aMW);
- Combustion turbine resource addition: Boundary C-T (0.01 aMW);
- Regulated hydro resource updates: Kerr (105 aMW) and Thompson Falls (50.1 aMW) which were inadvertently left out as regional resources;
- Regulated hydro resource removal: Decommissioning of Puget Sound Energy's White dam (32.1 aMW);
- Updated PNW regional import contracts; and
- Several generating projects were reclassified within the study. These changes had no effect on the regional generation totals.

Future studies will reflect new information as it becomes available.

Potential Capacity Planning for the Future

BPA is exploring alternative study methods to better portray capacity availability, duration, and adequacy to meet loads for the White Book and other planning processes which is presented in Section 7, page 55. While this study process is presently under way, this example shows how a 120-Hour peak capacity availability could be translated for BPA's 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, 2006. 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, and BPA's best estimate of non-power requirements. 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 2016;
- 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 2016;
- For the period October 1, 2007, through September 30, 2011, BPA's IOU RPSA settlement contracts reflect only financial benefits and no power is delivered. This assumption continues through OY 2016 and is consistent with the amendments made to the RPSA contracts by BPA and the IOUs on May 28, 2004;
- BPA's DSI PSC obligations reflect signed load reduction agreements, contract terminations, and closures. DSI purchases total up to an annual maximum of 265 aMW per month through September 30, 2006. DSI service estimates for October 1, 2006, through September 30, 2011, incorporate the policies adopted in BPA's Supplemental DSI ROD, dated May 31, 2006;
- 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.

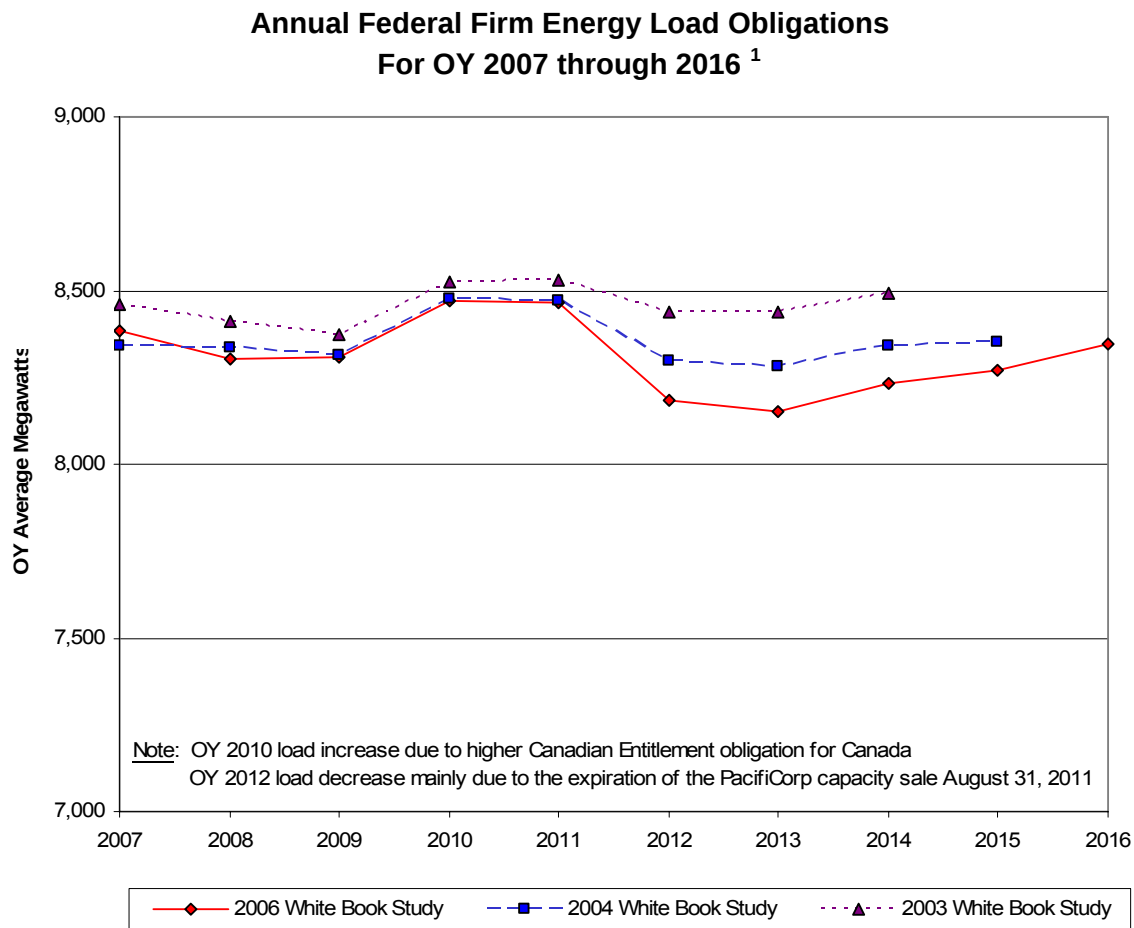
Annual Federal Firm Energy Load Obligations

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, including "The Slice Product" discussed on page 8, for PNW Federal

agencies, public agencies, cooperatives, USBR, IOUs, and DSIs. 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 difference between the forecasted 2006 White Book annual Federal system energy load obligations for OY 2007 through 2016 from the previous 2004 and 2003 Studies. The expected lower Federal load obligations for OY 2007 through 2016 reflect changes in BPA's small public agency, cooperative, DSI, and export contracts. The annual Federal firm energy load obligations for OY 2007 through 2016 are presented in Exhibit 1, page 65.

Figure 1

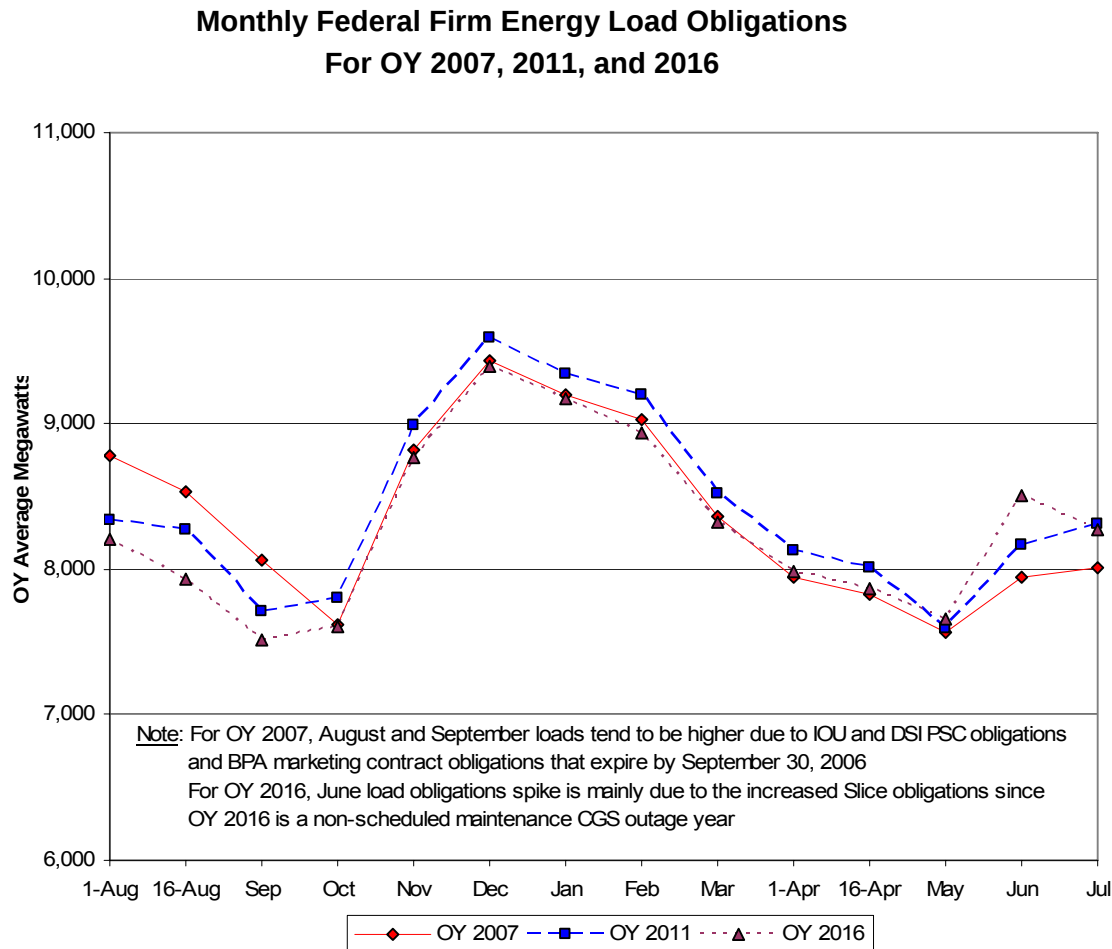


¹ 2003 White Book projections were published through OY 2014. 2004 White Book projections were published through OY 2015.

Monthly Federal Firm Energy Load Obligations

Figure 2, below, illustrates the monthly Federal firm energy load obligations for OY 2007, 2011, and 2016 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



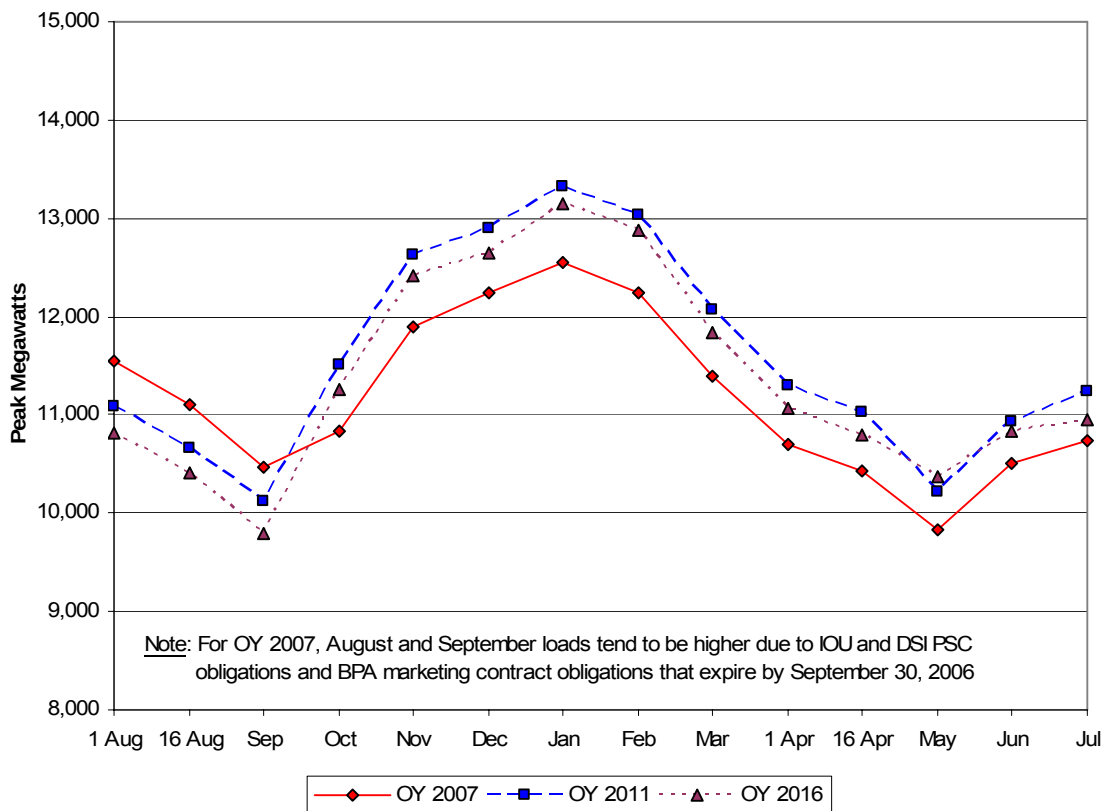
The monthly Federal firm energy load obligations for OY 2007, 2011, and 2016, assuming 1937-critical water conditions, are shown in Exhibits 2 through 4, pages 69-71.

Monthly Federal Firm 1-Hour Peak Load Obligations

Figure 3, page 20, illustrates the monthly Federal firm 1-hour peak load obligations for OY 2007, 2011, and 2016 and employs the same load components detailed in “Federal System Assumptions” and the “Annual Federal Firm Energy Load Obligations” detailed on page 17. The figure shows the expected 1-hour monthly maximum demand using BPA’s 2006 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 2007, 2011, and 2016



For OY 2007, August and September Federal peak load obligations are higher, mainly due to IOU and DSI PSC obligations that expire September 30, 2006. The monthly Federal firm peak loads are presented in Exhibits 5 through 7, pages 75-77.

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 2007. Federal system energy resources are comprised of approximately 80 percent hydropower, over 10 percent from one nuclear power plant, and less than 10 percent from BPA's contracts and small thermal and renewable resources.

Table 3
Federal Firm Total Resources for OY 2007¹
Based on 1937-Critical Water Conditions
Capacity Based on January 2007

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	12,662 ²	89.7%	6,877	80.0%
Nuclear	1,150	8.1%	877	10.2%
Contracts/Small Thermal Resources	309	2.2%	847	9.8%
Total Federal Firm Resources	14,121	100%	8,601	100%

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.

Combined, these resources represent BPA's available firm resources. A detailed listing of Federal generating resources is in BPA's "2006 Pacific Northwest Loads and Resources Study Technical Appendix" and is available on BPA's external website at <http://www.bpa.gov/power/whitebook2006>.

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

² The Federal hydroelectric capacity is reduced by an operational peaking adjustment to better estimate the monthly maximum operational capability that is available to meet the expected 1-hour peak load, for 1937-water conditions. The January 2007 reduction is -8,659 MW.

Table 4

**Federal System Hydro Projects
Capacity and Energy Based on OY 2007**

Project	Initial Year of Service	Number of Units	Nameplate Rating (MW)	OY 2007	
				Instantaneous Generating Capacity ¹ (Peak MW)	Firm Energy ² (aMW)
U.S. Bureau of Reclamation Hydro Projects					
Grand Coulee	1941	27	6,465	6,326	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	7,213	2,158
U.S. Army Corps of Engineers Hydro Projects					
Chief Joseph	1955	27	2,458	2,535	1,069
John Day	1968	16	2,160	2,484	807
The Dalles ³	1957	24	1,808	2,074	605
Bonneville	1938	20	1,093	1,047	383
McNary	1953	14	980	1,127	477
Lower Granite	1975	6	810	930	165
Lower Monumental	1969	6	810	923	155
Little Goose	1970	6	810	928	179
Ice Harbor	1961	6	603	693	168
Libby	1975	5	525	579	173
Dworshak	1974	3	400	445	146
Lookout Point	1954	3	120	67	35
Detroit	1953	2	100	96	41
Green Peter	1967	2	80	79	28
Lost Creek	1975	2	49	18	30
Albeni Falls	1955	3	43	22	25
Hills Creek	1962	2	30	30	18
Cougar	1964	2	25	25	16
Foster	1968	2	20	22	12
Big Cliff	1954	1	18	21	11
Dexter	1955	1	15	17	9
Total Corp of Engineer Projects		153	12,957	14,162	4,552
Total USBR and USACE Projects		206	20,445	21,375	6,710

¹ This is the maximum hydro generation using optimum conditions for January 2007 assuming 1937-critical water conditions and does not reflect operational peaking reductions.

² Firm energy is a 12-month annual average for OY 2007 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 2007**

Project	Type	Operator	Date in Service	OY 2007	
				Capacity ¹ (Peak MW)	Firm Energy (aMW)
Existing Non-Federally Owned BPA Resources					
Columbia Generating Station	Nuclear	ENW	1984	1,150	877
Cowlitz Falls	Hydro	Lewis County PUD	1994	13	26
Dworshak/Clearwater Small Hydro	Hydro	State of Idaho DWR	2000	3	3
Glines Canyon ²	Hydro	US Parks Service	1927	16	15
Elwah 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				1,227	1,006
Firm Contracts					
Canadian Entitlement for Canada (non-Federal)				234	134
Canadian Imports				1	1
Pacific Southwest Imports				0	50
Inland Southwest Imports				45	81
Eastern Imports				189	94
Intra-Regional Transfers In (Pacific Northwest Purchases)				10	522
Total BPA Firm Contracted Resources				479	882
Total Non-Federally Owned BPA Resource Contracts				1,706	1,888

¹ This is the maximum generation using optimum conditions for January 2007. Hydro projects assume 1937-critical water conditions.

² Elwah 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 1937-critical water conditions, the base case of this study, and the averages of the bottom ten percent, middle 80 percent, and top ten percent of the historical 50-water year conditions (1929 through 1978).

Table 6

Potential Variability of Total Federal Net Resource Projections¹
Utilizing Different Levels of Water Conditions
Energy in Average Megawatts

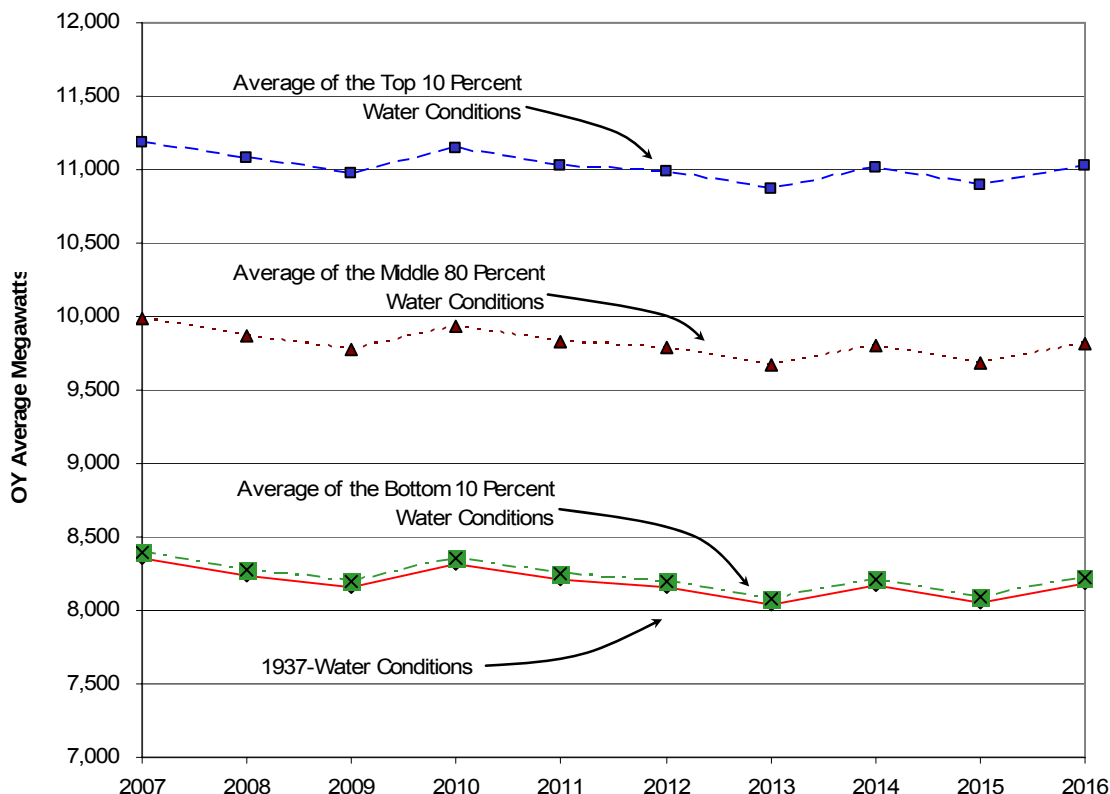
Operating Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
1937-Critical Water Conditions	8,359	8,238	8,158	8,319	8,206	8,163	8,040	8,172	8,056	8,181
Average Bottom 10% Water Conditions	8,397	8,278	8,197	8,359	8,246	8,202	8,080	8,212	8,095	8,221
Average Middle 80% Water Conditions	9,987	9,870	9,776	9,940	9,828	9,786	9,667	9,802	9,689	9,816
Average Top 10% Water Conditions	11,190	11,075	10,973	11,140	11,030	10,988	10,871	11,009	10,896	11,025

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 Projections¹
Utilizing Differing Water Conditions**



Annual Federal Firm Energy Surplus/Deficit Projections

Using the “Federal System Assumptions” detailed on page 17, the projections for annual Federal firm energy surplus/deficits for OY 2007 through 2016 are presented in Table 7 on page 26. The Federal system is projected to have minimal energy deficits throughout the study period due to lower Federal hydro generation estimates due to the incorporation of changing or additional power and non-power hydro operating requirements. BPA will most likely meet these deficits using a combination of methods described in “Federal Resource Adequacy”, page 34.

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

Table 7

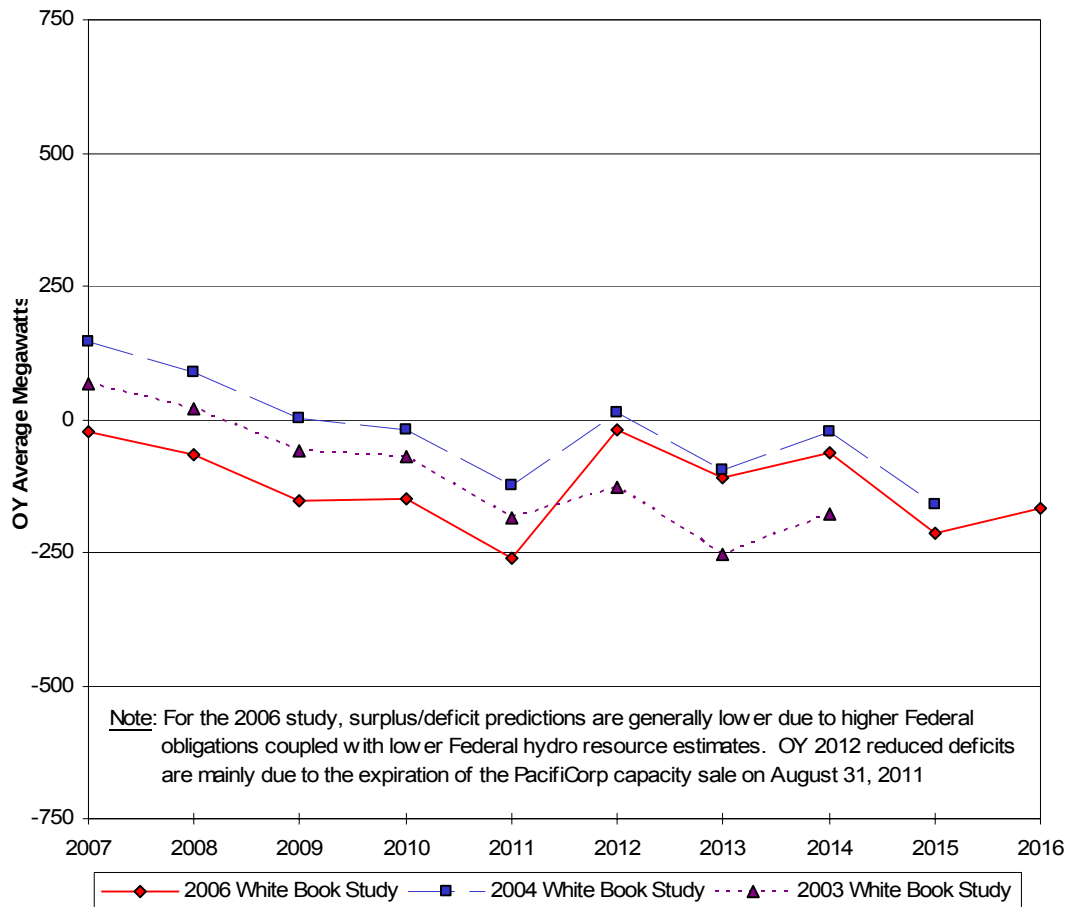
**Annual Federal Firm Energy Surplus/Deficit Projections
Using 1937-Critical Water Conditions
Energy in Average Megawatts**

Operating Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Federal Surplus/Deficit	-24	-66	-152	-148	-260	-21	-111	-62	-215	-167

Figure 5, below, illustrates how the 2006 White Book Federal energy surplus/deficits compares to the previous 2004 and 2003 studies.

Figure 5

**Annual Federal Firm Energy Surplus/Deficit Projections¹
Assuming Existing Loads, Resources, Contracts,
and Normal Weather Conditions**



¹ 2003 White Book projections were published through OY 2014. 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 2007 through 2016 are presented in Exhibit 1, page 65.

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 using 1937-critical water conditions, the base case of this study, and the averages of the bottom ten percent, middle 80 percent, and top ten percent of the historical 50-water year conditions (1929 through 1978).

Table 8

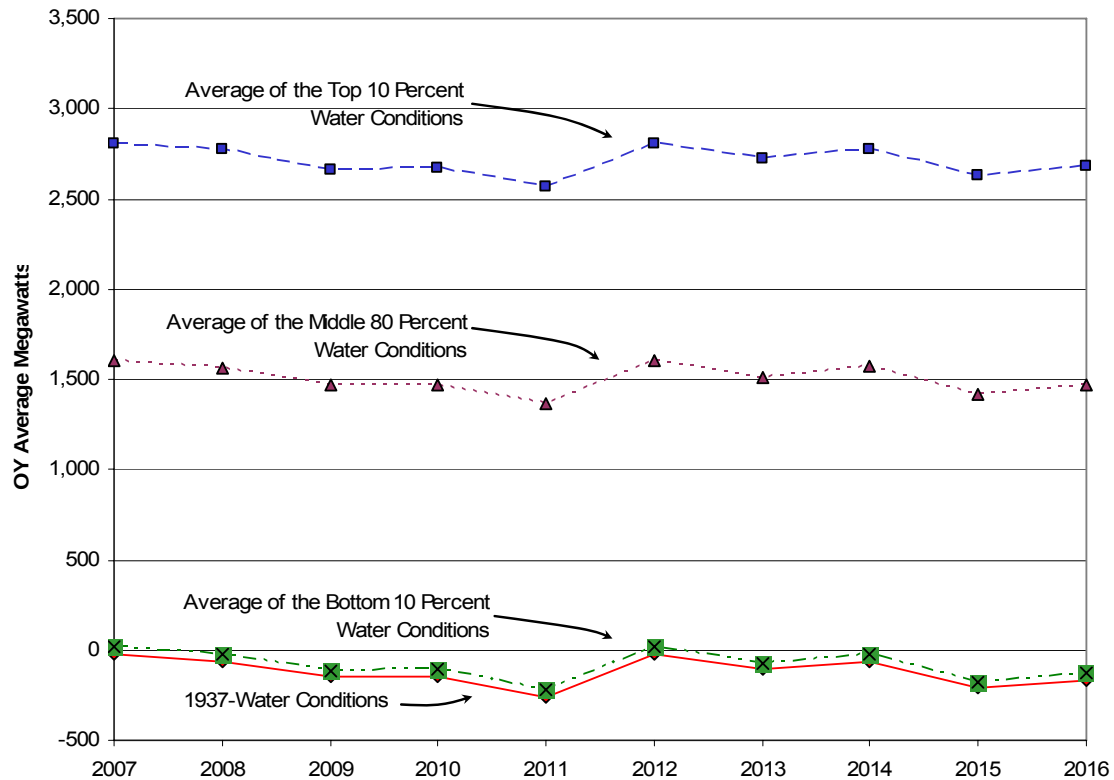
**Potential Variability of Annual Federal Energy Surplus/Deficit
Utilizing Differing Water Conditions**

Operating Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
1937-Critical Water Conditions	-24	-66	-152	-148	-260	-21	-111	-62	-215	-167
Average Bottom 10% Water Conditions	14	-27	-113	-109	-221	19	-72	-23	-175	-128
Average Middle 80% Water Conditions	1,604	1,565	1,466	1,472	1,362	1,603	1,515	1,568	1,418	1,468
Average Top 10% Water Conditions	2,807	2,771	2,663	2,672	2,563	2,805	2,719	2,774	2,626	2,677

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 2007 through 2016**

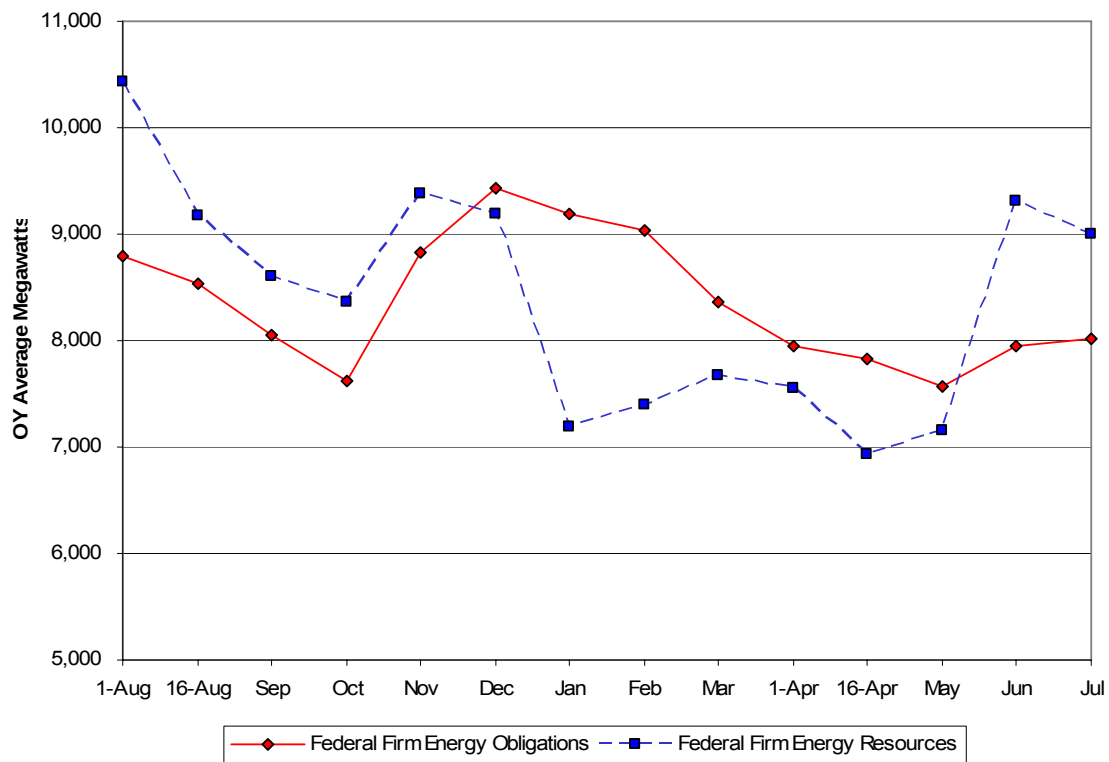


Monthly Federal Firm Energy Surplus/Deficit Projections

To depict the monthly variability of the loads and resources, using the “Federal System Assumptions” detailed on page 17, the monthly Federal system energy components using 1937-critical water conditions for OY 2007, 2011, and 2016 are shown in Exhibits 2 through 4, pages 69-71. Figure 7, below, illustrates the monthly Federal system firm energy loads and resources for OY 2007. This figure shows an example of the monthly timing of Federal system surpluses and deficits using current Biological Opinion flow requirements.

Figure 7

OY 2007 Monthly Federal Firm Energy Loads and Resources Using 1937-Critical Water Conditions



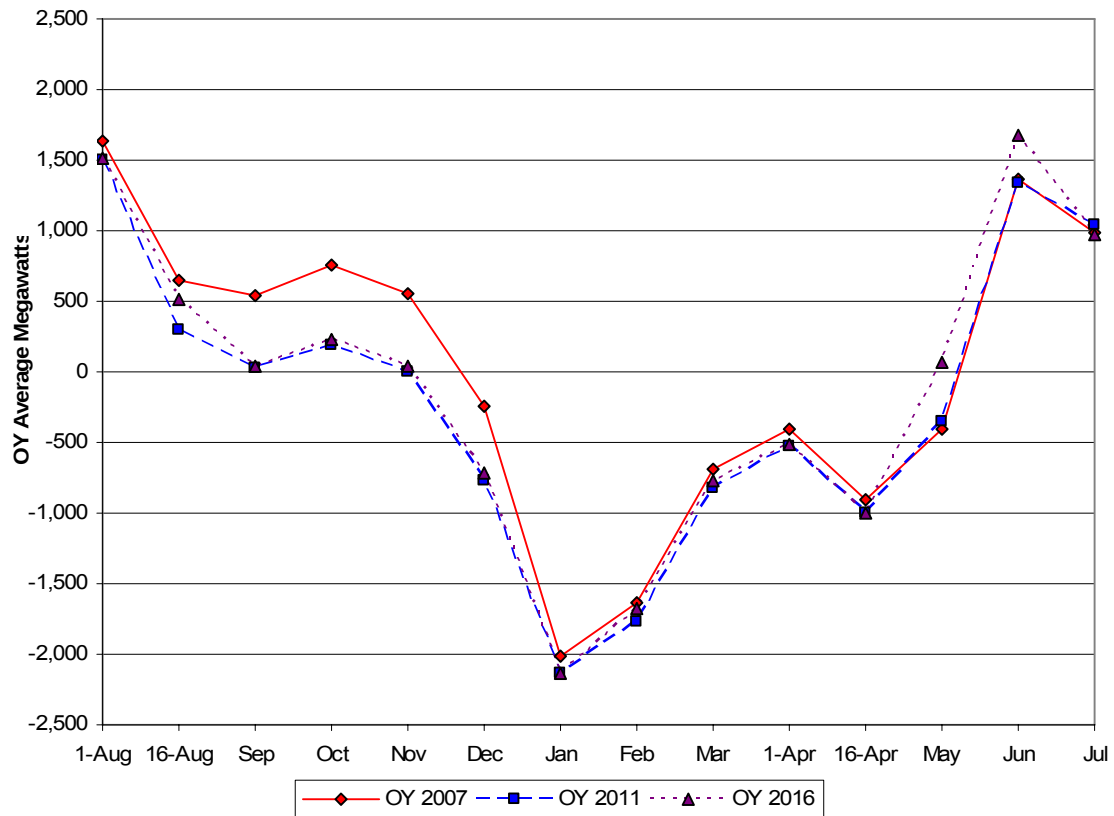
Using critical water conditions, Federal hydro resources are generally operated at lower power production levels during January through March to allow the reservoirs to store water for release in the spring to assist fish passage.

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 81-90, 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 2007, 2011, and 2016 incorporating the “Federal System Assumptions” detailed on page 17.

Figure 8

**Monthly Federal Firm Energy Surplus/Deficit Projections
Using 1937-Critical Water Conditions
For OY 2007, 2011, and 2016**

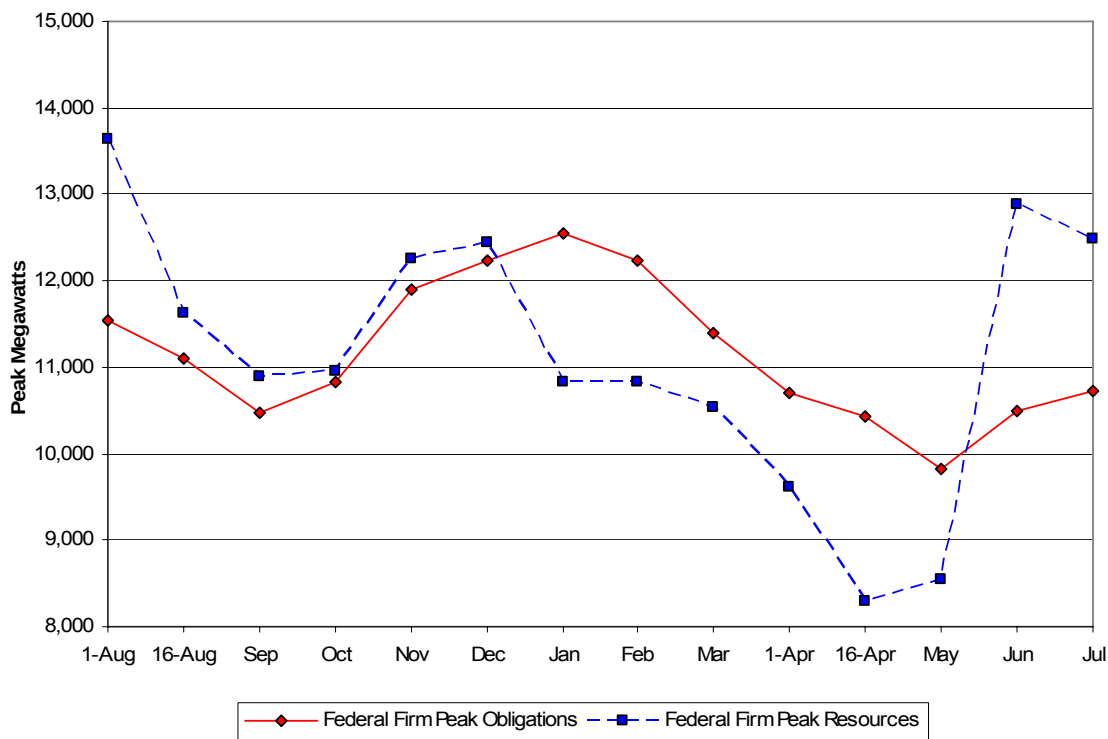


Federal Firm Monthly 1-Hour Capacity Surplus/Deficit Projections

Figure 9, below, illustrates the monthly 1-hour Federal system peak loads and resources for OY 2007 using the “Federal System Assumptions” detailed on page 17. 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 2007 Monthly 1-Hour Federal Capacity Loads and 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;

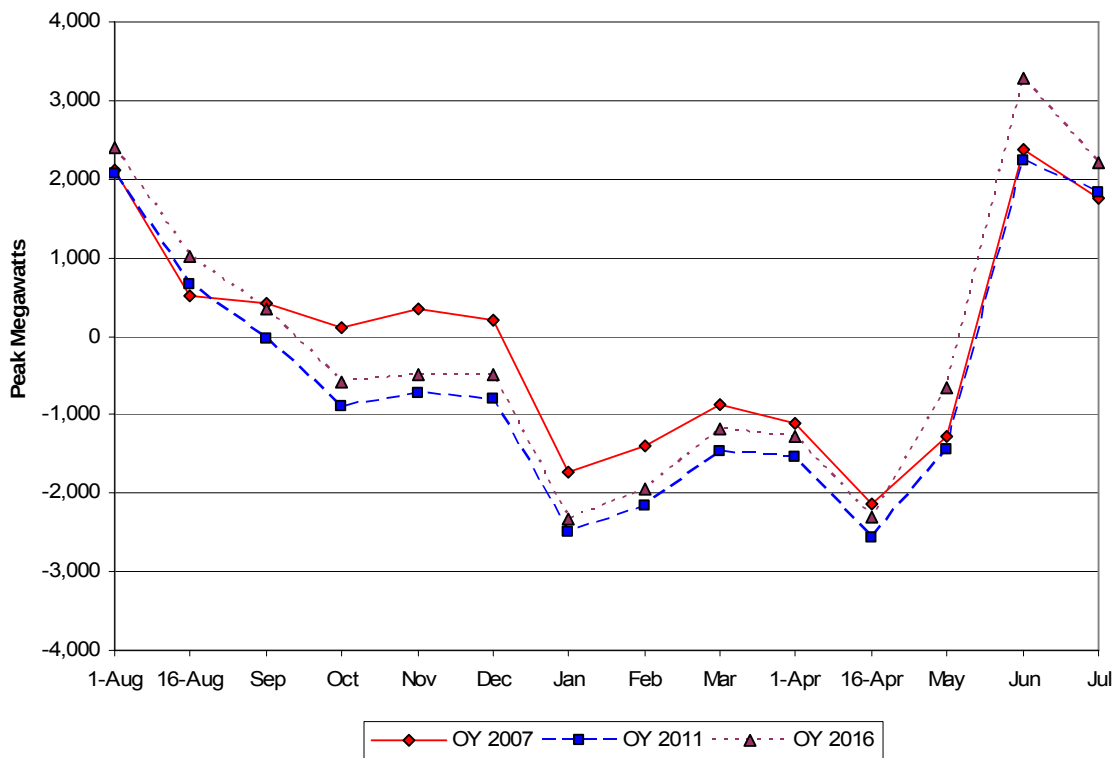
- Pondage limitations due to hydraulic imbalance from reservoir to reservoir;
- Fish and Biological Opinion requirements from the NOAA Fisheries Biological Opinion, dated December 2004, the 2004 Biological Opinion Remand Process and the U.S. Fish and Wildlife Service's 2000 Biological Opinion; and
- 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 2007, 2011, and 2016.

