2009 Pacific Northwest Loads & Resources Study

Operating Years 2010 through 2019

July 2009

Revised 11/30/2009

BONNEVILLE POWER ADMINISTRATION

Department of Energy

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

POWER SERVICES

October 7, 2009

In reply refer to: PGPL-5

Dear Interested Parties:

This document is Bonneville Power Administration's (BPA) *"2009 Pacific Northwest Loads and Resources Study,"* commonly called the "White Book." The 2009 White Book is a snapshot as of July 22, 2009, of both the Federal system and Pacific Northwest (PNW) region loads and resources for Operating Years (OY) 2010 through 2019. This analysis incorporates BPA's estimates of PNW total retail loads, contract obligations, contract purchases, and resource capabilities. BPA compiles these estimates with annual data submittals provided by PNW Federal agencies, public agencies, cooperatives, U.S. Bureau of Reclamation (USBR), U.S. Army Corps of Engineers (USACE), and investor-owned utilities (IOUs). These are combined to provide projections of the Federal system and the PNW region load and resource capabilities for the 10-year study horizon.

The White Book does not guide day to day operations of the Federal Columbia River Power System (FCRPS), nor is it used for determining BPA revenues or rates. The White Book is a 10-year guide to the obligations and resources in the PNW region and for the Federal power system. The White Book is developed as a planning tool for the Columbia River Treaty (Treaty) Studies, as an information tool for customers and regional interests, and contains published information used by other planning entities for their analyses. The 2009 Pacific Northwest Loads and Resources Study is an update to the previous 2007 White Book. There was no 2008 White Book published.

Hydro projections for this White Book are produced for the regulated regional hydro projects, by the HYDSIM model, using plant characteristics derived from: 1) 2009 PNCA planning criteria; 2) the 2008 NOAA Fisheries FCRPS BiOp; 3) the United States Fish and Wildlife Service 2006 BiOp; 4) operations described in the Northwest Power and Conservation Council's Fish and Wildlife Program; and 5) other fish mitigation measures. The regulated hydro generation projection where modeled to reflect operating reserve levels associated with 30-minute wind persistence scheduling accuracy forecasts, consistent with the FY 2010 Rate Case.

The Federal system is projected to have both annual energy surpluses and deficits throughout the study period. These surplus/deficits range from a surplus of 102 aMW in OY 2010 to a deficit of -898 aMW in OY 2019. See Section 4, *Federal System Analysis*, page 23.

The PNW region is expected to experience firm energy surpluses until OY 2018, using 1937-critical water conditions, and assuming 3,005 aMW of uncommitted IPP generation is available to serve PNW loads. See Section 5, *Pacific Northwest Regional Analysis*, page 51.

The 2009 White Book and the BPA's 2009 draft Resource Program containing the 'Needs Assessment' are coincidently being released about the same time period. The White Book and Needs Assessment both examine BPA's load and resource balance position. Overall, the two studies agree that BPA will experience seasonal energy and capacity deficits, and its annual energy position will become more deficit over the study period. Both analyses assume current levels of Federal system resource and that BPA would serve all customers' load growth.

However, the two studies have different purposes and therefore slightly different approaches. The purpose of the Needs Assessment analysis is to address BPA's future energy and capacity needs and to specifically identify and quantify the potential need to acquire resources. The White Book purpose is to produce a deterministic view of loads, obligations, resources, and surplus/deficits for the Federal power system and the region. Unlike the White Book, the Needs Assessment examines needs across the full spectrum of 70-historic water conditions and places more emphasis on various future scenarios surrounding choices for load-placement on BPA, potential new loads, and the effect of planned increases in conservation as guided by the Council's Draft Sixth Power Plan. The focus is solely on future deficits, not on surpluses.

Additional copies of the 2009 White Book can be obtained from BPA's Public Information Center, 1-800-622-4520. The 2009 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 website at: *www.bpa.gov/power/whitebook2009*

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

Sincerely,

/s/ Stephen R. Oliver

Stephen R. Oliver
Vice President, Generation Asset Management

Enclosure

2009 PACIFIC NORTHWEST LOADS AND RESOURCES STUDY

The White Book

BONNEVILLE POWER ADMINISTRATION
July 2009

Revised 11/30/2009

Cover Picture:

Source: BPA Photo archive

Pictured is the overview of Bonneville Dam. Bonneville is one of the major dams on the Columbia River where it passes through the Cascade Mountains between Oregon and Washington. The dam, 2,690 ft (820 m) long and 197 ft (60 m) high, was built between 1933 and 1943 by the U.S. Corps of Engineers and was one of the largest hydroelectric projects undertaken under the New Deal. It is used for navigation, flood control, and power production. Locks permit ships to pass around the dam; fish ladders allow salmon to spawn upriver.

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
Operational Planning Group

NW Requirements Marketing: Western Customer Services Group
Eastern Customer Services Group

Bulk Marketing and Transmission Services: Long Term Sales and Purchasing Group

Customer Support Services: Load Forecasting and Analysis Group

Office of General Counsel

Pacific Northwest Utilities Conference Committee

Northwest Power & Conservation Council

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Loads and Resources Information System

2009 Pacific Northwest Loads and Resources Study
For Operating Year 2010 through 2019

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Section 1: Introduction

Description of the White Book

The Pacific Northwest Loads and Resources Study (White Book), which is published annually by the Bonneville Power Administration (BPA), contains projections of regional and Federal system load and resource capabilities, along with relevant definitions and explanations. The White Book is a compilation of 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 a 10 year guide to the obligations and resources in the Pacific Northwest (PNW) region and BPA's Federal power system. This study is developed as a planning tool for Columbia River Treaty (Treaty) Studies, an informational tool for customers and regional interests, and as a published information source used by other planning entities for their analyses. The White Book does not guide day-to-day operations of the Federal Columbia River Power System (FCRPS), nor is it used for determining BPA revenues or rates.

Although the database that generates the data for the White Book analysis contributes to the development of BPA's inventory and ratemaking processes the White Book itself is not used in these processes. Operation of 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 for both energy and peaking capacity. Energy is the unit of measure for power delivered over a specific time period such as a month or annually for a given year, and is usually expressed in average megawatts (aMW). Peaking capacity is the unit of measure for the maximum power delivered at a given instant or within a given specified on-peak time period. Resources include projected capabilities plus contract purchases. Loads include a forecast of retail obligations plus contract obligations. Surplus energy and/or capacity may be available when resources are greater than loads. These surpluses may be marketed to increase revenues. Deficits occur when resources are less than loads. These deficits will be met or reduced by some combination of the following: better-than-critical water conditions, demand-side management and conservation programs, permanent loss of loads (due to economic conditions or closures), additional contract purchases, and/or the addition of new generating resources.

This study incorporates information on Pacific Northwest (PNW) regional retail loads, contract obligations, and contract resources and simulates the operation of the power system in the PNW. The simulated hydro operation incorporates plant characteristics, streamflows, and non-power requirements from the current Pacific Northwest Coordination Agreement (PNCA). Additional resource capability

estimates were provided by BPA, PNW Federal agency, public agency, cooperative, U.S. Bureau of Reclamation (USBR), and investor-owned utility (IOU) customers furnished through direct submittals to BPA and/or annual PNUCC data submittals.

The 2009 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 2009 White Book analysis updates the previous 2007 White Book, a White Book study was not published in 2008.

This analysis shows projections of the Federal system and region's yearly average annual energy consumption and resource availability for the study period, OY 2010-2019. As in past years, this study presents projections of Federal system and PNW region expected 1-hour monthly peak demand, monthly energy demand, monthly 1-hour and 120-hour peak generating capability, and monthly energy generation for OY 2010, 2014, and 2019. This year the White Book also incorporates a new capacity metric, discussed below.

While the 1-hour and 120-hour capacity measures the ability of the Federal system to meet typical peaks encountered in a month of normal weather, BPA is also concerned about the ability of the Federal system to meet load obligations during extreme temperature events. BPA, the Council, and other regional parties developed a metric to assess the hydro-system's performance during a 3-day cold snap or 3-day heat with temperature extremes that might occur once in ten years. This assessment is called '18-Hour capacity' because it measures ability of the system to meet the average of the 6 highest load hours (consecutive or non-consecutive) for a 3 day weather event. This metric is meant as a minimum reliability measure to ensure that "the lights stay on" during an extreme-weather event when there may be no power available on the spot market except at night. *Federal System 18-Hour Capacity* is presented in Section 4, beginning on page 43.

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 23. The analysis for the *Pacific Northwest Regional Analysis* is presented in Section 5, beginning on page 51. Section 6 presents a comparison of BPA's regional loads with the Northwest Power and Conservation Council beginning on page 69.

The Administrator's Record of Decision (ROD) for the 2009 White Book is contained in Section 9, beginning on page 165.

The glossary of terms and a list of acronyms are included in Section 10, beginning on page 169.

This document and the "2009 Pacific Northwest Loads and Resources Study Technical Appendix" are available on-line at: *http://www.bpa.gov/power/whitebook*

Additional hard copies of this summary document are available from BPA's Public Information Center, toll-free, 1-800-622-4520.

Section 2: Background

Pacific Northwest Planning Area

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

White Book Study Assumptions

This traditional loads and resources analysis for the Federal system and PNW region has been produced using a specific set of assumptions concerning contracts and non-hydro and hydro resources. The Federal system assumptions are detailed in Section 4, *Federal System Analysis Assumptions*, page 23. Regional assumptions are presented in Section 5, *Regional Analysis Assumptions*, page 51.

Total Retail Load Forecast

A utility's total retail load (TRL) is the sum of the electric power consumption within that utility's distribution system, as measured at metering points, with adjustments for system distribution losses, net metered contracts, system resources, and unmetered loads and generation. TRL forecasts are not necessarily the same as BPA's PSC obligations to a utility, however, they may be equal if a utility has no other resources or contract purchases specified to meet load.

The PNW regional TRL is the total TRL of all utilities in the PNW region, as defined by the Northwest Power Act. PNW regional TRL forecasts are used by BPA for regional planning purposes such as HYDSIM hydro generation forecasts, Columbia River Treaty (Treaty) studies that determine Treaty storage operating policy, and the calculation of BPA and other regional utilities obligations to Canada under Canadian Entitlement.

The TRL forecasts are also used by BPA's Agency Load Forecasting group to produce BPA's PSC obligation projections used for planning and ratemaking purposes.

For this study, the TRL forecasts were produced separately for each regional PNW customer group in the following manner:

Public Agencies TRL Forecast: TRL forecasts for most public agency, Federal agency, cooperative, and USBR customers were produced using BPA's Agency Load Forecasting system (ALF). The ALF forecasting tool uses a statistical approach that is based on time-series-based regressions that reflect a fundamental assumption that historical electrical consumption patterns will continue into the future. Forecasts produced by ALF allows customer TRL forecasts to be influenced by heating and cooling weather conditions, and explicitly models new industrial production sites in a customer's service territory.

The TRL forecasts for some generating public agency customers were developed by BPA's and incorporate data submitted to BPA through their PNUCC submittals or total retail load forecasts furnished directly to BPA.

Investor-Owned Utilities TRL Forecast: BPA reviews and assesses forecasts for the regional IOUs' total retail load within the PNW. The TRL forecasts for the IOUs were developed by BPA. As a starting point for review and planning for the IOU TRL forecast, BPA uses data submitted through their PNUCC submittals and forecasts furnished directly to BPA. BPA's IOU TRL assessment takes into account factors such as: characteristics of the load, economic conditions, and load variability.

Direct Service Industry TRL Forecast: Direct Service Industries' (DSI) total retail load estimates were prepared by BPA and incorporate current and future estimates of industrial and economic conditions for specific DSIs within the PNW. For load forecasting purposes, these industries are assumed to continue to operate at existing levels, regardless of who supplies the energy.

The non-coincidental and coincidental peak (MW) TRL forecast for each load serving entity is calculated using recent historical relationships. Though not specifically published in this document, the TRL forecasts are also split into heavy load hour megawatt hours (HLH MWh) and light load hour megawatt hours (LLH MWh) segments in megawatt hours (MWhs). BPA monitors TRL levels for factors that may alter energy consumption levels. Those factors may be taken into account in TRL forecasts. The 2009 White Book TRL forecast was completed July 22, 2009, and reflects current economic conditions that reduced the TRL when compared to the 2007 Study. This forecast reflects economic improvement by OY 2011. Additionally, the forecast does not reflect future climate change impacts. As climate change forecasting methods are introduced into BPA TRL modeling, those impacts will most likely be incorporated in future studies.

Pacific Northwest Hydro Resources

BPA uses its HYDSIM model to estimate the Federal system energy production that can be expected from regulated hydroelectric power projects in the PNW Columbia River Basin. The hydro energy production is maximized by coordinating hydro operations while continuing to meet power and non-power requirements for the 70-water years of record (October 1928 through September 1998). Although the regulated hydro generation forecasts are submitted to BPA in fiscal year, they are presented in operating year (OY) format (August 1928 through July 1998) for consistency within this Study. Physical characteristics of each hydro project are provided by annual PNCA data submittals from regional utilities and government agencies involved in the coordination and operation of regional hydro projects.

PNCA Hydro Operating Characteristics: Beginning in 1997, the PNCA agreement incorporated NOAA Fisheries and U.S Fish and Wildlife Service's Biological Opinions (BiOps). These BiOps changed the shape of energy production by increasing flow requirements in the spring and summer to aid in the downstream migration of juvenile salmon and requiring that reservoirs are no longer necessarily fully drafted to meet firm loads in the fall and winter in order to retain water for spring and summer flow requirements. 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. This Study incorporates the operating requirements from the 2009 PNCA data submittals and BiOps currently in effect. These requirements include, but are not limited to: storage content limits as determined by rule curves; maximum project draft rates determined by each project; and flow and spill objectives required by the BiOps. Deviations from the PNCA data submittals occur when specific operating decisions are made subsequent to the date of submission in order to implement the BiOps.

Regulated Hydro Generation: BPA's HYDSIM model is used to estimate the generation produced by the regional regulated hydro projects using plant characteristics, power and non-power requirements, and streamflows to simulate the coordinated operation of the hydro system. These operating characteristics are derived from: 1) 2009 PNCA planning criteria; 2) the 2008 NOAA Fisheries FCRPS BiOp; 3) the United States Fish and Wildlife Service 2006 (USFWS) BiOp; 4) operations described in the Northwest Power and Conservation Council's Fish and Wildlife Program; and 5) other fish mitigation measures. The operating characteristics of the regulated hydro projects 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 BiOps and the 2009 PNCA data submittals. Deviations from the PNCA data submittals occur when specific operating decisions are made subsequent to the date of submission in order to implement the BiOps. The hydro regulation studies specify particular hydroelectric project operations for fish, such as seasonal flow objectives, minimum flow levels, spill, reservoir target elevations and drawdown limitations, and turbine operation efficiency requirements that can vary by operating year and water conditions. The regulated hydro generation projections from BPA's HYDSIM model reflect operating

reserve levels associated with 30-minute wind persistence scheduling accuracy forecasts.

BPA also estimates expected hydro improvement generation increases due to: 1) hydro optimization; 2) turbine runner replacement; and 3) reliability increases through BPA's capital improvement programs at specific Federal regulated hydro projects. These generation increases are not captured in the HYDSIM studies. Hydro improvement generation increases are calculated by multiplying the project's generation estimate by a hydro improvement generation factor specific to that project. The hydro improvement forecast varies by operating year and water year.

Independent Hydro: The regional independent hydro projects are dams that are not modeled or regulated in the HYDSIM model. These projects are owned and operated by the USBR, the U.S. Army Corps of Engineers (USACE), and/or other project owners. Independent hydro generation estimates are provided by individual project owners for the 70-water years (August 1928 through July 1998). The independent hydro generation forecast can vary by operating year and water year throughout the Study.

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 2010-2019 for 70-historical water conditions (August 1928 through July 1998). The results are shown in Exhibits 11 through 20, pages 104-123, for the Federal system, and in Exhibits 31 through 40, pages 144-163, 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 1998 historical water conditions. This study uses one of the lowest water years, 1937 (August 1936 through July 1937), to represent the "critical period" during which the hydro system would produce the lowest hydro generation estimate for the Federal system's firm hydro energy capability.

Instantaneous Hydro Capacity: The estimated monthly instantaneous capacity of Columbia River Basin regulated and independent hydro projects are based on individual project full-gate-flow maximum generation at mid-month reservoir elevation using 1929 through 1998 historical water conditions. The instantaneous hydro capacity estimates, however, do not consider the ability of the hydro system to sustain generation levels needed to meet day-to-day and month-to-month hydro operations. This inability to sustain full hydro capacity is due to the fact that there are more hydro generating units than fuel (water) available to operate all units on a continuous basis. For this reason, the Federal hydro capacity estimates are reduced to show an operational peaking capability to better reflect BPA's actual ability to generate the hydropower needed to meet expected peak load obligations throughout each month.

Calculation of the Operational Peaking Capability: The operational peaking capability of the hydro system maximizes available energy and capacity associated with the monthly distribution of water and streamflow runoff to produce the energy and capacity while meeting non-power requirements and load obligations. The difference between the instantaneous hydro peaking capability and operating peaking capability is the hydro system's ability to continuously produce power for a specific time period by utilizing the limited water supply (power and non-power requirements), scheduled maintenance, operating reserves, and wind persistence scheduling accuracy estimates.

BPA uses its Hourly Operating and Schedule Simulator (HOSS) model to simulate the relationship of hydro energy to operational hydro peaking capability. The operational hydro peaking capability assumes monthly HLH hydro generation was maximized and is not an indication of the Federal hydro system's ability to react to system distress. This relationship was simulated for a variety of hours per month and the 1929 through 1998 historical water conditions. The operational hydro peaking capability projections are reduced to the extent required to provide operating reserve levels associated with 30-minute wind persistence scheduling accuracy forecasts, consistent with the FY2010 Rate Case. Below are two separate HOSS operational peaking methodologies included in this study:

- **1-Hour Operational Peaking**: Forecasts the monthly Federal system hydro generating capability based on the single largest 1-hour of hydro generation in that month, while meeting the Federal load obligations for that month, and
- **120-Hour Operational Peaking**: Forecasts the monthly Federal system hydro generating capability by averaging the generation of the top 6 heavy load hours (HLHs) per day, 5 days per week, and 4 weeks per month (6*5*4=120 hours), while continuing to meet Federal load obligations for that entire month.

Consequently, after accounting for these Operational Peaking methods for the Federal and regional capacity analysis, the hydro system capability can be estimated monthly for 1-Hour and 120-Hour sustained periods. Operational peaking capability estimates take into account hydro maintenance, operating reserves, and wind integration, which are netted out for reporting purposes.

BPA is developing a Federal system LOLP model that will be able to assess Federal system resource adequacy to meet a broad range of load obligations, resources, and temperature variations for the future.

Federal System 18-Hour Capacity: While the 1-hour and 120-hour capacity measures the ability of the Federal system to meet typical peaks encountered in a month of normal weather, the 18-hour capacity measures the ability of the Federal system to meet the average of the 6 highest peak load hours during three consecutive days of abnormally cold or hot weather. These Federal system 18-hour capacity studies assume: BPA PSC load obligations based on 1-in-10 year temperature events, median generation levels based on water conditions and unit availability, market purchases of up to 1,000 MW in LLHs, and the ability to shift water into the 3-day event period from the subsequent days of the month. By shifting of water within the month, power purchases may be required to meet end of month load obligations. The 18-hour capacity regulated hydro generation projections reflect operating reserve levels associated with 30-minute wind persistence scheduling

accuracy forecasts. The discussion of the Federal system 18-hour capacity is in Section 3, *Federal System 18-Hour Capacity*, page 21 and Section 4, *Monthly Federal Firm Capacity Surplus/Deficit Projections*, page 43.

Hydro Projects' Multiple-Use Planning: Federal hydro projects in the PNW have many uses in addition to power generation. The projects provide flood control, supply irrigation for farming, assist in river navigation, provide for reservoir recreation, and contribute to municipal water supplies. In addition, operational constraints are in place to protect and enhance resident and anadromous fish and wildlife populations. Non-power reservoir operating requirements may reduce or increase hydropower production. BPA's resource planning takes into account all currently known non-power operating requirements when assessing regional hydro system capability.

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

Hydro Improvements: As an outcome of the 2009 Integrated Program Review (IPR 2), BPA's small and large capital budget has established an average of $200 million per year for FY 2010 through 2017 (8 years) for maintaining and improving the reliability of the Federal hydro system. These improvements are expected to increase and preserve Federal hydro generation by:

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

Using *critical* water conditions, it is estimated that, the combination of these hydro improvements will annually create up to 189 average megawatts (aMW) of new and/or preserved capacity through the study period.

Using *average* water conditions, it is estimated that the combination of these hydro improvements will annually create up to 238 aMW over the study.

The total amount and timing of annual aMW actually realized over the period 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 operations further decrease the flexibility of the hydro system operations, through spill or other constraints, the annual megawatt contribution of the hydro improvements realized will most likely be lower. Hydro improvement estimates will be updated in future studies when more information is available.

Pacific Northwest Non-Hydro Resources

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: *Federal Firm Resources*, page 30. Regional resources are discussed in Section 5, *Regional Firm Resources*, page 56.

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 USACE. BPA also markets the generation from: hydro projects owned by Idaho Falls Power, through September 30, 2011, and Lewis County Public Utility District (PUD); thermal generation from the Columbia Generating Station nuclear plant operated by Energy Northwest, Inc. (ENW); and the output from several renewable power plants under power purchase contracts. The expected energy generation production from wind turbines is included in the analysis; however, since wind power production is intermittent and cannot be guaranteed to be available to meet peak hour loads, the capacity contribution from wind projects is assumed to be 5 percent of the installed capacity, following the current Council's Regional Resource Adequacy Standards' guidelines. The Federal system analysis is shown in Section 4, beginning on page 23.

Since finalizing data for this study, BPA has signed a long term contract for the acquisition of the output of the Idaho Falls Bulb Turbine project through September 30, 2021.

BPA Power Sales Contract Obligations

Forecasts for BPA's PSC obligations for most public agency, Federal agency, cooperative, and USBR customers are produced by BPA's Agency Load Forecasting group using the ALF tool. ALF calculates BPA's PSC obligation to a customer, by netting the customer's TRL forecast with its resources and contracts purchases that are specified to meet their own retail load. Some generating public agency customers PSC obligation forecasts incorporate TRL data received by BPA through PNUCC data submittals or direct submittals. The 2009 White Book PSC obligation forecast was completed July 22, 2009, and reflects current economic conditions that reduced the PSC obligations when compared to the 2007 Study. This forecast predicts economic improvement by 2011. BPA's PSC obligations do not reflect future climate change impacts.

BPA has existing PSCs with its PNW customers that began October 1, 2001, and extend through September 30, 2011 (2001 PSCs). For the period beginning October 1, 2011 and extending through September 30, 2028, BPA signed new 2012 PSCs. The terms and conditions of these new PSCs include different provisions and terms. The following describes BPA's PSC obligations associated with specific customer classes:

2001 Power Sales Contracts expiring September 30, 2011:

- BPA's Federal agency, public agency, cooperative, and USBR customers' signed PSC and Slice contract obligations through September 30, 2011. These contracts include full service, partial service, and block purchases based on each customer's need. BPA's Slice obligations are based on 22.63 percent of a specific set of defined Federal Slice resources coupled with a Slice block purchase established by the 2001 PSC agreements. See *The Slice Product*, page 11;
- BPA's obligation to the IOU's under sections 5(b) and 5(c) of the Northwest Power Act 16 U.S.C. §839c(c)(1) was established for five of the six regional IOUs when they signed "Bridge" New Resource Firm Power Block power sales agreements (Bridge NR Block contracts) and "Bridge" Residential Purchase and Sale Agreements (RPSA) contracts effective on or about October 1, 2008, and continuing through September 30, 2011. Under these contracts, BPA's obligations to the IOU's will be satisfied through financial benefits or power deliveries, or both. At this time, the IOUs are not currently purchasing power under the Bridge NR Block contracts; and
- BPA's only Direct Service Industry contract obligation is its service to Port Townsend Paper Corporation (PTPC) for 17 aMW through September 30, 2011. However, since finalizing this document, BPA is evaluating its options for long-term DSI service contracts due to recent court opinions in *Pacific Northwest Generating Cooperative v. Bonneville Power Administration*, 550 F.3d 846 (2008) (*"PNGC I"*) and *Pacific Northwest Generating Cooperative v. BPA*, Slip Op. 09-70228 (August 28, 2009) (*"PNGC II"*).

2012 Power Sales Contracts: October 1, 2011 through September 30, 2028:

BPA executed new 2012 Regional Dialog PSCs in December 2008 that begin power deliveries October 1, 2011. The terms and conditions of these new PSCs include different provisions and terms from BPA's 2001 PSCs. Power deliveries under these contracts allow customer to elect to add nonfederal resources or to have BPA supply power for their load growth, however, BPA's 2012 PSC obligation forecasts assume that BPA serves all of the customer's net requirements, including load growth. The following describes BPA's PSC obligations associated with specific customer classes:

- BPA's Federal agency, public agency, cooperative, and USBR customers' signed 2012 PSC and Slice contract obligations which begin power deliveries October 1, 2011. These contracts incorporate the concept of Tiered Rates to BPA's PNW regional customers. The forecasts assume that BPA serves all of the customer's net requirements, including load growth. BPA's Slice obligations are based on a 27.027 percent of a specific set of Tier 1 Federal system Slice resources and a Slice block purchase established by the 2012 PSC agreements. See *The Slice Product*, page 11;
- BPA's obligation to the IOU's is consistent with the 2012 IOU PSC agreements and RPSAs. Although the IOUs have a contractual right under the PSC agreements to place requirements load on BPA and/or receive financial benefits, this study assumes only financial benefits and no power deliveries through the study horizon; and
- BPA is currently in evaluating options for PNW aluminum smelter DSI's for service post September 30, 2011, however, this study assumes no DSI customer PSC obligations during this time period.

In actual operation, BPA's PSC obligations may be higher or lower than those shown in this analysis.

The Slice Product

The Slice Product (Slice) is a public preference requirements PSC product that provides both firm and non-firm energy and capacity deliveries to a customer based on their net requirements load. 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 a specific set of Federal system resources and contracts; and 2) non-firm power deliveries on a monthly or seasonal basis based on the actual generation of those Federal resources and contracts. Slice customers also purchase a firm block product to meet the remaining amount of their net requirements load. BPA's 2001 Block and Slice PSC agreements end on September 30, 2011. Since the 2007 Study, BPA signed new 2012 Block and Slice Power Sales Agreements (2012 PSAs) under the Regional Dialogue process that begin power deliveries October 1, 2011, and continue through September 30, 2028.

2001 Slice Product: Customers signed 10-year 2001 Slice contracts with power deliveries from October 1, 2001, through September 30, 2011. The 2001 Slice product terms and provisions provide participants with a share of a specific set of Federal system resources and contract purchases, netted against a specific set of Federal obligations which comprises the Slice System Resource Stack.

- Slice Power Deliveries: Customers signed Slice contracts for power deliveries based on 22.63 percent of the Slice System Resources stack. The Slice System Resource stack is comprised of a set of specific Federal resources and contract purchases, less 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 Slice System Resource Stack is comprised of a set of specific Federal resources and contract purchases, less a specific set of Federal obligations. *See* Slice of the System Product, Product Description, published October 8, 1999, and Exhibits H and L of the Block and Slice Power Sales Agreement that began October 1, 2001. 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 Contract Deliveries: All Slice customers receive Block contract purchases having a 100 percent load factor for each month. Under provisions of the Block and Slice contract, Slice customers were allowed to select a step up in their Block purchases for the second 5-year period of the contract to cover load growth during the first 5-years of their Block and Slice contract.

2012 Slice Product: Customers signed 20-year 2012 Slice PSA's with 17 years of power deliveries that begin October 1, 2011, and run through September 30, 2028. The 2012 Slice product terms and provisions differ from the 2001 Slice contracts, however, they still provide participants with a share of a specific set of Federal system resources and contract purchases, netted against a specific set of Federal obligations. Unlike the 2001 Slice System Resource Stack, the 2012 Slice is termed the Adjusted Annual Rate Period High Water Mark Tier 1 System Capability (AART1SC). The 2012 Slice customers and purchase amounts differ from the 2001 Slice contracts and cannot be directly compared.

- Slice Power Deliveries: Slice power deliveries begin October 1, 2011, and are based on 27.027 percent of the AART1SC. The AART1SC is comprised of a set of specific Federal resources and contract purchases, less a specific set of Federal obligations. *See* Tiered Rate Methodology Rate Case, Tiered Rate Methodology, TRM-12-A-02, Tables 3.1 through 3.5, pages 121-126. The amount of 2012 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 Contract Deliveries: All Slice customers receive Block contract purchases having a 100 percent load factor for each month.

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 51.

Canadian Treaty Downstream Benefits

The Treaty between the United States and Canada enhanced the volume 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 Canadians' share called "Canadian Entitlement". Both Canada and the U.S. have the option to terminate the Treaty after September 15, 2024, with 10 years' written notice. The Determination of Downstream Power Benefits analysis is performed annually and establishes the amount of downstream power 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. 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, page 14, and is considered a Federal export.

Values depicted in Table 1, forecast Canadian Entitlement Return obligation estimated for OY 2011 through 2019. After finalizing this Study, it was discovered that the Canadian Entitlement Return obligations for OY 2011 through 2014 had not been updated. These changes were considered minimal (~10 aMW) and will be incorporated in future studies. The forecast for OY 2014 through 2019 continue to be accurate forecast estimates.

Table 1

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

Operating Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Federal System	567	527	517	505	495	483	471	457	442	428

January Capacity in Megawatts

Operating Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Federal System	1,352	1,350	1,350	1,350	1,350	1,350	1,350	1,350	1,350	1,350

Table 2, below, depicts the Non-Federal entities share of Canadian Entitlement Return obligations delivered to BPA for the mid-Columbia hydro projects and is based on each individual entities' share of those projects.

Table 2

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

Operating Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Public Agencies	61	65	72	75	74	73	72	72	71	70
Investor-Owned Utilities	58	55	44	36	36	35	35	35	34	34
Other Entities	19	21	22	26	26	26	25	25	25	24
Total Energy Obligation	**138**	**140**	**139**	**137**	**136**	**134**	**133**	**131**	**129**	**128**

January Capacity in Megawatts

Operating Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Public Agencies	98	112	111	130	127	127	126	123	121	120
Investor-Owned Utilities	111	96	95	63	62	62	61	60	59	59
Other Entities	26	36	36	45	44	44	44	43	43	42
Total Capacity Obligation	**236**	**244**	**242**	**238**	**234**	**233**	**231**	**225**	**223**	**221**

[1] Values are estimated for OY 2011 through 2019.

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:

- Federal system and regional water availability that affects hydro generation available to meet load obligations. *See* Section 4, *Potential Variability of Federal System Resources*, page 33, and Section 5, *Potential Variability of Regional Resources*, page 57;
- Implementation of the 2012 PSC agreements that set BPA PSC obligations beginning September 30, 2011, including but not limited to Contract High Water Marks and customer above-HWM elections;
- Potential new BPA obligations to new publics utilities, Department of Energy and potential DSI service in the future;
- Deviation of BPA PSC obligations due to economic conditions;
- Volatility in short- and long-term electricity market prices;
- Deviation from forecasted regional total retail loads due to changes in the economy or future climate change impacts;
- Failure of existing or contracted generating resources to operate at anticipated times and output levels;
- The potential retention, termination, or amendment of the Columbia River Treaty Canadian Entitlement obligations and/or modifications in PNW hydro and thermal operations that could change power amounts owed by the U.S. to Canada;
- The availability of new and existing regional resources that can be purchased to serve firm loads in the PNW region;
- 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 2009 Pacific Northwest Loads and Resources Study

This section describes the major data updates and changes in the assumptions for the 2009 White Book analysis compared to the 2007 White Book. Specific resource and contract changes are detailed in the 2009 Pacific Northwest Loads and Resources Study Technical Appendix. The 2009 Technical Appendix will be available on BPA's external website at http://www.bpa.gov/power/whitebook2009. The 2009 Technical Appendix presents auxiliary tables (A-tables) that contain aggregate information summarized by customer type.

Federal Firm Sales and Obligations

The 2009 White Book analysis reflects the following Federal system contract and obligation changes compared to the 2007 study:

- Federal agency, public agency, cooperative, and USBR PSC obligations were updated using BPA's agency load forecasting tool (ALF) based on:
- BPA's 2001 PSCs through September 30, 2011; and
- BPA's 2012 PSCs that begin October 1, 2011.
- Federal public agency and cooperative Slice customer obligations were updated to include the 2012 Slice and Block PSCs that begin October 1, 2011. *See* Section 2, *The Slice Product*, page 11; and
- Updated Federal system contract sales.

Federal Resource Stack

The 2009 White Book analysis reflects the following Federal system resource stack changes compared to the 2007 study:

- Federal system resource changes:
- Regulated hydro:
- The hydro regulation study was updated to incorporate BPA's most recent estimate of power, non-power requirements, and hydro improvements expected to be in effect during the study period; and
- The regulated hydro generation projections reflect operating reserve levels associated with 30-minute wind persistence scheduling accuracy forecasts.
- Independent hydro:
- Generation forecasts for the Willamette projects operated by the USACE;
- Elwha (8.6 aMW) hydro project through January 2, 2012;
- Glines Canyon (15.0 aMW) hydro project through February 13, 2012
- Idaho Falls Power Bulb Turbine projects (18.5 aMW) through September 30, 2011; and

- Bonneville Fishway (21.4 aMW) previously assumed to be included in the total Bonneville dam generation. BPA discovered that this generation was not included and now has incorporated this project separately.
- Renewable Resources:
- Capacity credit for wind projects is assumed 5 percent of the project's installed capacity, following the Council's Regional Resource Adequacy standards current guidelines;
- Federal share of Klondike III (14.7 aMW of the 65 aMW total);
- NUG Renewable: Fourmile Hill start date updated to October 1, 2015; and
- Updated Federal system contract purchases.

Future studies will reflect new information as it becomes available.

PNW Total Retail Load

The 2009 White Book utilizes updated customer-by-customer regional retail load forecasts. The forecasts are based on a combination of their historical electrical load consumption and 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 which are aggregated for each of the following customer classes.

- Total Retail Load Updates:
- Federal agency, public agency, cooperative, and USBR retail load forecasts were developed by BPA using ALF incorporates historical retail load data and their 2001 PSCs' Exhibit C submittals. Some public agency customer loads were developed from their 2008-09 PNUCC data submittals or direct submittals to BPA; and
- IOU retail load forecasts were developed by BPA using ALF and data provided in IOUs' 2008-09 PNUCC data submittals; and
- Updated PNW regional export contracts.

PNW Regional Resource Stack

In addition to the Federal system resource stack updates presented on page 17, the 2009 White Book analysis reflects the following regional resource and contract changes compared to the 2007 study:

Regional resource additions:

- Independent Hydro:
    - Arrowrock Hydro (5.8 aMW in 2011); and
    - Swift Creek Hydro (0.9 aMW in 2010).

- Cogeneration:
    - Hampton Lumber Mill (Darrington) (3.5 aMW);
    - Sierra Pacific Burlington (26.0 aMW);
    - Simposon Tacoma CoGen (44.3 aMW); and
    - Wah Chang (Albany, OR) (11.8 aMW).
- Renewables:
    - Bennett Creek Wind (4.9 aMW);
    - Biglow Canyon I (29.8 aMW in 2011, and 44.0 aMW in 2012-2019);
    - Biglow Canyon II (34.9 aMW in 2011 and 51.5 aMW in 2012-2019);
    - Cassia Farms Wind (2.6 aMW);
    - Cassia Gulch Wind (4.8 aMW);
    - Goodnoe Hills (24.2 aMW),
    - Hay Canyon Wind (36.2);
    - Hopkins Ridge II (2.1 aMW);
    - Hot Springs Wind (5.0 aMW);
    - Klondike III (74.1 aMW);
    - Marengo II Wind Project (16.0 aMW);
    - Pebble Springs Wind Project (31.4 aMW);
    - Rattle Snake Road Wind Farm (27.4 aMW);
    - Rock River I Wind (12.1 aMW);
    - Tuolume Wind (35.1 aMW);
    - Wheatfield Wind (32.1 aMW);
    - White Creek (73.5 aMW);
    - Wild Horse II (7.5 aMW in 2011 and 11.0 aMW 2012-2019); and
    - Willow Creek Wind (24.0 aMW).
- NUG Hydro:
    - Lowline Midway (1.6 aMW); and
    - Big Sheep Creek (1.6 aMW).
- NUG Small Thermal & Miscellaneous Resources:
    - Treasure Valley (3.2 aMW)
- NUG Cogeneration:
    - Rough & Ready Lumber (1.0 aMW);
- NUG Renewables:
    - Bettencourt Dairy (Cargill) (1.1 aMW);
    - Big Sky Dairy (1.2 aMW);
    - DeRuyter & Son’s Dairy (1.2 aMW);
    - Finley Buttes BioEnergy (2.2 aMW in 2010 and 2.9 aMW 2011-2019);
    - Portland Waste Water (1.4 aMW); and
    - Qualco Dairy Digester (0.4 aMW).

Regional resources removed:

- Independent Hydro:
  - Cline Falls (0.5 aMW) – decommissioned.
- Small Thermal & Misc.:
  - Bangor Base #1 Diesel Generators (0.0 aMW) - decommissioned;
  - Bangor Base #2 Diesel Generators (0.0 aMW) - decommissioned;
  - Corette (0.0 aMW) - decommissioned;
  - Crystal Mountain (0.0 aMW) - decommissioned; and
  - Puget Sound Shipyards Diesel Gen. (0.0 aMW) - decommissioned.
- Combustion Turbines:
  - Hoquiam Diesels (0.0 aMW) – decommissioned.
- NUG Hydro:
  - Pancheri (0.0 aMW) – decommissioned; and
  - John Llewellyn (0.0 aMW) – decommissioned.

PNW regional import contracts updated:

The following projects or contracts were reclassified or renamed within the study and had no effect on the regional generation totals:

- NUG Combustion Turbines to Combustion Turbines:
  - Rathdrum-Boekel Road #1 (66.2 aMW); and
  - Rathdrum-Boekel Road #2 (66.2 aMW).
- NUG Cogeneration to Cogeneration:
  - Sumas Energy (118.8 aMW);
  - Tenaska Gas Cogen (147.4 aMW); and
  - Georgia-Pacific Paper (Wauna) (23 aMW).
- NUG Renewable to Renewables:
  - Big Horn (64.2 aMW);
  - Condon Wind Project (10.6 aMW);
  - Eurus Combine Hills (13.8 MW);
  - Foote Creek 1 (10.0 aMW);
  - Foote Creek 2 (0.4 aMW);
  - Foote Creek 4 (4.1 aMW),
  - Fossil Gulch Wind Project (2.6 aMW);
  - Klondike I (8.0 aMW);
  - Klondike II (22.5 aMW);
  - Nine Canyon Wind Project (28.4 aMW);
  - Stateline Wind Project (73.4 aMW);
  - Vanscycle Wind (8.3 aMW); and
  - Wolverine Creek (16.2 aMW).

- NUG Renewable to Small Thermal & Miscellaneous Resources:
    - Covanta Marion Solid Waste (9.7 aMW);
    - Telocaset Wind was renamed Elkhorn Valley Wind Farm;
    - Magic Valley was renamed Rupert Cogeneration Facility; and
    - Magic West was renamed Glenns Ferry Cogeneration Facility.

Future studies will reflect new information as it becomes available.

Federal System 18-Hour Capacity

The 1-hour and 120-hour capacity measures the ability of the Federal system to meet typical peaks encountered in a month of normal weather, while the 18-hour capacity measures ability of the Federal system to meet the average of the 6 highest load hours (consecutive or non-consecutive) for a 3-day weather event that might occur once in ten years. This metric is meant as a minimum reliability measure to ensure that "the lights stay on" during an extreme-weather event when there may be no power available on the spot market except at night.

To analyze the Federal system 18-hour capacity, BPA used the HOSS model to simulate Federal system hydro generation when operated to meet extreme weather event loads during the months of February and August. Unlike "critical period" water planning studies, hydro generation conditions for the 18-hour capacity analysis was assumed to be median or average water conditions. In this assessment, for such an extreme temperature event, additional water is released during the event, even if that may require purchasing in the days following the event. The Federal system 18-hour capacity analysis is presented in Section 4, *Monthly Federal Firm Capacity Surplus/Deficit Projections*, beginning on page 43.

Council's Resource Adequacy Standard

BPA has worked with the Council and other PNW entities to develop a resource adequacy standard for the PNW, which was adopted in April 2008.

Region: The standard is comprised of a consensus-based methodology for assessing the resource adequacy. The standard's minimum thresholds serve as an early warning should resource development fall dangerously short to meet regional loads. See detailed description in Section 6, *Council's Regional Resource Adequacy Standard*, page 69.

Federal System: Though the PNW Resource Adequacy Forum (Forum) has not yet decided whether to provide a detailed utility-by-utility deterministic translation of the regional energy resource adequacy standard, BPA has made a preliminary assessment of the Federal system energy resource adequacy, described in Section 6, Council's Regional *Resource Adequacy Standard*, page 69.

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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 July 22, 2009. The assumptions used for the Federal system analysis are as follows:

- Forecasted Federal load obligations reflect normal weather conditions and does not reflect future climate change impacts;
- Regulated hydro generation estimates incorporate PNCA plant characteristics, streamflows, BPA's best estimate of non-power requirements, and hydro improvements. The regulated hydro generation projections reflect operating reserve levels associated with 30-minute wind persistence scheduling accuracy forecasts;
- Generation forecasts for independent hydro and other generating resource projects are provided to BPA by the project owners;
- BPA's Federal agency, public agency, cooperative, and USBR and Slice PSC obligations continue through the study horizon. (2001 PSCs through September 30, 2011, and 2012 PSCs beginning October 1, 2011). The forecasts assume that BPA serves all of the customer's net requirements, including load growth;
- BPA's obligation to the IOU's under sections 5(b) and 5(c) of the Northwest Power Act 16 U.S.C. §839c(c)(1) was established for five of the six regional IOUs when they signed "Bridge" New Resource Firm Power Block power sales agreements (Bridge NR Block contracts) and "Bridge" Residential Purchase and Sale Agreements (RPSA) contracts effective on or about October 1, 2008, and continuing through September 30, 2011. Under these contracts, BPA's obligations to the IOU's will be satisfied through financial benefits or power deliveries, or both. This study assumes only financial benefits and no power deliveries through the study horizon;
- BPA's only Direct Service Industry contract obligation is its service to Port Townsend Paper Corporation (PTPC) for 17 aMW through September 30, 2011. However, since finalizing this document, BPA is evaluating its options for long-term DSI service contracts due to recent court opinions in *PNGC I* and *PNGC II*;
- 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 surplus capacity sale contract with PacifiCorp expires August 31, 2011, and is not renewed;
- Capacity credit for wind projects is assumed 5 percent of the project's installed capacity, following the latest Council Regional Resource Adequacy standards guidelines;
- Firm hydro energy and capacity estimates are based on 1937-critical water conditions, unless otherwise specified; and
- Transmission losses are treated as a resource reduction.

Draft Resource Program

The September 2009 draft Resource Program (RP) examines potential deficits in annual energy, monthly HLH energy, 18-hour capacity, and balancing reserve supplies. The results for annual energy and 18-hour capacity are in good agreement with the 2009 White Book. The White Book does not address balancing reserves (they are in the models, but not examined in detail). The monthly HLH energy assessment is more difficult to compare between the two studies.

The White Book examines monthly energy for all hours of the day using critical water, which of course has a particular shape for that specific water year (eg.1937). It also examines 1-hour and 120-hour peaking capacity for the average of the bottom 10^{th} percent conditions. In contrast, the Resource Program analyses focus on the Heavy Load Hours *at* the 10^{th} percentile conditions *for each month* across the array of 70 water years. Although both the RP and White Book methodologies provide useful insight, the studies use different methodologies therefore the results are not directly comparable. Different methodologies were used because we wanted to retain the continuity to past White Books, with the 120-hour analysis methodology in the case of the White Book, but we found that HLH energy was more constraining for resource planning. BPA will continue to consider the merit of aligning these long term planning assumptions. The BPA Resource Program can be found on-line at: http://www.bpa.gov/power/P/ResourceProgram/Index.shtml

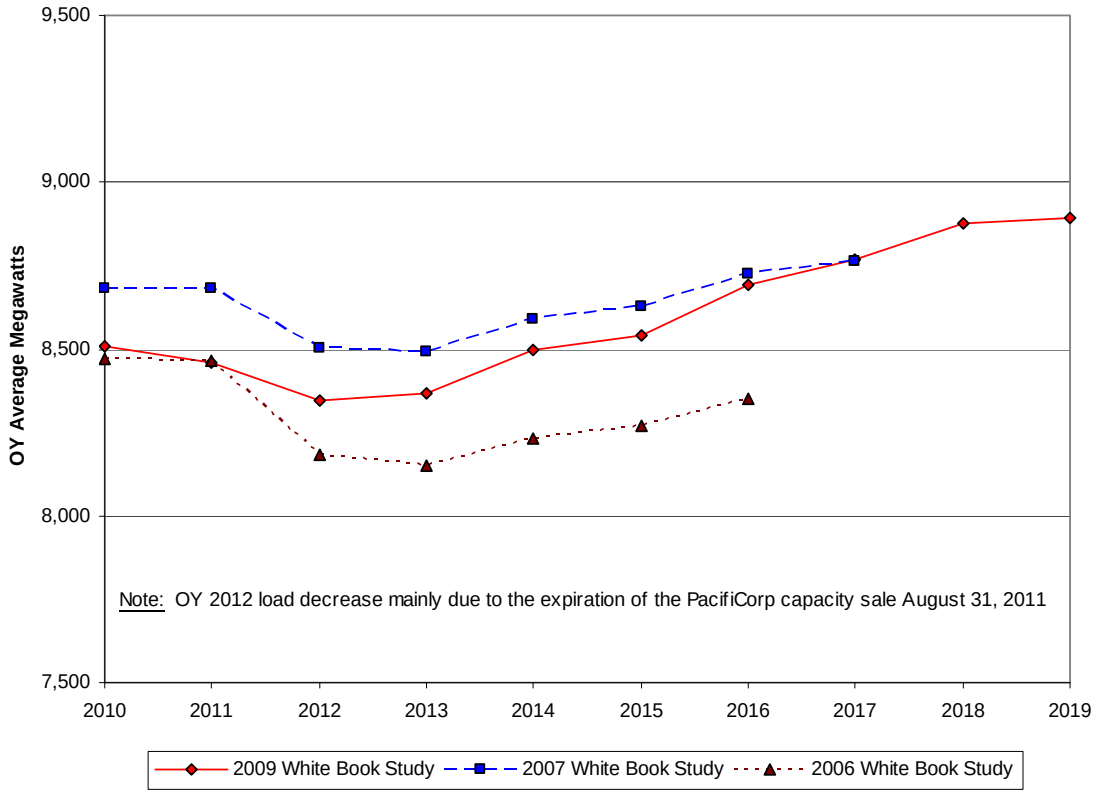
Federal Firm Energy Load Obligations

In this study, the annual Federal system firm energy load obligations incorporate the preceding "Federal System Assumptions" and include BPA's forecasted 2001, and 2012 PSC obligations for PNW Federal agencies, public agencies, cooperatives, USBR, IOUs, and DSIs. The methodology and key elements of BPA's PSC obligation forecasts are presented in Section 2, *BPA Power Sales Contract Obligations*, page 10 and Section 2, *The Slice Product* discussed on page 11. 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 entities' total retail load discussed in Section 2, *Total Retail Load Forecast*, page 3.

Figure 1, below, illustrates the differences between the forecasted 2009 White Book annual Federal system energy load obligations for OY 2010 through 2019 and the previous 2007 and 2006 studies. BPA's energy load obligations reflect current economic conditions that reduced load obligations in OY 2010, when compared to the 2007 Study and reflects economic improvement by OY 2011. The Federal load obligations show a long term increase of 547 aMW for OY 2010 through 2019. The annual Federal firm energy load obligations for OY 2010 through 2019 are presented in Exhibit 1, page 76.

Figure 1

Annual Federal Firm Energy Load Obligations [1]
For OY 2010 through 2019



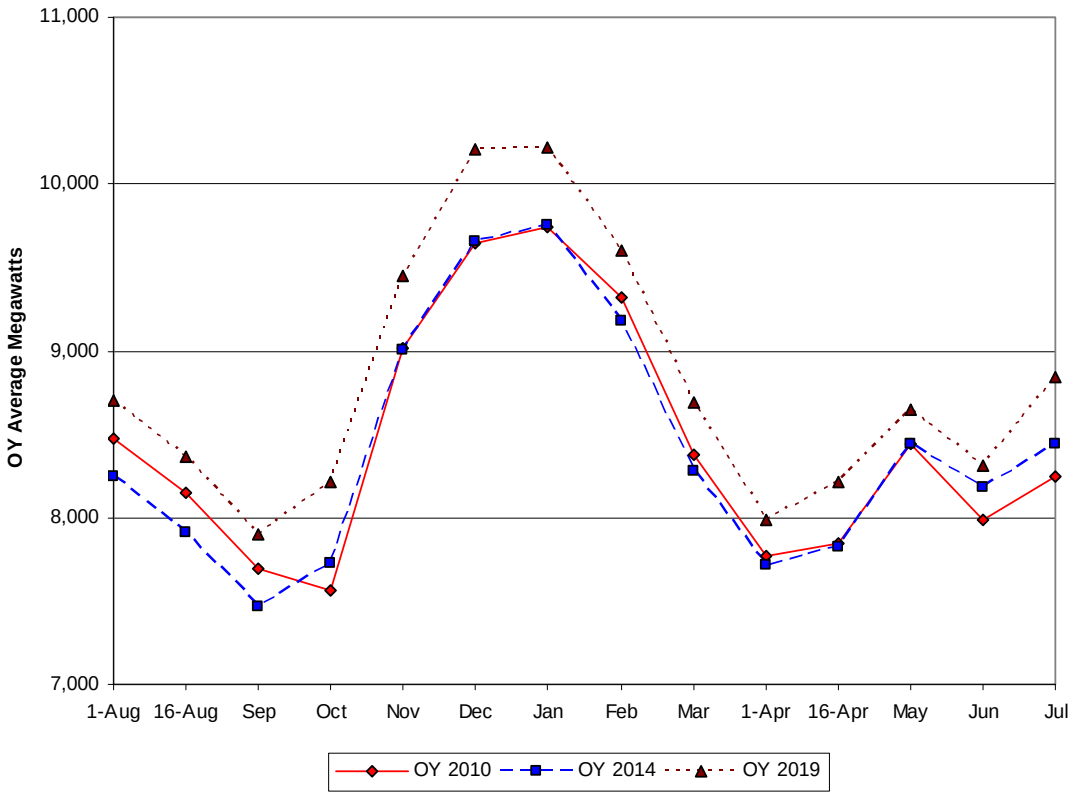
[1] 2007 White Book projections were published through OY 2017. 2006 White Book projections were published through OY 2016.

Monthly Federal Firm Energy Load Obligations

Figure 2, below, illustrates the monthly Federal firm energy load obligations for OY 2010, 2014, and 2019 and incorporates the same load components detailed in *Federal System Assumptions* and the *Federal Firm Energy Load Obligations* beginning on page 23.

Figure 2

Monthly Federal Firm Energy Load Obligations [1]
For OY 2010, 2014, and 2019



The monthly Federal firm energy load obligations for OY 2010, 2014, and 2019, assuming 1937-critical water conditions, are shown in Exhibits 2 through 4, pages 80-85.

[1] For OY 2010, BPA load obligations are higher than OY 2014 due to:

- Signed BPA marketing contract deliveries increased obligations during the August through September 2009 timeframe (~210 aMW);
- The expiration of BPA's Hungry Horse obligations on September 30, 2011 (~40 aMW);
- The expiration of a BPA contract with the city of Riverside, California on June 15, 2010 (~3 aMW); and
- The expiration of BPA's PacifiCorp capacity sale on August 31, 2011 (~186 aMW).

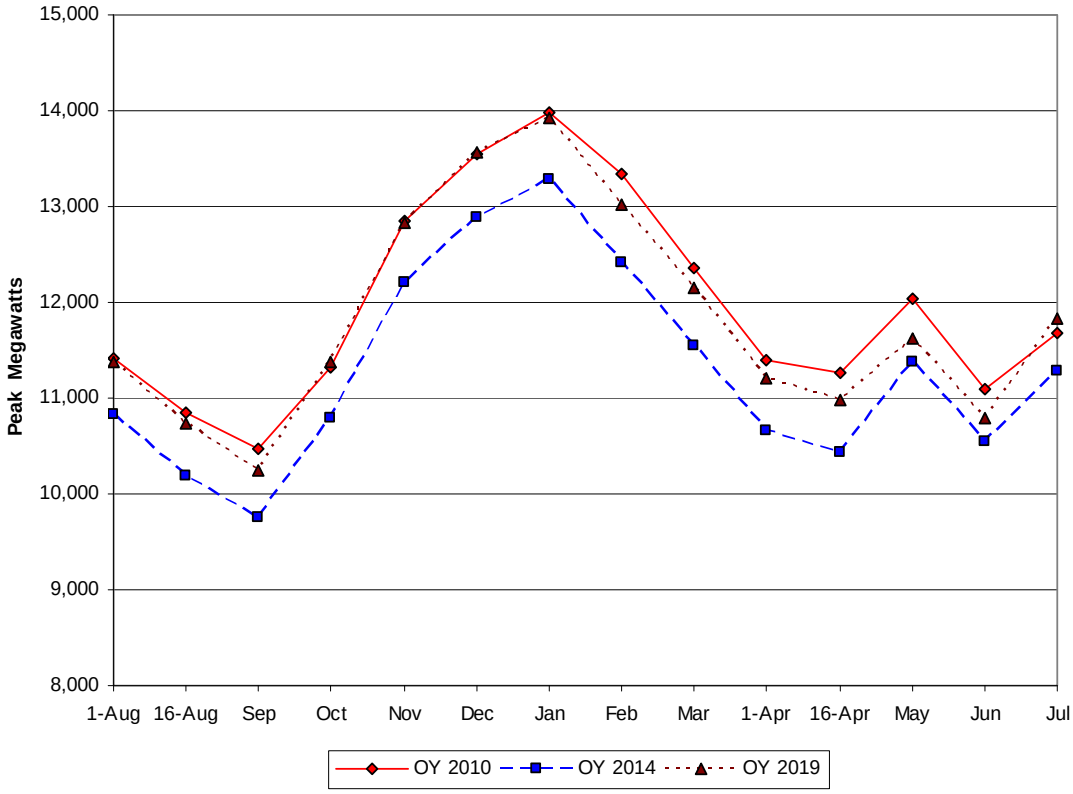
1-Hour Federal Peak Load Obligations: Figure 3, below, illustrates the monthly Federal firm 1-hour peak load obligations for OY 2010, 2014, and 2019. The forecast assumes that BPA serves all of the customer's net requirements, including load growth for the entire study period. Federal peak load obligations include BPA's exports and intra-regional contract sales. The peak load obligations assume normal weather conditions and do not reflect future climate change impacts. The forecast also assumes a 50-percent probability that the actual peak load obligations could be exceeded. The peak load projections are also reduced by a 1-hour diversity component to address the fact that BPA's peak electrical demands do not occur simultaneously throughout the region.

Figure 3

Monthly Federal Firm 1-Hour Peak Load Obligations [1]

For OY 2010, 2014, and 2019

(Revised 11/30/2009)



The monthly 1-hour Federal firm peak loads are presented in Exhibits 5 through 7, pages 88-93.

[1] For OY 2010, the peak load obligations are greater than OY 2014 and 2019 mainly due to:

- Signed BPA marketing contract deliveries increased obligations during the August through September 2009 timeframe (~500 MW);
- The expiration of BPA's Hungry Horse obligations on September 30, 2011 (~55 MW);
- The expiration of BPA's City of Riverside, California contract on June 15, 2010 (~20 MW);
- The expiration of BPA's Avista Corps WNP-3 Settlement on June 30, 2017 (~42 MW); and
- The expiration of BPA's PacifiCorp capacity sale on August 31, 2011 (~575 MW).