Figure 10

**Monthly 1-Hour Federal Capacity Surplus/Deficit Projections
Using 1937-Critical Water Conditions
For OY 2007, 2011, and 2016**



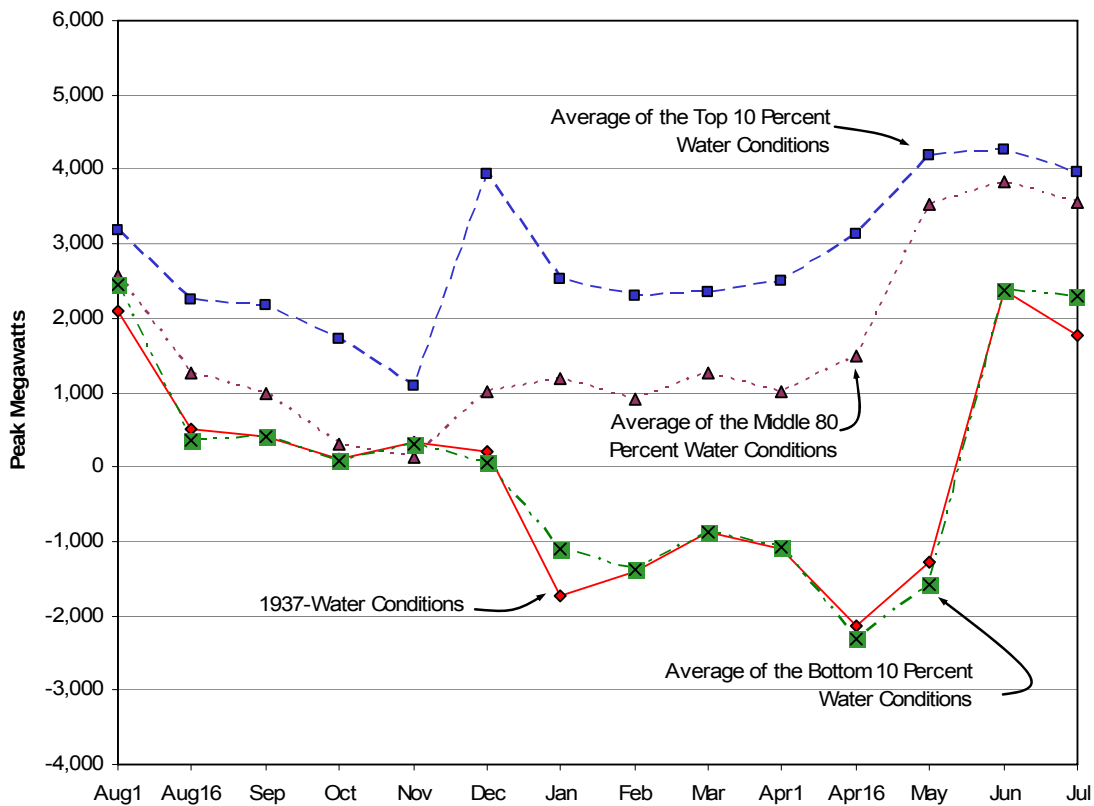
The 1-hour Federal capacity surplus/deficit projections, assuming normal weather conditions and 1937-critical water conditions for OY 2007, 2011, and 2016, are shown in Exhibits 5 through 7, pages 75-77.

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 2007 under four scenarios: resources using 1937-critical water conditions (the base case of this study), the averages of the bottom ten percent, middle 80 percent, and 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 2007



Federal Resource Adequacy

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 maximum 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, 2006. 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, and BPA's best estimate of non-power requirements. 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.

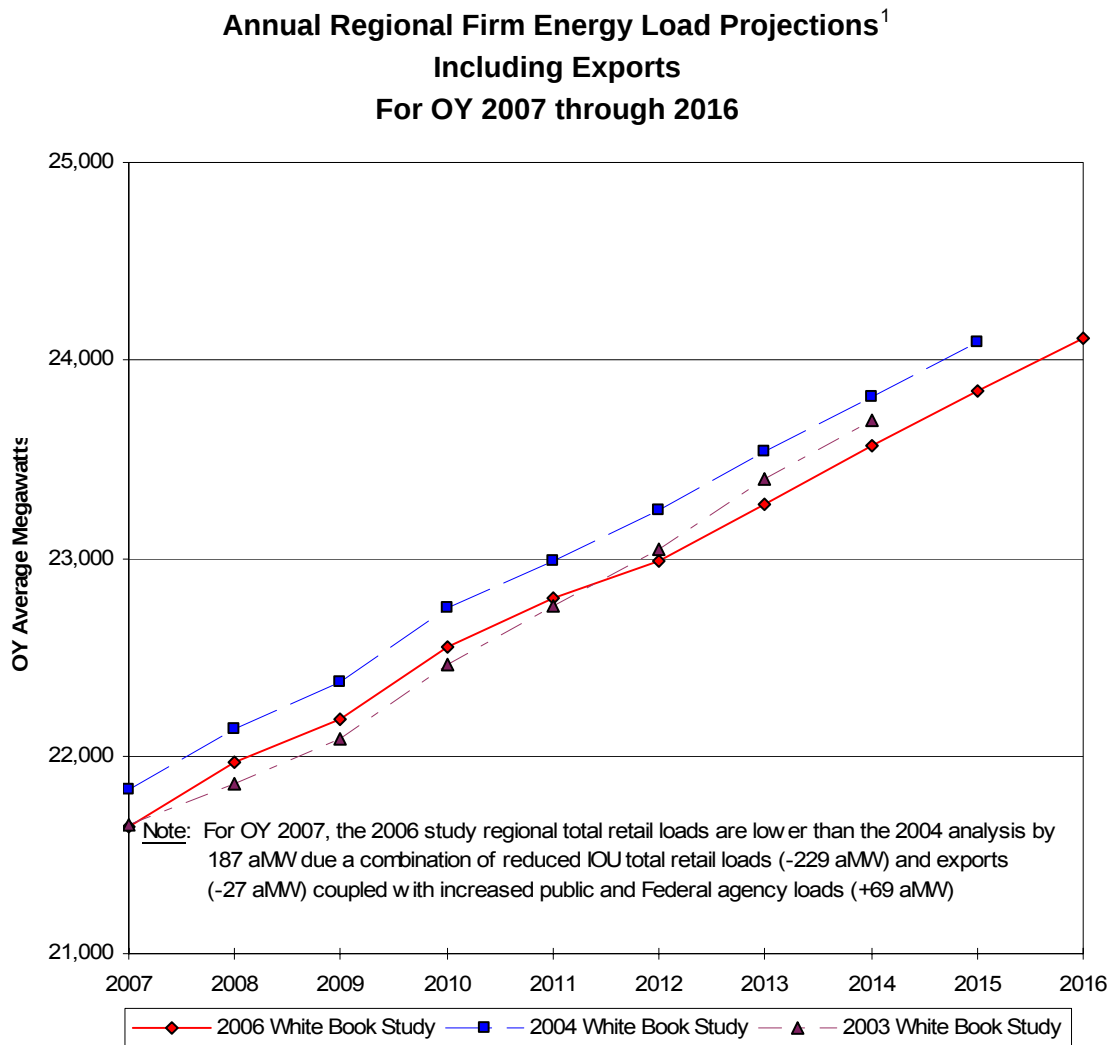
Annual Regional Firm Energy Load Projections

BPA's 2006 White Book annual regional firm energy load projections are comprised of two components:

- Total retail load consumption based on the individual entity's total retail load forecast 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 2006 White Book regional firm energy load projections compare to the previous 2004 and 2003 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



The PNW region utilized in this study 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, therefore making direct comparisons incompatible. 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 the use of a larger PNW regional area. In addition to the load area defined by the Northwest Power Act, the Power Pool PNW region includes loads from Sierra Pacific Power and British Columbia and Alberta, Canada.

¹ 2004 White Book projections were published through OY 2015. 2003 White Book projections were published through OY 2014.

Table 9, below, compares the relative size of regional firm loads by customer class for OY 2007.

Table 9

**Annual Regional Firm Energy Load
by Customer Class
For OY 2007**

Customer Class	Firm Energy (OY in aMW)	Firm Energy (Percent of Total)
Investor-Owned Entities	10,966	50.7%
Public Entities	8,598	39.7%
Exports	1,002	4.6%
Direct Service Industries	473	2.2%
Federal and Other Entities	601	2.8%
Total Regional Firm Load	21,640	100.0%

The annual regional firm energy loads are presented in Exhibit 18, page 95, and monthly firm energy loads for OY 2007, 2011, and 2016 are presented in Exhibits 19 through 21, pages 99-101.

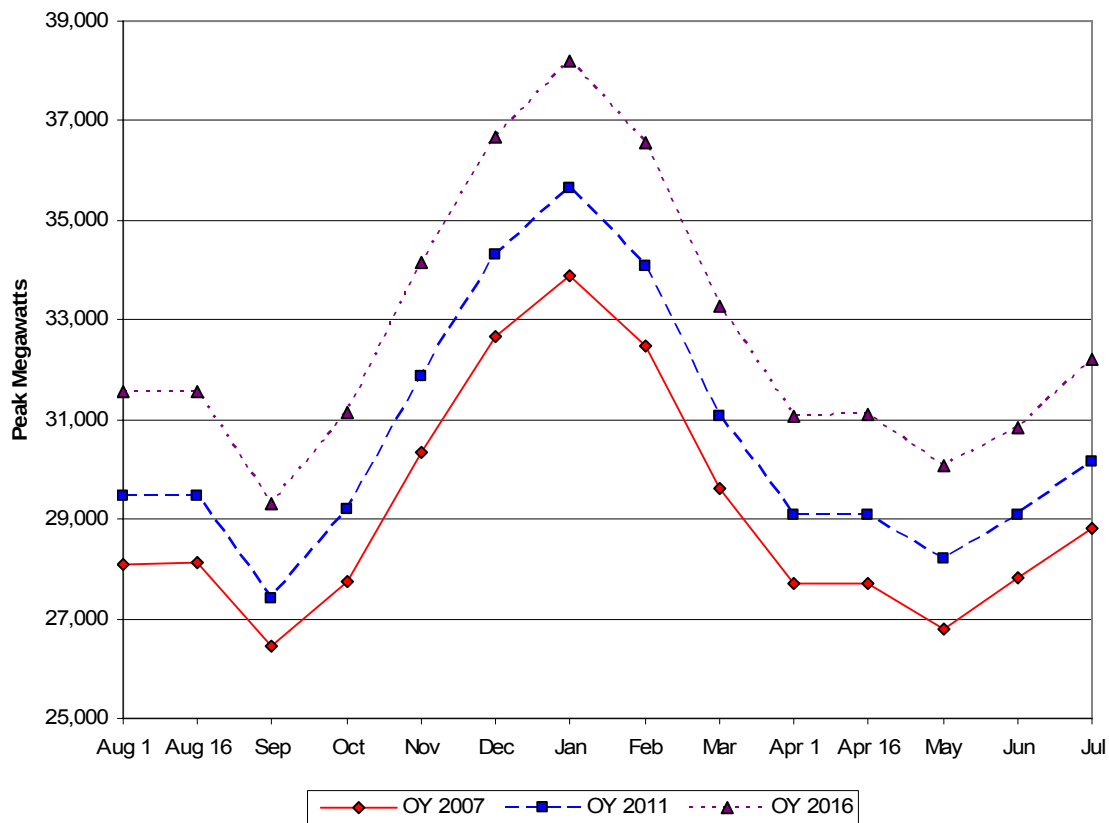
Monthly Regional Firm Peak Load Projections

BPA's 2006 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 13, below, illustrates the monthly regional 1-hour firm peak loads for OY 2007, 2011, and 2016.

Figure 13

**Monthly Regional Firm 1-Hour Peak Load Projections
For OY 2007, 2011, and 2016**



The monthly regional firm 1-hour peak loads are presented in Exhibits 22 through 24, pages 105-107.

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 2006 Pacific Northwest Loads and Resources Study", page 13.

Table 10, below, summarizes the PNW regional resource capacity and energy by generation type for OY 2007.

Table 10

**Total Regional Firm Resources for OY 2007¹
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	23,922 ²	60.0%	11,698	48.0%
Coal	5,903	14.9%	4,997	20.5%
Combustion Turbines	3,761	9.4%	2,254	9.3%
Cogeneration	2,248	5.6%	1,984	8.1%
Imports	1,630	4.1%	1,089	4.5%
Nuclear	1,150	2.9%	877	3.6%
Non-Utility Generation	1,130	2.8%	1,387	5.7%
Miscellaneous	131	0.3%	80	0.3%
Total Firm Resources	39,875	100.0%	24,366	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 1937-critical water conditions. For January 2007, 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 1937-critical water conditions as the base case and the averages of the bottom ten percent, middle 80 percent, and top ten percent of the historical 50-water year conditions (1929 through 1978). For OY 2007, regional resource estimates can potentially vary up to 6,250 aMW, ranging from approximately 23,650 to 29,920 aMW, due to possible hydro variability.

Table 11

Potential Variability of Total Regional Net Resource Projections¹
Utilizing Different Levels of Water Conditions
Energy in Average Megawatts

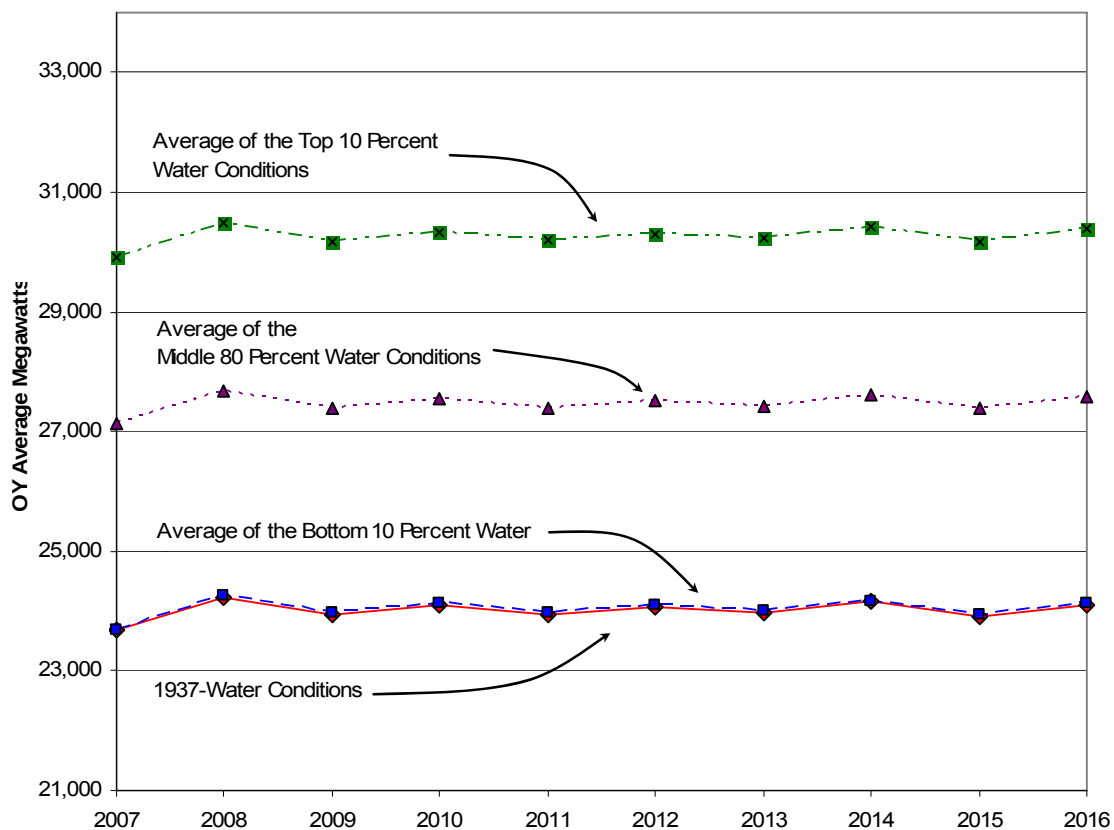
Operating Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
1937-Critical Water Conditions	23,667	24,229	23,943	24,096	23,952	24,067	23,967	24,154	23,917	24,114
Average of Bottom 10% Water Conditions	23,690	24,252	23,964	24,117	23,973	24,088	23,988	24,176	23,938	24,136
Average of Middle 80% Water Conditions	27,127	27,691	27,388	27,544	27,403	27,519	27,423	27,615	27,381	27,581
Average of Top 10% Water Conditions	29,924	30,489	30,172	30,333	30,193	30,310	30,217	30,411	30,179	30,381

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

Figure 14, below, graphically compares the potential annual regional resources under the four scenarios.

Figure 14

**Potential Variability of Total Regional Net Resource Projections¹
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 2007 through 2016, assuming 1937-critical water conditions, are presented below in Table 12. These projections incorporate the “Regional Analysis Assumptions” presented on page 35. The PNW regional resource stack assumption is that all regional IPP generation is available to the region. The region is expected to be in firm energy surplus through OY 2016 with surpluses ranging from 2,028 aMW in OY 2007, declining to 5 aMW by OY 2016. The changes in the regional energy surplus/deficit levels 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

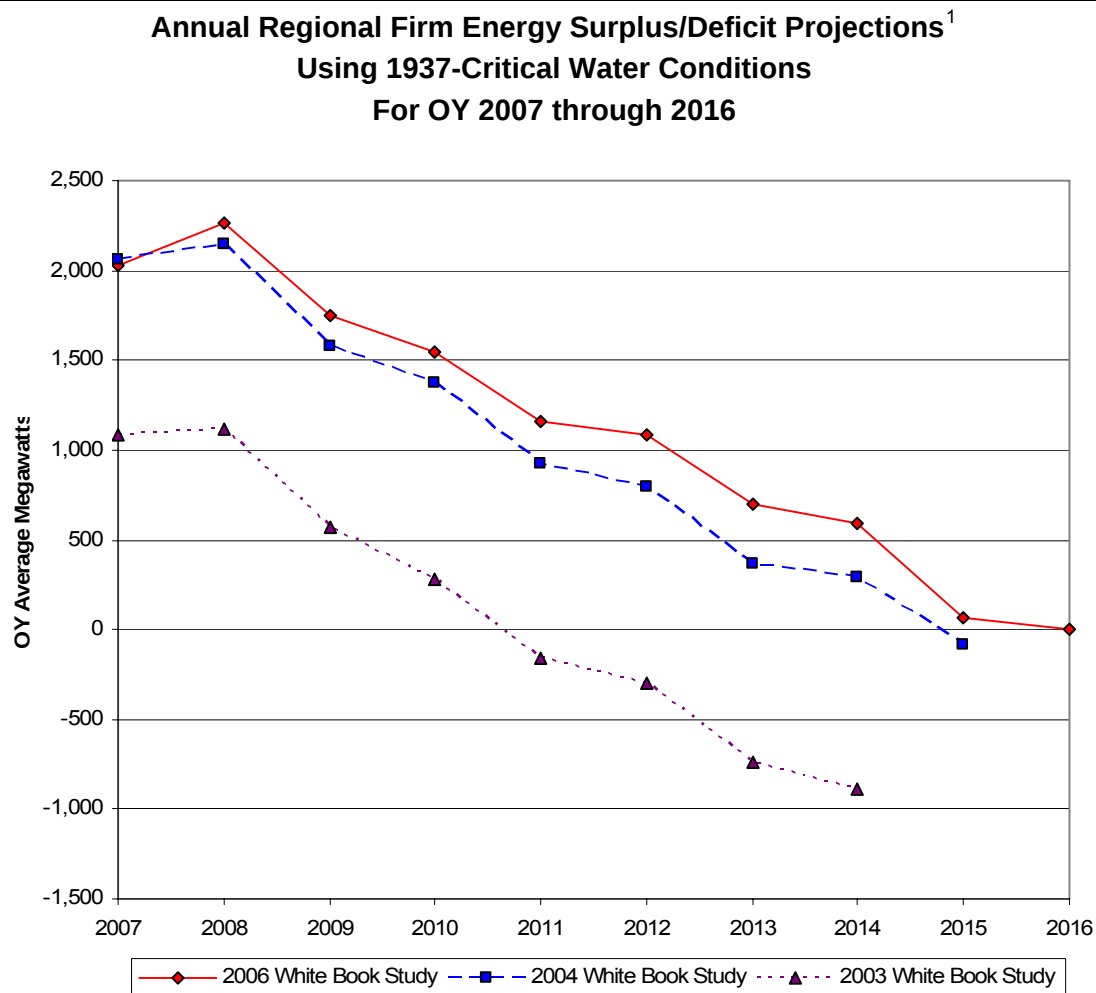
**Regional Firm Energy Surplus/Deficit Projections
Using 1937-Critical Water Conditions
Energy in Average Megawatts**

Operating Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Regional Surplus/Deficit	2,028	2,262	1,753	1,542	1,156	1,081	697	590	70	5

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 15, below, graphically illustrates how the 2006 White Book regional energy surplus/deficits compares to the previous 2004 and 2003 studies. The 2007 study shows larger regional energy surpluses—especially when compared to the 2003 study—mainly due to the addition of IPP generation within the PNW.

Figure 15



Components that make up the regional energy surplus/deficits for OY 2007 through 2016 are presented in Exhibit 18, page 95. Monthly firm energy loads and resources balances for OY 2007, 2011, and 2016 are presented in Exhibits 19 through 21, pages 99-101. 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 111-120, contain the regional firm energy surplus/deficit projections under the 50-water years of record (OYs 1929 through 1978).

¹ 2004 White Book projections were published through OY 2015. 2003 White Book projections were published through OY 2014.

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 under four different levels of regional generation based on different levels of water conditions by using the averages of the bottom ten percent, middle 80 percent, and top ten percent of the historical 50-water year conditions. These projections incorporate the “Regional Analysis Assumptions” presented on page 35. Table 13, below, presents the range of estimated regional surplus/deficits assuming the four differing levels of regional hydro generation. For OY 2007, regional surplus/deficit estimates can potentially vary up to 6,250 aMW, annually ranging from approximately 2,000 to 8,300 aMW, due to possible hydro variability.

Table 13

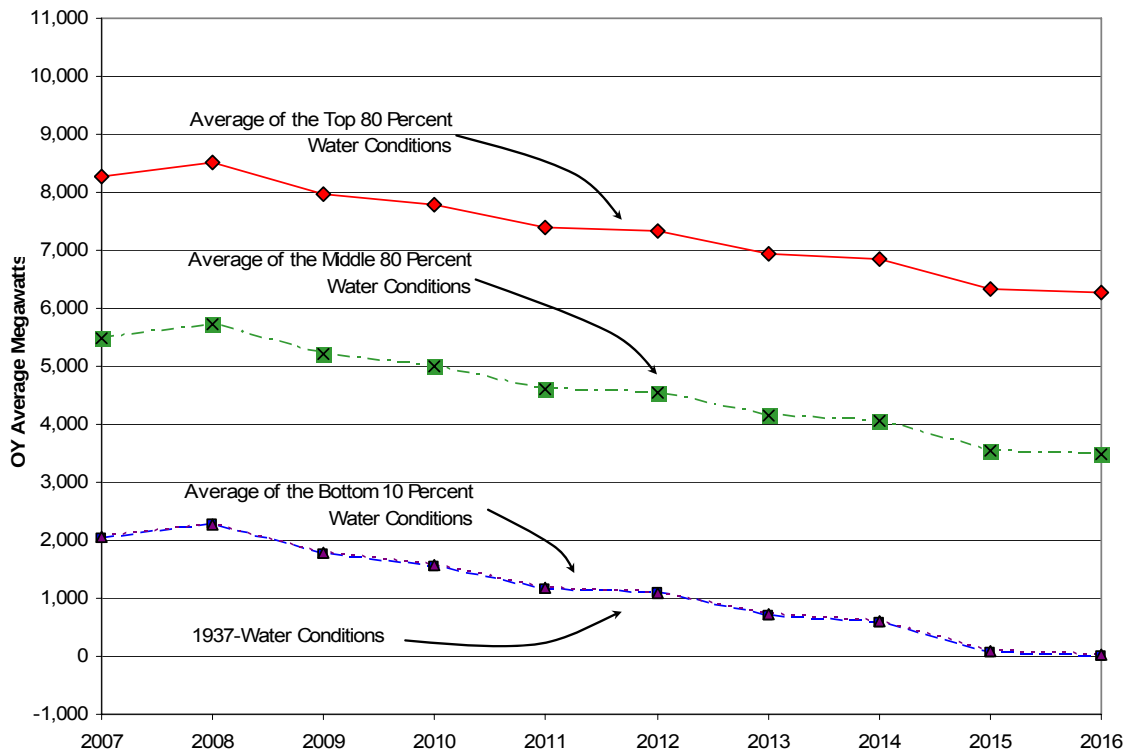
**Potential Variability of Annual Regional Firm Energy Surplus/Deficit
Based on Different Levels of Water Conditions
Energy in Average Megawatts**

Operating Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
1937-Critical Water Conditions	2,028	2,262	1,753	1,542	1,156	1,081	697	590	70	5
Average Bottom 10% Water Conditions	2,050	2,285	1,774	1,564	1,178	1,102	719	611	92	27
Average Middle 80% Water Conditions	5,487	5,724	5,198	4,991	4,607	4,533	4,153	4,050	3,534	3,472
Average Top 10% Water Conditions	8,284	8,522	7,983	7,780	7,398	7,324	6,947	6,847	6,332	6,273

Figure 16, below, illustrates the range of estimated regional surplus/deficits assuming differing levels of regional hydro generation discussed above.

Figure 16

**Variability of Annual Regional Firm Energy Surplus/Deficit
Based on Different Levels of Water Conditions
For OY 2007 through 2016**



Potential Variability Due to IPP Generation Amounts Delivered to the Region:

This study assumes approximately 3,360 aMW of uncommitted PNW IPP generation as regional resources though potentially these resources may not be available when needed to serve PNW regional loads. Table 14, page 46, details the peak annual energy of expected regional uncommitted IPP projects. The 2004 White Book showed about 3,110 aMW of IPP generation. This change is mostly due to updates in the timing of IPP project completions and/or new PNW regional acquisition of IPP generation. 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

**Expected PNW Uncommitted IPP Projects
For OY 2007
As of March 31, 2006**

Project	Peak (MW)	Energy (aMW)
Big Hannaford	248	224
Centralia #1	670	626
Centralia #2	670	511
Chehalis Generating Facility CCCT	520	417
Emmett Biomass Project	18	10
Goldendale Energy Center	248	224
Hermiston Power Project	469	568
Klamath Cogeneration Project	484	436
Klamath Peaking Unit	100	14
Lancaster Power Project (Rathdrum)	270	244
Metro Westpoint	1.2	1.2
SP Newsprint Cogeneration	40	25
Total Uncommitted IPP Generation	3,738	3,366

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—25 percent (840 aMW), 50 percent (1,680 aMW), 75 percent (2,520 aMW), and 100 percent (3,366 aMW). For OY 2007, regional surplus/deficit estimates can potentially vary up to 2,500 aMW, annually ranging from an approximate 2,000 aMW surplus to approximately -500 aMW deficit, due to differing possible IPP generation commitments to the PNW.

Table 15

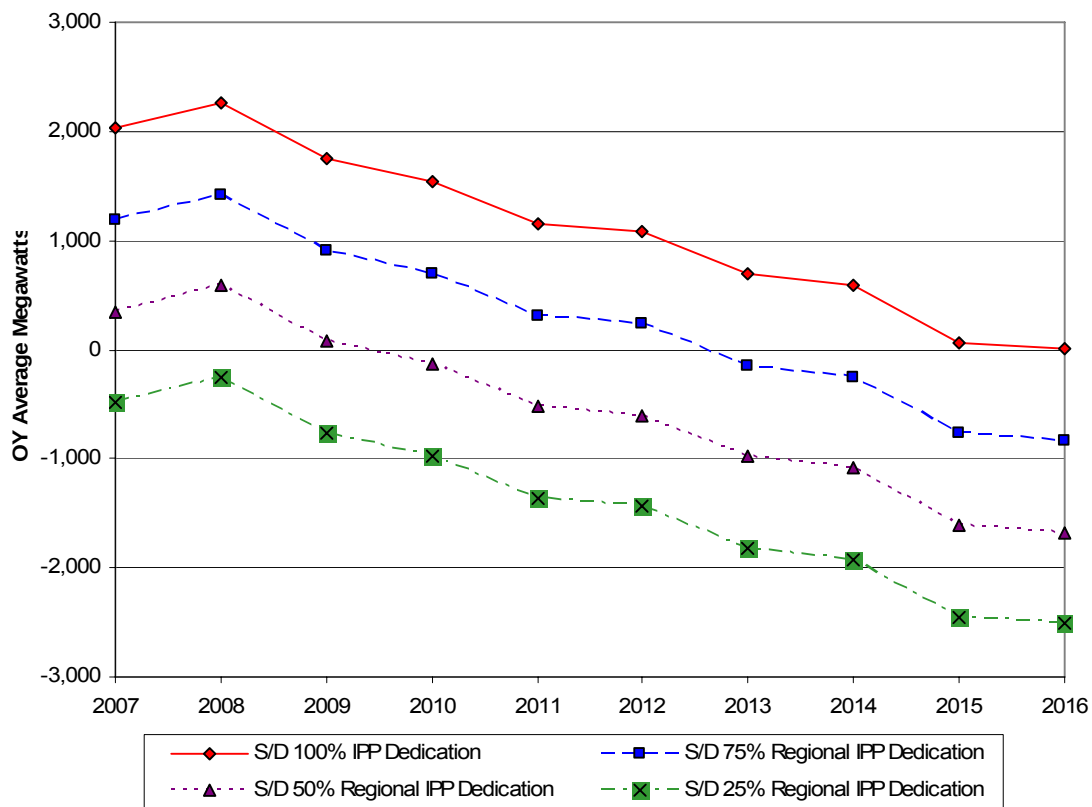
**Potential Variability of PNW Region Annual Firm Energy Surplus/Deficit
Based on Different Levels of IPP Generation Delivered to the Region
Using 1937-Critical Water Conditions
Energy in Average Megawatts**

Operating Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
S/D 100% IPP PNW Delivered (3,366 aMW)	2,028	2,262	1,753	1,542	1,156	1,081	697	590	70	5
S/D 75% IPP PNW Delivered (2,520 aMW)	1,188	1,422	913	702	316	241	-143	-250	-770	-835
S/D 50% IPP PNW Delivered (1,680 aMW)	348	582	73	-138	-524	-599	-983	-1,090	-1,610	-1,675
S/D 25% IPP PNW Delivered (840 aMW)	-492	-258	-767	-978	-1,364	-1,439	-1,823	-1,930	-2,450	-2,515

Figure 17, below, graphically illustrates the potential variability of regional surplus/deficits by assuming the above mentioned four differing levels of IPP generation delivered to the region—25 percent, 50 percent, 75 percent, and 100 percent.

Figure 17

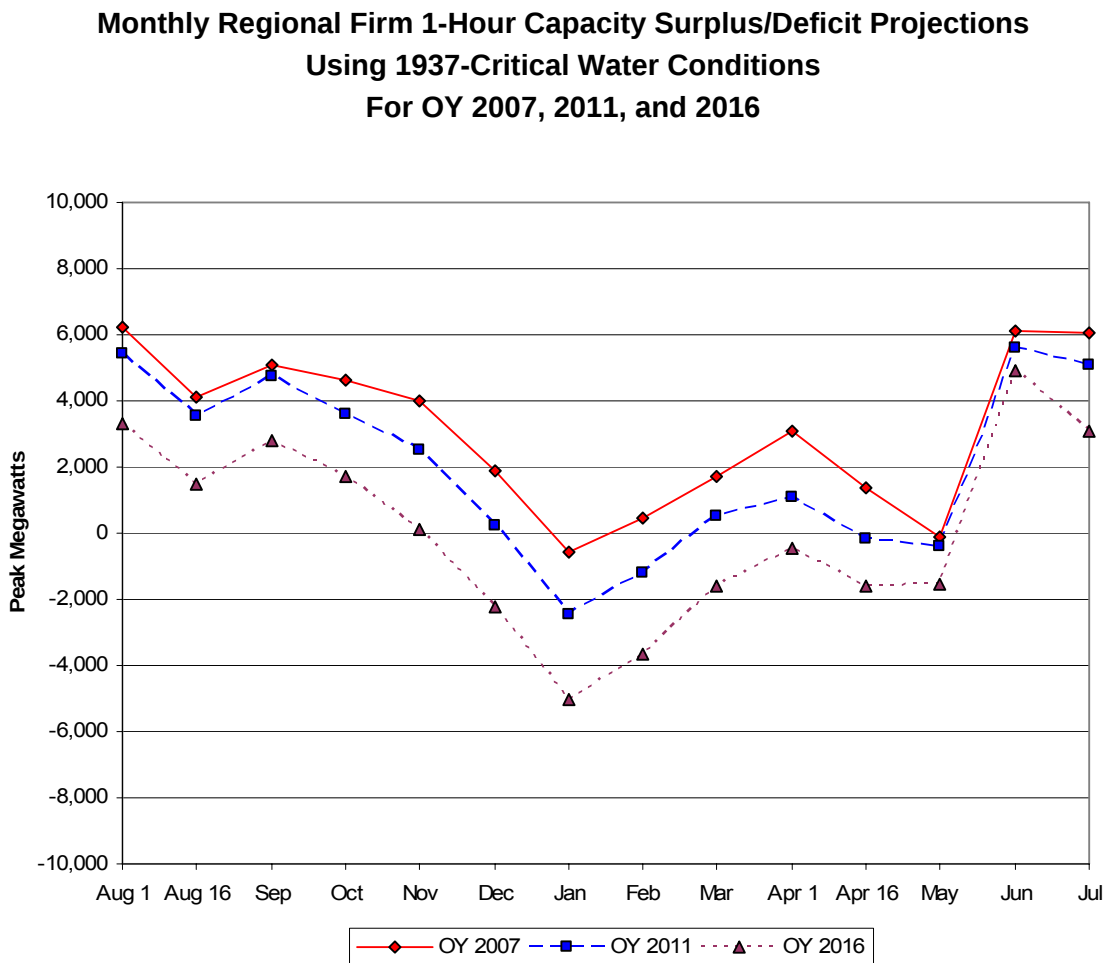
**Potential Variability of Annual Regional Firm Energy Surplus/Deficit
Based on Different Levels of IPP Generation Delivered to the Region
Using 1937-Critical Water Conditions**



Monthly Regional Firm 1-Hour Capacity Surplus/Deficit Projections

Figure 18, below, graphically illustrates the monthly regional 1-hour capacity surplus/deficit projections for OY 2007, 2011, and 2016 and incorporates the “Regional Analysis Assumptions” on page 35. 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 also 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 approximately 3,740 peak MW of uncommitted PNW IPP generation 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 46.) 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 Capacity”, page 5. Regional surplus firm capacity values take into account hydrologic constraints detailed in the Section 4, “Federal Firm Monthly 1-Hour Capacity Surplus/Deficit Projections”, page 31.

Figure 18



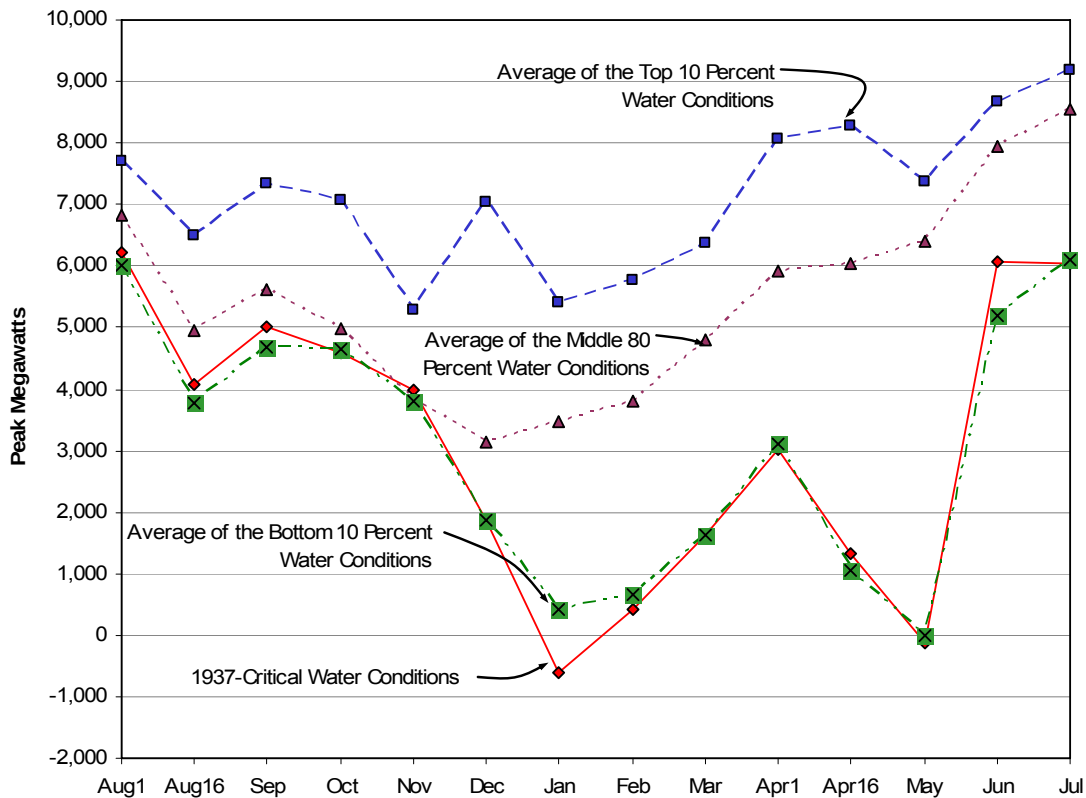
Regional 1-hour capacity surplus/deficit projections, assuming normal weather conditions and 1937-critical water conditions for OY 2007, 2011, and 2016, are shown in Exhibits 22 through 24, pages 105-107.

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 19, below, compares the 1-hour regional system capacity surplus/deficits under four scenarios: resources using 1937-critical water conditions (the base case of this study), the averages of the bottom ten percent, middle 80 percent, and 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 19

Potential Variability of 1-Hour Capacity PNW Regional Surplus/Deficit Projections Utilizing Differing Water Conditions For OY 2007



Regional Resource Adequacy

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, the resulting 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. 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 reach 608 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. In addition, the PNW is currently developing Resource Adequacy standards to answer the question of how to properly account for the capacity and energy for the region. These types of changes would most likely be presented in future studies.

Section 6: Northwest Power and Conservation Council Comparison

Non-DSI Regional Load Comparison: 2006 White Book to Council

The following compares the non-DSI regional firm total retail loads between BPA's 2006 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.

2006 White Book Non-DSI Total Retail Load Forecast: The 2006 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, 2006.

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; and
- Retail load forecasts sent directly to BPA through their PNUCC submittals.

The load forecasts for the IOUs were developed from both data submitted in their PNUCC submittals and load forecasts sent directly to BPA. Generally, the load estimates are slightly lower when compared to last year's.

Council Non-DSI Total Retail Load Forecast: The Council's final Fifth Northwest Electric Power and Conservation Plan (May 2005) assumes that non-DSI electricity demand is recovering from the economic recession of early 2000, but that demand is still lower than the Fourth Power Plan forecast. The expected lower level of demand is 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 2006 White Book non-DSI load forecasts average -1.6 percent over the 10 years of the study. The maximum difference expected is -1.9 percent (-437 aMW) in OY 2016. The difference is considered minor and is 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 2006 White Book and the Council's Fifth Northwest Electric Power and Conservation Plan (May 2005).

Table 15

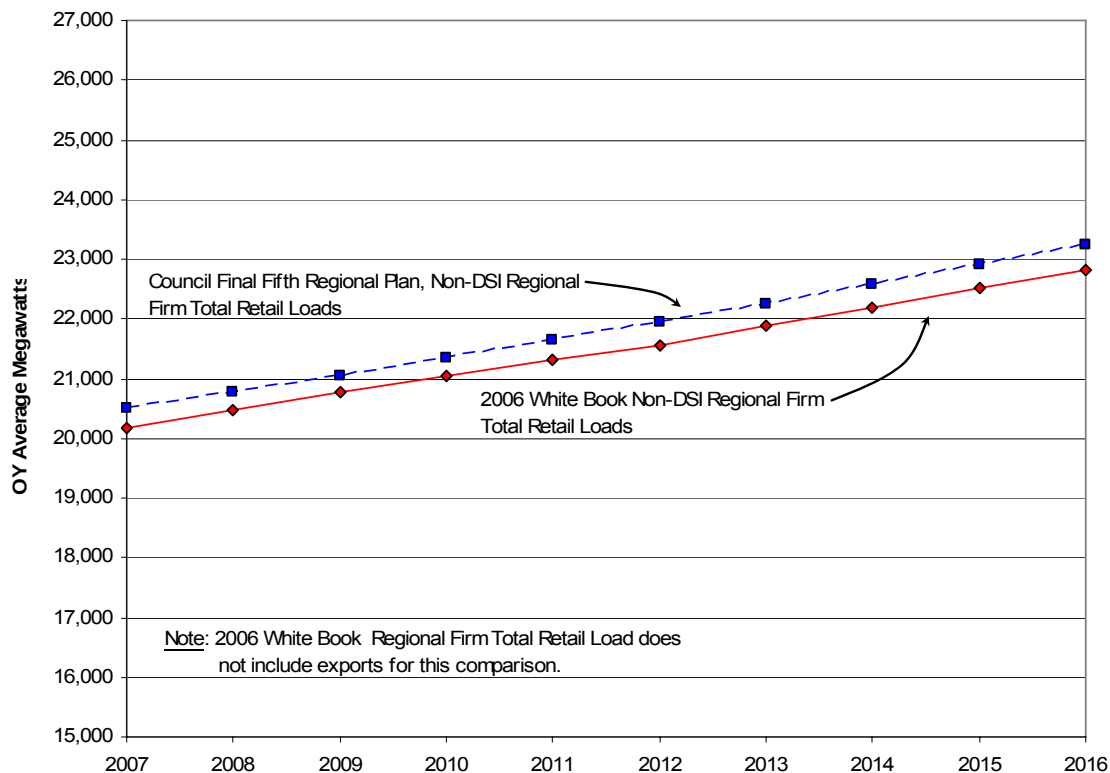
**Non-DSI PNW Regional Firm Total Retail Load Comparison
BPA's 2006 White Book Load Projections and
the Council's Fifth Northwest Electric Power and Conservation Plan (May 2005)
Annual Energy in Average Megawatts**

Operating Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
2006 White Book										
Regional Firm Loads	20,637	21,065	21,371	21,641	21,922	22,166	22,488	22,796	23,114	23,418
Less Regional DSI Loads	473	591	608	608	608	608	608	608	608	608
Non-DSI Regional Firm Loads	20,165	20,473	20,763	21,033	21,314	21,558	21,880	22,188	22,506	22,810
Council's Fifth Northwest Electric Power and Conservation Plan (May 2005)										
Non-DSI Regional Firm Loads	20,497	20,759	21,033	21,331	21,632	21,941	22,245	22,565	22,906	23,247
Comparison: 2006 White Book – Council										
Difference	-332	-286	-271	-299	-318	-383	-366	-377	-400	-437
Percent Difference	-1.6%	-1.4%	-1.3%	-1.4%	-1.5%	-1.8%	-1.7%	-1.7%	-1.8%	-1.9%

Figure 20, below, graphically illustrates the expected non-DSI regional firm total retail loads from BPA's 2006 White Book and the Northwest Power and Conservation Council's Fifth Northwest Electric Power and Conservation Plan (May 2005).

Figure 20

**Comparison of Non-DSI Regional Firm Total Retail Loads
BPA 2006 White Book Load Projections and the
Council's Fifth Northwest Electric Power and Conservation Plan (May 2005)**



Comparison of Resource Stack Assumptions: 2006 White Book to Council

A comparison of the resource assumptions between the 2006 White Book and the Council's Fifth Northwest Electric Power and Conservation Plan is listed below.

2006 White Book Resource Stack Assumptions: The 2006 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 2006 White Book and the Council's estimation in constructing their new resource stack.

- BPA includes only Pennsylvania Power & Light Company's (PP&L Montana) resources that are dedicated to serve Northwestern Energy's (formally Montana Power Company) eastern 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.
- The Council includes the nameplate rating of the following self-generating units: BP Cherry Point, Georgia Pacific Bellingham, Sierra Pine Medite, and Wah Chang. In addition, the Council includes the reactivated Frontier Energy project. BPA does not include these plants and will review these plants for possible inclusion 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. They are considered minor in long-range load resource planning.

Section 7: Potential 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. The over-installed hydro capability coupled with historic flexibility in hydro operation traditionally 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 updated its Federal system hydro 1-hour operational peaking adjustment and is presently in the process of investigating 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 Federal system hydro energy to capacity relationships 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:

- o 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, violate normal non-power requirements when appropriate, and make significant purchases to assure an adequate supply of power. BPA, the Council, and other regional parties are currently developing regional reliability and adequacy standards. 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 way, 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:

- o 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 21. 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, “Federal Resource Adequacy”, page 34.

Figure 21

**OY 2007 Monthly Federal Firm 120-Hour Capacity Loads and Resources
Using 1937-Critical Water Conditions**

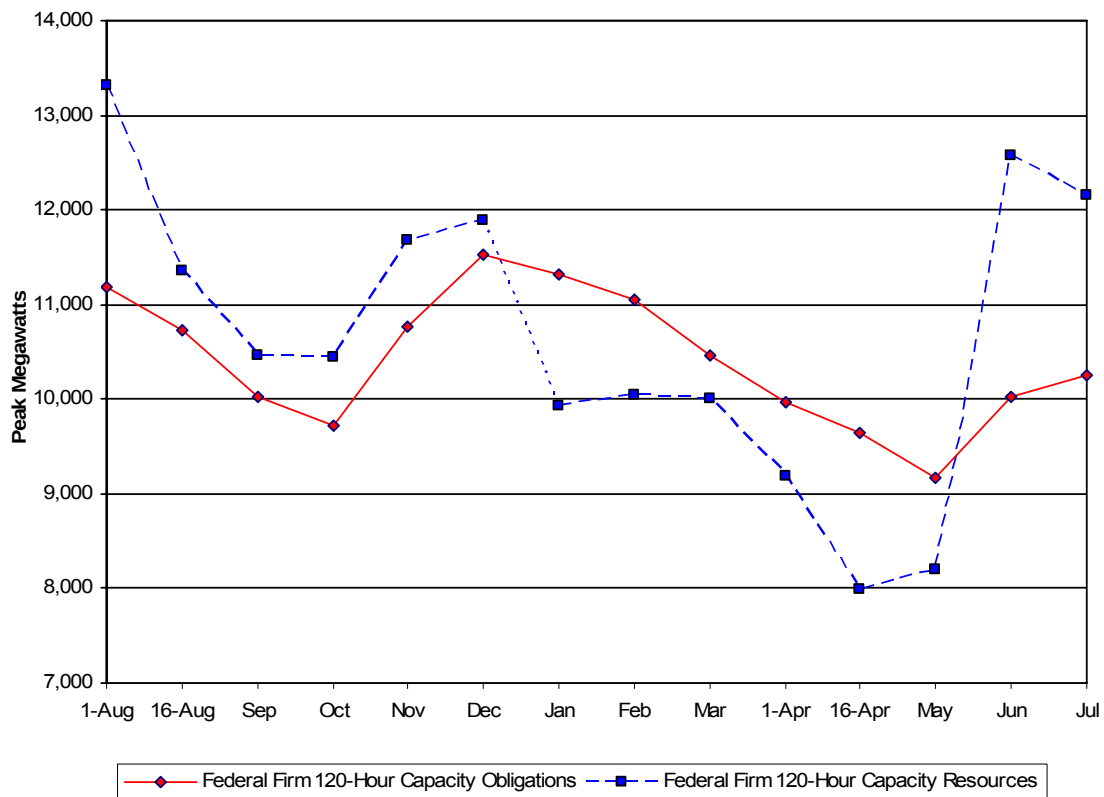
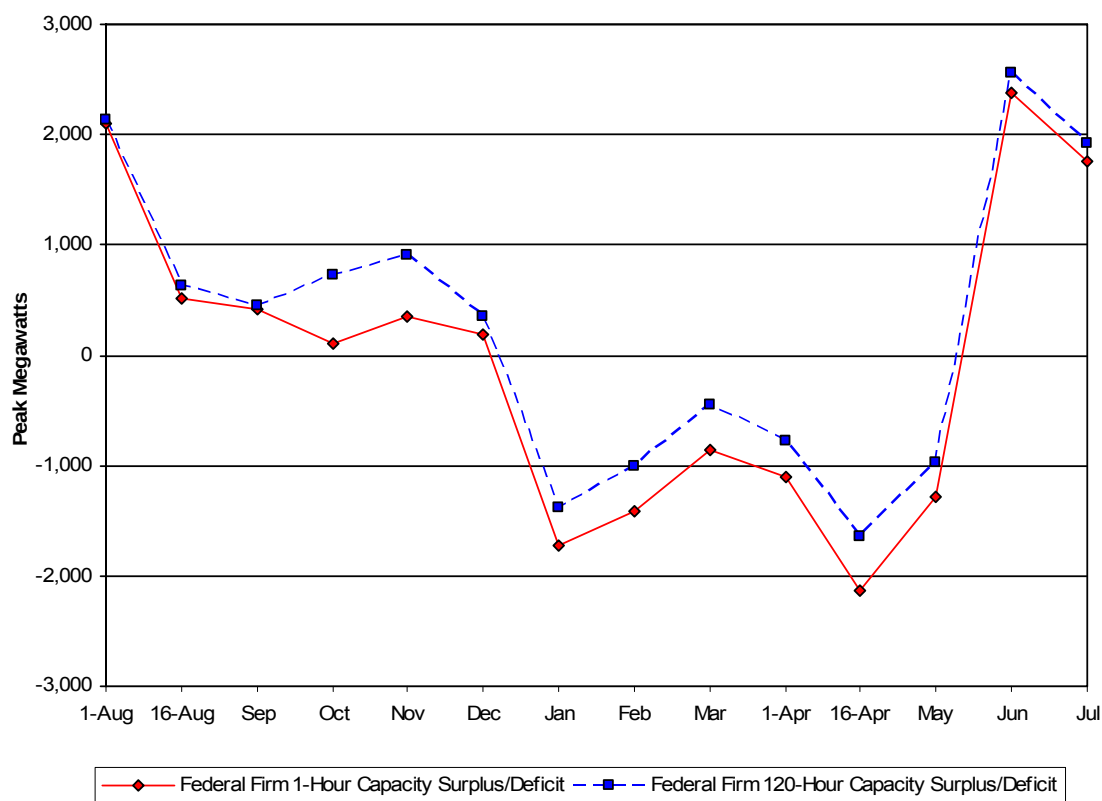


Figure 22, below, compares the Federal system 120-hour and 1-hour capacity surplus/deficits for OY 2007. The 120-hour Federal system capacity surpluses are generally larger and capacity deficits are generally smaller. This is mainly due to the fact that under low water conditions, the 120-hour Federal surplus/deficits include more hourly observations than those presented in a 1-hour study.

Figure 22

**OY 2007 Monthly Federal Firm Capacity Comparison of
120-Hour and 1-Hour Capacity Surplus/Deficits
Using 1937-Critical Water Conditions**

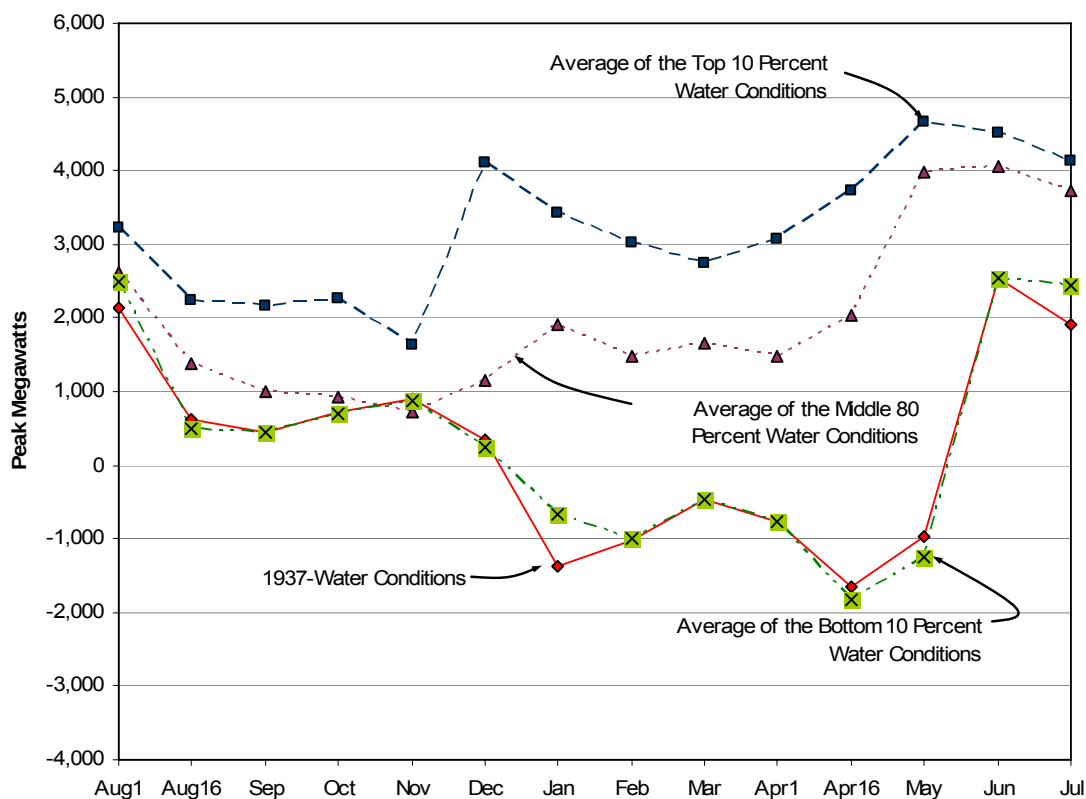


Potential Variability of Federal 120-Hour Capacity Surplus/Deficit Projections

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 23, below, compares the 120-hour Federal system capacity surplus/deficits under four scenarios: resources using 1937-critical water conditions (the base case of this study), the averages of the bottom ten percent, middle 80 percent, and 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 1-Hour Capacity Surplus/Deficit Projections”, Figure 11, page 33.)

Figure 23

Potential Variability of 120-Hour Capacity Federal Surplus/Deficit Projections Utilizing Differing Water Conditions For OY 2007



Section 8: Federal System Exhibits

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Exhibit 1

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

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Exhibit 1: OY 2007 through 2016 Annual Energy

Loads and Resources - Federal System
PNW Loads and Resource Study
2007 - 2016 Operating Years
1937 Water Year
[37] 2006 White Book (Final)

3/31/2006

Energy (aMW)	2007 Avg.	2008 Avg.	2009 Avg.	2010 Avg.	2011 Avg.	2012 Avg.	2013 Avg.	2014 Avg.	2015 Avg.	2016 Avg.
Non-Utility Obligations										
Fed. Agencies 2002 PSC	123	129	139	141	142	142	143	144	145	147
USBR 2002 PSC	160	160	160	160	160	160	160	160	160	160
DSI 2002 PSC	44	0	0	0	0	0	0	0	0	0
Total Firm Non-Utility Obligations	328	289	299	301	302	303	303	304	306	307
Transfers Out										
NGP 2002 PSC	2963	3037	3072	3096	3129	3139	3161	3195	3230	3263
GPU 2002 PSC	2351	2334	2353	2371	2389	2303	2308	2340	2374	2404
NGP 2002 Slice PSC	592	604	600	608	603	614	606	618	609	621
GPU 2002 Slice PSC	987	1007	1000	1013	1004	1022	1009	1029	1015	1035
IOU 2002 PSC	64	0	0	0	0	0	0	0	0	0
Exports	690	647	598	691	652	600	581	570	558	539
Regional Transfers (Out)	409	387	387	387	387	202	184	178	178	178
Federal Diversity	0	0	0	0	0	0	0	0	0	0
Total Transfers Out	8056	8015	8011	8166	8164	7881	7849	7930	7965	8041
Total Firm Obligations	8383	8305	8310	8468	8466	8183	8152	8234	8271	8348
Hydro Resources										
Regulated Hydro	6383	6405	6460	6486	6493	6498	6512	6526	6537	6548
Independent Hydro	359	356	356	356	356	356	356	356	356	356
Operational Peaking Adj.	0	0	0	0	0	0	0	0	0	0
Non-Fed CER (Canada)	134	131	132	138	140	139	137	136	134	133
Total Hydro Resources	6877	6892	6948	6980	6989	6992	7005	7018	7027	7037
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	226	199	184	183	175	175	175	175	175	171
Regional Transfers (In)	522	286	285	276	276	105	90	90	84	84
Large Thermal	877	1000	877	1000	877	1000	877	1000	877	1000
Non-Utility Generation	78	77	78	98	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	1725	1585	1447	1580	1455	1407	1269	1392	1263	1382
Total Resources	8601	8477	8395	8561	8444	8400	8274	8410	8290	8418
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	-237	-241	-238	-237	-233	-237	-234	-237
Total Reserves, Maintenance & Losses	-243	-239	-237	-241	-238	-237	-233	-237	-234	-237
Total Net Resources	8359	8238	8158	8319	8206	8163	8040	8172	8056	8181
Total Firm Surplus/Deficit	-24	-66	-152	-148	-260	-21	-111	-62	-215	-167

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Exhibits 2 - 4

***Federal System Monthly Energy Analysis Under the 2006 White Book Load
Forecast for 1937-Water Conditions***

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Exhibit 2: OY 2007 Monthly Energy

Loads and Resources - Federal System
PNW Loads and Resource Study
2006 - 2007 Operating Year
1937 Water Year
[37] 2006 White Book (Final)

3/31/2006

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
Non-Utility Obligations															
Fed. Agencies 2002 PSC	116	116	105	114	131	142	145	139	128	114	114	110	111	121	123
USBR 2002 PSC	252	259	219	94	14	31	70	79	50	206	242	290	287	310	160
DSI 2002 PSC	265	265	265	0	0	0	0	0	0	0	0	0	0	0	44
Total Firm Non-Utility Obligations	633	640	589	208	145	173	215	218	178	320	356	400	398	431	328
Transfers Out															
NGP 2002 PSC	2749	2764	2540	2669	3037	3370	3428	3317	2969	2800	2792	2777	2887	3010	2963
GPU 2002 PSC	1787	1788	1883	2239	2628	2901	2934	2878	2672	2374	2368	2151	1898	1867	2351
NGP 2002 Slice PSC	721	615	555	583	665	648	510	532	561	537	485	518	690	670	592
GPU 2002 Slice PSC	1200	1023	924	971	1107	1079	849	885	935	894	807	862	1148	1116	987
IOU 2002 PSC	382	382	382	0	0	0	0	0	0	0	0	0	0	0	64
Exports	893	893	883	636	632	645	642	640	630	643	644	677	680	676	690
Regional Transfers (Out)	421	423	305	308	609	622	619	564	411	380	378	184	244	243	409
Federal Diversity	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Transfers Out	8152	7888	7472	7407	8677	9265	8982	8815	8179	7627	7473	7168	7547	7584	8056
Total Firm Obligations	8785	8528	8060	7615	8823	9439	9197	9034	8357	7947	7829	7568	7945	8015	8383
Hydro Resources															
Regulated Hydro	7856	6580	5886	6105	7074	6956	5379	5650	5876	5595	4917	5822	8064	7309	6383
Independent Hydro	417	415	347	336	270	206	144	153	232	389	472	665	701	410	359
Operational Peaking Adj.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Non-Fed CER (Canada)	136	136	136	136	136	136	136	136	136	132	132	132	132	132	134
Total Hydro Resources	8409	7130	6368	6577	7480	7297	5659	5938	6244	6115	5521	6619	8897	7851	6877
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	184	184	216	250	318	377	300	255	224	227	187	102	123	154	226
Regional Transfers (In)	1045	1043	1188	703	749	684	334	322	300	295	295	177	296	169	522
Large Thermal	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	355	167	1000	877
Non-Utility Generation	71	69	53	62	79	80	76	70	97	100	100	95	81	68	78
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	2320	2316	2479	2036	2171	2166	1737	1673	1646	1648	1608	751	679	1410	1725
Total Resources	10729	9446	8847	8613	9651	9464	7396	7611	7890	7763	7129	7370	9576	9261	8601
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	-303	-266	-249	-243	-272	-267	-209	-215	-223	-219	-201	-208	-270	-261	-243
Total Reserves, Maintenance & Losses	-303	-266	-249	-243	-272	-267	-209	-215	-223	-219	-201	-208	-270	-261	-243
Total Net Resources	10427	9179	8597	8370	9379	9197	7188	7397	7668	7545	6928	7162	9306	9000	8359
Total Firm Surplus/Deficit	1642	651	537	755	556	-242	-2009	-1637	-690	-402	-901	-406	1362	985	-24

Exhibit 3: OY 2011 Monthly Energy

Loads and Resources - Federal System
PNW Loads and Resource Study
2010 - 2011 Operating Year
1937 Water Year
[37] 2006 White Book (Final)

3/31/2006

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
Non-Utility Obligations															
Fed. Agencies 2002 PSC	139	139	125	130	150	163	166	160	146	130	130	125	127	138	142
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	391	398	344	224	164	194	236	239	196	336	372	415	413	448	302
Transfers Out															
NGP 2002 PSC	3035	3243	2748	2813	3186	3529	3589	3474	3107	2926	2917	2896	3008	3137	3129
GPU 2002 PSC	2044	2047	2226	2256	2617	2856	2888	2850	2660	2385	2378	2012	1933	1945	2389
NGP 2002 Slice PSC	747	639	557	588	670	653	514	536	566	546	494	528	708	701	603
GPU 2002 Slice PSC	1244	1064	928	978	1115	1087	856	892	942	909	823	879	1179	1168	1004
IOU 2002 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exports	662	663	659	636	634	644	641	640	633	651	651	677	678	671	652
Regional Transfers (Out)	214	214	253	308	609	622	619	564	411	379	379	184	244	243	387
Federal Diversity	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Transfers Out	7946	7870	7372	7578	8831	9391	9107	8955	8318	7796	7643	7175	7750	7866	8164
Total Firm Obligations	8337	8268	7717	7803	8995	9586	9343	9194	8515	8131	8015	7591	8164	8314	8466
Hydro Resources															
Regulated Hydro	8179	6875	5916	6142	7116	6997	5413	5681	5910	5688	5016	5925	8270	7666	6493
Independent Hydro	398	396	327	336	270	206	144	153	232	389	472	665	701	410	356
Operational Peaking Adj.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Non-Fed CER (Canada)	141	141	141	141	141	141	141	141	141	139	139	139	139	139	140
Total Hydro Resources	8718	7411	6383	6619	7528	7344	5698	5975	6283	6216	5628	6729	9110	8215	6989
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	103	138	169	240	294	268	223	193	193	168	76	94	124	175
Regional Transfers (In)	184	184	329	318	364	300	324	312	290	285	285	167	286	159	276
Large Thermal	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	355	167	1000	877
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	1405	1404	1585	1610	1734	1722	1719	1659	1632	1612	1587	726	666	1405	1455
Total Resources	10123	8816	7968	8229	9261	9066	7417	7634	7916	7828	7214	7455	9777	9620	8444
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	-285	-249	-225	-232	-261	-256	-209	-215	-223	-221	-203	-210	-276	-271	-238
Total Reserves, Maintenance & Losses	-285	-249	-225	-232	-261	-256	-209	-215	-223	-221	-203	-210	-276	-271	-238
Total Net Resources	9838	8567	7743	7997	9000	8810	7208	7418	7692	7607	7011	7245	9501	9349	8206
Total Firm Surplus/Deficit	1501	299	26	194	5.1	-776	-2136	-1776	-822	-524	-1004	-346	1337	1035	-260

Exhibit 4: OY 2016 Monthly Energy

Loads and Resources - Federal System
PNW Loads and Resource Study
2015 - 2016 Operating Year
1937 Water Year
[37] 2006 White Book (Final)

3/31/2006

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
Non-Utility Obligations															
Fed. Agencies 2002 PSC	144	144	130	135	156	168	172	164	151	134	134	130	131	145	147
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	397	403	349	230	170	199	242	243	202	340	376	419	418	455	307
Transfers Out															
NGP 2002 PSC	3179	3179	2867	2933	3323	3682	3764	3592	3259	3066	3056	3041	3163	3298	3263
GPU 2002 PSC	2042	2042	2191	2219	2580	2813	2864	2789	2599	2365	2358	2087	2260	2039	2404
NGP 2002 Slice PSC	758	649	565	596	679	662	522	544	574	553	501	588	785	712	621
GPU 2002 Slice PSC	1262	1080	941	993	1131	1103	870	906	956	922	834	979	1307	1185	1035
IOU 2002 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exports	561	562	561	531	523	524	523	523	523	552	551	550	550	552	539
Regional Transfers (Out)	13	13	42	108	363	418	391	347	217	189	189	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	7814	7524	7168	7381	8599	9201	8935	8701	8127	7646	7490	7245	8083	7819	8041
Total Firm Obligations	8211	7928	7516	7611	8769	9400	9177	8943	8329	7986	7867	7664	8501	8274	8348
Hydro Resources															
Regulated Hydro	8258	6947	5963	6199	7181	7061	5466	5731	5965	5731	5048	5959	8317	7743	6548
Independent Hydro	398	396	327	336	270	206	144	153	232	389	472	665	701	410	356
Operational Peaking Adj.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Non-Fed CER (Canada)	133	133	133	133	133	133	133	133	133	132	132	132	132	132	133
Total Hydro Resources	8790	7475	6422	6669	7584	7400	5743	6017	6331	6252	5652	6755	9150	8284	7037
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	99	99	129	165	236	289	263	219	191	193	168	76	94	110	171
Regional Transfers (In)	0	0	112	112	112	112	112	112	112	112	112	0	112	0	84
Large Thermal	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Non-Utility Generation	96	97	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	1215	1216	1359	1401	1478	1530	1503	1455	1453	1439	1414	1204	1325	1232	1382
Total Resources	10005	8692	7781	8069	9062	8930	7246	7472	7784	7691	7066	7959	10475	9516	8418
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	-282	-245	-219	-228	-256	-252	-204	-211	-219	-217	-199	-224	-295	-268	-237
Total Reserves, Maintenance & Losses	-282	-245	-219	-228	-256	-252	-204	-211	-219	-217	-199	-224	-295	-268	-237
Total Net Resources	9723	8447	7562	7842	8807	8679	7042	7261	7564	7474	6867	7735	10179	9248	8181
Total Firm Surplus/Deficit	1512	519	46	231	37	-722	-2135	-1682	-765	-512	-1000	71	1679	974	-167

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Exhibits 5 – 7

***Federal System Monthly 1-Hour Capacity Analysis
Under the 2006 White Book Load Forecast for 1937-Water Conditions***

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Exhibit 5: OY 2007 Monthly 1-Hour Capacity

Loads and Resources - Federal System
PNW Loads and Resource Study
2006 - 2007 Operating Year
1937 Water Year
[37] 2006 White Book (Final)

3/31/2006

Capacity (MW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul
Non-Utility Obligations														
Fed. Agencies 2002 PSC	223	223	176	218	227	215	240	227	215	200	200	193	210	203
USBR 2002 PSC	220	227	205	36	0.3	0.3	0.3	0.3	28	226	262	288	260	269
DSI 2002 PSC	265	265	265	0	0	0	0	0	0	0	0	0	0	0
Total Firm Non-Utility Obligations	708	715	647	254	227	215	240	227	243	426	462	481	470	472
Transfers Out														
NGP 2002 PSC	3587	3602	3484	4077	4323	4510	4801	4612	4216	3940	3938	3756	3746	3907
GPU 2002 PSC	2101	2101	2177	2642	2998	3307	3344	3281	3076	2760	2760	2447	2099	2112
NGP 2002 Slice PSC	955	782	719	772	880	894	794	798	773	678	564	589	960	925
GPU 2002 Slice PSC	1591	1302	1197	1285	1466	1489	1323	1330	1287	1130	940	981	1598	1540
IOU 2002 PSC	382	382	382	0	0	0	0	0	0	0	0	0	0	0
Exports	1791	1791	1787	1543	1468	1483	1480	1480	1470	1476	1476	1566	1567	1579
Regional Transfers (Out)	918	918	697	700	917	971	945	901	791	764	764	592	645	660
Federal Diversity	-490	-492	-625	-434	-376	-629	-383	-394	-462	-465	-468	-589	-582	-460
Total Transfers Out	10835	10387	9817	10584	11676	12026	12304	12008	11151	10282	9973	9342	10033	10262
Total Firm Obligations	11543	11102	10463	10839	11903	12241	12545	12235	11394	10708	10436	9823	10503	10734
Hydro Resources														
Regulated Hydro	20201	20085	20437	20530	20742	20502	20473	20422	20063	19278	18958	19621	20385	20519
Independent Hydro	721	733	713	700	679	644	613	717	780	803	806	840	842	716
Operational Peaking Adj.	-4405	-6965	-8088	-7694	-6604	-7006	-8659	-8181	-8157	-8261	-9603	-9007	-5250	-5505
Non-Fed CER (Canada)	234	234	234	234	234	234	234	234	234	228	228	228	228	228
Total Hydro Resources	16751	14087	13297	13770	15051	14374	12662	13192	12920	12048	10389	11683	16205	15958
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	139	139	168	204	257	311	235	191	163	166	166	76	94	110
Regional Transfers (In)	848	848	871	408	408	385	10	10	10	10	10	10	10	10
Large Thermal	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	0	0	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	2195	2195	2231	1822	1884	1909	1459	1414	1385	1387	1387	162	162	1323
Total Resources	18946	16283	15528	15592	16936	16283	14121	14606	14306	13435	11776	11845	16367	17281
Reserves & Maintenance														
Hydro Reserves	-1046	-1041	-1058	-1061	-1071	-1057	-1054	-1057	-1042	-1004	-988	-1023	-1061	-1062
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	0	0	-172
Federal Hydro Maint.	-3263	-2761	-2770	-2752	-2705	-1866	-1408	-1883	-1915	-2061	-1805	-1756	-1635	-2785
Spinning Reserves	-341	-287	-266	-279	-312	-316	-285	-286	-279	-255	-220	-219	-333	-333
Federal Trans. Losses	-473	-403	-377	-379	-424	-431	-375	-375	-365	-333	-288	-296	-447	-433
Total Reserves, Maintenance & Losses	-5299	-4666	-4645	-4647	-4689	-3846	-3298	-3777	-3777	-3829	-3476	-3298	-3480	-4787
Total Net Resources	13647	11616	10883	10945	12247	12436	10823	10829	10529	9607	8300	8546	12888	12494
Total Firm Surplus/Deficit	2104	514	420	106	344	195	-1722	-1406	-865	-1101	-2136	-1276	2385	1760

Exhibit 6: OY 2011 Monthly 1-Hour Capacity

Loads and Resources - Federal System
PNW Loads and Resource Study
2010 - 2011 Operating Year
1937 Water Year
[37] 2006 White Book (Final)

3/31/2006

Capacity (MW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul
Non-Utility Obligations														
Fed. Agencies 2002 PSC	301	301	217	257	269	250	286	268	253	233	233	220	248	240
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	521	528	422	293	269	250	286	268	280	459	495	508	508	509
Transfers Out														
NGP 2002 PSC	3973	3970	3736	4332	4564	4760	5064	4868	4450	4152	4150	3953	3936	4106
GPU 2002 PSC	2417	2417	2638	3104	3482	3791	3884	3855	3549	3132	3132	2680	2330	2324
NGP 2002 Slice PSC	981	824	717	773	881	894	790	797	773	684	572	603	978	968
GPU 2002 Slice PSC	1634	1372	1195	1287	1467	1489	1316	1328	1287	1138	953	1005	1630	1612
IOU 2002 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exports	1569	1569	1565	1541	1498	1509	1506	1506	1499	1512	1512	1571	1572	1580
Regional Transfers (Out)	605	605	634	700	917	971	945	901	791	764	764	592	645	660
Federal Diversity	-619	-619	-777	-520	-455	-773	-465	-482	-557	-553	-556	-694	-670	-526
Total Transfers Out	10560	10138	9707	11217	12353	12643	13041	12773	11792	10829	10527	9710	10421	10724
Total Firm Obligations	11081	10666	10130	11510	12622	12894	13326	13041	12072	11288	11022	10218	10930	11232
Hydro Resources														
Regulated Hydro	20411	20296	20437	20530	20742	20502	20473	20422	20063	19278	18958	19621	20385	20520
Independent Hydro	702	714	693	700	679	644	613	717	780	803	806	840	842	716
Operational Peaking Adj.	-4213	-6575	-8034	-7630	-6548	-6955	-8659	-8145	-8109	-8148	-9460	-8785	-4970	-4922
Non-Fed CER (Canada)	244	244	244	244	244	244	244	244	244	242	242	242	242	242
Total Hydro Resources	17144	14678	13340	13844	15118	14435	12672	13239	12978	12176	10547	11919	16498	16556
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	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	1369	1407	1461	1495	1470	1425	1396	1398	1398	156	173	1337
Total Resources	18460	15995	14709	15251	16579	15930	14141	14664	14375	13573	11944	12075	16671	17893
Reserves & Maintenance														
Hydro Reserves	-1056	-1050	-1057	-1061	-1071	-1057	-1054	-1057	-1042	-1004	-988	-1023	-1061	-1062
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	-351	-302	-268	-281	-314	-318	-285	-288	-281	-258	-224	-224	-341	-348
Federal Trans. Losses	-456	-392	-350	-368	-412	-419	-376	-377	-367	-337	-293	-304	-457	-453
Total Reserves, Maintenance & Losses	-5302	-4681	-4620	-4638	-4679	-3837	-3300	-3782	-3782	-3837	-3487	-3312	-3498	-4823
Total Net Resources	13158	11313	10089	10613	11900	12092	10841	10882	10593	9736	8458	8764	13173	13069
Total Firm Surplus/Deficit	2077	647	-40	-898	-722	-801	-2485	-2159	-1479	-1552	-2564	-1455	2244	1837

Exhibit 7: OY 2016 Monthly 1-Hour Capacity

Loads and Resources - Federal System
PNW Loads and Resource Study
2015 - 2016 Operating Year
1937 Water Year
[37] 2006 White Book (Final)

3/31/2006

Capacity (MW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul
Non-Utility Obligations														
Fed. Agencies 2002 PSC	308	308	224	264	276	257	294	276	261	240	240	227	255	247
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	528	535	429	300	276	257	294	277	289	466	503	515	515	516
Transfers Out														
NGP 2002 PSC	4232	4232	3992	4613	4846	5046	5404	5164	4757	4439	4437	4220	4203	4382
GPU 2002 PSC	2577	2577	2726	3248	3676	3964	4073	4080	3698	3288	3288	3153	2563	2547
NGP 2002 Slice PSC	987	834	723	779	886	900	789	801	778	686	574	685	1059	976
GPU 2002 Slice PSC	1644	1388	1204	1298	1476	1498	1314	1334	1296	1143	957	1141	1764	1625
IOU 2002 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exports	1496	1496	1495	1465	1418	1419	1418	1418	1418	1447	1447	1432	1433	1434
Regional Transfers (Out)	13	13	42	108	325	379	353	309	199	172	172	0.1	18	34
Federal Diversity	-654	-655	-814	-549	-479	-815	-493	-509	-589	-586	-588	-771	-718	-564
Total Transfers Out	10295	9885	9368	10962	12149	12392	12858	12597	11556	10590	10286	9861	10323	10434
Total Firm Obligations	10823	10420	9796	11262	12425	12648	13153	12874	11845	11056	10789	10376	10838	10950
Hydro Resources														
Regulated Hydro	20411	20296	20437	20530	20742	20502	20473	20422	20063	19278	18958	19621	20385	20520
Independent Hydro	702	714	693	700	679	644	613	717	780	803	806	840	842	716
Operational Peaking Adj.	-4121	-6439	-7949	-7534	-6463	-6875	-8659	-8087	-8031	-8095	-9414	-8713	-4909	-4804
Non-Fed CER (Canada)	231	231	231	231	231	231	231	231	231	225	225	225	225	225
Total Hydro Resources	17223	14801	13412	13927	15190	14502	12659	13283	13043	12211	10575	11973	16543	16657
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	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	1346	1384	1438	1495	1470	1425	1396	1398	1398	1306	1323	1337
Total Resources	18539	16118	14758	15311	16628	15997	14128	14709	14439	13609	11973	13280	17865	17994
Reserves & Maintenance														
Hydro Reserves	-1056	-1050	-1057	-1061	-1071	-1057	-1054	-1057	-1042	-1004	-988	-1023	-1061	-1062
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	-353	-305	-270	-283	-316	-320	-285	-289	-283	-259	-225	-260	-377	-351
Federal Trans. Losses	-459	-396	-351	-370	-414	-421	-375	-379	-369	-339	-294	-337	-490	-456
Total Reserves, Maintenance & Losses	-5307	-4689	-4624	-4643	-4683	-3842	-3299	-3785	-3786	-3840	-3489	-3553	-3739	-4830
Total Net Resources	13232	11429	10134	10669	11945	12155	10829	10924	10653	9769	8484	9726	14126	13164
Total Firm Surplus/Deficit	2409	1009	338	-593	-479	-493	-2324	-1950	-1192	-1288	-2305	-650	3288	2214