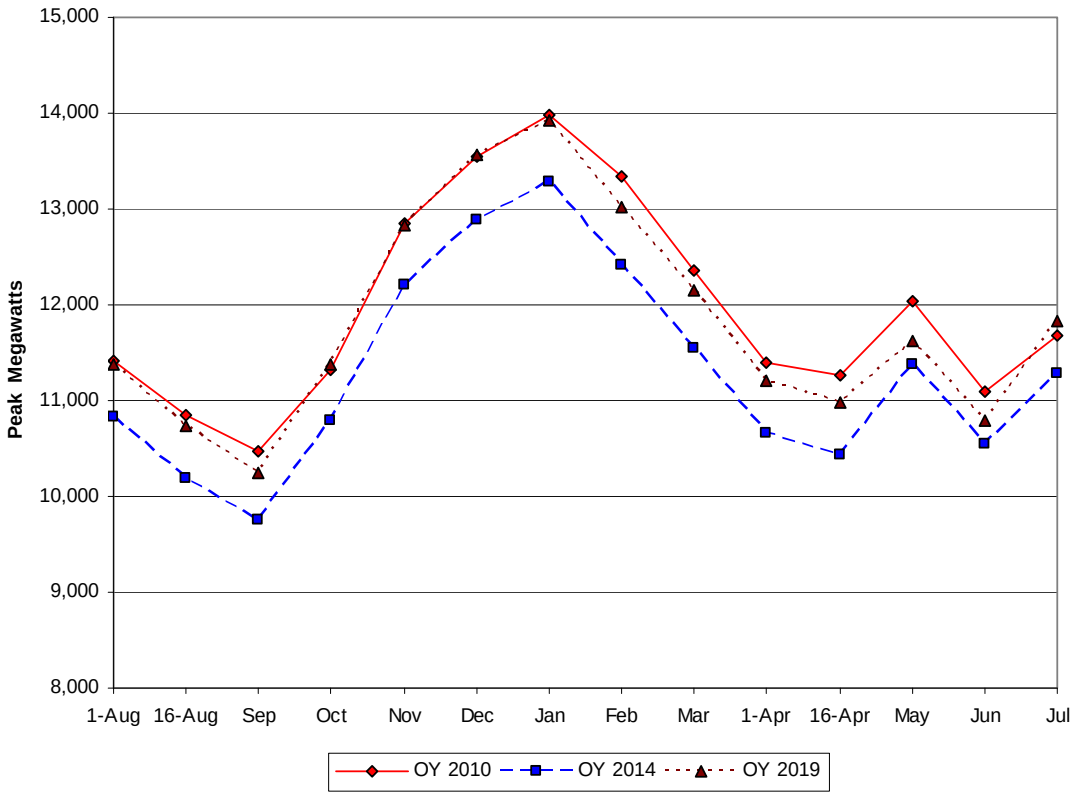
Figure 3, *Monthly Federal Firm 1-Hour Peak Load Obligations*, page 27, and Figure 4, *Monthly Federal Firm 120-Hour Peak Load Obligations*, page 29, show that BPA's OY 2010 peak load obligations are higher than OY 2014 and approximately the same level as OY 2019. The Federal system's OY 2010 load obligations are higher mainly due to the type of and size of BPA's power deliveries during this timeframe that include: a capacity contract with PacifiCorp, Hungry Horse power obligations, WNP-3 Settlement deliveries with Avista Corps, deliveries to the city of Riverside, California, and several other contract obligations, which expire prior to OY 2014.

These contracts are delivered on heavy load hours (HLHs) and have 2 to 3 times the amount of capacity obligations than that contract's average monthly energy delivery. This is evident when comparing Figure 3, page 27, or Figure 4, page 29, with Figure 2, Monthly Federal Firm Energy Load Obligations, page 26. In OY 2010, BPA's PacifiCorp capacity sale has a monthly capacity of about 575 MW and associated energy of 186 aMW; and BPA marketing contracts during the August through September 2009 timeframe have a total capacity of approximately 500 MW and monthly energy of only 210 aMW. Therefore, contract obligations like these, have a greater impact on capacity than energy during that timeframe. This is common with contracts that specify only HLH power deliveries.

120-Hour Federal Peak Load Obligations: Figure 4, below, illustrates the monthly Federal firm 120-hour peak load obligations for OY 2010, 2014, and 2019. The 120-hour monthly demand forecast the same assumptions as those described in *1-Hour Federal Peak Load Obligations*, page 27, with the exception of incorporating a 120-hour diversity reduction. The figure shows lower BPA peak load obligations in OY 2014 mainly due to lower peak load obligations to public utilities under the 2012 PSCs that begin October 1, 2011, and the expiration of BPA's PacifiCorp capacity contract on August 31, 2011.

Figure 4

Monthly Federal Firm 120-Hour Peak Load Obligations [1]
For OY 2010, 2014, and 2019
(Revised 11/30/2009)



The monthly 120-hour Federal firm peak loads are presented in Exhibits 8 through 10, pages 96-101.

[1] For OY 2010, the peak load obligations are greater than OY 2014 and 2019 mainly due to:
- Signed BPA marketing contract deliveries increased obligations during the August through September 2009 timeframe (~500 MW);
- The expiration of BPA's Hungry Horse obligations on September 30, 2011 (~55 MW);
- The expiration of BPA's City of Riverside, California contract on June 15, 2010 (~20 MW);
- The expiration of BPA's Avista Corps WNP-3 Settlement on June 30, 2017 (~42 MW); and
- The expiration of BPA's PacifiCorp capacity sale on August 31, 2011 (~575 MW).

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 2010. Federal system energy resources are comprised of approximately 78.8 percent hydropower, 11.6 percent from one nuclear power plant, and 9.6 percent from BPA's contracts and small thermal and renewable resources.

Table 3

Federal Firm Total Resources for OY 2010[1]
Based on 1937-Critical Water Conditions

Project Type	1-Hour Operational Peaking Capacity (January Peak MW)	Percent of Operational Peaking Capacity	Firm Energy (OY in aMW)	Percent of Firm Energy
Hydro	16,332	89.1%	6,983	78.8%
Nuclear	1,150	6.3%	1,030	11.6%
Contracts/Small Renewables/Cogen Resources	844	4.6%	849	9.6%
Total Federal Firm Resources	**18,326**	**100.0%**	**8,862**	**100.0%**

The Federal system hydro resources from which BPA markets power are detailed in Table 4, page 31. 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 32, shows the non-Federally owned resources, return energy associated with BPA's existing capacity/energy exchanges, contractual resources, and other BPA hydro-related contracts. Some hydro projects, presented in Table 4 and Table 5, have winter operating characteristics that may create lower expected January capacity than the annual firm energy generation.

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

Table 4

Federal System Hydro Projects
Capacity and Energy Based on OY 2010

Project	Initial Year of Service	Number of Units	Nameplate Rating (MW)	Instantaneous Generating Capacity[1] (Peak MW)	Firm Energy[2] (aMW)
U.S. Bureau of Reclamation (USBR) Hydro Projects					
Boise Diversion	1908	3	3	0	1
Grand Coulee	1941	27	6,735	6,192	1,866
○ GCL Pump Generation	1973	6	314	300	0
Hungry Horse	1952	4	428	379	83
Palisades	1957	4	176	34	65
Anderson Ranch	1950	2	40	36	16
Green Springs	1960	1	18	19	6
Minidoka	1909	4	28	13	15
Roza	1958	1	13	4	8
Black Canyon	1925	2	10	9	8
Chandler	1956	2	12	10	9
Total USBR Projects		**56**	**7,777**	**6,996**	**2,077**
U.S. Army Corps of Engineers Hydro Projects					
Chief Joseph	1955	27	2,614	2,535	1,069
John Day	1968	16	2,480	2,484	796
The Dalles[3]	1957	24	2,052	2,074	606
Bonneville[4]	1938	20	1,195	1,052	407
McNary	1953	14	1,120	1,127	499
Lower Granite	1975	6	930	930	198
Lower Monumental	1969	6	930	922	198
Little Goose	1970	6	930	928	204
Ice Harbor	1961	6	693	693	171
Libby	1975	5	605	579	184
Dworshak	1974	3	465	445	149
Lookout Point	1954	3	138	17	37
Detroit	1953	2	115	100	42
Green Peter	1967	2	92	20	28
Lost Creek	1975	2	56	19	29
Albeni Falls	1955	3	49	28	27
Hills Creek	1962	2	34	6	18
Cougar	1964	2	28	5	17
Foster	1968	2	23	5	13
Big Cliff	1954	1	21	7	10
Dexter	1955	1	15	4	9
Total Corp of Engineer Projects		**153**	**14,585**	**13,980**	**4,711**
Total USBR and USACE Projects		**209**	**22,363**	**20,976**	**6,788**

[1] This is the maximum hydro generation using optimum conditions for January 2010 assuming 1937-critical water conditions and does not reflect operational peaking reductions.
[2] Firm energy is a 12-month annual average for OY 2010 assuming 1937-water conditions.
[3] Though not purchased by Bonneville, The Dalles Fishway has two units that produce approximately 5 aMW which are not included in this table.
[4] The Bonneville dam does not include the Bonneville Fishway in the total. The Fishway project is included in Table 5, page 32.

Table 5

Non-Federally Owned BPA Resources and Contracts
Capacity and Energy Based on OY 2010

Project	Type	Operator	Date in Service	Capacity[1] (Peak MW)	Firm Energy (aMW)
Existing Non-Federally Owned BPA Resources					
Columbia Generating Station	Nuclear	ENW	1984	1,150	1,030[2]
Cowlitz Falls	Hydro	Lewis County PUD	1994	13	26
Idaho Falls Bulb Turbines	Hydro	Idaho Falls Power	1982	10	14
Dworshak/Clearwater Small Hydro	Hydro	State of Idaho DWR	2000	3	3
Glines Canyon[3]	Hydro	US Parks Service	1927	16	15
Elwha Hydro[4]	Hydro	US Parks Service	1910	13	9
Bonneville Fishway	Hydro	USACE	1981	24	21
Georgia Pacific Paper Wauna	Cogen.	Georgia Pacific	1996	32	23
Foote Creek 1[5]	Wind	Foote Creek 1, LLC	1999	1	4
Foote Creek 2[5]	Wind	Foote Creek 2, LLC	1999	0.1	0.4
Foote Creek 4[5]	Wind	Foote Creek 4, LLC	2000	1	4
Stateline Wind Project[5]	Wind	PPM, FLP	2001	5	22
Condon Wind Project[5]	Wind	Condon Wind Project, LLC	2002	3	11
Klondike Phase I[5]	Wind	NW Wind Power	2001	1	8
Klondike Phase III[5]	Wind	NW Wind Power		3	17
Fourmile Hill Geothermal	Geo.	Calpine	2012[6]	0	0
Ashland Solar Project	Solar	City of Ashland, OR	2000	0	0.003
White Bluffs Solar	Solar	Energy Northwest	2002	0	0.004
Total Non-Federally Owned BPA Resources				**1,275**	**1,207**
Firm Contracts					
Canadian Entitlement for Canada (non-Federal)				236	138
Canadian Imports				1	1
Pacific Southwest Imports				0	28
Inland Southwest Imports				45	60
Eastern Imports				400	160
Intra-Regional Transfers In (Pacific Northwest Purchases)				322	486
Total BPA Firm Contracted Resources				1,004	873
Total Non-Federally Owned BPA Resource Contracts				**2,763**	**2,080**

[1] This is the maximum generation using optimum conditions for January 2010. Hydro projects assume 1937-critical water conditions.
[2] Columbia Generating Station is not in a refueling year.
[3] Elwha hydro generation acquisition assumed through January 2, 2012.
[4] Glines Canyon hydro generation acquisition assumed through February 13, 2012.
[5] 5 percent peaking capacity credit for wind projects that follows the Council's Regional Resource Adequacy standards.
[6] Fourmile Hill is assumed to be operational October 1, 2015. 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

Variability Due to Water Conditions: To illustrate the potential variability of Federal system resources, this study compares different scenarios using varying levels of Federal system generation based on differing water conditions. Table 6, below, compares the estimated annual Federal system resources under four scenarios using: 1) 1937-critical water conditions (the base case of this study); and the averages of 2) the bottom ten percent; 3) the middle 80 percent; and 4) the top ten percent of the historical 70-water year conditions (1929 through 1998).

Table 6

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

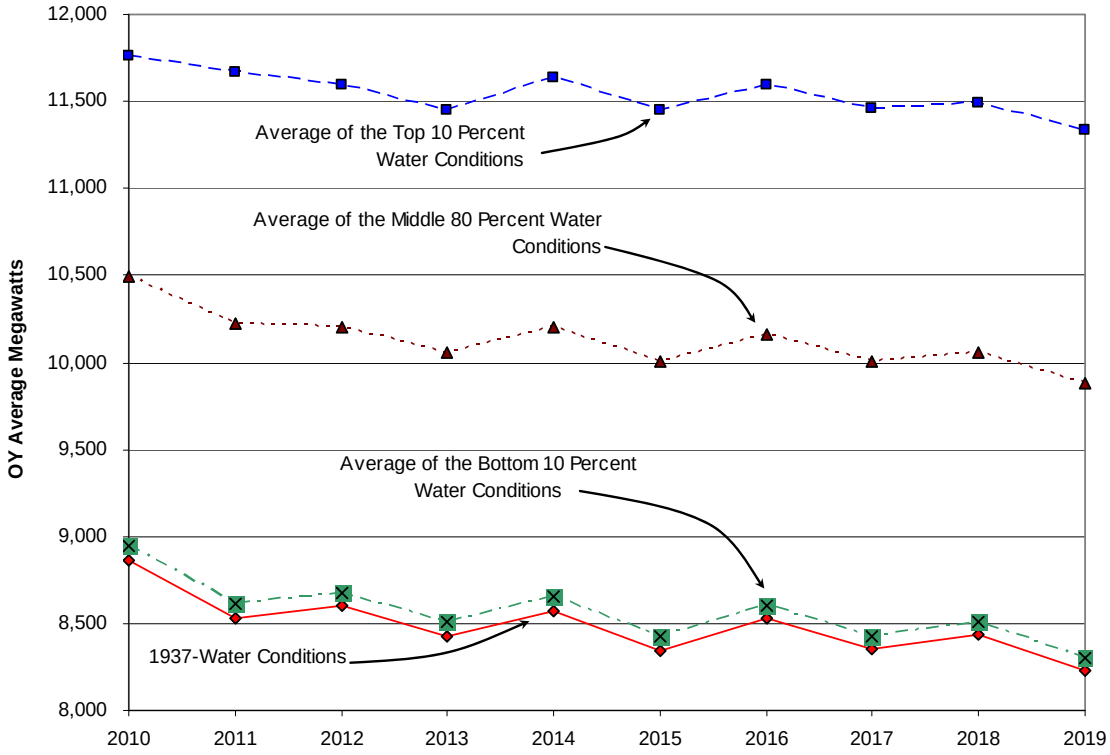
Operating Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
1937-Critical Water Conditions	8,862	8,532	8,600	8,431	8,576	8,346	8,530	8,351	8,432	8,227
Average Bottom 10% Water Conditions	8,944	8,615	8,678	8,507	8,651	8,421	8,605	8,425	8,508	8,302
Average Middle 80% Water Conditions	10,491	10,227	10,199	10,055	10,201	10,002	10,157	10,006	10,058	9,883
Average Top 10% Water Conditions	11,759	11,672	11,596	11,445	11,634	11,450	11,593	11,455	11,492	11,331

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

Figure 5, below, illustrates the four scenarios for the annual Federal system resources.

Figure 5

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



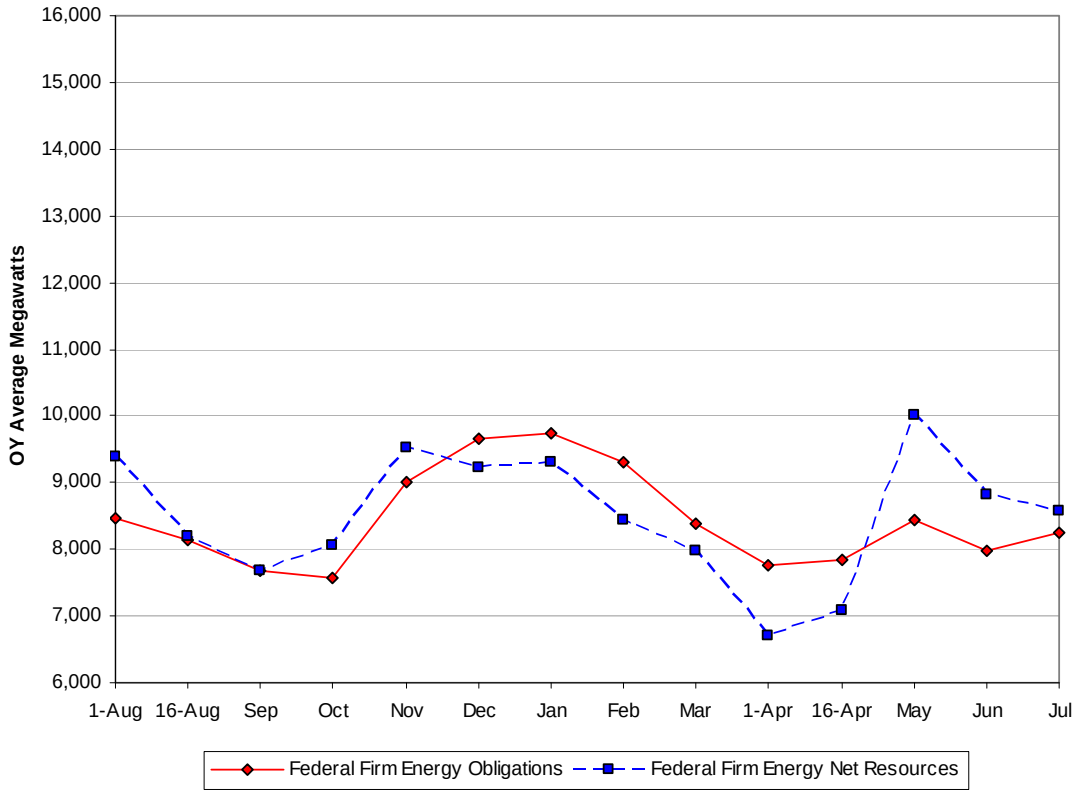
[1] Total Federal net resource estimates include adjustments for reserves, maintenance, and transmission losses.

Monthly Shape of Federal System Energy Load Obligations and Resources

Figure 6, below, illustrates the monthly Federal system firm energy loads and net resources for OY 2010. This figure shows an example of the monthly timing of Federal system surpluses and deficits using the 2008 NOAA Fisheries FCRPS BiOp flow requirements. Exhibits 2 through 4, pages 80-85, show the monthly variability of the components of the Federal System loads and net resources using 1937-critical water conditions for OY 2010, 2014, and 2019.

Figure 6

OY 2010 Monthly Federal Firm Energy Loads and Net Resources
Using 1937-Critical Water Conditions



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

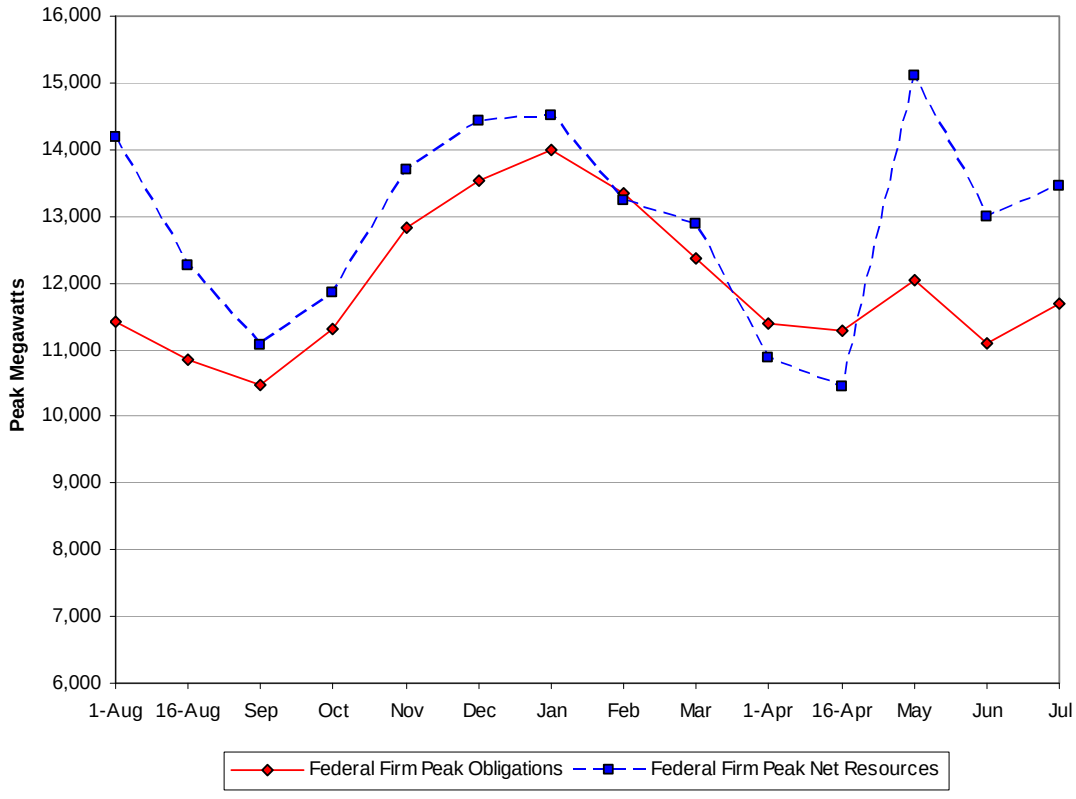
In addition to the monthly variability of the Federal surplus/deficit using critical water conditions, the Federal surplus/deficit can also vary greatly depending on water conditions in the PNW. Exhibits 11 through 20, pages 104-123, illustrate the Federal firm energy surplus/deficit projections using the 70-water years of record.

1-Hour Federal Load Obligations and Resources: Figure 7, below, illustrates the monthly 1-hour Federal system peak loads and net resources for OY 2010. These projections assume hydro resource generation under 1937-critical water conditions and incorporate normal weather peak load obligations and do not reflect future climate change impacts. The peak load obligations assume a 50-percent probability that the actual peak loads will be either higher or lower than the forecast. 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 one operating year using 1937-critical water conditions.

Figure 7

OY 2010 Monthly Federal System Firm 1-Hour Obligations and Net Resources Using 1937-Critical Water Conditions

(Revised 11/30/2009)

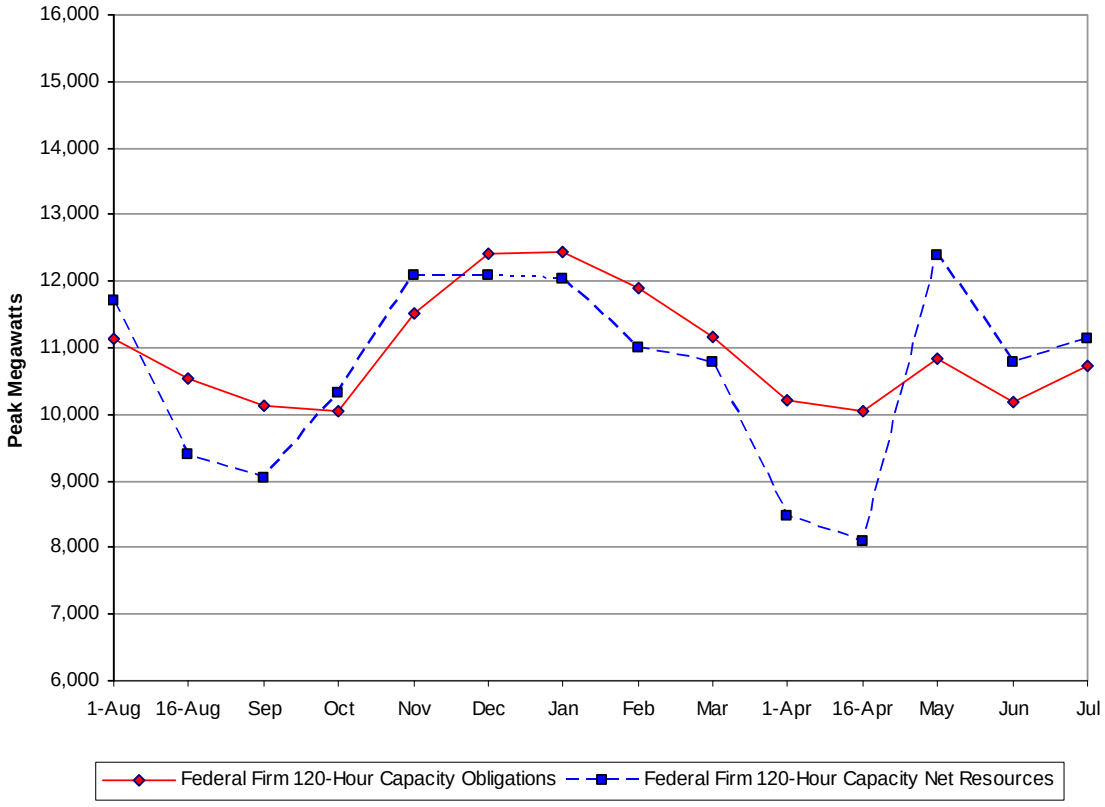


120-Hour Federal Load Obligations and Resources: The monthly 120-hour Federal system load obligations and resources for OY 2010 are shown below in Figure 8. Similar to the 1-hour Federal system analysis capacity analysis, these projections assume hydro resource generation under 1937-critical water conditions and incorporate normal weather peak load obligations and are unadjusted for any yet-to-be-determined climate changes. The peak load obligations assume a 50-percent probability that the actual peak loads will be either higher or lower than the forecast. Additionally, the Federal hydro capacity is reduced by an operational peaking adjustment to estimate the monthly maximum operational capability that is available to meet the 120-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 8

OY 2010 Monthly Federal Firm 120-Hour Obligations and Net Resources Using 1937-Critical Water Conditions

(Revised 11/30/2009)



BPA would meet these deficits using methods described in *Planning to Meet Federal System Deficits*, page 41.

Annual Federal Firm Energy Surplus/Deficit Projections

The projections for annual Federal firm energy surplus/deficits for OY 2010 through 2019 are presented in Table 7, below. The Federal system is projected to have both annual energy surpluses and deficits throughout the study period. These surplus/deficits range from a surplus of 102 aMW in OY 2010 to a deficit of -898 aMW in OY 2019. BPA will most likely meet these deficits using a combination of methods described in *Planning to meet Federal System Deficits*, page 50.

Table 7

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

Operating Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Federal Surplus/Deficit	102	-170	11	-173	-163	-429	-405	-652	-680	-898

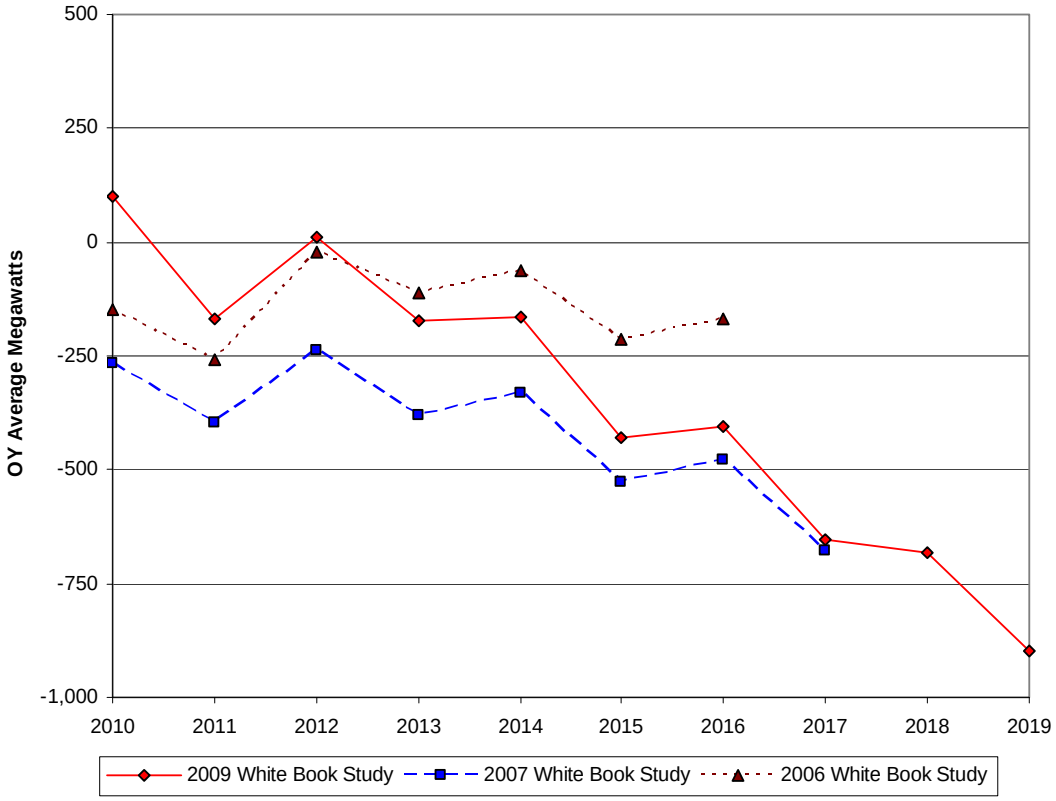
Comparing OY 2011 and 2012, the Federal system projects a minimal energy surplus in OY 2012 mainly due to the following:

- Columbia Generating Station returning from a maintenance/refueling outage in 2011; and
- Lower BPA peak load obligations in OY 2012 mainly due to:
    - Lower peak load obligations to public utilities under the 2012 PSCs that begin October 1, 2011; and
    - The expiration of the Hungry Horse and Port Townsend power deliveries that expire September 30, 2011.

Figure 9, below, illustrates how the 2009 White Book Federal energy surplus/deficits compare to the previous 2007 and 2006 studies.

Figure 9

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



The components of the annual Federal energy loads and resources balance using 1937-critical water conditions for OY 2010 through 2019 are presented in Exhibit 1, page 76.

[1] 2007 White Book projections were published through OY 2017. 2006 White Book projections were published through OY 2016.

Potential Variability of Annual Federal Energy Surplus/Deficit Projections

Variability Due to Water Conditions: 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 and do not reflect future climate change impacts. Table 8, below, compares the annual Federal system surplus/deficits under four scenarios using resources utilizing: 1) 1937-critical water conditions (the base case of this study); and the averages of 2) the bottom ten percent; 3) the middle 80 percent; and 4) the top ten percent of the historical 70-water year conditions (1929 through 1998).

Table 8

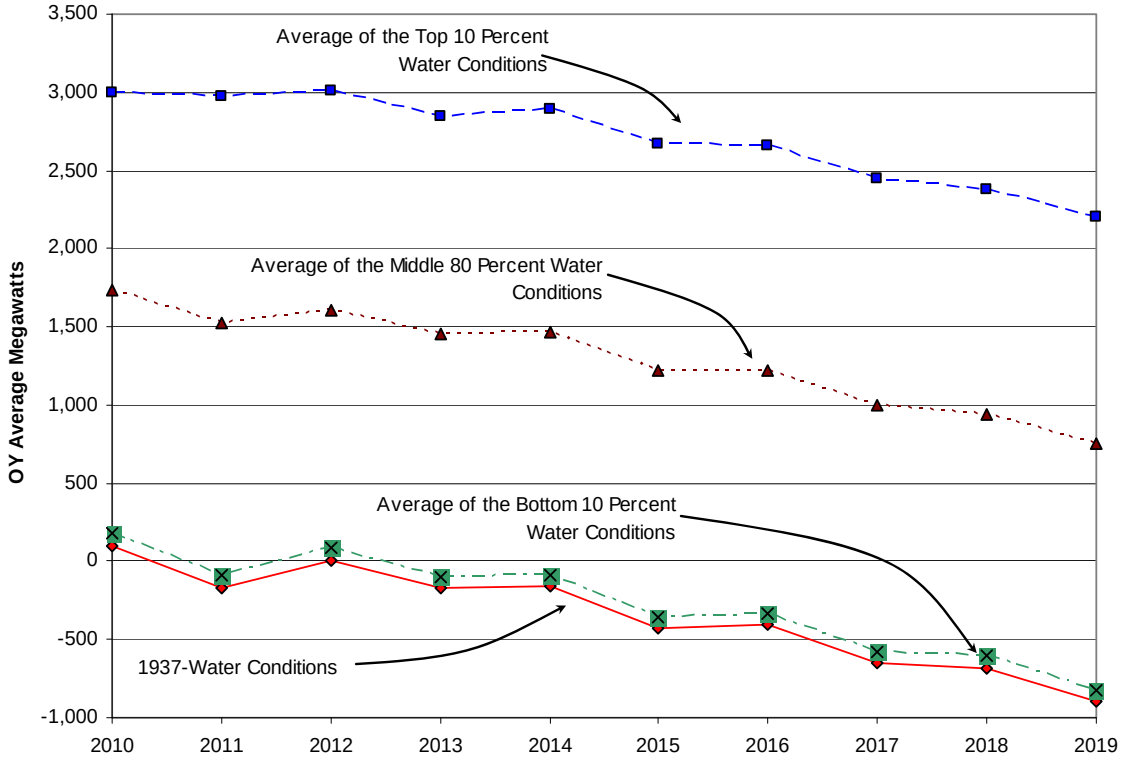
Potential Variability of Annual Federal Energy Surplus/Deficit
Utilizing Differing Water Conditions

Operating Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
1937-Critical Water Conditions	102	-170	11	-173	-163	-429	-405	-652	-680	-898
Average Bottom 10% Water Conditions	184	-87	88	-96	-87	-355	-330	-578	-605	-824
Average Middle 80% Water Conditions	1,731	1,526	1,610	1,452	1,463	1,226	1,222	1,003	946	757
Average Top 10% Water Conditions	2,998	2,971	3,007	2,842	2,896	2,675	2,659	2,452	2,379	2,206

Figure 10, below, graphically compares the annual Federal system surplus/deficits under four scenarios.

Figure 10

Potential Variability of Annual Federal Energy Surplus/Deficit Projections
Utilizing Differing Water Conditions
For OY 2010 through 2019

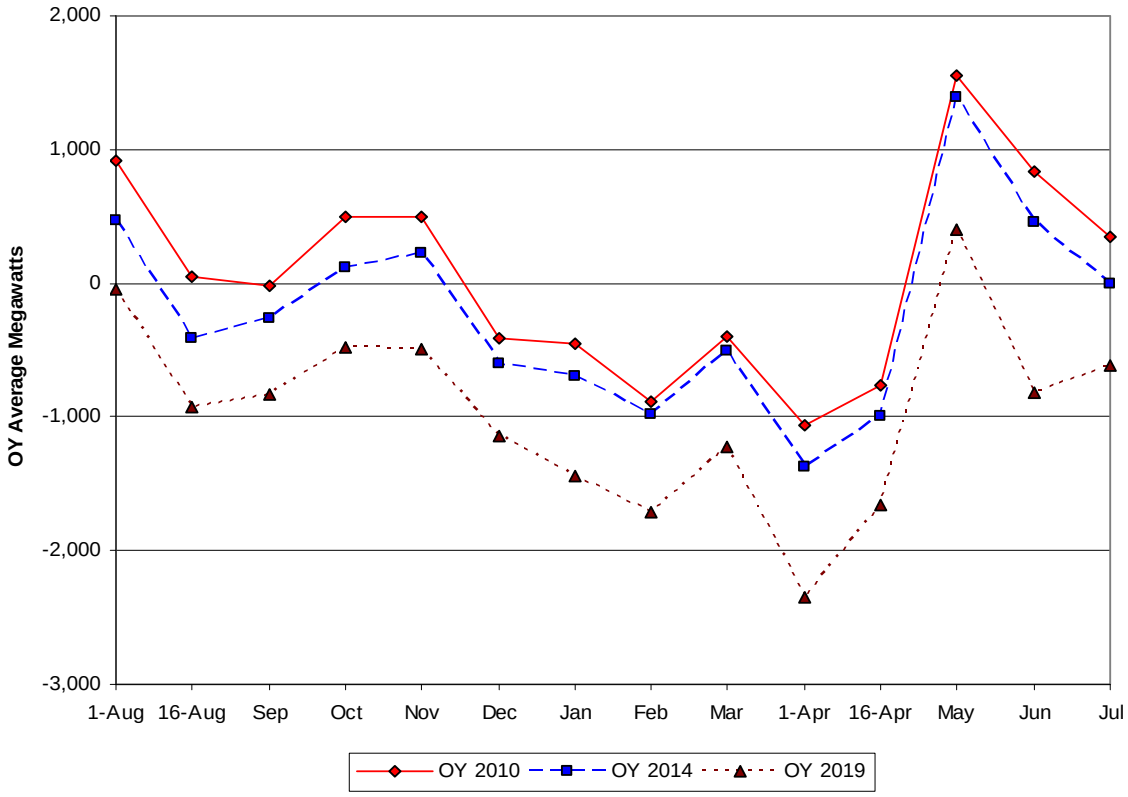


Monthly Federal Firm Energy Surplus/Deficit Projections

Figure 11, below, shows the monthly Federal firm energy surplus/deficit projections for OY 2010, 2014, and 2019.

Figure 11

Monthly Federal Firm Energy Surplus/Deficit Projections
Using 1937-Critical Water Conditions
For OY 2010, 2014, and 2019



Monthly Federal Firm Capacity Surplus/Deficit Projections

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

BPA's firm capacity analysis takes into account the following Federal system hydrologic constraints:

- Amount of 18-hour capacity available to meet capacity needs under extreme weather conditions as described in Section 3, *Federal System 18-Hour Capacity*, page 21;
- An operational peaking adjustment that reduced the maximum instantaneous Federal hydro capacity estimate to meet expected peak load in any given month, described in Section 2, *Calculation of the Operational Peaking Capability*, page 7;
- 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:
- 2009 PNCA planning criteria:
- 2008 NOAA Fisheries Biological Opinion;
- 2006 USFWS Biological Opinion;
- The Council's Fish and Wildlife Program;
- Other fish mitigation measures; and
- Navigation and recreation constraints, including restrictions on the rate of rise or fall of tailwater and forebay elevations.

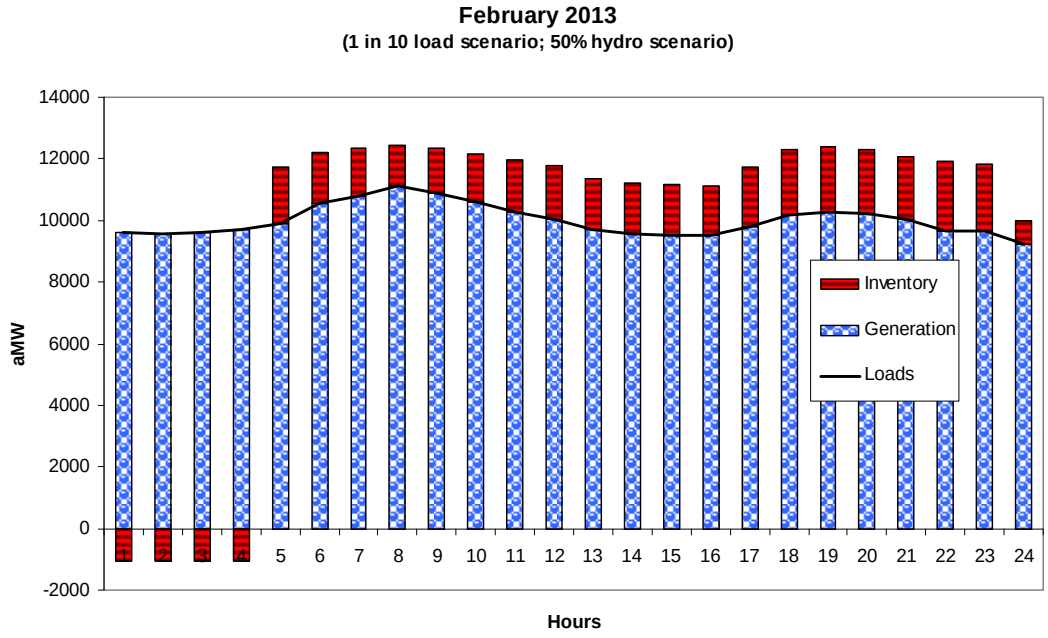
Federal System 18-Hour Capacity: The 18-hour capacity measures the ability of the Federal system to meet the average of the 6 highest load hours (consecutive or non-consecutive) for a 3-day weather event that might occur once in ten years. This metric is meant as a minimum reliability measure to ensure that "the lights stay on" during an extreme-weather event when there may be no power available on the spot market except at night.

To analyze the Federal system 18-hour capacity, BPA used the HOSS model to simulate Federal system hydro generation when operated to meet extreme-weather event loads during the months of February and August. Unlike "critical period" water planning studies, hydro generation conditions for the 18-hour capacity analysis was assumed to be median or average water/generation conditions. In this assessment, for such an extreme temperature event, additional water is released during the event, even if that may require purchasing in the days following the event.

Cold Snap Analysis: Figure 12, below, shows the capacity assessment for a cold snap in February 2013. The striped bars (red) above the load indicate surplus capacity. The striped bars (red) below the baseline indicate purchases made during LLHs. This is an average of three days of generation. The model attempts to shift as much excess generation into the peak hours. To measure the 18-hour capacity, we average the 6 highest load hours (consecutive or non-consecutive) for 3 days. The 18-hour average does not exceed the turbine capability of the single highest-load hour.

Figure 12

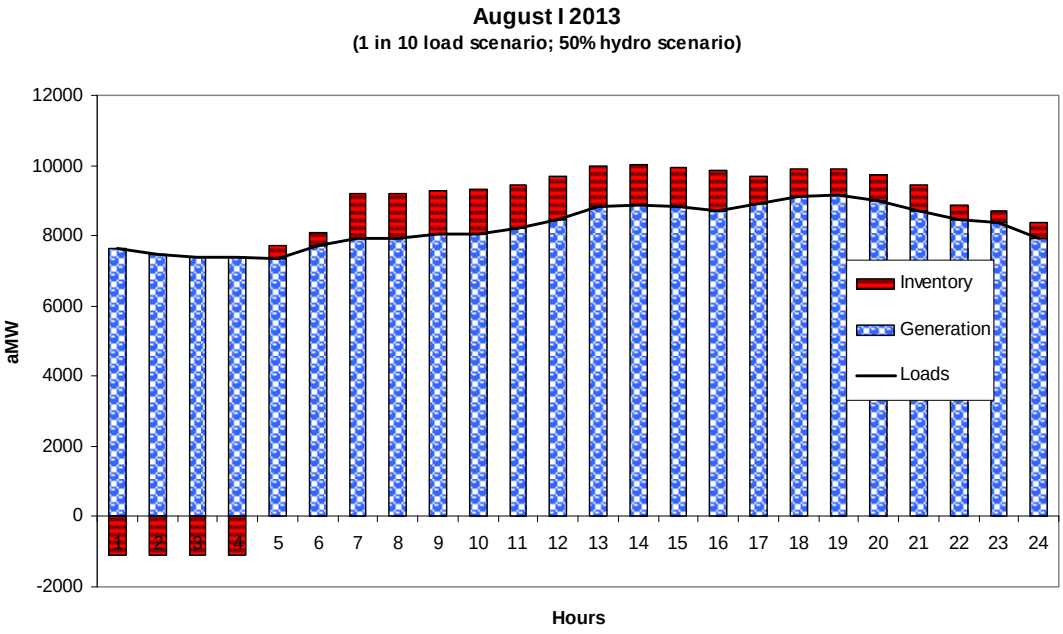
February 2013 Cold Snap 18-Hour Capacity Surplus
Peak in Megawatts



Heat Wave Analysis: Figure 13 below shows the capacity assessment for a heat wave in August 2013 following the same methodology as above.

Figure 13

August 2013 Heat Wave 18-Hour Capacity Surplus
Peak in Megawatts



White Book 18-Hour Capacity Surplus: Table 9, below, shows the estimated rounded surplus 18-hour capacity surpluses for 2011, 2013, and 2019. The projected 18-hour capacity surpluses' indicate that the Federal system has adequate system flexibility and resources to meet extreme-weather capacity conditions. These 18-hour capacity surpluses follow the same methodology set by BPA's Resource Program Needs Assessment. See *Draft Resource Program*, page 24.

Table 9

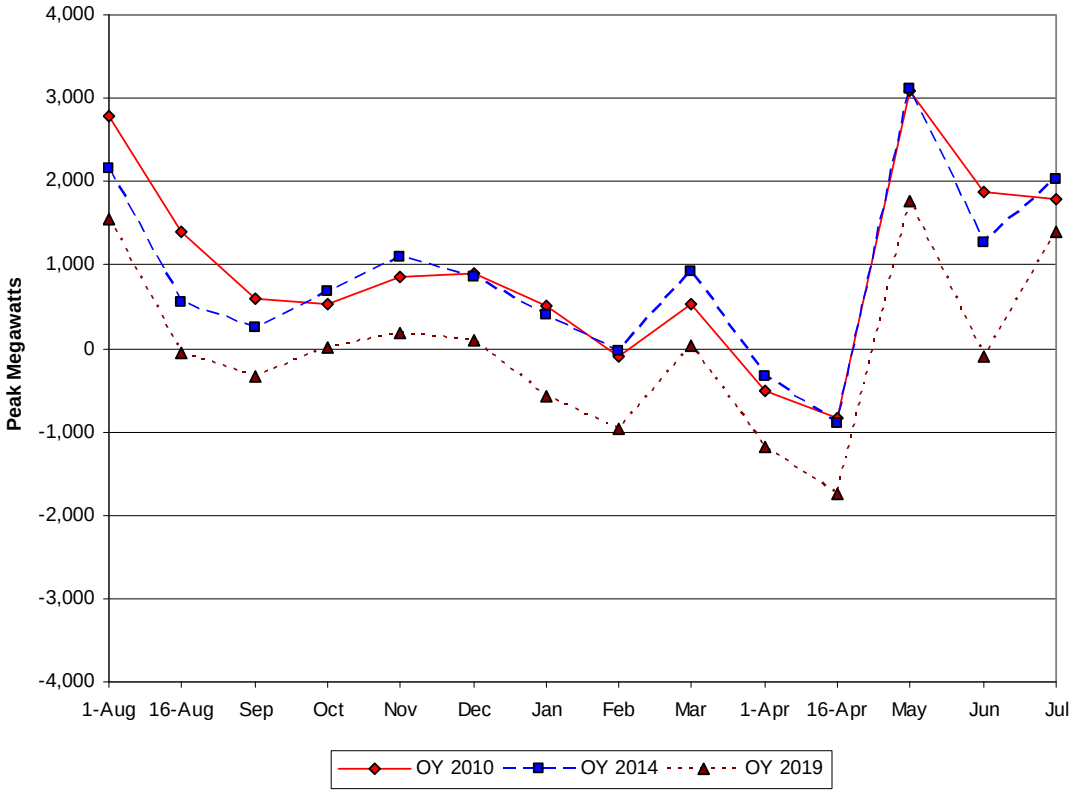
18-Hour Capacity Surplus for Extreme Weather for Specific Periods
Megawatts

Year	2011	2013	2019
February	1,400	1,350	400
August	1,250	800	400

1-Hour Operational Peaking: The forecast for the monthly Federal system surplus/deficit projections based on the single largest 1-hour of hydro generation and load projections in that month, while meeting the Federal load obligations for that month is shown below in Figure 14, below, for OY 2010, 2014, and 2019.

Figure 14

Monthly 1-Hour Federal Capacity Surplus/Deficit Projections [1]
Using 1937-Critical Water Conditions
For OY 2010, 2014, and 2019
(Revised 11/30/2009)



The 1-hour Federal capacity surplus/deficit projections, assuming normal weather conditions and 1937-critical water conditions for OY 2010, 2014, and 2019, are shown in Exhibits 5 through 7, pages 88-93.

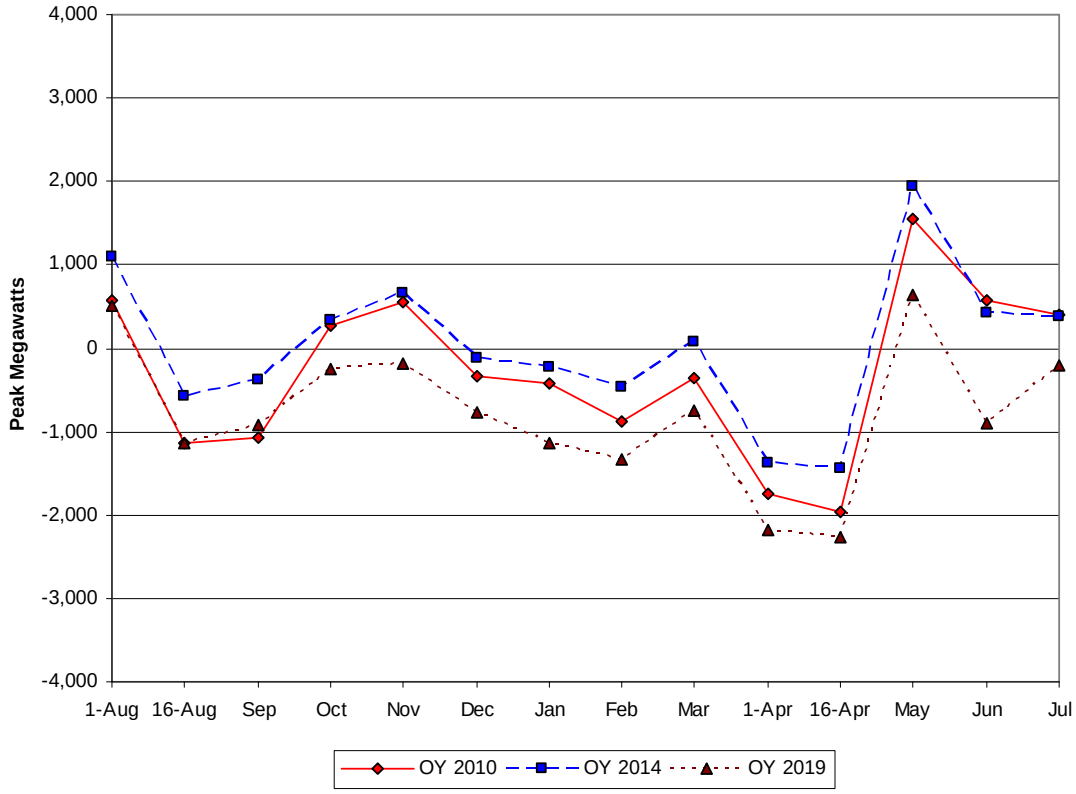
[1] For OY 2010, the 1-Hour Federal capacity surplus projections are lower than OY 2014 mainly due to the following contracts which increased load obligations:

- Signed BPA marketing contract deliveries increased obligations during the August through September 2009 timeframe (~500 MW);
- The expiration of BPA's Hungry Horse obligations on September 30, 2011 (~55 MW);
- The expiration of BPA's City of Riverside, California contract on June 15, 2010 (~20 MW);
- The expiration of BPA's Avista Corps WNP-3 Settlement on June 30, 2017 (~42 MW); and
- The expiration of BPA's PacifiCorp capacity sale on August 31, 2011 (~575 MW).

120-Hour Operational Peaking: The forecast for the monthly Federal system surplus/deficit projections based on the average of the top 120-hours of hydro generation and load projections in that month, while meeting the Federal load obligations for that month is shown below in Figure 15, below, for OY 2010, 2014, and 2019.

Figure 15

Monthly 120-Hour Federal Capacity Surplus/Deficit Projections [1]
Using 1937-Critical Water Conditions
For OY 2010, 2014, and 2019
(Revised 11/30/2009)



The 120-hour Federal capacity surplus/deficit projections, assuming normal weather conditions and 1937-critical water conditions for OY 2010, 2014, and 2019, are shown in Exhibits 8 through 10, pages 96-101.

[1] For OY 2010, the 120-Hour Federal capacity surplus projections are lower than OY 2014 mainly due to the following contracts which increased load obligations:

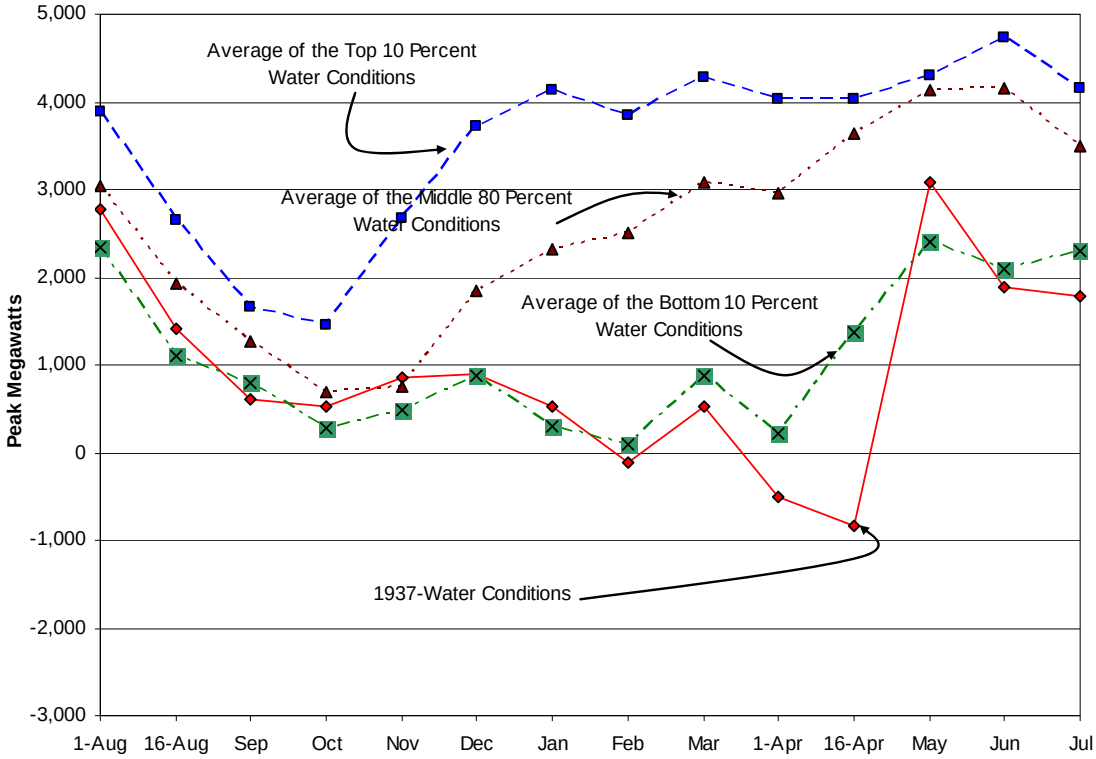
- Signed BPA marketing contract deliveries increased obligations during the August through September 2009 timeframe (~500 MW);
- The expiration of BPA's Hungry Horse obligations on September 30, 2011 (~55 MW);
- The expiration of BPA's City of Riverside, California contract on June 15, 2010 (~20 MW);
- The expiration of BPA's Avista Corps WNP-3 Settlement on June 30, 2017 (~42 MW); and
- The expiration of BPA's PacifiCorp capacity sale on August 31, 2011 (~575 MW).

Potential Variability Surplus/Deficit Projections

1-Hour Operational Peaking*:* 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 and are unadjusted for yet-to-be-determined climate changes. Figure 16, below, compares the 1-hour Federal system capacity surplus/deficits for OY 2010 under four scenarios: resources using: 1) 1937-critical water conditions (the base case of this study); the averages of 2) the bottom ten percent; 3) the middle 80 percent; and 4) the top ten percent of the historical 70-water year conditions (1929 through 1998).

Figure 16

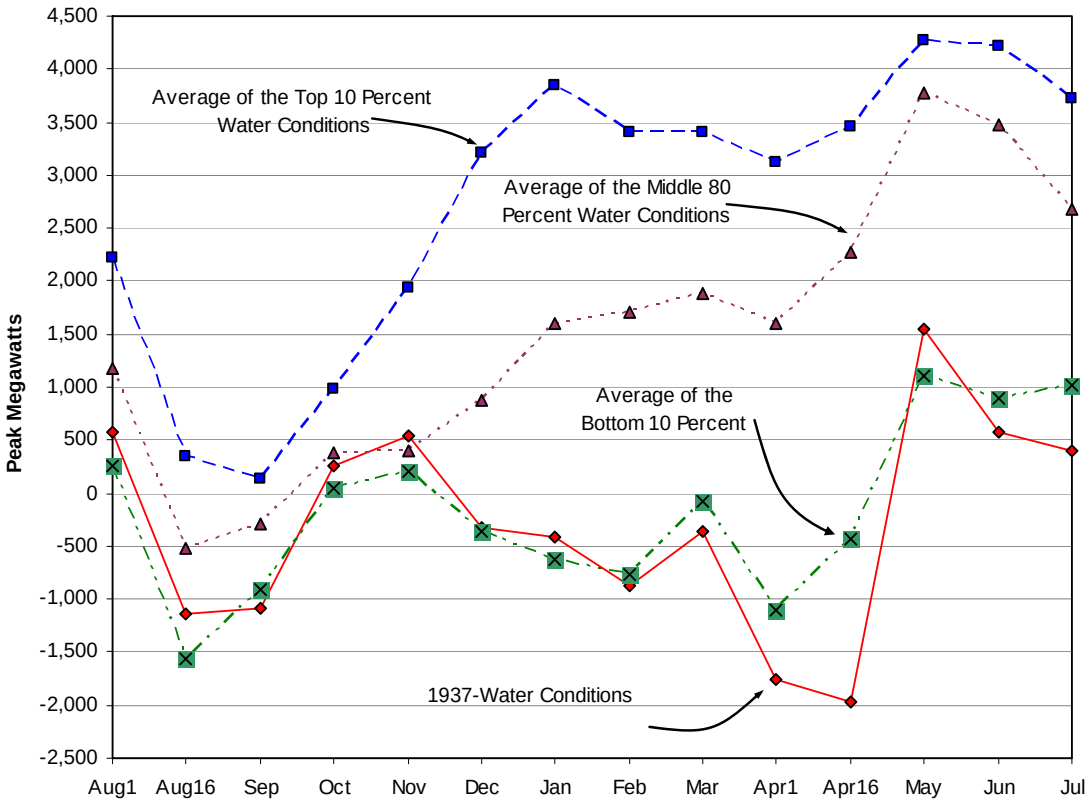
Potential Variability of 1-Hour Capacity Federal Surplus/Deficit Projections
Utilizing Differing Water Conditions
For OY 2010
(Revised 11/30/2009)



120-Hour Operational Peaking: Figure 17, below, compares the 120-hour Federal system capacity surplus/deficits under four scenarios: 1) resources using 1937-critical water conditions (the base case of this study); the averages of 2) the bottom ten percent; 3) the middle 80 percent; and 4) the top ten percent of the historical 70-water year conditions (1929 through 1998). Similar to the 1-hour Federal system analysis, the availability of 120-hour capacity surpluses increases as the Federal system experiences better water conditions — especially in the January through May time period.