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Exhibits 8 – 17

***Federal System Energy Surpluses and Deficits under the 2006 White Book Load
Forecast for 50-Historical Water Conditions***

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Exhibit 8: OY 2007 Monthly 50-WY Energy

Federal Surplus/Deficit by Water Year
PNW Loads and Resource Study
2006 - 2007 Operating Year
[37] 2006 White Book (Final)

3/31/2006

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1929 Federal Surplus/Deficit	2826	7.9	617	423	541	-572	-517	-1838	-430	-686	-1144	-867	2394	1365	135
1930 Federal Surplus/Deficit	1104	396	530	811	642	-139	-2019	-870	-503	-252	-715	-919	1234	1803	70
1931 Federal Surplus/Deficit	1698	718	387	824	616	-666	-1960	-1846	-694	40	-1320	-954	1176	1536	-84
1932 Federal Surplus/Deficit	1458	790	664	541	487	-518	-1911	-2042	649	2994	3827	4699	3420	2794	1110
1933 Federal Surplus/Deficit	1266	1542	1025	795	179	275	2971	1195	129	861	1642	2845	2704	2352	1427
1934 Federal Surplus/Deficit	2989	2354	1263	1454	1781	4995	2807	2728	2772	3079	3787	4386	883	1982	2596
1935 Federal Surplus/Deficit	828	245	342	582	128	-396	2191	2783	-622	550	1793	2108	2777	2720	1193
1936 Federal Surplus/Deficit	2446	459	622	677	520	-279	-1375	-1704	-515	78	3207	5284	3103	1512	912
1937 Federal Surplus/Deficit	1642	651	537	755	556	-242	-2009	-1637	-690	-402	-901	-406	1362	985	-24
1938 Federal Surplus/Deficit	1367	453	542	855	319	-83	2433	-98	1810	2267	3191	5149	3742	2476	1732
1939 Federal Surplus/Deficit	741	494	1030	876	506	-252	383	-1660	52	742	1623	2964	919	1928	712
1940 Federal Surplus/Deficit	2004	727	488	953	463	-42	-111	-833	1925	1187	2910	2345	1477	1381	955
1941 Federal Surplus/Deficit	614	122	459	865	368	38	236	-1713	-739	-225	-1003	612	1344	1101	194
1942 Federal Surplus/Deficit	645	567	1002	688	179	1459	2539	-180	-1200	81	1110	2214	3859	3461	1269
1943 Federal Surplus/Deficit	2705	1575	590	745	315	-156	2029	1911	2702	3300	3861	4957	3678	3158	2138
1944 Federal Surplus/Deficit	2843	1090	680	698	456	-279	60	-1750	-1156	-927	-1600	-949	292	962	-24
1945 Federal Surplus/Deficit	701	390	589	603	509	-776	-1870	-1329	-816	-724	-1231	2206	3795	1634	343
1946 Federal Surplus/Deficit	967	639	485	567	463	-121	1171	301	3044	2913	4047	5462	3401	3177	1853
1947 Federal Surplus/Deficit	2743	1113	1057	532	420	2663	2958	2623	3252	1612	2326	4672	3623	3298	2416
1948 Federal Surplus/Deficit	1984	346	888	2856	1117	1726	3868	324	1684	1290	3896	5766	5285	3180	2538
1949 Federal Surplus/Deficit	3144	2807	1255	941	384	-49	322	-162	3503	2169	4135	5188	3453	737	1808
1950 Federal Surplus/Deficit	714	-94	275	714	314	-430	966	3129	4132	3483	3673	4447	2533	2767	1895
1951 Federal Surplus/Deficit	2593	1698	1086	1609	1529	3371	3459	2876	2833	3571	3939	5388	3468	3241	2897
1952 Federal Surplus/Deficit	3177	1719	1013	2300	459	1710	2667	1305	1469	3955	4317	5493	3994	2423	2451
1953 Federal Surplus/Deficit	1976	335	717	709	552	-471	118	1848	15	118	1581	3860	3410	3121	1324
1954 Federal Surplus/Deficit	2703	1339	949	882	477	928	1296	2812	1800	2603	2755	4994	2723	2545	2009
1955 Federal Surplus/Deficit	4113	3684	3183	1052	618	1014	130	-1489	-976	189	1102	1914	2634	2278	1242
1956 Federal Surplus/Deficit	3212	2889	631	1235	1048	3156	3417	1670	3860	3700	3384	5221	2570	3083	2707
1957 Federal Surplus/Deficit	3101	1584	968	1081	338	547	1368	-681	1519	3326	3333	5667	3149	2352	1832
1958 Federal Surplus/Deficit	1165	406	690	724	461	-333	208	1410	1814	1287	3583	5435	3613	2222	1622
1959 Federal Surplus/Deficit	1164	777	826	688	660	2105	3379	2916	1873	2466	2277	3904	3015	2965	2139
1960 Federal Surplus/Deficit	3053	1417	3245	3326	2070	2730	3292	-632	1386	2954	4048	3006	3388	2611	2513
1961 Federal Surplus/Deficit	2123	232	861	782	364	323	1617	2246	2192	2711	1919	4349	2775	2625	1802
1962 Federal Surplus/Deficit	1714	1107	528	785	570	-255	1246	-458	-555	3333	3875	3782	3410	2985	1421
1963 Federal Surplus/Deficit	2216	1055	670	1243	820	2178	2743	336	-282	523	684	3722	3948	2908	1711
1964 Federal Surplus/Deficit	2867	1197	1047	551	508	-98	862	-408	-807	1483	2092	2849	2887	2601	1151
1965 Federal Surplus/Deficit	3173	2348	1465	1627	496	3120	3478	3621	3324	2401	4113	5185	3739	2657	2894
1966 Federal Surplus/Deficit	3041	1803	1033	1213	460	705	2762	-637	-674	3570	2201	2442	2752	2904	1522
1967 Federal Surplus/Deficit	3105	849	572	690	456	-2.6	3498	3564	762	960	389	3030	2777	3045	1753
1968 Federal Surplus/Deficit	3294	1178	1055	883	302	156	1933	2034	1536	-805	77	2176	3291	3522	1563
1969 Federal Surplus/Deficit	3281	2004	1972	1728	1171	1785	3626	2946	1142	3564	3747	5370	3218	3175	2703
1970 Federal Surplus/Deficit	2204	648	793	842	511	-151	1408	800	352	-72	1015	3666	3689	2469	1356
1971 Federal Surplus/Deficit	1021	238	479	721	851	-254	3045	2934	2675	3282	4156	5423	2882	2953	2172
1972 Federal Surplus/Deficit	3954	3043	1278	1059	509	615	3525	3625	3280	2550	3075	5304	3316	2553	2615
1973 Federal Surplus/Deficit	4170	3281	1737	1102	401	903	2383	-1495	-831	-1027	-1044	497	1189	1449	835
1974 Federal Surplus/Deficit	1188	94	19	592	60	1899	3000	2803	4141	3474	3793	5392	3273	2224	2307
1975 Federal Surplus/Deficit	3694	3118	1170	334	465	-95	2118	893	2451	754	1833	3905	3352	2790	1840
1976 Federal Surplus/Deficit	1558	1154	1136	1694	1447	4244	3413	2896	1957	3835	4020	5581	3559	2794	2834
1977 Federal Surplus/Deficit	3742	3871	3938	943	407	-283	286	-1862	-1508	-1374	-1835	-605	30	649	350
1978 Federal Surplus/Deficit	990	592	326	311	257	-24	1447	774	2102	3059	1814	3324	2973	3542	1522
-Ranked Averages-															
Top Ten Percent	2763	2019	1258	1579	1138	3135	3479	2802	2623	3414	3841	5349	3311	2990	2807
Middle Eighty Percent	2177	1202	992	951	526	548	1598	698	1137	1624	2246	3721	2962	2485	1604
Bottom Ten Percent	2023	573	550	702	562	-380	-1289	-1588	-695	-445	-1136	-819	1292	1330	14

Exhibit 9: OY 2008 Monthly 50-WY Energy

Federal Surplus/Deficit by Water Year
PNW Loads and Resource Study
2007 - 2008 Operating Year
[37] 2006 White Book (Final)

3/31/2006

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1929 Federal Surplus/Deficit	2630	-173	231	-30	130	-950	-479	-1753	-415	-697	-1159	-246	2988	1347	94
1930 Federal Surplus/Deficit	905	214	144	358	230	-518	-1986	-782	-487	-261	-729	-298	1826	1789	28
1931 Federal Surplus/Deficit	1499	537	1.5	371	205	-1045	-1926	-1761	-679	32	-1337	-332	1766	1517	-126
1932 Federal Surplus/Deficit	1258	608	279	88	76	-897	-1877	-1957	669	2992	3824	5332	4019	2797	1072
1933 Federal Surplus/Deficit	1069	1363	637	342	-233	-101	3014	1287	144	853	1631	3471	3310	2280	1384
1934 Federal Surplus/Deficit	2793	2177	877	1003	1374	4628	2858	2826	2795	3084	3786	5016	1472	1974	2562
1935 Federal Surplus/Deficit	637	71	-35	128	-284	-774	2234	2877	-608	540	1785	2735	3373	2723	1157
1936 Federal Surplus/Deficit	2251	279	241	224	109	-657	-1339	-1619	-498	68	3201	5920	3698	1496	873
1937 Federal Surplus/Deficit	1445	471	150	302	145	-620	-1975	-1551	-675	-413	-916	215	1952	965	-66
1938 Federal Surplus/Deficit	1168	271	156	402	-93	-461	2477	-9.0	1831	2265	3184	5782	4340	2476	1695
1939 Federal Surplus/Deficit	542	313	646	423	95	-630	422	-1574	70	734	1614	3595	1511	1916	673
1940 Federal Surplus/Deficit	1807	546	105	500	52	-419	-72	-745	1948	1182	2903	2973	2070	1363	916
1941 Federal Surplus/Deficit	414	-60	73	412	-43	-338	275	-1627	-723	-236	-1019	1235	1938	1083	153
1942 Federal Surplus/Deficit	445	385	618	236	-233	1086	2584	-93	-1185	73	1100	2841	4460	3469	1232
1943 Federal Surplus/Deficit	2509	1396	208	292	-97	-533	2073	2006	2727	3304	3860	5590	4280	3085	2097
1944 Federal Surplus/Deficit	2646	912	293	245	44	-656	100	-1664	-1142	-937	-1616	-329	884	941	-65
1945 Federal Surplus/Deficit	501	208	206	150	98	-1154	-1836	-1242	-801	-735	-1246	2835	4394	1621	303
1946 Federal Surplus/Deficit	768	459	100	114	52	-498	1212	393	3068	2911	4044	6095	3998	3183	1817
1947 Federal Surplus/Deficit	2547	934	675	79	8.9	2294	3004	2719	3275	1606	2319	5305	4220	3304	2382
1948 Federal Surplus/Deficit	1788	166	503	2408	708	1352	3914	415	1704	1284	3891	6403	5892	3106	2497
1949 Federal Surplus/Deficit	2950	2633	872	489	-27	-425	363	-72	3530	2165	4133	5822	4049	716	1772
1950 Federal Surplus/Deficit	514	-277	-109	262	-97	-809	1007	3224	4159	3485	3668	5077	3138	2694	1854
1951 Federal Surplus/Deficit	2396	1521	702	1158	1122	3002	3507	2977	2858	3572	3935	6021	4064	3167	2858
1952 Federal Surplus/Deficit	2982	1544	629	1850	48	1338	2712	1398	1490	3957	4316	6130	4593	2420	2417
1953 Federal Surplus/Deficit	1780	155	332	256	141	-849	158	1944	32	107	1571	4490	4014	3047	1281
1954 Federal Surplus/Deficit	2507	1160	565	430	66	552	1339	2908	1819	2601	2749	5626	3324	2472	1967
1955 Federal Surplus/Deficit	3919	3508	2804	601	208	638	168	-1403	-962	181	1089	2538	3239	2207	1199
1956 Federal Surplus/Deficit	3015	2712	246	783	639	2787	3467	1764	3887	3701	3386	5859	3176	3009	2669
1957 Federal Surplus/Deficit	2906	1408	583	630	-73	173	1410	-592	1539	3329	3326	6303	3754	2348	1797
1958 Federal Surplus/Deficit	967	225	305	272	50	-711	249	1504	1835	1281	3579	6070	4214	2214	1586
1959 Federal Surplus/Deficit	966	597	442	235	250	1733	3428	3012	1893	2462	2267	4533	3618	2891	2099
1960 Federal Surplus/Deficit	2857	1238	2867	2880	1664	2358	3336	-542	1407	2958	4043	3633	3987	2614	2479
1961 Federal Surplus/Deficit	1929	52	473	330	-46	-54	1658	2341	2214	2706	1911	4978	3378	2622	1766
1962 Federal Surplus/Deficit	1516	926	142	332	159	-634	1287	-370	-540	3334	3873	4409	4006	2988	1384
1963 Federal Surplus/Deficit	2019	876	285	792	411	1806	2786	429	-263	515	672	4353	4548	2911	1675
1964 Federal Surplus/Deficit	2672	1018	665	98	97	-476	903	-319	-792	1480	2082	3477	3492	2530	1108
1965 Federal Surplus/Deficit	2977	2171	1082	1177	85	2753	3530	3723	3349	2398	4112	5819	4341	2663	2863
1966 Federal Surplus/Deficit	2846	1627	647	762	50	331	2806	-549	-658	3569	2190	3070	3346	2909	1486
1967 Federal Surplus/Deficit	2909	669	187	237	45	-380	3542	3661	779	955	376	3656	3382	2972	1711
1968 Federal Surplus/Deficit	3098	1000	671	431	-109	-218	1977	2128	1557	-816	64	2802	3891	3448	1521
1969 Federal Surplus/Deficit	3086	1828	1590	1278	763	1412	3675	3043	1165	3567	3746	6006	3816	3180	2670
1970 Federal Surplus/Deficit	2017	476	416	389	100	-528	1452	895	369	-83	1003	4295	4291	2466	1321
1971 Federal Surplus/Deficit	823	58	94	269	440	-630	3093	3038	2700	3282	4152	6060	3487	2881	2133
1972 Federal Surplus/Deficit	3758	2867	894	607	99	241	3572	3727	3310	2553	3067	5940	3922	2481	2576
1973 Federal Surplus/Deficit	3975	3105	1354	650	-9.8	529	2429	-1409	-815	-1039	-1060	1119	1781	1432	796
1974 Federal Surplus/Deficit	989	-88	-367	139	-351	1528	3054	2905	4169	3477	3794	6028	3879	2156	2269
1975 Federal Surplus/Deficit	3498	2942	784	-120	53	-472	2161	986	2474	749	1824	4536	3955	2721	1799
1976 Federal Surplus/Deficit	1360	975	752	1244	1039	3879	3462	2993	1980	3839	4016	6217	4157	2722	2795
1977 Federal Surplus/Deficit	3550	3698	3559	491	-4.1	-660	326	-1777	-1495	-1386	-1852	15	618	621	308
1978 Federal Surplus/Deficit	790	410	-60	-142	-155	-399	1489	865	2126	3054	1805	3953	3570	3467	1479
-Ranked Averages-															
Top Ten Percent	2567	1841	874	1128	729	2767	3528	2900	2648	3415	3839	5984	3911	2948	2771
Middle Eighty Percent	1981	1024	608	499	115	172	1641	790	1157	1620	2238	4351	3561	2453	1565
Bottom Ten Percent	1825	392	164	249	151	-758	-1253	-1502	-679	-455	-1152	-198	1883	1312	-27

Exhibit 10: OY 2009 Monthly 50-WY Energy

Federal Surplus/Deficit by Water Year
PNW Loads and Resource Study
2008 - 2009 Operating Year
[37] 2006 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 Federal Surplus/Deficit	2629	-198	172	-43	111	-974	-504	-1847	-443	-668	-1111	-680	2491	1523	11
1930 Federal Surplus/Deficit	885	191	84	346	211	-542	-2013	-876	-516	-232	-681	-732	1317	1951	-57
1931 Federal Surplus/Deficit	1484	518	-58	359	186	-1069	-1953	-1855	-707	60	-1288	-766	1233	1611	-219
1932 Federal Surplus/Deficit	1242	590	220	76	56	-921	-1904	-2051	640	3022	3824	4900	3387	2967	976
1933 Federal Surplus/Deficit	1054	1355	578	329	-252	-125	2990	1196	115	882	1680	3040	2679	2274	1276
1934 Federal Surplus/Deficit	2797	2180	818	991	1355	4607	2837	2736	2769	3070	3786	4587	909	2082	2467
1935 Federal Surplus/Deficit	619	50	-94	116	-304	-798	2210	2786	-637	569	1834	2303	2871	2876	1072
1936 Federal Surplus/Deficit	2251	262	182	211	90	-681	-1366	-1713	-527	97	3197	5490	3195	1659	787
1937 Federal Surplus/Deficit	1433	453	90	290	126	-644	-2001	-1645	-703	-385	-868	-218	1442	1128	-152
1938 Federal Surplus/Deficit	1153	251	96	390	-113	-485	2454	-102	1803	2294	3233	5351	3707	2656	1602
1939 Federal Surplus/Deficit	522	293	587	411	75	-654	397	-1668	42	763	1661	3164	996	2075	587
1940 Federal Surplus/Deficit	1798	528	45	488	33	-444	-98	-839	1920	1211	2952	2541	1562	1522	831
1941 Federal Surplus/Deficit	394	-83	14	400	-63	-362	250	-1722	-752	-208	-970	803	1435	1255	69
1942 Federal Surplus/Deficit	425	369	559	223	-253	1063	2560	-187	-1214	101	1147	2408	3829	3638	1137
1943 Federal Surplus/Deficit	2508	1387	148	280	-116	-558	2048	1913	2699	3290	3859	5159	3647	3075	1985
1944 Federal Surplus/Deficit	2649	899	233	233	25	-681	74	-1759	-1171	-909	-1568	-762	377	1115	-148
1945 Federal Surplus/Deficit	480	186	147	138	79	-1178	-1863	-1337	-829	-706	-1198	2402	3762	1801	208
1946 Federal Surplus/Deficit	749	441	40	102	32	-523	1186	300	3040	2940	4093	5614	3366	3348	1718
1947 Federal Surplus/Deficit	2547	921	615	66	-11	2271	2980	2626	3248	1634	2369	4832	3728	3469	2297
1948 Federal Surplus/Deficit	1782	145	443	2397	689	1329	3890	321	1676	1313	3941	5922	5349	3097	2392
1949 Federal Surplus/Deficit	2955	2639	813	477	-47	-449	338	-166	3503	2193	4132	5340	3417	892	1673
1950 Federal Surplus/Deficit	495	-303	-169	249	-117	-834	982	3133	4133	3514	3718	4646	2507	2685	1744
1951 Federal Surplus/Deficit	2398	1516	643	1146	1103	2980	3485	2886	2830	3556	3934	5540	3431	3159	2742
1952 Federal Surplus/Deficit	2987	1538	570	1839	29	1315	2688	1305	1463	3941	4314	5649	3960	2605	2318
1953 Federal Surplus/Deficit	1772	135	273	243	122	-873	132	1852	3.1	136	1619	4059	3384	3039	1172
1954 Federal Surplus/Deficit	2506	1151	506	417	46	529	1315	2816	1792	2631	2797	5195	2694	2465	1860
1955 Federal Surplus/Deficit	3845	3521	2747	589	189	615	143	-1497	-990	210	1137	2105	2610	2201	1089
1956 Federal Surplus/Deficit	3022	2717	186	771	620	2764	3444	1671	3860	3685	3386	5378	2546	3001	2554
1957 Federal Surplus/Deficit	2910	1401	523	617	-93	149	1385	-687	1511	3359	3375	5822	3124	2521	1700
1958 Federal Surplus/Deficit	950	204	245	259	31	-735	224	1411	1807	1309	3627	5588	3583	2386	1487
1959 Federal Surplus/Deficit	949	580	382	223	231	1710	3405	2921	1865	2492	2317	4102	2988	2884	1990
1960 Federal Surplus/Deficit	2861	1228	2810	2870	1645	2336	3313	-636	1379	2945	4042	3203	3354	2771	2382
1961 Federal Surplus/Deficit	1924	30	414	317	-66	-77	1634	2248	2187	2737	1962	4547	2748	2774	1671
1962 Federal Surplus/Deficit	1502	911	83	320	140	-658	1263	-464	-568	3364	3872	3978	3514	3154	1299
1963 Federal Surplus/Deficit	2014	863	225	780	392	1783	2761	335	-291	544	722	3922	3987	3083	1587
1964 Federal Surplus/Deficit	2671	1006	606	85	78	-500	879	-412	-821	1507	2131	3045	2862	2523	1000
1965 Federal Surplus/Deficit	2982	2170	1024	1165	66	2729	3507	3631	3322	2427	4111	5352	3708	2862	2768
1966 Federal Surplus/Deficit	2851	1623	587	750	31	307	2782	-642	-686	3599	2240	2640	2837	3056	1401
1967 Federal Surplus/Deficit	2910	651	127	224	26	-404	3519	3570	751	985	426	3223	2752	2965	1603
1968 Federal Surplus/Deficit	3102	988	611	418	-128	-242	1953	2035	1529	-787	92	2370	3259	3440	1412
1969 Federal Surplus/Deficit	3091	1826	1531	1266	744	1389	3652	2951	1137	3553	3745	5525	3185	3344	2569
1970 Federal Surplus/Deficit	2009	456	357	377	81	-553	1427	802	341	-55	1054	3862	3659	2657	1229
1971 Federal Surplus/Deficit	803	34	34	256	421	-655	3069	2947	2673	3311	4202	5579	2856	2873	2019
1972 Federal Surplus/Deficit	3769	2872	835	594	79	217	3548	3636	3284	2539	3116	5459	3382	2474	2471
1973 Federal Surplus/Deficit	3915	3114	1295	637	-29	506	2405	-1503	-844	-1010	-1011	686	1273	1594	710
1974 Federal Surplus/Deficit	971	-114	-427	127	-371	1505	3032	2815	4142	3462	3793	5546	3308	2149	2157
1975 Federal Surplus/Deficit	3509	2950	725	-132	34	-496	2137	893	2447	778	1873	4104	3323	2713	1692
1976 Federal Surplus/Deficit	1350	963	692	1231	1020	3856	3439	2901	1952	3824	4065	5735	3524	2715	2681
1977 Federal Surplus/Deficit	3477	3630	3502	479	-23	-685	301	-1871	-1524	-1394	-1830	-436	81	714	207
1978 Federal Surplus/Deficit	771	391	-119	-155	-175	-425	1464	771	2099	3083	1855	3522	3081	3458	1381
-Ranked Averages-															
Top Ten Percent	2568	1839	815	1116	711	2744	3505	2808	2620	3409	3848	5506	3279	3016	2663
Middle Eighty Percent	1969	1009	549	487	96	148	1617	697	1129	1642	2275	3907	2974	2547	1466
Bottom Ten Percent	1816	373	104	237	132	-782	-1279	-1597	-708	-427	-1103	-632	1372	1465	-113

Exhibit 11: OY 2010 Monthly 50-WY Energy

Federal Surplus/Deficit by Water Year
PNW Loads and Resource Study
2009 - 2010 Operating Year
[37] 2006 White Book (Final)

3/31/2006

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1929 Federal Surplus/Deficit	2700	-161	72	-126	11	-1081	-608	-1953	-545	-789	-1233	-311	3024	1443	15
1930 Federal Surplus/Deficit	948	227	-16	263	112	-649	-2121	-981	-617	-353	-803	-363	1850	1872	-53
1931 Federal Surplus/Deficit	1522	553	-158	275	86	-1175	-2061	-1961	-809	-60	-1410	-395	1767	1532	-216
1932 Federal Surplus/Deficit	1202	543	121	-7.2	-44	-1027	-2013	-2157	539	2906	3712	5278	3926	2888	974
1933 Federal Surplus/Deficit	1120	1381	479	246	-353	-229	2890	1097	13	763	1562	3417	3219	2198	1283
1934 Federal Surplus/Deficit	2852	2212	720	910	1258	4507	2739	2639	2672	2957	3673	4966	1442	2005	2475
1935 Federal Surplus/Deficit	599	21	-194	32	-404	-904	2109	2689	-740	450	1718	2679	3408	2798	1072
1936 Federal Surplus/Deficit	2262	268	82	128	-10	-788	-1473	-1818	-628	-24	3079	5870	3732	1579	789
1937 Federal Surplus/Deficit	1477	492	-9.6	206	26	-751	-2109	-1751	-805	-505	-989	151	1975	1048	-148
1938 Federal Surplus/Deficit	1153	232	-3.3	307	-213	-592	2354	-206	1705	2177	3118	5730	4244	2577	1604
1939 Federal Surplus/Deficit	603	364	488	328	-25	-761	293	-1773	-60	643	1542	3542	1530	1996	594
1940 Federal Surplus/Deficit	1786	505	-55	405	-68	-550	-203	-943	1822	1093	2835	2916	2097	1442	831
1941 Federal Surplus/Deficit	402	-92	-86	317	-163	-468	146	-1827	-853	-329	-1091	1175	1970	1174	69
1942 Federal Surplus/Deficit	496	436	460	139	-354	960	2460	-292	-1317	-20	1028	2783	4367	3561	1145
1943 Federal Surplus/Deficit	2572	1433	48	197	-217	-664	1946	1811	2600	3175	3745	5538	4185	2997	1992
1944 Federal Surplus/Deficit	2725	978	134	149	-75	-788	-29	-1864	-1273	-1030	-1690	-393	910	1034	-142
1945 Federal Surplus/Deficit	548	227	47	54	-21	-1285	-1972	-1442	-932	-827	-1320	2775	4300	1721	213
1946 Federal Surplus/Deficit	824	492	-60	18	-68	-631	1082	198	2943	2824	3978	5993	3904	3270	1726
1947 Federal Surplus/Deficit	2612	991	516	-17	-111	2168	2879	2526	3151	1516	2254	5210	4266	3391	2306
1948 Federal Surplus/Deficit	1853	225	344	2317	590	1225	3789	217	1577	1196	3827	6301	5889	3020	2402
1949 Federal Surplus/Deficit	3024	2703	715	394	-147	-555	235	-269	3406	2075	4019	5718	3954	812	1681
1950 Federal Surplus/Deficit	570	-242	-269	166	-218	-941	880	3034	4037	3398	3603	5023	3047	2608	1753
1951 Federal Surplus/Deficit	2473	1586	544	1064	1005	2878	3386	2789	2733	3440	3821	5919	3967	3082	2752
1952 Federal Surplus/Deficit	3051	1610	472	1758	-71	1211	2587	1204	1364	3825	4199	6029	4498	2526	2327
1953 Federal Surplus/Deficit	1847	215	173	160	22	-980	27	1752	-99	15	1501	4437	3923	2961	1180
1954 Federal Surplus/Deficit	2577	1224	407	334	-54	424	1213	2717	1693	2515	2681	5574	3234	2388	1869
1955 Federal Surplus/Deficit	3753	3579	2652	506	90	511	38	-1602	-1093	90	1016	2480	3151	2126	1090
1956 Federal Surplus/Deficit	3085	2758	87	689	521	2662	3345	1570	3763	3570	3273	5757	3086	2924	2562
1957 Federal Surplus/Deficit	2977	1476	424	534	-193	45	1284	-791	1410	3244	3260	6200	3665	2442	1708
1958 Federal Surplus/Deficit	1030	278	145	176	-70	-843	121	1310	1709	1190	3513	5966	4122	2307	1496
1959 Federal Surplus/Deficit	1031	658	283	139	131	1607	3306	2823	1766	2377	2202	4480	3527	2807	2000
1960 Federal Surplus/Deficit	2922	1301	2714	2790	1548	2234	3212	-739	1279	2832	3929	3580	3892	2694	2391
1961 Federal Surplus/Deficit	1990	90	315	234	-166	-183	1533	2148	2089	2622	1847	4926	3289	2696	1680
1962 Federal Surplus/Deficit	1511	914	-17	236	39	-766	1161	-569	-670	3249	3759	4356	4050	3076	1301
1963 Federal Surplus/Deficit	2084	927	126	697	292	1680	2660	232	-391	424	603	4299	4524	3005	1595
1964 Federal Surplus/Deficit	2738	1077	507	1.1	-23	-607	777	-515	-923	1389	2014	3421	3401	2447	1008
1965 Federal Surplus/Deficit	3051	2239	926	1083	-34	2627	3408	3532	3224	2311	3997	5730	4246	2783	2777
1966 Federal Surplus/Deficit	2924	1702	488	667	-70	202	2682	-746	-788	3483	2123	3017	3373	2979	1410
1967 Federal Surplus/Deficit	2909	658	27	141	-75	-510	3419	3473	651	870	309	3598	3292	2889	1606
1968 Federal Surplus/Deficit	3163	1050	513	335	-228	-347	1852	1935	1431	-909	-26	2745	3798	3364	1420
1969 Federal Surplus/Deficit	3152	1900	1434	1184	645	1286	3553	2852	1038	3440	3632	5905	3724	3266	2579
1970 Federal Surplus/Deficit	2082	522	257	293	-19	-659	1325	701	239	-175	937	4239	4197	2577	1236
1971 Federal Surplus/Deficit	887	110	-66	173	321	-763	2968	2850	2574	3194	4088	5958	3396	2796	2029
1972 Federal Surplus/Deficit	3835	2936	736	511	-21	112	3448	3539	3188	2426	3001	5837	3922	2398	2481
1973 Federal Surplus/Deficit	3822	3175	1197	554	-130	401	2304	-1609	-946	-1131	-1132	1058	1808	1515	710
1974 Federal Surplus/Deficit	999	-98	-528	43	-472	1401	2935	2719	4045	3347	3680	5924	3848	2075	2163
1975 Federal Surplus/Deficit	3579	3014	627	-216	-66	-603	2036	791	2350	661	1757	4481	3861	2637	1700
1976 Federal Surplus/Deficit	1440	1051	593	1149	922	3755	3339	2803	1853	3709	3950	6114	4060	2639	2692
1977 Federal Surplus/Deficit	3385	3536	3408	396	-123	-791	198	-1977	-1627	-1515	-1952	-64	613	633	199
1978 Federal Surplus/Deficit	729	357	-219	-239	-275	-532	1361	667	2002	2967	1741	3899	3617	3380	1380
-Ranked Averages-															
Top Ten Percent	2640	1907	717	1034	612	2641	3406	2709	2522	3294	3735	5885	3817	2939	2672
Middle Eighty Percent	2008	1050	450	404	-4.5	43	1515	595	1030	1524	2158	4284	3512	2469	1472
Bottom Ten Percent	1874	418	4.6	153	32	-889	-1386	-1702	-810	-547	-1225	-262	1905	1386	-109

Exhibit 12: OY 2011 Monthly 50-WY Energy

Federal Surplus/Deficit by Water Year
PNW Loads and Resource Study
2010 - 2011 Operating Year
[37] 2006 White Book (Final)

3/31/2006

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1929 Federal Surplus/Deficit	2724	-354	108	-139	-11	-1106	-633	-1979	-563	-809	-1247	-808	2386	1430	-96
1930 Federal Surplus/Deficit	970	34	21	250	91	-674	-2148	-1006	-635	-372	-818	-860	1215	1860	-165
1931 Federal Surplus/Deficit	1544	361	-121	263	65	-1200	-2089	-1986	-827	-79	-1424	-892	1132	1519	-328
1932 Federal Surplus/Deficit	1225	351	157	-20	-65	-1052	-2040	-2183	521	2889	3703	4787	3292	2877	863
1933 Federal Surplus/Deficit	1145	1190	515	233	-375	-254	2868	1076	-5.3	744	1550	2925	2588	2191	1173
1934 Federal Surplus/Deficit	2876	2022	756	898	1238	4486	2720	2620	2657	2944	3665	4475	806	1994	2367
1935 Federal Surplus/Deficit	621	-172	-157	20	-427	-929	2087	2668	-758	431	1706	2186	2773	2787	962
1936 Federal Surplus/Deficit	2286	76	119	116	-32	-812	-1500	-1844	-646	-43	3065	5380	3097	1567	678
1937 Federal Surplus/Deficit	1501	299	26	194	5.1	-776	-2136	-1776	-822	-524	-1004	-346	1337	1035	-260
1938 Federal Surplus/Deficit	1176	39	33	295	-235	-618	2332	-230	1689	2159	3106	5239	3609	2566	1493
1939 Federal Surplus/Deficit	625	170	524	315	-46	-787	269	-1799	-78	623	1528	3050	895	1983	483
1940 Federal Surplus/Deficit	1809	313	-19	393	-89	-575	-228	-968	1806	1074	2824	2422	1463	1430	720
1941 Federal Surplus/Deficit	424	-285	-50	304	-185	-493	121	-1854	-871	-349	-1105	680	1334	1160	-43
1942 Federal Surplus/Deficit	518	244	496	126	-376	936	2438	-318	-1335	-40	1014	2289	3734	3551	1034
1943 Federal Surplus/Deficit	2596	1241	85	184	-239	-690	1922	1787	2584	3160	3734	5048	3550	2985	1882
1944 Federal Surplus/Deficit	2748	786	170	136	-97	-814	-54	-1890	-1291	-1049	-1704	-890	273	1019	-254
1945 Federal Surplus/Deficit	570	33	83	42	-42	-1310	-1999	-1468	-950	-847	-1335	2280	3665	1709	102
1946 Federal Surplus/Deficit	846	300	-24	5.9	-90	-657	1057	175	2927	2807	3968	5503	3271	3259	1616
1947 Federal Surplus/Deficit	2637	800	553	-31	-133	2144	2857	2503	3136	1498	2243	4719	3632	3381	2196
1948 Federal Surplus/Deficit	1877	32	380	2307	569	1202	3766	192	1560	1178	3817	5811	5258	3010	2292
1949 Federal Surplus/Deficit	3048	2513	752	381	-169	-580	211	-294	3390	2056	4010	5226	3320	799	1571
1950 Federal Surplus/Deficit	592	-436	-233	153	-240	-967	856	3012	4022	3381	3593	4532	2415	2598	1643
1951 Federal Surplus/Deficit	2496	1396	580	1052	984	2855	3365	2769	2717	3423	3811	5429	3332	3073	2643
1952 Federal Surplus/Deficit	3075	1420	509	1747	-93	1187	2565	1180	1348	3807	4188	5539	3863	2514	2217
1953 Federal Surplus/Deficit	1870	22	209	147	0.5	-1005	0.5	1729	-117	-4.3	1488	3945	3291	2952	1070
1954 Federal Surplus/Deficit	2601	1033	443	322	-76	400	1189	2695	1677	2498	2668	5083	2602	2380	1759
1955 Federal Surplus/Deficit	3779	3389	2692	495	69	488	12	-1627	-1110	70	1001	1985	2520	2119	980
1956 Federal Surplus/Deficit	3108	2568	123	677	500	2639	3324	1546	3747	3554	3265	5267	2455	2915	2453
1957 Federal Surplus/Deficit	3001	1285	460	522	-215	20	1261	-817	1392	3228	3248	5709	3034	2430	1598
1958 Federal Surplus/Deficit	1053	85	182	163	-91	-868	97	1286	1692	1171	3501	5475	3490	2294	1385
1959 Federal Surplus/Deficit	1053	466	319	126	110	1583	3285	2801	1749	2360	2190	3988	2895	2799	1891
1960 Federal Surplus/Deficit	2946	1109	2754	2780	1528	2212	3190	-763	1263	2819	3919	3088	3258	2683	2282
1961 Federal Surplus/Deficit	2015	-102	351	222	-187	-207	1510	2125	2073	2607	1837	4434	2658	2684	1570
1962 Federal Surplus/Deficit	1534	722	19	224	18	-791	1138	-594	-688	3234	3749	3864	3415	3066	1191
1963 Federal Surplus/Deficit	2107	736	162	685	271	1656	2637	207	-407	406	591	3807	3889	2994	1485
1964 Federal Surplus/Deficit	2763	885	544	-12	-44	-632	754	-540	-941	1369	2002	2927	2770	2439	898
1965 Federal Surplus/Deficit	3075	2048	963	1071	-55	2604	3388	3510	3209	2293	3986	5239	3611	2771	2668
1966 Federal Surplus/Deficit	2948	1511	524	654	-91	178	2659	-771	-806	3467	2111	2525	2738	2970	1300
1967 Federal Surplus/Deficit	2934	467	64	128	-96	-534	3397	3452	634	853	298	3104	2660	2881	1497
1968 Federal Surplus/Deficit	3187	859	550	323	-250	-371	1829	1911	1415	-928	-38	2251	3164	3355	1310
1969 Federal Surplus/Deficit	3177	1710	1472	1172	624	1262	3531	2830	1022	3426	3622	5415	3090	3256	2470
1970 Federal Surplus/Deficit	2106	329	294	281	-40	-684	1301	677	222	-194	926	3745	3563	2564	1126
1971 Federal Surplus/Deficit	910	-84	-30	160	299	-789	2945	2829	2558	3177	4077	5467	2763	2787	1919
1972 Federal Surplus/Deficit	3859	2747	772	498	-43	88	3425	3518	3174	2413	2989	5347	3290	2390	2372
1973 Federal Surplus/Deficit	3847	2985	1234	541	-152	376	2281	-1635	-964	-1151	-1147	562	1172	1502	599
1974 Federal Surplus/Deficit	1022	-292	-492	30	-495	1378	2915	2699	4030	3332	3671	5433	3216	2067	2054
1975 Federal Surplus/Deficit	3603	2824	665	-229	-88	-628	2013	768	2334	643	1745	3989	3227	2629	1591
1976 Federal Surplus/Deficit	1462	859	630	1137	901	3733	3318	2782	1836	3693	3940	5623	3425	2631	2583
1977 Federal Surplus/Deficit	3411	3348	3449	384	-145	-817	173	-2003	-1645	-1534	-1967	-559	-23	619	89
1978 Federal Surplus/Deficit	752	164	-183	-252	-297	-559	1337	641	1986	2949	1730	3407	2981	3370	1269
-Ranked Averages-															
Top Ten Percent	2664	1716	754	1022	591	2619	3385	2687	2506	3278	3725	5395	3183	2929	2563
Middle Eighty Percent	2031	858	486	391	-26	18	1491	571	1013	1506	2147	3792	2878	2458	1362
Bottom Ten Percent	1898	225	41	141	11	-914	-1412	-1728	-828	-567	-1239	-759	1268	1373	-221

Exhibit 13: OY 2012 Monthly 50-WY Energy

Federal Surplus/Deficit by Water Year
PNW Loads and Resource Study
2011 - 2012 Operating Year
[37] 2006 White Book (Final)

3/31/2006

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1929 Federal Surplus/Deficit	2692	-175	81	76	228	-844	-387	-1663	-307	-604	-1044	-242	2839	1499	143
1930 Federal Surplus/Deficit	936	213	-6.7	467	330	-412	-1903	-691	-379	-167	-614	-294	1669	1928	74
1931 Federal Surplus/Deficit	1511	540	-148	479	304	-937	-1844	-1671	-571	126	-1221	-325	1587	1587	-88
1932 Federal Surplus/Deficit	1192	531	130	197	174	-790	-1795	-1868	776	3096	3911	5358	3749	2947	1103
1933 Federal Surplus/Deficit	1113	1371	488	449	-137	9.1	3117	1394	250	950	1755	3495	3045	2263	1414
1934 Federal Surplus/Deficit	2844	2204	730	1115	1478	4752	2970	2940	2915	3153	3873	5047	1261	2064	2609
1935 Federal Surplus/Deficit	587	6.8	-184	236	-188	-666	2335	2987	-503	637	1912	2755	3229	2857	1202
1936 Federal Surplus/Deficit	2254	255	92	332	207	-550	-1255	-1528	-390	162	3269	5951	3553	1636	918
1937 Federal Surplus/Deficit	1468	478	-0.9	410	244	-513	-1890	-1460	-566	-319	-800	221	1791	1104	-21
1938 Federal Surplus/Deficit	1143	218	5.5	511	3.8	-357	2581	86	1946	2365	3312	5810	4064	2635	1734
1939 Federal Surplus/Deficit	591	349	497	531	192	-525	516	-1483	178	828	1732	3620	1350	2052	723
1940 Federal Surplus/Deficit	1777	492	-46	609	150	-313	18	-652	2063	1280	3029	2991	1918	1498	960
1941 Federal Surplus/Deficit	391	-105	-77	520	53	-230	368	-1538	-615	-145	-902	1247	1789	1228	197
1942 Federal Surplus/Deficit	484	423	469	342	-138	1199	2687	-2	-1080	164	1218	2857	4191	3622	1274
1943 Federal Surplus/Deficit	2564	1422	57	400	-0.9	-428	2170	2103	2840	3368	3940	5619	4006	3055	2122
1944 Federal Surplus/Deficit	2716	966	142	352	142	-553	193	-1575	-1035	-844	-1501	-324	726	1087	-15
1945 Federal Surplus/Deficit	537	212	56	257	196	-1048	-1755	-1153	-694	-642	-1132	2848	4120	1777	341
1946 Federal Surplus/Deficit	813	479	-52	222	149	-396	1303	491	3184	3013	4174	6074	3727	3329	1856
1947 Federal Surplus/Deficit	2605	980	525	185	105	2407	3105	2820	3394	1703	2449	5289	4087	3451	2436
1948 Federal Surplus/Deficit	1845	212	353	2524	809	1465	4014	508	1817	1385	4023	6382	5715	3081	2533
1949 Federal Surplus/Deficit	3015	2694	726	597	69	-318	458	22	3648	2260	4217	5797	3775	867	1811
1950 Federal Surplus/Deficit	558	-257	-261	369	-1.2	-706	1104	3330	4281	3588	3799	5102	2873	2668	1883
1951 Federal Surplus/Deficit	2463	1576	553	1268	1223	3119	3614	3088	2974	3630	4019	6000	3786	3143	2884
1952 Federal Surplus/Deficit	3043	1600	482	1964	146	1450	2813	1497	1606	4014	4394	6111	4319	2583	2458
1953 Federal Surplus/Deficit	1838	202	182	363	239	-743	246	2047	139	200	1692	4516	3748	3022	1310
1954 Federal Surplus/Deficit	2569	1212	416	538	163	663	1437	3013	1934	2704	2872	5654	3059	2451	2001
1955 Federal Surplus/Deficit	3748	3570	2667	711	308	751	259	-1312	-854	275	1204	2553	2978	2191	1221
1956 Federal Surplus/Deficit	3076	2749	96	893	739	2902	3574	1863	4005	3762	3473	5839	2913	2986	2695
1957 Federal Surplus/Deficit	2969	1465	433	738	23	283	1509	-502	1648	3436	3454	6280	3491	2500	1839
1958 Federal Surplus/Deficit	1020	264	154	379	148	-607	344	1603	1950	1376	3707	6045	3947	2363	1626
1959 Federal Surplus/Deficit	1020	645	292	342	348	1846	3534	3119	2006	2567	2396	4559	3352	2870	2132
1960 Federal Surplus/Deficit	2914	1290	2729	2997	1768	2476	3439	-447	1519	3029	4126	3658	3714	2753	2524
1961 Federal Surplus/Deficit	1983	77	324	438	52	55	1758	2443	2330	2814	2044	5005	3116	2754	1811
1962 Federal Surplus/Deficit	1501	903	-8.4	440	256	-530	1386	-279	-432	3442	3956	4434	3870	3136	1431
1963 Federal Surplus/Deficit	2075	916	135	901	510	1920	2885	522	-150	611	796	4377	4344	3064	1725
1964 Federal Surplus/Deficit	2731	1065	517	204	194	-370	1001	-223	-685	1574	2207	3496	3227	2511	1139
1965 Federal Surplus/Deficit	3043	2229	936	1288	183	2867	3637	3828	3466	2500	4193	5810	4067	2840	2909
1966 Federal Surplus/Deficit	2916	1692	497	870	148	441	2907	-455	-550	3674	2316	3094	3193	3040	1540
1967 Federal Surplus/Deficit	2902	647	36	344	142	-272	3646	3771	891	1060	503	3672	3117	2952	1738
1968 Federal Surplus/Deficit	3156	1040	523	539	-11	-109	2077	2228	1672	-724	168	2820	3620	3427	1550
1969 Federal Surplus/Deficit	3145	1891	1446	1389	863	1525	3780	3148	1279	3635	3830	5987	3547	3326	2712
1970 Federal Surplus/Deficit	2074	509	267	497	199	-422	1548	994	478	11	1132	4314	4019	2632	1366
1971 Federal Surplus/Deficit	876	95	-58	376	538	-528	3193	3149	2815	3383	4284	6038	3220	2858	2160
1972 Federal Surplus/Deficit	3827	2928	745	714	195	350	3673	3837	3433	2622	3195	5918	3748	2462	2613
1973 Federal Surplus/Deficit	3816	3167	1207	757	87	639	2529	-1319	-708	-946	-943	1129	1627	1571	839
1974 Federal Surplus/Deficit	989	-113	-519	246	-257	1640	3165	3019	4288	3540	3879	6004	3674	2139	2296
1975 Federal Surplus/Deficit	3571	3006	638	-13	151	-366	2261	1084	2592	848	1950	4559	3683	2700	1831
1976 Federal Surplus/Deficit	1429	1038	603	1353	1141	3997	3567	3100	2092	3901	4146	6194	3879	2703	2824
1977 Federal Surplus/Deficit	3381	3531	3424	600	94	-555	420	-1688	-1389	-1330	-1763	9.3	431	687	329
1978 Federal Surplus/Deficit	720	343	-210	-36	-59	-298	1584	957	2244	3155	1936	3977	3435	3440	1509
-Ranked Averages-															
Top Ten Percent	2631	1897	727	1238	830	2882	3634	3006	2763	3485	3932	5966	3638	3000	2805
Middle Eighty Percent	1999	1038	460	608	213	280	1739	888	1270	1713	2352	4362	3335	2528	1603
Bottom Ten Percent	1865	405	13	357	249	-652	-1166	-1412	-572	-362	-1036	-193	1722	1441	19

Exhibit 14: OY 2013 Monthly 50-WY Energy

Federal Surplus/Deficit by Water Year
PNW Loads and Resource Study
2012 - 2013 Operating Year
[37] 2006 White Book (Final)

3/31/2006

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1929 Federal Surplus/Deficit	2848	-20	277	72	221	-850	-420	-1814	-332	-633	-1074	-753	2191	1477	52
1930 Federal Surplus/Deficit	1092	367	188	463	323	-418	-1941	-839	-403	-196	-645	-805	1021	1907	-16
1931 Federal Surplus/Deficit	1667	695	47	475	297	-943	-1882	-1822	-596	99	-1251	-835	938	1565	-179
1932 Federal Surplus/Deficit	1348	685	326	193	167	-796	-1833	-2019	754	3074	3891	4858	3107	2926	1015
1933 Federal Surplus/Deficit	1269	1527	684	445	-145	4.8	3089	1252	226	924	1729	2994	2404	2243	1327
1934 Federal Surplus/Deficit	3000	2361	927	1114	1474	4752	2942	2800	2897	3132	3853	4547	612	2043	2524
1935 Federal Surplus/Deficit	743	160	11	232	-196	-672	2307	2847	-529	610	1887	2252	2586	2837	1115
1936 Federal Surplus/Deficit	2410	410	288	328	200	-556	-1292	-1679	-414	134	3244	5452	2909	1615	829
1937 Federal Surplus/Deficit	1624	633	195	406	237	-520	-1928	-1610	-591	-348	-831	-290	1142	1082	-111
1938 Federal Surplus/Deficit	1299	371	201	507	-3.7	-363	2553	-61	1926	2343	3290	5311	3423	2614	1647
1939 Federal Surplus/Deficit	746	503	694	527	185	-532	483	-1634	155	801	1704	3119	702	2031	634
1940 Federal Surplus/Deficit	1933	647	150	605	143	-319	-15	-801	2043	1255	3005	2487	1273	1476	872
1941 Federal Surplus/Deficit	547	48	118	516	46	-236	336	-1689	-640	-174	-932	739	1143	1205	107
1942 Federal Surplus/Deficit	639	577	665	338	-145	1197	2659	-151	-1105	136	1191	2353	3550	3601	1186
1943 Federal Surplus/Deficit	2721	1577	253	396	-8.6	-434	2141	1960	2822	3347	3920	5119	3364	3034	2036
1944 Federal Surplus/Deficit	2872	1122	338	348	135	-559	161	-1726	-1061	-874	-1532	-834	77	1064	-105
1945 Federal Surplus/Deficit	692	365	252	253	189	-1054	-1793	-1303	-719	-671	-1162	2343	3479	1756	251
1946 Federal Surplus/Deficit	968	634	143	218	142	-403	1271	347	3166	2991	4154	5575	3086	3309	1769
1947 Federal Surplus/Deficit	2761	1135	722	181	97	2406	3077	2678	3377	1679	2428	4789	3446	3430	2350
1948 Federal Surplus/Deficit	2002	367	549	2524	804	1462	3986	361	1796	1361	4003	5883	5074	3061	2447
1949 Federal Surplus/Deficit	3172	2851	924	594	62	-324	426	-125	3630	2237	4197	5297	3134	845	1724
1950 Federal Surplus/Deficit	714	-105	-66	365	-8.7	-713	1073	3190	4263	3566	3779	4602	2232	2648	1797
1951 Federal Surplus/Deficit	2619	1733	750	1266	1219	3119	3587	2948	2956	3608	3999	5500	3144	3123	2799
1952 Federal Surplus/Deficit	3199	1757	679	1963	139	1448	2785	1353	1586	3992	4373	5611	3677	2562	2372
1953 Federal Surplus/Deficit	1994	357	378	359	233	-750	213	1905	115	172	1666	4016	3108	3002	1223
1954 Federal Surplus/Deficit	2725	1368	612	534	156	659	1407	2872	1914	2683	2851	5154	2419	2432	1914
1955 Federal Surplus/Deficit	3905	3727	2868	709	303	747	225	-1462	-880	247	1174	2049	2337	2172	1133
1956 Federal Surplus/Deficit	3232	2906	292	890	734	2902	3546	1720	3987	3740	3453	5339	2272	2966	2610
1957 Federal Surplus/Deficit	3125	1621	630	734	16	279	1479	-650	1626	3415	3433	5780	2851	2478	1752
1958 Federal Surplus/Deficit	1175	418	350	375	140	-614	312	1459	1930	1351	3686	5545	3306	2342	1538
1959 Federal Surplus/Deficit	1176	800	488	338	342	1844	3506	2979	1986	2546	2374	4059	2712	2850	2046
1960 Federal Surplus/Deficit	3071	1445	2929	2997	1766	2475	3410	-594	1498	3008	4106	3157	3073	2733	2438
1961 Federal Surplus/Deficit	2139	231	520	434	44	50	1729	2300	2311	2793	2023	4505	2475	2733	1725
1962 Federal Surplus/Deficit	1657	1058	187	436	249	-537	1356	-428	-457	3421	3935	3933	3227	3115	1343
1963 Federal Surplus/Deficit	2231	1071	331	898	504	1918	2855	376	-172	584	768	3876	3702	3043	1638
1964 Federal Surplus/Deficit	2888	1221	714	200	187	-376	971	-370	-710	1550	2183	2996	2586	2492	1051
1965 Federal Surplus/Deficit	3200	2385	1134	1287	176	2866	3610	3688	3448	2478	4172	5311	3425	2819	2823
1966 Federal Surplus/Deficit	3073	1848	694	867	141	437	2879	-603	-575	3652	2290	2593	2549	3020	1453
1967 Federal Surplus/Deficit	3059	802	232	340	135	-278	3618	3631	869	1039	479	3171	2476	2933	1651
1968 Federal Surplus/Deficit	3312	1196	720	535	-18	-113	2049	2085	1652	-753	141	2316	2979	3407	1463
1969 Federal Surplus/Deficit	3302	2047	1646	1387	858	1523	3752	3008	1259	3614	3810	5487	2906	3306	2626
1970 Federal Surplus/Deficit	2231	664	462	493	192	-428	1519	850	454	-18	1107	3813	3378	2611	1278
1971 Federal Surplus/Deficit	1032	250	137	372	530	-535	3165	3009	2796	3361	4264	5539	2580	2837	2074
1972 Federal Surplus/Deficit	3984	3085	942	710	187	346	3645	3697	3416	2602	3174	5418	3107	2442	2528
1973 Federal Surplus/Deficit	3973	3323	1405	754	79	635	2501	-1469	-733	-977	-973	620	980	1549	750
1974 Federal Surplus/Deficit	1145	40	-325	241	-266	1639	3137	2880	4270	3519	3859	5505	3033	2120	2210
1975 Federal Surplus/Deficit	3728	3162	836	-18	144	-372	2232	940	2574	825	1926	4058	3041	2681	1745
1976 Federal Surplus/Deficit	1584	1193	799	1350	1136	3997	3539	2960	2073	3880	4125	5694	3237	2683	2738
1977 Federal Surplus/Deficit	3538	3688	3625	597	87	-562	388	-1839	-1415	-1360	-1794	-500	-219	663	239
1978 Federal Surplus/Deficit	875	496	-15	-41	-67	-305	1553	809	2227	3133	1915	3477	2793	3419	1422
-Ranked Averages-															
Top Ten Percent	2787	2053	924	1236	825	2881	3607	2865	2745	3464	3912	5466	2997	2979	2719
Middle Eighty Percent	2155	1194	656	604	206	276	1709	743	1248	1688	2328	3860	2692	2508	1515
Bottom Ten Percent	2021	559	209	353	243	-658	-1202	-1562	-596	-390	-1067	-703	1074	1419	-72

Exhibit 15: OY 2014 Monthly 50-WY Energy

Federal Surplus/Deficit by Water Year
PNW Loads and Resource Study
2013 - 2014 Operating Year
[37] 2006 White Book (Final)

3/31/2006

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1929 Federal Surplus/Deficit	2828	-41	252	24	163	-913	-482	-1873	-386	-686	-1129	-318	2805	1466	102
1930 Federal Surplus/Deficit	1071	345	164	415	266	-482	-2008	-896	-458	-249	-699	-370	1636	1897	33
1931 Federal Surplus/Deficit	1646	674	23	428	239	-1006	-1949	-1881	-652	48	-1306	-400	1551	1554	-130
1932 Federal Surplus/Deficit	1328	664	302	145	109	-859	-1900	-2078	702	3028	3848	5304	3729	2916	1067
1933 Federal Surplus/Deficit	1249	1507	661	398	-203	-56	3032	1202	171	875	1679	3440	3026	2235	1380
1934 Federal Surplus/Deficit	2980	2342	905	1068	1420	4696	2886	2753	2849	3088	3810	4993	1226	2033	2578
1935 Federal Surplus/Deficit	722	138	-13	184	-255	-734	2250	2798	-585	558	1839	2695	3205	2827	1167
1936 Federal Surplus/Deficit	2390	390	264	280	143	-619	-1357	-1738	-469	82	3195	5898	3528	1604	880
1937 Federal Surplus/Deficit	1604	612	170	359	180	-582	-1994	-1669	-645	-401	-885	146	1755	1071	-62
1938 Federal Surplus/Deficit	1278	350	177	460	-62	-426	2496	-116	1877	2296	3244	5757	4043	2604	1699
1939 Federal Surplus/Deficit	725	481	671	480	127	-595	422	-1692	101	750	1652	3565	1316	2020	685
1940 Federal Surplus/Deficit	1913	626	126	558	85	-382	-78	-858	1993	1206	2956	2930	1890	1465	923
1941 Federal Surplus/Deficit	526	27	94	469	-12	-297	275	-1748	-694	-228	-986	1178	1760	1194	157
1942 Federal Surplus/Deficit	618	556	642	291	-204	1138	2602	-208	-1161	85	1140	2795	4171	3592	1238
1943 Federal Surplus/Deficit	2701	1558	230	348	-67	-496	2083	1908	2773	3303	3875	5566	3985	3023	2089
1944 Federal Surplus/Deficit	2851	1102	314	301	77	-622	100	-1785	-1116	-927	-1587	-399	690	1051	-56
1945 Federal Surplus/Deficit	671	342	227	205	132	-1116	-1860	-1361	-774	-724	-1217	2784	4099	1745	301
1946 Federal Surplus/Deficit	947	614	118	171	84	-467	1210	293	3117	2945	4110	6021	3707	3299	1822
1947 Federal Surplus/Deficit	2741	1115	699	133	39	2349	3020	2627	3329	1631	2382	5235	4067	3420	2404
1948 Federal Surplus/Deficit	1982	347	525	2479	748	1403	3929	305	1745	1314	3958	6329	5694	3051	2501
1949 Federal Surplus/Deficit	3151	2832	903	547	3.4	-386	366	-179	3582	2189	4153	5742	3754	834	1777
1950 Federal Surplus/Deficit	692	-127	-91	317	-67	-777	1013	3141	4216	3520	3734	5048	2854	2638	1850
1951 Federal Surplus/Deficit	2598	1713	727	1220	1164	3062	3530	2900	2908	3562	3955	5946	3765	3114	2854
1952 Federal Surplus/Deficit	3179	1737	657	1918	81	1389	2728	1300	1537	3946	4328	6057	4298	2552	2426
1953 Federal Surplus/Deficit	1974	336	353	311	175	-813	151	1855	61	120	1616	4461	3730	2992	1275
1954 Federal Surplus/Deficit	2705	1348	589	487	98	599	1349	2822	1864	2637	2805	5601	3040	2423	1968
1955 Federal Surplus/Deficit	3886	3708	2848	663	247	687	162	-1520	-935	196	1120	2490	2959	2163	1185
1956 Federal Surplus/Deficit	3212	2887	269	844	678	2845	3490	1668	3939	3695	3410	5785	2894	2956	2664
1957 Federal Surplus/Deficit	3105	1601	606	688	-42	219	1420	-707	1574	3369	3387	6226	3472	2468	1805
1958 Federal Surplus/Deficit	1154	396	326	328	82	-677	252	1407	1880	1302	3641	5991	3927	2331	1591
1959 Federal Surplus/Deficit	1155	780	464	291	285	1786	3450	2930	1936	2500	2327	4505	3333	2841	2100
1960 Federal Surplus/Deficit	3050	1426	2910	2953	1712	2418	3354	-649	1447	2964	4061	3603	3694	2723	2493
1961 Federal Surplus/Deficit	2119	210	497	387	-13	-12	1671	2249	2262	2747	1978	4951	3097	2723	1778
1962 Federal Surplus/Deficit	1636	1038	162	388	191	-601	1297	-485	-511	3376	3891	4379	3846	3105	1395
1963 Federal Surplus/Deficit	2210	1052	307	851	448	1860	2797	322	-224	533	715	4321	4322	3033	1691
1964 Federal Surplus/Deficit	2868	1201	691	152	128	-438	912	-426	-764	1502	2135	3441	3208	2483	1103
1965 Federal Surplus/Deficit	3179	2365	1113	1241	119	2809	3553	3639	3400	2432	4128	5757	4046	2809	2878
1966 Federal Surplus/Deficit	3053	1828	670	821	83	377	2822	-659	-629	3606	2239	3038	3166	3011	1505
1967 Federal Surplus/Deficit	3039	782	208	292	77	-340	3561	3583	817	993	430	3616	3098	2924	1705
1968 Federal Surplus/Deficit	3292	1176	697	488	-76	-173	1992	2033	1602	-806	89	2758	3600	3398	1516
1969 Federal Surplus/Deficit	3282	2027	1625	1342	802	1464	3696	2959	1210	3570	3766	5933	3527	3296	2681
1970 Federal Surplus/Deficit	2211	643	438	445	135	-490	1460	798	400	-70	1058	4257	3998	2600	1330
1971 Federal Surplus/Deficit	1011	228	113	324	472	-598	3108	2961	2748	3315	4220	5985	3201	2828	2127
1972 Federal Surplus/Deficit	3964	3066	919	662	129	285	3588	3649	3369	2557	3129	5865	3728	2433	2582
1973 Federal Surplus/Deficit	3953	3304	1383	707	21	575	2444	-1528	-788	-1031	-1028	1058	1596	1539	800
1974 Federal Surplus/Deficit	1124	18	-350	193	-325	1581	3081	2832	4222	3474	3815	5951	3654	2111	2264
1975 Federal Surplus/Deficit	3707	3143	814	-66	86	-435	2174	887	2525	777	1879	4504	3662	2672	1798
1976 Federal Surplus/Deficit	1563	1173	776	1304	1081	3940	3482	2911	2023	3835	4081	6141	3857	2674	2793
1977 Federal Surplus/Deficit	3519	3670	3606	550	29	-624	327	-1898	-1472	-1414	-1849	-62	393	650	288
1978 Federal Surplus/Deficit	855	473	-40	-89	-125	-367	1494	754	2179	3087	1870	3923	3413	3409	1474
-Ranked Averages-															
Top Ten Percent	2767	2033	902	1190	769	2824	3550	2815	2696	3419	3868	5913	3618	2970	2774
Middle Eighty Percent	2135	1173	633	557	148	215	1650	689	1197	1640	2281	4305	3312	2498	1568
Bottom Ten Percent	2000	538	185	305	185	-721	-1266	-1621	-651	-443	-1121	-268	1688	1408	-23

Exhibit 16: OY 2015 Monthly 50-WY Energy

Federal Surplus/Deficit by Water Year
PNW Loads and Resource Study
2014 - 2015 Operating Year
[37] 2006 White Book (Final)

3/31/2006

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1929 Federal Surplus/Deficit	2782	-86	180	-47	87	-979	-545	-1944	-441	-741	-1184	-849	2130	1420	-50
1930 Federal Surplus/Deficit	1024	300	92	344	189	-548	-2075	-965	-513	-302	-754	-901	960	1850	-119
1931 Federal Surplus/Deficit	1600	629	-49	357	163	-1072	-2016	-1953	-707	-3.5	-1361	-931	875	1507	-283
1932 Federal Surplus/Deficit	1281	618	231	74	33	-925	-1967	-2150	649	2980	3801	4780	3059	2869	916
1933 Federal Surplus/Deficit	1202	1463	590	327	-280	-121	2972	1137	115	825	1628	2917	2356	2188	1230
1934 Federal Surplus/Deficit	2934	2298	835	1000	1347	4635	2826	2689	2799	3040	3763	4470	550	1987	2430
1935 Federal Surplus/Deficit	675	92	-84	113	-331	-799	2190	2735	-641	506	1789	2170	2534	2780	1016
1936 Federal Surplus/Deficit	2343	346	193	209	66	-685	-1424	-1809	-523	29	3146	5375	2856	1558	729
1937 Federal Surplus/Deficit	1557	567	99	288	104	-648	-2061	-1740	-700	-454	-940	-385	1080	1025	-215
1938 Federal Surplus/Deficit	1231	304	105	390	-139	-492	2436	-184	1826	2248	3196	5234	3373	2557	1550
1939 Federal Surplus/Deficit	679	437	600	410	51	-661	359	-1763	46	698	1599	3041	641	1974	534
1940 Federal Surplus/Deficit	1866	582	54	488	8.8	-448	-142	-928	1943	1156	2906	2404	1216	1419	772
1941 Federal Surplus/Deficit	479	-18	22	398	-89	-362	211	-1819	-749	-282	-1041	648	1086	1147	5.3
1942 Federal Surplus/Deficit	572	511	571	221	-280	1075	2542	-277	-1217	32	1088	2269	3501	3545	1088
1943 Federal Surplus/Deficit	2654	1514	159	278	-144	-561	2023	1843	2723	3255	3829	5043	3315	2977	1940
1944 Federal Surplus/Deficit	2805	1058	243	230	0.3	-688	36	-1856	-1172	-981	-1641	-931	14	1004	-208
1945 Federal Surplus/Deficit	624	296	156	134	55	-1182	-1927	-1432	-830	-777	-1272	2258	3429	1699	150
1946 Federal Surplus/Deficit	900	570	47	100	7.2	-533	1148	227	3068	2897	4063	5498	3037	3252	1672
1947 Federal Surplus/Deficit	2694	1071	629	62	-38	2288	2960	2563	3279	1582	2334	4711	3397	3373	2255
1948 Federal Surplus/Deficit	1935	303	454	2411	674	1340	3869	237	1693	1265	3912	5806	5023	3004	2352
1949 Federal Surplus/Deficit	3105	2788	833	477	-73	-451	303	-247	3532	2141	4106	5219	3084	787	1628
1950 Federal Surplus/Deficit	646	-173	-163	247	-144	-843	952	3077	4166	3472	3687	4525	2184	2591	1701
1951 Federal Surplus/Deficit	2552	1669	657	1151	1091	3001	3470	2837	2858	3514	3908	5423	3095	3067	2706
1952 Federal Surplus/Deficit	3132	1693	587	1849	5.0	1327	2668	1235	1486	3898	4281	5534	3628	2505	2277
1953 Federal Surplus/Deficit	1927	292	282	240	99	-879	87	1791	6.2	68	1565	3938	3060	2945	1125
1954 Federal Surplus/Deficit	2658	1304	518	417	22	535	1288	2758	1812	2589	2758	5078	2370	2376	1819
1955 Federal Surplus/Deficit	3839	3664	2780	593	172	624	97	-1591	-991	143	1065	1965	2289	2116	1034
1956 Federal Surplus/Deficit	3165	2843	198	775	603	2784	3430	1603	3890	3647	3363	5261	2224	2910	2516
1957 Federal Surplus/Deficit	3058	1557	536	618	-119	156	1359	-777	1522	3321	3341	5702	2802	2421	1655
1958 Federal Surplus/Deficit	1108	351	254	257	6.0	-743	190	1341	1829	1252	3594	5468	3257	2284	1441
1959 Federal Surplus/Deficit	1108	736	392	220	210	1724	3390	2867	1884	2452	2279	3982	2664	2794	1951
1960 Federal Surplus/Deficit	3004	1382	2841	2884	1640	2357	3294	-718	1395	2916	4015	3079	3024	2676	2344
1961 Federal Surplus/Deficit	2073	166	425	316	-90	-77	1609	2185	2212	2700	1930	4428	2427	2676	1629
1962 Federal Surplus/Deficit	1590	994	90	317	114	-668	1236	-555	-566	3328	3844	3856	3176	3058	1245
1963 Federal Surplus/Deficit	2164	1008	235	781	372	1798	2736	255	-277	480	662	3798	3652	2987	1541
1964 Federal Surplus/Deficit	2821	1157	620	81	52	-504	850	-495	-819	1454	2086	2917	2538	2436	953
1965 Federal Surplus/Deficit	3133	2321	1043	1172	43	2748	3493	3575	3350	2384	4081	5234	3376	2762	2730
1966 Federal Surplus/Deficit	3006	1784	600	751	7.3	314	2762	-729	-684	3558	2188	2514	2493	2964	1355
1967 Federal Surplus/Deficit	2992	739	136	221	0.7	-405	3501	3520	763	945	379	3092	2428	2877	1555
1968 Federal Surplus/Deficit	3245	1132	626	418	-152	-237	1932	1968	1551	-861	37	2232	2930	3351	1366
1969 Federal Surplus/Deficit	3235	1983	1557	1274	727	1402	3636	2896	1159	3522	3719	5410	2857	3249	2533
1970 Federal Surplus/Deficit	2164	598	367	374	58	-555	1400	733	346	-123	1007	3734	3328	2553	1180
1971 Federal Surplus/Deficit	964	183	41	253	396	-664	3047	2897	2698	3267	4173	5461	2532	2781	1978
1972 Federal Surplus/Deficit	3917	3022	848	591	52	221	3528	3586	3319	2510	3082	5341	3058	2387	2433
1973 Federal Surplus/Deficit	3906	3260	1313	636	-55	512	2384	-1599	-843	-1086	-1082	528	921	1492	649
1974 Federal Surplus/Deficit	1077	-28	-422	122	-403	1519	3021	2769	4172	3426	3769	5428	2984	2064	2115
1975 Federal Surplus/Deficit	3661	3099	744	-137	9.1	-500	2114	820	2475	729	1830	3981	2992	2625	1649
1976 Federal Surplus/Deficit	1517	1129	706	1234	1007	3879	3422	2848	1972	3787	4034	5618	3187	2628	2644
1977 Federal Surplus/Deficit	3472	3626	3538	480	-47	-690	264	-1969	-1528	-1469	-1904	-593	-284	602	136
1978 Federal Surplus/Deficit	808	427	-112	-161	-202	-433	1432	686	2129	3039	1823	3400	2744	3363	1324
-Ranked Averages-															
Top Ten Percent	2720	1989	832	1121	694	2763	3490	2752	2646	3371	3821	5389	2948	2923	2626
Middle Eighty Percent	2088	1129	562	487	72	150	1588	622	1144	1590	2231	3781	2641	2451	1418
Bottom Ten Percent	1953	494	113	234	109	-787	-1332	-1692	-707	-496	-1176	-799	1012	1361	-175

Exhibit 17: OY 2016 Monthly 50-WY Energy

Federal Surplus/Deficit by Water Year
PNW Loads and Resource Study
2015 - 2016 Operating Year
[37] 2006 White Book (Final)

3/31/2006

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1929 Federal Surplus/Deficit	2736	-134	127	-105	20	-1053	-616	-1886	-506	-799	-1244	-393	2729	1369	-2.8
1930 Federal Surplus/Deficit	979	251	38	287	123	-622	-2150	-906	-578	-360	-814	-446	1559	1799	-72
1931 Federal Surplus/Deficit	1554	581	-102	300	97	-1145	-2091	-1895	-773	-60	-1421	-475	1473	1456	-236
1932 Federal Surplus/Deficit	1236	570	178	17	-34	-999	-2042	-2092	586	2928	3749	5244	3664	2819	965
1933 Federal Surplus/Deficit	1157	1416	538	270	-346	-193	2905	1202	50	770	1572	3380	2961	2137	1280
1934 Federal Surplus/Deficit	2888	2250	784	945	1285	4566	2759	2756	2740	2988	3711	4934	1149	1936	2481
1935 Federal Surplus/Deficit	630	43	-137	55	-398	-873	2122	2801	-707	449	1734	2631	3138	2730	1066
1936 Federal Surplus/Deficit	2298	299	140	152	0.3	-758	-1497	-1751	-588	-28	3091	5839	3459	1507	778
1937 Federal Surplus/Deficit	1512	519	46	231	37	-722	-2135	-1682	-765	-512	-1000	71	1679	974	-167
1938 Federal Surplus/Deficit	1186	256	52	333	-205	-566	2369	-123	1765	2196	3143	5698	3978	2507	1600
1939 Federal Surplus/Deficit	633	388	548	353	-15	-735	289	-1705	-18	642	1541	3504	1240	1923	582
1940 Federal Surplus/Deficit	1821	534	1.2	431	-57	-521	-214	-868	1882	1101	2850	2865	1817	1368	821
1941 Federal Surplus/Deficit	434	-67	-31	342	-155	-435	141	-1761	-814	-340	-1101	1106	1688	1096	53
1942 Federal Surplus/Deficit	526	462	519	164	-347	1005	2475	-218	-1283	-24	1031	2730	4106	3494	1137
1943 Federal Surplus/Deficit	2609	1466	106	221	-210	-634	1956	1907	2663	3202	3776	5506	3920	2926	1991
1944 Federal Surplus/Deficit	2759	1010	191	173	-66	-762	-34	-1798	-1238	-1039	-1701	-475	613	953	-161
1945 Federal Surplus/Deficit	579	247	103	77	-11	-1256	-2002	-1373	-895	-835	-1332	2719	4034	1648	198
1946 Federal Surplus/Deficit	855	523	-6.7	43	-59	-607	1078	290	3008	2845	4011	5961	3642	3202	1722
1947 Federal Surplus/Deficit	2649	1024	577	5.3	-104	2219	2893	2628	3219	1528	2281	5175	4002	3323	2306
1948 Federal Surplus/Deficit	1890	255	402	2356	610	1269	3802	298	1631	1212	3860	6269	5627	2954	2402
1949 Federal Surplus/Deficit	3059	2740	783	420	-139	-524	233	-186	3472	2088	4054	5683	3689	736	1678
1950 Federal Surplus/Deficit	600	-222	-217	189	-210	-917	883	3144	4106	3420	3635	4989	2789	2541	1751
1951 Federal Surplus/Deficit	2506	1622	606	1095	1027	2932	3403	2903	2798	3462	3856	5887	3700	3017	2758
1952 Federal Surplus/Deficit	3087	1646	536	1795	-61	1257	2601	1298	1425	3846	4229	5997	4233	2454	2328
1953 Federal Surplus/Deficit	1882	245	229	183	33	-953	16	1857	-58	10	1508	4402	3665	2895	1174
1954 Federal Surplus/Deficit	2613	1257	466	360	-45	464	1219	2824	1751	2537	2706	5541	2975	2326	1870
1955 Federal Surplus/Deficit	3794	3617	2730	538	107	552	26	-1532	-1057	86	1005	2426	2894	2066	1083
1956 Federal Surplus/Deficit	3120	2795	145	719	539	2715	3363	1667	3830	3595	3311	5725	2829	2859	2567
1957 Federal Surplus/Deficit	3013	1510	484	562	-185	85	1291	-717	1459	3269	3289	6166	3407	2371	1705
1958 Federal Surplus/Deficit	1062	303	202	200	-60	-817	121	1405	1767	1198	3542	5931	3862	2233	1491
1959 Federal Surplus/Deficit	1063	688	340	163	144	1655	3323	2933	1823	2400	2226	4446	3268	2744	2002
1960 Federal Surplus/Deficit	2958	1334	2791	2829	1578	2288	3226	-657	1332	2864	3963	3543	3629	2626	2395
1961 Federal Surplus/Deficit	2027	118	373	259	-156	-150	1541	2249	2151	2647	1877	4891	3032	2626	1679
1962 Federal Surplus/Deficit	1544	947	37	260	48	-742	1167	-495	-632	3276	3792	4319	3780	3008	1294
1963 Federal Surplus/Deficit	2118	960	183	725	307	1728	2668	318	-340	424	604	4261	4257	2936	1591
1964 Federal Surplus/Deficit	2776	1110	568	23	-15	-578	781	-434	-885	1401	2031	3381	3143	2386	1002
1965 Federal Surplus/Deficit	3087	2274	992	1117	-23	2679	3426	3642	3291	2331	4029	5697	3981	2712	2781
1966 Federal Surplus/Deficit	2961	1737	548	694	-59	242	2695	-669	-749	3506	2130	2977	3095	2913	1405
1967 Federal Surplus/Deficit	2947	691	83	164	-66	-478	3434	3586	700	893	323	3556	3033	2827	1605
1968 Federal Surplus/Deficit	3200	1085	574	361	-218	-308	1864	2033	1490	-919	-21	2694	3535	3301	1417
1969 Federal Surplus/Deficit	3190	1936	1507	1218	663	1331	3569	2962	1098	3470	3667	5874	3462	3198	2584
1970 Federal Surplus/Deficit	2119	550	314	317	-7.6	-629	1332	797	281	-180	950	4198	3933	2502	1230
1971 Federal Surplus/Deficit	919	135	-12	196	330	-738	2980	2963	2638	3215	4121	5925	3136	2731	2029
1972 Federal Surplus/Deficit	3872	2974	796	534	-14	150	3461	3652	3259	2457	3030	5805	3662	2336	2484
1973 Federal Surplus/Deficit	3861	3213	1262	579	-122	441	2316	-1540	-908	-1145	-1143	986	1521	1441	697
1974 Federal Surplus/Deficit	1032	-78	-476	65	-470	1449	2954	2835	4112	3374	3716	5891	3588	2014	2165
1975 Federal Surplus/Deficit	3615	3052	693	-195	-57	-573	2046	883	2415	675	1776	4444	3597	2575	1699
1976 Federal Surplus/Deficit	1471	1081	654	1178	943	3810	3355	2914	1911	3735	3982	6081	3792	2577	2696
1977 Federal Surplus/Deficit	3427	3578	3488	423	-114	-764	194	-1912	-1595	-1528	-1964	-136	314	550	184
1978 Federal Surplus/Deficit	763	378	-165	-219	-269	-506	1363	747	2069	2987	1770	3863	3348	3312	1374
-Ranked Averages-															
Top Ten Percent	2675	1942	781	1066	630	2693	3423	2817	2586	3319	3769	5853	3553	2873	2677
Middle Eighty Percent	2043	1081	510	430	5.9	78	1519	684	1082	1536	2177	4243	3245	2400	1468
Bottom Ten Percent	1908	445	60	177	42	-861	-1405	-1633	-772	-554	-1236	-344	1611	1310	-128

Section 9: Pacific Northwest Regional Exhibits

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Exhibit 18

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

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Exhibit 18: OY 2007 through 2016 Annual Energy

Loads and Resources - Pacific Northwest Region
PNW Loads and Resource Study
2007 - 2016 Operating Years
1937 Water Year
[37] 2006 White Book (Final)

3/31/2006

Energy (aMW)	2007 Avg.	2008 Avg.	2009 Avg.	2010 Avg.	2011 Avg.	2012 Avg.	2013 Avg.	2014 Avg.	2015 Avg.	2016 Avg.
Firm Regional Loads										
Regional Firm Loads	20637	21065	21371	21641	21922	22166	22488	22796	23114	23418
Exports	1002	902	819	913	874	820	782	769	732	691
Federal Diversity	0	0	0	0	0	0	0	0	0	0
Total Firm Regional Loads	21640	21967	22190	22553	22796	22986	23270	23564	23847	24108
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	21650	21978	22201	22564	22806	22997	23280	23575	23857	24119
Hydro Resources										
Regulated Hydro	10662	10684	10739	10765	10772	10776	10790	10805	10816	10827
Independent Hydro	1037	1034	1028	1028	1030	1030	1030	1032	1033	1033
Operational Peaking Adjustment	0	0	0	0	0	0	0	0	0	0
Total Hydro Resources	11698	11718	11767	11793	11802	11806	11821	11836	11848	11859
Other Resources										
Small Thermal & Misc.	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Combustion Turbines	2254	2520	2536	2515	2520	2539	2538	2539	2558	2558
Renewables	80	81	77	81	80	81	80	81	81	80
Cogeneration	1984	1977	1993	1991	1993	1993	1993	1993	1993	1993
Imports	1089	1081	926	873	815	786	788	794	800	803
Large Thermal	5875	6148	5922	6104	5990	6113	6001	6217	5936	6126
Non-Utility Generation	1387	1419	1429	1450	1458	1458	1454	1407	1407	1407
Resource Acquisition	0	0	0	0	0	0	0	0	0	0
Total Other Resources	12668	13226	12883	13014	12858	12971	12854	13031	12774	12966
Total Resources	24366	24944	24650	24807	24659	24777	24674	24867	24623	24825
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	-687	-703	-695	-699	-695	-698	-695	-701	-694	-700
Total Reserves, Maintenance & Losses	-699	-715	-707	-711	-707	-710	-708	-713	-706	-712
Total Net Resources	23667	24229	23943	24096	23952	24067	23967	24154	23917	24114
Surplus/Deficits										
Firm Surplus/Deficit	2028	2262	1753	1542	1156	1081	697	590	70	5.1
Total Surplus/Deficit	2017	2251	1743	1532	1146	1070	686	579	59	-5.6