Figure 17

Potential Variability of 120-Hour Capacity Federal Surplus/Deficit Projections Utilizing Differing Water Conditions For OY 2010



Planning to Meet Federal System Deficits

The Federal system energy and capacity load resource projections use the Federal System Assumptions, presented on page 23. This analysis assumes Federal system hydro generation using 1937-critical water conditions, Federal non-hydro resources operating at expected generation levels, and Federal contract obligations and purchases delivered at full contract levels. Federal system deficits can vary annually due to weather conditions, water conditions, load variability due to economic conditions, future load placement on BPA, and resource availability and performance. Federal system deficits will be met through a combination of the following, and as described in BPA's draft Resource Program, released September 30, 2009:

- Achievement of the public power share of the energy conservation targets in the Council's Sixth Power Plan;
- Market power purchases including acquisitions of generation from uncommitted IPP projects;
- Continue wind integration initiatives;
- Support development of small renewable and high-efficiency resources;
- Pursue pumped storage and natural gas-fired generation to provide seasonal heavy load hour energy and balancing reserves;
- Continue support of emerging technologies that may provide cost-effective alternatives to new generation such as Smart Grid and demand response technologies;
- PSC net requirement load obligation reduction through customers' choices to develop new dedicated resources or use IPP power purchases to self-supply more of their load; 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 and existing resources, those amounts will be incorporated into future White Book studies. The final Resource Program will be completed in 2010. BPA intends to refresh its Resource Program periodically to reflect changes in its load obligations, resource supplies and market conditions.

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 July 22, 2009. Study assumptions for the regional analysis are as follows:

- Total retail load forecasts reflect normal weather conditions and do not reflect future climate change impacts;
- Regulated hydro generation estimates incorporate PNCA plant characteristics, streamflows, BPA's best estimate of non-power requirements, and hydro improvements. The regulated hydro generation projections reflect operating reserve levels associated with 30-minute wind persistence scheduling accuracy forecasts;
- Generating forecasts for independent hydro and other generating resource 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;
- Uncommitted PNW IPP generation is included in the regional resource stack and is assumed available to meet regional load unless otherwise specified;
- Capacity credit for wind projects is assumed 5 percent of the project's installed capacity, following the Council's latest Regional Resource Adequacy standards guidelines;
- Firm hydro energy and capacity estimates are based on 1937-critical water conditions, unless otherwise specified; and
- Transmission losses are treated as a resource reduction.

Annual Regional Firm Energy Load Projections

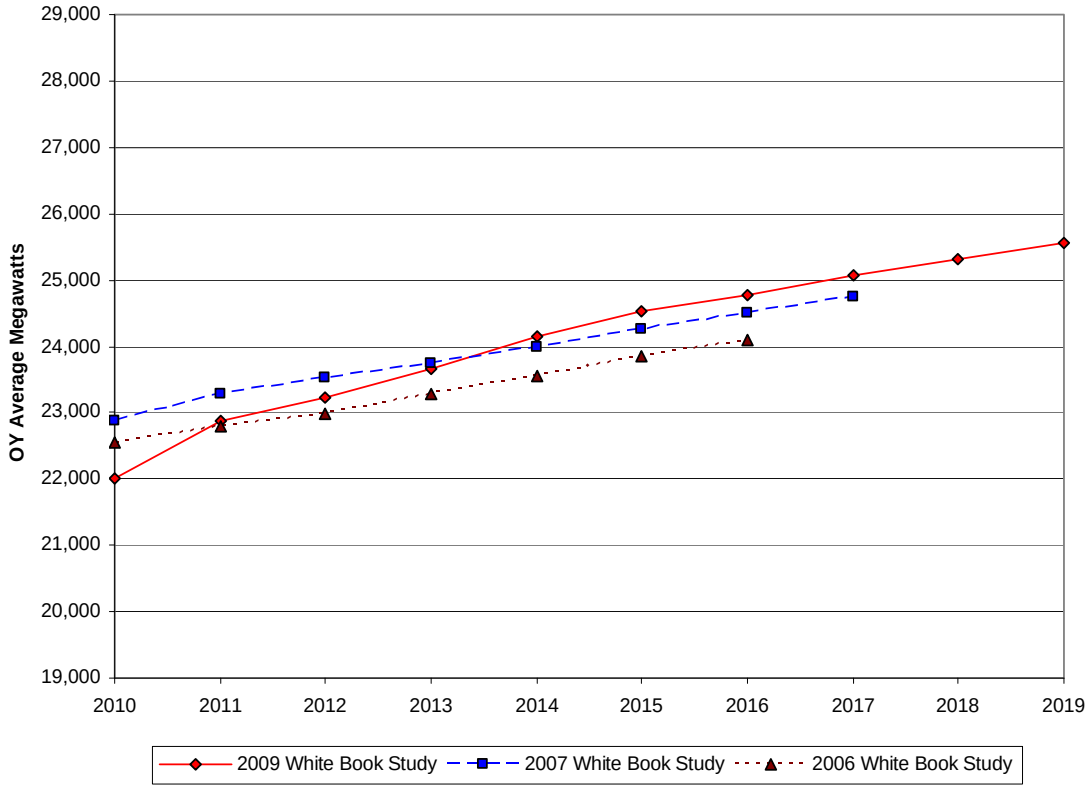
BPA's 2009 White Book annual regional firm energy load projections are comprised of two components:

- Total retail load consumption which is based on the individual entity's total retail load forecast as discussed in Section 2, *Total Retail Load Forecast*, page 5; plus
- Reported long-term and multi-year export contracts made by PNW entities, including BPA.

Figure 18, below, graphically illustrates how the 2009 White Book regional firm energy load projections compare to the previous 2007 and 2006 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 18

Annual Regional Firm Energy Load Projections[1]
Including Exports
For OY 2010 through 2019



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

[1] 2007 White Book projections were published through OY 2017. 2006 White Book projections were published through OY 2016.

Table 10, below, compares the relative size of regional firm loads by customer class for OY 2010.

Table 10

Annual Regional Firm Energy Load by Customer Class For OY 2010

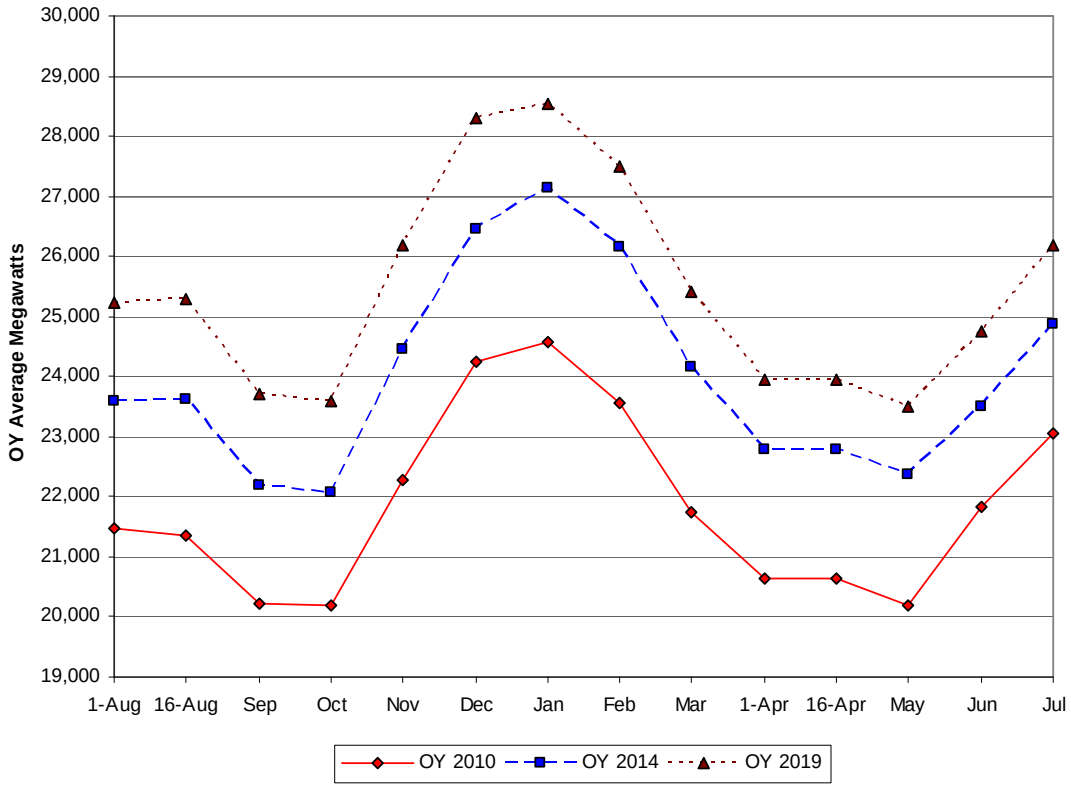
Customer Class	Firm Energy (OY in aMW)	Firm Energy (Percent of Total)
Investor-Owned Entities	10,731	48.8%
Public Entities	8,840	40.2%
Exports	1,303	5.9%
Direct Service Industries	521	2.4%
Federal and Other Entities	600	2.7%
Total Regional Firm Load	**21,995**	**100.0%**

The annual regional firm energy loads are presented in Exhibit 21, page 129, and monthly firm energy loads for OY 2010, 2014, and 2019 are presented in Exhibits 22 through 24, pages 132-134.

Figure 19, below, graphically illustrates the monthly Regional firm energy load projections for OY 2010, 2014, and 2019.

Figure 19

Monthly Regional Firm Energy Load Obligations
For OY 2010, 2014, 2019



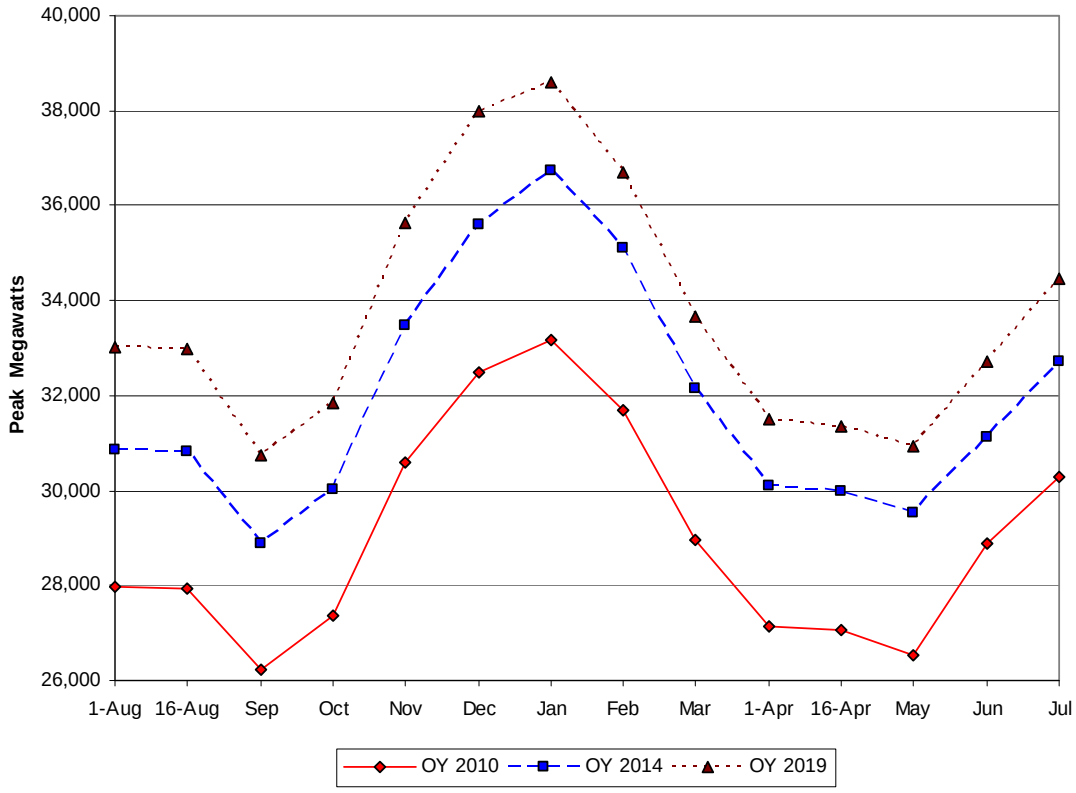
Monthly Regional Firm 1-Hour Peak Load Projections

BPA's 2009 White Book total retail load peaks are based on the individual entity forecasts of expected 1-hour monthly peak demand. The peak load obligations assume a 50-percent probability that the actual peak loads will be either higher or lower than the forecast and incorporates the same assumptions as those described in Section 3, *1-Hour Federal Peak Load Obligations*, page 27. In addition, the projected regional peak loads include export contracts made by PNW utilities, including those in the Federal system.

Figure 20, below, illustrates the monthly regional 1-hour firm peak loads for OY 2010, 2014, and 2019.

Figure 20

Monthly Regional Firm 1-Hour Peak Load Projections
For OY 2010, 2014, 2019
(Revised 11/30/2009)



The monthly regional firm 1-hour peak loads are presented in Exhibits 25 through 27, pages 136-138.

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 in the region such as thermal resources, which are primarily comprised of coal, gas, and oil-fired projects. New generating projects are included when they have been placed into operation or are in the actual construction process. The projects are detailed in Section 3, *Changes in the 2009 Pacific Northwest Loads and Resources Study*, starting on page 17.

Table 11, below, summarizes the PNW regional resource capacity and energy by generation type for OY 2010.

Table 11

Total Regional Firm Resources for OY 2010[1]
Based on 1937-Critical Water Conditions

Project Type	1-Hour Operational Peaking Capacity (January Peak MW)	Percent of Operational Peaking Capacity	Firm Energy (OY in aMW)	Percent of Firm Energy
Hydro	27,142	59.5%	11,842	45.5%
Coal	5,866	12.9%	4,951	19.0%
Combustion Turbines	5,526	12.1%	2,824	10.8%
Cogeneration	2,938	6.4%	2,530	9.7%
Imports	2,094	4.6%	1,239	4.8%
Nuclear	1,150	2.5%	1,030	4.0%
Non-Utility Generation	630	1.4%	626	2.4%
Miscellaneous	258	0.6%	991	3.8%
Total Firm Resources	**45,603**	**100.0%**	**26,033**	**100.0%**

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

Potential Variability of Regional Resources

Variability Due to Water Conditions: 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 12, below, compares the expected annual regional resources under four scenarios using: 1) 1937-critical water conditions as the base case; and the averages of 2) the bottom ten percent; 3) the middle 80 percent; and 4) the top ten percent of the historical 70-water year conditions (1929 through 1998). For OY 2010, regional resource estimates can potentially vary up to about 6,250 aMW, ranging from an estimated 26,237 to 32,487 aMW, due to potential hydro variability.

Table 12

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

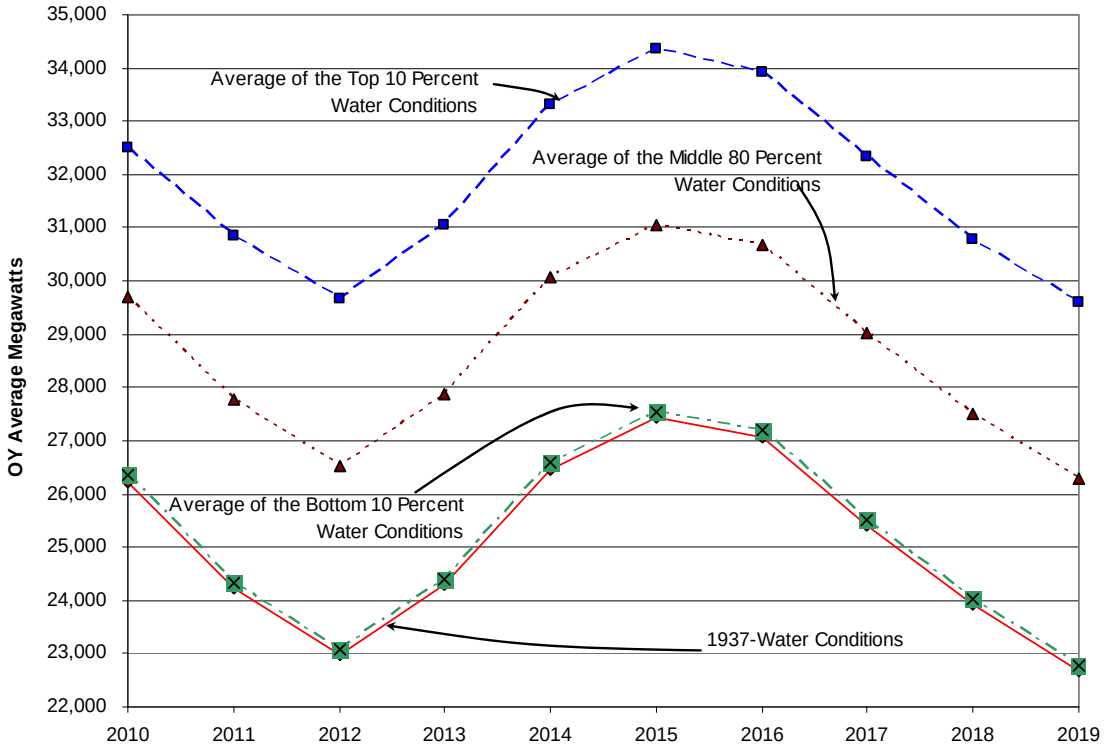
Operating Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
1937-Critical Water Conditions	26,237	24,215	22,981	24,283	26,472	27,420	27,075	25,403	23,931	22,662
Average of Bottom 10% Water Conditions	26,347	24,325	23,092	24,392	26,581	27,529	27,185	25,512	24,039	22,771
Average of Middle 80% Water Conditions	29,691	27,760	26,520	27,869	30,059	31,049	30,667	29,032	27,519	26,291
Average of Top 10% Water Conditions	32,487	30,854	29,674	31,055	33,306	34,356	33,921	32,339	30,765	29,598

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

Figure 21, below, graphically compares the potential annual regional net resources under the four scenarios.

Figure 21

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



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

Annual Regional Firm Energy Surplus/Deficit Projections

The annual regional firm energy surplus/deficit projections for OY 2010 through 2019, assuming 1937-critical water conditions, are presented below in Table 13. The PNW regional resource stack assumes that all regional IPP generation is available to the region. The region is expected to be in firm energy surplus through OY 2017 with surpluses ranging from 3,292 aMW in OY 2010, declining to a deficit of -352 aMW in OY 2019.

Table 13

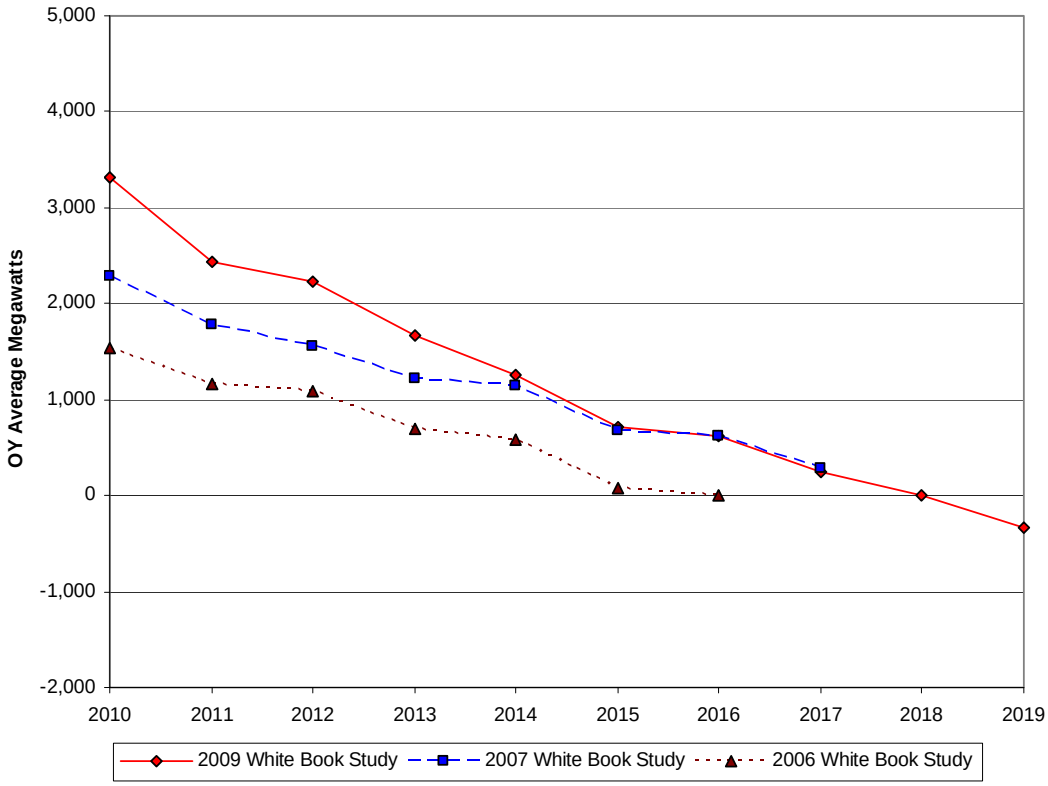
Regional Firm Energy Surplus/Deficit Projections
Using 1937-Critical Water Conditions
Energy in Average Megawatts

Operating Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Regional Surplus/Deficit	3,292	2,421	2,219	1,650	1,241	699	596	229	-17	-352

Figure 22, below, graphically illustrates how the 2009 White Book regional energy surplus/deficits compares to the previous 2007 and 2006 studies. The 2009 study shows larger regional energy surpluses—especially when compared to the 2006 and 2007 studies—mainly due to new PNW IPP generating projects and lower total retail load forecasts.

Figure 22

Annual Regional Firm Energy Surplus/Deficit Projections[1]
Using 1937-Critical Water Conditions
For OY 2010 through 2019



Components that make up the regional energy surplus/deficits for OY 2010 through 2019 are presented in Exhibit 21, page 129. Monthly firm energy loads and resources balances for OY 2010, 2014, and 2019 are presented in Exhibits 22 through 24, pages 132-134. 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 31 through 40, pages 144-163, contain the regional firm energy surplus/deficit projections under the historical 70-water years of record (OYs 1929 through 1998).

[1] 2007 White Book projections were published through OY 2017. 2006 White Book projections were published through OY 2016.

Potential Variability of Annual Regional Energy Surplus/Deficit Projections

Variability Due to Water Conditions: To show the potential variability of regional surplus/deficits, this study compares the surplus/deficits using four different levels of regional generation based on different levels of water conditions. These scenarios include: 1) 1937-critical water conditions as the base case; and the averages of 2) the bottom ten percent: 3) the middle 80 percent; and 4) the top ten percent of the historical 70-water year conditions. Table 14, below, presents the range of estimated regional surplus/deficits assuming the four differing levels of regional hydro generation. For OY 2010, regional surplus/deficit estimates can potentially vary up to 6,250 aMW, annually ranging from approximately 3,292 to 9,542 aMW, due to possible hydro variability.

Table 14

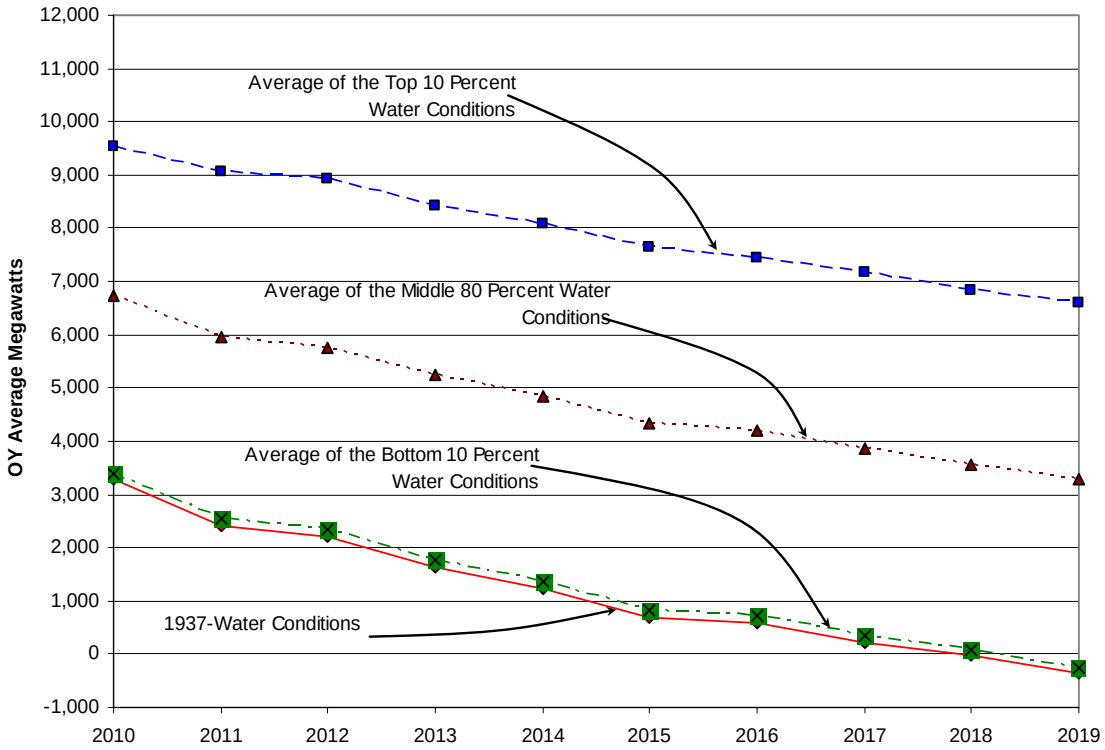
Potential Variability of Annual Regional Firm Energy Surplus/Deficit
Based on Different Levels of Water Conditions
Energy in Average Megawatts

Operating Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
1937-Critical Water Conditions	3,292	2,421	2,219	1,650	1,241	699	596	229	-17	-352
Average Bottom 10% Water Conditions	3,401	2,531	2,330	1,759	1,350	808	706	338	92	-243
Average Middle 80% Water Conditions	6,745	5,966	5,758	5,236	4,828	4,328	4,188	3,858	3,571	3,277
Average Top 10% Water Conditions	9,542	9,060	8,911	8,422	8,075	7,635	7,442	7,165	6,818	6,584

Figure 23, below, illustrates the range of estimated regional surplus/deficits assuming differing levels of regional hydro generation as discussed on page 57.

Figure 23

Potential Variability of Annual Regional Firm Energy Surplus/Deficit
Based on Different Levels of Water Conditions
For OY 2010 through 2019



Variability Due to IPP Generation Amounts Delivered to the Region: This study assumes approximately 3,452 peak MW with an associated energy capability of 3,005 aMW of uncommitted PNW IPP generation as regional resources. The generation forecasts for these uncommitted regional resources were updated; however, these IPP resources may not be available when needed to serve PNW regional loads. While this assumption is reasonable from an electrical reliability standpoint, resulting regional surpluses may understate the potential for price volatility and overstate the availability of IPP generation for use within the PNW. The PNW region may have to compete with other western markets to secure uncommitted IPP generation to meet electricity demand. Table 15, below, details the peak annual energy of expected regional uncommitted IPP projects as well as their fuel type. Annual generation projections may change due to variations in maintenance schedules. The 2007 White Book estimated about 4,022 aMW of uncommitted IPP generation.

Table 15

Expected PNW Uncommitted IPP Projects
As of July 22, 2009

Project	Peak (MW)	Energy (aMW)	Fuel Type
Big Hanaford CCCT	248	224	Natural Gas
Centralia #1	670	554	Coal
Centralia #2	670	626	Coal
Hermiston Power Project	630	567	Natural Gas
Klamath Cogeneration Project	484	435	Natural Gas
Klamath Peaking Unit	100	14	Natural Gas
Satsop	650	584	Natural Gas
White Creek Wind (1.5%)	0	1	Wind
Total Uncommitted IPP Generation	**3,452**	**3,005**	

Since the 2007 White Book the following projects were either; purchased, used for self-supply, or cancelled and are no longer considered uncommitted IPP:

- Emmett Biomass (18 MW) - cancelled
- Klondike III (4.9%) reallocated to regional utilities
- Lancaster Power Project (270 MW) - purchased by Avista Corp
- Metro Westpoint (1.2 MW) - used for self supply
- Mint Farm Energy Center (320 MW) - purchased by PSE
- Chehalis Generating Facility (417 MW) - purchased by PAC

Table 16, below, shows the potential variability of the PNW region annual firm energy surplus/deficits by assuming four different IPP generation levels that are available to the region. The potential variability of regional firm annual energy surplus/deficits can differ, depending on the level of IPP generation assumed delivered to the region — 100 percent (3,005 aMW), 75 percent (2,254 aMW), 50 percent (1,503 aMW), and 25 percent (751 aMW). Table 16, below, shows that for OY 2010, regional energy surplus/deficit estimates can vary up to 2,254 aMW annually, ranging from a surplus of 3,310 aMW to a 1,056 aMW, depending on IPP generation commitment levels to the PNW.

Table 16

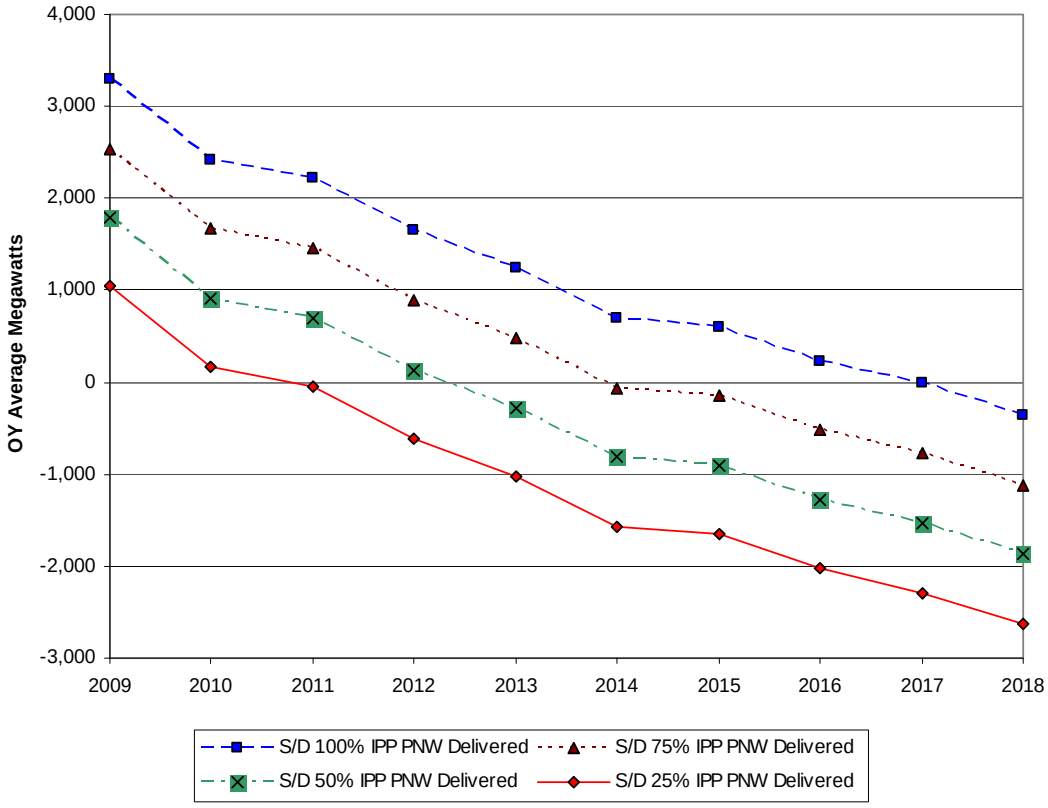
Potential Variability of PNW Region Annual Firm Energy Surplus/Deficit
Based on Different Levels of IPP Generation Available to the Region
Using 1937-Critical Water Conditions
Energy in Average Megawatts

Operating Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
S/D 100% IPP PNW Delivered (Up to 3,005 aMW)	3,292	2,421	2,219	1,650	1,241	699	596	229	-17	-352
S/D 75% IPP PNW Delivered (Up to 2,254 aMW)	2,540	1,670	1,462	893	484	-58	-155	-522	-774	-1,114
S/D 50% IPP PNW Delivered (Up to 1,503 aMW)	1,789	918	705	136	-273	-815	-906	-1,273	-1,530	-1,876
S/D 25% IPP PNW Delivered (Up to 751 aMW)	1,038	167	-52	-621	-1,030	-1,572	-1,657	-2,025	-2,287	-2,637

Figure 24, below, graphically illustrates the potential variability of regional surplus/deficits by assuming the four different levels of IPP generation available to the region—100 percent, 75 percent, 50 percent, and 25 percent.

Figure 24

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

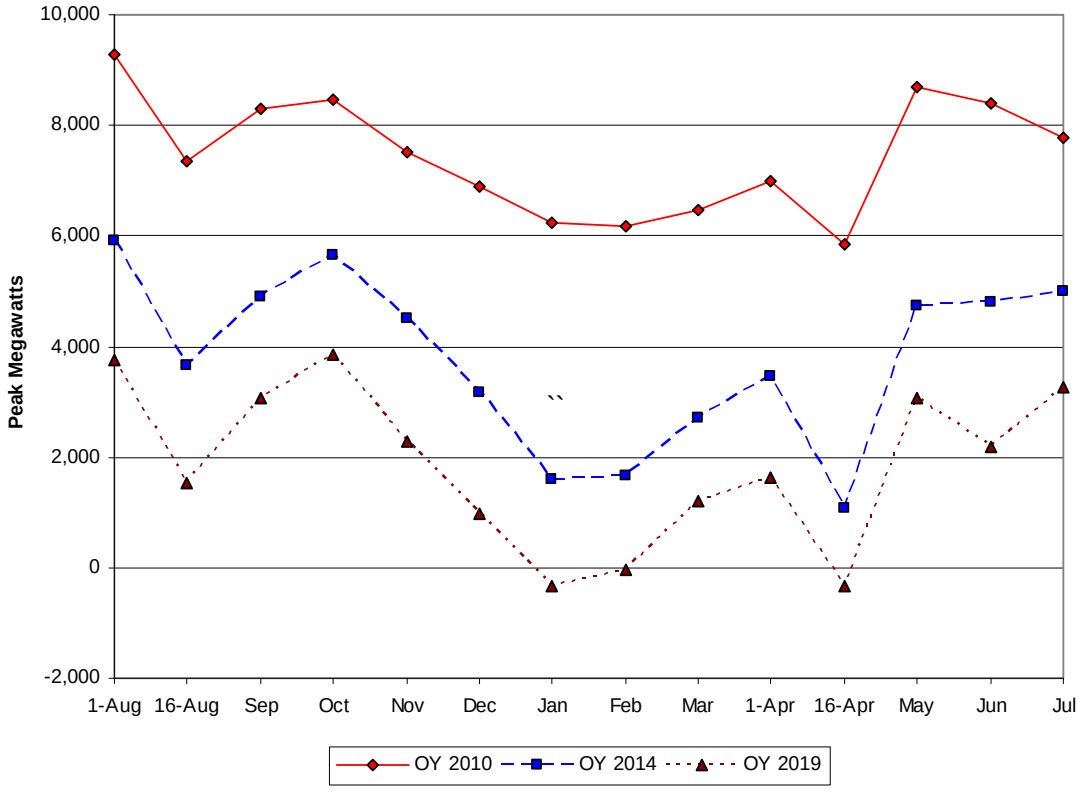


Monthly Regional Firm 1-Hour Capacity Surplus/Deficit Projections

Figure 25, below, graphically illustrates the monthly regional 1-hour capacity surplus/deficit projections for OY 2010, 2014, and 2019. The projections assume 1937-critical water conditions, normal weather conditions that are unadjusted for yet-to-be-determined climate changes, and a 50-percent probability that the actual peak loads will be either higher or lower than the forecast. The study assumes 3,452 peak MW (3,005 aMW) of uncommitted PNW IPP generation in OY 2010 as regional resources though potentially these resource may not be available when needed to serve PNW regional loads, shown in Table 15, *Expected PNW Uncommitted IPP Projects*, page 63. Regional surplus firm capacity values take into account hydrologic constraints detailed in Section 4, Monthly *Federal Firm Capacity Surplus/Deficit Projections*, on page 43.

Figure 25

Monthly Regional Firm 1-Hour Capacity Surplus/Deficit Projections
Using 1937-Critical Water Conditions
For OY 2010, 2014, and 2019
(Revised 11/30/2009)



Regional 1-hour capacity surplus/deficit projections, assuming normal weather conditions and 1937-critical water conditions for OY 2010, 2014, and 2019, are shown in Exhibits 25 through 27, pages 136-138.

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

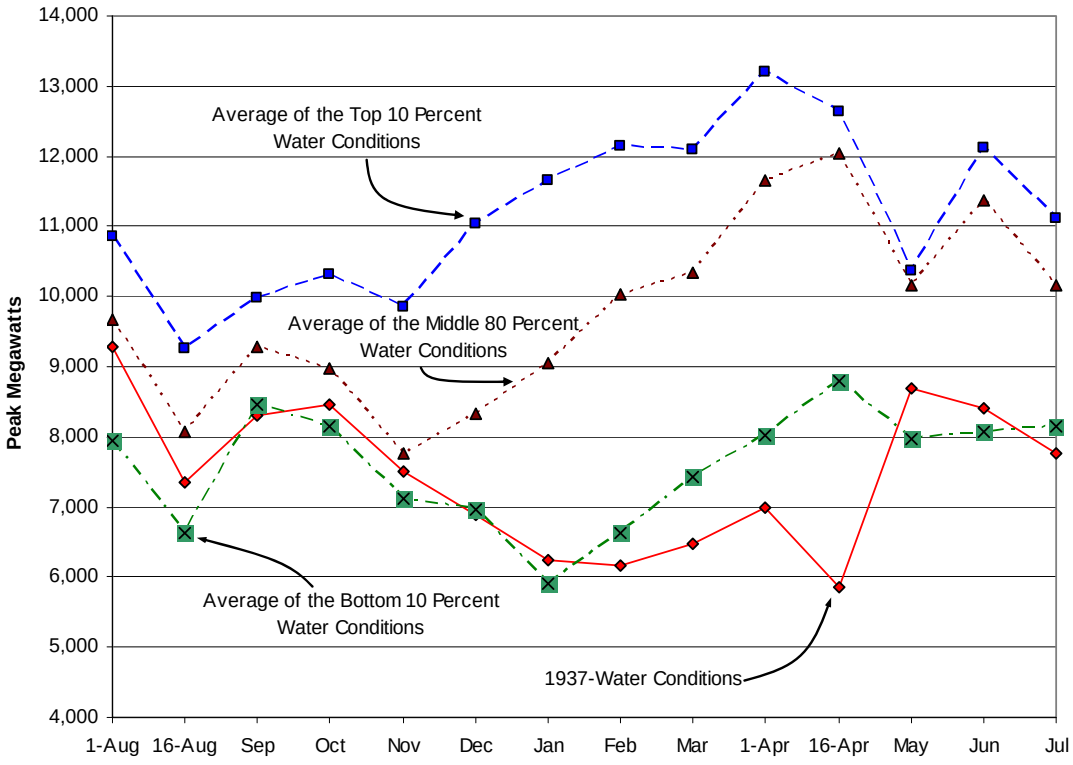
Variability Due to Water Conditions: To illustrate the potential variability of 1-hour PNW region capacity surplus/deficits, this study compares different scenarios using varying levels of regional generation based on water conditions and normal weather loads and are unadjusted for yet-to-be-determined climate changes. Figure 26, below, compares the 1-hour regional system capacity surplus/deficits under four scenarios: resources using: 1) 1937-critical water conditions (the base case of this study); the averages of 2) the bottom ten percent; 3) the middle 80 percent; and 4) the top ten percent of the historical 70-water year conditions (1929 through 1998). As the region experiences better water conditions, the availability of 1-hour capacity surpluses increases, especially in the December through May time period.

Figure 26

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

Utilizing Differing Water Conditions for OY 2010

(Revised 11/30/2009)



Planning to Meet Regional Deficits

The regional energy and capacity load resource projections use the "Regional Analysis Assumptions" presented on page 51 and are considered conservative with the exception of the treatment of uncommitted IPP resources. This analysis assumes regional hydro generation using 1937-critical water conditions, non-hydro resources operating at expected generation levels, and contract obligations and purchases delivered at maximum contract levels. IPP plants are assumed to be available to meet regional loads unless otherwise contracted. However, regional surpluses may understate the potential for price volatility because the PNW region may have to compete with other western markets to secure these sources of supply. Regional deficits can vary month to month and annually due to weather conditions, water conditions, load variability due to economic conditions, and resource availability and performance. Even though the regional analysis shows annual average energy surpluses through OY 2017, there is potential for monthly energy deficits within any operating year. Regional deficits will be met by any combination of the following, and are described in the Council's Sixth Power Plan:

- Achievement of the energy conservation targets set forth by the Council's Sixth Power Plan;
- Support development of small renewable and high-efficiency resources;
- Pursue pumped storage and natural gas-fired generation to provide seasonal heavy load hour energy and balancing reserves;
- Continue wind integration initiatives;
- Market power purchases including acquisitions of generation from uncommitted IPP projects; and
- Purchase of off-system storage and exchange agreements with other regions that allow for monthly seasonal shaping of regional hydropower.

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

Section 6: Northwest Power and Conservation Council Perspective

Council's Regional Resource Adequacy Standard

Pacific-Northwest (PNW) Resource Adequacy Standard: On April 16, 2008, the Northwest Power and Conservation Council (Council) adopted a resource adequacy standard for the regional power supply. The Council's standard is based on recommendations from the Resource Adequacy Forum, which was initiated in 2005 by the Council and BPA to address resource adequacy issues. This standard includes both energy and capacity adequacy metrics. Currently, the minimum thresholds include an annual load resource energy balance, a 23 percent winter planning reserve margin (PRM), and a 24 percent summer PRM. These thresholds are derived from the Council's probabilistic analyses, in which a regionally adequate resource mix is defined as one with a Loss of Load Probability (LOLP) not greater than 5 percent.

The standard is comprised of a consensus-based methodology for assessing the resource adequacy of the Northwest, as defined by the 1980 Northwest Power Act footprint. The standard provides an implementation plan, which is predicated upon voluntary actions to ensure that the Region's electricity supply is sufficient to meet the region's needs now and in the future. The standard's minimum thresholds serve as an early warning should resource development fall dangerously short. It also suggests a higher threshold that encourages greater resource development to offset electricity price volatility. It does not mandate compliance or enforcement. Only high-level guidance has been provided to date, to allow individual utilities to determine whether their resource planning efforts are aligned with the regional standard. Because every utility's circumstances differ, individual utilities must assess their own needs and risk factors and determine their own planning targets in coordination with their public utility commissions or local regulatory bodies. It would be a misapplication of the adequacy standard to infer that utilities should slow their resource acquisition activity simply because the minimum threshold in the adequacy standard is being met. The Pacific Northwest Resource Adequacy Standard can be found at: *http://www.nwcouncil.org/library/2008/2008-07.pdf*.

PNW Resource Adequacy Standard Translation: Since the region traditionally uses deterministic planning approaches, the Council provided translation adjustments for regional load resource balance planning under critical water conditions. These adjustments include an estimated portion of the out-of-region market purchases and non-firm hydro energy — called a "planning adjustment"; plus a regional share of uncommitted IPP resources. These adjustments are based on the Council's regional energy adequacy standard assessment, published May 28, 2008. This translation includes a 1,300 aMW planning adjustment and 2,200 aMW of uncommitted IPP resources. For 2013, the Council's deterministic critical water load resource analysis results in an annual surplus of 1,884 aMW. The region is deemed to be energy adequate since there is no annual average energy deficit.

In 2008, when the region's utilities compared their load and (firm) resources, they showed a substantial need to acquire resources. In contrast, as previously described, the regional resource adequacy assessment indicated that the region was above the minimum threshold for physical adequacy. While these perspectives appear inconsistent with one another, each is valid. The regional adequacy standard defines a floor or minimum amount of resource development, whereas the utility assessments (and the Council's Power Plan) suggest targets for more optimal amounts of new resource capability in their service territories.

There are four main reasons for the difference:

- The regional adequacy standard includes a large amount of market generation that is physically available to the region but is not owned or under contract by any regional utility. Most utilities count only resources they have firm rights to, through ownership or contract.
- Most utilities use low or dry water conditions to forecast hydroelectric generating capacity for planning. Critical water is usually considered the water period that produces the lowest amount of hydro generation production and may not be the lowest water conditions on record. The regional adequacy standard uses a less stringent measure to define the minimum threshold for adequacy.
- Many utilities do not count the full availability of particular resources because of high operating costs, lack of firm fuel contracts, or other reasons. The regional standard is based on the assumption that during emergencies, many of these resources would be available.
- Many utilities are concerned about the risk of high costs during periods when the power supply is tight, and therefore take a more conservative, risk-managed approach in defining their need to acquire new resources.

BPA's Federal System Resource Adequacy Analysis: Guidance on how to align utility resource planning efforts with the Council's Resource Adequacy Standard has thus far been limited to a presentation made by Council staff at the June 27, 2007, Resource Adequacy Forum's Steering Committee Meeting. The presentation itemized non-firm hydro and uncontracted market resources, which the regional LOLP analysis counts as being available to the Region. The Steering Committee agreed with the suggestion that each utility limit its reliance on these common resources to the following:

- Utility share of in-Region market = Region's uncontracted merchant generation * utility load share.
- Utility share of out-of-Region market = assumption regarding winter market availability of resources from California * utility load share.
- Utility share of non-firm hydro = total non-firm hydro available to Region under a 5 percent LOLP study * hydro utility's percentage of Regional hydro resources.

Applying this Guidance to OY 2013 using the White Book study, increases the White Book Federal Surplus Adjusted (Council's Regional Resource Adequacy Standard) to 1,705 aMW.

- 2009 White Book shows that the OY 2013 Federal system energy load resource balance is deficit -173 aMW
- Utility Share Hydro Resources (Federal system hydro energy to the regional hydro energy) = 33 percent
- Utility Share uncommitted regional IPP generation (3,005 aMW) = 788 aMW
- Utility Share Out-of-Region Market (300 MW per Hour Oct-May) = 666 aMW
- Utility Share regional "energy planning adjustment" (1,300 aMW) = 433 aMW

Using this guidance increases the Federal resource stack by 1,878 aMW resulting in an annual energy surplus of 1,705 aMW in OY 2013. Although by White Book definition, the Federal system is energy deficit under critical water, the Council's translated load resource balance as applied to this White Book study is surplus and therefore meets the Council's energy resource adequacy standard. BPA is working with the Council to develop a Federal system LOLP based on their regional Genesys model to assess uncertainty for future BPA resource adequacy planning.

Non-DSI Regional Load Comparison: 2009 White Book to Council

The following discussion compares the non-DSI regional firm total retail loads between BPA's 2009 White Book and the Northwest Power and Conservation Council's Draft Sixth Northwest Electric Power and Conservation Plan (September 2009). 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.

The Council will be producing the Final Sixth Power Plan. BPA will incorporate those Council updates in future studies.

2009 White Book Non-DSI Total Retail Load Forecast: The 2009 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 July 22, 2009.

The total retail load forecasts for the Federal agencies, public agencies, cooperatives, and USBR were developed as follows:

- Federal agency, public agency, cooperative, and USBR retail load forecasts were developed by BPA using ALF which incorporates historical retail load data from regional utility PSCs' submittals;
- Some public retail load forecasts were sent directly to BPA through their PNUCC submittals; and
- IOU retail load forecasts were developed from both data submitted in their PNUCC submittals and load forecasts sent directly to BPA.

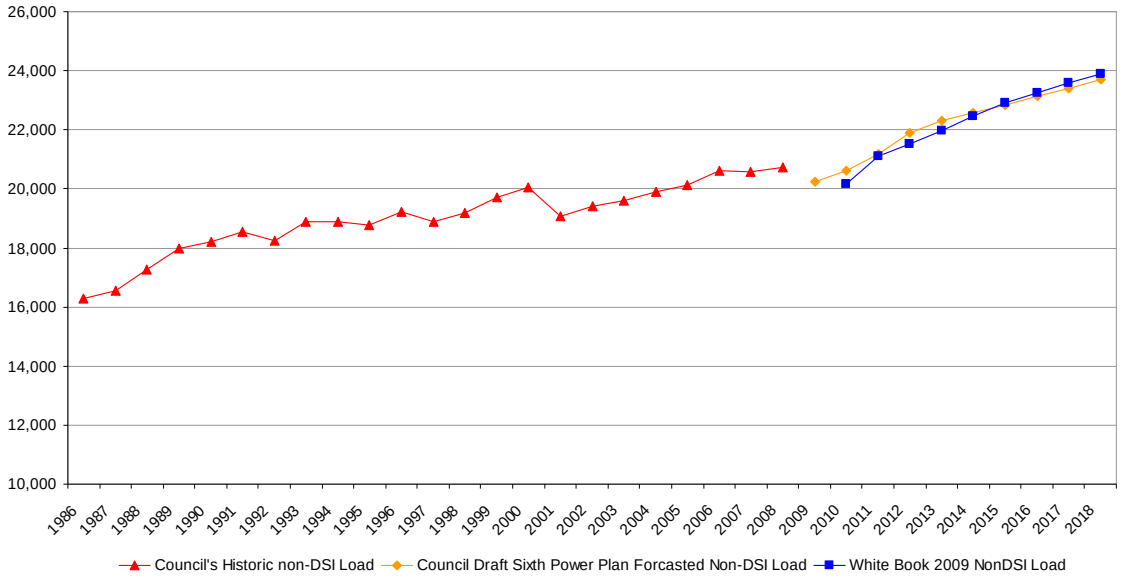
Council Non-DSI Total Retail Load Forecast: The Council's Drift Sixth Northwest Electric Power and Conservation Plan (September 2009) assumes lower non-DSI electricity demand due to current economic trends in the short term. The expected lower level of demand, portrays anticipated levels of permanent loss load which are expected to not return as part of the economic recovery.

Comparison of the Non-DSI Total Retail Load Forecast: The differences between the 2009 White Book and the Council's Draft Sixth Power Plan non-DSI load forecasts shows the White Book load forecast to be an average of -0.5 percent lower over the study period. The difference appears to be the economic down turn shown in BPA's ALF forecast in the initial year. BPA's forecast is 2.2 percent lower the Draft Sixth Power Plan in OY2010.

Figure 27, below, graphically illustrates the expected non-DSI regional firm total retail loads (Historic and Forecasted) from the Council's Draft Sixth Power Plan (September 2009) compared to BPA's 2009 White Book.