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Exhibits 19 – 21

***Regional Monthly Energy Analysis Under the 2006 BPA White Book Load
Forecast for 1937-Water Conditions***

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Exhibit 19: OY 2007 Monthly Energy

Loads and Resources - Pacific Northwest Region
PNW Loads and Resource Study
2006 - 2007 Operating Year
1937 Water Year
[37] 2006 White Book (Final)

3/31/2006

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
Firm Regional Loads															
Regional Firm Loads	19816	19812	18638	19094	20945	22982	23469	22468	20840	19694	19683	19308	19784	20617	20637
Exports	1485	1485	1479	912	862	875	873	870	860	873	866	794	1031	1116	1002
Federal Diversity	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Firm Regional Loads	21300	21297	20117	20006	21808	23858	24341	23338	21701	20567	20550	20102	20814	21733	21640
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	21300	21297	20131	20006	21808	23858	24345	23361	21755	20601	20583	20102	20814	21733	21650
Hydro Resources															
Regulated Hydro	11812	10114	9504	10120	11700	12103	9653	9125	9709	10116	9017	9800	13934	11760	10662
Independent Hydro	988	1013	949	957	889	980	743	736	877	1136	1190	1506	1539	1100	1037
Operational Peaking Adjustment	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Hydro Resources	12800	11127	10452	11077	12589	13083	10396	9862	10586	11252	10207	11306	15473	12861	11698
Other Resources															
Small Thermal & Misc.	0	0	0	0	0.2	0.2	0.2	0.2	0	0	0	0	0	0	0.1
Combustion Turbines	2393	2422	2500	2296	2309	2300	2272	2274	1994	1941	1941	2029	2047	2679	2254
Renewables	81	81	81	83	85	87	88	87	86	86	86	61	51	81	80
Cogeneration	2085	2085	1984	2107	2118	2118	2125	2122	1496	2108	2108	1381	2091	2076	1984
Imports	1057	1029	974	965	1230	1443	1264	1174	992	949	929	848	1052	1139	1089
Large Thermal	6318	6318	6190	6225	6323	6323	6323	6323	6283	6304	5833	3398	4391	6329	5875
Non-Utility Generation	1385	1385	1349	1266	1272	1303	1253	1242	1434	1358	1356	1525	1661	1598	1387
Resource Acquisition	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Other Resources	13319	13319	13078	12943	13336	13574	13325	13221	12284	12745	12252	9241	11293	13902	12668
Total Resources	26119	24446	23530	24020	25926	26656	23721	23083	22870	23998	22459	20547	26766	26763	24366
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	-736	-689	-663	-677	-731	-752	-669	-651	-645	-677	-633	-579	-754	-753	-687
Total Reserves, Maintenance & Losses	-766	-713	-672	-686	-735	-752	-669	-651	-650	-684	-641	-599	-769	-803	-699
Total Net Resources	25353	23733	22858	23334	25191	25905	23052	22432	22220	23314	21818	19948	25997	25960	23667
Surplus/Deficits															
Firm Surplus/Deficit	4053	2435	2741	3328	3383	2047	-1289	-906	519	2746	1269	-154	5182	4227	2028
Total Surplus/Deficit	4053	2435	2726	3328	3383	2047	-1293	-929	465	2713	1235	-154	5182	4227	2017

Exhibit 20: OY 2011 Monthly Energy

Loads and Resources - Pacific Northwest Region
 PNW Loads and Resource Study
 2010 - 2011 Operating Year
 1937 Water Year
 [37] 2006 White Book (Final)

3/31/2006

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
<u>Firm Regional Loads</u>															
Regional Firm Loads	21339	21331	20114	20284	22196	24349	24807	23713	22043	20853	20841	20439	21026	21909	21922
Exports	933	934	935	883	839	849	846	845	838	856	847	769	948	950	874
Federal Diversity	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Firm Regional Loads	22272	22265	21049	21167	23035	25198	25653	24558	22880	21709	21688	21208	21974	22859	22796
<u>Non-Firm Regional Loads</u>															
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	22272	22265	21063	21167	23035	25198	25657	24581	22935	21743	21722	21208	21974	22859	22806
<u>Hydro Resources</u>															
Regulated Hydro	12135	10409	9533	10157	11742	12144	9687	9157	9743	10210	9116	9903	14140	12117	10772
Independent Hydro	986	1011	947	958	891	954	731	725	866	1125	1179	1495	1541	1103	1030
Operational Peaking Adjustment	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Hydro Resources	13120	11420	10481	11115	12633	13098	10418	9882	10609	11334	10295	11398	15682	13221	11802
<u>Other Resources</u>															
Small Thermal & Misc.	0	0	0	0	0.2	0.2	0.2	0.2	0	0	0	0	0	0	0.1
Combustion Turbines	2752	2781	2844	2672	2694	2711	2659	2659	2390	2333	2333	1714	2136	2665	2520
Renewables	81	81	81	83	85	87	88	87	86	86	86	61	51	81	80
Cogeneration	2085	2085	2095	2107	2118	2118	2125	2122	1496	2108	2108	1381	2091	2076	1993
Imports	814	785	775	777	888	1012	878	851	771	723	717	674	785	856	815
Large Thermal	6344	6344	6344	6344	6344	6344	6344	6344	6201	5489	5317	4580	4953	6344	5990
Non-Utility Generation	1478	1478	1467	1383	1387	1355	1308	1298	1510	1387	1386	1567	1709	1651	1458
Resource Acquisition	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Other Resources	13553	13552	13605	13366	13515	13626	13402	13361	12454	12126	11947	9975	11725	13672	12858
Total Resources	26673	24972	24086	24480	26148	26724	23820	23243	23063	23460	22242	21373	27407	26893	24659
<u>Reserves & Maintenance</u>															
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	-751	-704	-679	-690	-737	-754	-672	-655	-650	-661	-627	-602	-772	-757	-695
Total Reserves, Maintenance & Losses	-781	-728	-688	-699	-741	-754	-672	-655	-655	-669	-635	-622	-787	-806	-707
Total Net Resources	25891	24244	23399	23781	25407	25970	23149	22588	22408	22791	21607	20751	26620	26086	23952
<u>Surplus/Deficits</u>															
Firm Surplus/Deficit	3620	1979	2349	2614	2372	773	-2505	-1970	-473	1082	-81	-457	4646	3228	1156
Total Surplus/Deficit	3620	1979	2335	2614	2372	773	-2508	-1993	-527	1048	-115	-457	4646	3228	1146

Exhibit 21: OY 2016 Monthly Energy

Loads and Resources - Pacific Northwest Region
PNW Loads and Resource Study
2015 - 2016 Operating Year
1937 Water Year
[37] 2006 White Book (Final)

3/31/2006

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
Firm Regional Loads															
Regional Firm Loads	22859	22853	21501	21695	23676	25952	26536	25096	23616	22334	22319	21852	22449	23457	23418
Exports	762	762	767	719	668	669	668	668	667	696	688	558	725	726	691
Federal Diversity	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Firm Regional Loads	23621	23616	22268	22414	24344	26621	27204	25763	24283	23030	23007	22410	23174	24183	24108
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	23621	23616	22282	22414	24344	26621	27207	25786	24338	23064	23041	22410	23174	24183	24119
Hydro Resources															
Regulated Hydro	12214	10481	9580	10214	11807	12209	9740	9207	9798	10253	9148	9936	14187	12194	10827
Independent Hydro	989	1014	950	960	894	957	735	727	868	1127	1182	1498	1544	1106	1033
Operational Peaking Adjustment	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Hydro Resources	13203	11495	10530	11174	12701	13166	10475	9934	10666	11380	10330	11434	15731	13300	11859
Other Resources															
Small Thermal & Misc.	0	0	0	0	0.2	0.2	0.2	0.2	0	0	0	0	0	0	0.1
Combustion Turbines	2778	2806	2868	2681	2717	2734	2706	2684	2425	2364	2364	1871	2160	2688	2558
Renewables	81	81	81	83	85	87	88	87	86	86	86	62	51	81	80
Cogeneration	2085	2085	2095	2107	2118	2118	2125	2122	1496	2108	2108	1381	2091	2076	1993
Imports	757	729	709	713	808	937	895	874	804	753	750	709	810	880	803
Large Thermal	6344	6344	6344	6344	6344	6344	6344	6344	6283	5680	5634	4910	5911	6344	6126
Non-Utility Generation	1428	1432	1412	1328	1332	1299	1258	1251	1458	1338	1337	1522	1658	1592	1407
Resource Acquisition	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Other Resources	13471	13477	13508	13255	13404	13518	13416	13362	12552	12329	12279	10454	12681	13661	12966
Total Resources	26674	24972	24038	24430	26105	26684	23891	23296	23218	23709	22609	21888	28412	26961	24825
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	-751	-704	-678	-689	-736	-752	-674	-657	-655	-668	-637	-617	-801	-759	-700
Total Reserves, Maintenance & Losses	-781	-728	-686	-698	-740	-752	-674	-657	-660	-676	-645	-637	-815	-808	-712
Total Net Resources	25893	24244	23351	23732	25365	25932	23217	22639	22558	23034	21964	21251	27597	26153	24114
Surplus/Deficits															
Firm Surplus/Deficit	2272	628	1084	1318	1021	-689	-3987	-3125	-1726	3.3	-1043	-1158	4423	1970	5.1
Total Surplus/Deficit	2272	628	1070	1318	1021	-689	-3990	-3148	-1780	-30	-1077	-1158	4423	1970	-5.6

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Exhibits 22 – 24

***Regional Monthly 1-Hour Capacity Analysis
Under the 2006 BPA White Book Load Forecast for 1937-Water Conditions***

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Exhibit 22: OY 2007 Monthly 1-Hour Capacity

Loads and Resources - Pacific Northwest Region
PNW Loads and Resource Study
2006 - 2007 Operating Year
1937 Water Year
[37] 2006 White Book (Final)

3/31/2006

Capacity (MW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul
Firm Regional Loads														
Regional Firm Loads	25822	25883	24339	26275	28962	31508	32471	31093	28316	26393	26405	25628	26099	26954
Exports	2743	2743	2739	1924	1770	1785	1782	1782	1772	1778	1778	1772	2316	2328
Federal Diversity	-490	-492	-625	-434	-376	-629	-383	-394	-462	-465	-468	-589	-582	-460
Total Firm Regional Loads	28075	28134	26453	27765	30356	32664	33870	32480	29626	27706	27715	26810	27833	28821
Non-Firm Regional Loads														
Regional Non-Firm Loads	25	25	39	25	25	25	28	48	79	59	59	25	25	25
Total Non-Firm Regional Loads	25	25	39	25	25	25	28	48	79	59	59	25	25	25
Total Loads	28100	28159	26493	27790	30381	32689	33899	32528	29706	27764	27774	26835	27858	28846
Hydro Resources														
Regulated Hydro	30914	30744	31381	31174	31406	31166	30908	30705	30202	29623	29417	29479	31178	31165
Independent Hydro	1814	1796	1790	1780	1748	1740	1673	1771	1865	1917	1942	2044	2019	1870
Operational Peaking Adjustment	-4405	-6965	-8088	-7694	-6604	-7006	-8659	-8181	-8157	-8261	-9603	-9007	-5250	-5505
Total Hydro Resources	28323	25575	25083	25260	26549	25900	23922	24295	23910	23279	21756	22515	27948	27530
Other Resources														
Small Thermal & Misc.	30	30	30	30	33	33	33	33	30	30	30	30	30	30
Combustion Turbines	3693	3693	3706	3726	3747	3759	3761	3754	3744	3360	3360	3472	3493	4105
Renewables	91	91	91	94	95	97	98	98	97	96	96	43	42	91
Cogeneration	2204	2204	1992	2228	2240	2001	2248	2243	1606	2229	2229	1699	2211	2182
Imports	1281	1248	1144	1113	1532	1725	1630	1622	1186	1077	1091	1042	1323	1353
Large Thermal	7047	7047	6894	6894	7053	7053	7053	7053	7053	7053	6370	3076	4331	7076
Non-Utility Generation	1373	1371	1291	1213	1172	1151	1130	1152	1181	1232	1232	1131	1464	1440
Resource Acquisition	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Other Resources	15720	15685	15147	15297	15871	15818	15953	15955	14897	15076	14407	10493	12893	16277
Total Resources	44043	41260	40230	40556	42421	41719	39875	40249	38807	38355	36163	33008	40841	43807
Reserves & Maintenance														
Hydro Reserves	-1636	-1627	-1659	-1648	-1658	-1645	-1629	-1624	-1603	-1577	-1568	-1576	-1660	-1652
Small Thermal & Misc. Reserves	-370	-369	-355	-365	-364	-352	-364	-364	-333	-347	-347	-319	-362	-392
Contract Reserves	-54	-49	-50	-50	-46	-57	-52	-50	-35	-35	-37	-51	-66	-58
Large Thermal Reserves	-1057	-1057	-1034	-1034	-1058	-1058	-1058	-1058	-1058	-1058	-955	-461	-650	-1061
Regional Hydro Maintenance	-4595	-4032	-3787	-3208	-2935	-2037	-1561	-2286	-2626	-2751	-2483	-2360	-2202	-3720
Spinning Reserves	-826	-771	-738	-762	-806	-807	-775	-766	-748	-731	-679	-618	-791	-824
Regional Transmission Losses	-1189	-1117	-1092	-1122	-1191	-1198	-1154	-1142	-1086	-1067	-1008	-925	-1176	-1209
Total Reserves, Maintenance & Losses	-9727	-9023	-8716	-8188	-8058	-7154	-6593	-7291	-7489	-7566	-7078	-6311	-6906	-8917
Total Net Resources	34315	32238	31515	32368	34363	34564	33283	32959	31318	30789	29085	26698	33934	34890
Surplus/Deficits														
Firm Surplus/Deficit	6241	4104	5061	4603	4007	1901	-588	479	1692	3083	1370	-113	6101	6069
Total Surplus/Deficit	6216	4079	5022	4578	3982	1876	-616	431	1612	3024	1311	-138	6076	6044

Exhibit 23: OY 2011 Monthly 1-Hour Capacity

Loads and Resources - Pacific Northwest Region
 PNW Loads and Resource Study
 2010 - 2011 Operating Year
 1937 Water Year
 [37] 2006 White Book (Final)

3/31/2006

Capacity (MW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul
Firm Regional Loads														
Regional Firm Loads	28090	28080	26200	27834	30546	33302	34326	32797	29856	27840	27852	27140	27770	28682
Exports	1986	1986	1981	1897	1774	1785	1782	1782	1775	1788	1788	1751	1988	1996
Federal Diversity	-619	-619	-777	-520	-455	-773	-465	-482	-557	-553	-556	-694	-670	-526
Total Firm Regional Loads	29457	29446	27404	29210	31865	34314	35643	34097	31074	29075	29084	28196	29088	30152
Non-Firm Regional Loads														
Regional Non-Firm Loads	25	25	39	25	25	25	28	48	79	59	59	25	25	25
Total Non-Firm Regional Loads	25	25	39	25	25	25	28	48	79	59	59	25	25	25
Total Loads	29482	29471	27444	29235	31890	34339	35671	34145	31154	29134	29143	28221	29113	30177
Hydro Resources														
Regulated Hydro	31124	30954	31381	31173	31405	31166	30908	30705	30202	29623	29417	29479	31178	31165
Independent Hydro	1789	1771	1767	1756	1724	1703	1657	1755	1849	1901	1927	2028	2018	1868
Operational Peaking Adjustment	-4213	-6575	-8034	-7630	-6548	-6955	-8659	-8145	-8109	-8148	-9460	-8785	-4970	-4922
Total Hydro Resources	28700	26150	25113	25299	26582	25914	23906	24316	23942	23376	21884	22722	28225	28112
Other Resources														
Small Thermal & Misc.	30	30	30	30	33	33	33	33	30	30	30	30	30	30
Combustion Turbines	4108	4108	4121	4141	4162	4174	4176	4169	4159	3775	3775	2814	3493	4105
Renewables	91	91	91	94	95	97	98	98	97	96	96	43	42	91
Cogeneration	2204	2204	2215	2228	2240	2001	2248	2243	1606	2229	2229	1699	2211	2182
Imports	1036	1001	975	963	1062	1228	1092	1091	995	887	901	889	1067	1068
Large Thermal	7076	7076	7076	7076	7076	7076	7076	7076	7076	5876	5717	4812	5237	7076
Non-Utility Generation	1392	1390	1327	1234	1193	1180	1159	1181	1210	1261	1261	1381	1477	1465
Resource Acquisition	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Other Resources	15938	15902	15835	15767	15860	15789	15883	15891	15174	14154	14008	11667	13555	16017
Total Resources	44638	42052	40949	41066	42442	41703	39789	40207	39116	37530	35893	34389	41781	44128
Reserves & Maintenance														
Hydro Reserves	-1646	-1636	-1657	-1646	-1656	-1643	-1628	-1623	-1603	-1576	-1567	-1575	-1660	-1652
Small Thermal & Misc. Reserves	-391	-391	-389	-386	-386	-374	-386	-386	-355	-370	-370	-298	-363	-394
Contract Reserves	-38	-33	-33	-33	-40	-49	-31	-31	-21	-20	-22	-27	-33	-25
Large Thermal Reserves	-1061	-1061	-1061	-1061	-1061	-1061	-1061	-1061	-1061	-881	-858	-722	-786	-1061
Regional Hydro Maintenance	-4595	-4032	-3787	-3208	-2935	-2037	-1561	-2286	-2626	-2751	-2483	-2360	-2202	-3720
Spinning Reserves	-827	-777	-756	-774	-813	-813	-781	-773	-756	-725	-690	-643	-821	-835
Regional Transmission Losses	-1209	-1143	-1114	-1138	-1191	-1197	-1150	-1141	-1095	-1045	-1002	-964	-1203	-1221
Total Reserves, Maintenance & Losses	-9767	-9074	-8798	-8248	-8082	-7175	-6599	-7301	-7518	-7369	-6991	-6588	-7067	-8908
Total Net Resources	34871	32978	32151	32818	34360	34528	33190	32906	31598	30162	28902	27801	34713	35221
Surplus/Deficits														
Firm Surplus/Deficit	5415	3532	4746	3608	2495	214	-2453	-1191	524	1087	-182	-395	5625	5069
Total Surplus/Deficit	5390	3507	4707	3583	2470	189	-2481	-1239	445	1028	-241	-420	5600	5044

Exhibit 24: OY 2016 Monthly 1-Hour Capacity

Loads and Resources - Pacific Northwest Region
PNW Loads and Resource Study
2015 - 2016 Operating Year
1937 Water Year
[37] 2006 White Book (Final)

3/31/2006

Capacity (MW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul
Firm Regional Loads														
Regional Firm Loads	30459	30451	28376	29976	33070	35929	37124	35509	32289	30063	30074	29420	29921	31127
Exports	1763	1763	1761	1700	1575	1575	1574	1574	1574	1603	1603	1442	1649	1650
Federal Diversity	-654	-655	-814	-549	-479	-815	-493	-509	-589	-586	-588	-771	-718	-564
Total Firm Regional Loads	31567	31559	29322	31127	34165	36689	38205	36574	33274	31080	31088	30092	30852	32213
Non-Firm Regional Loads														
Regional Non-Firm Loads	25	25	39	25	25	25	28	48	79	59	59	25	25	25
Total Non-Firm Regional Loads	25	25	39	25	25	25	28	48	79	59	59	25	25	25
Total Loads	31592	31584	29362	31152	34190	36714	38234	36622	33354	31139	31147	30117	30877	32238
Hydro Resources														
Regulated Hydro	31124	30954	31381	31174	31406	31166	30908	30705	30202	29623	29418	29479	31178	31166
Independent Hydro	1793	1776	1771	1760	1729	1707	1661	1760	1854	1905	1931	2032	2022	1873
Operational Peaking Adjustment	-4121	-6439	-7949	-7534	-6463	-6875	-8659	-8087	-8031	-8095	-9414	-8713	-4909	-4804
Total Hydro Resources	28796	26291	25202	25400	26671	25999	23910	24378	24024	23433	21934	22798	28291	28234
Other Resources														
Small Thermal & Misc.	30	30	30	30	33	33	33	33	30	30	30	30	30	30
Combustion Turbines	4108	4108	4121	4141	4162	4174	4176	4169	4159	3775	3775	3057	3493	4105
Renewables	91	91	91	94	95	97	98	98	97	96	96	43	42	91
Cogeneration	2204	2204	2215	2228	2240	2001	2248	2243	1606	2229	2229	1699	2211	2182
Imports	992	956	919	905	965	1142	1105	1108	1039	923	940	937	1090	1108
Large Thermal	7076	7076	7076	7076	7076	7076	7076	7076	7076	6406	6406	5426	6541	7076
Non-Utility Generation	1331	1329	1265	1173	1132	1119	1099	1121	1150	1201	1201	1321	1416	1403
Resource Acquisition	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Other Resources	15833	15796	15718	15648	15702	15642	15835	15848	15157	14660	14677	12513	14823	15995
Total Resources	44630	42086	40920	41048	42374	41641	39746	40226	39181	38093	36611	35311	43114	44229
Reserves & Maintenance														
Hydro Reserves	-1646	-1636	-1658	-1647	-1657	-1644	-1628	-1623	-1603	-1576	-1567	-1576	-1660	-1652
Small Thermal & Misc. Reserves	-388	-388	-386	-383	-383	-371	-383	-383	-352	-366	-366	-307	-360	-391
Contract Reserves	-28	-22	-22	-23	-30	-39	-35	-35	-25	-24	-27	-31	-38	-30
Large Thermal Reserves	-1061	-1061	-1061	-1061	-1061	-1061	-1061	-1061	-1061	-961	-961	-814	-981	-1061
Regional Hydro Maintenance	-4595	-4032	-3787	-3208	-2935	-2037	-1561	-2286	-2626	-2751	-2483	-2360	-2202	-3720
Spinning Reserves	-828	-779	-757	-775	-813	-814	-779	-773	-757	-740	-710	-667	-860	-837
Regional Transmission Losses	-1209	-1145	-1114	-1137	-1189	-1195	-1149	-1141	-1097	-1061	-1022	-990	-1240	-1224
Total Reserves, Maintenance & Losses	-9755	-9064	-8785	-8235	-8068	-7161	-6597	-7303	-7521	-7480	-7136	-6745	-7340	-8914
Total Net Resources	34875	33022	32135	32813	34306	34480	33148	32923	31660	30613	29475	28565	35773	35315
Surplus/Deficits														
Firm Surplus/Deficit	3308	1463	2813	1686	140	-2209	-5057	-3651	-1614	-467	-1613	-1526	4922	3102
Total Surplus/Deficit	3283	1438	2774	1661	115	-2234	-5085	-3699	-1694	-526	-1672	-1551	4897	3077

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Exhibits 25 – 34

Regional Energy Surpluses and Deficits for 50-Historical Water Conditions

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Exhibit 25: OY 2007 Monthly 50-WY Energy

Regional Surplus/Deficit by Water Year
PNW Loads and Resource Study
2006 - 2007 Operating Year
[37] 2006 White Book (Final)

3/31/2006

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1929 Regional Surplus/Deficit	6766	1751	3183	3206	3951	857	1356	-407	960	1837	1571	-378	6252	4921	2489
1930 Regional Surplus/Deficit	3512	1908	2579	3397	3411	1749	-715	1247	824	2856	1801	-984	3869	5011	2119
1931 Regional Surplus/Deficit	4046	2403	2366	3428	3514	31	-636	-68	554	2643	1033	-1634	3794	4679	1758
1932 Regional Surplus/Deficit	3101	2278	2617	2821	3375	811	-321	-797	3458	8789	10380	8930	9439	7711	4193
1933 Regional Surplus/Deficit	3616	4124	3542	3545	4117	2977	8167	4506	2352	4901	5394	5669	9865	9267	5252
1934 Regional Surplus/Deficit	7265	5898	4275	5736	7126	11931	9888	9323	8023	10213	9978	8661	3954	5489	7590
1935 Regional Surplus/Deficit	2758	2069	2047	3338	4136	1754	7032	8198	929	3738	5865	4596	7768	7652	4555
1936 Regional Surplus/Deficit	5645	2233	2906	3270	3428	2050	-53	-113	621	3202	8324	9809	8144	4798	3714
1937 Regional Surplus/Deficit	4053	2435	2726	3328	3383	2047	-1293	-929	465	2713	1235	-154	5182	4227	2017
1938 Regional Surplus/Deficit	3503	1956	2657	3724	4171	2397	7556	2685	5480	7151	9145	10453	9575	7214	5566
1939 Regional Surplus/Deficit	3565	2131	3378	3630	3612	1619	3826	77	2226	4961	5878	6180	4188	5605	3551
1940 Regional Surplus/Deficit	4577	2386	2523	3725	3446	2070	2618	1732	5777	5484	7907	4326	4289	4669	3779
1941 Regional Surplus/Deficit	2494	1417	2186	3286	3063	1810	2529	330	246	2456	620	1075	4016	3949	2165
1942 Regional Surplus/Deficit	2328	1818	3227	3172	2654	4797	6412	2601	-621	3335	4864	4229	9308	8677	4219
1943 Regional Surplus/Deficit	6055	4043	2795	3374	3984	2293	6684	6805	7131	11451	10868	10173	9890	9670	6584
1944 Regional Surplus/Deficit	6838	3609	3146	3571	3725	2552	2205	-81	-566	1685	114	-1253	2414	3823	2138
1945 Regional Surplus/Deficit	2462	1659	2506	2778	3146	694	-464	195	242	1812	1255	4594	9150	5439	2656
1946 Regional Surplus/Deficit	3798	2290	2507	3322	4180	2333	5692	3723	8127	9026	10345	11212	9364	8733	5994
1947 Regional Surplus/Deficit	6322	3554	3784	3352	4247	7461	8445	8408	8606	7039	7766	8949	8987	8361	6912
1948 Regional Surplus/Deficit	4897	2150	3508	8545	5875	5381	9814	3573	4893	6035	9828	11152	13264	9182	7220
1949 Regional Surplus/Deficit	7512	6914	4355	4260	4102	1994	3148	2910	8789	7670	10593	10529	9250	4265	5829
1950 Regional Surplus/Deficit	3596	1891	2189	3671	4370	1937	5150	8879	10530	10569	10304	8889	9889	9417	6508
1951 Regional Surplus/Deficit	6867	5257	4083	6106	7135	9768	10357	10526	8161	11057	10822	10950	9286	9172	8545
1952 Regional Surplus/Deficit	7235	4696	4026	7453	4521	5487	8084	5887	4907	10552	10821	11301	9913	7025	7105
1953 Regional Surplus/Deficit	5000	2086	3175	3377	3625	895	4199	6895	2370	3698	5713	8094	10102	9466	5037
1954 Regional Surplus/Deficit	6521	4153	3655	4071	4315	4559	5995	8514	5976	8704	8198	9781	9319	9446	6618
1955 Regional Surplus/Deficit	9287	8606	8028	4504	4909	4230	2668	717	-29	3852	4340	3793	9363	9349	5048
1956 Regional Surplus/Deficit	7578	6681	3142	5515	6129	8688	10569	6643	9797	11179	10811	11080	10275	9342	8275
1957 Regional Surplus/Deficit	7260	4668	3826	4898	4124	3893	5533	2484	5541	9564	8790	11328	9815	6577	6097
1958 Regional Surplus/Deficit	3500	2197	3123	3576	3726	2365	3565	6094	5577	6170	9122	10771	9564	6345	5433
1959 Regional Surplus/Deficit	3389	2895	3377	3623	5041	6531	9742	8566	5680	8637	7519	7807	9316	9142	6670
1960 Regional Surplus/Deficit	6912	4114	8429	9474	7868	7512	8388	2300	4977	11126	10523	6185	9160	7559	7349
1961 Regional Surplus/Deficit	5355	2008	3444	3676	4291	2604	6418	7644	6384	8458	6028	8194	9010	7172	5813
1962 Regional Surplus/Deficit	4220	3270	2726	3722	4046	1935	5330	2249	866	9874	10926	7692	8591	7818	4927
1963 Regional Surplus/Deficit	5506	3391	3115	4726	5244	6727	7736	4453	1505	4688	4224	7170	9468	7681	5561
1964 Regional Surplus/Deficit	6300	3485	3726	3356	4474	2182	4898	1957	622	6211	6459	5984	10318	9313	4838
1965 Regional Surplus/Deficit	7514	5981	4798	5515	4313	8376	10512	10492	8515	8178	10972	10385	9890	7764	8074
1966 Regional Surplus/Deficit	7120	5002	3936	4672	4036	3273	8169	1609	1243	10570	6858	5286	7432	8069	5208
1967 Regional Surplus/Deficit	6718	2881	2927	3537	4070	2745	9790	9680	3615	5875	3901	6677	10088	9242	6005
1968 Regional Surplus/Deficit	7154	3451	3758	4443	4066	2671	7090	7570	5735	2000	2837	4490	9259	9090	5491
1969 Regional Surplus/Deficit	7108	5400	5873	6143	6055	5722	10134	8624	4473	11168	10677	11314	9395	8271	7765
1970 Regional Surplus/Deficit	5085	2454	3468	4010	4079	1932	5888	4537	2825	3466	4415	7591	9957	6929	4911
1971 Regional Surplus/Deficit	3497	1655	2802	3656	4638	2545	9007	10318	7766	9696	10521	11035	10163	9736	7029
1972 Regional Surplus/Deficit	8958	7065	4342	4630	4516	3434	10110	10585	10918	11297	9602	10931	11057	9440	8202
1973 Regional Surplus/Deficit	9267	7617	5295	4436	4005	4463	7644	172	597	1337	2010	1403	4202	4823	3930
1974 Regional Surplus/Deficit	3236	1686	1544	3148	3380	6207	10781	10624	10773	11079	10753	10902	11092	9546	7614
1975 Regional Surplus/Deficit	8545	7351	4168	2851	4014	2545	7557	4527	6494	4767	6068	8316	10108	9839	6149
1976 Regional Surplus/Deficit	4622	4238	4220	5936	6704	11228	10516	8772	6116	11310	10501	11282	9814	9330	8271
1977 Regional Surplus/Deficit	9457	9483	9287	4009	3621	1931	2606	-227	-700	569	-716	-717	1544	2967	2810
1978 Regional Surplus/Deficit	2717	1777	1895	2226	3237	2177	5731	4343	6141	9295	6572	7451	7838	9199	5035
-Ranked Averages-															
Top Ten Percent	7108	5844	4117	5540	5760	8299	10413	9404	8701	10604	10542	10926	10064	9010	8273
Middle Eighty Percent	5454	3587	3690	4126	4283	3462	6048	4546	4271	6714	7171	7495	8690	7642	5476
Bottom Ten Percent	4189	2354	2601	3402	3419	1638	418	100	304	2470	961	-590	3855	4338	2039

Exhibit 26: OY 2008 Monthly 50-WY Energy

Regional Surplus/Deficit by Water Year
PNW Loads and Resource Study
2007 - 2008 Operating Year
[37] 2006 White Book (Final)

3/31/2006

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1929 Regional Surplus/Deficit	6954	1934	3465	3369	3964	862	1374	-337	985	1925	1653	550	7403	4815	2723
1930 Regional Surplus/Deficit	3696	2090	2861	3563	3437	1753	-703	1321	849	2945	1886	-58	5018	4908	2355
1931 Regional Surplus/Deficit	4232	2587	2649	3592	3527	35	-624	2.5	578	2734	1114	-706	4940	4570	1991
1932 Regional Surplus/Deficit	3288	2462	2899	2986	3387	815	-310	-727	3488	8888	10479	9873	10597	7630	4433
1933 Regional Surplus/Deficit	3804	4310	3824	3705	4128	2982	8191	4585	2377	4992	5482	6604	11031	9091	5484
1934 Regional Surplus/Deficit	7450	6083	4552	5892	7142	11949	9922	9410	8058	10321	10079	9600	5099	5395	7832
1935 Regional Surplus/Deficit	2943	2250	2328	3492	4148	1758	7055	8280	952	3828	5957	5531	8922	7572	4794
1936 Regional Surplus/Deficit	5833	2416	3186	3434	3447	2055	-39	-43	648	3291	8418	10756	9296	4694	3951
1937 Regional Surplus/Deficit	4238	2616	3006	3494	3409	2050	-1280	-858	490	2800	1317	775	6329	4118	2251
1938 Regional Surplus/Deficit	3687	2136	2936	3885	4182	2400	7581	2761	5512	7250	9238	11396	10732	7130	5806
1939 Regional Surplus/Deficit	3751	2315	3661	3795	3624	1623	3845	148	2254	5053	5969	7119	5336	5506	3788
1940 Regional Surplus/Deficit	4764	2569	2805	3888	3468	2073	2636	1807	5811	5580	7999	5263	5440	4563	4017
1941 Regional Surplus/Deficit	2680	1600	2467	3449	3074	1817	2548	401	272	2544	702	2005	5167	3843	2400
1942 Regional Surplus/Deficit	2515	2002	3504	3328	2667	4807	6438	2675	-597	3427	4953	5164	10468	8604	4459
1943 Regional Surplus/Deficit	6243	4229	3077	3538	3995	2298	6709	6887	7168	11559	10970	11117	11051	9492	6819
1944 Regional Surplus/Deficit	7024	3793	3426	3729	3738	2559	2225	-10	-543	1774	195	-326	3562	3712	2372
1945 Regional Surplus/Deficit	2648	1840	2785	2942	3165	702	-451	268	267	1901	1338	5531	10308	5339	2893
1946 Regional Surplus/Deficit	3983	2474	2785	3487	4192	2338	5713	3803	8163	9125	10444	12155	10519	8657	6235
1947 Regional Surplus/Deficit	6509	3737	4065	3505	4259	7476	8472	8493	8641	7133	7859	9893	10143	8285	7154
1948 Regional Surplus/Deficit	5085	2334	3789	8704	5891	5391	9842	3650	4923	6129	9924	12100	14432	9002	7455
1949 Regional Surplus/Deficit	7699	7101	4636	4415	4113	1999	3169	2987	8829	7767	10692	11474	10405	4155	6068
1950 Regional Surplus/Deficit	3779	2070	2466	3825	4382	1940	5171	8963	10571	10674	10401	9828	11054	9239	6742
1951 Regional Surplus/Deficit	7052	5441	4363	6261	7153	9784	10387	10617	8198	11160	10921	11894	10440	8992	8781
1952 Regional Surplus/Deficit	7424	4884	4309	7610	4535	5498	8110	5968	4940	10657	10922	12250	11071	6938	7348
1953 Regional Surplus/Deficit	5187	2268	3456	3543	3651	904	4220	6979	2397	3785	5801	9033	11268	9288	5272
1954 Regional Surplus/Deficit	6707	4336	3936	4234	4327	4566	6018	8598	6006	8804	8293	10722	10480	9269	6852
1955 Regional Surplus/Deficit	9475	8791	8312	4660	4924	4237	2686	789	-5.2	3944	4425	4725	10530	9175	5279
1956 Regional Surplus/Deficit	7762	6866	3420	5669	6144	8703	10601	6726	9837	11281	10915	12029	11442	9163	8512
1957 Regional Surplus/Deficit	7444	4850	4106	5054	4137	3901	5556	2559	5572	9670	8884	12275	10981	6488	6338
1958 Regional Surplus/Deficit	3685	2379	3404	3739	3739	2369	3586	6176	5608	6263	9219	11717	10725	6252	5674
1959 Regional Surplus/Deficit	3575	3078	3656	3783	5055	6542	9773	8651	5711	8734	7609	8745	10479	8964	6905
1960 Regional Surplus/Deficit	7099	4299	8706	9635	7888	7525	8413	2377	5009	11233	10618	7121	10317	7479	7591
1961 Regional Surplus/Deficit	5543	2190	3724	3836	4304	2609	6440	7727	6417	8554	6119	9131	10173	7084	6054
1962 Regional Surplus/Deficit	4405	3453	3003	3876	4058	1938	5352	2323	892	9976	11026	8629	9746	7738	5165
1963 Regional Surplus/Deficit	5691	3573	3395	4882	5258	6738	7759	4534	1534	4779	4311	8111	10628	7601	5801
1964 Regional Surplus/Deficit	6488	3669	4006	3519	4486	2187	4919	2033	647	6308	6548	6920	11484	9138	5070
1965 Regional Surplus/Deficit	7699	6164	5078	5678	4325	8393	10547	10583	8554	8277	11074	11330	11052	7690	8320
1966 Regional Surplus/Deficit	7310	5190	4220	4839	4053	3284	8193	1683	1270	10670	6947	6223	8583	7992	5450
1967 Regional Surplus/Deficit	6908	3066	3207	3697	4082	2750	9815	9766	3642	5970	3987	7611	11253	9064	6238
1968 Regional Surplus/Deficit	7342	3637	4040	4598	4081	2678	7115	7653	5766	2088	2923	5425	10418	8911	5723
1969 Regional Surplus/Deficit	7297	5588	6147	6297	6067	5728	10166	8711	4507	11274	10778	12261	10552	8193	8008
1970 Regional Surplus/Deficit	5264	2630	3741	4163	4090	1933	5913	4620	2853	3554	4503	8529	11119	6842	5148
1971 Regional Surplus/Deficit	3677	1835	3075	3810	4648	2547	9038	10412	7803	9797	10619	11984	11329	9560	7264
1972 Regional Surplus/Deficit	9141	7248	4614	4784	4526	3440	10139	10677	10962	11403	9693	11879	12224	9263	8438
1973 Regional Surplus/Deficit	9452	7801	5573	4597	4018	4471	7671	244	623	1424	2092	2332	5351	4717	4165
1974 Regional Surplus/Deficit	3419	1865	1818	3304	3389	6215	10819	10716	10814	11185	10856	11848	12259	9375	7852
1975 Regional Surplus/Deficit	8727	7534	4448	3013	4030	2551	7581	4607	6529	4862	6158	9257	11272	9667	6383
1976 Regional Surplus/Deficit	4803	4416	4497	6092	6718	11244	10547	8857	6151	11416	10597	12229	10970	9153	8506
1977 Regional Surplus/Deficit	9645	9670	9574	4172	3641	1944	2625	-156	-678	655	-635	210	2689	2847	3045
1978 Regional Surplus/Deficit	2902	1957	2170	2380	3245	2180	5754	4421	6177	9391	6663	8390	8993	9019	5265
-Ranked Averages-															
Top Ten Percent	7292	6027	4395	5697	5773	8313	10444	9492	8740	10708	10640	11872	11226	8852	8511
Middle Eighty Percent	5640	3770	3970	4286	4296	3469	6071	4625	4302	6811	7263	8435	9848	7519	5714
Bottom Ten Percent	4374	2537	2882	3565	3437	1642	433	171	329	2560	1043	338	5003	4230	2274

Exhibit 27: OY 2009 Monthly 50-WY Energy

Regional Surplus/Deficit by Water Year
PNW Loads and Resource Study
2008 - 2009 Operating Year
[37] 2006 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	6767	1891	3486	3094	3608	434	863	-820	576	584	368	-756	6703	4619	2218
1930 Regional Surplus/Deficit	3485	2050	2882	3288	3081	1325	-1216	838	441	1604	600	-1363	4302	4695	1845
1931 Regional Surplus/Deficit	4027	2552	2670	3317	3171	-393	-1137	-481	170	1393	-171	-2010	4193	4270	1473
1932 Regional Surplus/Deficit	3082	2429	2921	2711	3031	388	-823	-1210	3079	7548	9131	8570	9722	7428	3909
1933 Regional Surplus/Deficit	3599	4289	3845	3431	3771	2556	7682	4106	1968	3651	4197	5302	10158	8659	4945
1934 Regional Surplus/Deficit	7270	6077	4573	5618	6787	11526	9416	8932	7652	8925	8731	8301	4313	5112	7311
1935 Regional Surplus/Deficit	2733	2213	2349	3217	3790	1331	6545	7801	543	2487	4674	4229	8215	7347	4285
1936 Regional Surplus/Deficit	5647	2384	3207	3159	3091	1628	-552	-526	239	1949	7066	9455	8588	4482	3441
1937 Regional Surplus/Deficit	4036	2583	3027	3219	3053	1623	-1793	-1341	82	1459	32	-530	5612	3906	1743
1938 Regional Surplus/Deficit	3483	2101	2957	3611	3825	1972	7072	2278	5105	5909	7953	10094	9856	6940	5286
1939 Regional Surplus/Deficit	3539	2278	3682	3520	3267	1195	3334	-335	1846	3711	4683	5818	4613	5288	3278
1940 Regional Surplus/Deficit	4566	2536	2826	3613	3112	1646	2124	1324	5404	4239	6715	3960	4725	4346	3509
1941 Regional Surplus/Deficit	2467	1560	2488	3174	2718	1390	2036	-83	-137	1203	-583	702	4459	3641	1893
1942 Regional Surplus/Deficit	2302	1971	3525	3053	2310	4381	5929	2192	-1006	2084	3667	3861	9594	8400	3938
1943 Regional Surplus/Deficit	6056	4207	3098	3263	3638	1870	6198	6405	6760	10162	9621	9815	10175	9057	6275
1944 Regional Surplus/Deficit	6842	3767	3447	3454	3381	2130	1713	-494	-951	432	-1090	-1631	2849	3514	1866
1945 Regional Surplus/Deficit	2434	1803	2806	2667	2809	275	-965	-216	-141	559	52	4226	9433	5149	2372
1946 Regional Surplus/Deficit	3772	2440	2806	3212	3835	1909	5201	3321	7756	7785	9159	10789	9645	8447	5708
1947 Regional Surplus/Deficit	6323	3710	4086	3230	3902	7050	7962	8012	8235	5792	6575	8537	9448	8075	6645
1948 Regional Surplus/Deficit	4892	2297	3810	8431	5535	4965	9332	3168	4516	4789	8641	10733	13672	8569	6920
1949 Regional Surplus/Deficit	7518	7099	4658	4140	3757	1572	2658	2504	8423	6425	9344	10106	9529	3960	5542
1950 Regional Surplus/Deficit	3568	2027	2486	3550	4025	1512	4661	8483	10165	9333	9117	8526	10181	8806	6202
1951 Regional Surplus/Deficit	6868	5426	4384	5987	6797	9359	9879	10138	7791	9761	9572	10527	9563	8560	8233
1952 Regional Surplus/Deficit	7244	4867	4330	7337	4178	5071	7601	5486	4533	9257	9572	10884	10195	6755	6820
1953 Regional Surplus/Deficit	4992	2233	3477	3268	3295	477	3707	6498	1988	2444	4516	7731	10394	8855	4732
1954 Regional Surplus/Deficit	6520	4314	3957	3960	3970	4140	5508	8117	5599	7463	7007	9420	9607	8836	6314
1955 Regional Surplus/Deficit	9194	8798	8336	4386	4568	3810	2174	306	-413	2603	3139	3421	9658	8745	4738
1956 Regional Surplus/Deficit	7585	6862	3441	5395	5788	8278	10093	6244	9430	9883	9568	10662	10570	8730	7965
1957 Regional Surplus/Deficit	7263	4831	4127	4779	3780	3474	5046	2076	5164	8331	7599	10908	10109	6289	5814
1958 Regional Surplus/Deficit	3477	2342	3424	3464	3382	1941	3075	5694	5201	4922	7934	10350	9851	6052	5148
1959 Regional Surplus/Deficit	3367	3047	3677	3508	4699	6116	9265	8171	5304	7395	6326	7443	9606	8531	6366
1960 Regional Surplus/Deficit	6918	4275	8730	9363	7532	7100	7904	1895	4602	9838	9269	5819	9442	7261	7066
1961 Regional Surplus/Deficit	5351	2151	3745	3561	3947	2182	5930	7246	6010	7216	4837	7830	9301	6858	5533
1962 Regional Surplus/Deficit	4201	3423	3024	3601	3702	1510	4842	1840	483	8637	9677	7327	9052	7531	4657
1963 Regional Surplus/Deficit	5499	3546	3416	4607	4902	6312	7249	4051	1127	3439	3027	6809	9845	7400	5289
1964 Regional Surplus/Deficit	6302	3643	4027	3244	4129	1759	4409	1551	238	4966	5264	5617	10611	8706	4531
1965 Regional Surplus/Deficit	7519	6154	5100	5404	3969	7967	10040	10103	8147	6936	9724	9981	10177	7523	7798
1966 Regional Surplus/Deficit	7130	5175	4241	4564	3696	2858	7684	1201	861	9331	5664	4922	7867	7760	4942
1967 Regional Surplus/Deficit	6724	3033	3228	3422	3726	2323	9307	9287	3235	4631	2704	6307	10381	8632	5699
1968 Regional Surplus/Deficit	7162	3612	4062	4323	3724	2252	6605	7172	5359	746	1611	4122	9543	8478	5184
1969 Regional Surplus/Deficit	7117	5576	6169	6023	5711	5302	9657	8230	4100	9878	9429	10895	9678	7983	7479
1970 Regional Surplus/Deficit	5068	2594	3762	3888	3734	1506	5403	4139	2444	2213	3220	7225	10244	6667	4630
1971 Regional Surplus/Deficit	3467	1794	3096	3535	4291	2119	8528	9933	7396	8456	9335	10617	10455	9127	6719
1972 Regional Surplus/Deficit	8969	7245	4636	4509	4169	3013	9629	10198	10558	10007	8409	10512	11467	8832	7903
1973 Regional Surplus/Deficit	9188	7804	5595	4322	3661	4044	7161	-240	214	83	807	1028	4636	4505	3656
1974 Regional Surplus/Deficit	3210	1822	1839	3028	3031	5789	10312	10238	10407	9787	9508	10481	11463	8944	7308
1975 Regional Surplus/Deficit	8555	7534	4470	2738	3674	2124	7071	4125	6123	3522	4874	7953	10397	9235	5846
1976 Regional Surplus/Deficit	4604	4392	4518	5817	6362	10819	10039	8378	5743	10019	9313	10862	10094	8722	7960
1977 Regional Surplus/Deficit	9365	9571	9598	3897	3285	1516	2114	-639	-1087	-733	-1954	-1118	1936	2545	2514
1978 Regional Surplus/Deficit	2691	1922	2191	2105	2888	1751	5243	3937	5770	8050	5380	7088	8303	8585	4740
-Ranked Averages-															
Top Ten Percent	7109	6016	4416	5422	5417	7887	9936	9012	8334	9321	9317	10509	10374	8473	7972
Middle Eighty Percent	5439	3742	3991	4011	3940	3042	5561	4143	3894	5460	5961	7116	9029	7224	5188
Bottom Ten Percent	4171	2502	2903	3290	3081	1215	-79	-312	-79	1218	-243	-967	4283	4005	1764

Exhibit 28: OY 2010 Monthly 50-WY Energy

Regional Surplus/Deficit by Water Year
PNW Loads and Resource Study
2009 - 2010 Operating Year
[37] 2006 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	6611	1516	2945	2753	3156	-101	533	-1171	265	364	582	297	6623	4261	2008
1930 Regional Surplus/Deficit	3318	1674	2340	2949	2630	789	-1551	489	130	1385	815	-310	4224	4336	1635
1931 Regional Surplus/Deficit	3828	2175	2129	2977	2720	-927	-1472	-831	-141	1176	44	-956	4115	3911	1261
1932 Regional Surplus/Deficit	2782	1946	2380	2371	2579	-147	-1158	-1561	2769	7335	9357	9635	9651	7071	3692
1933 Regional Surplus/Deficit	3436	3901	3304	3091	3319	2022	7358	3764	1656	3435	4417	6365	10088	8307	4739
1934 Regional Surplus/Deficit	7094	5696	4034	5281	6339	10999	9095	8594	7347	8716	8957	9367	4234	4755	7106
1935 Regional Surplus/Deficit	2459	1753	1808	2877	3338	796	6220	7461	230	2270	4895	5290	8142	6991	4070
1936 Regional Surplus/Deficit	5413	1969	2667	2819	2640	1093	-886	-876	-71	1731	7285	10522	8514	4124	3229
1937 Regional Surplus/Deficit	3846	2210	2485	2879	2602	1087	-2127	-1691	-230	1241	247	523	5533	3547	1532
1938 Regional Surplus/Deficit	3235	1654	2416	3271	3373	1436	6748	1931	4798	5695	8176	11160	9782	6583	5073
1939 Regional Surplus/Deficit	3396	1948	3142	3181	2816	659	3005	-685	1535	3494	4900	6882	4535	4930	3072
1940 Regional Surplus/Deficit	4303	2084	2285	3274	2660	1111	1793	975	5097	4024	6936	5020	4649	3988	3294
1941 Regional Surplus/Deficit	2230	1126	1946	2835	2265	855	1707	-433	-448	983	-367	1758	4383	3280	1678
1942 Regional Surplus/Deficit	2146	1636	2985	2713	1857	3850	5605	1842	-1319	1866	3885	4921	9522	8044	3732
1943 Regional Surplus/Deficit	5891	3844	2557	2924	3186	1335	5872	6060	6453	9951	9845	10881	10102	8700	6070
1944 Regional Surplus/Deficit	6692	3446	2905	3114	2929	1594	1384	-844	-1263	213	-876	-578	2769	3154	1659
1945 Regional Surplus/Deficit	2274	1433	2265	2327	2357	-260	-1300	-566	-453	340	266	5285	9359	4790	2163
1946 Regional Surplus/Deficit	3621	2085	2264	2873	3383	1372	4872	2976	7450	7572	9383	11854	9572	8091	5503
1947 Regional Surplus/Deficit	6160	3379	3545	2889	3450	6519	7638	7669	7930	5577	6798	9601	9375	7719	6441
1948 Regional Surplus/Deficit	4736	1978	3269	8095	5085	4433	9007	2820	4208	4575	8865	11799	13602	8214	6717
1949 Regional Surplus/Deficit	7360	6759	4120	3801	3304	1037	2329	2157	8117	6209	9569	11170	9456	3600	5337
1950 Regional Surplus/Deficit	3418	1683	1944	3210	3573	975	4333	8142	9861	9120	9341	9590	10111	8450	5998
1951 Regional Surplus/Deficit	6718	5094	3844	5649	6347	8829	9556	9798	7485	9549	9797	11593	9489	8205	8031
1952 Regional Surplus/Deficit	7079	4537	3791	7000	3726	4540	7276	5142	4226	9044	9795	11950	10122	6397	6616
1953 Regional Surplus/Deficit	4840	1914	2936	2928	2844	-59	3376	6156	1677	2225	4735	8796	10324	8499	4528
1954 Regional Surplus/Deficit	6364	3986	3417	3620	3519	3607	5181	7776	5292	7251	7229	10486	9537	8482	6111
1955 Regional Surplus/Deficit	8827	8450	7801	4048	4118	3278	1843	-44	-725	2385	3354	4480	9590	8392	4524
1956 Regional Surplus/Deficit	7418	6492	2900	5056	5338	7748	9770	5900	9125	9672	9794	11728	10501	8375	7761
1957 Regional Surplus/Deficit	7102	4506	3586	4440	3328	2941	4719	1727	4854	8120	7822	11973	10040	5931	5609
1958 Regional Surplus/Deficit	3334	2016	2883	3124	2931	1405	2746	5349	4894	4706	8158	11414	9780	5694	4944
1959 Regional Surplus/Deficit	3225	2725	3136	3168	4248	5585	8942	7831	4996	7183	6548	8507	9535	8177	6164
1960 Regional Surplus/Deficit	6750	3947	8194	9027	7085	6570	7579	1548	4294	9629	9494	6883	9370	6905	6864
1961 Regional Surplus/Deficit	5188	1807	3205	3221	3496	1648	5604	6903	5704	7005	5061	8895	9232	6501	5328
1962 Regional Surplus/Deficit	3964	3005	2483	3261	3250	973	4515	1490	172	8427	9902	8391	8977	7174	4445
1963 Regional Surplus/Deficit	5342	3207	2875	4268	4451	5781	6923	3704	818	3222	3246	7873	9771	7044	5085
1964 Regional Surplus/Deficit	6141	3313	3487	2903	3677	1224	4082	1203	-74	4750	5485	6679	10541	8353	4327
1965 Regional Surplus/Deficit	7361	5820	4561	5067	3518	7437	9716	9762	7841	6723	9948	11046	10103	7166	7595
1966 Regional Surplus/Deficit	6977	4856	3701	4225	3245	2325	7359	853	550	9119	5883	5985	7792	7405	4738
1967 Regional Surplus/Deficit	6474	2619	2687	3082	3274	1788	8982	8947	2925	4419	2924	7368	10311	8278	5488
1968 Regional Surplus/Deficit	6993	3269	3522	3983	3272	1718	6280	6827	5052	527	1830	5182	9471	8124	4979
1969 Regional Surplus/Deficit	6949	5250	5632	5686	5261	4771	9333	7889	3793	9668	9654	11962	9606	7626	7277
1970 Regional Surplus/Deficit	4914	2256	3221	3548	3283	971	5076	3794	2134	1995	3441	8287	10172	6308	4425
1971 Regional Surplus/Deficit	3327	1470	2554	3195	3839	1582	8202	9594	7089	8243	9559	11683	10384	8772	6516
1972 Regional Surplus/Deficit	8807	6906	4096	4169	3717	2480	9304	9858	10254	9798	8632	11577	11398	8478	7700
1973 Regional Surplus/Deficit	8820	7460	5056	3983	3209	3511	6836	-590	-98	-137	1022	2084	4559	4146	3440
1974 Regional Surplus/Deficit	2999	1420	1297	2688	2578	5258	9991	9900	10102	9576	9733	11546	11393	8592	7101
1975 Regional Surplus/Deficit	8397	7195	3931	2398	3222	1588	6745	3780	5817	3307	5095	9017	10324	8881	5642
1976 Regional Surplus/Deficit	4472	4083	3978	5479	5913	10290	9715	8037	5436	9808	9537	11927	10019	8368	7759
1977 Regional Surplus/Deficit	8999	9027	9064	3558	2833	981	1786	-990	-1399	-952	-1740	-62	1857	2184	2290
1978 Regional Surplus/Deficit	2389	1456	1649	1764	2436	1214	4915	3589	5465	7837	5604	8152	8228	8228	4524
-Ranked Averages-															
Top Ten Percent	6955	5679	3876	5084	4967	7357	9612	8671	8028	9110	9542	11574	10302	8118	7769
Middle Eighty Percent	5243	3374	3451	3672	3488	2508	5234	3798	3586	5246	6182	8179	8956	6868	4980
Bottom Ten Percent	3983	2126	2361	2951	2629	680	-412	-662	-390	1000	-28	88	4205	3646	1553

Exhibit 29: OY 2011 Monthly 50-WY Energy

Regional Surplus/Deficit by Water Year
PNW Loads and Resource Study
2010 - 2011 Operating Year
[37] 2006 White Book (Final)

3/31/2006

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1929 Regional Surplus/Deficit	6385	1285	2795	2488	2926	-417	155	-1473	-33	172	221	-684	5737	3942	1622
1930 Regional Surplus/Deficit	3090	1442	2190	2684	2401	474	-1932	187	-168	1193	453	-1291	3340	4018	1249
1931 Regional Surplus/Deficit	3600	1944	1979	2712	2491	-1242	-1854	-1134	-439	984	-318	-1936	3231	3592	875
1932 Regional Surplus/Deficit	2555	1716	2231	2106	2349	-462	-1540	-1864	2471	7146	9003	8662	8769	6754	3307
1933 Regional Surplus/Deficit	3211	3672	3155	2826	3088	1709	6983	3467	1357	3243	4058	5391	9209	7994	4356
1934 Regional Surplus/Deficit	6868	5469	3885	5017	6111	10689	8723	8299	7053	8531	8603	8395	3349	4439	6725
1935 Regional Surplus/Deficit	2231	1521	1659	2612	3107	481	5845	7164	-68	2078	4537	4314	7258	6675	3686
1936 Regional Surplus/Deficit	5187	1738	2517	2554	2410	778	-1267	-1179	-369	1539	6924	9551	7631	3806	2844
1937 Regional Surplus/Deficit	3620	1979	2335	2614	2372	773	-2508	-1993	-527	1048	-115	-457	4646	3228	1146
1938 Regional Surplus/Deficit	3007	1423	2266	3007	3143	1120	6373	1630	4502	5505	7818	10188	8898	6266	4689
1939 Regional Surplus/Deficit	3167	1716	2992	2915	2586	343	2627	-987	1237	3301	4539	5909	3651	4612	2687
1940 Regional Surplus/Deficit	4077	1853	2134	3009	2430	796	1414	673	4801	3832	6578	4044	3766	3668	2909
1941 Regional Surplus/Deficit	2002	895	1796	2569	2035	541	1329	-736	-745	790	-729	780	3498	2960	1292
1942 Regional Surplus/Deficit	1918	1405	2835	2448	1626	3536	5230	1540	-1617	1672	3524	3944	8641	7729	3347
1943 Regional Surplus/Deficit	5666	3614	2407	2658	2955	1019	5495	5760	6157	9764	9488	9909	9219	8382	5686
1944 Regional Surplus/Deficit	6466	3217	2755	2849	2699	1278	1006	-1147	-1561	20	-1238	-1558	1883	2832	1272
1945 Regional Surplus/Deficit	2046	1201	2115	2062	2127	-575	-1682	-869	-751	148	-96	4307	8476	4472	1778
1946 Regional Surplus/Deficit	3393	1854	2114	2608	3153	1056	4493	2676	7154	7382	9026	10883	8690	7775	5119
1947 Regional Surplus/Deficit	5934	3149	3396	2623	3219	6206	7262	7369	7636	5385	6441	8628	8493	7403	6058
1948 Regional Surplus/Deficit	4511	1747	3119	7833	4856	4119	8631	2518	3911	4384	8509	10828	12723	7898	6334
1949 Regional Surplus/Deficit	7134	6531	3971	3536	3074	723	1951	1856	7822	6017	9214	10197	8573	3280	4953
1950 Regional Surplus/Deficit	3189	1451	1793	2945	3343	659	3956	7844	9568	8931	8985	8616	9232	8134	5614
1951 Regional Surplus/Deficit	6491	4866	3695	5384	6117	8518	9183	9502	7190	9359	9441	10621	8605	7890	7649
1952 Regional Surplus/Deficit	6853	4309	3642	6737	3496	4226	6901	4841	3930	8854	9437	10979	9239	6079	6233
1953 Regional Surplus/Deficit	4614	1683	2786	2663	2614	-374	2996	5857	1379	2033	4375	7822	9444	8184	4144
1954 Regional Surplus/Deficit	6138	3756	3267	3355	3288	3293	4804	7477	4997	7061	6869	9513	8658	8169	5728
1955 Regional Surplus/Deficit	8604	8223	7655	3783	3888	2965	1464	-346	-1023	2192	2993	3503	8711	8080	4141
1956 Regional Surplus/Deficit	7192	6265	2751	4792	5109	7435	9397	5600	8831	9484	9440	10757	9622	8060	7379
1957 Regional Surplus/Deficit	6876	4277	3436	4174	3097	2627	4343	1424	4556	7932	7464	11000	9161	5613	5226
1958 Regional Surplus/Deficit	3106	1784	2733	2859	2700	1089	2369	5049	4598	4513	7800	10441	8900	5375	4560
1959 Regional Surplus/Deficit	2997	2494	2986	2902	4018	5271	8568	7533	4700	6994	6190	7534	8655	7863	5781
1960 Regional Surplus/Deficit	6524	3718	8048	8765	6857	6259	7204	1247	3997	9445	9139	5908	8487	6588	6481
1961 Regional Surplus/Deficit	4963	1575	3055	2956	3266	1334	5228	6604	5409	6817	4705	7922	8354	6184	4945
1962 Regional Surplus/Deficit	3738	2775	2333	2996	3020	658	4139	1188	-126	8239	9546	7417	8093	6858	4060
1963 Regional Surplus/Deficit	5115	2978	2725	4003	4222	5468	6547	3402	522	3030	2887	6898	8887	6728	4700
1964 Regional Surplus/Deficit	5916	3083	3338	2638	3447	909	3706	903	-371	4557	5126	5703	9661	8040	3943
1965 Regional Surplus/Deficit	7135	5591	4413	4803	3288	7124	9343	9464	7546	6533	9592	10074	9220	6848	7212
1966 Regional Surplus/Deficit	6752	4627	3551	3960	3015	2011	6983	552	252	8930	5525	5011	6909	7090	4354
1967 Regional Surplus/Deficit	6250	2390	2537	2817	3044	1474	8608	8651	2629	4230	2566	6391	9431	7965	5105
1968 Regional Surplus/Deficit	6767	3041	3373	3718	3042	1404	5904	6527	4756	334	1472	4205	8589	7810	4595
1969 Regional Surplus/Deficit	6724	5021	5484	5422	5032	4458	8959	7591	3497	9483	9299	10991	8725	7310	6894
1970 Regional Surplus/Deficit	4689	2025	3072	3283	3054	656	4698	3494	1836	1802	3084	7311	9289	5988	4040
1971 Regional Surplus/Deficit	3099	1238	2403	2930	3609	1266	7826	9298	6793	8053	9203	10711	9504	8457	6133
1972 Regional Surplus/Deficit	8581	6679	3946	3904	3486	2166	8928	9562	9961	9613	8274	10605	10518	8165	7318
1973 Regional Surplus/Deficit	8596	7233	4907	3717	2979	3197	6460	-893	-396	-330	661	1105	3675	3828	3055
1974 Regional Surplus/Deficit	2771	1188	1146	2423	2346	4944	9619	9606	9808	9388	9378	10573	10514	8280	6718
1975 Regional Surplus/Deficit	8171	6967	3782	2132	2992	1273	6369	3480	5522	3116	4737	8042	9442	8567	5258
1976 Regional Surplus/Deficit	4244	3852	3828	5214	5684	9979	9341	7740	5139	9620	9180	10955	9135	8055	7376
1977 Regional Surplus/Deficit	8776	8803	8920	3293	2603	665	1408	-1293	-1697	-1145	-2102	-1039	971	1864	1905
1978 Regional Surplus/Deficit	2162	1224	1499	1499	2205	897	4537	3287	5171	7646	5247	7178	7343	7912	4139
-Ranked Averages-															
Top Ten Percent	6729	5450	3726	4819	4737	7044	9238	8374	7733	8922	9185	10602	9420	7804	7387
Middle Eighty Percent	5017	3144	3302	3407	3258	2194	4857	3498	3289	5055	5824	7205	8074	6551	4596
Bottom Ten Percent	3756	1895	2211	2686	2399	365	-792	-965	-688	807	-389	-892	3320	3326	1167

Exhibit 30: OY 2012 Monthly 50-WY Energy

Regional Surplus/Deficit by Water Year
PNW Loads and Resource Study
2011 - 2012 Operating Year
[37] 2006 White Book (Final)

3/31/2006

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1929 Regional Surplus/Deficit	6019	917	2463	2197	2627	-658	-41	-1500	78	140	355	-807	6737	3744	1546
1930 Regional Surplus/Deficit	2722	1074	1858	2394	2102	233	-2130	161	-56	1161	587	-1414	4341	3821	1173
1931 Regional Surplus/Deficit	3233	1576	1647	2422	2192	-1482	-2052	-1160	-328	952	-184	-2058	4233	3394	800
1932 Regional Surplus/Deficit	2187	1348	1899	1816	2050	-703	-1738	-1890	2582	7116	9143	8544	9773	6557	3232
1933 Regional Surplus/Deficit	2845	3306	2823	2535	2788	1469	6790	3445	1468	3212	4194	5272	10214	7801	4282
1934 Regional Surplus/Deficit	6501	5104	3553	4728	5813	10453	8532	8278	7167	8504	8743	8278	4351	4243	6652
1935 Regional Surplus/Deficit	1863	1153	1327	2321	2808	241	5652	7143	42	2047	4674	4195	8261	6479	3611
1936 Regional Surplus/Deficit	4821	1371	2185	2264	2111	538	-1464	-1205	-258	1506	7058	9435	8634	3608	2769
1937 Regional Surplus/Deficit	3253	1611	2003	2324	2073	532	-2706	-2019	-415	1017	20	-580	5646	3030	1070
1938 Regional Surplus/Deficit	2640	1054	1934	2716	2844	879	6181	1605	4615	5474	7955	10071	9901	6069	4615
1939 Regional Surplus/Deficit	2799	1347	2660	2625	2287	102	2431	-1013	1349	3269	4674	5790	4653	4414	2612
1940 Regional Surplus/Deficit	3710	1485	1802	2719	2131	555	1218	647	4914	3801	6715	3924	4769	3470	2834
1941 Regional Surplus/Deficit	1635	527	1464	2279	1735	300	1134	-763	-634	757	-594	659	4500	2761	1216
1942 Regional Surplus/Deficit	1549	1036	2503	2157	1326	3297	5037	1514	-1507	1640	3659	3823	9645	7533	3272
1943 Regional Surplus/Deficit	5300	3247	2075	2368	2656	778	5300	5735	6269	9736	9626	9792	10222	8186	5611
1944 Regional Surplus/Deficit	6099	2849	2423	2558	2400	1037	811	-1174	-1450	-12	-1104	-1681	2883	2633	1196
1945 Regional Surplus/Deficit	1678	832	1783	1771	1829	-816	-1881	-895	-640	115	38	4185	9479	4274	1702
1946 Regional Surplus/Deficit	3025	1486	1781	2317	2854	814	4296	2651	7267	7352	9164	10766	9694	7579	5044
1947 Regional Surplus/Deficit	5568	2782	3064	2332	2920	5967	7069	7345	7751	5354	6579	8510	9496	7207	5983
1948 Regional Surplus/Deficit	4145	1379	2787	7545	4558	3880	8437	2492	4024	4354	8647	10711	13729	7703	6261
1949 Regional Surplus/Deficit	6768	6166	3639	3245	2774	482	1756	1830	7936	5985	9353	10079	9576	3082	4878
1950 Regional Surplus/Deficit	2821	1081	1460	2654	3043	417	3762	7821	9682	8901	9122	8498	10237	7938	5540
1951 Regional Surplus/Deficit	6123	4499	3363	5094	5819	8279	8990	9481	7303	9330	9580	10504	9606	7695	7575
1952 Regional Surplus/Deficit	6487	3943	3310	6447	3197	3987	6707	4817	4043	8824	9575	10862	10242	5882	6159
1953 Regional Surplus/Deficit	4247	1315	2454	2373	2315	-615	2799	5833	1490	2000	4510	7704	10449	7988	4069
1954 Regional Surplus/Deficit	5771	3389	2935	3065	2989	3053	4610	7454	5110	7031	7005	9396	9663	7975	5654
1955 Regional Surplus/Deficit	8239	7858	7326	3493	3590	2726	1268	-372	-911	2160	3127	3382	9717	7887	4066
1956 Regional Surplus/Deficit	6826	5899	2419	4502	4810	7197	9205	5575	8944	9455	9580	10640	10628	7865	7305
1957 Regional Surplus/Deficit	6510	3910	3104	3884	2798	2387	4149	1398	4668	7903	7601	10882	10166	5416	5151
1958 Regional Surplus/Deficit	2738	1416	2401	2568	2402	848	2174	5025	4712	4481	7937	10323	9904	5177	4485
1959 Regional Surplus/Deficit	2630	2126	2654	2612	3719	5032	8376	7511	4812	6965	6327	7416	9660	7669	5707
1960 Regional Surplus/Deficit	6158	3351	7719	8477	6559	6020	7010	1221	4110	9419	9277	5790	9490	6393	6408
1961 Regional Surplus/Deficit	4597	1207	2723	2666	2967	1094	5035	6580	5522	6788	4843	7804	9359	5988	4871
1962 Regional Surplus/Deficit	3371	2407	2000	2705	2721	416	3945	1162	-14	8211	9684	7298	9095	6662	3986
1963 Regional Surplus/Deficit	4748	2610	2393	3712	3923	5229	6353	3376	635	2998	3023	6779	9889	6532	4626
1964 Regional Surplus/Deficit	5550	2716	3006	2347	3148	668	3511	878	-260	4525	5263	5583	10666	7847	3868
1965 Regional Surplus/Deficit	6769	5225	4082	4513	2989	6885	9151	9441	7660	6503	9730	9957	10223	6651	7139
1966 Regional Surplus/Deficit	6386	4260	3218	3670	2716	1771	6790	526	363	8901	5661	4892	7911	6895	4280
1967 Regional Surplus/Deficit	5884	2022	2205	2526	2745	1233	8415	8630	2742	4201	2703	6270	10436	7771	5031
1968 Regional Surplus/Deficit	6401	2674	3041	3428	2743	1164	5710	6503	4869	302	1609	4085	9593	7616	4520
1969 Regional Surplus/Deficit	6358	4655	5153	5132	4734	4218	8767	7568	3609	9456	9438	10874	9728	7114	6821
1970 Regional Surplus/Deficit	4323	1658	2740	2992	2755	415	4503	3469	1947	1770	3222	7191	10293	5790	3965
1971 Regional Surplus/Deficit	2731	870	2071	2639	3310	1024	7632	9277	6906	8023	9342	10594	10509	8262	6059
1972 Regional Surplus/Deficit	8216	6313	3614	3613	3187	1925	8734	9541	10076	9587	8411	10488	11524	7971	7245
1973 Regional Surplus/Deficit	8231	6867	4576	3427	2679	2956	6266	-919	-284	-362	795	983	4677	3630	2980
1974 Regional Surplus/Deficit	2404	820	814	2132	2046	4704	9428	9585	9922	9360	9518	10456	11519	8086	6645
1975 Regional Surplus/Deficit	7805	6602	3451	1841	2693	1032	6175	3455	5636	3085	4873	7924	10445	8373	5184
1976 Regional Surplus/Deficit	3876	3484	3496	4923	5386	9741	9148	7717	5251	9592	9318	10838	10136	7861	7303
1977 Regional Surplus/Deficit	8412	8439	8592	3003	2304	424	1213	-1319	-1586	-1177	-1968	-1160	1972	1665	1830
1978 Regional Surplus/Deficit	1795	856	1167	1208	1906	655	4342	3261	5285	7616	5385	7059	8345	7716	4064
-Ranked Averages-															
Top Ten Percent	6362	5084	3395	4529	4438	6805	9046	8351	7847	8893	9324	10485	10423	7609	7313
Middle Eighty Percent	4650	2777	2970	3116	2959	1953	4663	3473	3402	5025	5961	7086	9077	6355	4522
Bottom Ten Percent	3388	1527	1879	2395	2101	124	-989	-991	-577	775	-255	-1015	4321	3128	1091

Exhibit 31: OY 2013 Monthly 50-WY Energy

Regional Surplus/Deficit by Water Year
PNW Loads and Resource Study
2012 - 2013 Operating Year
[37] 2006 White Book (Final)

3/31/2006

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1929 Regional Surplus/Deficit	5818	713	2288	1996	2456	-904	-305	-2079	-544	94	116	-1273	5506	3447	1163
1930 Regional Surplus/Deficit	2519	869	1683	2193	1931	-13	-2401	-416	-678	1116	348	-1880	3111	3524	790
1931 Regional Surplus/Deficit	3031	1372	1472	2221	2021	-1728	-2322	-1740	-951	909	-423	-2524	3002	3097	416
1932 Regional Surplus/Deficit	1985	1143	1725	1615	1879	-948	-2009	-2470	1963	7080	8918	8092	8551	6261	2852
1933 Regional Surplus/Deficit	2643	3103	2649	2334	2616	1225	6532	2876	846	3172	3961	4820	8993	7507	3903
1934 Regional Surplus/Deficit	6300	4902	3381	4530	5647	10216	8275	7713	6554	8471	8519	7826	3120	3947	6275
1935 Regional Surplus/Deficit	1660	947	1152	2120	2635	-4.1	5394	6577	-582	2004	4443	3739	7037	6183	3232
1936 Regional Surplus/Deficit	4620	1168	2011	2063	1940	292	-1733	-1784	-879	1463	6827	8983	7409	3312	2388
1937 Regional Surplus/Deficit	3051	1407	1828	2123	1902	286	-2975	-2598	-1038	972	-219	-1046	4415	2733	686
1938 Regional Surplus/Deficit	2438	849	1759	2516	2672	632	5923	1031	4000	5437	7728	9619	8678	5773	4236
1939 Regional Surplus/Deficit	2596	1142	2487	2424	2115	-145	2168	-1592	727	3226	4438	5337	3423	4118	2230
1940 Regional Surplus/Deficit	3509	1282	1628	2518	1960	309	953	70	4298	3761	6484	3467	3542	3174	2453
1941 Regional Surplus/Deficit	1432	322	1289	2078	1564	56	870	-1343	-1256	711	-833	197	3273	2463	834
1942 Regional Surplus/Deficit	1347	832	2329	1956	1154	3056	4780	936	-2130	1596	3424	3366	8424	7238	2892
1943 Regional Surplus/Deficit	5098	3045	1901	2167	2483	533	5041	5164	5654	9701	9400	9340	9000	7890	5233
1944 Regional Surplus/Deficit	5897	2646	2249	2357	2229	790	548	-1753	-2074	-57	-1343	-2147	1652	2335	813
1945 Regional Surplus/Deficit	1475	626	1609	1570	1657	-1062	-2151	-1474	-1263	70	-201	3727	8257	3978	1319
1946 Regional Surplus/Deficit	2822	1283	1606	2117	2682	567	4033	2079	6653	7316	8939	10314	8472	7283	4666
1947 Regional Surplus/Deficit	5367	2579	2890	2131	2747	5728	6811	6776	7137	5315	6352	8057	8274	6911	5606
1948 Regional Surplus/Deficit	3943	1176	2613	7348	4389	3639	8179	1917	3406	4316	8422	10259	12507	7408	5883
1949 Regional Surplus/Deficit	6566	5964	3468	3045	2602	237	1494	1256	7322	5947	9128	9626	8354	2785	4499
1950 Regional Surplus/Deficit	2618	875	1285	2453	2871	170	3501	7255	9069	8865	8897	8047	9016	7643	5161
1951 Regional Surplus/Deficit	5921	4297	3190	4896	5651	8041	8733	8915	6689	9294	9355	10052	8384	7400	7199
1952 Regional Surplus/Deficit	6286	3741	3138	6250	3026	3746	6449	4246	3428	8788	9349	10411	9020	5586	5782
1953 Regional Surplus/Deficit	4046	1112	2279	2171	2144	-861	2534	5265	868	1956	4277	7252	9229	7693	3689
1954 Regional Surplus/Deficit	5570	3186	2762	2865	2818	2811	4350	6887	4493	6995	6778	8945	8442	7681	5276
1955 Regional Surplus/Deficit	8039	7656	7158	3295	3421	2484	1002	-951	-1535	2117	2888	2924	8496	7593	3686
1956 Regional Surplus/Deficit	6624	5698	2245	4303	4641	6958	8948	5005	8331	9420	9356	10188	9407	7571	6929
1957 Regional Surplus/Deficit	6308	3708	2931	3684	2626	2145	3889	821	4049	7868	7374	10430	8946	5120	4772
1958 Regional Surplus/Deficit	2536	1211	2226	2368	2230	601	1912	4454	4095	4441	7711	9871	8683	4881	4106
1959 Regional Surplus/Deficit	2427	1923	2480	2411	3548	4792	8119	6945	4196	6929	6099	6964	8440	7375	5330
1960 Regional Surplus/Deficit	5957	3149	7550	8281	6394	5782	6753	647	3492	9385	9052	5337	8269	6097	6031
1961 Regional Surplus/Deficit	4396	1003	2549	2465	2795	849	4775	6011	4907	6753	4617	7352	8139	5692	4493
1962 Regional Surplus/Deficit	3169	2205	1825	2504	2549	169	3685	584	-637	8176	9459	6846	7871	6367	3606
1963 Regional Surplus/Deficit	4547	2408	2218	3513	3753	4989	6093	2802	16	2956	2787	6327	8667	6236	4247
1964 Regional Surplus/Deficit	5349	2513	2833	2146	2976	423	3251	302	-883	4486	5032	5130	9445	7553	3489
1965 Regional Surplus/Deficit	6568	5023	3910	4315	2818	6646	8894	8875	7046	6466	9504	9505	9001	6355	6762
1966 Regional Surplus/Deficit	6184	4058	3045	3470	2545	1529	6532	-50	-259	8865	5428	4439	6685	6600	3900
1967 Regional Surplus/Deficit	5683	1820	2030	2325	2573	988	8157	8064	2123	4166	2472	5816	9216	7477	4653
1968 Regional Surplus/Deficit	6200	2472	2868	3228	2572	921	5452	5933	4253	256	1375	3628	8371	7321	4142
1969 Regional Surplus/Deficit	6157	4453	4984	4934	4565	3978	8509	7002	2993	9422	9213	10423	8507	6819	6445
1970 Regional Surplus/Deficit	4122	1454	2565	2791	2584	170	4243	2899	1326	1726	2990	6737	9071	5493	3585
1971 Regional Surplus/Deficit	2529	665	1895	2438	3138	777	7374	8711	6292	7987	9116	10142	9288	7967	5681
1972 Regional Surplus/Deficit	8014	6112	3441	3412	3015	1682	8476	8975	9464	9553	8185	10037	10303	7677	6868
1973 Regional Surplus/Deficit	8030	6666	4404	3227	2507	2714	6008	-1498	-907	-409	557	520	3448	3333	2598
1974 Regional Surplus/Deficit	2202	614	638	1930	1873	4464	9170	9020	9308	9325	9293	10004	10298	7792	6268
1975 Regional Surplus/Deficit	7604	6401	3279	1640	2521	786	5916	2884	5022	3047	4644	7472	9223	8079	4806
1976 Regional Surplus/Deficit	3674	3281	3323	4724	5218	9503	8891	7151	4635	9557	9092	10386	8914	7567	6926
1977 Regional Surplus/Deficit	8211	8238	8424	2803	2133	178	950	-1899	-2211	-1224	-2207	-1624	739	1366	1447
1978 Regional Surplus/Deficit	1593	650	992	1006	1733	409	4080	2685	4671	7579	5158	6607	7122	7420	3685
-Ranked Averages-															
Top Ten Percent	6160	4882	3222	4330	4268	6566	8788	7784	7233	8858	9098	10034	9202	7314	6937
Middle Eighty Percent	4449	2573	2796	2916	2788	1710	4402	2900	2783	4986	5731	6632	7854	6060	4143
Bottom Ten Percent	3186	1323	1704	2194	1929	-122	-1256	-1570	-1199	730	-494	-1480	3090	2830	708