Figure 27

Non-DSI Regional Firm Total Retail Loads Comparison
BPA 2009 White Book Load Projections and the
Council's Draft Sixth Northwest Electric Power and Conservation Plan
(September 2009)



Section 7: Federal System Exhibits

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Exhibit 1

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

Exhibit 1: OY 2010 through 2019 Annual Energy

Loads and Resources - Federal System
PNW Loads and Resource Study
2010 - 2019 Operating Years
1937 Water Year
[61] 2009 White Book - 30 Minute Wind (Final)

7/22/2009

Energy (aMW)	2010 Avg.	2011 Avg.	2012 Avg.	2013 Avg.	2014 Avg.	2015 Avg.	2016 Avg.	2017 Avg.	2018 Avg.	2019 Avg.
Non-Utility Obligations										
Fed. Agencies 2002 PSC	120	123	19	0	0	0	0	0	0	0
USBR 2002 PSC	161	161	40	0	0	0	0	0	0	0
DSI 2002 PSC	17	17	2.8	0	0	0	0	0	0	0
Fed. Agencies 2012 PSC	0	0	106	127	136	144	147	176	198	200
USBR 2012 PSC	0	0	121	161	161	161	161	161	161	161
DSI 2012 PSC	0	0	0	0	0	0	0	0	0	0
Total Firm Non-Utility Obligations	298	301	289	287	296	305	307	337	358	360
Transfers Out										
NGP 2002 PSC	3135	3191	506	0	0	0	0	0	0	0
GPU 2002 PSC	2249	2251	338	0	0	0	0	0	0	0
NGP 2002 Slice PSC	607	591	94	0	0	0	0	0	0	0
GPU 2002 Slice PSC	1011	984	156	0	0	0	0	0	0	0
IOU 2002 PSC	0	0	0	0	0	0	0	0	0	0
NGP 2012 PSC	0	0	2972	3596	3664	3727	3798	3864	3935	4005
GPU 2012 PSC	0	0	1462	1724	1749	1772	1817	1860	1905	1950
NGP 2012 Slice PSC	0	0	321	373	382	374	385	377	388	381
GPU 2012 Slice PSC	0	0	1310	1522	1559	1528	1570	1537	1582	1552
IOU 2012 PSC	0	0	0	0	0	0	0	0	0	0
Exports	719	674	632	614	604	591	573	550	506	443
Regional Transfers (Out)	491	471	267	249	243	243	244	243	201	201
Federal Diversity	0	0	0	0	0	0	0	0	0	0
Total Transfers Out	8212	8160	8058	8078	8200	8236	8387	8431	8516	8533
Total Firm Obligations	8510	8461	8347	8366	8497	8540	8694	8768	8875	8893
Hydro Resources										
Regulated Hydro	6455	6463	6491	6505	6513	6513	6514	6513	6514	6513
Independent Hydro	389	389	377	375	375	375	375	375	375	375
Operational Peaking Adj.	0	0	0	0	0	0	0	0	0	0
Non-Fed CER (Canada)	138	140	139	137	136	134	133	131	129	128
Total Hydro Resources	6983	6993	7007	7017	7024	7022	7022	7019	7019	7016
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	65	65	65	65	65	65	65	65	65	65
Cogeneration	23	23	23	23	23	23	16	0	0	0
Imports	249	241	241	241	241	241	237	221	192	161
Regional Transfers (In)	486	399	222	204	190	115	115	115	74	55
Large Thermal	1030	785	1030	878	1030	878	1030	878	1030	878
Non-Utility Generation	26	26	12	2.6	2.6	2.6	44	53	53	53
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	1879	1539	1593	1413	1552	1324	1508	1332	1413	1211
Total Resources	8862	8532	8600	8431	8576	8346	8530	8351	8432	8227
Reserves & Maintenance										
Contingency Reserves (Non-Spinning)	0	0	0	0	0	0	0	0	0	0
Contingency Reserves (Spinning)	0	0	0	0	0	0	0	0	0	0
Generation Imbalance Reserves	0	0	0	0	0	0	0	0	0	0
Load Following Reserves	0	0	0	0	0	0	0	0	0	0
Federal Hydro Maintenance	0	0	0	0	0	0	0	0	0	0
Federal Transmission Losses	-250	-241	-243	-238	-242	-235	-241	-235	-238	-232

Loads and Resources - Federal System
PNW Loads and Resource Study
2010 - 2019 Operating Years
1937 Water Year
[61] 2009 White Book - 30 Minute Wind (Final)

Continued 7/22/2009

Energy (aMW)	2010 Avg.	2011 Avg.	2012 Avg.	2013 Avg.	2014 Avg.	2015 Avg.	2016 Avg.	2017 Avg.	2018 Avg.	2019 Avg.
Total Reserves, Maintenance & Losses	-250	-241	-243	-238	-242	-235	-241	-235	-238	-232
Total Net Resources	8612	8291	8358	8193	8334	8111	8289	8116	8195	7995
Total Firm Surplus/Deficit	102	-170	11	-173	-163	-429	-405	-652	-680	-898

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Exhibits 2 - 4

Federal System Monthly Energy Analysis Using the 2009 White Book Load Forecast for 1937-Water Conditions

Exhibit 2: OY 2010 Federal System Monthly Energy

Loads and Resources - Federal System
PNW Loads and Resource Study
2009 - 2010 Operating Year
1937 Water Year
[61] 2009 White Book - 30 Minute Wind (Final)

7/22/2009

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	115	106	106	126	139	145	137	124	114	114	108	105	117	120
USBR 2002 PSC	256	256	219	94	14	31	70	79	50	224	224	289	286	310	161
DSI 2002 PSC	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17
Fed. Agencies 2012 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
USBR 2012 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DSI 2012 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Firm Non-Utility Obligations	389	388	341	218	157	187	232	233	192	355	355	414	408	444	298
Transfers Out															
NGP 2002 PSC	3065	3042	2787	2776	3207	3586	3647	3476	3011	2922	2922	2907	3033	3229	3135
GPU 2002 PSC	1968	1960	2089	2015	2505	2756	2719	2695	2481	2135	2135	1935	1831	1896	2249
NGP 2002 Slice PSC	648	546	516	576	681	655	659	588	555	431	466	744	635	622	607
GPU 2002 Slice PSC	1079	909	859	959	1134	1091	1098	979	924	718	776	1238	1057	1036	1011
IOU 2002 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NGP 2012 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GPU 2012 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NGP 2012 Slice PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GPU 2012 Slice PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
IOU 2012 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exports	744	741	734	694	693	701	693	691	694	725	728	756	759	749	719
Regional Transfers (Out)	583	562	364	328	639	670	693	657	523	488	459	451	266	266	491
Federal Diversity	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Transfers Out	8088	7761	7350	7348	8860	9458	9509	9085	8189	7420	7486	8031	7582	7797	8212
Total Firm Obligations	8477	8149	7691	7565	9018	9645	9741	9318	8380	7774	7840	8445	7989	8242	8510
Hydro Resources															
Regulated Hydro	7046	5818	5482	6079	7302	7093	7197	6345	5812	4367	4756	7896	6522	6684	6455
Independent Hydro	414	391	338	336	297	210	188	186	275	402	438	730	783	496	389
Operational Peaking Adj.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Non-Fed CER (Canada)	137	137	137	137	137	137	137	137	137	141	141	141	141	141	138
Total Hydro Resources	7597	6346	5957	6552	7736	7440	7522	6669	6224	4910	5335	8767	7446	7322	6983
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	54	68	52	57	61	59	62	60	81	74	70	74	80	66	65
Cogeneration	20	20	21	22	25	26	27	27	26	25	25	22	12	20	23
Imports	175	162	162	217	297	367	367	344	332	330	270	136	134	165	249
Regional Transfers (In)	766	781	668	397	619	552	526	524	502	499	500	220	345	214	486
Large Thermal	1030	1030	1030	1030	1030	1030	1030	1030	1030	1030	1030	1030	1030	1030	1030
Non-Utility Generation	27	25	9.0	13	26	30	29	26	25	45	45	41	27	19	26
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	2072	2086	1942	1737	2057	2063	2042	2011	1995	2003	1941	1523	1628	1514	1879
Total Resources	9669	8432	7898	8288	9793	9503	9564	8679	8219	6913	7276	10290	9074	8836	8862
Reserves & Maintenance															
Contingency Reserves (Non-Spinning)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Contingency Reserves (Spinning)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Generation Imbalance Reserves	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Load Following Reserves	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Federal Hydro Maintenance	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Federal Transmission Losses	-273	-238	-223	-234	-276	-268	-270	-245	-232	-195	-205	-290	-256	-249	-250

Exhibit 2: OY 2010 Federal System Monthly Energy

Loads and Resources - Federal System
PNW Loads and Resource Study
2009 - 2010 Operating Year
1937 Water Year
[61] 2009 White Book - 30 Minute Wind (Final)

Continued 7/22/2009

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
Total Reserves, Maintenance & Losses	-273	-238	-223	-234	-276	-268	-270	-245	-232	-195	-205	-290	-256	-249	-250
Total Net Resources	9396	8194	7676	8054	9516	9235	9294	8435	7987	6718	7071	10000	8818	8587	8612
Total Firm Surplus/Deficit	919	45	-15	489	499	-410	-447	-883	-393	-1056	-770	1554	829	345	102

Exhibit 3: OY 2014 Federal System Monthly Energy

Loads and Resources - Federal System
PNW Loads and Resource Study
2013 - 2014 Operating Year
1937 Water Year
[61] 2009 White Book - 30 Minute Wind (Final)

7/22/2009

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
Non-Utility Obligations															
Fed. Agencies 2002 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
USBR 2002 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DSI 2002 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fed. Agencies 2012 PSC	124	124	113	114	136	150	171	161	144	131	131	125	122	137	136
USBR 2012 PSC	256	256	219	94	14	31	70	79	50	224	224	289	286	310	161
DSI 2012 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Firm Non-Utility Obligations	380	380	332	208	151	182	241	240	195	355	355	414	407	447	296
Transfers Out															
NGP 2002 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GPU 2002 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NGP 2002 Slice PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GPU 2002 Slice PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
IOU 2002 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NGP 2012 PSC	3588	3591	3312	3280	3754	4159	4216	4019	3528	3401	3401	3395	3539	3785	3664
GPU 2012 PSC	1477	1477	1468	1646	1957	2166	2167	2040	1863	1693	1693	1543	1489	1492	1749
NGP 2012 Slice PSC	413	348	330	368	425	411	409	364	349	263	291	470	401	395	382
GPU 2012 Slice PSC	1684	1419	1347	1502	1734	1677	1671	1486	1423	1073	1188	1918	1636	1611	1559
IOU 2012 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exports	628	625	621	579	577	580	573	571	576	611	613	644	651	640	604
Regional Transfers (Out)	79	65	59	145	408	480	479	458	345	315	286	54	58	74	243
Federal Diversity	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Transfers Out	7870	7525	7137	7521	8855	9472	9515	8939	8083	7356	7472	8023	7774	7997	8200
Total Firm Obligations	8249	7905	7469	7729	9006	9654	9756	9179	8278	7712	7828	8437	8181	8444	8497
Hydro Resources															
Regulated Hydro	7125	5879	5533	6134	7372	7232	7257	6396	5855	4263	4798	7963	6576	6745	6513
Independent Hydro	399	376	328	329	287	198	179	176	262	385	422	708	761	476	375
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	135	135	135	135	135	136
Total Hydro Resources	7660	6391	5997	6600	7795	7566	7572	6708	6253	4784	5354	8806	7472	7355	7024
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	54	68	52	57	61	59	62	60	81	74	70	73	81	66	65
Cogeneration	20	20	21	22	25	26	27	27	26	25	25	22	12	20	23
Imports	170	156	154	207	284	357	355	334	322	319	266	130	134	166	241
Regional Transfers (In)	27	39	159	153	305	275	269	278	285	289	290	42	162	44	190
Large Thermal	1030	1030	1030	1030	1030	1030	1030	1030	1030	1030	1030	1030	1030	1030	1030
Non-Utility Generation	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6
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	1304	1315	1419	1472	1707	1749	1746	1732	1747	1741	1683	1300	1422	1328	1552
Total Resources	8964	7706	7416	8072	9502	9315	9318	8439	8001	6524	7038	10106	8893	8684	8576
Reserves & Maintenance															
Contingency Reserves (Non-Spinning)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Contingency Reserves (Spinning)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Generation Imbalance Reserves	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Load Following Reserves	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Federal Hydro Maintenance	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Federal Transmission Losses	-253	-217	-209	-228	-268	-263	-263	-238	-226	-184	-198	-285	-251	-245	-242

Exhibit 3: OY 2014 Federal System Monthly Energy

Loads and Resources - Federal System
PNW Loads and Resource Study
2013 - 2014 Operating Year
1937 Water Year
[61] 2009 White Book - 30 Minute Wind (Final)

Continued 7/22/2009

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
Total Reserves, Maintenance & Losses	-253	-217	-209	-228	-268	-263	-263	-238	-226	-184	-198	-285	-251	-245	-242
Total Net Resources	8712	7488	7207	7844	9234	9052	9055	8201	7775	6340	6839	9821	8643	8439	8334
Total Firm Surplus/Deficit	462	-417	-262	115	228	-602	-701	-978	-503	-1371	-988	1384	461	-4.7	-163

Exhibit 4: OY 2019 Federal System Monthly Energy

Loads and Resources - Federal System
PNW Loads and Resource Study
2018 - 2019 Operating Year
1937 Water Year
[61] 2009 White Book - 30 Minute Wind (Final)

7/22/2009

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
Non-Utility Obligations															
Fed. Agencies 2002 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
USBR 2002 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DSI 2002 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fed. Agencies 2012 PSC	189	189	172	176	217	241	248	230	203	183	183	174	171	194	200
USBR 2012 PSC	256	256	219	94	14	31	70	79	50	224	224	289	286	310	161
DSI 2012 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Firm Non-Utility Obligations	445	445	390	270	231	272	318	309	253	407	407	463	457	504	360
Transfers Out															
NGP 2002 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GPU 2002 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NGP 2002 Slice PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GPU 2002 Slice PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
IOU 2002 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NGP 2012 PSC	3931	3935	3640	3605	4100	4522	4582	4366	3858	3729	3729	3724	3878	4140	4005
GPU 2012 PSC	1661	1661	1651	1849	2163	2372	2374	2247	2067	1897	1897	1746	1692	1696	1950
NGP 2012 Slice PSC	419	354	334	372	433	433	416	371	353	249	298	440	355	395	381
GPU 2012 Slice PSC	1708	1442	1364	1517	1765	1768	1698	1514	1440	1015	1218	1797	1447	1611	1552
IOU 2012 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exports	465	462	459	450	457	459	452	439	428	428	428	428	428	428	443
Regional Transfers (Out)	79	65	59	145	307	379	378	357	295	265	237	54	58	74	201
Federal Diversity	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Transfers Out	8262	7918	7508	7939	9224	9933	9901	9293	8441	7583	7807	8189	7858	8343	8533
Total Firm Obligations	8707	8363	7898	8209	9455	10205	10219	9602	8694	7991	8215	8652	8315	8847	8893
Hydro Resources															
Regulated Hydro	7138	5889	5541	6134	7372	7498	7222	6364	5824	3870	4798	7963	6576	6745	6513
Independent Hydro	399	376	328	329	287	198	179	176	262	385	422	708	761	476	375
Operational Peaking Adj.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Non-Fed CER (Canada)	128	128	128	128	128	128	128	128	128	127	127	127	127	127	128
Total Hydro Resources	7665	6393	5997	6592	7788	7824	7529	6668	6214	4382	5346	8798	7464	7347	7016
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	54	68	52	57	61	59	62	60	81	74	70	73	81	66	65
Cogeneration	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Imports	80	66	60	146	207	278	278	257	247	217	188	55	59	75	161
Regional Transfers (In)	27	39	79	76	89	83	75	55	57	55	55	0	57	0	55
Large Thermal	1030	1030	1030	1030	1030	1030	1030	1030	1030	1030	1030	332	0	930	878
Non-Utility Generation	53	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	0
Augmentation Resources	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Other Resources	1244	1255	1274	1362	1439	1503	1498	1455	1467	1428	1395	513	249	1123	1211
Total Resources	8909	7647	7270	7954	9226	9327	9027	8123	7681	5810	6741	9310	7713	8471	8227
Reserves & Maintenance															
Contingency Reserves (Non-Spinning)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Contingency Reserves (Spinning)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Generation Imbalance Reserves	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Load Following Reserves	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Federal Hydro Maintenance	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Federal Transmission Losses	-251	-216	-205	-224	-260	-263	-255	-229	-217	-164	-190	-263	-218	-239	-232

Exhibit 4: OY 2019 Federal System Monthly Energy

Loads and Resources - Federal System
PNW Loads and Resource Study
2018 - 2019 Operating Year
1937 Water Year
[61] 2009 White Book - 30 Minute Wind (Final)

Continued

7/22/2009

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
Total Reserves, Maintenance & Losses	-251	-216	-205	-224	-260	-263	-255	-229	-217	-164	-190	-263	-218	-239	-232
Total Net Resources	8658	7432	7065	7730	8966	9064	8772	7894	7465	5646	6551	9048	7495	8232	7995
Total Firm Surplus/Deficit	-49	-931	-833	-479	-489	-1141	-1447	-1708	-1230	-2344	-1663	396	-820	-615	-898

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Exhibits 5 – 7

Federal System Monthly 1-Hour Capacity Analysis
Using the 2009 White Book Load Forecast for 1937-Water Conditions

Exhibit 5: OY 2010 Federal System Monthly 1-Hour Capacity

Loads and Resources - Federal System
PNW Loads and Resource Study
2009 - 2010 Operating Year
1937 Water Year
[61] 2009 White Book - 30 Minute Wind (Final)

7/22/2009

Capacity (MW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul
Non-Utility Obligations														
Fed. Agencies 2002 PSC	158	158	152	160	177	185	202	188	171	161	161	157	151	151
USBR 2002 PSC	197	197	205	35	0.5	0.4	0.4	0.4	24	261	261	286	259	268
DSI 2002 PSC	17	17	17	17	17	17	17	17	17	17	17	17	17	17
Fed. Agencies 2012 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
USBR 2012 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DSI 2012 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Firm Non-Utility Obligations	372	372	373	212	194	203	219	205	213	439	439	460	427	437
Transfers Out														
NGP 2002 PSC	4014	4014	3857	4142	4622	5060	5217	4964	4410	4237	4237	4047	4069	4254
GPU 2002 PSC	2493	2493	2559	2673	3204	3425	3448	3413	3203	2795	2795	2516	2313	2474
NGP 2002 Slice PSC	789	590	580	850	981	1038	1051	947	917	724	687	1119	945	984
GPU 2002 Slice PSC	1314	983	965	1415	1634	1729	1750	1578	1528	1206	1144	1864	1575	1639
IOU 2002 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NGP 2012 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GPU 2012 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NGP 2012 Slice PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GPU 2012 Slice PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
IOU 2012 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exports	1592	1592	1585	1539	1492	1497	1497	1496	1491	1515	1515	1581	1564	1571
Regional Transfers (Out)	1310	1310	1107	842	1046	1144	1146	1074	993	994	994	967	718	739
Federal Diversity	-474	-509	-549	-360	-333	-558	-339	-346	-389	-523	-539	-521	-510	-416
Total Transfers Out	11039	10473	10103	11100	12647	13335	13769	13126	12153	10949	10834	11573	10674	11245
Total Firm Obligations	11411	10844	10476	11312	12841	13538	13988	13331	12366	11388	11272	12034	11100	11682
Hydro Resources														
Regulated Hydro	20306	20297	20459	20566	20798	20631	20368	19914	19316	18560	18507	18832	19892	20506
Independent Hydro	630	642	576	636	604	413	354	405	559	609	728	855	920	690
Operational Peaking Adj.	-3367	-5945	-6951	-6255	-4887	-4671	-4626	-4982	-4869	-6164	-6950	-2007	-5423	-4151
Non-Fed CER (Canada)	236	236	236	236	236	236	236	236	236	244	244	244	244	244
Total Hydro Resources	17805	15231	14321	15183	16751	16609	16332	15573	15243	13249	12529	17924	15633	17288
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	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Cogeneration	25	25	25	27	29	30	32	31	30	29	29	27	26	24
Imports	206	206	208	313	346	444	446	381	382	413	413	238	184	206
Regional Transfers (In)	528	528	247	119	420	398	322	321	313	312	312	15	17	16
Large Thermal	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150
Non-Utility Generation	34	34	17	32	41	32	32	32	32	32	32	49	32	29
Augmentation Purchases	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Augmentation Resources	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Other Resources	1954	1954	1660	1654	1998	2067	1994	1928	1920	1949	1949	1492	1422	1437
Total Resources	19760	17185	15980	16837	18749	18675	18326	17501	17163	15198	14478	19416	17055	18725
Reserves & Maintenance														
Contingency Reserves (Non-Spinning)	-565	-566	-568	-572	-577	-568	-560	-550	-539	-521	-523	-535	-562	-572
Contingency Reserves (Spinning)	-332	-270	-266	-338	-378	-396	-401	-370	-361	-308	-296	-433	-377	-389
Generation Imbalance Reserves	-666	-666	-666	-666	-666	-666	-694	-748	-748	-779	-779	-779	-779	-779
Load Following Reserves	-251	-251	-251	-251	-251	-251	-256	-266	-266	-272	-272	-272	-272	-272
Federal Hydro Maintenance	-3263	-2761	-2770	-2752	-2705	-1866	-1408	-1883	-1915	-2061	-1805	-1756	-1635	-2785
Federal Transmission Losses	-492	-425	-384	-411	-475	-500	-503	-458	-447	-377	-362	-524	-450	-467

Loads and Resources - Federal System
PNW Loads and Resource Study
2009 - 2010 Operating Year
1937 Water Year
[61] 2009 White Book - 30 Minute Wind (Final)

Continued 7/22/2009

Capacity (MW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul
Total Reserves, Maintenance & Losses	-5569	-4937	-4904	-4989	-5053	-4248	-3821	-4276	-4276	-4319	-4038	-4299	-4076	-5264
Total Net Resources	14190	12248	11076	11848	13696	14428	14505	13225	12887	10878	10440	15116	12979	13461
Total Firm Surplus/Deficit	2779	1403	600	536	855	890	516	-106	522	-510	-833	3083	1878	1779

Loads and Resources - Federal System
PNW Loads and Resource Study
2013 - 2014 Operating Year
1937 Water Year
[61] 2009 White Book - 30 Minute Wind (Final)

7/22/2009

Capacity (MW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul
Non-Utility Obligations														
Fed. Agencies 2002 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
USBR 2002 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DSI 2002 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fed. Agencies 2012 PSC	169	169	161	171	191	200	236	216	195	182	182	179	173	169
USBR 2012 PSC	197	197	205	35	0.5	0.4	0.4	0.4	24	261	261	286	259	268
DSI 2012 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Firm Non-Utility Obligations	366	366	366	207	192	200	236	217	220	443	443	466	432	438
Transfers Out														
NGP 2002 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GPU 2002 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NGP 2002 Slice PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GPU 2002 Slice PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
IOU 2002 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NGP 2012 PSC	4736	4736	4538	4844	5397	5869	6049	5728	5117	4916	4916	4758	4765	4983
GPU 2012 PSC	1513	1513	1503	1704	2015	2220	2229	2104	1923	1747	1747	1574	1522	1533
NGP 2012 Slice PSC	593	473	433	515	595	611	609	544	551	423	381	667	528	606
GPU 2012 Slice PSC	2418	1930	1766	2101	2426	2495	2484	2218	2246	1727	1555	2721	2153	2473
IOU 2012 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exports	1514	1514	1512	1466	1420	1421	1419	1420	1420	1448	1448	1511	1512	1513
Regional Transfers (Out)	130	130	132	267	464	562	564	499	418	419	419	162	108	130
Federal Diversity	-437	-470	-503	-319	-294	-496	-307	-308	-343	-460	-474	-474	-472	-384
Total Transfers Out	10466	9826	9380	10579	12023	12682	13047	12205	11333	10220	9993	10919	10114	10854
Total Firm Obligations	10832	10192	9746	10785	12215	12883	13283	12422	11552	10664	10437	11385	10546	11291
Hydro Resources														
Regulated Hydro	20306	20297	20459	20566	20798	20615	20335	19877	19275	18536	18507	18832	19892	20506
Independent Hydro	615	627	566	629	594	400	345	394	546	593	712	833	897	669
Operational Peaking Adj.	-3072	-5962	-6870	-5610	-4163	-4273	-4398	-4826	-4278	-5746	-6926	-1712	-5735	-3326
Non-Fed CER (Canada)	234	234	234	234	234	234	234	234	234	233	233	233	233	233
Total Hydro Resources	18083	15196	14389	15819	17463	16976	16515	15680	15777	13616	12525	18187	15287	18081
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	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Cogeneration	25	25	25	27	29	30	32	31	30	29	29	27	26	24
Imports	206	206	208	313	346	444	446	381	382	413	413	238	184	206
Regional Transfers (In)	4.5	4.5	28	28	278	255	255	255	255	255	255	4.5	4.5	4.5
Large Thermal	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150
Non-Utility Generation	3	3	3	3	3	3	3	3	3	3	3	3	3	3
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	1401	1401	1426	1533	1817	1894	1898	1832	1832	1862	1862	1435	1380	1400
Total Resources	19484	16597	15815	17352	19281	18870	18413	17512	17609	15478	14387	19622	16667	19481
Reserves & Maintenance														
Contingency Reserves (Non-Spinning)	-564	-564	-567	-571	-576	-567	-558	-548	-537	-520	-522	-533	-561	-571
Contingency Reserves (Spinning)	-398	-339	-318	-354	-397	-406	-406	-373	-375	-318	-297	-439	-369	-410
Generation Imbalance Reserves	-1404	-1404	-1404	-1404	-1411	-1411	-1471	-1471	-1471	-1471	-1471	-1471	-1471	-1527
Load Following Reserves	-416	-416	-416	-416	-416	-416	-416	-416	-416	-416	-416	-416	-416	-416
Federal Hydro Maintenance	-3263	-2761	-2770	-2752	-2705	-1866	-1408	-1883	-1915	-2061	-1805	-1756	-1635	-2785
Federal Transmission Losses	-450	-372	-346	-397	-462	-476	-474	-429	-432	-358	-331	-503	-409	-461

Exhibit 6: OY 2014 Federal System Monthly 1-Hour Capacity

Loads and Resources - Federal System
PNW Loads and Resource Study
2013 - 2014 Operating Year
1937 Water Year
[61] 2009 White Book - 30 Minute Wind (Final)

Continued 7/22/2009

Capacity (MW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul
Total Reserves, Maintenance & Losses	-6496	-5856	-5821	-5894	-5966	-5141	-4733	-5121	-5146	-5144	-4842	-5119	-4862	-6169
Total Net Resources	12988	10741	9994	11458	13315	13729	13680	12391	12463	10334	9546	14503	11805	13312
Total Firm Surplus/Deficit	2156	549	248	672	1100	846	397	-31	911	-330	-891	3119	1259	2021

Loads and Resources - Federal System
PNW Loads and Resource Study
2018 - 2019 Operating Year
1937 Water Year
[61] 2009 White Book - 30 Minute Wind (Final)

7/22/2009

Capacity (MW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul
Non-Utility Obligations														
Fed. Agencies 2002 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
USBR 2002 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DSI 2002 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fed. Agencies 2012 PSC	256	256	234	252	291	308	333	298	264	243	243	242	239	221
USBR 2012 PSC	197	197	205	35	0.5	0.4	0.4	0.4	24	261	261	286	259	268
DSI 2012 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Firm Non-Utility Obligations	453	453	439	287	291	309	333	298	289	504	504	529	498	490
Transfers Out														
NGP 2002 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GPU 2002 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NGP 2002 Slice PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GPU 2002 Slice PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
IOU 2002 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NGP 2012 PSC	5177	5177	4963	5279	5852	6344	6539	6193	5555	5345	5345	5192	5201	5438
GPU 2012 PSC	1699	1699	1688	1910	2224	2430	2439	2313	2130	1953	1953	1779	1727	1739
NGP 2012 Slice PSC	598	479	437	518	599	630	612	546	554	427	385	617	477	611
GPU 2012 Slice PSC	2441	1953	1782	2112	2444	2569	2498	2229	2260	1741	1569	2515	1947	2493
IOU 2012 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exports	1350	1350	1350	1350	1350	1350	1350	1350	1350	1350	1350	1350	1350	1350
Regional Transfers (Out)	130	130	132	267	382	480	482	417	377	378	378	162	108	130
Federal Diversity	-474	-510	-544	-347	-319	-538	-332	-333	-371	-495	-510	-512	-511	-415
Total Transfers Out	10921	10278	9808	11088	12532	13264	13588	12716	11856	10699	10471	11102	10299	11345
Total Firm Obligations	11374	10731	10247	11376	12823	13573	13921	13014	12145	11203	10974	11630	10797	11835
Hydro Resources														
Regulated Hydro	20306	20297	20459	20566	20798	20557	20212	19743	19120	18449	18507	18832	19892	20506
Independent Hydro	615	627	566	629	594	400	345	394	546	593	712	833	897	669
Operational Peaking Adj.	-2703	-5593	-6508	-5257	-3804	-3606	-4022	-4456	-3828	-5363	-6628	-1407	-5430	-3077
Non-Fed CER (Canada)	221	221	221	221	221	221	221	221	221	219	219	219	219	219
Total Hydro Resources	18440	15553	14738	16159	17809	17572	16756	15902	16059	13898	12810	18477	15578	18317
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	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Cogeneration	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Imports	131	131	133	268	301	399	401	336	337	338	338	163	109	131
Regional Transfers (In)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	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	1351	1351	1353	1488	1521	1619	1621	1551	1552	1553	1553	228	174	1346
Total Resources	19790	16904	16091	17647	19330	19191	18377	17454	17611	15451	14363	18706	15752	19663
Reserves & Maintenance														
Contingency Reserves (Non-Spinning)	-565	-565	-568	-572	-577	-566	-556	-545	-534	-518	-522	-493	-521	-571
Contingency Reserves (Spinning)	-407	-347	-327	-363	-405	-420	-412	-379	-382	-325	-304	-408	-337	-416
Generation Imbalance Reserves	-1757	-1757	-1757	-1757	-1770	-1770	-1770	-1770	-1770	-1770	-1770	-1776	-1776	-1776
Load Following Reserves	-416	-416	-416	-416	-416	-416	-416	-416	-416	-416	-416	-416	-416	-416
Federal Hydro Maintenance	-3263	-2761	-2770	-2752	-2705	-1866	-1408	-1883	-1915	-2061	-1805	-1756	-1635	-2785
Federal Transmission Losses	-448	-370	-344	-395	-451	-474	-463	-417	-422	-347	-320	-464	-371	-459

Exhibit 7: OY 2019 Federal System Monthly 1-Hour Capacity

Loads and Resources - Federal System
PNW Loads and Resource Study
2018 - 2019 Operating Year
1937 Water Year
[61] 2009 White Book - 30 Minute Wind (Final)

Continued 7/22/2009

Capacity (MW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul
Total Reserves, Maintenance & Losses	-6856	-6216	-6180	-6254	-6323	-5512	-5023	-5410	-5438	-5437	-5136	-5313	-5056	-6422
Total Net Resources	12934	10687	9911	11393	13007	13679	13354	12044	12173	10015	9227	13392	10696	13241
Total Firm Surplus/Deficit	1560	-44	-336	17	184	106	-567	-970	28	-1188	-1748	1762	-102	1406

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Exhibits 8 – 10

Federal System Monthly 120-Hour Capacity Analysis
Using the 2009 White Book Load Forecast for 1937-Water Conditions

Exhibit 8: OY 2010 Federal System Monthly 120-Hour Capacity

Loads and Resources - Federal System
PNW Loads and Resource Study
2009 - 2010 Operating Year
1937 Water Year
[61] 2009 White Book - 30 Minute Wind (Final)

7/22/2009

Capacity 120 (MW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul
Non-Utility Obligations														
Fed. Agencies 2002 PSC	158	158	152	160	177	185	202	188	171	161	161	157	151	151
USBR 2002 PSC	197	197	205	35	0.5	0.4	0.4	0.4	24	261	261	286	259	268
DSI 2002 PSC	17	17	17	17	17	17	17	17	17	17	17	17	17	17
Fed. Agencies 2012 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
USBR 2012 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DSI 2012 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Firm Non-Utility Obligations	372	372	373	212	194	203	219	205	213	439	439	460	427	437
Transfers Out														
NGP 2002 PSC	4014	4014	3857	4142	4622	5060	5217	4964	4410	4237	4237	4047	4069	4254
GPU 2002 PSC	2493	2493	2559	2673	3204	3425	3448	3413	3203	2795	2795	2516	2313	2474
NGP 2002 Slice PSC	789	590	580	719	844	840	840	760	740	520	487	887	759	787
GPU 2002 Slice PSC	1314	983	965	1198	1405	1399	1398	1265	1232	865	811	1477	1264	1311
IOU 2002 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NGP 2012 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GPU 2012 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NGP 2012 Slice PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GPU 2012 Slice PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
IOU 2012 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exports	1592	1592	1585	1539	1492	1497	1497	1496	1491	1515	1515	1581	1564	1571
Regional Transfers (Out)	1310	1310	1107	842	1046	1144	1146	1074	993	994	994	967	718	739
Federal Diversity	-761	-823	-905	-1277	-1277	-1146	-1328	-1285	-1130	-1142	-1225	-1103	-918	-831
Total Transfers Out	10752	10159	9747	9835	11336	12220	12218	11686	10939	9784	9613	10372	9769	10305
Total Firm Obligations	11123	10530	10121	10047	11530	12422	12437	11891	11152	10223	10052	10832	10195	10742
Hydro Resources														
Regulated Hydro	20306	20297	20459	20566	20798	20631	20368	19914	19316	18560	18507	18832	19892	20506
Independent Hydro	630	642	576	636	604	413	354	405	559	609	728	855	920	690
Operational Peaking Adj.	-5797	-8677	-8833	-7884	-6607	-7146	-7263	-7329	-7089	-8722	-9454	-4914	-7756	-6614
Non-Fed CER (Canada)	236	236	236	236	236	236	236	236	236	244	244	244	244	244
Total Hydro Resources	15375	12498	12438	13554	15031	14134	13696	13225	13023	10691	10025	15017	13300	14825
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	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Cogeneration	25	25	25	27	29	30	32	31	30	29	29	27	26	24
Imports	206	206	208	313	346	444	446	381	382	413	413	238	184	206
Regional Transfers (In)	528	528	247	119	420	398	322	321	313	312	312	15	17	16
Large Thermal	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150
Non-Utility Generation	34	34	17	32	41	32	32	32	32	32	32	49	32	29
Augmentation Purchases	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Augmentation Resources	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Other Resources	1954	1954	1660	1654	1998	2067	1994	1928	1920	1949	1949	1492	1422	1437
Total Resources	17330	14453	14098	15208	17029	16201	15690	15154	14943	12640	11974	16508	14722	16262
Reserves & Maintenance														
Contingency Reserves (Non-Spinning)	-565	-566	-568	-572	-577	-568	-560	-550	-539	-521	-523	-535	-562	-572
Contingency Reserves (Spinning)	-475	-488	-489	-298	-336	-335	-336	-313	-307	-245	-235	-362	-320	-328
Generation Imbalance Reserves	-666	-666	-666	-666	-666	-666	-694	-748	-748	-779	-779	-779	-779	-779
Load Following Reserves	-251	-251	-251	-251	-251	-251	-256	-266	-266	-272	-272	-272	-272	-272
Federal Hydro Maintenance	-3263	-2761	-2770	-2752	-2705	-1866	-1408	-1883	-1915	-2061	-1805	-1756	-1635	-2785
Federal Transmission Losses	-406	-326	-313	-357	-419	-419	-417	-382	-374	-293	-280	-429	-374	-386

Exhibit 8: OY 2010 Federal System Monthly 120-Hour Capacity

Loads and Resources - Federal System
PNW Loads and Resource Study
2009 - 2010 Operating Year
1937 Water Year
[61] 2009 White Book - 30 Minute Wind (Final)

Continued 7/22/2009

Capacity 120 (MW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul
Total Reserves, Maintenance & Losses	-5626	-5057	-5057	-4896	-4954	-4106	-3671	-4142	-4149	-4173	-3895	-4133	-3943	-5122
Total Net Resources	11703	9396	9041	10312	12074	12095	12019	11012	10794	8467	8079	12375	10779	11140
Total Firm Surplus/Deficit	580	-1134	-1080	265	545	-328	-418	-880	-358	-1756	-1973	1543	584	398

Exhibit 9: OY 2014 Federal System Monthly 120-Hour Capacity

Loads and Resources - Federal System
PNW Loads and Resource Study
2013 - 2014 Operating Year
1937 Water Year
[61] 2009 White Book - 30 Minute Wind (Final)

7/22/2009

Capacity 120 (MW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul
Non-Utility Obligations														
Fed. Agencies 2002 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
USBR 2002 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DSI 2002 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fed. Agencies 2012 PSC	169	169	161	171	191	200	236	216	195	182	182	179	173	169
USBR 2012 PSC	197	197	205	35	0.5	0.4	0.4	0.4	24	261	261	286	259	268
DSI 2012 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Firm Non-Utility Obligations	366	366	366	207	192	200	236	217	220	443	443	466	432	438
Transfers Out														
NGP 2002 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GPU 2002 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NGP 2002 Slice PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GPU 2002 Slice PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
IOU 2002 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NGP 2012 PSC	4736	4736	4538	4844	5397	5869	6049	5728	5117	4916	4916	4758	4765	4983
GPU 2012 PSC	1513	1513	1503	1704	2015	2220	2229	2104	1923	1747	1747	1574	1522	1533
NGP 2012 Slice PSC	495	370	364	432	502	503	498	452	443	308	297	543	439	459
GPU 2012 Slice PSC	2020	1509	1484	1762	2048	2050	2030	1843	1806	1258	1212	2216	1792	1871
IOU 2012 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exports	1514	1514	1512	1466	1420	1421	1419	1420	1420	1448	1448	1511	1512	1513
Regional Transfers (Out)	130	130	132	267	464	562	564	499	418	419	419	162	108	130
Federal Diversity	-703	-760	-829	-1132	-1126	-1019	-1202	-1146	-995	-1005	-1078	-1003	-849	-767
Total Transfers Out	9705	9012	8704	9344	10720	11607	11587	10900	10132	9092	8961	9763	9288	9721
Total Firm Obligations	10071	9378	9070	9551	10911	11807	11823	11117	10352	9535	9405	10228	9720	10159
Hydro Resources														
Regulated Hydro	20306	20297	20459	20566	20798	20615	20335	19877	19275	18536	18507	18832	19892	20506
Independent Hydro	615	627	566	629	594	400	345	394	546	593	712	833	897	669
Operational Peaking Adj.	-5016	-8021	-8248	-7265	-6012	-6445	-6616	-6661	-6430	-8039	-8608	-4178	-7500	-6269
Non-Fed CER (Canada)	234	234	234	234	234	234	234	234	234	233	233	233	233	233
Total Hydro Resources	16139	13138	13011	14164	15614	14804	14297	13844	13625	11323	10844	15721	13523	15139
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	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Cogeneration	25	25	25	27	29	30	32	31	30	29	29	27	26	24
Imports	206	206	208	313	346	444	446	381	382	413	413	238	184	206
Regional Transfers (In)	4.5	4.5	28	28	278	255	255	255	255	255	255	4.5	4.5	4.5
Large Thermal	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150	1150
Non-Utility Generation	3	3	3	3	3	3	3	3	3	3	3	3	3	3
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	1401	1401	1426	1533	1817	1894	1898	1832	1832	1862	1862	1435	1380	1400
Total Resources	17540	14538	14437	15697	17432	16698	16195	15677	15457	13185	12706	17156	14902	16539
Reserves & Maintenance														
Contingency Reserves (Non-Spinning)	-564	-564	-567	-571	-576	-567	-558	-548	-537	-520	-522	-533	-561	-571
Contingency Reserves (Spinning)	-350	-286	-284	-314	-354	-355	-354	-331	-325	-266	-260	-382	-326	-333
Generation Imbalance Reserves	-1404	-1404	-1404	-1404	-1411	-1411	-1471	-1471	-1471	-1471	-1471	-1471	-1471	-1527
Load Following Reserves	-416	-416	-416	-416	-416	-416	-416	-416	-416	-416	-416	-416	-416	-416
Federal Hydro Maintenance	-3263	-2761	-2770	-2752	-2705	-1866	-1408	-1883	-1915	-2061	-1805	-1756	-1635	-2785
Federal Transmission Losses	-387	-305	-301	-343	-401	-405	-402	-369	-362	-283	-276	-422	-352	-365

Exhibit 9: OY 2014 Federal System Monthly 120-Hour Capacity

Loads and Resources - Federal System
PNW Loads and Resource Study
2013 - 2014 Operating Year
1937 Water Year
[61] 2009 White Book - 30 Minute Wind (Final)

Continued

7/22/2009

Capacity 120 (MW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul
Total Reserves, Maintenance & Losses	-6384	-5736	-5742	-5800	-5863	-5020	-4609	-5019	-5025	-5017	-4749	-4980	-4761	-5996
Total Net Resources	11156	8802	8694	9897	11569	11678	11587	10658	10432	8168	7957	12176	10141	10543
Total Firm Surplus/Deficit	1085	-576	-375	346	657	-129	-236	-459	80	-1367	-1448	1948	422	384

Exhibit 10: OY 2019 Federal System Monthly 120-Hour Capacity

Loads and Resources - Federal System
PNW Loads and Resource Study
2018 - 2019 Operating Year
1937 Water Year
[61] 2009 White Book - 30 Minute Wind (Final)

7/22/2009

Capacity 120 (MW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul
Non-Utility Obligations														
Fed. Agencies 2002 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
USBR 2002 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DSI 2002 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fed. Agencies 2012 PSC	256	256	234	252	291	308	333	298	264	243	243	242	239	221
USBR 2012 PSC	197	197	205	35	0.5	0.4	0.4	0.4	24	261	261	286	259	268
DSI 2012 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Firm Non-Utility Obligations	453	453	439	287	291	309	333	298	289	504	504	529	498	490
Transfers Out														
NGP 2002 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GPU 2002 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NGP 2002 Slice PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GPU 2002 Slice PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
IOU 2002 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NGP 2012 PSC	5177	5177	4963	5279	5852	6344	6539	6193	5555	5345	5345	5192	5201	5438
GPU 2012 PSC	1699	1699	1688	1910	2224	2430	2439	2313	2130	1953	1953	1779	1727	1739
NGP 2012 Slice PSC	501	375	368	435	506	525	501	455	446	312	300	493	389	463
GPU 2012 Slice PSC	2043	1532	1501	1773	2066	2142	2043	1856	1820	1272	1226	2011	1587	1891
IOU 2012 PSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exports	1350	1350	1350	1350	1350	1350	1350	1350	1350	1350	1350	1350	1350	1350
Regional Transfers (Out)	130	130	132	267	382	480	482	417	377	378	378	162	108	130
Federal Diversity	-763	-825	-896	-1231	-1223	-1105	-1301	-1237	-1076	-1082	-1160	-1084	-919	-829
Total Transfers Out	10138	9439	9105	9783	11157	12165	12052	11347	10603	9528	9392	9903	9441	10182
Total Firm Obligations	10591	9892	9544	10070	11448	12474	12385	11645	10892	10032	9896	10431	9940	10672
Hydro Resources														
Regulated Hydro	20306	20297	20459	20566	20798	20557	20212	19743	19120	18449	18507	18832	19892	20506
Independent Hydro	615	627	566	629	594	400	345	394	546	593	712	833	897	669
Operational Peaking Adj.	-4645	-7652	-7884	-6912	-5653	-5696	-6246	-6281	-5980	-7655	-8309	-3873	-7195	-6019
Non-Fed CER (Canada)	221	221	221	221	221	221	221	221	221	219	219	219	219	219
Total Hydro Resources	16497	13494	13362	14504	15960	15482	14532	14078	13907	11605	11128	16011	13813	15374
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	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Cogeneration	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Imports	131	131	133	268	301	399	401	336	337	338	338	163	109	131
Regional Transfers (In)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	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	1351	1351	1353	1488	1521	1619	1621	1551	1552	1553	1553	228	174	1346
Total Resources	17848	14845	14715	15992	17481	17101	16152	15629	15459	13159	12682	16240	13988	16721
Reserves & Maintenance														
Contingency Reserves (Non-Spinning)	-565	-565	-568	-572	-577	-566	-556	-545	-534	-518	-522	-493	-521	-571
Contingency Reserves (Spinning)	-360	-297	-294	-324	-364	-374	-361	-338	-333	-274	-268	-351	-296	-340
Generation Imbalance Reserves	-1757	-1757	-1757	-1757	-1770	-1770	-1770	-1770	-1770	-1770	-1770	-1776	-1776	-1776
Load Following Reserves	-416	-416	-416	-416	-416	-416	-416	-416	-416	-416	-416	-416	-416	-416
Federal Hydro Maintenance	-3263	-2761	-2770	-2752	-2705	-1866	-1408	-1883	-1915	-2061	-1805	-1756	-1635	-2785
Federal Transmission Losses	-385	-303	-298	-341	-390	-406	-390	-358	-351	-272	-265	-383	-313	-363

Exhibit 10: OY 2019 Federal System Monthly 120-Hour Capacity

Loads and Resources - Federal System
PNW Loads and Resource Study
2018 - 2019 Operating Year
1937 Water Year
[61] 2009 White Book - 30 Minute Wind (Final)

Continued 7/22/2009

Capacity 120 (MW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul
Total Reserves, Maintenance & Losses	-6746	-6099	-6103	-6161	-6222	-5397	-4900	-5310	-5318	-5311	-5045	-5176	-4957	-6251
Total Net Resources	11102	8746	8612	9831	11259	11704	11253	10319	10141	7847	7636	11063	9031	10470
Total Firm Surplus/Deficit	511	-1146	-932	-240	-189	-770	-1133	-1326	-751	-2184	-2259	632	-909	-202

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Exhibits 11 – 20

Federal System Energy Surpluses and Deficits Using the 2009 White Book Load Forecast for 70 Historical Water Conditions

Table A-30: Federal Surplus/Deficit - By Water Year
PNW Loads and Resource Study
2009 - 2010 Operating Year
[61] 2009 White Book - 30 Minute Wind (Final)

7/22/2009

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1929 Federal Surplus/Deficit	1630	-145	393	305	159	-436	-602	-690	373	-395	967	555	2029	904	337
1930 Federal Surplus/Deficit	464	-394	254	550	242	-341	-509	-738	36	-88	2095	234	693	722	184
1931 Federal Surplus/Deficit	-39	-256	80	377	407	-192	-612	-628	-219	538	-712	965	552	985	128
1932 Federal Surplus/Deficit	967	51	554	-39	-194	-453	-1156	-1211	666	2134	4421	5518	3958	1654	1099
1933 Federal Surplus/Deficit	427	292	667	537	-259	563	3099	1540	109	1941	2482	4243	3817	3180	1674
1934 Federal Surplus/Deficit	2968	1682	950	1013	1948	3207	3446	3111	3411	4052	4351	4516	3782	1711	2798
1935 Federal Surplus/Deficit	67	-342	412	369	-536	-127	2483	2895	-134	860	2238	3695	2579	2617	1295
1936 Federal Surplus/Deficit	2186	69	124	403	93	-501	-1455	-259	102	442	4095	4529	4160	1266	988
1937 Federal Surplus/Deficit	919	45	-15	489	499	-410	-447	-883	-393	-1056	-770	1554	829	345	102
1938 Federal Surplus/Deficit	1091	234	372	462	-25	427	2564	600	1999	3078	4653	5271	3904	2147	1861
1939 Federal Surplus/Deficit	386	-278	736	594	95	-612	-431	-701	820	1241	3659	4720	1877	869	880
1940 Federal Surplus/Deficit	8.8	-498	-48	640	513	676	-612	-344	2439	3006	3710	3183	2974	7.3	1049
1941 Federal Surplus/Deficit	-232	-496	341	439	407	138	-875	-543	1334	253	933	1324	920	820	383
1942 Federal Surplus/Deficit	721	191	962	13	363	873	658	731	-24	419	2590	3129	4532	3209	1366
1943 Federal Surplus/Deficit	2211	795	546	537	-243	42	1916	2201	2603	4457	4142	5433	3922	3043	2148
1944 Federal Surplus/Deficit	1577	-109	-381	417	187	-527	-539	-576	132	-320	1128	335	85	135	36
1945 Federal Surplus/Deficit	683	10	700	18	-188	-517	-921	-1239	-235	-896	-1436	3507	3271	655	362
1946 Federal Surplus/Deficit	617	-186	97	175	468	641	1222	76	3127	3899	4627	5025	3888	2972	1857
1947 Federal Surplus/Deficit	1626	243	636	342	421	2782	3059	2774	3498	3021	3430	4902	4314	3160	2503
1948 Federal Surplus/Deficit	1368	-20	481	2234	2160	1397	3901	1209	1830	2073	4319	5439	3574	3831	2504
1949 Federal Surplus/Deficit	2770	1718	848	745	231	371	-486	1092	3568	3465	4483	5393	4107	452	1878
1950 Federal Surplus/Deficit	231	-616	-296	424	-20	177	2055	2869	4095	4092	4011	4904	3494	3449	2079
1951 Federal Surplus/Deficit	1953	899	647	1313	1575	3122	3642	3263	4098	3996	4416	5121	3883	3703	3001
1952 Federal Surplus/Deficit	2624	330	468	1764	1074	1491	3925	1527	840	4569	4715	5411	4381	2506	2461
1953 Federal Surplus/Deficit	1557	150	77	459	27	-449	10	2714	1147	-169	2352	4874	4291	3835	1568
1954 Federal Surplus/Deficit	1766	287	505	732	508	1035	1883	3513	1505	2843	3073	5419	3425	3005	2116
1955 Federal Surplus/Deficit	4222	3511	2425	750	1102	951	-170	-442	379	272	1646	2965	4028	3101	1671
1956 Federal Surplus/Deficit	2993	1416	281	913	1676	2989	3983	3757	4092	4246	3843	4946	3464	3787	3010
1957 Federal Surplus/Deficit	1872	763	587	916	38	850	837	442	2672	3459	3593	5644	3857	1739	1877
1958 Federal Surplus/Deficit	733	-279	396	459	342	-18	675	2398	1829	2276	4214	5712	4422	1650	1768
1959 Federal Surplus/Deficit	729	95	271	685	868	2189	3902	3734	2013	3880	3242	5035	3585	2304	2371
1960 Federal Surplus/Deficit	2130	633	2681	2753	2979	2488	2912	1250	2201	3958	4261	4163	4368	2429	2812
1961 Federal Surplus/Deficit	1131	-139	563	563	134	39	2199	1493	2776	3853	2188	5352	3967	2110	1894
1962 Federal Surplus/Deficit	1252	554	124	177	363	541	1390	1334	526	2809	4508	4806	4552	1126	1620
1963 Federal Surplus/Deficit	859	105	88	1147	1082	1998	2112	2035	94	1278	2145	3908	4539	2769	1828
1964 Federal Surplus/Deficit	1964	346	520	223	240	437	412	1160	32	1533	863	4326	4258	3615	1464
1965 Federal Surplus/Deficit	3003	773	1187	1272	933	3032	4066	3651	4043	2891	4245	5456	4756	2297	3008
1966 Federal Surplus/Deficit	2306	1376	698	854	179	356	1748	428	-220	3900	2895	3759	3323	2742	1597
1967 Federal Surplus/Deficit	1824	151	162	331	-8.6	541	3615	3949	1960	1698	298	3928	4014	3868	2019
1968 Federal Surplus/Deficit	2492	511	646	662	144	529	2509	2328	2017	-71	1397	2806	4034	3779	1799
1969 Federal Surplus/Deficit	2391	1222	1772	1322	1802	1541	3962	4192	2356	4002	4066	5270	4133	3482	2961
1970 Federal Surplus/Deficit	1250	-212	312	774	384	-187	55	2022	1642	1531	1761	3717	4742	2030	1461
1971 Federal Surplus/Deficit	668	-285	92	428	287	289	3953	3983	4068	4302	4287	5141	3788	3656	2505
1972 Federal Surplus/Deficit	3291	1657	820	901	363	756	3950	4045	3617	3557	3742	5158	3606	3096	2696
1973 Federal Surplus/Deficit	3952	2602	969	747	302	1108	671	-373	317	-959	893	2469	1409	817	986
1974 Federal Surplus/Deficit	-43	-594	-17	365	-328	2164	3786	3509	3853	4158	4041	5071	3616	3185	2411
1975 Federal Surplus/Deficit	2829	1751	613	160	137	-107	1375	1215	2631	449	2060	5319	4022	3762	1897
1976 Federal Surplus/Deficit	1372	809	966	1456	1935	3545	3693	3887	3288	4276	4445	5334	4335	3559	3116
1977 Federal Surplus/Deficit	4288	4261	3331	770	282	-395	-532	-358	188	-905	174	-269	-438	250	568
1978 Federal Surplus/Deficit	896	289	534	-480	-358	1127	1124	755	1623	4030	2931	4690	3503	2706	1612
1979 Federal Surplus/Deficit	1226	334	1849	927	401	-271	-250	969	2412	1390	1599	4509	1233	502	1213
1980 Federal Surplus/Deficit	-168	-492	-52	410	375	554	-1087	373	265	1058	3745	5530	4408	1460	1192
1981 Federal Surplus/Deficit	513	-267	503	498	501	2654	3714	2093	1812	87	1977	3420	4089	3994	2040
1982 Federal Surplus/Deficit	3317	2204	504	614	674	615	2637	4148	3692	4217	3635	5587	4095	3421	2714
1983 Federal Surplus/Deficit	3146	1342	1691	1463	882	1115	3450	1844	4005	3688	3955	4813	4304	3977	2807
1984 Federal Surplus/Deficit	3043	1346	951	757	2379	717	3865	1448	4350	4812	4846	3914	4678	3947	2841
1985 Federal Surplus/Deficit	2061	104	861	666	867	506	1108	-646	1856	3711	4095	4824	2065	240	1453
1986 Federal Surplus/Deficit	-546	-721	191	675	1427	-292	2086	2904	4257	4242	4031	3289	3723	2102	1976
1987 Federal Surplus/Deficit	1375	-102	30	220	739	-57	-532	-234	980	1837	1874	2885	3009	867	868
1988 Federal Surplus/Deficit	60	-583	-154	231	169	-774	-810	-790	-123	-132	1457	2077	83	1310	141
1989 Federal Surplus/Deficit	907	72	236	38	-173	-55	-922	-4.1	1409	3769	4434	4336	2576	600	1053
1990 Federal Surplus/Deficit	-446	-476	97	353	437	1316	2858	1797	1458	3575	4417	3862	4078	1987	1811
1991 Federal Surplus/Deficit	1691	630	-9.4	70	1706	1566	3673	3651	1128	2902	2739	5071	4065	3500	2357
1992 Federal Surplus/Deficit	3076	1185	218	265	-49	-706	-393	-782	1947	405	1086	1763	920	568	561

Table A-30: Federal Surplus/Deficit - By Water Year
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Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1993 Federal Surplus/Deficit	-299	-414	-264	271	139	-320	-508	-604	397	834	852	4081	1683	1483	580
1994 Federal Surplus/Deficit	1051	302	-292	243	559	189	-580	-202	58	-223	3028	2170	1301	908	539
1995 Federal Surplus/Deficit	-83	-474	-144	167	-137	6.3	163	1981	3163	2733	1428	3829	3635	2526	1411
1996 Federal Surplus/Deficit	973	111	426	987	2946	3523	3622	3169	3573	3920	4048	5485	4562	3826	3052
1997 Federal Surplus/Deficit	2940	702	528	642	282	1489	3719	3716	3787	4088	4041	5132	3845	3594	2713
1998 Federal Surplus/Deficit	2772	1252	1793	2789	1339	432	2284	1646	1991	1819	2000	4200	4328	2579	2278
-Ranked Averages-															
Top Ten Percent	2247	939	890	1146	1892	2638	3833	3338	3686	4020	4273	5075	4259	3514	2998
Middle Eighty Percent	1510	462	571	631	456	644	1485	1453	1817	2336	3006	4284	3472	2300	1731
Bottom Ten Percent	756	-205	125	341	211	-457	-634	-792	-61	-336	390	1318	1077	722	184

Table A-30: Federal Surplus/Deficit - By Water Year
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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	1250	-623	179	235	84	-502	-630	-717	352	-784	173	-238	1235	767	66
1930 Federal Surplus/Deficit	80	-873	40	480	168	-408	-537	-766	14	-476	1302	-559	-101	586	-87
1931 Federal Surplus/Deficit	-424	-734	-133	307	333	-258	-640	-655	-241	150	-1509	173	-241	850	-143
1932 Federal Surplus/Deficit	586	-425	342	-110	-269	-519	-1185	-1238	643	1746	4081	5274	3918	1519	955
1933 Federal Surplus/Deficit	43	-184	454	466	-335	498	3058	1515	87	1555	1689	3459	3774	3224	1480
1934 Federal Surplus/Deficit	2592	1210	738	943	1859	3628	3888	3781	3367	4284	4494	3733	2956	1577	2722
1935 Federal Surplus/Deficit	-318	-820	199	298	-612	-193	2450	2839	-157	472	1446	2910	1788	2485	1022
1936 Federal Surplus/Deficit	1808	-408	-89	333	18	-567	-1485	-285	80	54	3302	3743	3794	1131	753
1937 Federal Surplus/Deficit	538	-432	-230	419	425	-477	-475	-910	-415	-1446	-1567	763	34	208	-170
1938 Federal Surplus/Deficit	710	-242	159	391	-100	361	2530	574	1978	2692	4444	4972	3114	2013	1656
1939 Federal Surplus/Deficit	1.9	-757	523	523	20	-679	-460	-727	798	853	2868	3936	1085	733	610
1940 Federal Surplus/Deficit	-376	-977	-262	570	439	611	-640	-371	2418	2620	2918	2397	2184	-129	779
1941 Federal Surplus/Deficit	-617	-974	128	368	333	72	-861	-621	1313	-134	140	532	125	684	112
1942 Federal Surplus/Deficit	338	-286	750	-59	288	806	630	706	-46	30	1797	2342	3742	3076	1097
1943 Federal Surplus/Deficit	1832	320	333	467	-319	-25	1881	2150	2581	4737	4543	4642	3768	2909	2004
1944 Federal Surplus/Deficit	1196	-588	-597	346	112	-594	-567	-602	110	-708	335	-458	-711	-1.8	-235
1945 Federal Surplus/Deficit	301	-467	487	-53	-263	-583	-950	-1267	-258	-1285	-2233	2720	2479	518	91
1946 Federal Surplus/Deficit	234	-664	-117	104	393	575	1195	48	3099	3502	4557	4795	3098	2840	1663
1947 Federal Surplus/Deficit	1246	-233	422	271	346	2709	3025	2724	3463	2636	2638	4109	3995	3028	2268
1948 Federal Surplus/Deficit	987	-498	268	2145	2087	1332	4250	580	1809	1686	3702	5205	3526	3867	2349
1949 Federal Surplus/Deficit	2393	1245	635	675	156	306	-514	1067	3523	3079	4466	4965	3677	316	1699
1950 Federal Surplus/Deficit	-154	-1096	-512	353	-95	111	2021	2820	4364	3762	3211	4108	3454	3428	1904
1951 Federal Surplus/Deficit	1573	423	434	1243	1501	3042	4454	3941	4400	4440	4463	4773	3093	3692	2999
1952 Federal Surplus/Deficit	2247	-146	254	1686	1000	1426	3884	1492	818	4144	4464	5178	4059	2372	2296
1953 Federal Surplus/Deficit	1177	-328	-138	389	-48	-516	-19	2665	1126	-558	1559	4087	4250	3816	1368
1954 Federal Surplus/Deficit	1386	-190	291	662	433	969	1849	3457	1484	2456	2280	4680	3388	3047	1924
1955 Federal Surplus/Deficit	3849	3044	2217	680	1028	886	-198	-468	358	-116	853	2177	3986	3144	1479
1956 Federal Surplus/Deficit	2617	943	67	843	1602	2908	4743	3300	4047	3875	3964	4712	3433	3773	2929
1957 Federal Surplus/Deficit	1492	288	374	845	-38	784	810	415	2651	3072	2801	5257	3828	1604	1704
1958 Federal Surplus/Deficit	350	-757	183	388	267	-85	648	2348	1808	1890	3421	5259	4280	1515	1578
1959 Federal Surplus/Deficit	346	-382	57	614	793	2116	4468	3670	1263	3483	2403	4137	3553	2170	2137
1960 Federal Surplus/Deficit	1752	157	2474	2659	2882	2416	2878	1225	2180	4313	3471	3378	4062	2296	2609
1961 Federal Surplus/Deficit	750	-617	350	493	59	-27	2166	1443	2756	3469	1395	4561	3525	1977	1650
1962 Federal Surplus/Deficit	871	78	-90	106	288	476	1363	1309	504	2422	4752	4022	4242	990	1433
1963 Federal Surplus/Deficit	476	-372	-126	1076	1007	1925	2081	1985	72	891	1353	3121	3778	2636	1558
1964 Federal Surplus/Deficit	1586	-130	307	152	165	371	385	1136	10.0	1144	68	3541	4213	3657	1271
1965 Federal Surplus/Deficit	2626	298	975	1203	859	2960	4829	4407	3999	2494	4654	4914	4288	2163	2960
1966 Federal Surplus/Deficit	1928	902	485	783	104	290	1722	403	-243	4102	2103	2974	2533	2610	1352
1967 Federal Surplus/Deficit	1445	-326	-52	260	-84	476	4193	3746	1144	1239	-522	3135	3441	3914	1748
1968 Federal Surplus/Deficit	2114	35	433	591	69	463	2475	2278	1997	-459	604	2019	3744	3647	1569
1969 Federal Surplus/Deficit	2013	748	1562	1252	1728	1476	4588	3646	2054	4421	4469	4969	3711	3350	2838
1970 Federal Surplus/Deficit	870	-690	98	704	309	-253	26	1973	1621	1144	968	2930	4594	1894	1243
1971 Federal Surplus/Deficit	285	-763	-123	357	212	223	4326	4461	3914	3703	3750	4906	3748	3696	2421
1972 Federal Surplus/Deficit	2916	1185	607	830	287	690	4215	4037	4996	4013	2951	4924	3564	3139	2730
1973 Federal Surplus/Deficit	3579	2133	756	676	227	1042	643	-399	295	-1348	100	1681	615	682	716
1974 Federal Surplus/Deficit	-428	-1074	-232	294	-404	2091	4394	3932	5015	4240	4445	4832	3584	3228	2522
1975 Federal Surplus/Deficit	2452	1279	401	89	63	-174	1340	1190	2610	61	1268	4528	3982	3802	1704
1976 Federal Surplus/Deficit	990	333	754	1386	1861	3959	4427	4098	2549	4458	4008	5021	3979	3601	3038
1977 Federal Surplus/Deficit	3916	3798	3127	700	207	-461	-561	-384	167	-1294	-620	-1062	-1232	114	298
1978 Federal Surplus/Deficit	515	-187	321	-551	-434	1052	1096	728	1601	3614	2139	3898	2712	2573	1340
1979 Federal Surplus/Deficit	844	-142	1640	857	326	-337	-278	944	2391	1004	805	3723	440	366	944
1980 Federal Surplus/Deficit	-553	-971	-266	340	301	489	-1096	323	243	671	2953	5123	3618	1324	954
1981 Federal Surplus/Deficit	129	-746	290	427	427	2582	4385	1034	1785	-349	1183	2616	4051	4040	1823
1982 Federal Surplus/Deficit	2942	1734	291	543	599	549	2603	4501	4963	3559	2805	5093	3501	3286	2611
1983 Federal Surplus/Deficit	2770	869	1481	1393	808	1049	3408	1793	5168	3270	3163	4021	3512	3846	2634
1984 Federal Surplus/Deficit	2666	871	739	686	2289	651	4439	638	4501	4188	4055	3126	4627	3815	2627
1985 Federal Surplus/Deficit	1682	-373	648	595	792	440	1081	-673	1836	3293	3303	4038	1273	104	1182
1986 Federal Surplus/Deficit	-933	-1201	-24	605	1353	-359	2052	2841	4801	4443	3239	2501	2931	1968	1775
1987 Federal Surplus/Deficit	994	-579	-185	149	664	-123	-560	-261	958	1451	1081	2098	2220	732	598
1988 Federal Surplus/Deficit	-326	-1062	-369	161	95	-841	-839	-817	-145	-521	663	1289	-712	1175	-130
1989 Federal Surplus/Deficit	525	-405	22	-33	-249	-121	-952	-31	1386	3370	3791	3552	1785	464	789
1990 Federal Surplus/Deficit	-833	-955	-117	283	362	1252	2826	1772	1437	3191	4508	3078	4031	1853	1639
1991 Federal Surplus/Deficit	1311	155	-224	-1.3	1633	1501	3956	3541	606	2504	1944	4284	3276	3542	2080
1992 Federal Surplus/Deficit	2700	712	4.3	194	-125	-773	-422	-809	1927	18	292	972	127	432	291

Table A-30: Federal Surplus/Deficit - By Water Year
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Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1993 Federal Surplus/Deficit	-685	-893	-479	200	65	-386	-536	-630	374	445	57	3294	888	1347	309
1994 Federal Surplus/Deficit	668	-175	-508	173	485	123	-609	-228	35	-611	2237	1382	509	772	268
1995 Federal Surplus/Deficit	-468	-953	-359	96	-212	-60	135	1930	3119	2347	634	3042	2843	2392	1137
1996 Federal Surplus/Deficit	591	-367	213	917	2857	3927	4469	3832	4732	3821	4453	5115	4513	3868	3221
1997 Federal Surplus/Deficit	2564	227	315	571	207	1424	4260	4269	4946	3758	4443	4898	3805	3635	2811
1998 Federal Surplus/Deficit	2395	778	1583	2696	1265	366	2250	1613	1971	1433	1207	3405	4284	2445	2066
-Ranked Averages-															
Top Ten Percent	1853	372	617	1059	1516	2814	4539	3928	3818	3895	4351	4915	3832	3440	2971
Middle Eighty Percent	1131	-2.3	366	561	418	572	1547	1366	1874	2026	2385	3583	3042	2213	1526
Bottom Ten Percent	373	-683	-89	271	136	-523	-663	-819	-83	-724	-405	527	284	586	-87

Table A-30: Federal Surplus/Deficit - By Water Year
PNW Loads and Resource Study
2011 - 2012 Operating Year
[61] 2009 White Book - 30 Minute Wind (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	1360	-472	144	102	102	-468	-520	-521	326	-438	844	596	1735	676	233
1930 Federal Surplus/Deficit	188	-722	4.8	333	183	-379	-520	-560	106	-146	1911	292	475	505	87
1931 Federal Surplus/Deficit	-316	-582	-169	178	343	-233	-614	-447	-130	453	-746	989	346	763	38
1932 Federal Surplus/Deficit	696	-273	307	-221	-232	-482	-1132	-1001	702	1958	4541	5784	3724	1389	1027
1933 Federal Surplus/Deficit	152	-32	419	327	-294	480	2879	1606	175	1780	2281	4105	3586	3486	1573
1934 Federal Surplus/Deficit	2705	1364	703	779	1790	3639	3892	4103	3281	4334	4727	4367	3361	1453	2821
1935 Federal Surplus/Deficit	-210	-669	163	168	-557	-173	2308	2846	-51	754	2052	3585	2263	2307	1146
1936 Federal Surplus/Deficit	1920	-256	-125	199	41	-528	-1422	-102	167	356	3805	4369	3932	1023	868
1937 Federal Surplus/Deficit	647	-280	-265	281	428	-443	-459	-692	-299	-1062	-804	1544	600	147	11
1938 Federal Surplus/Deficit	820	-90	124	250	-75	349	2380	712	1967	2854	4814	5430	3521	1859	1729
1939 Federal Surplus/Deficit	110	-605	488	377	44	-632	-448	-520	849	1113	3395	4556	1600	646	749
1940 Federal Surplus/Deficit	-268	-826	-298	422	440	590	-617	-183	2383	2788	3445	3096	2643	-169	905
1941 Federal Surplus/Deficit	-509	-822	93	230	339	76	-675	-530	1273	182	816	1328	688	601	274
1942 Federal Surplus/Deficit	447	-134	715	-174	295	770	585	839	52	333	2380	3043	4116	2866	1215
1943 Federal Surplus/Deficit	1943	472	297	320	-286	-20	1761	2193	2534	4771	4760	5218	3581	2704	2019
1944 Federal Surplus/Deficit	1305	-437	-634	210	128	-554	-551	-404	198	-364	999	389	-104	-52	-52
1945 Federal Surplus/Deficit	410	-315	452	-173	-229	-544	-912	-1034	-149	-909	-1436	3399	2918	440	257
1946 Federal Surplus/Deficit	343	-513	-153	-25	391	550	1116	208	3023	3599	4976	5293	3506	2642	1733
1947 Federal Surplus/Deficit	1356	-81	387	134	346	2564	2846	2738	3366	2802	3178	4711	3964	2821	2291
1948 Federal Surplus/Deficit	1097	-346	232	1897	1998	1270	4006	715	1806	1903	4186	6003	3358	4032	2405
1949 Federal Surplus/Deficit	2504	1399	600	516	166	296	-497	1180	3419	3221	4710	5491	3876	249	1765
1950 Federal Surplus/Deficit	-46	-945	-548	209	-73	108	1897	2829	4217	3844	3721	4712	3290	3198	1924
1951 Federal Surplus/Deficit	1684	576	398	1052	1438	2878	4354	4298	4236	4469	4685	5223	3502	3939	3084
1952 Federal Surplus/Deficit	2359	6.0	219	1470	968	1356	3657	1567	863	4189	4847	5922	4124	2200	2337
1953 Federal Surplus/Deficit	1287	-176	-174	249	-24	-480	-36	2680	1159	-222	2156	4691	4038	4054	1468
1954 Federal Surplus/Deficit	1497	-38	256	506	430	926	1732	3425	1500	2629	2837	5255	3229	3320	1997
1955 Federal Surplus/Deficit	3963	3201	2167	526	995	844	-199	-274	434	197	1490	2887	3786	3411	1589
1956 Federal Surplus/Deficit	2728	1097	31	677	1538	2753	4624	3101	3912	3953	4208	5439	3261	3885	2939
1957 Federal Surplus/Deficit	1603	441	338	680	-16	747	758	560	2599	3212	3331	5880	3635	1471	1749
1958 Federal Surplus/Deficit	459	-606	147	250	275	-75	600	2382	1806	2100	3914	5883	4172	1386	1638
1959 Federal Surplus/Deficit	455	-231	21	462	772	2003	4387	3389	1288	3589	2962	4642	3381	2006	2140
1960 Federal Surplus/Deficit	1868	310	2424	2386	2747	2291	2708	1330	2160	4355	3972	4027	3961	2127	2615
1961 Federal Surplus/Deficit	859	-466	315	349	79	-16	2036	1526	2706	3592	2007	5140	3483	1825	1702
1962 Federal Surplus/Deficit	981	231	-126	-18	295	457	1281	1405	574	2596	5110	4637	4173	887	1496
1963 Federal Surplus/Deficit	586	-220	-162	902	977	1825	1954	2039	164	1157	1968	3779	4152	2449	1649
1964 Federal Surplus/Deficit	1697	22	272	24	177	357	354	1248	105	1386	741	4181	4007	3898	1377
1965 Federal Surplus/Deficit	2738	450	941	1016	831	2795	4698	4564	3437	2643	4880	5360	4390	2000	2942
1966 Federal Surplus/Deficit	2040	1056	449	623	122	283	1615	545	-139	4171	2671	3643	2971	2425	1459
1967 Federal Surplus/Deficit	1556	-174	-88	125	-58	455	3955	3703	1179	1486	192	3797	3609	3736	1824
1968 Federal Surplus/Deficit	2226	187	398	439	85	441	2324	2316	1986	-130	1251	2738	3808	3391	1639
1969 Federal Surplus/Deficit	2124	901	1520	1066	1659	1407	4484	3402	2033	4456	4692	5666	3901	3127	2857
1970 Federal Surplus/Deficit	980	-538	63	544	312	-236	9.0	2029	1630	1388	1595	3601	4468	1745	1314
1971 Federal Surplus/Deficit	394	-612	-159	211	215	212	4072	4571	3495	3795	4233	5733	3563	3930	2472
1972 Federal Surplus/Deficit	3028	1339	572	659	286	654	3968	3968	5008	4105	3476	5725	3392	3407	2800
1973 Federal Surplus/Deficit	3692	2288	721	520	235	993	591	-217	371	-972	776	2418	1153	596	864
1974 Federal Surplus/Deficit	-320	-923	-268	154	-369	1974	4165	4083	4904	4265	4657	5380	3405	3487	2562
1975 Federal Surplus/Deficit	2564	1434	366	-41	76	-165	1244	1290	2559	362	1881	5110	3784	4031	1787
1976 Federal Surplus/Deficit	1099	485	719	1191	1783	3779	4326	3834	2502	4505	4468	5644	3931	3843	3068
1977 Federal Surplus/Deficit	4060	3955	3078	547	221	-427	-548	-195	257	-915	97	-182	-597	60	487
1978 Federal Surplus/Deficit	625	-34	286	-641	-391	989	1024	856	1608	3709	2705	4513	3139	2387	1440
1979 Federal Surplus/Deficit	954	10.0	1590	695	333	-311	-283	1056	2353	1257	1440	4350	985	297	1073
1980 Federal Surplus/Deficit	-445	-820	-301	204	308	471	-902	305	325	940	3476	5642	3998	1205	1068
1981 Federal Surplus/Deficit	238	-595	255	288	428	2448	4295	795	1789	-25	1800	3302	3850	3914	1849
1982 Federal Surplus/Deficit	3055	1890	256	388	583	520	2450	4543	4504	3631	3336	5575	3769	3063	2628
1983 Federal Surplus/Deficit	2882	1022	1436	1192	780	994	3203	1852	5135	3249	3676	4628	3890	4017	2717
1984 Federal Surplus/Deficit	2778	1025	704	523	2184	617	4178	764	4342	4249	4514	3785	4406	3566	2617
1985 Federal Surplus/Deficit	1792	-222	612	442	769	421	1005	-479	1829	3400	3800	4651	1776	49	1291
1986 Federal Surplus/Deficit	-826	-1051	-60	447	1298	-339	1918	2821	4878	4485	3747	3194	3346	1816	1865
1987 Federal Surplus/Deficit	1104	-428	-221	22	651	-107	-551	-82	1002	1683	1704	2811	2677	644	737
1988 Federal Surplus/Deficit	-217	-911	-405	36	116	-786	-805	-603	-39	-183	1312	2046	-106	1065	46
1989 Federal Surplus/Deficit	635	-253	-13	-152	-214	-105	-913	141	1408	3476	4266	4192	2261	390	918
1990 Federal Surplus/Deficit	-726	-804	-153	147	364	1197	2661	1847	1456	3332	4727	3744	3844	1706	1668
1991 Federal Surplus/Deficit	1422	307	-259	-122	1568	1432	3731	3508	670	2685	2529	4878	3675	3786	2189
1992 Federal Surplus/Deficit	2813	866	-31	66	-94	-723	-410	-598	1924	328	961	1745	692	360	456

Table A-30: Federal Surplus/Deficit - By Water Year
PNW Loads and Resource Study
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Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1993 Federal Surplus/Deficit	-577	-742	-515	70	83	-358	-517	-426	448	730	736	3938	1407	1225	457
1994 Federal Surplus/Deficit	777	-23	-544	44	483	127	-591	-47	128	-275	2800	2133	1052	683	426
1995 Federal Surplus/Deficit	-360	-802	-394	-29	-180	-53	116	1987	3042	2533	1283	3706	3261	2216	1246
1996 Federal Surplus/Deficit	700	-215	178	747	2716	3717	4431	4130	4815	3903	4671	5566	4299	4095	3267
1997 Federal Surplus/Deficit	2676	380	279	414	210	1341	4235	4557	5016	3843	4663	5402	3622	3875	2890
1998 Federal Surplus/Deficit	2506	932	1538	2415	1214	350	2104	1682	1955	1664	1822	4040	4074	2268	2091
-Ranked Averages-															
Top Ten Percent	1964	525	581	881	1454	2667	4450	3984	3707	3967	4610	5472	3844	3538	3007
Middle Eighty Percent	1242	150	329	410	416	551	1465	1456	1867	2214	2916	4229	3193	2153	1610
Bottom Ten Percent	482	-531	-125	138	153	-487	-626	-609	1.9	-378	297	1322	838	506	88

Table A-30: Federal Surplus/Deficit - By Water Year
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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	1212	-523	195	16	9.8	-565	-394	-697	-6.9	-527	784	4.5	934	525	42
1930 Federal Surplus/Deficit	103	-758	68	247	92	-477	-625	-712	28	-234	1852	-300	-325	354	-96
1931 Federal Surplus/Deficit	-378	-628	-96	92	252	-329	-719	-597	-208	365	-810	398	-453	614	-144
1932 Federal Surplus/Deficit	591	-326	362	-307	-323	-579	-1238	-1153	623	1869	4395	4932	4287	1239	931
1933 Federal Surplus/Deficit	70	-102	465	241	-387	384	2764	1458	97	1694	2223	3101	4257	3533	1487
1934 Federal Surplus/Deficit	2492	1223	732	694	1693	4069	4140	4358	3160	4319	4613	3423	2344	1372	2681
1935 Federal Surplus/Deficit	-268	-701	225	82	-650	-270	2200	2684	-129	666	1993	2910	1465	2161	949
1936 Federal Surplus/Deficit	1745	-317	-50	113	-51	-625	-1529	-253	89	268	3746	3782	3245	874	691
1937 Federal Surplus/Deficit	541	-336	-184	195	337	-540	-563	-843	-377	-1153	-868	954	-202	-4.5	-173
1938 Federal Surplus/Deficit	705	-155	185	164	-167	252	2271	561	1890	2768	4710	4368	2724	1710	1503
1939 Federal Surplus/Deficit	31	-646	530	291	-48	-730	-553	-671	771	1025	3338	3816	802	495	554
1940 Federal Surplus/Deficit	-328	-855	-216	336	349	494	-723	-335	2306	2702	3387	2509	1847	-320	727
1941 Federal Surplus/Deficit	-556	-851	155	144	247	-21	-538	-702	936	94	756	739	-113	450	90
1942 Federal Surplus/Deficit	350	-199	744	-261	203	673	480	689	-26	243	2321	2456	3320	2719	1028
1943 Federal Surplus/Deficit	1769	377	348	233	-379	-118	1650	2035	2442	4651	4917	4254	4260	2554	1921
1944 Federal Surplus/Deficit	1162	-488	-538	123	36	-652	-438	-577	99	-470	560	-219	-906	-205	-240
1945 Federal Surplus/Deficit	315	-371	495	-260	-321	-641	-1018	-1187	-228	-998	-1500	2811	2119	288	72
1946 Federal Surplus/Deficit	249	-560	-84	-112	299	453	1010	57	2908	3476	4951	4218	2710	2495	1508
1947 Federal Surplus/Deficit	1212	-149	431	47	254	2469	2737	2582	3245	2717	3121	4126	3472	2664	2121
1948 Federal Surplus/Deficit	964	-403	282	1814	1904	1174	3891	563	1729	1817	4084	4989	4038	3704	2289
1949 Federal Surplus/Deficit	2300	1254	634	430	74	199	-602	1023	3296	3133	4702	4871	3259	97	1580
1950 Federal Surplus/Deficit	-118	-969	-455	123	-166	11	1787	2673	4090	3721	3663	3796	3786	3050	1813
1951 Federal Surplus/Deficit	1519	472	438	966	1345	2785	4495	4443	3512	4493	4677	4142	2705	3621	2827
1952 Federal Surplus/Deficit	2160	-70	267	1385	876	1260	3541	1410	786	4049	4784	4797	3619	2052	2122
1953 Federal Surplus/Deficit	1144	-241	-101	163	-115	-577	-142	2524	1082	-311	2097	3960	4714	3837	1380
1954 Federal Surplus/Deficit	1344	-110	307	420	339	830	1622	3263	1423	2543	2779	4204	3891	3469	1909
1955 Federal Surplus/Deficit	3501	2942	2103	440	905	748	-304	-425	357	109	1431	2300	4460	3561	1520
1956 Federal Surplus/Deficit	2511	967	95	592	1444	2659	4708	2463	3759	3806	4391	4361	3937	3723	2803
1957 Federal Surplus/Deficit	1443	343	383	594	-108	651	654	409	2483	3105	3273	5191	4316	1321	1670
1958 Federal Surplus/Deficit	358	-651	201	164	184	-173	496	2226	1730	2014	3848	5184	4143	1237	1504
1959 Federal Surplus/Deficit	357	-292	84	375	680	1908	4508	2635	1211	3467	2873	3591	4059	1856	2003
1960 Federal Surplus/Deficit	1694	219	2341	2303	2650	2197	2599	1181	2084	4339	3814	3347	3623	1980	2445
1961 Federal Surplus/Deficit	737	-518	359	263	-13	-113	1928	1369	2609	3470	1948	4117	4039	1677	1585
1962 Federal Surplus/Deficit	854	146	-55	-105	203	360	1178	1256	497	2509	4983	3881	3694	737	1318
1963 Federal Surplus/Deficit	479	-283	-91	816	886	1730	1844	1882	86	1070	1909	3192	3356	2301	1462
1964 Federal Surplus/Deficit	1535	-52	323	-62	84	260	250	1099	28	1296	679	3573	3992	3902	1263
1965 Federal Surplus/Deficit	2521	353	955	932	740	2700	4809	4262	3061	2503	4874	4291	3779	1850	2697
1966 Federal Surplus/Deficit	1857	926	485	537	30	187	1505	395	-218	4050	2613	3037	2175	2278	1264
1967 Federal Surplus/Deficit	1399	-240	-22	39	-150	359	3720	3541	1102	1400	132	3207	3959	3405	1698
1968 Federal Surplus/Deficit	2035	103	441	353	-6.9	345	2215	2159	1910	-219	1192	2151	3313	3060	1454
1969 Federal Surplus/Deficit	1938	779	1497	981	1569	1312	4619	2723	1956	4414	4617	4564	3291	2902	2604
1970 Federal Surplus/Deficit	853	-586	123	458	221	-333	-98	1873	1554	1301	1536	3014	4278	1595	1175
1971 Federal Surplus/Deficit	296	-655	-90	125	123	114	3956	4381	3375	3672	4127	4651	4235	4056	2373
1972 Federal Surplus/Deficit	2791	1195	602	572	194	557	3853	3805	4791	3938	3419	4658	3782	3556	2665
1973 Federal Surplus/Deficit	3295	2095	742	434	143	896	486	-369	293	-1061	717	1831	353	446	659
1974 Federal Surplus/Deficit	-382	-951	-191	68	-463	1879	4411	4343	4704	4248	4723	4337	4045	3635	2539
1975 Federal Surplus/Deficit	2355	1286	411	-128	-15	-262	1132	1140	2483	274	1823	4111	4457	4150	1701
1976 Federal Surplus/Deficit	964	383	743	1105	1688	3686	4467	3352	2426	4381	4403	4554	3543	3857	2872
1977 Federal Surplus/Deficit	3477	3435	2966	461	129	-525	-431	-371	153	-1023	-360	-773	-1399	-91	245
1978 Federal Surplus/Deficit	516	-107	337	-728	-484	891	920	704	1531	3588	2648	3774	2342	2238	1240
1979 Federal Surplus/Deficit	829	-64	1556	609	242	-408	-388	907	2271	1170	1380	3764	185	146	877
1980 Federal Surplus/Deficit	-498	-852	-221	118	217	375	-767	-118	247	853	3419	4884	3201	1055	874
1981 Federal Surplus/Deficit	150	-638	306	202	337	2354	3957	782	1713	-113	1740	2714	4526	3454	1752
1982 Federal Surplus/Deficit	2767	1720	307	302	492	424	2341	4328	4347	3507	3278	4497	4015	2913	2454
1983 Federal Surplus/Deficit	2655	893	1405	1106	688	897	3086	1694	4741	3126	3619	4043	3084	3914	2491
1984 Federal Surplus/Deficit	2556	895	728	436	2086	520	4056	612	4186	4127	4426	3197	4201	3418	2462
1985 Federal Surplus/Deficit	1621	-287	639	355	677	324	902	-394	1528	3276	3735	4066	977	-103	1101
1986 Federal Surplus/Deficit	-859	-1071	4.4	360	1207	-436	1808	2642	4927	4346	3689	2606	2548	1667	1688
1987 Federal Surplus/Deficit	970	-481	-152	-65	560	-204	-502	-418	925	1598	1645	2223	1851	494	549
1988 Federal Surplus/Deficit	-282	-938	-319	-50	25	-879	-911	-755	-117	-272	1251	1454	-908	915	-134
1989 Federal Surplus/Deficit	525	-314	53	-239	-306	-202	-898	-153	1329	3353	4202	3480	1463	239	721
1990 Federal Surplus/Deficit	-764	-836	-82	61	273	1102	2542	1699	1379	3249	4728	2959	3712	1558	1526
1991 Federal Surplus/Deficit	1272	216	-187	-208	1478	1337	3517	3346	593	2601	2472	4014	2879	3803	1979
1992 Federal Surplus/Deficit	2538	749	34	-21	-186	-821	-515	-680	1848	185	902	1149	-106	210	265

Table A-30: Federal Surplus/Deficit - By Water Year
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Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1993 Federal Surplus/Deficit	-624	-778	-424	-16	-8.2	-455	-622	-577	368	640	667	3350	605	1074	278
1994 Federal Surplus/Deficit	658	-99	-455	-43	392	30	-660	-201	47	-366	2673	1545	254	533	241
1995 Federal Surplus/Deficit	-419	-836	-311	-115	-272	-150	11	1828	2921	2448	1223	3119	2462	2067	1058
1996 Federal Surplus/Deficit	587	-279	231	662	2620	3937	4554	4412	4740	3741	4865	4505	4300	4111	3203
1997 Federal Surplus/Deficit	2460	286	325	328	118	1245	4478	4810	4729	3721	4839	4339	3926	3879	2806
1998 Federal Surplus/Deficit	2299	808	1501	2332	1123	253	1994	1526	1879	1578	1764	3451	4625	2120	2002
-Ranked Averages-															
Top Ten Percent	1865	487	503	754	1378	3011	4522	4014	3627	3852	4666	4231	3505	3202	2842
Middle Eighty Percent	1079	56	387	329	322	414	1392	1271	1742	2119	2848	3497	2975	2056	1452
Bottom Ten Percent	382	-578	-54	52	62	-583	-667	-767	-116	-470	181	729	37	355	-96

Table A-30: Federal Surplus/Deficit - By Water Year
PNW Loads and Resource Study
2013 - 2014 Operating Year
[61] 2009 White Book - 30 Minute Wind (Final)

7/22/2009

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1929 Federal Surplus/Deficit	1134	-605	117	-65	-101	-592	-622	-826	-127	-647	668	433	1597	526	52
1930 Federal Surplus/Deficit	23	-840	-9.9	167	-18	-512	-765	-849	-100	-362	1591	129	339	355	-87
1931 Federal Surplus/Deficit	-459	-710	-173	12	143	-443	-850	-726	-328	245	-930	827	213	616	-133
1932 Federal Surplus/Deficit	512	-406	285	-388	-434	-580	-1382	-1411	501	1749	4338	5491	4564	1241	923
1933 Federal Surplus/Deficit	-10	-182	388	161	-499	270	2638	1332	-24	1577	2108	3660	4411	3888	1498
1934 Federal Surplus/Deficit	2384	1146	656	614	1585	4298	4617	4442	3000	4583	4606	3999	3108	1309	2821
1935 Federal Surplus/Deficit	-349	-783	148	2.1	-762	-385	2074	2560	-249	546	1879	3400	2132	2165	967
1936 Federal Surplus/Deficit	1668	-397	-128	33	-161	-578	-1675	-575	-31	148	3630	4214	3970	876	706
1937 Federal Surplus/Deficit	462	-417	-262	115	228	-602	-701	-978	-503	-1371	-988	1384	461	-4.7	-163
1938 Federal Surplus/Deficit	626	-236	108	83	-278	137	2144	433	1771	2651	4653	4928	3392	1713	1529
1939 Federal Surplus/Deficit	-49	-727	453	210	-158	-752	-417	-835	247	907	3224	4307	1469	496	564
1940 Federal Surplus/Deficit	-410	-937	-294	256	239	381	-855	-466	2187	2586	3273	2942	2516	-320	739
1941 Federal Surplus/Deficit	-637	-933	78	63	137	-135	-354	-860	474	-25	640	1169	550	451	97
1942 Federal Surplus/Deficit	271	-280	667	-342	92	558	349	561	-146	123	2205	2888	3989	2723	1040
1943 Federal Surplus/Deficit	1692	298	270	153	-491	-234	1520	1907	2323	4807	4895	4821	4418	2556	1918
1944 Federal Surplus/Deficit	1082	-570	-617	42	-75	-608	-367	-747	-61	-622	-275	210	-243	-205	-236
1945 Federal Surplus/Deficit	235	-452	418	-341	-431	-756	-1150	-1318	-348	-1119	-1621	3244	2785	287	83
1946 Federal Surplus/Deficit	169	-642	-162	-193	189	338	879	-73	2790	3359	4983	4776	3378	2499	1537
1947 Federal Surplus/Deficit	1134	-229	353	-34	143	2356	2609	2455	3129	2601	3007	4560	4198	2679	2140
1948 Federal Surplus/Deficit	885	-484	204	1736	1796	1061	3765	434	1611	1700	4018	5559	4197	3765	2279
1949 Federal Surplus/Deficit	2224	1176	556	349	-37	85	-422	529	3179	3016	4645	5311	3927	97	1594
1950 Federal Surplus/Deficit	-199	-1051	-534	42	-277	-104	1659	2546	3974	3605	3550	4354	3944	3053	1794
1951 Federal Surplus/Deficit	1441	392	361	886	1235	2673	4734	4159	2417	4472	4605	4703	3373	3686	2799
1952 Federal Surplus/Deficit	2084	-151	189	1306	767	1147	3416	1282	667	3932	4679	5368	4287	2055	2148
1953 Federal Surplus/Deficit	1066	-322	-179	83	-226	-682	-285	2397	963	-431	1982	4451	4872	3898	1360
1954 Federal Surplus/Deficit	1265	-191	229	340	228	716	1494	3139	1305	2425	2664	4768	4064	3819	1922
1955 Federal Surplus/Deficit	3342	2830	2013	360	795	635	-435	-553	239	-11	1315	2732	4617	3912	1515
1956 Federal Surplus/Deficit	2434	889	17	512	1335	2547	4695	2025	3643	3690	4615	4920	4093	3784	2790
1957 Federal Surplus/Deficit	1365	263	306	514	-219	537	525	281	2365	2987	3159	5682	4474	1323	1646
1958 Federal Surplus/Deficit	278	-732	123	83	73	-288	366	2099	1613	1897	3734	5675	4775	1239	1518
1959 Federal Surplus/Deficit	277	-373	6.2	295	570	1795	4420	2509	1091	3352	2793	4149	4223	1859	1990
1960 Federal Surplus/Deficit	1617	139	2251	2225	2543	2086	2472	1054	1966	4497	3757	3837	4292	1983	2477
1961 Federal Surplus/Deficit	658	-600	282	182	-124	-227	1801	1241	2492	3356	1834	4686	4199	1680	1568
1962 Federal Surplus/Deficit	775	66	-133	-186	92	247	1048	1128	378	2390	5052	4382	4419	738	1348
1963 Federal Surplus/Deficit	399	-363	-169	736	777	1617	1716	1755	-34	951	1794	3624	4025	2304	1475
1964 Federal Surplus/Deficit	1457	-132	246	-143	-26	147	119	973	-91	1176	561	4031	4305	4184	1272
1965 Federal Surplus/Deficit	2445	273	879	852	631	2588	4915	3674	2943	2385	4987	4849	4448	1852	2715
1966 Federal Surplus/Deficit	1780	847	408	457	-80	73	1376	267	-339	3937	2499	3493	2844	2283	1280
1967 Federal Surplus/Deficit	1322	-320	-100	-41	-261	245	3632	3418	983	1282	15	3647	4119	3466	1678
1968 Federal Surplus/Deficit	1959	23	364	273	-118	231	2088	2032	1793	-338	1077	2584	3994	3121	1473
1969 Federal Surplus/Deficit	1862	700	1409	902	1460	1199	4574	2507	1828	4310	4674	5130	3960	2963	2640
1970 Federal Surplus/Deficit	774	-667	45	378	111	-448	-231	1746	1435	1182	1420	3447	4946	1597	1187
1971 Federal Surplus/Deficit	216	-737	-169	44	12	-0.2	3829	4256	3257	3555	4065	5211	4389	4247	2373
1972 Federal Surplus/Deficit	2679	1117	525	492	83	443	3727	3679	5022	4331	3306	5215	4223	3907	2749
1973 Federal Surplus/Deficit	3182	2019	665	354	32	782	355	-132	142	-1203	551	2158	755	447	662
1974 Federal Surplus/Deficit	-463	-1034	-269	-13	-575	1767	4890	4814	4588	4444	4777	4888	4238	3984	2670
1975 Federal Surplus/Deficit	2278	1209	333	-210	-126	-378	1002	1012	2365	154	1708	4670	4612	4256	1691
1976 Federal Surplus/Deficit	884	303	666	1025	1579	3575	4678	2463	2309	4265	4289	5117	4212	3965	2876
1977 Federal Surplus/Deficit	3317	3276	2877	381	18	-640	-140	-551	-20	-1183	-1182	-344	-735	-90	246
1978 Federal Surplus/Deficit	437	-188	260	-810	-595	776	788	575	1412	3475	2533	4294	3009	2241	1259
1979 Federal Surplus/Deficit	751	-145	1465	530	132	-522	-232	430	2153	1053	1263	4197	849	146	886
1980 Federal Surplus/Deficit	-580	-934	-298	38	106	261	-476	-732	128	735	3305	5375	3869	1057	889
1981 Federal Surplus/Deficit	70	-719	228	122	227	2242	3917	535	1596	-233	1624	3147	4683	3562	1731
1982 Federal Surplus/Deficit	2655	1644	230	222	382	309	2214	4203	4231	3391	3164	5057	4176	2915	2436
1983 Federal Surplus/Deficit	2579	815	1314	1026	578	783	2959	1566	4626	3009	3506	4478	3750	3975	2509
1984 Federal Surplus/Deficit	2480	816	651	355	1978	405	3930	483	4069	4012	4312	3628	4868	3422	2476
1985 Federal Surplus/Deficit	1543	-369	561	274	566	210	772	-107	1010	3159	3621	4500	1642	-103	1111
1986 Federal Surplus/Deficit	-942	-1153	-74	280	1098	-550	1732	2507	4911	4242	3576	3038	3118	1670	1705
1987 Federal Surplus/Deficit	892	-562	-230	-146	449	-319	-210	-1062	805	1481	1530	2655	2551	496	561
1988 Federal Surplus/Deficit	-363	-1021	-397	-131	-85	-690	-1074	-915	-247	-419	1092	1632	-246	909	-128
1989 Federal Surplus/Deficit	446	-395	-25	-320	-420	-353	-606	-517	949	3236	4089	3971	2129	240	730
1990 Federal Surplus/Deficit	-846	-918	-160	-20	162	990	2420	1573	1261	3135	4725	3471	4478	1560	1559
1991 Federal Surplus/Deficit	1194	137	-265	-289	1369	1225	3429	3222	474	2486	2358	4578	3548	3931	2017
1992 Federal Surplus/Deficit	2425	671	-43	-101	-297	-678	-676	-429	1121	3.2	785	1571	560	211	269

Table A-30: Federal Surplus/Deficit - By Water Year
PNW Loads and Resource Study
2013 - 2014 Operating Year
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Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1993 Federal Surplus/Deficit	-705	-859	-502	-96	-118	-570	-754	-706	246	519	538	3781	1268	1075	289
1994 Federal Surplus/Deficit	579	-180	-534	-123	282	-83	-678	-343	-83	-495	2346	1977	920	535	252
1995 Federal Surplus/Deficit	-500	-917	-389	-195	-382	-264	-120	1699	2805	2332	1107	3552	3127	2069	1071
1996 Federal Surplus/Deficit	507	-360	154	582	2513	4264	4807	4595	4607	3570	5015	5064	4905	4222	3332
1997 Federal Surplus/Deficit	2382	206	247	247	7.4	1131	4910	4788	4553	3605	4879	4895	4447	4232	2905
1998 Federal Surplus/Deficit	2223	729	1410	2254	1014	139	1865	1399	1761	1461	1648	3881	4910	2123	1982
-Ranked Averages-															
Top Ten Percent	1816	527	375	623	1191	2704	4595	3736	3650	4074	4473	4845	4052	3586	2896
Middle Eighty Percent	991	-41	314	255	221	349	1353	1128	1556	1989	2768	3976	3476	2074	1463
Bottom Ten Percent	302	-659	-132	-29	-48	-601	-790	-908	-245	-614	-66	1123	701	355	-87

Table A-30: Federal Surplus/Deficit - By Water Year
PNW Loads and Resource Study
2014 - 2015 Operating Year
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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	1027	-681	7.3	-170	-343	-686	-1008	-1038	-324	-866	449	-24	780	251	-214
1930 Federal Surplus/Deficit	-87	-917	-120	61	-260	-563	-1014	-1077	-317	-600	1025	-328	-478	81	-356
1931 Federal Surplus/Deficit	-569	-786	-283	-93	-99	-535	-1092	-956	-542	9.3	-1399	370	-604	341	-401
1932 Federal Surplus/Deficit	404	-482	177	-493	-676	-820	-1607	-1624	304	1530	4119	5034	4432	966	714
1933 Federal Surplus/Deficit	-120	-257	279	55	-741	31	2413	1120	-221	1358	1889	3203	4609	3697	1323
1934 Federal Surplus/Deficit	2312	1073	547	509	1343	4096	4449	4230	2802	4364	4387	3542	2290	1034	2565
1935 Federal Surplus/Deficit	-459	-859	38	-103	-1004	-624	1849	2348	-446	327	1659	2944	1315	1890	702
1936 Federal Surplus/Deficit	1563	-473	-237	-73	-403	-780	-1903	-832	-229	-71	3411	3757	3153	601	440
1937 Federal Surplus/Deficit	354	-493	-372	9.2	-14	-653	-950	-1212	-722	-1869	-1207	927	-356	-279	-429
1938 Federal Surplus/Deficit	518	-311	-1.7	-22	-520	-103	1919	221	1574	2432	4434	4471	2574	1438	1263
1939 Federal Surplus/Deficit	-159	-804	344	105	-401	-992	-602	-1052	5.5	687	3005	3850	652	221	298
1940 Federal Surplus/Deficit	-520	-1014	-404	151	-3.2	142	-1080	-678	1990	2366	3054	2485	1699	-594	474
1941 Federal Surplus/Deficit	-748	-1009	-32	-42	-105	-375	-579	-1073	276	-244	421	712	-267	176	-169
1942 Federal Surplus/Deficit	162	-356	558	-448	-150	318	124	349	-343	-96	1986	2431	3172	2449	774
1943 Federal Surplus/Deficit	1585	223	161	48	-733	-474	1295	1695	2125	4588	4869	4364	4613	2281	1744
1944 Federal Surplus/Deficit	974	-647	-729	-64	-317	-830	-612	-959	-258	-841	-494	-247	-1060	-480	-501
1945 Federal Surplus/Deficit	126	-528	309	-446	-674	-995	-1375	-1531	-545	-1338	-1840	2787	1968	13	-182
1946 Federal Surplus/Deficit	60	-718	-272	-299	-54	99	654	-285	2592	3140	4764	4319	2561	2224	1272
1947 Federal Surplus/Deficit	1026	-305	244	-140	-99	2117	2384	2242	2931	2382	2788	4103	3381	2404	1875
1948 Federal Surplus/Deficit	777	-560	95	1630	1554	821	3540	221	1414	1481	3799	5102	4385	3490	2096
1949 Federal Surplus/Deficit	2118	1103	447	244	-279	-155	-607	268	2982	2797	4426	4854	3110	-178	1328
1950 Federal Surplus/Deficit	-309	-1129	-645	-63	-519	-343	1434	2334	3776	3386	3331	3897	4138	2779	1612
1951 Federal Surplus/Deficit	1334	317	251	781	993	2434	4509	3946	2220	4253	4386	4246	2556	3412	2534
1952 Federal Surplus/Deficit	1978	-226	79	1201	524	908	3191	1070	470	3713	4460	4911	3470	1780	1882
1953 Federal Surplus/Deficit	959	-398	-289	-23	-468	-921	-510	2185	765	-650	1763	3994	4853	3623	1160
1954 Federal Surplus/Deficit	1158	-267	120	234	-14	477	1269	2926	1108	2206	2445	4311	4130	3941	1763
1955 Federal Surplus/Deficit	3321	2797	1906	254	553	396	-660	-766	42	-230	1096	2275	4678	3950	1354
1956 Federal Surplus/Deficit	2329	815	-93	406	1092	2307	4470	1812	3446	3471	4521	4463	4287	3509	2613
1957 Federal Surplus/Deficit	1258	188	196	408	-462	297	300	68	2168	2768	2940	5225	4632	1049	1461
1958 Federal Surplus/Deficit	169	-809	14	-23	-169	-527	141	1887	1415	1678	3515	5218	4052	964	1260
1959 Federal Surplus/Deficit	168	-449	-104	190	328	1556	4195	2297	894	3133	2574	3692	4049	1584	1778
1960 Federal Surplus/Deficit	1510	64	2145	2120	2301	1846	2247	841	1769	4278	3538	3380	3475	1709	2212
1961 Federal Surplus/Deficit	550	-676	172	77	-366	-466	1576	1028	2294	3137	1614	4229	4309	1405	1379
1962 Federal Surplus/Deficit	668	-8.9	-243	-291	-150	7	823	915	180	2171	4833	3925	3602	463	1083
1963 Federal Surplus/Deficit	290	-439	-279	630	534	1378	1491	1543	-231	732	1575	3167	3208	2030	1209
1964 Federal Surplus/Deficit	1351	-208	136	-249	-268	-93	-106	761	-289	957	342	3574	4337	3909	1077
1965 Federal Surplus/Deficit	2340	198	770	747	388	2348	4690	3462	2745	2166	4835	4392	3631	1578	2453
1966 Federal Surplus/Deficit	1674	773	298	351	-322	-167	1151	55	-536	3718	2280	3036	2027	2008	1014
1967 Federal Surplus/Deficit	1215	-396	-209	-147	-503	5.6	3407	3205	786	1063	-204	3190	4311	3191	1495
1968 Federal Surplus/Deficit	1854	-51	255	167	-360	-9	1863	1820	1596	-557	858	2127	3176	2846	1208
1969 Federal Surplus/Deficit	1756	627	1302	796	1218	960	4349	2295	1630	4091	4455	4673	3143	2688	2374
1970 Federal Surplus/Deficit	667	-743	-64	273	-132	-604	-534	1517	1238	963	1201	2990	4129	1322	921
1971 Federal Surplus/Deficit	107	-814	-280	-62	-230	-240	3604	4044	3060	3336	3846	4754	4588	4352	2223
1972 Federal Surplus/Deficit	2611	1044	415	386	-160	204	3502	3467	4825	4389	3087	4758	4133	3934	2582
1973 Federal Surplus/Deficit	3115	1948	556	248	-210	543	130	-285	-61	-1425	324	1651	-62	172	397
1974 Federal Surplus/Deficit	-574	-1111	-380	-118	-817	1527	4722	4685	4391	4225	4726	4431	4161	4106	2517
1975 Federal Surplus/Deficit	2172	1136	224	-315	-368	-617	777	800	2168	-65	1489	4213	4811	4371	1542
1976 Federal Surplus/Deficit	775	227	556	920	1337	3335	4453	2250	2112	4046	4070	4660	3394	3690	2611
1977 Federal Surplus/Deficit	3297	3291	2772	275	-224	-879	-324	-769	-223	-1406	-1459	-801	-1552	-364	-12
1978 Federal Surplus/Deficit	330	-263	150	-727	-836	331	563	362	1215	3256	2314	3837	2191	1966	992
1979 Federal Surplus/Deficit	643	-220	1358	424	-110	-648	-421	19	1956	834	1044	3740	32	-129	618
1980 Federal Surplus/Deficit	-690	-1011	-408	-68	-136	22	-661	-991	-70	516	3086	4918	3052	782	624
1981 Federal Surplus/Deficit	-39	-796	119	16	-15	2003	3692	323	1399	-452	1405	2690	4773	3287	1540
1982 Federal Surplus/Deficit	2587	1572	121	116	140	70	1988	3991	4034	3172	2945	4600	4359	2641	2254
1983 Federal Surplus/Deficit	2474	741	1206	921	336	544	2734	1354	4429	2790	3287	4021	2933	3700	2243
1984 Federal Surplus/Deficit	2375	742	541	250	1736	166	3705	270	3872	3793	4093	3171	4051	3148	2210
1985 Federal Surplus/Deficit	1436	-445	452	168	324	-30	547	-261	756	2940	3402	4043	825	-377	845
1986 Federal Surplus/Deficit	-1054	-1231	-185	174	856	-790	1507	2295	4714	4023	3357	2581	2301	1395	1440
1987 Federal Surplus/Deficit	784	-638	-341	-252	207	-559	-394	-1324	608	1262	1310	2198	1734	221	295
1988 Federal Surplus/Deficit	-473	-1098	-507	-236	-327	-744	-1319	-1147	-465	-657	844	1000	-1063	635	-400
1989 Federal Surplus/Deficit	330	-478	-142	-425	-662	-592	-791	-733	709	3017	3870	3514	1312	-35	463
1990 Federal Surplus/Deficit	-957	-995	-270	-125	-80	750	2195	1361	1063	2916	4506	3015	3661	1286	1293
1991 Federal Surplus/Deficit	1087	62	-375	-395	1127	985	3204	3010	277	2267	2139	4121	2731	3656	1752
1992 Federal Surplus/Deficit	2358	597	-153	-206	-539	-729	-923	-590	645	-216	566	1114	-257	-64	0.3

Table A-30: Federal Surplus/Deficit - By Water Year
PNW Loads and Resource Study
2014 - 2015 Operating Year
[61] 2009 White Book - 30 Minute Wind (Final)

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Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1993 Federal Surplus/Deficit	-816	-936	-613	-201	-361	-634	-1001	-943	30	283	-3.9	3324	451	801	19
1994 Federal Surplus/Deficit	470	-256	-645	-229	40	-323	-903	-555	-280	-714	2127	1520	103	260	-14
1995 Federal Surplus/Deficit	-611	-994	-499	-301	-625	-504	-345	1487	2608	2113	888	3095	2310	1794	805
1996 Federal Surplus/Deficit	398	-436	45	476	2271	4293	4621	4493	4409	3351	4997	4607	4168	3948	3116
1997 Federal Surplus/Deficit	2280	131	138	142	-235	892	4727	4513	4355	3386	4802	4438	4276	4005	2701
1998 Federal Surplus/Deficit	2117	655	1302	2149	772	-100	1640	1186	1564	1242	1429	3424	4914	1848	1785
-Ranked Averages-															
Top Ten Percent	1720	453	266	517	949	2509	4390	3530	3453	3894	4321	4388	3586	3362	2675
Middle Eighty Percent	888	-115	205	153	-21	117	1131	913	1351	1770	2549	3518	2967	1834	1226
Bottom Ten Percent	193	-736	-242	-134	-291	-715	-1053	-1132	-453	-880	-375	641	-116	80	-355

Table A-30: Federal Surplus/Deficit - By Water Year
PNW Loads and Resource Study
2015 - 2016 Operating Year
[61] 2009 White Book - 30 Minute Wind (Final)

7/22/2009

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1929 Federal Surplus/Deficit	943	-766	-77	-252	-432	-926	-932	-1075	-429	-963	352	279	1444	349	-190
1930 Federal Surplus/Deficit	-170	-1002	-204	-20	-349	-846	-1076	-1098	-402	-678	1275	-25	186	178	-329
1931 Federal Surplus/Deficit	-653	-871	-367	-175	-189	-777	-1161	-974	-630	-71	-1246	674	59	439	-375
1932 Federal Surplus/Deficit	320	-566	93	-575	-765	-914	-1693	-1660	199	1433	4022	5337	4410	1064	676
1933 Federal Surplus/Deficit	-204	-342	195	-26	-831	-64	2327	1083	-326	1261	1792	3507	4258	3711	1258
1934 Federal Surplus/Deficit	2228	988	463	427	1253	3964	4306	4194	2698	4267	4290	3846	2954	1132	2587
1935 Federal Surplus/Deficit	-543	-944	-46	-185	-1094	-719	1763	2311	-551	230	1563	3247	1978	1988	731
1936 Federal Surplus/Deficit	1479	-558	-321	-154	-492	-912	-1986	-823	-333	-168	3315	4061	3816	699	463
1937 Federal Surplus/Deficit	270	-578	-456	-72	-104	-936	-1011	-1226	-805	-1688	-1304	1231	308	-182	-405
1938 Federal Surplus/Deficit	434	-396	-86	-104	-610	-197	1833	184	1469	2335	4338	4775	3238	1536	1285
1939 Federal Surplus/Deficit	-243	-889	260	23	-490	-1086	-727	-1084	-55	591	2908	4153	1315	319	320
1940 Federal Surplus/Deficit	-604	-1099	-488	69	-93	47	-1166	-714	1886	2270	2957	2788	2362	-496	496
1941 Federal Surplus/Deficit	-831	-1094	-116	-124	-195	-469	-665	-1109	172	-341	324	1016	397	274	-146
1942 Federal Surplus/Deficit	78	-441	474	-529	-239	224	39	312	-448	-193	1889	2735	3835	2546	799
1943 Federal Surplus/Deficit	1501	138	77	-34	-822	-568	1210	1659	2021	4491	4579	4667	4264	2379	1678
1944 Federal Surplus/Deficit	890	-732	-813	-145	-406	-942	-678	-996	-363	-938	-591	57	-397	-382	-477
1945 Federal Surplus/Deficit	43	-613	225	-528	-763	-1090	-1461	-1567	-650	-1435	-1937	3090	2631	110	-161
1946 Federal Surplus/Deficit	-24	-803	-356	-380	-143	4.4	568	-322	2488	3043	4668	4623	3224	2322	1293
1947 Federal Surplus/Deficit	943	-390	160	-221	-188	2022	2299	2206	2827	2285	2691	4407	4044	2502	1901
1948 Federal Surplus/Deficit	693	-645	11	1549	1464	727	3454	185	1309	1384	3702	5406	4044	3588	2034
1949 Federal Surplus/Deficit	2034	1018	363	162	-368	-249	-733	281	2877	2700	4329	5158	3773	-80	1351
1950 Federal Surplus/Deficit	-393	-1214	-729	-145	-608	-438	1349	2298	3672	3289	3234	4201	3790	2877	1556
1951 Federal Surplus/Deficit	1250	232	167	699	904	2339	4424	3910	2115	4156	4289	4550	3220	3510	2563
1952 Federal Surplus/Deficit	1894	-311	-4.7	1119	435	813	3105	1034	365	3616	4363	5215	4133	1878	1905
1953 Federal Surplus/Deficit	875	-483	-373	-104	-557	-1016	-596	2149	661	-747	1666	4298	4719	3721	1123
1954 Federal Surplus/Deficit	1074	-352	36	153	-103	382	1183	2890	1003	2109	2348	4615	3910	3642	1685
1955 Federal Surplus/Deficit	3237	2712	1822	173	464	301	-745	-802	-63	-327	999	2579	4463	3735	1275
1956 Federal Surplus/Deficit	2245	731	-177	325	1003	2213	4385	1776	3341	3374	4299	4767	3939	3607	2548
1957 Federal Surplus/Deficit	1174	103	112	327	-551	203	214	32	2063	2671	2843	5529	4320	1147	1402
1958 Federal Surplus/Deficit	85	-894	-70	-104	-258	-622	55	1851	1311	1581	3418	5522	4621	1062	1279
1959 Federal Surplus/Deficit	84	-534	-188	108	239	1461	4110	2261	789	3036	2478	3995	4070	1682	1752
1960 Federal Surplus/Deficit	1427	-21	2061	2038	2212	1751	2161	805	1665	4181	3441	3684	4138	1806	2233
1961 Federal Surplus/Deficit	466	-761	89	-4.5	-455	-561	1490	992	2190	3040	1518	4533	4045	1503	1327
1962 Federal Surplus/Deficit	584	-94	-327	-373	-239	-87	738	879	76	2074	4736	4228	4266	561	1107
1963 Federal Surplus/Deficit	206	-524	-363	549	445	1283	1406	1507	-336	635	1478	3470	3871	2127	1236
1964 Federal Surplus/Deficit	1267	-293	52	-330	-358	-188	-191	725	-393	860	246	3877	4151	4007	1031
1965 Federal Surplus/Deficit	2256	113	686	665	299	2254	4605	3426	2641	2069	4671	4695	4294	1676	2478
1966 Federal Surplus/Deficit	1590	688	214	270	-411	-261	1066	19	-641	3621	2183	3340	2690	2106	1037
1967 Federal Surplus/Deficit	1131	-481	-293	-228	-592	-89	3321	3169	681	966	-301	3493	3966	3289	1443
1968 Federal Surplus/Deficit	1770	-136	171	86	-449	-103	1777	1783	1491	-654	761	2430	3840	2944	1235
1969 Federal Surplus/Deficit	1672	542	1218	715	1129	865	4264	2259	1526	3994	4358	4977	3806	2786	2399
1970 Federal Surplus/Deficit	583	-828	-148	191	-221	-782	-542	1497	1133	866	1105	3294	4792	1420	949
1971 Federal Surplus/Deficit	23	-899	-364	-143	-320	-334	3518	4008	2956	3239	3749	5058	4235	4070	2137
1972 Federal Surplus/Deficit	2527	959	331	305	-249	109	3416	3431	4720	4015	2991	5062	4070	3730	2513
1973 Federal Surplus/Deficit	3031	1863	472	167	-300	448	45	-380	-160	-1519	235	2005	602	270	421
1974 Federal Surplus/Deficit	-658	-1196	-464	-200	-907	1432	4579	4565	4287	4128	4462	4734	4084	3808	2435
1975 Federal Surplus/Deficit	2088	1051	140	-397	-457	-712	692	764	2063	-162	1392	4516	4459	4079	1449
1976 Federal Surplus/Deficit	691	142	473	838	1247	3241	4368	2214	2007	3949	3973	4964	4058	3788	2635
1977 Federal Surplus/Deficit	3213	3206	2688	194	-313	-974	-450	-800	-322	-1499	-1498	-498	-889	-266	11
1978 Federal Surplus/Deficit	246	-348	66	-997	-927	442	478	326	1110	3159	2218	4140	2855	2064	1017
1979 Federal Surplus/Deficit	559	-305	1274	343	-200	-856	-543	181	1851	737	947	4044	695	-31	645
1980 Federal Surplus/Deficit	-774	-1096	-492	-149	-225	-73	-787	-981	-174	419	2990	5222	3715	880	645
1981 Federal Surplus/Deficit	-123	-881	35	-65	-105	1908	3606	287	1294	-549	1309	2993	4529	3385	1487
1982 Federal Surplus/Deficit	2503	1487	37	35	51	-25	1903	3955	3929	3075	2848	4903	4022	2738	2202
1983 Federal Surplus/Deficit	2390	656	1122	839	246	449	2648	1317	4324	2693	3190	4324	3596	3798	2266
1984 Federal Surplus/Deficit	2291	657	458	168	1647	71	3620	234	3767	3696	3997	3475	4715	3246	2230
1985 Federal Surplus/Deficit	1352	-530	368	87	235	-125	461	-355	708	2843	3305	4347	1489	-279	868
1986 Federal Surplus/Deficit	-1138	-1316	-269	93	767	-884	1421	2259	4609	3926	3260	2885	2964	1493	1467
1987 Federal Surplus/Deficit	700	-723	-425	-333	118	-653	-520	-1311	504	1165	1214	2502	2397	319	316
1988 Federal Surplus/Deficit	-557	-1183	-591	-317	-416	-1024	-1385	-1163	-549	-735	777	1479	-399	733	-370
1989 Federal Surplus/Deficit	246	-563	-226	-507	-751	-687	-917	-765	647	2920	3773	3818	1975	63	486
1990 Federal Surplus/Deficit	-1041	-1080	-354	-207	-169	656	2110	1325	959	2819	4409	3318	4325	1384	1319
1991 Federal Surplus/Deficit	1003	-23	-459	-476	1038	891	3118	2973	172	2170	2042	4425	3394	3754	1781
1992 Federal Surplus/Deficit	2274	513	-237	-288	-629	-1012	-986	-678	819	-313	470	1418	406	34	29

Table A-30: Federal Surplus/Deficit - By Water Year
PNW Loads and Resource Study
2015 - 2016 Operating Year
[61] 2009 White Book - 30 Minute Wind (Final)

Continued 7/22/2009

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1993 Federal Surplus/Deficit	-900	-1021	-697	-283	-450	-904	-1064	-955	-56	203	223	3628	1114	899	46
1994 Federal Surplus/Deficit	386	-341	-728	-310	-49	-417	-989	-591	-385	-811	2030	1824	766	358	10.0
1995 Federal Surplus/Deficit	-694	-1079	-583	-382	-714	-598	-431	1451	2503	2016	791	3399	2974	1892	832
1996 Federal Surplus/Deficit	315	-521	-39	395	2181	3930	4496	4346	4305	3254	4699	4911	4752	4045	3096
1997 Federal Surplus/Deficit	2196	47	54	60	-324	797	4600	4539	4251	3289	4564	4741	4293	4055	2670
1998 Federal Surplus/Deficit	2033	570	1218	2067	683	-195	1554	1150	1459	1145	1333	3728	4756	1946	1741
-Ranked Averages-															
Top Ten Percent	1636	368	182	436	859	2370	4285	3487	3348	3758	4158	4691	3898	3410	2659
Middle Eighty Percent	804	-200	121	68	-110	15	1042	880	1254	1673	2452	3823	3322	1897	1222
Bottom Ten Percent	109	-821	-326	-216	-380	-935	-1100	-1157	-547	-930	-382	969	547	178	-330