Exhibit 32: OY 2014 Monthly 50-WY Energy

Regional Surplus/Deficit by Water Year
PNW Loads and Resource Study
2013 - 2014 Operating Year
[37] 2006 White Book (Final)

3/31/2006

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1929 Regional Surplus/Deficit	5541	433	2016	1679	2118	-1279	-679	-2374	-752	73	268	-708	6302	3191	1056
1930 Regional Surplus/Deficit	2240	589	1411	1877	1594	-389	-2781	-709	-887	1096	500	-1315	3908	3269	683
1931 Regional Surplus/Deficit	2752	1093	1200	1905	1684	-2103	-2702	-2035	-1160	891	-271	-1958	3797	2840	308
1932 Regional Surplus/Deficit	1707	864	1453	1300	1542	-1324	-2388	-2766	1757	7069	9084	8672	9357	6007	2748
1933 Regional Surplus/Deficit	2366	2826	2378	2019	2278	852	6165	2593	636	3156	4120	5399	9799	7254	3801
1934 Regional Surplus/Deficit	6022	4626	3112	4217	5314	9849	7909	7433	6354	8461	8686	8407	3916	3693	6175
1935 Regional Surplus/Deficit	1382	666	881	1804	2297	-379	5026	6295	-792	1985	4604	4315	7840	5929	3128
1936 Regional Surplus/Deficit	4342	889	1740	1747	1603	-83	-2111	-2079	-1088	1443	6986	9563	8212	3057	2282
1937 Regional Surplus/Deficit	2773	1127	1556	1807	1565	-89	-3354	-2893	-1246	951	-66	-479	5210	2477	579
1938 Regional Surplus/Deficit	2160	569	1487	2201	2334	257	5557	740	3797	5425	7891	10199	9483	5518	4133
1939 Regional Surplus/Deficit	2317	862	2216	2109	1778	-520	1796	-1887	520	3208	4594	5916	4220	3863	2125
1940 Regional Surplus/Deficit	3231	1003	1356	2203	1623	-66	579	-223	4096	3745	6643	4042	4341	2918	2348
1941 Regional Surplus/Deficit	1154	42	1017	1763	1226	-318	498	-1638	-1465	690	-680	766	4072	2207	728
1942 Regional Surplus/Deficit	1068	552	2058	1641	816	2686	4413	644	-2340	1576	3581	3940	9229	6984	2788
1943 Regional Surplus/Deficit	4821	2767	1630	1851	2145	158	4673	4878	5453	9691	9565	9920	9805	7635	5131
1944 Regional Surplus/Deficit	5619	2369	1977	2041	1891	414	175	-2048	-2283	-79	-1191	-1582	2447	2077	706
1945 Regional Surplus/Deficit	1197	344	1337	1253	1320	-1437	-2531	-1768	-1472	49	-49	4301	9061	3722	1213
1946 Regional Surplus/Deficit	2544	1005	1333	1801	2345	190	3662	1792	6452	7304	9104	10894	9278	7029	4563
1947 Regional Surplus/Deficit	5089	2302	2620	1815	2409	5359	6444	6492	6937	5300	6515	8637	9079	6657	5504
1948 Regional Surplus/Deficit	3666	898	2342	7037	4055	3268	7811	1626	3202	4302	8587	10839	13311	7154	5781
1949 Regional Surplus/Deficit	6288	5688	3200	2730	2265	-137	1123	966	7121	5933	9294	10206	9159	2528	4397
1950 Regional Surplus/Deficit	2340	594	1012	2137	2533	-207	3130	6973	8870	8854	9062	8626	9822	7389	5059
1951 Regional Surplus/Deficit	5643	4020	2920	4582	5318	7673	8367	8634	6488	9282	9521	10632	9188	7146	7099
1952 Regional Surplus/Deficit	6008	3464	2869	5938	2689	3376	6082	3959	3226	8776	9514	10991	9824	5330	5680
1953 Regional Surplus/Deficit	3768	833	2008	1855	1807	-1237	2160	4982	660	1937	4435	7831	10035	7439	3586
1954 Regional Surplus/Deficit	5292	2909	2491	2549	2480	2438	3981	6604	4290	6984	6941	9525	9248	7427	5175
1955 Regional Surplus/Deficit	7762	7380	6892	2981	3086	2112	628	-1245	-1745	2097	3041	3499	9302	7340	3583
1956 Regional Surplus/Deficit	6347	5421	1974	3989	4307	6590	8582	4719	8130	9409	9522	10768	10213	7317	6828
1957 Regional Surplus/Deficit	6031	3430	2660	3370	2288	1773	3520	529	3843	7857	7538	11010	9752	4865	4670
1958 Regional Surplus/Deficit	2258	931	1955	2052	1892	225	1541	4168	3893	4425	7875	10450	9489	4625	4003
1959 Regional Surplus/Deficit	2149	1645	2209	2095	3212	4422	7753	6663	3993	6918	6262	7544	9246	7121	5229
1960 Regional Surplus/Deficit	5679	2871	7284	7969	6062	5414	6386	356	3287	9375	9218	5916	9074	5843	5930
1961 Regional Surplus/Deficit	4119	724	2278	2150	2458	475	4406	5727	4705	6742	4781	7932	8945	5437	4391
1962 Regional Surplus/Deficit	2891	1927	1553	2189	2211	-208	3316	291	-846	8166	9624	7425	8674	6112	3502
1963 Regional Surplus/Deficit	4269	2130	1947	3198	3417	4619	5725	2513	-189	2937	2943	6905	9471	5982	4144
1964 Regional Surplus/Deficit	5072	2235	2563	1829	2638	47	2881	12	-1092	4472	5193	5708	10251	7300	3385
1965 Regional Surplus/Deficit	6291	4746	3641	4003	2481	6278	8528	8592	6845	6454	9669	10085	9806	6100	6662
1966 Regional Surplus/Deficit	5907	3781	2774	3155	2208	1157	6165	-342	-467	8853	5586	5017	7486	6346	3797
1967 Regional Surplus/Deficit	5406	1542	1758	2009	2235	614	7790	7783	1917	4154	2632	6395	10022	7224	4551
1968 Regional Surplus/Deficit	5923	2195	2598	2913	2235	549	5084	5648	4051	234	1531	4203	9177	7068	4039
1969 Regional Surplus/Deficit	5880	4176	4717	4622	4230	3607	8143	6719	2791	9412	9379	11003	9313	6564	6344
1970 Regional Surplus/Deficit	3845	1175	2294	2476	2247	-205	3874	2613	1118	1706	3149	7315	9876	5237	3482
1971 Regional Surplus/Deficit	2250	386	1623	2122	2801	401	7007	8430	6090	7975	9282	10722	10094	7713	5579
1972 Regional Surplus/Deficit	7737	5835	3171	3096	2677	1310	8109	8694	9264	9543	8350	10617	11108	7424	6767
1973 Regional Surplus/Deficit	7753	6389	4135	2911	2170	2342	5641	-1793	-1116	-432	709	1088	4246	3078	2493
1974 Regional Surplus/Deficit	1923	332	365	1614	1533	4095	8804	8740	9108	9315	9460	10584	11104	7539	6167
1975 Regional Surplus/Deficit	7327	6124	3010	1323	2183	411	5548	2596	4821	3033	4805	8051	10028	7826	4704
1976 Regional Surplus/Deficit	3395	3002	3052	4410	4884	9135	8524	6870	4432	9546	9257	10966	9718	7314	6825
1977 Regional Surplus/Deficit	7935	7962	8159	2488	1795	-198	578	-2194	-2422	-1247	-2055	-1056	1533	1107	1341
1978 Regional Surplus/Deficit	1315	368	720	689	1395	33	3710	2395	4471	7567	5322	7186	7926	7166	3581
-Ranked Averages-															
Top Ten Percent	5883	4605	2952	4016	3933	6197	8422	7502	7032	8847	9264	10614	10007	7060	6836
Middle Eighty Percent	4171	2295	2526	2601	2451	1336	4033	2612	2578	4971	5893	7210	8658	5805	4040
Bottom Ten Percent	2908	1044	1432	1879	1592	-497	-1633	-1865	-1408	710	-342	-914	3887	2574	601

Exhibit 33: OY 2015 Monthly 50-WY Energy

Regional Surplus/Deficit by Water Year
PNW Loads and Resource Study
2014 - 2015 Operating Year
[37] 2006 White Book (Final)

3/31/2006

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1929 Regional Surplus/Deficit	5287	184	1767	1433	1837	-1585	-956	-2620	-963	-856	-704	-2207	4821	2953	536
1930 Regional Surplus/Deficit	1987	338	1162	1632	1314	-695	-3063	-952	-1098	167	-472	-2814	2426	3031	163
1931 Regional Surplus/Deficit	2499	843	952	1660	1403	-2409	-2985	-2281	-1372	-36	-1243	-3457	2314	2601	-212
1932 Regional Surplus/Deficit	1454	613	1205	1054	1261	-1629	-2670	-3012	1549	6147	8123	7183	7882	5768	2230
1933 Regional Surplus/Deficit	2113	2577	2131	1773	1996	548	5893	2355	425	2231	3153	3910	8325	7015	3284
1934 Regional Surplus/Deficit	5769	4377	2866	3975	5038	9550	7636	7198	6150	7540	7724	6918	2433	3454	5660
1935 Regional Surplus/Deficit	1129	415	632	1558	2015	-684	4753	6060	-1004	1058	3638	2823	6364	5691	2611
1936 Regional Surplus/Deficit	4089	640	1492	1502	1322	-389	-2392	-2325	-1298	515	6021	8074	6735	2818	1764
1937 Regional Surplus/Deficit	2520	877	1308	1562	1285	-395	-3636	-3138	-1457	22	-1038	-1978	3728	2239	59
1938 Regional Surplus/Deficit	1907	318	1239	1956	2053	-49	5284	498	3592	4504	6928	8710	8008	5280	3617
1939 Regional Surplus/Deficit	2064	612	1969	1864	1497	-827	1519	-2133	310	2282	3624	4426	2738	3624	1607
1940 Regional Surplus/Deficit	2978	753	1108	1958	1342	-372	301	-466	3890	2821	5677	2550	2862	2680	1831
1941 Regional Surplus/Deficit	901	-208	769	1518	945	-623	221	-1883	-1675	-240	-1652	-730	2593	1968	209
1942 Regional Surplus/Deficit	815	302	1811	1396	535	2384	4140	400	-2552	649	2613	2448	7755	6746	2271
1943 Regional Surplus/Deficit	4568	2519	1382	1606	1864	-147	4400	4641	5249	8770	8603	8432	8331	7396	4615
1944 Regional Surplus/Deficit	5366	2120	1730	1796	1610	109	-101	-2294	-2495	-1008	-2163	-3081	964	1838	186
1945 Regional Surplus/Deficit	944	93	1089	1008	1039	-1743	-2813	-2013	-1684	-879	-1021	2808	7587	3484	694
1946 Regional Surplus/Deficit	2290	756	1085	1556	2064	-116	3386	1552	6248	6383	8143	9406	7803	6791	4047
1947 Regional Surplus/Deficit	4836	2053	2373	1570	2128	5060	6171	6255	6733	4377	5553	7148	7605	6419	4989
1948 Regional Surplus/Deficit	3413	649	2094	6794	3776	2966	7539	1384	2995	3380	7625	9351	11836	6916	5265
1949 Regional Surplus/Deficit	6035	5439	2955	2486	1984	-442	847	725	6917	5011	8332	8717	7684	2290	3881
1950 Regional Surplus/Deficit	2086	343	763	1892	2252	-513	2855	6737	8666	7933	8101	7138	8348	7151	4543
1951 Regional Surplus/Deficit	5390	3771	2674	4339	5041	7374	8095	8399	6284	8361	8560	9143	7714	6908	6584
1952 Regional Surplus/Deficit	5755	3215	2622	5696	2408	3075	5810	3721	3020	7855	8552	9502	8350	5092	5165
1953 Regional Surplus/Deficit	3515	584	1760	1610	1526	-1543	1883	4746	450	1009	3468	6343	8561	7201	3069
1954 Regional Surplus/Deficit	5039	2660	2244	2305	2200	2135	3707	6368	4084	6062	5979	8036	7774	7189	4659
1955 Regional Surplus/Deficit	7509	7131	6648	2737	2807	1809	349	-1490	-1957	1170	2069	2006	7828	7102	3065
1956 Regional Surplus/Deficit	6094	5172	1727	3745	4028	6290	8309	4481	7926	8487	8560	9279	8738	7079	6313
1957 Regional Surplus/Deficit	5778	3182	2413	3125	2007	1471	3246	285	3636	6936	6577	9521	8277	4627	4154
1958 Regional Surplus/Deficit	2004	680	1707	1807	1612	-81	1265	3929	3687	3502	6914	8961	8015	4387	3486
1959 Regional Surplus/Deficit	1896	1396	1961	1850	2932	4122	7480	6427	3786	5996	5299	6055	7772	6883	4714
1960 Regional Surplus/Deficit	5426	2622	7040	7727	5787	5115	6113	114	3080	8454	8256	4427	7599	5605	5416
1961 Regional Surplus/Deficit	3866	474	2031	1905	2177	170	4132	5489	4500	5821	3819	6443	7470	5199	3876
1962 Regional Surplus/Deficit	2638	1678	1305	1943	1930	-515	3041	48	-1057	7244	8663	5936	7199	5874	2985
1963 Regional Surplus/Deficit	4016	1881	1699	2954	3138	4319	5451	2273	-398	2010	1973	5416	7996	5743	3628
1964 Regional Surplus/Deficit	4819	1986	2316	1583	2357	-258	2606	-231	-1303	3550	4228	4220	8777	7061	2868
1965 Regional Surplus/Deficit	6038	4497	3396	3760	2200	5979	8256	8357	6641	5533	8708	8596	8332	5862	6147
1966 Regional Surplus/Deficit	5654	3532	2527	2911	1927	854	5892	-585	-678	7932	4618	3527	6008	6108	3280
1967 Regional Surplus/Deficit	5153	1293	1510	1763	1954	309	7518	7548	1708	3233	1665	4906	8547	6986	4035
1968 Regional Surplus/Deficit	5670	1946	2351	2668	1954	246	4812	5411	3845	-695	562	2711	7702	6830	3523
1969 Regional Surplus/Deficit	5627	3927	4473	4379	3951	3306	7870	6484	2586	8491	8418	9514	7838	6326	5830
1970 Regional Surplus/Deficit	3591	925	2046	2230	1966	-510	3601	2375	908	778	2182	5826	8401	4999	2965
1971 Regional Surplus/Deficit	1997	135	1374	1877	2520	95	6734	8194	5886	7053	8320	9233	8620	7475	5064
1972 Regional Surplus/Deficit	7484	5586	2924	2851	2395	1006	7837	8459	9060	8622	7388	9128	9633	7186	6252
1973 Regional Surplus/Deficit	7500	6140	3889	2666	1889	2040	5368	-2038	-1327	-1362	-262	-409	2766	2839	1974
1974 Regional Surplus/Deficit	1670	81	116	1368	1251	3795	8532	8504	8904	8393	8498	9095	9629	7301	5651
1975 Regional Surplus/Deficit	7074	5875	2764	1077	1902	106	5275	2357	4617	2110	3840	6562	8554	7587	4188
1976 Regional Surplus/Deficit	3142	2753	2805	4167	4606	8835	8252	6634	4227	8624	8295	9477	8243	7076	6311
1977 Regional Surplus/Deficit	7682	7713	7914	2243	1514	-503	301	-2440	-2635	-2177	-3027	-2554	49	867	821
1978 Regional Surplus/Deficit	1062	117	471	443	1114	-272	3436	2153	4267	6646	4360	5698	6452	6928	3065
-Ranked Averages-															
Top Ten Percent	5629	4356	2705	3772	3654	5897	8150	7266	6828	7926	8302	9125	8532	6822	6321
Middle Eighty Percent	3918	2045	2279	2356	2171	1032	3758	2372	2371	4047	4928	5720	7183	5567	3523
Bottom Ten Percent	2655	794	1184	1633	1311	-802	-1913	-2110	-1619	-219	-1314	-2412	2405	2335	81

Exhibit 34: OY 2016 Monthly 50-WY Energy

Regional Surplus/Deficit by Water Year
PNW Loads and Resource Study
2015 - 2016 Operating Year
[37] 2006 White Book (Final)

3/31/2006

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1929 Regional Surplus/Deficit	5039	-66	1528	1189	1574	-1880	-1306	-2629	-1286	-910	-742	-1387	5516	2684	472
1930 Regional Surplus/Deficit	1739	88	923	1388	1050	-990	-3418	-959	-1421	114	-510	-1995	3120	2762	98
1931 Regional Surplus/Deficit	2251	594	713	1416	1139	-2703	-3340	-2291	-1696	-86	-1281	-2637	3007	2332	-277
1932 Regional Surplus/Deficit	1206	363	966	810	997	-1924	-3025	-3022	1229	6102	8095	8013	8585	5499	2168
1933 Regional Surplus/Deficit	1865	2329	1893	1529	1732	256	5547	2354	102	2182	3119	4740	9027	6746	3223
1934 Regional Surplus/Deficit	5521	4129	2630	3733	4778	9261	7291	7198	5833	7494	7696	7748	3128	3185	5600
1935 Regional Surplus/Deficit	880	165	394	1314	1751	-978	4407	6061	-1329	1007	3606	3651	7065	5421	2549
1936 Regional Surplus/Deficit	3841	392	1254	1258	1058	-684	-2746	-2335	-1620	464	5990	8904	7435	2549	1701
1937 Regional Surplus/Deficit	2272	628	1070	1318	1021	-689	-3990	-3148	-1780	-30	-1077	-1158	4423	1970	-5.6
1938 Regional Surplus/Deficit	1659	68	1000	1712	1788	-344	4939	492	3274	4459	6899	9540	8711	5010	3555
1939 Regional Surplus/Deficit	1816	362	1731	1621	1233	-1122	1169	-2142	-12	2231	3588	5256	3433	3355	1543
1940 Regional Surplus/Deficit	2730	504	869	1714	1078	-666	-50	-474	3573	2773	5645	3377	3559	2410	1768
1941 Regional Surplus/Deficit	652	-458	530	1274	681	-916	-128	-1893	-1998	-293	-1691	92	3291	1699	145
1942 Regional Surplus/Deficit	567	53	1574	1152	271	2094	3795	393	-2876	598	2579	3275	8457	6477	2209
1943 Regional Surplus/Deficit	4320	2270	1145	1362	1600	-440	4055	4639	4933	8724	8575	9262	9033	7127	4555
1944 Regional Surplus/Deficit	5118	1871	1492	1552	1347	-186	-451	-2304	-2820	-1061	-2201	-2262	1658	1568	122
1945 Regional Surplus/Deficit	696	-158	850	763	775	-2037	-3168	-2022	-2007	-932	-1059	3635	8289	3215	630
1946 Regional Surplus/Deficit	2042	508	846	1312	1800	-411	3037	1548	5932	6338	8114	10236	8506	6521	3986
1947 Regional Surplus/Deficit	4588	1805	2136	1326	1864	4771	5826	6255	6417	4330	5523	7978	8307	6149	4929
1948 Regional Surplus/Deficit	3165	401	1857	6553	3515	2676	7193	1379	2676	3333	7597	10180	12537	6647	5205
1949 Regional Surplus/Deficit	5787	5191	2720	2243	1720	-736	498	720	6601	4965	8304	9547	8387	2021	3820
1950 Regional Surplus/Deficit	1838	92	524	1648	1988	-808	2507	6738	8350	7887	8072	7967	9050	6882	4483
1951 Regional Surplus/Deficit	5142	3523	2437	4097	4780	7085	7749	8400	5968	8316	8532	9973	8416	6639	6525
1952 Regional Surplus/Deficit	5507	2967	2386	5455	2145	2785	5464	3718	2702	7810	8524	10332	9052	4823	5105
1953 Regional Surplus/Deficit	3267	336	1521	1366	1263	-1838	1533	4746	127	957	3435	7173	9263	6932	3007
1954 Regional Surplus/Deficit	4791	2412	2006	2061	1936	1844	3361	6369	3765	6017	5951	8866	8476	6920	4599
1955 Regional Surplus/Deficit	7261	6883	6414	2495	2545	1517	-2	-1500	-2281	1119	2031	2833	8530	6833	3003
1956 Regional Surplus/Deficit	5846	4924	1489	3503	3767	6002	7964	4479	7610	8442	8532	10109	9441	6809	6254
1957 Regional Surplus/Deficit	5530	2933	2176	2883	1743	1180	2899	278	3316	6890	6549	10351	8980	4357	4093
1958 Regional Surplus/Deficit	1756	431	1469	1563	1348	-376	917	3927	3368	3454	6886	9791	8717	4118	3425
1959 Regional Surplus/Deficit	1648	1147	1722	1606	2670	3833	7135	6428	3468	5951	5269	6885	8474	6614	4654
1960 Regional Surplus/Deficit	5178	2374	6806	7486	5528	4826	5768	109	2761	8409	8228	5257	8302	5335	5356
1961 Regional Surplus/Deficit	3618	225	1793	1661	1914	-124	3785	5488	4183	5775	3790	7273	8172	4930	3815
1962 Regional Surplus/Deficit	2390	1430	1066	1699	1666	-811	2694	40	-1380	7199	8635	6766	7900	5605	2923
1963 Regional Surplus/Deficit	3768	1633	1460	2712	2875	4029	5104	2269	-718	1959	1936	6246	8699	5474	3567
1964 Regional Surplus/Deficit	4571	1738	2078	1339	2093	-553	2258	-237	-1626	3504	4196	5050	9479	6792	2806
1965 Regional Surplus/Deficit	5789	4249	3159	3518	1936	5690	7910	8358	6325	5488	8680	9426	9034	5592	6088
1966 Regional Surplus/Deficit	5406	3284	2290	2668	1664	563	5546	-593	-1001	7887	4583	4356	6706	5838	3218
1967 Regional Surplus/Deficit	4905	1045	1271	1519	1691	15	7172	7549	1387	3188	1631	5736	9249	6717	3974
1968 Regional Surplus/Deficit	5422	1697	2114	2425	1691	-45	4466	5409	3527	-748	526	3538	8405	6561	3462
1969 Regional Surplus/Deficit	5379	3679	4238	4138	3690	3015	7525	6485	2268	8446	8390	10344	8540	6057	5771
1970 Regional Surplus/Deficit	3343	676	1807	1987	1702	-804	3254	2373	586	726	2148	6656	9104	4730	2904
1971 Regional Surplus/Deficit	1749	-114	1136	1633	2256	-199	6389	8195	5570	7008	8292	10063	9322	7206	5003
1972 Regional Surplus/Deficit	7236	5338	2686	2607	2131	714	7491	8459	8744	8577	7360	9958	10335	6917	6192
1973 Regional Surplus/Deficit	7252	5892	3652	2423	1625	1748	5023	-2047	-1651	-1417	-301	413	3462	2570	1911
1974 Regional Surplus/Deficit	1422	-170	-124	1124	986	3505	8186	8505	8588	8348	8470	9925	10330	7032	5591
1975 Regional Surplus/Deficit	6826	5627	2528	833	1638	-188	4929	2353	4300	2064	3809	7392	9256	7318	4127
1976 Regional Surplus/Deficit	2894	2505	2568	3924	4346	8547	7906	6635	3909	8579	8267	10307	8946	6807	6252
1977 Regional Surplus/Deficit	7434	7465	7680	2000	1251	-798	-49	-2450	-2960	-2231	-3066	-1733	742	595	757
1978 Regional Surplus/Deficit	814	-134	232	198	850	-565	3088	2148	3951	6601	4331	6528	7154	6658	3004
-Ranked Averages-															
Top Ten Percent	5381	4108	2468	3530	3392	5608	7804	7266	6511	7880	8274	9955	9234	6553	6262
Middle Eighty Percent	3670	1797	2041	2113	1907	740	3410	2368	2051	3999	4896	6549	7884	5298	3462
Bottom Ten Percent	2407	545	945	1390	1048	-1097	-2266	-2119	-1943	-271	-1352	-1592	3100	2066	16

Section 10: Potential Federal System 120-Hour Capacity Planning for the Future

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Exhibits 35 – 37

***Federal System Monthly 120-Hour Capacity Analysis Under the 2006 White Book
Load Forecast for 1937-Water Conditions***

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Exhibit 35: OY 2007 Monthly 120-Hour Capacity

Loads and Resources - Federal System
PNW Loads and Resource Study
2006 - 2007 Operating Year
1937 Water Year
[37] 2006 White Book (Final)

3/31/2006

Capacity 120 (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul
Non-Utility Obligations														
Fed. Agencies 2002 PSC	223	223	176	218	227	215	240	227	215	200	200	193	210	203
USBR 2002 PSC	220	227	205	36	0.3	0.3	0.3	0.3	28	226	262	288	260	269
DSI 2002 PSC	265	265	265	0	0	0	0	0	0	0	0	0	0	0
Total Firm Non-Utility Obligations	708	715	647	254	227	215	240	227	243	426	462	481	470	472
Transfers Out														
NGP 2002 PSC	3587	3602	3484	4077	4323	4510	4801	4612	4216	3940	3938	3756	3746	3907
GPU 2002 PSC	2101	2101	2177	2642	2998	3307	3344	3281	3076	2760	2760	2447	2099	2112
NGP 2002 Slice PSC	927	761	683	730	831	847	719	732	729	642	538	560	934	896
GPU 2002 Slice PSC	1543	1267	1138	1215	1385	1411	1197	1219	1214	1070	897	933	1555	1493
IOU 2002 PSC	382	382	382	0	0	0	0	0	0	0	0	0	0	0
Exports	1791	1791	1787	1543	1468	1483	1480	1480	1470	1476	1476	1566	1567	1579
Regional Transfers (Out)	918	918	697	700	917	971	945	901	791	764	764	592	645	660
Federal Diversity	-771	-802	-977	-1432	-1379	-1210	-1413	-1396	-1272	-1117	-1189	-1166	-988	-875
Total Transfers Out	10478	10020	9370	9475	10544	11320	11074	10830	10225	9535	9184	8688	9557	9771
Total Firm Obligations	11186	10735	10016	9729	10771	11535	11314	11057	10467	9961	9646	9169	10027	10244
Hydro Resources														
Regulated Hydro	20201	20085	20437	20530	20742	20502	20473	20422	20063	19278	18958	19621	20385	20519
Independent Hydro	721	733	713	700	679	644	613	717	780	803	806	840	842	716
Operational Peaking Adj.	-4761	-7232	-8532	-8219	-7212	-7593	-9601	-9014	-8704	-8709	-9926	-9371	-5578	-5859
Non-Fed CER (Canada)	234	234	234	234	234	234	234	234	234	228	228	228	228	228
Total Hydro Resources	16395	13820	12852	13245	14443	13787	11719	12360	12373	11601	10066	11319	15877	15604
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	139	139	168	204	257	311	235	191	163	166	166	76	94	110
Regional Transfers (In)	848	848	871	408	408	385	10	10	10	10	10	10	10	10
Large Thermal	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	0	0	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	2195	2195	2231	1822	1884	1909	1459	1414	1385	1387	1387	162	162	1323
Total Resources	18590	16015	15084	15067	16327	15695	13178	13774	13758	12987	11453	11481	16039	16927
Reserves & Maintenance														
Hydro Reserves	-1046	-1041	-1058	-1061	-1071	-1057	-1054	-1057	-1042	-1004	-988	-1023	-1061	-1062
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	0	0	-172
Federal Hydro Maint.	-3263	-2761	-2770	-2752	-2705	-1866	-1408	-1883	-1915	-2061	-1805	-1756	-1635	-2785
Spinning Reserves	-332	-280	-255	-266	-297	-301	-261	-265	-265	-243	-212	-210	-325	-324
Federal Trans. Losses	-461	-394	-363	-362	-405	-412	-344	-348	-347	-318	-277	-284	-436	-422
Total Reserves, Maintenance & Losses	-5278	-4651	-4619	-4616	-4654	-3813	-3243	-3729	-3745	-3803	-3458	-3277	-3461	-4767
Total Net Resources	13312	11364	10464	10450	11674	11883	9935	10045	10013	9185	7996	8204	12579	12161
Total Firm Surplus/Deficit	2126	629	448	722	903	348	-1379	-1012	-454	-776	-1650	-965	2552	1917

Exhibit 36: OY 2011 Monthly 120-Hour Capacity

Loads and Resources - Federal System
PNW Loads and Resource Study
2010 - 2011 Operating Year
1937 Water Year
[37] 2006 White Book (Final)

3/31/2006

Capacity 120 (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul
Non-Utility Obligations														
Fed. Agencies 2002 PSC	301	301	217	257	269	250	286	268	253	233	233	220	248	240
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	521	528	422	293	269	250	286	268	280	459	495	508	508	509
Transfers Out														
NGP 2002 PSC	3973	3970	3736	4332	4564	4760	5064	4868	4450	4152	4150	3953	3936	4106
GPU 2002 PSC	2417	2417	2638	3104	3482	3791	3884	3855	3549	3132	3132	2680	2330	2324
NGP 2002 Slice PSC	953	798	681	730	831	847	715	731	729	648	546	574	952	939
GPU 2002 Slice PSC	1587	1329	1135	1216	1385	1410	1191	1217	1213	1080	910	956	1586	1563
IOU 2002 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exports	1569	1569	1565	1541	1498	1509	1506	1506	1499	1512	1512	1571	1572	1580
Regional Transfers (Out)	605	605	634	700	917	971	945	901	791	764	764	592	645	660
Federal Diversity	-974	-1010	-1215	-1716	-1667	-1485	-1717	-1706	-1533	-1328	-1412	-1373	-1137	-1001
Total Transfers Out	10130	9678	9174	9908	11010	11804	11588	11372	10698	9961	9602	8953	9884	10171
Total Firm Obligations	10651	10206	9596	10201	11279	12054	11874	11640	10978	10420	10097	9461	10393	10680
Hydro Resources														
Regulated Hydro	20411	20296	20437	20530	20742	20502	20473	20422	20063	19278	18958	19621	20385	20520
Independent Hydro	702	714	693	700	679	644	613	717	780	803	806	840	842	716
Operational Peaking Adj.	-4567	-6900	-8483	-8165	-7162	-7550	-9601	-8976	-8662	-8587	-9782	-9153	-5297	-5284
Non-Fed CER (Canada)	244	244	244	244	244	244	244	244	244	242	242	242	242	242
Total Hydro Resources	16790	14353	12891	13309	14503	13840	11729	12408	12425	11736	10224	11551	16171	16194
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	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	1369	1407	1461	1495	1470	1425	1396	1398	1398	156	173	1337
Total Resources	18107	15670	14260	14717	15965	15334	13199	13833	13821	13134	11622	11707	16344	17530
Reserves & Maintenance														
Hydro Reserves	-1056	-1050	-1057	-1061	-1071	-1057	-1054	-1057	-1042	-1004	-988	-1023	-1061	-1062
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	-342	-294	-257	-267	-298	-303	-262	-267	-267	-247	-216	-215	-333	-339
Federal Trans. Losses	-445	-382	-335	-350	-392	-400	-345	-350	-349	-323	-283	-292	-446	-441
Total Reserves, Maintenance & Losses	-5282	-4662	-4594	-4607	-4643	-3803	-3245	-3734	-3750	-3812	-3468	-3290	-3479	-4803
Total Net Resources	12825	11007	9666	10109	11321	11531	9953	10099	10071	9322	8154	8417	12865	12728
Total Firm Surplus/Deficit	2174	801	70	-92	42	-523	-1921	-1541	-907	-1098	-1943	-1044	2472	2048

Exhibit 37: OY 2016 Monthly 120-Hour Capacity

Loads and Resources - Federal System
PNW Loads and Resource Study
2015 - 2016 Operating Year
1937 Water Year
[37] 2006 White Book (Final)

3/31/2006

Capacity 120 (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul
Non-Utility Obligations														
Fed. Agencies 2002 PSC	308	308	224	264	276	257	294	276	261	240	240	227	255	247
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	528	535	429	300	276	257	294	277	289	466	503	515	515	516
Transfers Out														
NGP 2002 PSC	4232	4232	3992	4613	4846	5046	5404	5164	4757	4439	4437	4220	4203	4382
GPU 2002 PSC	2577	2577	2726	3248	3676	3964	4073	4080	3698	3288	3288	3153	2563	2547
NGP 2002 Slice PSC	959	807	687	736	837	851	714	735	733	652	549	656	1033	947
GPU 2002 Slice PSC	1597	1343	1143	1225	1393	1417	1189	1223	1221	1085	914	1092	1721	1576
IOU 2002 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exports	1496	1496	1495	1465	1418	1419	1418	1418	1418	1447	1447	1432	1433	1434
Regional Transfers (Out)	13	13	42	108	325	379	353	309	199	172	172	0.1	18	34
Federal Diversity	-1029	-1067	-1274	-1811	-1757	-1566	-1817	-1800	-1622	-1406	-1494	-1525	-1219	-1073
Total Transfers Out	9845	9401	8811	9583	10738	11510	11333	11129	10404	9677	9312	9028	9752	9848
Total Firm Obligations	10373	9936	9240	9883	11014	11767	11627	11406	10692	10144	9814	9543	10268	10364
Hydro Resources														
Regulated Hydro	20411	20296	20437	20530	20742	20502	20473	20422	20063	19278	18958	19621	20385	20520
Independent Hydro	702	714	693	700	679	644	613	717	780	803	806	840	842	716
Operational Peaking Adj.	-4474	-6776	-8405	-8081	-7086	-7483	-9601	-8916	-8594	-8530	-9736	-9083	-5236	-5168
Non-Fed CER (Canada)	231	231	231	231	231	231	231	231	231	225	225	225	225	225
Total Hydro Resources	16870	14464	12956	13380	14567	13894	11716	12454	12480	11776	10253	11604	16216	16293
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	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	1346	1384	1438	1495	1470	1425	1396	1398	1398	1306	1323	1337
Total Resources	18187	15781	14302	14764	16005	15389	13186	13879	13876	13174	11651	12910	17539	17630
Reserves & Maintenance														
Hydro Reserves	-1056	-1050	-1057	-1061	-1071	-1057	-1054	-1057	-1042	-1004	-988	-1023	-1061	-1062
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	-344	-297	-259	-269	-300	-305	-262	-268	-268	-248	-217	-251	-368	-342
Federal Trans. Losses	-447	-385	-336	-352	-394	-401	-345	-352	-351	-324	-284	-325	-479	-444
Total Reserves, Maintenance & Losses	-5286	-4669	-4597	-4611	-4647	-3807	-3245	-3737	-3753	-3815	-3470	-3532	-3720	-4809
Total Net Resources	12900	11112	9705	10153	11359	11582	9941	10143	10123	9359	8180	9378	13818	12821
Total Firm Surplus/Deficit	2527	1176	464	269	344	-185	-1686	-1263	-570	-785	-1634	-165	3551	2458

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Section 11: Administrator's Record of Decision on the 2006 Pacific Northwest Loads and Resources Study

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Section 11: Administrator's Record of Decision on the 2006 Pacific Northwest Loads and Resources Study (The White Book)

I. Introduction

The 2006 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 2006 White Book updates the 2004 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.

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 2006 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 2016. BPA's total public utility load obligations are estimated to range from 7,176 aMW in OY 2007 to 7,631 aMW in OY 2016. 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). As a result of negotiations in 2001, IOU RPSA settlement firm power deliveries were reduced in exchange for financial considerations through September 30, 2006. This resulted in a net IOU RPSA settlement power delivery of 258 aMW during this time period. For the period October 1, 2006, through September 30, 2011, this study assumes that BPA's IOU RPSA settlement contracts provide only financial benefits and no firm power is delivered. This assumption is consistent with the amendments made to the RPSA contracts by BPA and the IOUs on May 28, 2004; and
- BPA's DSI customers signed 5-year contracts effective from October 1, 2001, through September 30, 2006. BPA's DSI load obligations reflect signed load reduction agreements, contract terminations, and closures through March 31, 2006. BPA's DSI load obligations are estimated to be up to 265 aMW through September 30, 2006. For OY 2007, the DSI load obligations are estimated to annually average 44 aMW for the partial year. For October 1, 2006, through September 30, 2011, this study incorporates 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. Beginning October 1, 2006, this study assumes that BPA will offer Port Townsend Paper Corporation 17 aMW of surplus firm power via a local preference customer. This delivery is shown as an Intra-regional transfer from BPA through a local preference customer for Port Townsend and is not shown as a DSI PSC load obligation. Actual DSI load obligations may differ from those presented in this study due to additional purchases or curtailments caused by changes in economic conditions. This assumption does not represent a decision by BPA as to whether or what form of DSI service will be offered post September 30, 2006.

IV. Excess Federal Power

This 2006 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 2006 White Book reflects Federal system load obligations, resources, and contracts that were finalized as of March 31, 2006. 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 2006 White Book also includes the following changes to the Federal system resource projections:

- The hydro regulation study was updated to incorporate BPA’s most recent estimate of power and non-power requirements expected to be in effect during the study period;
- Acquisition contracts for the output from the Elwah and Glines Canyon hydro projects were extended from July 31, 2006, to September 30, 2009;

- Estimated start date for the Fourmile Hill Geothermal plant was revised from October 1, 2007, to October 1, 2009;
- Output from the Idaho Falls Bulb Turbine hydro projects changed from a Federal Independent Hydro resource to the City of Idaho Falls, due to the expiration of BPA's acquisition contract on September 30, 2006. This assumption may change depending on the disposition of a new Idaho Falls Bulb Turbine contract;
- Hellroaring (Big) Creek hydro project generation output changed from a Federal Independent Hydro resource to Mission Valley and remains a regional resource;
- Bonneville Fishway project was removed as a Federal resource to avoid double counting of the generation, which was previously included in the regulated hydro Bonneville Dam generation estimates; 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 2006 White Book are adopted and approved.

Issued in Portland, Oregon on December 1, 2006.

/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 (Industries) (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 2006 is October 1, 2005, through September 30, 2006.

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 Streamflow Record – 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 generating 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 2006 is August 1, 2005, through July 31, 2006.

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 DSIIs 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)
EPM	Enron Power Marketing, Inc.
FCRPS	Federal Columbia River Power System
FCRTS	Federal Columbia River Transmission System
FERC	Federal Energy Regulatory Commission
FRE	Firm Resource Exhibit
FPS	Federal Power System
FY	Fiscal Year
IOU	Investor-owned utility
IPP	Independent Power Producer
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