Table A-30: Federal Surplus/Deficit - By Water Year
PNW Loads and Resource Study
2016 - 2017 Operating Year
[61] 2009 White Book - 30 Minute Wind (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	872	-871	-165	-353	-567	-908	-1272	-1334	-601	-1126	245	-297	581	86	-437
1930 Federal Surplus/Deficit	-241	-1107	-292	-121	-484	-785	-1278	-1373	-594	-860	821	-601	-677	-85	-579
1931 Federal Surplus/Deficit	-724	-976	-455	-276	-323	-757	-1357	-1251	-818	-251	-1604	97	-803	176	-624
1932 Federal Surplus/Deficit	250	-671	4.6	-676	-900	-1041	-1872	-1919	28	1270	3915	4761	4233	801	491
1933 Federal Surplus/Deficit	-274	-447	107	-127	-965	-191	2148	824	-498	1097	1685	2930	4410	3531	1100
1934 Federal Surplus/Deficit	2158	883	375	326	1119	3874	4185	3934	2526	4104	4182	3269	2092	869	2342
1935 Federal Surplus/Deficit	-614	-1049	-134	-286	-1228	-846	1584	2052	-723	67	1455	2670	1116	1725	479
1936 Federal Surplus/Deficit	1408	-663	-409	-256	-627	-1002	-2168	-1128	-505	-331	3207	3484	2954	436	217
1937 Federal Surplus/Deficit	199	-683	-544	-174	-238	-875	-1215	-1508	-999	-2130	-1412	654	-555	-445	-652
1938 Federal Surplus/Deficit	363	-501	-174	-205	-744	-324	1654	-75	1298	2172	4230	4198	2375	1273	1040
1939 Federal Surplus/Deficit	-314	-994	172	-78	-624	-1214	-866	-1347	-271	427	2801	3577	453	56	75
1940 Federal Surplus/Deficit	-675	-1203	-576	-32	-227	-80	-1345	-973	1714	2106	2850	2212	1500	-760	251
1941 Federal Surplus/Deficit	-902	-1199	-204	-225	-329	-597	-844	-1368	0.1	-504	217	439	-466	11	-392
1942 Federal Surplus/Deficit	7.1	-546	386	-631	-374	96	-140	53	-620	-356	1782	2158	2973	2283	552
1943 Federal Surplus/Deficit	1431	33	-11	-135	-956	-695	1030	1399	1849	4328	4665	4091	4414	2116	1521
1944 Federal Surplus/Deficit	819	-837	-901	-247	-540	-1052	-876	-1255	-534	-1101	-698	-520	-1259	-646	-724
1945 Federal Surplus/Deficit	-28	-718	137	-629	-897	-1217	-1640	-1826	-821	-1598	-2045	2513	1769	-153	-405
1946 Federal Surplus/Deficit	-95	-908	-444	-481	-277	-123	389	-581	2316	2880	4560	4046	2362	2059	1049
1947 Federal Surplus/Deficit	872	-495	72	-323	-323	1895	2120	1947	2655	2122	2584	3830	3182	2239	1652
1948 Federal Surplus/Deficit	623	-750	-77	1448	1330	599	3275	-74	1137	1220	3595	4829	4186	3324	1873
1949 Federal Surplus/Deficit	1963	913	275	61	-503	-377	-871	-28	2705	2537	4222	4581	2911	-343	1105
1950 Federal Surplus/Deficit	-463	-1319	-817	-246	-743	-565	1170	2039	3500	3126	3127	3624	3939	2613	1389
1951 Federal Surplus/Deficit	1179	127	79	598	769	2212	4244	3651	1944	3993	4182	3973	2357	3246	2311
1952 Federal Surplus/Deficit	1823	-416	-93	1018	301	686	2926	774	194	3453	4255	4638	3271	1615	1660
1953 Federal Surplus/Deficit	804	-588	-461	-206	-692	-1143	-775	1890	489	-910	1558	3721	4654	3458	937
1954 Federal Surplus/Deficit	1003	-456	-52	52	-237	255	1004	2631	832	1946	2240	4038	3931	3775	1540
1955 Federal Surplus/Deficit	3166	2607	1734	71	330	174	-924	-1061	-235	-490	892	2002	4479	3784	1131
1956 Federal Surplus/Deficit	2174	626	-265	224	869	2086	4206	1517	3170	3211	4316	4190	4088	3344	2390
1957 Federal Surplus/Deficit	1103	-1.9	24	225	-685	75	35	-227	1892	2507	2736	4952	4433	883	1238
1958 Federal Surplus/Deficit	14	-999	-158	-206	-392	-749	-124	1591	1139	1418	3311	4945	3853	799	1037
1959 Federal Surplus/Deficit	13	-639	-276	7	104	1334	3930	2001	618	2873	2370	3419	3850	1418	1555
1960 Federal Surplus/Deficit	1356	-126	1973	1937	2077	1624	1982	546	1493	4018	3334	3107	3276	1543	1989
1961 Federal Surplus/Deficit	395	-866	0.5	-106	-590	-688	1311	733	2018	2876	1410	3956	4111	1240	1156
1962 Federal Surplus/Deficit	513	-199	-415	-474	-374	-215	559	620	-96	1911	4629	3652	3403	297	860
1963 Federal Surplus/Deficit	135	-629	-451	447	311	1156	1227	1247	-508	472	1371	2894	3009	1864	987
1964 Federal Surplus/Deficit	1196	-397	-36	-432	-492	-315	-370	465	-565	697	138	3301	4139	3744	854
1965 Federal Surplus/Deficit	2185	8.4	598	564	165	2127	4426	3167	2469	1906	4630	4119	3432	1412	2230
1966 Federal Surplus/Deficit	1520	584	126	168	-546	-389	886	-240	-813	3458	2076	2763	1828	1842	791
1967 Federal Surplus/Deficit	1060	-586	-381	-330	-727	-216	3142	2910	509	803	-409	2917	4112	3025	1272
1968 Federal Surplus/Deficit	1699	-241	83	-15	-584	-231	1598	1524	1319	-818	654	1854	2977	2681	985
1969 Federal Surplus/Deficit	1601	437	1130	614	994	738	4085	1999	1354	3831	4251	4400	2944	2523	2152
1970 Federal Surplus/Deficit	512	-933	-236	90	-355	-825	-799	1221	962	703	997	2717	3930	1157	698
1971 Federal Surplus/Deficit	-47	-1004	-452	-245	-454	-462	3339	3748	2784	3076	3642	4481	4389	4187	2000
1972 Federal Surplus/Deficit	2456	854	243	204	-383	-18	3237	3172	4548	4129	2883	4485	3934	3769	2359
1973 Federal Surplus/Deficit	2960	1758	384	65	-434	321	-135	-581	-337	-1686	119	1378	-261	6.9	175
1974 Federal Surplus/Deficit	-728	-1301	-552	-301	-1041	1305	4458	4389	4115	3965	4522	4158	3962	3940	2294
1975 Federal Surplus/Deficit	2018	946	52	-498	-592	-839	513	504	1891	-325	1285	3940	4612	4206	1319
1976 Federal Surplus/Deficit	620	37	385	737	1113	3113	4189	1955	1835	3786	3865	4387	3196	3525	2388
1977 Federal Surplus/Deficit	3142	3101	2600	92	-448	-1101	-589	-1064	-500	-1666	-1663	-1074	-1751	-530	-235
1978 Federal Surplus/Deficit	175	-453	-22	-910	-1060	109	299	67	938	2995	2110	3564	1993	1800	770
1979 Federal Surplus/Deficit	488	-410	1186	241	-334	-870	-686	-277	1680	573	840	3467	-167	-294	395
1980 Federal Surplus/Deficit	-845	-1201	-580	-251	-359	-200	-925	-1287	-346	255	2882	4645	2853	616	401
1981 Federal Surplus/Deficit	-194	-986	-53	-167	-239	1781	3427	27	1123	-712	1201	2417	4574	3122	1317
1982 Federal Surplus/Deficit	2433	1382	-51	-67	-84	-152	1724	3695	3758	2911	2741	4327	4160	2475	2031
1983 Federal Surplus/Deficit	2320	551	1034	738	112	322	2469	1058	4153	2530	3083	3748	2734	3534	2021
1984 Federal Surplus/Deficit	2220	552	369	67	1512	-56	3441	-25	3596	3533	3889	2898	3852	2982	1988
1985 Federal Surplus/Deficit	1281	-635	280	-14	100	-252	282	-556	480	2680	3197	3770	626	-543	623
1986 Federal Surplus/Deficit	-1208	-1421	-357	-8.4	632	-1012	1242	1999	4437	3762	3152	2308	2102	1230	1217
1987 Federal Surplus/Deficit	629	-828	-513	-435	-17	-780	-659	-1620	332	1002	1106	1925	1535	56	72
1988 Federal Surplus/Deficit	-628	-1288	-679	-419	-551	-966	-1584	-1442	-741	-917	640	727	-1262	469	-623
1989 Federal Surplus/Deficit	175	-668	-314	-608	-886	-814	-1056	-1029	432	2757	3666	3241	1113	-201	240
1990 Federal Surplus/Deficit	-1112	-1185	-442	-308	-304	528	1930	1065	787	2655	4301	2741	3462	1120	1071
1991 Federal Surplus/Deficit	933	-128	-547	-578	903	763	2939	2714	0.2	2007	1935	3848	2532	3491	1529
1992 Federal Surplus/Deficit	2203	408	-325	-389	-763	-950	-1188	-885	368	-476	362	841	-456	-229	-223

Table A-30: Federal Surplus/Deficit - By Water Year
PNW Loads and Resource Study
2016 - 2017 Operating Year
[61] 2009 White Book - 30 Minute Wind (Final)

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Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1993 Federal Surplus/Deficit	-971	-1126	-785	-384	-584	-856	-1265	-1238	-246	23	-208	3051	252	635	-204
1994 Federal Surplus/Deficit	316	-446	-817	-412	-184	-545	-1168	-850	-557	-974	1923	1247	-96	95	-237
1995 Federal Surplus/Deficit	-765	-1184	-671	-483	-848	-726	-610	1192	2331	1852	684	2822	2111	1628	582
1996 Federal Surplus/Deficit	244	-626	-127	294	2047	4071	4356	4198	4133	3091	4793	4334	3969	3782	2893
1997 Federal Surplus/Deficit	2125	-58	-34	-41	-459	670	4462	4218	4079	3126	4598	4165	4077	3839	2478
1998 Federal Surplus/Deficit	1962	465	1130	1966	548	-322	1375	891	1288	982	1225	3151	4715	1682	1562
-Ranked Averages-															
Top Ten Percent	1565	263	94	334	725	2287	4126	3235	3176	3634	4117	4115	3388	3196	2452
Middle Eighty Percent	733	-304	33	-30	-245	-105	867	617	1074	1510	2345	3245	2768	1668	1003
Bottom Ten Percent	39	-926	-414	-317	-514	-937	-1318	-1427	-730	-1140	-579	368	-315	-85	-578

Table A-30: Federal Surplus/Deficit - By Water Year
PNW Loads and Resource Study
2017 - 2018 Operating Year
[61] 2009 White Book - 30 Minute Wind (Final)

7/22/2009

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1929 Federal Surplus/Deficit	732	-1011	-350	-550	-707	-1205	-1228	-1426	-725	-1214	84	46	1153	94	-465
1930 Federal Surplus/Deficit	-381	-1247	-477	-318	-625	-1125	-1371	-1449	-698	-929	1007	-258	-105	-76	-604
1931 Federal Surplus/Deficit	-864	-1116	-641	-473	-464	-1056	-1456	-1325	-926	-322	-1514	441	-232	184	-650
1932 Federal Surplus/Deficit	109	-812	-181	-873	-1041	-1192	-1988	-2011	-96	1182	3754	5104	4120	809	405
1933 Federal Surplus/Deficit	-415	-588	-79	-324	-1106	-342	2032	732	-622	1010	1524	3273	3967	3456	981
1934 Federal Surplus/Deficit	2017	743	189	129	978	3685	4011	3843	2402	4016	4022	3612	2663	877	2305
1935 Federal Surplus/Deficit	-754	-1189	-319	-483	-1369	-997	1467	1960	-847	-21	1295	3014	1687	1733	450
1936 Federal Surplus/Deficit	1268	-803	-595	-452	-767	-1190	-2281	-1174	-629	-419	3046	3828	3526	444	189
1937 Federal Surplus/Deficit	59	-823	-730	-370	-379	-1214	-1307	-1577	-1101	-1939	-1572	998	17	-436	-680
1938 Federal Surplus/Deficit	223	-641	-360	-402	-885	-475	1538	-167	1173	2084	4069	4541	2947	1281	1011
1939 Federal Surplus/Deficit	-454	-1134	-14	-275	-765	-1365	-1023	-1435	-351	339	2640	3920	1025	64	47
1940 Federal Surplus/Deficit	-815	-1344	-762	-229	-368	-231	-1461	-1065	1590	2018	2689	2555	2072	-751	222
1941 Federal Surplus/Deficit	-1042	-1339	-390	-422	-470	-748	-960	-1460	-124	-592	56	782	106	19	-421
1942 Federal Surplus/Deficit	-133	-686	200	-828	-515	-55	-257	-39	-744	-444	1621	2501	3544	2292	522
1943 Federal Surplus/Deficit	1290	-107	-197	-332	-1097	-846	914	1308	1725	4240	4311	4434	3973	2124	1401
1944 Federal Surplus/Deficit	679	-977	-1087	-444	-681	-1221	-974	-1347	-659	-1189	-859	-177	-687	-637	-753
1945 Federal Surplus/Deficit	-168	-859	-49	-826	-1038	-1368	-1757	-1918	-945	-1686	-2205	2857	2341	-144	-434
1946 Federal Surplus/Deficit	-235	-1048	-630	-678	-418	-274	273	-673	2192	2792	4399	4390	2934	2067	1020
1947 Federal Surplus/Deficit	732	-635	-114	-519	-464	1744	2003	1855	2531	2034	2423	4173	3754	2247	1623
1948 Federal Surplus/Deficit	482	-890	-263	1251	1189	448	3158	-166	1013	1133	3434	5172	3753	3333	1761
1949 Federal Surplus/Deficit	1823	773	89	-136	-644	-528	-1028	-70	2581	2449	4061	4924	3483	-335	1077
1950 Federal Surplus/Deficit	-604	-1459	-1003	-443	-884	-716	1053	1947	3376	3038	2966	3968	3500	2622	1277
1951 Federal Surplus/Deficit	1039	-13	-107	401	629	2061	4128	3559	1820	3905	4021	4317	2929	3255	2282
1952 Federal Surplus/Deficit	1683	-556	-279	821	160	535	2810	683	69	3365	4095	4982	3843	1623	1630
1953 Federal Surplus/Deficit	664	-728	-647	-402	-832	-1294	-892	1798	365	-998	1398	4064	4428	3466	843
1954 Federal Surplus/Deficit	863	-597	-238	-145	-378	104	888	2539	707	1858	2080	4382	3620	3387	1404
1955 Federal Surplus/Deficit	3026	2467	1548	-125	189	23	-1041	-1153	-359	-578	731	2345	4173	3480	1003
1956 Federal Surplus/Deficit	2034	485	-451	27	728	1935	4089	1425	3045	3123	4031	4534	3648	3352	2273
1957 Federal Surplus/Deficit	963	-142	-162	29	-826	-76	-82	-319	1767	2420	2575	5296	4030	892	1128
1958 Federal Surplus/Deficit	-126	-1140	-344	-402	-533	-900	-241	1500	1015	1330	3150	5288	4330	807	1000
1959 Federal Surplus/Deficit	-127	-779	-462	-190	-37	1183	3814	1910	493	2785	2209	3762	3779	1427	1473
1960 Federal Surplus/Deficit	1216	-266	1787	1740	1937	1473	1866	454	1369	3930	3173	3451	3848	1552	1960
1961 Federal Surplus/Deficit	255	-1006	-185	-303	-730	-839	1195	641	1894	2789	1250	4299	3755	1248	1051
1962 Federal Surplus/Deficit	373	-339	-601	-671	-515	-366	442	528	-220	1823	4468	3995	3975	306	831
1963 Federal Surplus/Deficit	-5.0	-769	-637	251	170	1005	1110	1156	-632	384	1210	3237	3581	1873	957
1964 Federal Surplus/Deficit	1056	-538	-222	-628	-633	-466	-487	374	-689	609	-23	3644	3861	3752	755
1965 Federal Surplus/Deficit	2045	-132	413	367	24	1976	4309	3075	2345	1818	4403	4462	4003	1421	2198
1966 Federal Surplus/Deficit	1379	443	-60	-29	-687	-540	770	-332	-937	3370	1915	3107	2400	1851	762
1967 Federal Surplus/Deficit	920	-726	-567	-527	-868	-367	3026	2818	385	715	-569	3260	3675	3034	1160
1968 Federal Surplus/Deficit	1559	-382	-102	-212	-725	-382	1481	1432	1195	-905	493	2197	3549	2689	956
1969 Federal Surplus/Deficit	1461	296	944	417	853	587	3968	1908	1230	3743	4090	4743	3516	2531	2122
1970 Federal Surplus/Deficit	372	-1073	-422	-107	-496	-1060	-837	1146	838	615	837	3060	4502	1165	670
1971 Federal Surplus/Deficit	-188	-1144	-637	-441	-595	-613	3223	3657	2660	2988	3481	4824	3945	3816	1855
1972 Federal Surplus/Deficit	2316	714	58	6.9	-524	-169	3121	3080	4424	3763	2722	4828	3779	3475	2233
1973 Federal Surplus/Deficit	2820	1618	198	-132	-575	170	-251	-731	-456	-1770	-33	1771	311	15	146
1974 Federal Surplus/Deficit	-869	-1442	-737	-498	-1182	1154	4283	4214	3991	3877	4194	4501	3794	3553	2152
1975 Federal Surplus/Deficit	1877	806	-134	-695	-733	-990	396	413	1767	-413	1124	4283	4168	3824	1174
1976 Federal Surplus/Deficit	480	-103	199	540	972	2962	4072	1863	1711	3698	3705	4730	3767	3533	2359
1977 Federal Surplus/Deficit	3002	2960	2414	-104	-589	-1252	-746	-1151	-618	-1750	-1766	-731	-1179	-521	-264
1978 Federal Surplus/Deficit	35	-593	-208	-1295	-1202	163	182	-25	814	2908	1949	3907	2564	1809	742
1979 Federal Surplus/Deficit	348	-550	1000	45	-475	-1135	-838	-170	1556	486	679	3811	405	-286	369
1980 Federal Surplus/Deficit	-985	-1341	-766	-447	-500	-351	-1082	-1332	-470	168	2721	4989	3424	625	372
1981 Federal Surplus/Deficit	-334	-1126	-239	-363	-380	1630	3311	-64	998	-800	1041	2760	4239	3130	1213
1982 Federal Surplus/Deficit	2292	1242	-237	-263	-225	-303	1607	3604	3633	2824	2580	4670	3731	2484	1920
1983 Federal Surplus/Deficit	2179	411	848	541	-29	171	2353	966	4028	2442	2922	4091	3306	3543	1991
1984 Federal Surplus/Deficit	2080	412	184	-130	1371	-207	3324	-117	3471	3445	3729	3242	4424	2991	1958
1985 Federal Surplus/Deficit	1141	-775	94	-211	-40	-403	166	-706	412	2592	3037	4114	1198	-534	594
1986 Federal Surplus/Deficit	-1348	-1561	-543	-205	491	-1163	1126	1908	4313	3675	2992	2652	2674	1238	1188
1987 Federal Surplus/Deficit	489	-968	-699	-631	-158	-931	-816	-1662	208	914	946	2268	2107	64	43
1988 Federal Surplus/Deficit	-768	-1428	-865	-616	-692	-1303	-1681	-1514	-845	-986	508	1246	-690	478	-646
1989 Federal Surplus/Deficit	35	-808	-500	-805	-1026	-965	-1213	-1116	351	2669	3505	3585	1685	-192	212
1990 Federal Surplus/Deficit	-1252	-1326	-628	-505	-445	377	1814	974	663	2568	4141	3085	4034	1129	1041
1991 Federal Surplus/Deficit	792	-268	-733	-774	763	612	2822	2623	-124	1919	1774	4191	3104	3499	1500
1992 Federal Surplus/Deficit	2063	267	-511	-586	-904	-1290	-1282	-1029	523	-564	201	1185	116	-221	-246

Table A-30: Federal Surplus/Deficit - By Water Year
PNW Loads and Resource Study
2017 - 2018 Operating Year
[61] 2009 White Book - 30 Minute Wind (Final)

Continued 7/22/2009

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1993 Federal Surplus/Deficit	-1111	-1266	-971	-581	-725	-1182	-1360	-1306	-352	-48	-45	3395	824	644	-229
1994 Federal Surplus/Deficit	175	-586	-1002	-608	-324	-696	-1285	-942	-681	-1062	1762	1591	476	103	-266
1995 Federal Surplus/Deficit	-905	-1324	-857	-680	-989	-877	-727	1100	2207	1765	523	3165	2683	1637	553
1996 Federal Surplus/Deficit	104	-766	-313	97	1906	3652	4200	3995	4009	3003	4431	4677	4461	3790	2815
1997 Federal Surplus/Deficit	1985	-199	-220	-238	-599	519	4304	4188	3955	3038	4295	4508	4003	3800	2388
1998 Federal Surplus/Deficit	1822	325	944	1769	407	-473	1258	799	1163	894	1064	3495	4466	1691	1465
-Ranked Averages-															
Top Ten Percent	1425	123	-92	138	584	2092	3989	3136	3052	3507	3890	4458	3607	3155	2379
Middle Eighty Percent	593	-445	-153	-230	-386	-263	746	529	958	1422	2184	3589	3031	1642	946
Bottom Ten Percent	-102	-1066	-600	-514	-655	-1213	-1396	-1508	-843	-1181	-650	736	257	-77	-605

Table A-30: Federal Surplus/Deficit - By Water Year
PNW Loads and Resource Study
2018 - 2019 Operating Year
[61] 2009 White Book - 30 Minute Wind (Final)

7/22/2009

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1929 Federal Surplus/Deficit	623	-1120	-453	-658	-817	-1174	-1504	-1534	-831	-1341	-7.0	-556	316	-85	-683
1930 Federal Surplus/Deficit	-490	-1356	-580	-427	-735	-1051	-1510	-1573	-824	-1074	569	-860	-942	-255	-825
1931 Federal Surplus/Deficit	-972	-1225	-744	-582	-574	-1023	-1588	-1451	-1049	-465	-1855	-161	-1068	5.1	-870
1932 Federal Surplus/Deficit	0.9	-920	-284	-981	-1151	-1308	-2104	-2119	-203	1055	3663	4502	3968	630	245
1933 Federal Surplus/Deficit	-523	-696	-182	-433	-1216	-458	1916	624	-728	883	1433	2672	4145	3361	854
1934 Federal Surplus/Deficit	1909	634	86	20	868	3607	3953	3734	2295	3889	3931	3011	1827	698	2096
1935 Federal Surplus/Deficit	-863	-1298	-422	-592	-1479	-1112	1352	1852	-953	-148	1203	2412	851	1554	233
1936 Federal Surplus/Deficit	1159	-912	-698	-561	-877	-1268	-2400	-1328	-736	-545	2955	3226	2689	265	-29
1937 Federal Surplus/Deficit	-49	-931	-833	-479	-489	-1141	-1447	-1708	-1230	-2344	-1663	396	-820	-615	-898
1938 Federal Surplus/Deficit	115	-750	-462	-510	-995	-591	1422	-275	1067	1957	3978	3940	2110	1102	794
1939 Federal Surplus/Deficit	-562	-1243	-117	-383	-875	-1480	-1098	-1547	-502	213	2549	3318	188	-115	-171
1940 Federal Surplus/Deficit	-923	-1452	-865	-337	-478	-347	-1577	-1173	1483	1892	2598	1954	1235	-930	4.7
1941 Federal Surplus/Deficit	-1151	-1448	-493	-530	-580	-863	-1075	-1568	-231	-719	-35	181	-731	-160	-638
1942 Federal Surplus/Deficit	-242	-795	98	-936	-625	-170	-372	-147	-850	-571	1530	1900	2708	2113	306
1943 Federal Surplus/Deficit	1182	-216	-300	-441	-1207	-962	799	1200	1618	4113	4413	3832	4149	1945	1275
1944 Federal Surplus/Deficit	571	-1086	-1189	-552	-791	-1319	-1108	-1455	-765	-1315	-950	-778	-1524	-816	-970
1945 Federal Surplus/Deficit	-277	-967	-152	-934	-1148	-1484	-1872	-2026	-1052	-1813	-2297	2255	1504	-323	-651
1946 Federal Surplus/Deficit	-344	-1157	-733	-787	-528	-389	158	-781	2085	2666	4308	3788	2097	1888	803
1947 Federal Surplus/Deficit	623	-744	-217	-628	-574	1628	1888	1747	2424	1907	2332	3572	2917	2068	1406
1948 Federal Surplus/Deficit	374	-999	-366	1142	1079	333	3043	-274	906	1006	3343	4571	3921	3154	1627
1949 Federal Surplus/Deficit	1715	664	-13	-245	-754	-643	-1103	-228	2474	2323	3970	4323	2646	-514	859
1950 Federal Surplus/Deficit	-712	-1567	-1106	-551	-994	-832	938	1839	3269	2911	2875	3366	3674	2443	1143
1951 Federal Surplus/Deficit	930	-121	-209	293	518	1945	4013	3451	1713	3779	3930	3715	2092	3076	2065
1952 Federal Surplus/Deficit	1575	-665	-381	712	50	419	2695	574	-37	3239	4004	4380	3006	1444	1414
1953 Federal Surplus/Deficit	555	-837	-750	-511	-942	-1410	-1007	1690	258	-1125	1307	3463	4389	3287	691
1954 Federal Surplus/Deficit	755	-705	-341	-254	-488	-11	773	2431	601	1732	1988	3780	3666	3604	1294
1955 Federal Surplus/Deficit	2918	2358	1446	-234	79	-93	-1156	-1261	-466	-704	640	1744	4214	3614	885
1956 Federal Surplus/Deficit	1925	377	-554	-82	618	1819	3974	1317	2939	2997	4064	3932	3823	3173	2144
1957 Federal Surplus/Deficit	854	-251	-265	-80	-936	-191	-197	-427	1661	2293	2484	4694	4168	713	992
1958 Federal Surplus/Deficit	-234	-1248	-447	-511	-643	-1015	-356	1392	908	1204	3059	4687	3588	628	791
1959 Federal Surplus/Deficit	-236	-887	-564	-298	-147	1067	3699	1801	387	2658	2118	3160	3585	1248	1309
1960 Federal Surplus/Deficit	1107	-375	1684	1632	1827	1358	1750	346	1262	3804	3082	2849	3011	1373	1743
1961 Federal Surplus/Deficit	146	-1115	-288	-411	-840	-955	1080	533	1787	2662	1158	3698	3846	1069	910
1962 Federal Surplus/Deficit	264	-448	-703	-779	-625	-481	327	420	-327	1696	4377	3394	3138	127	614
1963 Federal Surplus/Deficit	-113	-878	-739	142	60	889	995	1047	-738	258	1119	2635	2744	1694	741
1964 Federal Surplus/Deficit	947	-646	-325	-737	-743	-581	-602	265	-796	482	-114	3042	3873	3573	608
1965 Federal Surplus/Deficit	1937	-240	310	259	-86	1860	4194	2967	2238	1691	4378	3861	3167	1242	1984
1966 Federal Surplus/Deficit	1271	335	-163	-137	-797	-655	655	-440	-1044	3244	1824	2505	1563	1672	545
1967 Federal Surplus/Deficit	812	-835	-670	-635	-978	-483	2910	2710	278	588	-660	2658	3847	2855	1026
1968 Federal Surplus/Deficit	1451	-490	-205	-321	-835	-497	1366	1324	1088	-1032	402	1595	2712	2510	739
1969 Federal Surplus/Deficit	1353	188	841	308	743	472	3853	1799	1123	3617	3999	4142	2679	2352	1906
1970 Federal Surplus/Deficit	263	-1182	-525	-216	-606	-1092	-1031	1021	731	489	745	2459	3665	986	452
1971 Federal Surplus/Deficit	-296	-1253	-740	-550	-705	-728	3107	3548	2553	2862	3390	4223	4124	4016	1754
1972 Federal Surplus/Deficit	2208	605	-45	-102	-634	-285	3005	2972	4317	3915	2631	4227	3669	3598	2113
1973 Federal Surplus/Deficit	2711	1509	95	-240	-685	55	-366	-781	-568	-1900	-133	1120	-526	-164	-71
1974 Federal Surplus/Deficit	-977	-1550	-840	-606	-1292	1039	4226	4189	3884	3751	4270	3899	3697	3770	2048
1975 Federal Surplus/Deficit	1769	697	-236	-803	-843	-1105	281	304	1661	-539	1033	3681	4347	4035	1073
1976 Federal Surplus/Deficit	372	-211	96	432	862	2847	3957	1755	1604	3572	3614	4129	2931	3354	2142
1977 Federal Surplus/Deficit	2894	2852	2312	-213	-699	-1367	-821	-1264	-730	-1880	-1915	-1333	-2016	-700	-481
1978 Federal Surplus/Deficit	-74	-701	-310	-1215	-1310	-157	67	-133	707	2781	1858	3305	1727	1630	524
1979 Federal Surplus/Deficit	239	-659	897	-64	-585	-1137	-918	-477	1449	359	588	3209	-432	-465	149
1980 Federal Surplus/Deficit	-1093	-1450	-869	-556	-610	-467	-1157	-1487	-577	41	2630	4387	2588	446	155
1981 Federal Surplus/Deficit	-443	-1235	-342	-472	-490	1515	3196	-173	892	-926	949	2158	4309	2951	1071
1982 Federal Surplus/Deficit	2184	1134	-340	-372	-335	-418	1492	3495	3527	2697	2489	4068	3895	2305	1785
1983 Federal Surplus/Deficit	2071	302	745	432	-139	55	2238	858	3922	2315	2831	3489	2469	3364	1775
1984 Federal Surplus/Deficit	1971	303	81	-238	1261	-322	3209	-225	3365	3318	3637	2640	3587	2812	1742
1985 Federal Surplus/Deficit	1033	-884	-8.9	-320	-150	-518	50	-756	249	2465	2945	3512	361	-713	377
1986 Federal Surplus/Deficit	-1457	-1670	-646	-314	381	-1278	1010	1799	4207	3548	2900	2050	1837	1059	971
1987 Federal Surplus/Deficit	381	-1077	-801	-740	-268	-1047	-891	-1820	101	788	854	1667	1270	-115	-174
1988 Federal Surplus/Deficit	-877	-1537	-968	-724	-802	-1232	-1816	-1642	-972	-1131	388	469	-1527	299	-869
1989 Federal Surplus/Deficit	-73	-917	-602	-913	-1136	-1080	-1288	-1228	202	2543	3414	2983	848	-371	-5.7
1990 Federal Surplus/Deficit	-1361	-1434	-730	-614	-555	262	1699	866	556	2441	4050	2483	3197	950	825
1991 Federal Surplus/Deficit	684	-377	-835	-883	653	497	2707	2514	-231	1792	1683	3590	2267	3320	1283
1992 Federal Surplus/Deficit	1954	159	-614	-694	-1014	-1217	-1420	-1085	137	-690	110	583	-721	-400	-469

Table A-30: Federal Surplus/Deficit - By Water Year
PNW Loads and Resource Study
2018 - 2019 Operating Year
[61] 2009 White Book - 30 Minute Wind (Final)

Continued 7/22/2009

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1993 Federal Surplus/Deficit	-1219	-1375	-1073	-690	-835	-1122	-1497	-1438	-477	-191	-460	2793	-13	465	-450
1994 Federal Surplus/Deficit	67	-695	-1105	-717	-434	-811	-1400	-1050	-788	-1189	1671	989	-361	-76	-483
1995 Federal Surplus/Deficit	-1014	-1433	-960	-789	-1099	-992	-842	992	2100	1638	432	2564	1846	1458	336
1996 Federal Surplus/Deficit	-4.9	-875	-416	-12	1796	3804	4124	3998	3902	2876	4541	4076	3704	3611	2647
1997 Federal Surplus/Deficit	1876	-307	-323	-346	-709	403	4230	4018	3848	2912	4346	3906	3812	3669	2232
1998 Federal Surplus/Deficit	1714	216	841	1661	297	-588	1143	691	1057	768	973	2893	4450	1512	1316
-Ranked Averages-															
Top Ten Percent	1316	14	-195	29	474	2020	3894	3035	2946	3420	3865	3857	3123	3026	2206
Middle Eighty Percent	485	-553	-256	-335	-496	-371	635	417	844	1295	2093	2987	2503	1498	757
Bottom Ten Percent	-210	-1175	-703	-622	-765	-1204	-1549	-1627	-960	-1355	-831	109	-580	-256	-824

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Section 8: Pacific Northwest Regional Exhibits

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Exhibit 21

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

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Exhibit 21: OY 2010 Through 2019 PNW Region Annual Energy

Loads and Resources - Pacific Northwest Region
PNW Loads and Resource Study
2010 - 2019 Operating Years
1937 Water Year
[61] 2009 White Book - 30 Minute Wind (Final)

7/22/2009

Energy (aMW)	2010 Avg.	2011 Avg.	2012 Avg.	2013 Avg.	2014 Avg.	2015 Avg.	2016 Avg.	2017 Avg.	2018 Avg.	2019 Avg.
Firm Regional Loads										
Regional Firm Loads	20693	21627	22038	22491	22989	23443	23766	24098	24409	24708
Exports	1303	1237	1193	1166	1154	1073	994	965	903	860
Federal Diversity	0	0	0	0	0	0	0	0	0	0
Total Firm Regional Loads	21995	22865	23231	23657	24143	24515	24760	25063	25312	25567
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	22006	22875	23241	23668	24154	24526	24771	25074	25323	25578
Hydro Resources										
Regulated Hydro	10765	10773	10800	10814	10822	10821	10822	10821	10824	10821
Independent Hydro	1077	1084	1084	1085	1085	1087	1087	1088	1088	1088
Operational Peaking Adjustment	0	0	0	0	0	0	0	0	0	0
Total Hydro Resources	11842	11857	11884	11899	11907	11908	11909	11909	11911	11909
Other Resources										
Small Thermal & Misc.	0	0	0	0	0	0	0	0	0	0
Combustion Turbines	2824	2962	2969	2979	2958	2977	2967	2977	2956	2977
Renewables	991	1064	1097	1097	1098	1097	1096	1097	1097	1098
Cogeneration	2530	2536	2544	2537	2541	2535	2537	2537	2531	2543
Imports	1239	1137	1126	1057	976	981	959	948	924	899
Large Thermal	5981	5851	5970	5882	6052	5857	5991	5917	5968	5882
Non-Utility Generation	626	624	610	602	602	603	645	653	653	652
Resource Acquisition	0	0	0	0	0	0	0	0	0	0
Total Other Resources	14191	14175	14316	14155	14226	14050	14195	14130	14130	14050
Total Resources	26033	26031	26200	26054	26133	25958	26104	26038	26041	25959
Reserves & Maintenance										
Contingency Reserves (Non-Spinning)	0	0	0	0	0	0	0	0	0	0
Contingency Reserves (Spinning)	0	0	0	0	0	0	0	0	0	0
Generation Imbalance Reserves	0	0	0	0	0	0	0	0	0	0
Load Following Reserves	0	0	0	0	0	0	0	0	0	0
Regional Hydro Maintenance	-12	-12	-12	-12	-12	-12	-12	-12	-12	-12
Regional Transmission Losses	-734	-734	-738	-734	-737	-732	-736	-734	-734	-732
Total Reserves, Maintenance & Losses	-746	-746	-751	-747	-749	-744	-748	-746	-746	-744
Total Net Resources	25287	25286	25449	25307	25384	25215	25356	25292	25295	25215
Surplus/Deficits										
Firm Surplus/Deficit	3292	2421	2219	1650	1241	699	596	229	-17	-352
Total Surplus/Deficit	3281	2410	2208	1639	1230	688	586	218	-27	-363

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Exhibits 22 – 24

Regional Monthly Energy Analysis Using the 2009 White Book Load Forecast for 1937-Water Conditions

Exhibit 22: OY 2010 PNW Region Monthly Energy

Loads and Resources - Pacific Northwest Region
PNW Loads and Resource Study
2009 - 2010 Operating Year
1937 Water Year
[61] 2009 White Book - 30 Minute Wind (Final)

7/22/2009

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
Firm Regional Loads															
Regional Firm Loads	19972	19849	18769	18976	21104	23047	23382	22355	20464	19442	19442	18967	20441	21519	20693
Exports	1500	1521	1464	1222	1166	1211	1202	1209	1291	1204	1212	1213	1392	1536	1303
Federal Diversity	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Firm Regional Loads	21472	21369	20232	20197	22270	24258	24584	23564	21755	20646	20654	20180	21833	23055	21995
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	21472	21369	20247	20197	22270	24258	24587	23587	21809	20680	20688	20180	21833	23055	22006
Hydro Resources															
Regulated Hydro	11635	9433	8527	9920	11759	12391	12028	10317	9474	8042	8316	12845	11985	11123	10765
Independent Hydro	988	969	850	916	836	900	767	821	1003	1278	1321	1618	1698	1229	1077
Operational Peaking Adjustment	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Hydro Resources	12623	10402	9377	10836	12595	13291	12795	11138	10477	9320	9637	14462	13683	12352	11842
Other Resources															
Small Thermal & Misc.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Combustion Turbines	2797	2797	2980	2862	2897	2934	3170	3157	3135	3066	3000	955	2828	3186	2824
Renewables	883	1035	806	836	884	864	855	847	1219	1119	1145	1150	1250	1081	991
Cogeneration	2687	2686	2693	2678	2719	2739	2744	2726	2076	2686	2688	1679	2297	2664	2530
Imports	1070	1056	964	1023	1401	1647	1569	1541	1291	1197	1138	958	1088	1174	1239
Large Thermal	6252	6252	6232	6232	6232	6232	6232	6232	5917	5271	4935	5133	5980	6001	5981
Non-Utility Generation	717	714	605	529	515	509	496	499	514	667	669	816	833	804	626
Resource Acquisition	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Other Resources	14406	14541	14280	14161	14649	14925	15065	15002	14153	14007	13573	10692	14277	14909	14191
Total Resources	27029	24942	23657	24997	27244	28215	27860	26140	24630	23327	23210	25154	27960	27261	26033
Reserves & Maintenance															
Contingency Reserves (Non-Spinning)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Contingency Reserves (Spinning)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Generation Imbalance Reserves	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Load Following 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
Regional Transmission Losses	-761	-703	-667	-705	-768	-796	-786	-737	-694	-658	-654	-709	-788	-767	-734
Total Reserves, Maintenance & Losses	-791	-727	-675	-714	-772	-796	-786	-737	-700	-665	-662	-729	-802	-817	-746
Total Net Resources	26237	24215	22981	24283	26472	27420	27075	25403	23931	22662	22548	24425	27158	26444	25287
Surplus/Deficits															
Firm Surplus/Deficit	4766	2846	2749	4086	4202	3161	2491	1839	2176	2016	1894	4245	5325	3389	3292
Total Surplus/Deficit	4766	2846	2735	4086	4202	3161	2488	1816	2121	1982	1861	4245	5325	3389	3281

Exhibit 23: OY 2014 PNW Region Monthly Energy

Loads and Resources - Pacific Northwest Region
PNW Loads and Resource Study
2013 - 2014 Operating Year
1937 Water Year
[61] 2009 White Book - 30 Minute Wind (Final)

7/22/2009

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
Firm Regional Loads															
Regional Firm Loads	22245	22257	20903	21011	23426	25386	26087	25117	23028	21723	21723	21272	22249	23506	22989
Exports	1356	1376	1298	1073	1024	1052	1043	1045	1136	1069	1059	1088	1266	1381	1154
Federal Diversity	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Firm Regional Loads	23601	23633	22201	22084	24450	26438	27130	26162	24164	22791	22782	22360	23515	24887	24143
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	23601	23633	22216	22084	24450	26438	27134	26185	24218	22825	22815	22360	23515	24887	24154
Hydro Resources															
Regulated Hydro	11714	9494	8578	9975	11829	12561	12089	10368	9517	7869	8358	12911	12039	11183	10822
Independent Hydro	1013	992	866	928	847	898	765	819	1001	1276	1321	1629	1709	1241	1085
Operational Peaking Adjustment	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Hydro Resources	12727	10485	9444	10903	12675	13459	12854	11187	10518	9145	9679	14540	13748	12424	11907
Other Resources															
Small Thermal & Misc.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Combustion Turbines	3279	3280	3330	3123	3162	3200	3170	3158	3135	3066	3000	955	2827	3155	2958
Renewables	1016	1165	924	927	955	920	901	921	1350	1236	1262	1279	1401	1238	1098
Cogeneration	2689	2688	2687	2676	2711	2758	2733	2752	1976	2674	2257	1905	2534	2638	2541
Imports	817	803	752	808	1165	1333	1250	1221	993	896	842	748	843	933	976
Large Thermal	6232	6232	6232	6232	6232	6232	6232	6232	5949	5898	5437	5085	6227	6087	6052
Non-Utility Generation	694	693	598	519	494	484	472	478	494	627	628	772	796	782	602
Resource Acquisition	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Other Resources	14728	14860	14524	14285	14719	14927	14758	14762	13898	14397	13427	10743	14629	14833	14226
Total Resources	27455	25345	23968	25188	27394	28386	27612	25949	24416	23542	23106	25284	28377	27257	26133
Reserves & Maintenance															
Contingency Reserves (Non-Spinning)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Contingency Reserves (Spinning)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Generation Imbalance Reserves	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Load Following 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
Regional Transmission Losses	-773	-714	-676	-710	-772	-800	-779	-732	-688	-664	-651	-712	-800	-767	-737
Total Reserves, Maintenance & Losses	-803	-739	-684	-719	-776	-800	-779	-732	-694	-671	-659	-732	-814	-816	-749
Total Net Resources	26651	24607	23283	24469	26618	27586	26833	25217	23722	22871	22447	24551	27563	26441	25384
Surplus/Deficits															
Firm Surplus/Deficit	3050	974	1082	2385	2168	1147	-297	-945	-442	80	-335	2191	4048	1554	1241
Total Surplus/Deficit	3050	974	1068	2385	2168	1147	-300	-968	-496	46	-369	2191	4048	1554	1230

Exhibit 24: OY 2019 PNW Region Monthly Energy

Loads and Resources - Pacific Northwest Region
PNW Loads and Resource Study
2018 - 2019 Operating Year
1937 Water Year
[61] 2009 White Book - 30 Minute Wind (Final)

7/22/2009

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
Firm Regional Loads															
Regional Firm Loads	24248	24260	22742	22806	25413	27550	27792	26709	24547	23159	23159	22690	23771	25133	24708
Exports	996	1018	979	787	769	766	757	778	852	786	775	804	980	1051	860
Federal Diversity	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Firm Regional Loads	25244	25278	23720	23593	26182	28316	28549	27487	25399	23945	23934	23494	24750	26184	25567
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	25244	25278	23735	23593	26182	28316	28553	27510	25453	23979	23968	23494	24750	26184	25578
Hydro Resources															
Regulated Hydro	11727	9503	8585	9975	11829	12938	12054	10336	9486	7222	8358	12911	12039	11183	10821
Independent Hydro	1017	995	868	930	850	902	769	821	1003	1278	1324	1632	1712	1244	1088
Operational Peaking Adjustment	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Hydro Resources	12743	10498	9453	10906	12678	13840	12822	11157	10489	8501	9681	14543	13751	12427	11909
Other Resources															
Small Thermal & Misc.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Combustion Turbines	3271	3271	3316	3123	3162	3200	3170	3157	3135	3066	3000	1212	2826	3154	2977
Renewables	1016	1165	924	927	955	920	901	921	1350	1236	1262	1272	1406	1238	1098
Cogeneration	2684	2683	2646	2679	2744	2753	2726	2747	2090	2297	2254	2085	2438	2666	2543
Imports	756	742	684	773	1039	1209	1125	1097	943	817	788	699	800	878	899
Large Thermal	5945	6232	6232	6232	6232	6232	6232	6232	6068	5952	5335	4494	4983	5924	5882
Non-Utility Generation	745	744	649	568	545	535	527	533	549	672	678	823	832	833	652
Resource Acquisition	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Other Resources	14416	14837	14452	14302	14678	14850	14682	14688	14135	14041	13317	10585	13284	14694	14050
Total Resources	27160	25335	23906	25208	27356	28689	27504	25846	24624	22542	22999	25128	27035	27121	25959
Reserves & Maintenance															
Contingency Reserves (Non-Spinning)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Contingency Reserves (Spinning)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Generation Imbalance Reserves	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Load Following 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
Regional Transmission Losses	-765	-714	-674	-711	-771	-809	-776	-729	-694	-635	-648	-708	-762	-763	-732
Total Reserves, Maintenance & Losses	-795	-738	-682	-720	-775	-809	-776	-729	-699	-643	-656	-728	-776	-813	-744
Total Net Resources	26364	24597	23223	24488	26581	27880	26728	25117	23924	21899	22343	24400	26259	26308	25215
Surplus/Deficits															
Firm Surplus/Deficit	1120	-681	-497	896	399	-435	-1821	-2370	-1474	-2046	-1592	907	1508	124	-352
Total Surplus/Deficit	1120	-681	-511	896	399	-435	-1825	-2393	-1529	-2080	-1625	907	1508	124	-363

Exhibits 25 – 27

Regional Monthly 1-Hour Capacity Analysis
Using the 2009 White Book Load Forecast for 1937-Water Conditions

Loads and Resources - Pacific Northwest Region
PNW Loads and Resource Study
2009 - 2010 Operating Year **7/22/2009**
1937 Water Year
[61] 2009 White Book - 30 Minute Wind (Final)

Capacity (MW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul
Firm Regional Loads														
Regional Firm Loads	25941	25941	24284	25651	28994	31100	31576	30090	27407	25694	25694	25084	26928	28217
Exports	2487	2487	2487	2080	1946	1950	1949	1948	1946	1970	1892	1950	2466	2474
Federal Diversity	-474	-509	-549	-360	-333	-558	-339	-346	-389	-523	-539	-521	-510	-416
Total Firm Regional Loads	27954	27919	26222	27371	30608	32491	33186	31693	28964	27142	27048	26513	28884	30274
Non-Firm Regional Loads														
Regional Non-Firm Loads	0	0	14	0	0	0	3.5	23	54	34	34	0	0	0
Total Non-Firm Regional Loads	0	0	14	0	0	0	3.5	23	54	34	34	0	0	0
Total Loads	27954	27919	26236	27371	30608	32491	33190	31716	29018	27176	27081	26513	28884	30274
Hydro Resources														
Regulated Hydro	30824	30729	30638	30626	30957	30974	30323	29763	28912	28510	28197	28722	30398	30947
Independent Hydro	1631	1639	1684	1721	1671	1530	1446	1515	1703	1807	1929	2104	2164	1818
Operational Peaking Adjustment	-3367	-5945	-6951	-6255	-4887	-4671	-4626	-4982	-4869	-6164	-6950	-2007	-5423	-4151
Total Hydro Resources	29088	26422	25371	26092	27741	27833	27142	26296	25747	24153	23176	28819	27140	28614
Other Resources														
Small Thermal & Misc.	32	32	32	32	32	32	32	32	32	32	32	32	32	32
Combustion Turbines	4774	4774	5030	5129	5204	5239	5526	5502	4939	5307	5224	2859	4710	5245
Renewables	226	226	226	226	226	226	226	226	226	226	226	226	226	226
Cogeneration	2905	2905	2912	2903	2935	2939	2938	2934	2300	2919	2919	1845	2621	2895
Imports	1339	1339	1201	1307	1759	2082	2094	2062	1570	1466	1466	1250	1389	1461
Large Thermal	7016	7016	7016	7016	7016	7016	7016	7016	7016	6346	5816	5906	7016	7016
Non-Utility Generation	862	860	774	708	656	637	630	639	620	783	785	950	957	934
Resource Acquisition	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Other Resources	17154	17152	17191	17321	17829	18170	18461	18412	16702	17079	16468	13068	16951	17809
Total Resources	46242	43574	42562	43413	45569	46003	45603	44708	42448	41232	39644	41887	44091	46423
Reserves & Maintenance														
Contingency Reserves (Non-Spinning)	-1279	-1277	-1280	-1282	-1290	-1287	-1276	-1263	-1216	-1214	-1189	-1128	-1276	-1300
Contingency Reserves (Spinning)	-913	-850	-854	-936	-982	-1008	-1010	-971	-934	-907	-869	-925	-975	-991
Generation Imbalance Reserves	-666	-666	-666	-666	-666	-666	-694	-748	-748	-779	-779	-779	-779	-779
Load Following Reserves	-251	-251	-251	-251	-251	-251	-256	-266	-266	-272	-272	-272	-272	-272
Regional Hydro Maintenance	-4595	-4032	-3787	-3208	-2935	-2037	-1561	-2286	-2626	-2751	-2483	-2360	-2202	-3720
Regional Transmission Losses	-1291	-1223	-1197	-1242	-1321	-1365	-1367	-1312	-1228	-1183	-1141	-1220	-1293	-1319
Total Reserves, Maintenance & Losses	-8995	-8298	-8035	-7585	-7445	-6614	-6164	-6846	-7019	-7107	-6733	-6684	-6797	-8381
Total Net Resources	37247	35276	34527	35827	38124	39389	39439	37862	35429	34125	32910	35203	37294	38042
Surplus/Deficits														
Firm Surplus/Deficit	9293	7357	8305	8456	7516	6897	6253	6169	6466	6983	5863	8690	8410	7767
Total Surplus/Deficit	9293	7357	8291	8456	7516	6897	6249	6146	6411	6949	5829	8690	8410	7767

Exhibit 26: OY 2014 PNW Region Monthly 1-Hour Capacity

Loads and Resources - Pacific Northwest Region
PNW Loads and Resource Study
2013 - 2014 Operating Year **7/22/2009**
1937 Water Year
[61] 2009 White Book - 30 Minute Wind (Final)

Capacity (MW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul
Firm Regional Loads														
Regional Firm Loads	28940	28940	27021	28337	31906	34237	35204	33550	30621	28692	28692	28157	29234	30722
Exports	2366	2366	2365	1988	1855	1853	1851	1852	1854	1883	1747	1860	2365	2366
Federal Diversity	-437	-470	-503	-319	-294	-496	-307	-308	-343	-460	-474	-474	-472	-384
Total Firm Regional Loads	30869	30836	28882	30006	33467	35594	36748	35094	32132	30115	29965	29544	31127	32704
Non-Firm Regional Loads														
Regional Non-Firm Loads	0	0	14	0	0	0	3.5	23	54	34	34	0	0	0
Total Non-Firm Regional Loads	0	0	14	0	0	0	3.5	23	54	34	34	0	0	0
Total Loads	30869	30836	28897	30006	33467	35594	36752	35117	32187	30149	29999	29544	31127	32704
Hydro Resources														
Regulated Hydro	30824	30729	30638	30626	30957	30958	30289	29726	28870	28486	28197	28722	30398	30947
Independent Hydro	1659	1667	1710	1748	1697	1541	1455	1524	1712	1816	1940	2117	2178	1832
Operational Peaking Adjustment	-3072	-5962	-6870	-5610	-4163	-4273	-4398	-4826	-4278	-5746	-6926	-1712	-5735	-3326
Total Hydro Resources	29411	26433	25478	26764	28491	28225	27346	26425	26304	24556	23210	29127	26841	29453
Other Resources														
Small Thermal & Misc.	32	32	32	32	32	32	32	32	32	32	32	32	32	32
Combustion Turbines	5243	5243	5300	5404	5483	5519	5526	5502	4939	4799	4716	2859	4710	5245
Renewables	244	244	244	244	244	244	244	244	244	244	244	244	244	244
Cogeneration	2908	2908	2912	2931	2942	2951	2953	2950	2313	2929	2457	2327	2634	2906
Imports	1059	1059	998	1102	1502	1676	1688	1656	1267	1162	1162	1047	1114	1188
Large Thermal	7016	7016	7016	7016	7016	7016	7016	7016	7016	7016	5906	5236	7016	7016
Non-Utility Generation	837	836	764	683	627	617	610	620	600	764	766	906	921	909
Resource Acquisition	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Other Resources	17340	17338	17266	17412	17847	18055	18070	18020	16412	16946	15282	12652	16671	17541
Total Resources	46751	43771	42745	44176	46338	46280	45416	44445	42716	41502	38493	41779	43512	46994
Reserves & Maintenance														
Contingency Reserves (Non-Spinning)	-1289	-1287	-1286	-1287	-1295	-1292	-1273	-1261	-1213	-1222	-1165	-1113	-1273	-1298
Contingency Reserves (Spinning)	-987	-927	-909	-957	-1008	-1024	-1015	-974	-948	-905	-831	-943	-968	-1012
Generation Imbalance Reserves	-1404	-1404	-1404	-1404	-1411	-1411	-1471	-1471	-1471	-1471	-1471	-1471	-1471	-1527
Load Following Reserves	-416	-416	-416	-416	-416	-416	-416	-416	-416	-416	-416	-416	-416	-416
Regional Hydro Maintenance	-4595	-4032	-3787	-3208	-2935	-2037	-1561	-2286	-2626	-2751	-2483	-2360	-2202	-3720
Regional Transmission Losses	-1275	-1196	-1171	-1236	-1316	-1343	-1329	-1274	-1207	-1164	-1076	-1188	-1246	-1307
Total Reserves, Maintenance & Losses	-9966	-9262	-8972	-8509	-8380	-7524	-7066	-7681	-7882	-7929	-7443	-7492	-7576	-9279
Total Net Resources	36784	34509	33772	35667	37958	38756	38350	36764	34834	33573	31050	34287	35937	37714
Surplus/Deficits														
Firm Surplus/Deficit	5915	3672	4890	5662	4491	3162	1602	1671	2701	3458	1085	4744	4810	5011
Total Surplus/Deficit	5915	3672	4876	5662	4491	3162	1599	1648	2647	3424	1051	4744	4810	5011

Loads and Resources - Pacific Northwest Region
PNW Loads and Resource Study
2018 - 2019 Operating Year **7/22/2009**
1937 Water Year
[61] 2009 White Book - 30 Minute Wind (Final)

Capacity (MW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul
Firm Regional Loads														
Regional Firm Loads	31551	31551	29313	30555	34365	36929	37336	35453	32444	30419	30419	29995	31269	32924
Exports	1958	1958	1958	1627	1590	1590	1590	1595	1595	1595	1459	1459	1962	1962
Federal Diversity	-474	-510	-544	-347	-319	-538	-332	-333	-371	-495	-510	-512	-511	-415
Total Firm Regional Loads	33034	32999	30727	31835	35636	37981	38594	36715	33667	31519	31368	30941	32720	34472
Non-Firm Regional Loads														
Regional Non-Firm Loads	0	0	14	0	0	0	3.5	23	54	34	34	0	0	0
Total Non-Firm Regional Loads	0	0	14	0	0	0	3.5	23	54	34	34	0	0	0
Total Loads	33034	32999	30741	31835	35636	37981	38598	36738	33722	31553	31401	30941	32720	34472
Hydro Resources														
Regulated Hydro	30824	30729	30638	30626	30957	30900	30167	29593	28715	28399	28197	28722	30398	30947
Independent Hydro	1664	1671	1715	1752	1701	1545	1460	1528	1716	1820	1944	2121	2182	1836
Operational Peaking Adjustment	-2703	-5593	-6508	-5257	-3804	-3606	-4022	-4456	-3828	-5363	-6628	-1407	-5430	-3077
Total Hydro Resources	29785	26807	25844	27121	28854	28839	27605	26665	26603	24856	23513	29436	27150	29706
Other Resources														
Small Thermal & Misc.	32	32	32	32	32	32	32	32	32	32	32	32	32	32
Combustion Turbines	5243	5243	5300	5404	5483	5519	5526	5502	4939	4799	4716	3174	4701	5245
Renewables	244	244	244	244	244	244	244	244	244	244	244	244	244	244
Cogeneration	2905	2905	2909	2927	2939	2948	2950	2946	2310	2454	2454	2323	2630	2903
Imports	1018	1018	953	1086	1411	1587	1598	1566	1249	1112	1112	1002	1078	1156
Large Thermal	7016	7016	7016	7016	7016	7016	7016	7016	7016	7016	5906	4616	5866	7016
Non-Utility Generation	889	887	816	735	679	669	662	672	655	816	822	961	973	960
Resource Acquisition	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Other Resources	17347	17345	17270	17444	17804	18014	18028	17978	16445	16472	15285	12353	15525	17556
Total Resources	47132	44152	43114	44565	46658	46853	45632	44643	43048	41329	38798	41789	42675	47262
Reserves & Maintenance														
Contingency Reserves (Non-Spinning)	-1291	-1288	-1287	-1289	-1296	-1292	-1272	-1259	-1211	-1210	-1167	-1101	-1234	-1300
Contingency Reserves (Spinning)	-996	-936	-918	-965	-1016	-1039	-1021	-979	-956	-900	-839	-937	-936	-1018
Generation Imbalance Reserves	-1757	-1757	-1757	-1757	-1770	-1770	-1770	-1770	-1770	-1770	-1770	-1776	-1776	-1776
Load Following Reserves	-416	-416	-416	-416	-416	-416	-416	-416	-416	-416	-416	-416	-416	-416
Regional Hydro Maintenance	-4595	-4032	-3787	-3208	-2935	-2037	-1561	-2286	-2626	-2751	-2483	-2360	-2202	-3720
Regional Transmission Losses	-1276	-1197	-1171	-1237	-1314	-1350	-1326	-1271	-1208	-1148	-1076	-1179	-1210	-1308
Total Reserves, Maintenance & Losses	-10330	-9626	-9336	-8872	-8747	-7904	-7366	-7980	-8186	-8195	-7750	-7769	-7773	-9537
Total Net Resources	36801	34526	33779	35693	37911	38949	38267	36664	34862	33134	31048	34020	34901	37725
Surplus/Deficits														
Firm Surplus/Deficit	3767	1527	3052	3858	2275	968	-327	-52	1195	1615	-319	3080	2181	3253
Total Surplus/Deficit	3767	1527	3038	3858	2275	968	-331	-75	1140	1581	-353	3080	2181	3253

Exhibits 28 – 30

Regional Monthly 120-Hour Capacity Analysis
Using the 2009 White Book Load Forecast for 1937-Water Conditions

Exhibit 28: OY 2010 PNW Region Monthly 120-Hour Capacity

Loads and Resources - Pacific Northwest Region
PNW Loads and Resource Study
2009 - 2010 Operating Year **7/22/2009**
1937 Water Year
[61] 2009 White Book - 30 Minute Wind (Final)

Capacity 120 (MW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul
Firm Regional Loads														
Regional Firm Loads	25941	25941	24284	25651	28994	31100	31576	30090	27407	25694	25694	25084	26928	28217
Exports	2487	2487	2487	2080	1946	1950	1949	1948	1946	1970	1892	1950	2466	2474
Federal Diversity	-761	-823	-905	-1277	-1277	-1146	-1328	-1285	-1130	-1142	-1225	-1103	-918	-831
Total Firm Regional Loads	27667	27605	25867	26454	29664	31903	32197	30753	28223	26522	26361	25932	28476	29860
Non-Firm Regional Loads														
Regional Non-Firm Loads	0	0	14	0	0	0	3.5	23	54	34	34	0	0	0
Total Non-Firm Regional Loads	0	0	14	0	0	0	3.5	23	54	34	34	0	0	0
Total Loads	27667	27605	25881	26454	29664	31903	32201	30776	28277	26556	26395	25932	28476	29860
Hydro Resources														
Regulated Hydro	30824	30729	30638	30626	30957	30974	30323	29763	28912	28510	28197	28722	30398	30947
Independent Hydro	1631	1639	1684	1721	1671	1530	1446	1515	1703	1807	1929	2104	2164	1818
Operational Peaking Adjustment	-5797	-8677	-8833	-7884	-6607	-7146	-7263	-7329	-7089	-8722	-9454	-4914	-7756	-6614
Total Hydro Resources	26658	23690	23489	24463	26021	25359	24505	23949	23526	21595	20673	25912	24807	26151
Other Resources														
Small Thermal & Misc.	32	32	32	32	32	32	32	32	32	32	32	32	32	32
Combustion Turbines	4774	4774	5030	5129	5204	5239	5526	5502	4939	5307	5224	2859	4710	5245
Renewables	226	226	226	226	226	226	226	226	226	226	226	226	226	226
Cogeneration	2905	2905	2912	2903	2935	2939	2938	2934	2300	2919	2919	1845	2621	2895
Imports	1339	1339	1201	1307	1759	2082	2094	2062	1570	1466	1466	1250	1389	1461
Large Thermal	7016	7016	7016	7016	7016	7016	7016	7016	7016	6346	5816	5906	7016	7016
Non-Utility Generation	862	860	774	708	656	637	630	639	620	783	785	950	957	934
Resource Acquisition	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Other Resources	17154	17152	17191	17321	17829	18170	18461	18412	16702	17079	16468	13068	16951	17809
Total Resources	43812	40842	40680	41784	43850	43528	42967	42361	40228	38674	37140	38980	41758	43960
Reserves & Maintenance														
Contingency Reserves (Non-Spinning)	-1279	-1277	-1280	-1282	-1290	-1287	-1276	-1263	-1216	-1214	-1189	-1128	-1276	-1300
Contingency Reserves (Spinning)	-1056	-1068	-1077	-896	-941	-947	-945	-913	-880	-844	-808	-854	-918	-930
Generation Imbalance Reserves	-666	-666	-666	-666	-666	-666	-694	-748	-748	-779	-779	-779	-779	-779
Load Following Reserves	-251	-251	-251	-251	-251	-251	-256	-266	-266	-272	-272	-272	-272	-272
Regional Hydro Maintenance	-4595	-4032	-3787	-3208	-2935	-2037	-1561	-2286	-2626	-2751	-2483	-2360	-2202	-3720
Regional Transmission Losses	-1205	-1124	-1126	-1189	-1265	-1284	-1281	-1236	-1155	-1099	-1059	-1125	-1216	-1238
Total Reserves, Maintenance & Losses	-9052	-8418	-8188	-7492	-7347	-6473	-6014	-6712	-6892	-6960	-6590	-6518	-6664	-8240
Total Net Resources	34760	32425	32493	34292	36502	37055	36953	35649	33336	31714	30550	32462	35094	35720
Surplus/Deficits														
Firm Surplus/Deficit	7094	4820	6626	7838	6839	5152	4756	4895	5113	5192	4189	6530	6618	5861
Total Surplus/Deficit	7094	4820	6612	7838	6839	5152	4753	4872	5058	5158	4155	6530	6618	5861

Exhibit 29: OY 2014 PNW Region Monthly 120-Hour Capacity

Loads and Resources - Pacific Northwest Region
PNW Loads and Resource Study
2013 - 2014 Operating Year **7/22/2009**
1937 Water Year
[61] 2009 White Book - 30 Minute Wind (Final)

Capacity 120 (MW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul
Firm Regional Loads														
Regional Firm Loads	28940	28940	27021	28337	31906	34237	35204	33550	30621	28692	28692	28157	29234	30722
Exports	2366	2366	2365	1988	1855	1853	1851	1852	1854	1883	1747	1860	2365	2366
Federal Diversity	-703	-760	-829	-1132	-1126	-1019	-1202	-1146	-995	-1005	-1078	-1003	-849	-767
Total Firm Regional Loads	30604	30546	28557	29193	32635	35071	35853	34256	31480	29570	29361	29015	30750	32321
Non-Firm Regional Loads														
Regional Non-Firm Loads	0	0	14	0	0	0	3.5	23	54	34	34	0	0	0
Total Non-Firm Regional Loads	0	0	14	0	0	0	3.5	23	54	34	34	0	0	0
Total Loads	30604	30546	28571	29193	32635	35071	35857	34279	31535	29604	29395	29015	30750	32321
Hydro Resources														
Regulated Hydro	30824	30729	30638	30626	30957	30958	30289	29726	28870	28486	28197	28722	30398	30947
Independent Hydro	1659	1667	1710	1748	1697	1541	1455	1524	1712	1816	1940	2117	2178	1832
Operational Peaking Adjustment	-5016	-8021	-8248	-7265	-6012	-6445	-6616	-6661	-6430	-8039	-8608	-4178	-7500	-6269
Total Hydro Resources	27467	24375	24100	25109	26642	26053	25129	24590	24153	22263	21529	26661	25076	26510
Other Resources														
Small Thermal & Misc.	32	32	32	32	32	32	32	32	32	32	32	32	32	32
Combustion Turbines	5243	5243	5300	5404	5483	5519	5526	5502	4939	4799	4716	2859	4710	5245
Renewables	244	244	244	244	244	244	244	244	244	244	244	244	244	244
Cogeneration	2908	2908	2912	2931	2942	2951	2953	2950	2313	2929	2457	2327	2634	2906
Imports	1059	1059	998	1102	1502	1676	1688	1656	1267	1162	1162	1047	1114	1188
Large Thermal	7016	7016	7016	7016	7016	7016	7016	7016	7016	7016	5906	5236	7016	7016
Non-Utility Generation	837	836	764	683	627	617	610	620	600	764	766	906	921	909
Resource Acquisition	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Other Resources	17340	17338	17266	17412	17847	18055	18070	18020	16412	16946	15282	12652	16671	17541
Total Resources	44807	41712	41366	42521	44489	44108	43199	42610	40564	39209	36811	39313	41748	44051
Reserves & Maintenance														
Contingency Reserves (Non-Spinning)	-1289	-1287	-1286	-1287	-1295	-1292	-1273	-1261	-1213	-1222	-1165	-1113	-1273	-1298
Contingency Reserves (Spinning)	-939	-875	-875	-917	-965	-974	-963	-932	-898	-853	-794	-886	-925	-935
Generation Imbalance Reserves	-1404	-1404	-1404	-1404	-1411	-1411	-1471	-1471	-1471	-1471	-1471	-1471	-1471	-1527
Load Following Reserves	-416	-416	-416	-416	-416	-416	-416	-416	-416	-416	-416	-416	-416	-416
Regional Hydro Maintenance	-4595	-4032	-3787	-3208	-2935	-2037	-1561	-2286	-2626	-2751	-2483	-2360	-2202	-3720
Regional Transmission Losses	-1211	-1129	-1126	-1182	-1255	-1272	-1257	-1214	-1137	-1089	-1021	-1108	-1188	-1211
Total Reserves, Maintenance & Losses	-9854	-9143	-8893	-8415	-8277	-7402	-6941	-7579	-7761	-7802	-7350	-7354	-7475	-9107
Total Net Resources	34953	32570	32473	34107	36212	36706	36257	35031	32803	31407	29461	31959	34273	34945
Surplus/Deficits														
Firm Surplus/Deficit	4349	2023	3916	4914	3578	1634	404	775	1323	1837	100	2944	3523	2624
Total Surplus/Deficit	4349	2023	3902	4914	3578	1634	401	752	1268	1803	66	2944	3523	2624

Exhibit 30: OY 2019 PNW Region Monthly 120-Hour Capacity

Loads and Resources - Pacific Northwest Region
PNW Loads and Resource Study
2018 - 2019 Operating Year **7/22/2009**
1937 Water Year
[61] 2009 White Book - 30 Minute Wind (Final)

Capacity 120 (MW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul
Firm Regional Loads														
Regional Firm Loads	31551	31551	29313	30555	34365	36929	37336	35453	32444	30419	30419	29995	31269	32924
Exports	1958	1958	1958	1627	1590	1590	1590	1595	1595	1595	1459	1459	1962	1962
Federal Diversity	-763	-825	-896	-1231	-1223	-1105	-1301	-1237	-1076	-1082	-1160	-1084	-919	-829
Total Firm Regional Loads	32746	32684	30375	30951	34732	37414	37625	35811	32962	30932	30718	30370	32312	34058
Non-Firm Regional Loads														
Regional Non-Firm Loads	0	0	14	0	0	0	3.5	23	54	34	34	0	0	0
Total Non-Firm Regional Loads	0	0	14	0	0	0	3.5	23	54	34	34	0	0	0
Total Loads	32746	32684	30389	30951	34732	37414	37629	35834	33017	30966	30751	30370	32312	34058
Hydro Resources														
Regulated Hydro	30824	30729	30638	30626	30957	30900	30167	29593	28715	28399	28197	28722	30398	30947
Independent Hydro	1664	1671	1715	1752	1701	1545	1460	1528	1716	1820	1944	2121	2182	1836
Operational Peaking Adjustment	-4645	-7652	-7884	-6912	-5653	-5696	-6246	-6281	-5980	-7655	-8309	-3873	-7195	-6019
Total Hydro Resources	27842	24748	24468	25466	27005	26748	25380	24840	24451	22564	21832	26970	25385	26764
Other Resources														
Small Thermal & Misc.	32	32	32	32	32	32	32	32	32	32	32	32	32	32
Combustion Turbines	5243	5243	5300	5404	5483	5519	5526	5502	4939	4799	4716	3174	4701	5245
Renewables	244	244	244	244	244	244	244	244	244	244	244	244	244	244
Cogeneration	2905	2905	2909	2927	2939	2948	2950	2946	2310	2454	2454	2323	2630	2903
Imports	1018	1018	953	1086	1411	1587	1598	1566	1249	1112	1112	1002	1078	1156
Large Thermal	7016	7016	7016	7016	7016	7016	7016	7016	7016	7016	5906	4616	5866	7016
Non-Utility Generation	889	887	816	735	679	669	662	672	655	816	822	961	973	960
Resource Acquisition	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Other Resources	17347	17345	17270	17444	17804	18014	18028	17978	16445	16472	15285	12353	15525	17556
Total Resources	45189	42093	41738	42910	44809	44763	43408	42819	40897	39036	37117	39323	40910	44319
Reserves & Maintenance														
Contingency Reserves (Non-Spinning)	-1291	-1288	-1287	-1289	-1296	-1292	-1272	-1259	-1211	-1210	-1167	-1101	-1234	-1300
Contingency Reserves (Spinning)	-949	-885	-886	-927	-975	-992	-970	-939	-906	-850	-803	-881	-894	-942
Generation Imbalance Reserves	-1757	-1757	-1757	-1757	-1770	-1770	-1770	-1770	-1770	-1770	-1770	-1776	-1776	-1776
Load Following Reserves	-416	-416	-416	-416	-416	-416	-416	-416	-416	-416	-416	-416	-416	-416
Regional Hydro Maintenance	-4595	-4032	-3787	-3208	-2935	-2037	-1561	-2286	-2626	-2751	-2483	-2360	-2202	-3720
Regional Transmission Losses	-1212	-1129	-1126	-1183	-1253	-1282	-1254	-1211	-1138	-1073	-1021	-1098	-1152	-1212
Total Reserves, Maintenance & Losses	-10220	-9508	-9259	-8780	-8645	-7789	-7242	-7880	-8067	-8069	-7659	-7632	-7674	-9365
Total Net Resources	34970	32585	32480	34130	36164	36974	36166	34939	32830	30967	29458	31691	33236	34954
Surplus/Deficits														
Firm Surplus/Deficit	2223	-99	2105	3179	1432	-440	-1460	-872	-133	35	-1259	1322	923	896
Total Surplus/Deficit	2223	-99	2091	3179	1432	-440	-1463	-895	-187	0.8	-1293	1322	923	896

Exhibits 31 – 40

Regional Energy Surpluses and Deficits for 70 Historical Water Conditions

Table A-30: Regional Surplus/Deficit - By Water Year
PNW Loads and Resource Study
2009 - 2010 Operating Year
[61] 2009 White Book - 30 Minute Wind (Final)

7/22/2009

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1929 Regional Surplus/Deficit	5424	2949	3831	4643	4494	3297	1975	2642	3460	3092	5039	2887	7144	4390	3915
1930 Regional Surplus/Deficit	3968	2108	3343	4250	3822	3087	2302	2564	2867	3323	7027	2159	4208	3981	3396
1931 Regional Surplus/Deficit	2562	2072	3013	3913	4258	3230	2410	2436	2608	4063	1596	2825	3780	4022	3138
1932 Regional Surplus/Deficit	4355	2752	3809	3176	3288	2904	1714	1673	4568	7506	11904	11440	11621	6098	5303
1933 Regional Surplus/Deficit	4079	3434	3973	4414	4267	4896	9659	6571	3529	7543	8168	9387	11776	10222	6689
1934 Regional Surplus/Deficit	8335	5995	5192	6409	8572	11089	10978	11143	10214	11645	11266	9889	9782	5484	8928
1935 Regional Surplus/Deficit	3127	2165	3570	4267	4129	3989	8487	9551	2954	4972	7425	8681	8710	7829	5889
1936 Regional Surplus/Deficit	6433	3410	3261	4112	3833	2895	959	2937	3128	4735	10954	10079	11469	4657	5004
1937 Regional Surplus/Deficit	4766	2846	2735	4086	4202	3161	2488	1816	2121	1982	1861	4245	5325	3389	3281
1938 Regional Surplus/Deficit	5199	3283	3501	4238	4477	4713	8976	5085	6893	9134	12375	12081	10631	6942	6885
1939 Regional Surplus/Deficit	3944	2403	4115	4516	4008	3115	2864	2689	4580	6251	10246	10286	7380	4133	4931
1940 Regional Surplus/Deficit	2866	1764	2731	4487	4341	4665	2489	3828	7697	8992	9975	6901	8147	2733	4979
1941 Regional Surplus/Deficit	2325	1814	3383	4037	4269	3329	1655	3058	5192	3642	4750	3377	4361	3782	3557
1942 Regional Surplus/Deficit	3749	2800	4489	3451	4256	5265	4404	5368	2692	4189	8437	6968	11533	8516	5532
1943 Regional Surplus/Deficit	6303	4025	4186	4422	4079	4361	7389	8055	8022	12745	12375	11884	11912	9560	7620
1944 Regional Surplus/Deficit	5774	3221	2625	4420	4371	3429	2275	2797	3551	3200	5081	1896	3300	2453	3310
1945 Regional Surplus/Deficit	3624	2493	4060	3179	3023	2669	2141	1696	2515	1946	575	8048	9512	3831	3757
1946 Regional Surplus/Deficit	4190	2479	3101	3969	5154	5019	6927	4338	9194	10864	12260	12057	11266	8739	7067
1947 Regional Surplus/Deficit	5541	3838	4247	4354	5209	9191	9301	10036	10207	9896	10578	10444	11513	8535	8149
1948 Regional Surplus/Deficit	4951	3422	3971	8865	8725	6272	10968	6279	6513	7740	11818	12102	12137	10234	8348
1949 Regional Surplus/Deficit	7959	6255	5077	5343	4850	4490	2704	6002	9648	10525	12169	12149	11539	3904	7006
1950 Regional Surplus/Deficit	3958	1906	2658	4352	4769	4511	8120	9548	11594	12380	11995	10937	11472	10488	7780
1951 Regional Surplus/Deficit	6840	5376	4548	6973	8259	10761	11416	12082	11480	12399	12288	11830	11252	10173	9755
1952 Regional Surplus/Deficit	7617	4259	4268	7887	6719	6590	10883	7459	4900	11923	12406	12227	12029	7579	8216
1953 Regional Surplus/Deficit	5370	3612	3343	4258	3770	3237	4583	9373	5376	3661	7927	10951	12048	10423	6447
1954 Regional Surplus/Deficit	6018	4057	4098	5311	5394	6079	8125	11016	6636	9698	9987	11601	11366	10360	7880
1955 Regional Surplus/Deficit	10484	9524	8153	5478	6837	5477	3805	3391	3859	4872	6287	6688	11681	10262	6780
1956 Regional Surplus/Deficit	8333	5498	4047	6285	8284	9927	11704	11563	11443	12522	12220	11936	11983	10415	9726
1957 Regional Surplus/Deficit	6372	5052	4378	5860	4673	5753	5659	5461	8767	10156	10184	12255	11849	5830	7203
1958 Regional Surplus/Deficit	4651	2451	3676	4421	4523	3948	5376	9248	6620	8443	11384	12210	11781	5638	6710
1959 Regional Surplus/Deficit	4546	3125	3442	4974	6397	8117	10944	11262	7161	11879	10157	11092	11299	7856	8089
1960 Regional Surplus/Deficit	6612	4700	8508	9910	10525	8645	8878	7298	7552	12305	11683	9250	11353	7556	8920
1961 Regional Surplus/Deficit	5596	2847	4094	4637	4928	3574	8326	7523	8536	11143	7520	11091	11134	6529	6981
1962 Regional Surplus/Deficit	4952	4048	3203	3862	4690	5030	6191	6534	4014	9121	12305	10357	11383	5014	6275
1963 Regional Surplus/Deficit	4988	3174	3119	5884	6754	7712	7757	8869	3435	6223	7258	8386	11874	7792	6846
1964 Regional Surplus/Deficit	6006	3849	4030	4171	4925	4466	5123	6214	3534	6840	5377	9542	12253	10281	6290
1965 Regional Surplus/Deficit	8243	4323	5725	6286	6075	9779	11569	11989	10864	9727	12396	11996	11706	7510	9215
1966 Regional Surplus/Deficit	7103	5545	4791	5515	4728	4091	7257	4661	2994	12055	9031	8750	9712	7970	6446
1967 Regional Surplus/Deficit	5887	3678	3574	4241	4270	5026	11004	11515	7235	7489	4710	9341	12037	10242	7421
1968 Regional Surplus/Deficit	7058	4171	4220	5345	4887	4738	9104	9174	7672	3713	5704	6719	11478	9583	6921
1969 Regional Surplus/Deficit	6890	5262	7028	6859	8248	6729	11248	11585	7665	12487	12174	12269	11708	9175	9215
1970 Regional Surplus/Deficit	4641	2860	3824	5260	4938	3277	4491	8235	6232	6445	6522	8794	12091	6535	6132
1971 Regional Surplus/Deficit	4536	2349	3114	4336	4631	4752	11772	11856	11640	12529	12197	12016	12127	10947	8558
1972 Regional Surplus/Deficit	8879	5867	4897	5759	5380	5038	11853	12205	11960	12628	11917	11892	12158	10467	9249
1973 Regional Surplus/Deficit	10180	7943	5490	5349	4900	6172	5549	3626	3697	1997	5275	5841	5736	4343	5298
1974 Regional Surplus/Deficit	2734	1519	3028	4153	3796	7912	11880	12168	11845	12440	12193	11726	12025	10604	8609
1975 Regional Surplus/Deficit	8219	6216	4617	4046	4553	3806	7332	6646	8119	4848	7573	11588	12126	10842	7265
1976 Regional Surplus/Deficit	5337	5230	5168	7054	8584	11695	11518	11736	9583	12549	12139	12032	11975	10297	9759
1977 Regional Surplus/Deficit	10938	10963	9737	5206	4592	3369	2179	3056	3226	2363	3082	1014	2074	2513	4223
1978 Regional Surplus/Deficit	4113	3109	3731	2250	3244	5935	5681	5488	6112	11609	9285	10552	9771	8028	6236
1979 Regional Surplus/Deficit	4787	4081	6891	5296	4736	3523	2902	5779	8038	6109	6246	9637	6317	3720	5614
1980 Regional Surplus/Deficit	2313	1703	2859	4003	4180	4733	1877	5262	3774	5892	10937	12070	11858	5465	5529
1981 Regional Surplus/Deficit	4070	2373	3986	4329	5212	9513	10781	8941	7038	4077	7012	7774	11557	10058	7322
1982 Regional Surplus/Deficit	8368	6610	4268	4981	5496	4983	9268	12113	11605	12007	10425	11973	11766	9870	8728
1983 Regional Surplus/Deficit	8408	5198	6533	6772	6043	6183	11188	8125	11768	10671	11083	10737	11675	10658	8950
1984 Regional Surplus/Deficit	8517	5441	5319	5215	9450	5269	11846	7860	11775	12518	12200	8369	12111	10279	8897
1985 Regional Surplus/Deficit	6450	3640	4738	5158	6368	4330	5510	3112	6643	10635	11214	10876	8422	3286	6207
1986 Regional Surplus/Deficit	1887	1517	3628	5099	7089	2644	8562	9517	11764	12456	11333	7639	10496	6330	7165
1987 Regional Surplus/Deficit	4826	2811	3275	4138	5921	4189	2624	4334	5267	6945	6914	6782	7991	3928	4923
1988 Regional Surplus/Deficit	2802	1583	2757	3509	3704	2544	1466	2239	2917	3475	6278	5409	3230	4636	3293
1989 Regional Surplus/Deficit	4489	2833	3194	3223	3950	3998	2064	3827	6036	10668	12197	9725	8473	4441	5330
1990 Regional Surplus/Deficit	2268	2138	3237	4009	5037	6723	9905	7636	6238	10827	11367	8907	11220	6945	6916
1991 Regional Surplus/Deficit	5648	4557	3021	3802	8584	6821	10556	11304	5897	9612	8714	10831	10923	10039	7976
1992 Regional Surplus/Deficit	8158	5065	3705	3789	4254	2818	2977	2768	6985	4819	5697	4381	4285	3373	4274

Table A-30: Regional Surplus/Deficit - By Water Year
PNW Loads and Resource Study
2009 - 2010 Operating Year
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Continued 7/22/2009

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1993 Regional Surplus/Deficit	1872	1642	2296	3588	3755	3222	2107	2914	3988	5534	5483	8830	6217	5456	4143
1994 Regional Surplus/Deficit	4452	3630	2569	3670	4628	3632	2264	4147	3519	3384	9356	5375	5305	4147	4132
1995 Regional Surplus/Deficit	2499	1716	2560	3421	3660	4133	4257	8543	9523	9098	6423	8706	10454	7479	6027
1996 Regional Surplus/Deficit	5038	3183	3715	5724	10706	11514	11595	12170	11593	12442	12511	12101	11755	10353	9798
1997 Regional Surplus/Deficit	7878	4040	4427	5167	5147	6611	11854	12226	11879	12337	12220	12063	12069	10699	9175
1998 Regional Surplus/Deficit	8117	5377	7083	9953	7263	4684	8800	8214	7433	7570	7679	9203	11969	7747	8051
-Ranked Averages-															
Top Ten Percent	7080	4963	5018	6420	7934	9349	11558	11904	10655	12108	12235	12008	11791	9770	9531
Middle Eighty Percent	5608	3863	4210	4875	5248	5114	6771	7008	6843	8377	9313	9536	10364	7377	6734
Bottom Ten Percent	3689	2305	3131	3914	3950	3064	2105	2372	3110	3090	3881	3994	4816	3728	3390

Table A-30: Regional Surplus/Deficit - By Water Year
PNW Loads and Resource Study
2010 - 2011 Operating Year
[61] 2009 White Book - 30 Minute Wind (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	4871	2042	3211	4004	3566	2487	755	1479	2454	1855	3512	2108	6176	4156	3044
1930 Regional Surplus/Deficit	3412	1201	2725	3608	2889	2276	1083	1401	1860	2087	5502	1383	3240	3747	2525
1931 Regional Surplus/Deficit	2005	1167	2394	3273	3331	2420	1190	1273	1601	2826	69	2043	2809	3788	2268
1932 Regional Surplus/Deficit	3800	1847	3191	2536	2360	2092	492	509	3559	6266	11098	11365	11627	5865	4602
1933 Regional Surplus/Deficit	3521	2529	3354	3775	3338	4086	8423	5414	2521	6307	6647	8619	11781	10219	5919
1934 Regional Surplus/Deficit	7793	5099	4576	5770	7626	10907	10872	10885	9180	11680	11288	9120	8773	5250	8386
1935 Regional Surplus/Deficit	2574	1262	2956	3628	3199	3179	7260	8349	1947	3733	5900	7907	7746	7600	5017
1936 Regional Surplus/Deficit	5884	2505	2641	3473	2905	2084	-263	1775	2121	3503	9439	9311	11057	4424	4181
1937 Regional Surplus/Deficit	4213	1941	2116	3443	3270	2351	1268	653	1114	742	332	3470	4355	3153	2410
1938 Regional Surplus/Deficit	4647	2380	2884	3600	3548	3902	7749	3923	5887	7909	12205	11943	9669	6710	6126
1939 Regional Surplus/Deficit	3392	1501	3501	3875	3080	2304	1644	1525	3577	5020	8734	9522	6416	3898	4064
1940 Regional Surplus/Deficit	2309	857	2112	3848	3413	3856	1268	2664	6691	7756	8455	6134	7186	2498	4111
1941 Regional Surplus/Deficit	1767	908	2765	3398	3342	2519	511	1804	4187	2404	3228	2599	3395	3548	2687
1942 Regional Surplus/Deficit	3191	1893	3872	2811	3328	4455	3184	4206	1686	2952	6916	6198	10573	8287	4664
1943 Regional Surplus/Deficit	5753	3123	3573	3779	3150	3550	6170	6869	7016	12774	12403	11110	11924	9330	6945
1944 Regional Surplus/Deficit	5223	2314	2002	3780	3443	2618	1055	1635	2546	1963	3559	1119	2331	2217	2440
1945 Regional Surplus/Deficit	3074	1594	3447	2535	2095	1858	919	531	1508	708	-954	7274	8548	3596	2887
1946 Regional Surplus/Deficit	3634	1572	2481	3326	4226	4209	5707	3182	8182	9626	12283	12012	10305	8510	6323
1947 Regional Surplus/Deficit	4990	2934	3631	3714	4281	8373	8073	8854	9183	8661	9060	9671	11311	8306	7339
1948 Regional Surplus/Deficit	4401	2518	3355	8202	7799	5463	10370	4037	5508	6506	10521	12048	12134	10234	7617
1949 Regional Surplus/Deficit	7416	5360	4463	4704	3922	3680	1484	4840	8613	9297	12168	11857	11044	3669	6278
1950 Regional Surplus/Deficit	3406	1004	2041	3713	3841	3700	6892	8355	11126	10938	10458	10155	11480	10403	7036
1951 Regional Surplus/Deficit	6292	4476	3932	6334	7332	9932	11327	11821	10893	12446	12318	11627	10292	10173	9271
1952 Regional Surplus/Deficit	7074	3360	3651	7238	5792	5781	9655	6294	3898	10641	12204	12173	11685	7347	7511
1953 Regional Surplus/Deficit	4819	2708	2724	3616	2841	2426	3362	8191	4369	2424	6407	10182	12052	10421	5676
1954 Regional Surplus/Deficit	5471	3155	3482	4672	4467	5270	6897	9826	5631	8463	8469	10895	11375	10357	7114
1955 Regional Surplus/Deficit	9947	8638	7546	4839	5910	4668	2586	2228	2855	3634	4762	5912	11688	10259	6013
1956 Regional Surplus/Deficit	7789	4604	3432	5646	7358	9098	11614	9688	10417	11313	12258	11881	12001	10413	9123
1957 Regional Surplus/Deficit	5825	4152	3764	5222	3745	4943	4440	4307	7762	8922	8667	12199	11872	5597	6478
1958 Regional Surplus/Deficit	4100	1549	3059	3782	3595	3137	4157	8066	5615	7210	9868	12158	11778	5404	5981
1959 Regional Surplus/Deficit	3994	2222	2823	4335	5470	7298	10841	10032	4853	10558	8538	10176	11320	7625	7261
1960 Regional Surplus/Deficit	6064	3799	7899	9241	9568	7827	7651	6137	6548	12344	10170	8484	11284	7325	8173
1961 Regional Surplus/Deficit	5042	1942	3481	3998	4000	2764	7099	6329	7531	9910	5997	10311	11134	6296	6188
1962 Regional Surplus/Deficit	4400	3150	2586	3223	3762	4220	4972	5372	3008	7885	12325	9593	11355	4779	5547
1963 Regional Surplus/Deficit	4433	2269	2503	5245	5826	6893	6532	7675	2430	4986	5733	7617	10952	7562	5977
1964 Regional Surplus/Deficit	5460	2948	3415	3531	3997	3657	3904	5061	2528	5600	3849	8777	12253	10277	5522
1965 Regional Surplus/Deficit	7699	3422	5113	5646	5148	8961	11488	11729	9836	8462	12419	11635	11594	7280	8678
1966 Regional Surplus/Deficit	6559	4649	4174	4875	3800	3281	6039	3504	1987	11581	7511	7986	8750	7740	5611
1967 Regional Surplus/Deficit	5337	2776	2953	3601	3342	4216	10777	10185	4786	6046	3097	8558	12028	10242	6586
1968 Regional Surplus/Deficit	6508	3266	3604	4706	3959	3928	7878	7982	6669	2477	4185	5947	11161	9354	6104
1969 Regional Surplus/Deficit	6337	4357	6412	6221	7322	5921	11147	9509	6159	12531	12204	12214	11222	8946	8547
1970 Regional Surplus/Deficit	4087	1959	3210	4621	4010	2467	3269	7050	5227	5211	5005	8026	12085	6302	5342
1971 Regional Surplus/Deficit	3983	1443	2497	3697	3703	3942	11260	11589	10129	10712	11015	11960	12132	10943	7926
1972 Regional Surplus/Deficit	8332	4966	4282	5120	4452	4228	11122	11151	12473	12662	10405	11837	12163	10464	8772
1973 Regional Surplus/Deficit	9640	7053	4878	4710	3971	5362	4329	2473	2691	758	3750	5066	4770	4108	4431
1974 Regional Surplus/Deficit	2177	614	2412	3513	2866	7093	11773	11890	12372	12476	12228	11674	12043	10601	8310
1975 Regional Surplus/Deficit	7669	5317	4004	3404	3625	2995	6102	5493	7114	3613	6057	10812	12133	10838	6496
1976 Regional Surplus/Deficit	4787	4332	4551	6415	7658	11506	11425	11031	7289	11974	11249	11978	11875	10293	9170
1977 Regional Surplus/Deficit	10399	10081	9133	4566	3664	2558	959	1894	2222	1125	1559	230	1101	2279	3356
1978 Regional Surplus/Deficit	3564	2211	3116	1610	2315	5112	4460	4324	5105	10334	7760	9767	8809	7797	5364
1979 Regional Surplus/Deficit	4231	3180	6283	4658	3808	2713	1682	4618	7034	4876	4725	8864	5349	3485	4746
1980 Regional Surplus/Deficit	1755	801	2244	3364	3252	3923	694	4056	2767	4662	9424	11793	10897	5231	4703
1981 Regional Surplus/Deficit	3512	1469	3369	3685	4284	8695	10681	5904	6034	2681	5458	6974	11567	10059	6494
1982 Regional Surplus/Deficit	7822	5714	3649	4342	4568	4173	8042	11839	12137	10217	8807	11581	11754	9640	8142
1983 Regional Surplus/Deficit	7863	4298	5921	6134	5115	5373	9957	6943	12300	9404	9572	9961	10711	10655	8229
1984 Regional Surplus/Deficit	7975	4543	4706	4575	8503	4459	11748	5269	10948	10811	10686	7601	12105	10050	8089
1985 Regional Surplus/Deficit	5904	2741	4125	4518	5439	3520	4294	1953	5639	9361	9699	10110	7456	3051	5339
1986 Regional Surplus/Deficit	1331	612	3011	4460	6162	1833	7334	8308	12283	11991	9821	6871	9532	6097	6454
1987 Regional Surplus/Deficit	4278	1907	2659	3498	4993	3379	1403	3171	4263	5715	5394	6006	7028	3692	4055
1988 Regional Surplus/Deficit	2244	675	2142	2864	2777	1733	245	1075	1910	2236	4752	4629	2259	4400	2422
1989 Regional Surplus/Deficit	3937	1928	2573	2584	3021	3188	842	2664	5031	9416	10866	8955	7510	4207	4468
1990 Regional Surplus/Deficit	1708	1230	2617	3370	4109	5914	8679	6475	5232	9596	11403	8137	11216	6713	6190
1991 Regional Surplus/Deficit	5102	3660	2406	3162	7658	6013	9819	10069	3985	8336	7183	10053	9960	10032	7084
1992 Regional Surplus/Deficit	7613	4170	3088	3146	3320	2006	1757	1604	5981	3582	4172	3598	3317	3136	3403

Table A-30: Regional Surplus/Deficit - By Water Year
PNW Loads and Resource Study
2010 - 2011 Operating Year
[61] 2009 White Book - 30 Minute Wind (Final)

Continued 7/22/2009

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1993 Regional Surplus/Deficit	1314	736	1676	2948	2827	2412	887	1752	2981	4296	3958	8058	5249	5222	3273
1994 Regional Surplus/Deficit	3898	2728	1946	3024	3701	2822	1043	2985	2512	2146	7834	4601	4338	3913	3261
1995 Regional Surplus/Deficit	1941	809	1938	2779	2730	3323	3037	7352	8489	7863	4897	7938	9490	7247	5153
1996 Regional Surplus/Deficit	4487	2281	3099	5086	9760	11317	11511	11906	12112	11584	12545	11872	11751	10351	9499
1997 Regional Surplus/Deficit	7330	3136	3810	4528	4219	5802	11762	11968	12405	11185	12253	12009	12077	10694	8830
1998 Regional Surplus/Deficit	7567	4475	6473	9280	6337	3875	7577	7050	6428	6340	6165	8424	11973	7518	7259
-Ranked Averages-															
Top Ten Percent	6674	3888	4031	5539	6561	8692	11464	11328	10775	11375	11921	11834	11679	9953	9049
Middle Eighty Percent	5040	2983	3640	4263	4374	4316	5708	5791	5800	7241	8081	8916	9886	7173	5955
Bottom Ten Percent	3134	1400	2513	3271	3021	2253	896	1196	2104	1852	2355	3217	3848	3493	2520

Table A-30: Regional Surplus/Deficit - By Water Year
PNW Loads and Resource Study
2011 - 2012 Operating Year
[61] 2009 White Book - 30 Minute Wind (Final)

7/22/2009

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1929 Regional Surplus/Deficit	4495	2003	2974	3837	3394	2203	657	1153	1911	1983	3614	1540	6897	3558	2841
1930 Regional Surplus/Deficit	3033	1160	2487	3444	2720	1991	812	1085	1503	2218	5607	813	3960	3149	2325
1931 Regional Surplus/Deficit	1626	1126	2157	3109	3162	2139	918	962	1242	2959	157	1478	3531	3194	2069
1932 Regional Surplus/Deficit	3425	1812	2954	2369	2187	1808	215	193	3200	6404	11211	10782	11607	5273	4332
1933 Regional Surplus/Deficit	3144	2495	3121	3612	3162	3807	8164	5114	2161	6448	6755	8082	11757	10296	5723
1934 Regional Surplus/Deficit	7419	5062	4340	5609	7466	10909	10927	11077	8831	11783	11112	8583	9492	4663	8281
1935 Regional Surplus/Deficit	2195	1222	2720	3464	3022	2896	6999	8037	1587	3867	6008	7366	8477	7018	4835
1936 Regional Surplus/Deficit	5504	2465	2406	3308	2735	1801	-544	1465	1762	3637	9555	8767	11479	3831	3956
1937 Regional Surplus/Deficit	3838	1907	1878	3278	3102	2068	998	340	753	864	419	2908	5072	2552	2208
1938 Regional Surplus/Deficit	4270	2341	2647	3434	3374	3621	7486	3616	5538	8056	12227	11264	10408	6123	5915
1939 Regional Surplus/Deficit	3010	1458	3264	3710	2908	2018	1372	1212	3222	5157	8849	8986	7144	3301	3864
1940 Regional Surplus/Deficit	1931	818	1875	3685	3244	3579	995	2351	6344	7904	8571	5587	7924	1898	3916
1941 Regional Surplus/Deficit	1387	867	2527	3233	3172	2238	529	1281	3710	2538	3329	2039	4115	2952	2486
1942 Regional Surplus/Deficit	2813	1853	3634	2643	3157	4175	2917	3902	1328	3084	7025	5649	11316	7706	4472
1943 Regional Surplus/Deficit	5377	3085	3334	3615	2974	3265	5900	6558	6669	12877	12223	10568	11899	8743	6678
1944 Regional Surplus/Deficit	4846	2274	1763	3614	3271	2332	783	1323	2189	2092	3662	551	3046	1615	2240
1945 Regional Surplus/Deficit	2698	1556	3212	2368	1922	1574	644	212	1148	833	-872	6724	9281	2996	2684
1946 Regional Surplus/Deficit	3256	1532	2244	3159	4055	3929	5443	2870	7840	9746	12110	11375	11045	7928	6105
1947 Regional Surplus/Deficit	4613	2894	3393	3546	4109	8094	7810	8546	8834	8810	9174	9123	11518	7726	7111
1948 Regional Surplus/Deficit	4025	2478	3116	8027	7638	5189	10115	3728	5158	6650	10642	12000	12116	10228	7448
1949 Regional Surplus/Deficit	7041	5323	4226	4539	3749	3399	1213	4537	8261	9448	12020	11271	11541	3069	6049
1950 Regional Surplus/Deficit	3027	963	1803	3547	3667	3418	6625	8049	10780	11059	10575	9611	11461	9821	6787
1951 Regional Surplus/Deficit	5916	4437	3695	6172	7167	9656	11374	12015	10506	12547	12139	10923	11032	10266	9183
1952 Regional Surplus/Deficit	6701	3323	3416	7069	5624	5507	9399	5982	3544	10740	12244	12049	12030	6763	7318
1953 Regional Surplus/Deficit	4444	2670	2488	3450	2669	2143	3090	7884	4017	2553	6514	9636	12032	10512	5486
1954 Regional Surplus/Deficit	5095	3117	3244	4508	4296	4993	6630	9514	5281	8607	8580	10354	11360	10434	6927
1955 Regional Surplus/Deficit	9576	8604	7291	4675	5744	4392	2316	1918	2500	3765	4866	5362	11663	10338	5805
1956 Regional Surplus/Deficit	7415	4566	3193	5483	7194	8821	11663	9034	10067	11435	12068	11551	11970	10502	8935
1957 Regional Surplus/Deficit	5449	4113	3526	5058	3571	4664	4177	4000	7417	9069	8782	11831	11844	5007	6235
1958 Regional Surplus/Deficit	3723	1509	2821	3615	3424	2853	3892	7759	5267	7356	9976	11731	11779	4812	5746
1959 Regional Surplus/Deficit	3616	2182	2584	4170	5301	7016	10890	9312	4499	10683	8654	9498	11300	7036	6998
1960 Regional Surplus/Deficit	5697	3759	7642	9068	9401	7549	7388	5835	6202	12446	10291	7944	11351	6741	7922
1961 Regional Surplus/Deficit	4664	1900	3242	3834	3827	2482	6836	6015	7187	10056	6104	9767	11120	5710	5937
1962 Regional Surplus/Deficit	4023	3111	2347	3055	3589	3941	4710	5070	2653	8028	12154	9057	11386	4183	5287
1963 Regional Surplus/Deficit	4052	2227	2264	5083	5659	6612	6266	7366	2072	5124	5840	7070	11697	6977	5792
1964 Regional Surplus/Deficit	5085	2909	3179	3365	3824	3377	3637	4761	2170	5735	3945	8236	12237	10359	5325
1965 Regional Surplus/Deficit	7325	3383	4876	5488	4980	8683	11536	11915	8640	8530	12240	10936	11705	6692	8413
1966 Regional Surplus/Deficit	6184	4611	3937	4716	3629	3001	5780	3197	1626	11709	7622	7443	9487	7158	5416
1967 Regional Surplus/Deficit	4964	2737	2719	3436	3169	3937	10524	9877	4433	6186	3194	8017	12024	9770	6356
1968 Regional Surplus/Deficit	6134	3228	3366	4542	3787	3649	7614	7673	6323	2608	4288	5396	11480	8755	5883
1969 Regional Surplus/Deficit	5963	4320	6166	6062	7159	5648	11196	8806	5811	12637	12026	11890	11710	8368	8342
1970 Regional Surplus/Deficit	3710	1917	2973	4458	3840	2183	2996	6742	4877	5349	5109	7480	12083	5712	5094
1971 Regional Surplus/Deficit	3605	1402	2259	3531	3530	3660	11004	11693	9210	10842	11137	11809	12108	11018	7757
1972 Regional Surplus/Deficit	7958	4930	4046	4957	4279	3949	10867	10840	12468	12766	10522	11726	12143	10543	8649
1973 Regional Surplus/Deficit	9269	7020	4643	4546	3799	5085	4062	2161	2335	883	3853	4515	5493	3512	4232
1974 Regional Surplus/Deficit	1799	575	2176	3347	2688	6812	11820	12077	12132	12576	12043	11107	12014	10675	8181
1975 Regional Surplus/Deficit	7294	5280	3767	3236	3453	2710	5830	5189	6768	3745	6165	10269	12110	10915	6296
1976 Regional Surplus/Deficit	4410	4295	4316	6256	7496	11284	11472	10380	6921	12097	11359	11529	11970	10373	9000
1977 Regional Surplus/Deficit	10068	10051	8881	4402	3492	2274	687	1583	1867	1251	1655	-340	1815	1681	3155
1978 Regional Surplus/Deficit	3186	2169	2879	1438	2138	4822	4193	4014	4755	10461	7872	9220	9545	7211	5168
1979 Regional Surplus/Deficit	3853	3141	6026	4497	3638	2429	1411	4315	6689	5015	4827	8322	6071	2886	4552
1980 Regional Surplus/Deficit	1377	762	2008	3199	3082	3644	707	3430	2409	4799	9540	11210	11638	4639	4506
1981 Regional Surplus/Deficit	3134	1428	3132	3521	4114	8418	10694	4932	5688	2812	5563	6425	11546	9669	6227
1982 Regional Surplus/Deficit	7450	5680	3413	4178	4399	3893	7779	11884	11259	10292	8922	10943	11753	9056	7876
1983 Regional Surplus/Deficit	7489	4260	5671	5975	4946	5096	9699	6631	12203	9251	9689	9413	11441	10744	8102
1984 Regional Surplus/Deficit	7602	4507	4472	4415	8344	4180	11494	4961	10603	10936	10798	7053	12099	9472	7834
1985 Regional Surplus/Deficit	5529	2702	3890	4355	5269	3239	4032	1637	5294	9479	9806	9571	8184	2451	5138
1986 Regional Surplus/Deficit	951	572	2775	4295	5997	1550	7067	7969	12283	12108	9938	6321	10267	5509	6295
1987 Regional Surplus/Deficit	3901	1866	2420	3331	4822	3096	1129	2860	3910	5860	5500	5454	7766	3096	3859
1988 Regional Surplus/Deficit	1865	633	1903	2698	2607	1446	-29	762	1551	2366	4855	4073	2973	3808	2221
1989 Regional Surplus/Deficit	3555	1886	2335	2417	2847	2906	565	2353	4678	9536	10977	8417	8241	3608	4269
1990 Regional Surplus/Deficit	1327	1189	2379	3204	3937	5641	8421	6176	4881	9750	11220	7598	11214	6124	5930
1991 Regional Surplus/Deficit	4724	3623	2169	2994	7496	5741	9565	9759	3631	8485	7294	9508	10701	10110	6961
1992 Regional Surplus/Deficit	7236	4130	2849	2980	3147	1719	1485	1289	5636	3716	4274	3041	4041	2539	3203

Table A-30: Regional Surplus/Deficit - By Water Year
PNW Loads and Resource Study
2011 - 2012 Operating Year
[61] 2009 White Book - 30 Minute Wind (Final)

Continued 7/22/2009

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1993 Regional Surplus/Deficit	930	693	1437	2783	2656	2128	616	1440	2621	4429	4055	7505	5968	4627	3073
1994 Regional Surplus/Deficit	3521	2690	1709	2858	3532	2543	769	2676	2154	2275	7949	4047	5062	3318	3066
1995 Regional Surplus/Deficit	1562	767	1700	2613	2558	3040	2767	7039	8139	8010	4999	7393	10223	6660	4968
1996 Regional Surplus/Deficit	4110	2241	2862	4924	9592	11313	11563	12083	12115	11708	12359	11194	11747	10431	9406
1997 Regional Surplus/Deficit	6956	3098	3573	4364	4046	5516	11817	12164	12406	11308	12068	11387	12058	10773	8720
1998 Regional Surplus/Deficit	7193	4438	6225	9108	6172	3595	7309	6741	6081	6484	6271	7866	11956	6933	7005
-Ranked Averages-															
Top Ten Percent	6299	3850	3794	5378	6394	8460	11470	11204	10446	11484	11822	11321	11804	9940	8901
Middle Eighty Percent	4664	2944	3401	4098	4204	4041	5477	5481	5438	7367	8147	8393	10249	6719	5747
Bottom Ten Percent	2756	1360	2275	3106	2851	1970	665	852	1728	1981	2451	2655	4568	2895	2319

Table A-30: Regional Surplus/Deficit - By Water Year
PNW Loads and Resource Study
2012 - 2013 Operating Year
[61] 2009 White Book - 30 Minute Wind (Final)

7/22/2009

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1929 Regional Surplus/Deficit	3868	1506	2443	3297	2858	1567	644	619	1162	1649	3323	1054	5261	3118	2266
1930 Regional Surplus/Deficit	2397	661	1955	2905	2185	1355	351	583	1241	1884	5317	328	2326	2710	1755
1931 Regional Surplus/Deficit	986	629	1625	2570	2627	1504	456	463	979	2626	-140	994	1898	2757	1498
1932 Regional Surplus/Deficit	2794	1318	2426	1829	1651	1173	-248	-308	2935	6071	10801	9939	11991	4834	3901
1933 Regional Surplus/Deficit	2508	2002	2594	3072	2624	3173	7688	4619	1898	6118	6466	7031	12139	10268	5303
1934 Regional Surplus/Deficit	6803	4580	3813	5071	6922	10995	10949	11133	8510	11550	10747	7615	7545	4350	7786
1935 Regional Surplus/Deficit	1557	724	2190	2925	2484	2261	6534	7522	1325	3534	5719	6766	6845	6584	4242
1936 Regional Surplus/Deficit	4883	1970	1875	2769	2199	1166	-1008	966	1500	3303	9264	8287	10001	3393	3402
1937 Regional Surplus/Deficit	3207	1412	1345	2739	2568	1433	537	-160	491	528	122	2425	3436	2111	1639
1938 Regional Surplus/Deficit	3639	1847	2117	2895	2838	2986	7019	3117	5277	7726	11875	10134	8778	5686	5291
1939 Regional Surplus/Deficit	2373	960	2736	3171	2372	1382	910	711	2960	4825	8562	8297	5514	2862	3280
1940 Regional Surplus/Deficit	1291	319	1342	3146	2709	2946	532	1849	6083	7575	8283	5108	6296	1457	3348
1941 Regional Surplus/Deficit	748	370	1997	2693	2636	1603	534	751	2957	2205	3038	1556	2480	2513	1912
1942 Regional Surplus/Deficit	2180	1359	3107	2102	2620	3539	2456	3404	1065	2750	6734	5169	9688	7271	3902
1943 Regional Surplus/Deficit	4754	2595	2805	3076	2436	2628	5430	6049	6386	12639	12255	9571	12292	8304	6243
1944 Regional Surplus/Deficit	4217	1776	1226	3074	2735	1696	743	793	1896	1734	2659	36	1409	1173	1666
1945 Regional Surplus/Deficit	2063	1060	2683	1828	1385	939	181	-290	885	498	-1170	6244	7649	2554	2117
1946 Regional Surplus/Deficit	2621	1035	1711	2619	3519	3294	4979	2369	7527	9365	12137	10227	9416	7493	5491
1947 Regional Surplus/Deficit	3987	2401	2863	3005	3571	7461	7343	8039	8512	8481	8887	8646	10307	7277	6563
1948 Regional Surplus/Deficit	3396	1982	2586	7492	7100	4556	9639	3227	4898	6320	10292	10935	12511	9545	6979
1949 Regional Surplus/Deficit	6422	4839	3698	4000	3212	2764	751	4030	7938	9114	11801	10747	10158	2628	5495
1950 Regional Surplus/Deficit	2389	462	1267	3007	3130	2783	6157	7542	10450	10678	10288	8679	11853	9385	6330
1951 Regional Surplus/Deficit	5290	3947	3166	5634	6629	9026	11387	12062	9040	12315	11879	9765	9403	9597	8512
1952 Regional Surplus/Deficit	6082	2830	2885	6532	5089	4873	8923	5474	3283	10335	11949	10832	10799	6327	6715
1953 Regional Surplus/Deficit	3816	2175	1955	2910	2133	1508	2627	7377	3756	2219	6224	8959	12420	9983	5048
1954 Regional Surplus/Deficit	4468	2623	2714	3969	3760	4360	6162	8998	5020	8277	8290	9239	11748	10406	6493
1955 Regional Surplus/Deficit	8720	8107	6753	4136	5210	3759	1855	1419	2240	3432	4576	4882	12049	10310	5434
1956 Regional Surplus/Deficit	6796	4080	2661	4945	6654	8189	11674	7612	9701	10927	12098	10399	12358	10047	8437
1957 Regional Surplus/Deficit	4824	3622	2996	4518	3034	4030	3718	3501	7103	8710	8493	11213	12240	4568	5819
1958 Regional Surplus/Deficit	3089	1011	2290	3075	2888	2217	3432	7252	5008	7027	9677	11098	11525	4374	5267
1959 Regional Surplus/Deficit	2982	1687	2052	3631	4765	6384	10860	7694	4237	10304	8323	8383	11693	6598	6479
1960 Regional Surplus/Deficit	5074	3269	7105	8532	8859	6918	6922	5338	5943	12212	9865	7337	10402	6305	7399
1961 Regional Surplus/Deficit	4033	1402	2713	3295	3290	1848	6370	5506	6899	9678	5815	8689	11515	5274	5475
1962 Regional Surplus/Deficit	3393	2620	1815	2515	3053	3307	4251	4572	2392	7696	12177	8345	10336	3744	4757
1963 Regional Surplus/Deficit	3419	1733	1732	4544	5124	5980	5798	6858	1809	4792	5550	6589	10069	6542	5214
1964 Regional Surplus/Deficit	4461	2416	2649	2825	3287	2743	3177	4265	1909	5401	3652	7728	12596	10335	4951
1965 Regional Surplus/Deficit	6708	2893	4350	4951	4445	8051	11548	11184	7816	8038	12266	9796	10633	6254	7803
1966 Regional Surplus/Deficit	5562	4126	3407	4177	3093	2367	5312	2699	1363	11332	7334	6937	7859	6723	4847
1967 Regional Surplus/Deficit	4339	2242	2187	2897	2632	3302	9885	9363	4171	5855	2902	7534	12407	9084	5902
1968 Regional Surplus/Deficit	5514	2737	2838	4002	3250	3014	7148	7165	6063	2274	3999	4917	10263	8068	5318
1969 Regional Surplus/Deficit	5342	3833	5633	5525	6625	5015	11209	7262	5548	12366	12050	10704	10337	7827	7697
1970 Regional Surplus/Deficit	3081	1420	2442	3919	3305	1548	2532	6235	4617	5018	4819	7001	11723	5274	4621
1971 Regional Surplus/Deficit	2970	904	1726	2991	2994	3024	10526	11141	8890	10461	10781	10651	12492	10995	7302
1972 Regional Surplus/Deficit	7338	4447	3518	4418	3741	3315	10391	10324	12367	12528	10236	10590	12515	10515	8230
1973 Regional Surplus/Deficit	8482	6544	4115	4006	3262	4451	3601	1660	2073	549	3563	4035	3860	3073	3659
1974 Regional Surplus/Deficit	1159	75	1642	2808	2148	6179	11839	12140	11702	12342	12072	10003	12401	10645	7831
1975 Regional Surplus/Deficit	6675	4798	3238	2696	2917	2075	5360	4692	6508	3412	5876	9225	12495	10892	5880
1976 Regional Surplus/Deficit	3779	3804	3788	5717	6954	10654	11484	9270	6626	11711	11057	10360	10990	10345	8442
1977 Regional Surplus/Deficit	9055	9256	8350	3863	2956	1638	656	1049	1569	891	600	-825	179	1241	2555
1978 Regional Surplus/Deficit	2555	1677	2349	897	1600	4186	3732	3514	4493	10083	7584	8533	7914	6773	4579
1979 Regional Surplus/Deficit	3223	2648	5484	3958	3102	1794	949	3817	6421	4685	4535	7843	4436	2446	3979
1980 Regional Surplus/Deficit	737	263	1475	2661	2546	3010	710	2414	2147	4467	9253	10497	10008	4200	3917
1981 Regional Surplus/Deficit	2499	930	2602	2981	3579	7788	9896	4694	5429	2479	5273	5945	11936	8805	5780
1982 Regional Surplus/Deficit	6760	5202	2884	3639	3864	3258	7313	11297	10889	9911	8634	9791	12132	8618	7381
1983 Regional Surplus/Deficit	6872	3774	5127	5436	4410	4461	9221	6122	11508	8870	9403	8936	9799	10370	7498
1984 Regional Surplus/Deficit	6984	4020	3944	3875	7800	3545	11009	4460	10232	10557	10469	6572	11739	9037	7359
1985 Regional Surplus/Deficit	4904	2206	3361	3815	4733	2604	3572	1600	4612	9097	9508	9094	6551	2010	4573
1986 Regional Surplus/Deficit	308	70	2240	3756	5462	914	6598	7432	12194	11705	9650	5840	8636	5073	5725
1987 Regional Surplus/Deficit	3272	1370	1886	2791	4286	2461	964	2012	3648	5531	5210	4974	6097	2657	3285
1988 Regional Surplus/Deficit	1225	132	1369	2159	2072	819	-492	261	1288	2032	4563	3585	1337	3370	1651
1989 Regional Surplus/Deficit	2924	1392	1804	1877	2310	2272	335	1584	4415	9154	10681	7767	6609	3168	3683
1990 Regional Surplus/Deficit	685	689	1847	2664	3401	5009	7940	5681	4620	9424	11012	6847	10643	5687	5423
1991 Regional Surplus/Deficit	4099	3132	1636	2454	6962	5109	8954	9244	3370	8157	7007	8649	9073	10085	6371
1992 Regional Surplus/Deficit	6545	3645	2318	2441	2610	1082	1024	968	5376	3219	3961	2546	2409	2099	2638

Table A-30: Regional Surplus/Deficit - By Water Year
PNW Loads and Resource Study
2012 - 2013 Operating Year
[61] 2009 White Book - 30 Minute Wind (Final)

Continued 7/22/2009

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1993 Regional Surplus/Deficit	289	194	902	2243	2121	1486	154	940	2357	4093	3747	7024	4332	4187	2501
1994 Regional Surplus/Deficit	2889	2195	1173	2318	2997	1909	378	2172	1887	1937	7533	3566	3430	2879	2494
1995 Regional Surplus/Deficit	922	268	1166	2074	2021	2406	2306	6529	7817	7681	4709	6913	8590	6222	4383
1996 Regional Surplus/Deficit	3477	1745	2332	4385	9050	11390	11574	12130	11856	11218	12390	10063	11527	10407	9071
1997 Regional Surplus/Deficit	6339	2608	3044	3824	3509	4882	11832	12218	11857	10928	12100	10255	12429	10745	8353
1998 Regional Surplus/Deficit	6574	3951	5682	8573	5637	2961	6841	6233	5821	6154	5981	7384	12340	6496	6599
-Ranked Averages-															
Top Ten Percent	4883	2958	2879	4533	5527	7662	11454	10822	10450	11710	11690	10205	11660	10329	8411
Middle Eighty Percent	4118	2496	2918	3597	3708	3452	5063	4934	5069	6950	7864	7682	9409	6240	5225
Bottom Ten Percent	2121	863	1743	2567	2315	1336	330	343	1391	1644	2056	2167	2933	2455	1748

Table A-30: Regional Surplus/Deficit - By Water Year
PNW Loads and Resource Study
2013 - 2014 Operating Year
[61] 2009 White Book - 30 Minute Wind (Final)

7/22/2009

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1929 Regional Surplus/Deficit	3712	1066	2167	2942	2457	1350	-366	-180	183	1369	2838	817	5873	2562	1858
1930 Regional Surplus/Deficit	2238	221	1679	2550	1786	1122	-491	-227	252	1595	4558	92	2940	2154	1346
1931 Regional Surplus/Deficit	827	189	1348	2215	2228	1118	-373	-336	1.3	2347	-630	759	2513	2203	1091
1932 Regional Surplus/Deficit	2638	880	2150	1474	1250	1007	-1095	-1356	1955	5791	10397	9881	11922	4279	3454
1933 Regional Surplus/Deficit	2350	1564	2318	2718	2222	2787	6866	3823	919	5843	5983	6974	12053	10197	4895
1934 Regional Surplus/Deficit	6606	4146	3537	4717	6525	11079	10953	10631	7465	11798	10412	7581	8309	3675	7553
1935 Regional Surplus/Deficit	1397	285	1914	2571	2081	1874	5711	6729	347	3255	5236	6615	7461	6033	3843
1936 Regional Surplus/Deficit	4730	1532	1598	2414	1799	1093	-1858	-196	521	3024	8780	8057	10698	2839	3000
1937 Regional Surplus/Deficit	3050	974	1068	2385	2168	1147	-300	-968	-496	46	-369	2191	4048	1554	1230
1938 Regional Surplus/Deficit	3483	1410	1841	2540	2436	2599	6196	2319	4301	7451	11472	10079	9396	5133	4904
1939 Regional Surplus/Deficit	2215	520	2460	2816	1972	1175	606	-136	1208	4547	8080	8146	6131	2306	2871
1940 Regional Surplus/Deficit	1132	-121	1065	2792	2310	2561	-298	1049	5107	7300	7801	4878	6916	901	2941
1941 Regional Surplus/Deficit	588	-69	1720	2338	2235	1216	317	-88	1331	1927	2554	1323	3092	1957	1498
1942 Regional Surplus/Deficit	2022	920	2831	1745	2219	3152	1627	2606	87	2470	6250	4938	10307	6720	3496
1943 Regional Surplus/Deficit	4600	2158	2529	2721	2034	2239	4603	5251	5409	13055	12244	9526	12211	7749	5843
1944 Regional Surplus/Deficit	4060	1336	947	2718	2334	1616	319	-63	864	1412	814	-199	2020	615	1252
1945 Regional Surplus/Deficit	1906	620	2408	1472	984	552	-650	-1092	-93	218	-1661	6013	8264	1997	1710
1946 Regional Surplus/Deficit	2463	595	1434	2263	3118	2908	4150	1569	6551	9091	11856	10170	10035	6941	5108
1947 Regional Surplus/Deficit	3831	1963	2587	2649	3170	7077	6518	7243	7539	8207	8405	8418	11004	6741	6166
1948 Regional Surplus/Deficit	3239	1543	2309	7140	6702	4171	8817	2427	3921	6044	9876	10893	12431	9071	6542
1949 Regional Surplus/Deficit	6269	4405	3422	3645	2811	2377	524	2535	6963	8840	11397	10527	10777	2071	5092
1950 Regional Surplus/Deficit	2230	21	989	2651	2728	2396	5332	6747	9477	10404	9806	8622	11773	8833	5882
1951 Regional Surplus/Deficit	5135	3510	2889	5279	6229	8643	11307	11063	6141	12117	11426	9711	10021	9131	8019
1952 Regional Surplus/Deficit	5929	2391	2608	6179	4689	4488	8102	4676	2306	10061	11479	10792	11418	5774	6328
1953 Regional Surplus/Deficit	3661	1737	1678	2556	1733	1140	1775	6582	2779	1940	5740	8809	12341	9509	4598
1954 Regional Surplus/Deficit	4313	2185	2438	3614	3359	3974	5337	8205	4044	8001	7807	9189	11670	10328	6087
1955 Regional Surplus/Deficit	8453	7626	6459	3782	4811	3375	1026	620	1264	3153	4091	4652	11967	10233	5004
1956 Regional Surplus/Deficit	6643	3645	2384	4591	6255	7806	11052	6223	8728	10654	12096	10342	12275	9573	7988
1957 Regional Surplus/Deficit	4668	3185	2720	4164	2633	3643	2891	2702	6128	8433	8011	11063	12160	4014	5363
1958 Regional Surplus/Deficit	2932	571	2013	2720	2488	1829	2604	6456	4032	6752	9194	10947	12093	3820	4864
1959 Regional Surplus/Deficit	2824	1248	1775	3277	4364	6000	10090	6899	3259	10032	7887	8324	11620	6044	6038
1960 Regional Surplus/Deficit	4919	2831	6811	8181	8463	6535	6098	4541	4968	12314	9461	7186	11022	5753	7020
1961 Regional Surplus/Deficit	3876	963	2437	2940	2889	1461	5546	4708	5925	9406	5332	8647	11437	4721	5029
1962 Regional Surplus/Deficit	3237	2183	1538	2160	2652	2921	3424	3774	1415	7418	11946	8208	11033	3188	4376
1963 Regional Surplus/Deficit	3261	1294	1455	4189	4724	5596	4974	6061	831	4515	5066	6358	10688	5989	4809
1964 Regional Surplus/Deficit	4306	1978	2373	2469	2886	2357	2349	3470	932	5121	3165	7533	12522	10164	4524
1965 Regional Surplus/Deficit	6555	2456	4075	4597	4046	7667	11180	9448	6841	7762	12258	9737	11252	5700	7400
1966 Regional Surplus/Deficit	5409	3690	3130	3822	2692	1981	4486	1901	383	11062	6852	6739	8478	6172	4445
1967 Regional Surplus/Deficit	4184	1804	1911	2542	2231	2917	9115	8571	3195	5579	2416	7313	12330	8610	5452
1968 Regional Surplus/Deficit	5362	2300	2562	3648	2849	2628	6324	6368	5088	1995	3515	4687	10899	7594	4922
1969 Regional Surplus/Deficit	5189	3398	5343	5171	6226	4631	10512	6338	4547	12095	11798	10657	10957	7353	7323
1970 Regional Surplus/Deficit	2926	981	2165	3564	2905	1161	1700	5439	3640	4741	4335	6771	12342	4719	4215
1971 Regional Surplus/Deficit	2812	464	1448	2635	2592	2637	9703	10347	7915	10186	10371	10596	12406	10914	6897
1972 Regional Surplus/Deficit	7136	4013	3242	4062	3340	2929	9569	9530	12307	13019	9755	10530	12448	10438	7932
1973 Regional Surplus/Deficit	8278	6112	3839	3651	2861	4065	2771	1567	1052	240	3010	3634	3989	2517	3243
1974 Regional Surplus/Deficit	1000	-366	1365	2453	1745	5795	11846	12163	10730	12495	12063	9935	12320	10567	7594
1975 Regional Surplus/Deficit	6522	4364	2962	2339	2516	1687	4532	3894	5532	3133	5393	9168	12411	10809	5472
1976 Regional Surplus/Deficit	3622	3366	3512	5363	6556	10273	11313	7007	5630	11435	10573	10308	11608	9936	8006
1977 Regional Surplus/Deficit	8788	8711	8058	3508	2555	1251	646	180	518	557	-1287	-1060	791	685	2136
1978 Regional Surplus/Deficit	2399	1239	2072	540	1198	3798	2903	2714	3516	9812	7102	8422	8531	6219	4183
1979 Regional Surplus/Deficit	3067	2210	5190	3605	2702	1408	677	2360	5446	4409	4050	7614	5049	1889	3568
1980 Regional Surplus/Deficit	577	-177	1198	2306	2146	2624	697	693	1169	4190	8772	10347	10626	3645	3516
1981 Regional Surplus/Deficit	2341	491	2325	2626	3178	7405	9207	3672	4455	2200	4788	5714	11853	8396	5324
1982 Regional Surplus/Deficit	6557	4769	2608	3284	3464	2872	6489	10503	9916	9636	8151	9735	12055	8064	6932
1983 Regional Surplus/Deficit	6720	3338	4831	5082	4010	4075	8398	5324	10536	8595	8922	8709	10414	9896	7099
1984 Regional Surplus/Deficit	6832	3584	3668	3519	7402	3158	10187	3660	9259	10283	9988	6340	12357	8485	6955
1985 Regional Surplus/Deficit	4750	1766	3085	3459	4331	2218	2745	1608	2878	8821	9026	8866	7166	1453	4164
1986 Regional Surplus/Deficit	146	-371	1962	3401	5064	528	5876	6624	11424	11461	9168	5609	9060	4519	5330
1987 Regional Surplus/Deficit	3116	931	1608	2435	3885	2074	953	236	2671	5257	4726	4743	6759	2102	2877
1988 Regional Surplus/Deficit	1066	-308	1092	1805	1672	1018	-1365	-581	319	1750	4033	2892	1947	2805	1246
1989 Regional Surplus/Deficit	2767	954	1528	1521	1856	1817	323	352	2934	8880	10200	7617	7226	2612	3268
1990 Regional Surplus/Deficit	524	249	1570	2309	3000	4625	7124	4886	3644	9152	10682	6727	11397	5134	5045
1991 Regional Surplus/Deficit	3944	2695	1358	2098	6564	4725	8183	8452	2393	7884	6526	8599	9693	9703	6001
1992 Regional Surplus/Deficit	6343	3210	2042	2086	2209	1194	154	974	3260	2749	3449	2297	3025	1544	2223

Table A-30: Regional Surplus/Deficit - By Water Year
PNW Loads and Resource Study
2013 - 2014 Operating Year
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Continued 7/22/2009

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1993 Regional Surplus/Deficit	129	-245	624	1889	1720	1091	-676	141	1376	3813	3239	6793	4943	3632	2092
1994 Regional Surplus/Deficit	2732	1755	894	1963	2598	1523	-233	1356	895	1646	6654	3335	4046	2325	2087
1995 Regional Surplus/Deficit	763	-172	889	1719	1620	2019	1477	5730	6844	7407	4224	6684	9205	5668	3977
1996 Regional Surplus/Deficit	3319	1306	2057	4031	8653	11609	11567	12150	10820	10763	12386	10000	12060	10002	8877
1997 Regional Surplus/Deficit	6183	2171	2767	3469	3108	4497	11835	11525	10762	10655	12091	10194	12369	10672	8035
1998 Regional Surplus/Deficit	6420	3515	5386	8223	5238	2575	6015	5437	4846	5879	5498	7151	12268	5943	6136
-Ranked Averages-															
Top Ten Percent	4720	2521	2602	4178	5127	7364	11213	9951	9303	11591	11484	10146	11871	10046	8064
Middle Eighty Percent	3954	2055	2639	3242	3307	3099	4357	4081	4036	6697	7390	7525	9800	5748	4817
Bottom Ten Percent	1962	423	1466	2212	1915	1113	-363	-479	311	1328	1328	1867	3546	1898	1339

Table A-30: Regional Surplus/Deficit - By Water Year
PNW Loads and Resource Study
2014 - 2015 Operating Year
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Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1929 Regional Surplus/Deficit	2868	509	1561	2372	1871	910	-840	-336	-6	681	2469	535	4483	1999	1317
1930 Regional Surplus/Deficit	1391	-337	1073	1980	1200	764	-694	-405	35	881	3533	-191	1550	1591	803
1931 Regional Surplus/Deficit	-21	-368	743	1645	1641	681	-566	-516	-211	1636	-1499	477	1122	1640	549
1932 Regional Surplus/Deficit	1793	325	1546	903	664	284	-1266	-1512	1766	5102	10028	9599	11622	3717	3005
1933 Regional Surplus/Deficit	1503	1009	1714	2147	1636	2065	6696	3668	730	5154	5614	6691	12053	9749	4481
1934 Regional Surplus/Deficit	5810	3594	2933	4147	5939	10408	10862	10475	7276	11110	10042	7298	6919	3112	7028
1935 Regional Surplus/Deficit	549	-272	1309	2000	1495	1151	5541	6574	157	2567	4867	6333	6071	5470	3304
1936 Regional Surplus/Deficit	3888	976	993	1843	1213	444	-2032	-437	332	2336	8411	7774	9307	2277	2461
1937 Regional Surplus/Deficit	2205	418	462	1814	1582	791	-505	-1154	-716	-1271	-738	1908	2657	991	688
1938 Regional Surplus/Deficit	2638	854	1236	1970	1850	1876	6025	2163	4111	6762	11103	9796	8006	4571	4365
1939 Regional Surplus/Deficit	1368	-37	1856	2245	1385	452	514	-297	933	3859	7711	7864	4740	1743	2331
1940 Regional Surplus/Deficit	283	-679	459	2222	1723	1838	-468	893	4917	6612	7432	4596	5525	338	2402
1941 Regional Surplus/Deficit	-260	-626	1115	1767	1649	493	147	-244	1141	1238	2185	1041	1702	1394	959
1942 Regional Surplus/Deficit	1176	364	2227	1175	1633	2429	1457	2450	-102	1781	5881	4656	8917	6157	2957
1943 Regional Surplus/Deficit	3757	1604	1924	2150	1448	1517	4433	5095	5219	12367	12214	9243	12208	7187	5432
1944 Regional Surplus/Deficit	3215	778	339	2148	1748	927	112	-218	675	723	445	-482	630	53	712
1945 Regional Surplus/Deficit	1060	64	1803	902	398	-170	-820	-1248	-283	-471	-2031	5730	6874	1434	1171
1946 Regional Surplus/Deficit	1617	38	828	1693	2532	2185	3980	1413	6362	8402	11487	9887	8644	6379	4569
1947 Regional Surplus/Deficit	2987	1407	1982	2078	2584	6354	6348	7087	7349	7519	8036	8135	9613	6179	5627
1948 Regional Surplus/Deficit	2394	986	1704	6570	6116	3448	8647	2272	3732	5356	9507	10611	12418	8509	6116
1949 Regional Surplus/Deficit	5427	3852	2817	3074	2225	1655	432	2286	6774	8151	11028	10244	9387	1508	4553
1950 Regional Surplus/Deficit	1382	-537	382	2081	2142	1674	5162	6591	9287	9716	9437	8340	11768	8270	5457
1951 Regional Surplus/Deficit	4290	2956	2284	4709	5643	7921	11136	10907	5952	11428	11057	9428	8631	8568	7480
1952 Regional Surplus/Deficit	5087	1836	2003	5608	4103	3766	7931	4521	2117	9372	11110	10510	10027	5212	5789
1953 Regional Surplus/Deficit	2817	1180	1072	1985	1147	418	1605	6426	2589	1251	5371	8527	12327	8946	4172
1954 Regional Surplus/Deficit	3469	1629	1832	3044	2773	3252	5167	8050	3855	7312	7438	8907	11508	10309	5695
1955 Regional Surplus/Deficit	7728	7129	5858	3211	4225	2652	856	464	1074	2465	3722	4370	11961	10209	4632
1956 Regional Surplus/Deficit	5801	3092	1779	4020	5669	7083	10881	6067	8539	9966	12021	10060	12270	9011	7575
1957 Regional Surplus/Deficit	3824	2630	2114	3593	2047	2921	2720	2546	5938	7745	7642	10780	12156	3452	4938
1958 Regional Surplus/Deficit	2085	13	1408	2149	1902	1107	2433	6300	3843	6064	8825	10665	10832	3257	4336
1959 Regional Surplus/Deficit	1978	691	1169	2706	3778	5277	9920	6743	3070	9344	7518	8041	11110	5482	5572
1960 Regional Surplus/Deficit	4077	2277	6211	7610	7876	5812	5928	4386	4778	11626	9092	6904	9631	5190	6481
1961 Regional Surplus/Deficit	3031	406	1832	2369	2303	739	5376	4552	5735	8717	4963	8364	11318	4159	4595
1962 Regional Surplus/Deficit	2392	1628	932	1589	2066	2198	3254	3618	1225	6730	11577	7926	9642	2626	3837
1963 Regional Surplus/Deficit	2415	738	850	3619	4138	4873	4803	5906	641	3827	4697	6076	9298	5427	4270
1964 Regional Surplus/Deficit	3463	1422	1768	1899	2300	1635	2179	3314	742	4433	2795	7250	12501	9602	4097
1965 Regional Surplus/Deficit	5714	1901	3471	4027	3460	6944	11010	9292	6651	7073	11981	9455	9861	5137	6865
1966 Regional Surplus/Deficit	4566	3137	2524	3252	2106	1258	4316	1746	194	10374	6483	6457	7088	5610	3906
1967 Regional Surplus/Deficit	3342	1249	1305	1971	1645	2194	8944	8415	3005	4891	2047	7030	12322	8047	5027
1968 Regional Surplus/Deficit	4521	1745	1958	3077	2263	1906	6153	6212	4899	1307	3146	4405	9509	7031	4383
1969 Regional Surplus/Deficit	4348	2844	4740	4601	5640	3908	10342	6183	4357	11406	11429	10374	9566	6791	6785
1970 Regional Surplus/Deficit	2081	424	1560	2993	2318	601	1382	5251	3451	4052	3966	6489	10951	4157	3675
1971 Regional Surplus/Deficit	1966	-93	841	2065	2006	1915	9533	10191	7725	9498	10002	10314	12408	10871	6516
1972 Regional Surplus/Deficit	6346	3461	2638	3492	2754	2206	9399	9374	12118	12711	9386	10247	12428	10413	7569
1973 Regional Surplus/Deficit	7489	5562	3235	3081	2275	3343	2601	1524	855	-454	2629	3261	2598	1955	2707
1974 Regional Surplus/Deficit	152	-924	758	1882	1159	5072	11755	12121	10541	11807	11923	9652	12302	10547	7238
1975 Regional Surplus/Deficit	5680	3812	2358	1769	1930	964	4362	3738	5343	2444	5024	8885	12413	10781	5093
1976 Regional Surplus/Deficit	2776	2810	2907	4792	5970	9550	11143	6851	5440	10746	10204	10026	10218	9374	7467
1977 Regional Surplus/Deficit	8063	8278	7459	2937	1969	528	554	17	321	-137	-1779	-1343	-599	123	1608
1978 Regional Surplus/Deficit	1554	684	1467	337	624	2683	2732	2558	3326	9124	6732	8140	7141	5657	3643
1979 Regional Surplus/Deficit	2222	1654	4588	3034	2116	904	585	1829	5257	3721	3681	7332	3659	1327	3026
1980 Regional Surplus/Deficit	-271	-735	593	1736	1560	1902	605	447	979	3502	8402	10064	9236	3082	2976
1981 Regional Surplus/Deficit	1495	-67	1720	2056	2592	6682	9037	3516	4265	1511	4419	5432	11847	7833	4898
1982 Regional Surplus/Deficit	5768	4219	2004	2714	2878	2149	6318	10348	9727	8947	7782	9453	12036	7501	6509
1983 Regional Surplus/Deficit	5879	2785	4228	4511	3424	3353	8227	5168	10347	7907	8553	8427	9024	9333	6560
1984 Regional Surplus/Deficit	5990	3030	3063	2949	6816	2435	10017	3504	9069	9595	9619	6058	10967	7923	6416
1985 Regional Surplus/Deficit	3905	1209	2480	2888	3745	1495	2575	1565	2581	8133	8656	8584	5776	891	3625
1986 Regional Surplus/Deficit	-704	-930	1355	2830	4477	-195	5706	6468	11235	10772	8799	5327	7670	3957	4791
1987 Regional Surplus/Deficit	2272	374	1002	1864	3299	1351	861	-14	2482	4568	4357	4461	5369	1540	2337
1988 Regional Surplus/Deficit	218	-866	486	1234	1086	656	-1562	-763	102	1036	3623	2289	557	2243	701
1989 Regional Surplus/Deficit	1911	388	913	951	1270	1095	231	191	2661	8191	9831	7334	5835	2050	2726
1990 Regional Surplus/Deficit	-325	-309	964	1739	2414	3902	6954	4730	3455	8464	10313	6444	10006	4571	4506
1991 Regional Surplus/Deficit	3101	2141	753	1528	5978	4003	8013	8296	2204	7196	6157	8317	8302	9141	5463
1992 Regional Surplus/Deficit	5553	2658	1436	1516	1622	836	-47	931	2544	2061	3080	2015	1635	981	1679

Table A-30: Regional Surplus/Deficit - By Water Year
PNW Loads and Resource Study
2014 - 2015 Operating Year
[61] 2009 White Book - 30 Minute Wind (Final)

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Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1993 Regional Surplus/Deficit	-720	-802	18	1318	1134	707	-876	-48	1162	3101	2252	6510	3553	3069	1548
1994 Regional Surplus/Deficit	1886	1199	287	1393	2011	801	-403	1200	705	957	6285	3053	2656	1762	1548
1995 Regional Surplus/Deficit	-85	-729	283	1149	1034	1296	1306	5574	6654	6719	3854	6401	7815	5105	3438
1996 Regional Surplus/Deficit	2473	749	1452	3460	8067	11254	11475	12109	10631	10075	12529	9718	10779	9439	8415
1997 Regional Surplus/Deficit	5346	1617	2162	2899	2522	3774	11744	11260	10572	9967	12102	9911	12342	10174	7628
1998 Regional Surplus/Deficit	5578	2961	4784	7652	4652	1852	5845	5281	4656	5190	5129	6868	12208	5381	5707
-Ranked Averages-															
Top Ten Percent	3884	1966	1997	3608	4541	6694	11076	9813	9113	10957	11318	9863	11281	9647	7625
Middle Eighty Percent	3118	1503	2034	2678	2721	2396	4188	3917	3831	6009	7015	7241	8837	5226	4317
Bottom Ten Percent	1115	-134	860	1641	1329	592	-555	-650	106	539	788	1539	2156	1335	798

Table A-30: Regional Surplus/Deficit - By Water Year
PNW Loads and Resource Study
2015 - 2016 Operating Year
[61] 2009 White Book - 30 Minute Wind (Final)

7/22/2009

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1929 Regional Surplus/Deficit	2554	339	1351	2242	1624	393	-876	-623	70	52	1564	864	5191	2123	1214
1930 Regional Surplus/Deficit	1076	-507	863	1851	952	165	-1001	-670	138	277	3283	138	2258	1715	703
1931 Regional Surplus/Deficit	-336	-538	532	1516	1394	161	-883	-779	-113	1030	-1905	806	1831	1764	449
1932 Regional Surplus/Deficit	1478	155	1336	774	417	50	-1605	-1799	1841	4473	9123	9928	11241	3840	2803
1933 Regional Surplus/Deficit	1188	838	1504	2018	1389	1831	6357	3380	805	4525	4709	7020	11371	9758	4254
1934 Regional Surplus/Deficit	5495	3424	2723	4017	5692	10122	10444	10188	7351	10481	9137	7627	7628	3236	6926
1935 Regional Surplus/Deficit	235	-443	1098	1871	1248	917	5202	6286	233	1938	3961	6662	6780	5594	3213
1936 Regional Surplus/Deficit	3573	806	783	1714	966	137	-2368	-639	407	1707	7506	8104	10016	2400	2353
1937 Regional Surplus/Deficit	1890	247	252	1685	1335	190	-810	-1411	-610	-1272	-1643	2237	3366	1114	586
1938 Regional Surplus/Deficit	2323	684	1026	1840	1603	1642	5686	1875	4187	6133	10197	10125	8714	4694	4259
1939 Regional Surplus/Deficit	1053	-207	1646	2116	1138	218	96	-579	1094	3230	6806	8193	5449	1867	2225
1940 Regional Surplus/Deficit	-31	-849	248	2092	1476	1604	-808	606	4993	5983	6526	4925	6234	462	2298
1941 Regional Surplus/Deficit	-574	-796	905	1638	1402	259	-193	-531	1217	609	1279	1370	2410	1518	856
1942 Regional Surplus/Deficit	861	194	2017	1045	1386	2195	1117	2163	-27	1152	4975	4985	9625	6281	2855
1943 Regional Surplus/Deficit	3442	1434	1713	2021	1200	1283	4094	4808	5295	11738	10969	9572	11529	7310	5204
1944 Regional Surplus/Deficit	2900	608	129	2018	1500	659	-191	-506	750	94	-461	-153	1338	176	610
1945 Regional Surplus/Deficit	745	-107	1593	773	151	-405	-1160	-1536	-207	-1100	-2936	6059	7582	1558	1064
1946 Regional Surplus/Deficit	1302	-132	618	1563	2285	1951	3641	1126	6437	7773	10581	10216	9353	6502	4460
1947 Regional Surplus/Deficit	2672	1237	1771	1949	2337	6120	6009	6799	7425	6890	7131	8464	10322	6302	5531
1948 Regional Surplus/Deficit	2079	816	1494	6440	5869	3214	8308	1984	3808	4727	8602	10940	11750	8632	5893
1949 Regional Surplus/Deficit	5112	3682	2607	2945	1977	1421	15	2092	6849	7522	10122	10573	10096	1632	4447
1950 Regional Surplus/Deficit	1067	-708	171	1952	1895	1440	4823	6303	9363	9087	8532	8669	11091	8394	5246
1951 Regional Surplus/Deficit	3976	2785	2074	4579	5396	7687	10797	10619	6027	10799	10152	9757	9339	8691	7389
1952 Regional Surplus/Deficit	4773	1665	1792	5479	3855	3532	7592	4233	2192	8743	10205	10839	10736	5335	5685
1953 Regional Surplus/Deficit	2502	1010	862	1856	899	184	1266	6138	2665	622	4465	8856	11659	9070	3965
1954 Regional Surplus/Deficit	3154	1459	1622	2914	2526	3018	4827	7762	3931	6683	6533	9236	10989	9889	5454
1955 Regional Surplus/Deficit	7413	6958	5648	3082	3977	2418	516	177	1150	1836	2817	4699	11285	9794	4361
1956 Regional Surplus/Deficit	5486	2922	1568	3891	5422	6849	10542	5780	8614	9337	10822	10389	11593	9134	7345
1957 Regional Surplus/Deficit	3510	2460	1904	3464	1799	2687	2381	2259	6014	7116	6736	11109	11478	3575	4718
1958 Regional Surplus/Deficit	1770	-157	1197	2020	1654	872	2094	6013	3918	5435	7920	10994	11411	3381	4230
1959 Regional Surplus/Deficit	1663	521	959	2577	3531	5043	9581	6456	3146	8715	6613	8370	10938	5605	5402
1960 Regional Surplus/Deficit	3762	2106	6001	7481	7629	5578	5588	4098	4854	10997	8187	7233	10340	5314	6375
1961 Regional Surplus/Deficit	2716	235	1622	2240	2056	504	5037	4265	5811	8088	4058	8693	10755	4282	4390
1962 Regional Surplus/Deficit	2078	1458	722	1460	1819	1964	2915	3331	1301	6101	10672	8255	10351	2749	3736
1963 Regional Surplus/Deficit	2100	568	639	3489	3890	4639	4464	5618	717	3198	3792	6405	10006	5550	4174
1964 Regional Surplus/Deficit	3148	1252	1558	1769	2053	1401	1840	3027	818	3804	1890	7579	11840	9725	3883
1965 Regional Surplus/Deficit	5400	1731	3261	3898	3213	6710	10670	9005	6727	6444	10984	9784	10570	5261	6768
1966 Regional Surplus/Deficit	4252	2967	2314	3122	1859	1024	3976	1458	269	9745	5578	6786	7797	5733	3800
1967 Regional Surplus/Deficit	3027	1078	1095	1842	1398	1960	8605	8128	3081	4262	1141	7360	11648	8171	4823
1968 Regional Surplus/Deficit	4207	1575	1748	2948	2016	1672	5814	5925	4975	678	2240	4734	10217	7155	4288
1969 Regional Surplus/Deficit	4033	2674	4530	4472	5393	3674	10003	5895	4433	10777	10524	10703	10275	6914	6683
1970 Regional Surplus/Deficit	1767	254	1350	2864	2071	205	1191	4996	3526	3423	3061	6818	11660	4280	3581
1971 Regional Surplus/Deficit	1651	-263	631	1936	1759	1681	9193	9904	7801	8869	9096	10643	11724	10475	6268
1972 Regional Surplus/Deficit	6032	3290	2427	3363	2506	1972	9060	9087	12193	11701	8480	10576	11766	9999	7301
1973 Regional Surplus/Deficit	7174	5392	3024	2951	2027	3108	2262	1124	938	-1078	1735	3681	3307	2078	2603
1974 Regional Surplus/Deficit	-163	-1095	548	1753	911	4838	11336	11719	10616	11178	10788	9981	11638	10128	6968
1975 Regional Surplus/Deficit	5365	3642	2147	1640	1683	730	4022	3451	5419	1815	4118	9214	11729	10370	4830
1976 Regional Surplus/Deficit	2461	2640	2697	4663	5722	9316	10803	6564	5516	10117	9299	10355	10927	9497	7366
1977 Regional Surplus/Deficit	7748	8108	7249	2808	1722	294	136	-263	404	-760	-2561	-1014	109	246	1503
1978 Regional Surplus/Deficit	1239	513	1257	-160	365	2841	2393	2270	3402	8495	5827	8469	7849	5780	3541
1979 Regional Surplus/Deficit	1907	1484	4378	2905	1869	451	168	1917	5332	3092	2775	7661	4368	1450	2927
1980 Regional Surplus/Deficit	-586	-905	383	1606	1313	1667	187	250	1055	2873	7497	10393	9944	3206	2870
1981 Regional Surplus/Deficit	1180	-237	1509	1927	2345	6448	8698	3229	4341	882	3513	5761	11172	7957	4681
1982 Regional Surplus/Deficit	5453	4049	1793	2584	2631	1915	5979	10060	9802	8318	6877	9782	11373	7625	6306
1983 Regional Surplus/Deficit	5564	2614	4018	4382	3177	3118	7888	4881	10423	7278	7648	8756	9732	9457	6456
1984 Regional Surplus/Deficit	5675	2860	2852	2820	6569	2201	9678	3217	9145	8966	8713	6387	11675	8046	6308
1985 Regional Surplus/Deficit	3591	1039	2269	2759	3498	1261	2235	1165	2765	7504	7751	8913	6484	1014	3519
1986 Regional Surplus/Deficit	-1019	-1100	1145	2701	4230	-429	5366	6181	11310	10143	7894	5656	8379	4080	4695
1987 Regional Surplus/Deficit	1957	204	791	1735	3052	1117	443	-207	2557	3939	3452	4790	6078	1663	2231
1988 Regional Surplus/Deficit	-97	-1037	276	1105	839	61	-1874	-1024	205	433	2759	2939	1266	2366	602
1989 Regional Surplus/Deficit	1596	218	702	822	1023	861	-187	-91	2820	7562	8925	7663	6544	2173	2620
1990 Regional Surplus/Deficit	-640	-479	753	1610	2167	3668	6615	4443	3530	7835	9408	6773	10715	4695	4407
1991 Regional Surplus/Deficit	2786	1971	542	1398	5731	3769	7674	8009	2279	6567	5252	8646	9011	9264	5370
1992 Regional Surplus/Deficit	5238	2487	1226	1386	1375	237	-355	531	3146	1432	2174	2344	2343	1105	1584

Table A-30: Regional Surplus/Deficit - By Water Year
PNW Loads and Resource Study
2015 - 2016 Operating Year
[61] 2009 White Book - 30 Minute Wind (Final)

Continued 7/22/2009

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1993 Regional Surplus/Deficit	-1035	-972	-192	1189	887	134	-1185	-302	1262	2495	1964	6839	4261	3192	1448
1994 Regional Surplus/Deficit	1571	1028	77	1264	1764	567	-742	913	781	328	5380	3382	3364	1885	1447
1995 Regional Surplus/Deficit	-400	-899	73	1019	787	1062	967	5287	6730	6089	2949	6730	8523	5229	3343
1996 Regional Surplus/Deficit	2159	579	1241	3331	7820	10652	11057	11707	10706	9446	11111	10047	11378	9563	8248
1997 Regional Surplus/Deficit	5031	1447	1952	2770	2275	3540	11326	11082	10648	9338	10817	10240	11687	10233	7407
1998 Regional Surplus/Deficit	5264	2791	4573	7523	4404	1618	5505	4994	4732	4561	4223	7197	11586	5504	5496
-Ranked Averages-															
Top Ten Percent	3569	1796	1787	3478	4293	6408	10703	9508	9189	10274	10210	10192	11190	9606	7432
Middle Eighty Percent	2803	1333	1824	2543	2473	2142	3847	3638	3922	5380	6116	7571	9118	5309	4178
Bottom Ten Percent	801	-304	650	1512	1082	156	-873	-922	197	10	54	1914	2864	1459	696

Table A-30: Regional Surplus/Deficit - By Water Year
PNW Loads and Resource Study
2016 - 2017 Operating Year
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Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1929 Regional Surplus/Deficit	2670	17	1180	1994	1264	337	-1593	-961	-415	134	1678	224	4242	1641	847
1930 Regional Surplus/Deficit	1192	-829	692	1603	592	191	-1446	-1030	-374	334	2742	-502	1309	1233	333
1931 Regional Surplus/Deficit	-220	-860	361	1268	1034	108	-1319	-1142	-619	1088	-2289	166	882	1282	79
1932 Regional Surplus/Deficit	1595	-167	1165	526	57	-289	-2018	-2137	1357	4555	9238	9288	11382	3359	2535
1933 Regional Surplus/Deficit	1304	517	1333	1770	1029	1491	5943	3042	321	4607	4823	6380	11813	9390	4011
1934 Regional Surplus/Deficit	5612	3102	2552	3769	5332	9834	10109	9849	6867	10562	9252	6987	6679	2754	6558
1935 Regional Surplus/Deficit	351	-764	928	1623	888	578	4788	5948	-251	2019	4076	6022	5831	5112	2834
1936 Regional Surplus/Deficit	3689	484	612	1466	606	-129	-2785	-1063	-77	1789	7621	7463	9067	1918	1991
1937 Regional Surplus/Deficit	2006	-74	81	1437	975	218	-1257	-1780	-1124	-1819	-1528	1597	2417	633	218
1938 Regional Surplus/Deficit	2439	362	855	1592	1243	1303	5272	1537	3703	6215	10312	9485	7765	4212	3895
1939 Regional Surplus/Deficit	1169	-529	1475	1868	778	-121	-239	-923	525	3312	6920	7553	4500	1385	1861
1940 Regional Surplus/Deficit	85	-1171	77	1844	1116	1265	-1221	267	4509	6064	6641	4285	5285	-20	1932
1941 Regional Surplus/Deficit	-458	-1118	734	1390	1042	-80	-606	-869	733	691	1394	730	1461	1036	489
1942 Regional Surplus/Deficit	978	-128	1846	797	1026	1856	704	1824	-511	1234	5090	4345	8676	5799	2487
1943 Regional Surplus/Deficit	3558	1112	1542	1773	840	944	3680	4470	4811	11819	11423	8932	11968	6828	4962
1944 Regional Surplus/Deficit	3016	286	-42	1770	1140	354	-640	-844	266	176	-346	-793	389	-306	242
1945 Regional Surplus/Deficit	862	-428	1422	524	-209	-744	-1573	-1874	-691	-1018	-2821	5419	6633	1076	701
1946 Regional Surplus/Deficit	1418	-454	447	1315	1925	1612	3227	788	5953	7855	10696	9576	8404	6020	4099
1947 Regional Surplus/Deficit	2789	915	1601	1701	1977	5781	5595	6461	6941	6972	7245	7824	9373	5820	5158
1948 Regional Surplus/Deficit	2195	494	1323	6192	5509	2875	7894	1646	3323	4809	8716	10300	12178	8150	5647
1949 Regional Surplus/Deficit	5228	3360	2436	2697	1617	1081	-320	1660	6365	7604	10237	9933	9147	1150	4083
1950 Regional Surplus/Deficit	1183	-1029	0.6	1703	1535	1100	4409	5965	8879	9169	8647	8029	11528	7912	4987
1951 Regional Surplus/Deficit	4092	2464	1903	4331	5036	7347	10384	10281	5543	10881	10266	9117	8390	8210	7010
1952 Regional Surplus/Deficit	4889	1344	1621	5231	3495	3193	7179	3895	1708	8825	10319	10199	9787	4853	5319
1953 Regional Surplus/Deficit	2618	688	691	1608	539	-156	852	5800	2181	704	4580	8216	12086	8588	3702
1954 Regional Surplus/Deficit	3270	1137	1451	2666	2166	2678	4414	7424	3446	6765	6647	8596	11268	9950	5225
1955 Regional Surplus/Deficit	7529	6637	5477	2834	3617	2079	103	-162	666	1917	2931	4059	11720	9851	4162
1956 Regional Surplus/Deficit	5603	2600	1398	3643	5062	6510	10129	5441	8130	9418	11230	9749	12030	8652	7105
1957 Regional Surplus/Deficit	3626	2138	1733	3216	1439	2347	1967	1920	5530	7197	6851	10469	11916	3093	4468
1958 Regional Surplus/Deficit	1887	-479	1026	1772	1294	533	1681	5675	3434	5517	8035	10354	10591	2899	3866
1959 Regional Surplus/Deficit	1779	199	788	2329	3171	4704	9167	6118	2661	8796	6728	7730	10870	5124	5102
1960 Regional Surplus/Deficit	3878	1785	5830	7233	7269	5239	5175	3760	4369	11079	8301	6593	9391	4832	6012
1961 Regional Surplus/Deficit	2832	-86	1451	1992	1696	165	4623	3927	5327	8170	4172	8053	11078	3800	4125
1962 Regional Surplus/Deficit	2194	1136	551	1212	1459	1625	2501	2993	816	6183	10786	7615	9402	2267	3367
1963 Regional Surplus/Deficit	2216	246	468	3241	3530	4300	4051	5280	233	3280	3906	5765	9058	5069	3800
1964 Regional Surplus/Deficit	3265	930	1387	1521	1693	1061	1426	2688	334	3886	2005	6939	12261	9243	3627
1965 Regional Surplus/Deficit	5516	1409	3090	3650	2853	6371	10257	8666	6243	6526	11190	9144	9621	4779	6395
1966 Regional Surplus/Deficit	4368	2645	2143	2874	1499	685	3563	1120	-215	9827	5692	6146	6848	5252	3436
1967 Regional Surplus/Deficit	3143	757	924	1594	1038	1621	8192	7789	2597	4343	1256	6719	12082	7689	4557
1968 Regional Surplus/Deficit	4323	1253	1577	2700	1656	1332	5401	5586	4490	760	2355	4094	9268	6673	3913
1969 Regional Surplus/Deficit	4149	2352	4359	4223	5033	3335	9589	5557	3949	10859	10638	10063	9326	6432	6315
1970 Regional Surplus/Deficit	1883	-68	1179	2616	1711	28	629	4625	3042	3505	3175	6178	10711	3798	3205
1971 Regional Surplus/Deficit	1767	-585	460	1687	1399	1341	8780	9566	7317	8951	9211	10003	12167	10513	6046
1972 Regional Surplus/Deficit	6148	2969	2257	3115	2146	1633	8646	8748	11709	12164	8595	9936	12188	10055	7099
1973 Regional Surplus/Deficit	7290	5070	2854	2703	1667	2769	1848	899	447	-1001	1839	2950	2358	1596	2237
1974 Regional Surplus/Deficit	-47	-1416	377	1505	551	4499	11002	11495	10132	11259	11133	9341	12062	10189	6768
1975 Regional Surplus/Deficit	5481	3320	1977	1391	1323	391	3609	3113	4934	1897	4233	8574	12172	10422	4623
1976 Regional Surplus/Deficit	2577	2318	2526	4415	5362	8977	10390	6225	5032	10199	9414	9715	9978	9015	6998
1977 Regional Surplus/Deficit	7864	7786	7078	2560	1362	-45	-199	-609	-88	-684	-2569	-1654	-839	-236	1138
1978 Regional Surplus/Deficit	1355	192	1086	-41	17	2110	1980	1932	2918	8577	5942	7828	6900	5299	3173
1979 Regional Surplus/Deficit	2024	1162	4207	2657	1509	331	-168	1204	4848	3173	2890	7021	3419	969	2556
1980 Regional Surplus/Deficit	-470	-1227	212	1358	953	1328	-148	-178	571	2954	7612	9753	8995	2724	2506
1981 Regional Surplus/Deficit	1296	-559	1339	1679	1985	6109	8284	2890	3856	964	3628	5121	11607	7475	4428
1982 Regional Surplus/Deficit	5569	3727	1623	2336	2271	1576	5566	9722	9318	8400	6992	9141	11796	7143	6039
1983 Regional Surplus/Deficit	5680	2293	3847	4134	2817	2779	7475	4543	9938	7359	7762	8116	8783	8975	6090
1984 Regional Surplus/Deficit	5792	2538	2682	2571	6209	1862	9264	2878	8661	9048	8828	5747	10727	7564	5946
1985 Regional Surplus/Deficit	3707	717	2099	2511	3138	922	1822	940	2173	7586	7866	8273	5536	532	3155
1986 Regional Surplus/Deficit	-902	-1422	974	2453	3870	-768	4953	5843	10826	10225	8009	5016	7430	3599	4321
1987 Regional Surplus/Deficit	2073	-118	621	1487	2692	778	108	-640	2073	4021	3566	4150	5129	1181	1867
1988 Regional Surplus/Deficit	19	-1358	105	857	479	83	-2315	-1389	-307	489	2833	1978	317	1885	231
1989 Regional Surplus/Deficit	1712	-104	532	574	663	521	-522	-435	2252	7644	9040	7023	5595	1691	2256
1990 Regional Surplus/Deficit	-524	-801	583	1361	1807	3329	6201	4104	3046	7916	9522	6133	9766	4213	4036
1991 Regional Surplus/Deficit	2902	1649	371	1150	5371	3429	7260	7671	1795	6648	5366	8006	8062	8782	4993
1992 Regional Surplus/Deficit	5354	2166	1055	1138	1015	263	-800	306	2136	1514	2289	1704	1394	623	1209

Table A-30: Regional Surplus/Deficit - By Water Year
PNW Loads and Resource Study
2016 - 2017 Operating Year
[61] 2009 White Book - 30 Minute Wind (Final)

Continued 7/22/2009

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1993 Regional Surplus/Deficit	-918	-1294	-363	941	527	134	-1629	-674	753	2554	1461	6199	3312	2711	1078
1994 Regional Surplus/Deficit	1688	707	-94	1015	1404	227	-1156	574	297	410	5494	2742	2415	1404	1078
1995 Regional Surplus/Deficit	-284	-1221	-98	771	427	723	554	4948	6246	6171	3064	6090	7574	4747	2968
1996 Regional Surplus/Deficit	2275	257	1071	3083	7460	10681	10722	11484	10222	9528	11739	9407	10538	9081	7945
1997 Regional Surplus/Deficit	5147	1125	1781	2522	1915	3201	10991	10635	10164	9420	11311	9600	12101	9816	7158
1998 Regional Surplus/Deficit	5380	2469	4403	7275	4044	1279	5092	4656	4248	4643	4338	6557	11967	5022	5237
-Ranked Averages-															
Top Ten Percent	3685	1474	1616	3230	3933	6121	10323	9187	8705	10410	10527	9552	11041	9288	7155
Middle Eighty Percent	2919	1011	1653	2301	2114	1822	3436	3291	3423	5461	6224	6930	8596	4867	3848
Bottom Ten Percent	917	-626	479	1264	722	19	-1308	-1275	-302	-8.4	-2.4	1228	1916	977	328

Table A-30: Regional Surplus/Deficit - By Water Year
PNW Loads and Resource Study
2017 - 2018 Operating Year
[61] 2009 White Book - 30 Minute Wind (Final)

7/22/2009

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1929 Regional Surplus/Deficit	2211	-306	889	1714	985	-279	-1551	-1281	-671	-396	823	-218	5027	1433	600
1930 Regional Surplus/Deficit	733	-1153	401	1323	313	-507	-1676	-1328	-603	-170	2543	-944	2094	1025	89
1931 Regional Surplus/Deficit	-679	-1183	71	988	755	-511	-1558	-1438	-853	582	-2645	-277	1667	1073	-166
1932 Regional Surplus/Deficit	1135	-490	875	246	-222	-623	-2281	-2457	1101	4026	8383	8846	11076	3150	2197
1933 Regional Surplus/Deficit	845	193	1042	1490	750	1158	5681	2722	65	4078	3968	5938	11207	9067	3638
1934 Regional Surplus/Deficit	5152	2779	2262	3489	5053	9449	9768	9529	6611	10033	8397	6545	7463	2545	6298
1935 Regional Surplus/Deficit	-108	-1088	637	1343	609	245	4526	5628	-508	1490	3221	5579	6615	4904	2586
1936 Regional Surplus/Deficit	3230	161	321	1186	327	-536	-3043	-1297	-333	1260	6766	7021	9852	1710	1743
1937 Regional Surplus/Deficit	1547	-398	-210	1157	696	-482	-1486	-2069	-1350	-1719	-2383	1155	3202	424	-27
1938 Regional Surplus/Deficit	1980	39	564	1312	964	970	5010	1217	3446	5686	9457	9043	8550	4004	3647
1939 Regional Surplus/Deficit	710	-852	1184	1588	499	-454	-580	-1238	353	2783	6065	7110	5285	1177	1614
1940 Regional Surplus/Deficit	-374	-1494	-213	1564	837	931	-1483	-53	4252	5535	5786	3842	6069	-228	1684
1941 Regional Surplus/Deficit	-917	-1442	443	1110	763	-413	-868	-1189	476	162	539	287	2246	828	241
1942 Regional Surplus/Deficit	518	-451	1555	517	747	1523	442	1504	-767	705	4235	3902	9461	5591	2239
1943 Regional Surplus/Deficit	3099	789	1252	1493	561	610	3418	4150	4554	11290	10229	8490	11365	6620	4586
1944 Regional Surplus/Deficit	2557	-37	-333	1490	861	-13	-867	-1164	9.7	-353	-1201	-1235	1174	-514	-5.6
1945 Regional Surplus/Deficit	402	-752	1132	244	-488	-1077	-1835	-2194	-948	-1547	-3676	4977	7418	867	453
1946 Regional Surplus/Deficit	959	-777	156	1035	1646	1278	2965	468	5697	7326	9841	9134	9189	5812	3851
1947 Regional Surplus/Deficit	2329	592	1310	1421	1698	5448	5333	6141	6684	6442	6390	7382	10158	5612	4909
1948 Regional Surplus/Deficit	1736	171	1032	5912	5230	2542	7632	1326	3067	4279	7861	9858	11585	7942	5285
1949 Regional Surplus/Deficit	4769	3037	2145	2417	1338	748	-661	1433	6109	7075	9382	9491	9931	942	3835
1950 Regional Surplus/Deficit	724	-1353	-290	1424	1256	767	4147	5645	8622	8639	7792	7586	10927	7704	4625
1951 Regional Surplus/Deficit	3633	2140	1612	4051	4757	7014	10121	9961	5287	10352	9411	8675	9175	8001	6762
1952 Regional Surplus/Deficit	4430	1020	1331	4951	3217	2859	6916	3575	1452	8296	9464	9756	10571	4645	5071
1953 Regional Surplus/Deficit	2159	365	400	1328	260	-489	590	5480	1924	175	3725	7773	11494	8380	3341
1954 Regional Surplus/Deficit	2811	814	1161	2386	1887	2345	4152	7104	3190	6236	5792	8153	10824	9199	4830
1955 Regional Surplus/Deficit	7070	6313	5186	2554	3339	1745	-159	-482	409	1388	2076	3616	11121	9104	3754
1956 Regional Surplus/Deficit	5143	2277	1107	3363	4783	6177	9866	5121	7874	8889	10081	9307	11428	8444	6731
1957 Regional Surplus/Deficit	3167	1815	1442	2936	1160	2014	1705	1600	5273	6668	5996	10027	11313	2885	4106
1958 Regional Surplus/Deficit	1427	-802	736	1492	1015	200	1418	5355	3178	4988	7180	9911	11247	2690	3607
1959 Regional Surplus/Deficit	1320	-124	498	2049	2892	4370	8905	5797	2405	8267	5873	7288	10774	4915	4781
1960 Regional Surplus/Deficit	3419	1461	5539	6953	6990	4905	4913	3440	4113	10550	7446	6150	10175	4624	5763
1961 Regional Surplus/Deficit	2373	-410	1161	1712	1417	-168	4361	3607	5070	7641	3317	7611	10591	3592	3772
1962 Regional Surplus/Deficit	1735	813	260	932	1180	1292	2239	2673	560	5654	9931	7172	10186	2059	3119
1963 Regional Surplus/Deficit	1757	-77	178	2961	3251	3966	3788	4960	-24	2750	3051	5322	9842	4860	3552
1964 Regional Surplus/Deficit	2805	607	1096	1241	1414	728	1164	2368	77	3356	1150	6497	11675	9035	3267
1965 Regional Surplus/Deficit	5057	1086	2799	3370	2574	6037	9995	8346	5986	5997	10244	8701	10405	4571	6143
1966 Regional Surplus/Deficit	3909	2322	1853	2594	1220	351	3301	800	-471	9297	4837	5703	7632	5043	3188
1967 Regional Surplus/Deficit	2684	433	633	1314	759	1287	7929	7469	2340	3814	401	6277	11484	7481	4195
1968 Regional Surplus/Deficit	3864	930	1286	2420	1377	999	5138	5266	4234	230	1500	3651	10053	6465	3665
1969 Regional Surplus/Deficit	3690	2029	4068	3943	4754	3002	9327	5237	3692	10330	9783	9621	10111	6224	6066
1970 Regional Surplus/Deficit	1424	-391	888	2336	1432	-468	515	4337	2786	2976	2320	5735	11496	3590	2958
1971 Regional Surplus/Deficit	1308	-908	169	1407	1120	1008	8518	9246	7060	8421	8356	9560	11559	9785	5639
1972 Regional Surplus/Deficit	5689	2645	1966	2835	1868	1299	8384	8428	11453	11254	7740	9494	11602	9309	6677
1973 Regional Surplus/Deficit	6831	4747	2563	2423	1388	2436	1586	465	197	-1525	995	2598	3143	1388	1989
1974 Regional Surplus/Deficit	-506	-1740	87	1225	272	4165	10660	11061	9876	10730	10048	8899	11474	9438	6336
1975 Regional Surplus/Deficit	5022	2997	1686	1112	1044	58	3347	2792	4678	1368	3378	8132	11564	9679	4215
1976 Regional Surplus/Deficit	2118	1995	2235	4135	5083	8643	10128	5905	4775	9670	8559	9272	10762	8807	6749
1977 Regional Surplus/Deficit	7405	7463	6787	2280	1083	-379	-539	-922	-337	-1208	-3301	-2096	-55	-444	889
1978 Regional Surplus/Deficit	896	-132	795	-688	-274	2169	1717	1612	2661	8047	5087	7386	7685	5090	2926
1979 Regional Surplus/Deficit	1564	839	3916	2377	1230	-222	-508	1259	4592	2644	2035	6578	4203	760	2311
1980 Regional Surplus/Deficit	-929	-1550	-79	1078	674	995	-488	-409	314	2425	6757	9311	9780	2516	2258
1981 Regional Surplus/Deficit	837	-882	1048	1399	1706	5776	8022	2570	3600	435	2773	4678	11007	7267	4066
1982 Regional Surplus/Deficit	5110	3404	1332	2056	1992	1242	5303	9402	9062	7871	6137	8699	11209	6934	5678
1983 Regional Surplus/Deficit	5221	1969	3557	3854	2538	2446	7212	4222	9682	6830	6907	7673	9568	8767	5842
1984 Regional Surplus/Deficit	5332	2214	2391	2292	5930	1529	9002	2558	8404	8519	7973	5304	11511	7356	5698
1985 Regional Surplus/Deficit	3248	394	1808	2231	2859	588	1560	506	2024	7057	7011	7830	6320	324	2907
1986 Regional Surplus/Deficit	-1362	-1745	683	2173	3591	-1102	4691	5523	10570	9696	7154	4573	8214	3390	4073
1987 Regional Surplus/Deficit	1614	-441	330	1207	2413	444	-233	-865	1816	3492	2711	3707	5913	973	1619
1988 Regional Surplus/Deficit	-440	-1682	-186	577	200	-611	-2550	-1682	-535	-14	2018	1856	1101	1676	-12
1989 Regional Surplus/Deficit	1253	-428	241	294	384	188	-863	-749	2079	7115	8185	6581	6379	1483	2009
1990 Regional Surplus/Deficit	-983	-1124	292	1082	1528	2996	5939	3784	2790	7387	8667	5691	10550	4005	3788
1991 Regional Surplus/Deficit	2443	1325	81	870	5092	3096	6998	7351	1539	6119	4511	7563	8846	8574	4744
1992 Regional Surplus/Deficit	4895	1842	765	858	736	-436	-1031	-127	2406	984	1434	1261	2179	415	969

Table A-30: Regional Surplus/Deficit - By Water Year
PNW Loads and Resource Study
2017 - 2018 Operating Year
[61] 2009 White Book - 30 Minute Wind (Final)

Continued 7/22/2009

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1993 Regional Surplus/Deficit	-1378	-1618	-654	661	248	-539	-1861	-961	522	2048	1224	5757	4097	2502	835
1994 Regional Surplus/Deficit	1228	383	-384	735	1125	-106	-1418	254	40	-119	4639	2299	3200	1195	830
1995 Regional Surplus/Deficit	-743	-1544	-389	491	148	390	291	4628	5989	5642	2209	5648	8359	4539	2719
1996 Regional Surplus/Deficit	1816	-66	780	2803	7181	9980	10381	11048	9966	8998	10371	8964	11214	8873	7620
1997 Regional Surplus/Deficit	4688	802	1490	2242	1636	2867	10650	10424	9907	8891	10077	9158	11523	9543	6778
1998 Regional Surplus/Deficit	4921	2146	4112	6995	3765	945	4830	4336	3991	4114	3483	6115	11422	4814	4879
-Ranked Averages-															
Top Ten Percent	3226	1150	1325	2950	3654	5735	10027	8850	8448	9826	9469	9110	11025	8916	6808
Middle Eighty Percent	2460	688	1362	2014	1835	1469	3171	2979	3181	4933	5375	6489	8954	4619	3561
Bottom Ten Percent	458	-949	188	984	443	-517	-1549	-1581	-543	-437	-687	831	2700	769	82

Table A-30: Regional Surplus/Deficit - By Water Year
PNW Loads and Resource Study
2018 - 2019 Operating Year
[61] 2009 White Book - 30 Minute Wind (Final)

7/22/2009

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1929 Regional Surplus/Deficit	1784	-589	588	1453	688	-316	-2160	-1575	-819	-128	1582	-467	3334	1132	265
1930 Regional Surplus/Deficit	307	-1436	100	1061	17	-462	-2014	-1644	-778	72	2645	-1193	401	724	-248
1931 Regional Surplus/Deficit	-1106	-1466	-231	726	458	-546	-1886	-1755	-1024	827	-2386	-525	-27	773	-503
1932 Regional Surplus/Deficit	709	-773	573	-15	-519	-942	-2586	-2751	953	4294	9141	8597	10473	2849	1954
1933 Regional Surplus/Deficit	418	-90	741	1229	453	838	5376	2428	-83	4345	4727	5690	10904	8881	3429
1934 Regional Surplus/Deficit	4726	2496	1960	3228	4756	9181	9542	9236	6463	10301	9155	6297	5770	2245	5976
1935 Regional Surplus/Deficit	-535	-1371	335	1082	312	-75	4221	5334	-656	1758	3979	5331	4922	4603	2253
1936 Regional Surplus/Deficit	2804	-122	20	925	30	-782	-3352	-1676	-481	1527	7524	6773	8158	1409	1409
1937 Regional Surplus/Deficit	1120	-681	-511	896	399	-435	-1825	-2393	-1529	-2080	-1625	907	1508	124	-363
1938 Regional Surplus/Deficit	1553	-244	263	1051	667	650	4705	923	3298	5953	10215	8794	6857	3703	3314
1939 Regional Surplus/Deficit	283	-1135	883	1327	202	-774	-806	-1537	120	3050	6823	6862	3591	876	1280
1940 Regional Surplus/Deficit	-801	-1778	-515	1303	540	612	-1788	-346	4104	5803	6544	3594	4376	-529	1351
1941 Regional Surplus/Deficit	-1344	-1725	142	849	466	-733	-1173	-1483	328	430	1297	39	553	527	-92
1942 Regional Surplus/Deficit	92	-734	1254	256	450	1203	137	1211	-915	972	4993	3654	7768	5290	1906
1943 Regional Surplus/Deficit	2672	506	950	1232	265	290	3113	3856	4406	11558	11326	8241	11059	6319	4381
1944 Regional Surplus/Deficit	2131	-320	-634	1229	565	-299	-1208	-1458	-138	-86	-443	-1484	-519	-815	-339
1945 Regional Surplus/Deficit	-24	-1035	830	-17	-785	-1397	-2140	-2488	-1096	-1280	-2918	4729	5725	567	119
1946 Regional Surplus/Deficit	532	-1060	-145	774	1349	959	2660	174	5549	7593	10599	8885	7495	5511	3518
1947 Regional Surplus/Deficit	1903	309	1008	1160	1401	5128	5028	5847	6536	6710	7148	7134	8464	5311	4576
1948 Regional Surplus/Deficit	1310	-112	731	5651	4933	2222	7327	1032	2919	4547	8619	9609	11269	7641	5065
1949 Regional Surplus/Deficit	4343	2754	1844	2156	1042	428	-888	1046	5961	7342	10140	9242	8238	641	3501
1950 Regional Surplus/Deficit	298	-1636	-592	1162	959	447	3842	5351	8474	8907	8550	7338	10619	7403	4405
1951 Regional Surplus/Deficit	3206	1857	1311	3790	4460	6694	9816	9667	5139	10619	10169	8427	7482	7700	6429
1952 Regional Surplus/Deficit	4003	737	1029	4690	2920	2539	6611	3281	1304	8563	10223	9508	8878	4344	4738
1953 Regional Surplus/Deficit	1732	82	99	1067	-36	-809	285	5186	1776	442	4483	7525	11178	8079	3121
1954 Regional Surplus/Deficit	2384	531	859	2125	1590	2025	3847	6810	3042	6503	6550	7905	10359	9441	4644
1955 Regional Surplus/Deficit	6643	6030	4885	2293	3042	1426	-464	-775	261	1656	2835	3368	10812	9341	3581
1956 Regional Surplus/Deficit	4717	1994	805	3102	4486	5857	9561	4828	7726	9157	11133	9058	11121	8143	6524
1957 Regional Surplus/Deficit	2740	1532	1141	2675	864	1694	1400	1307	5125	6936	6754	9778	11007	2584	3887
1958 Regional Surplus/Deficit	1001	-1085	434	1231	719	-120	1113	5061	3030	5255	7938	9663	9683	2390	3284
1959 Regional Surplus/Deficit	894	-407	196	1788	2595	4051	8600	5504	2257	8535	6631	7039	9961	4614	4520
1960 Regional Surplus/Deficit	2992	1178	5238	6692	6693	4586	4608	3146	3965	10817	8204	5902	8482	4323	5430
1961 Regional Surplus/Deficit	1947	-693	859	1451	1120	-488	4056	3313	4922	7909	4075	7362	10169	3291	3543
1962 Regional Surplus/Deficit	1308	530	-41	671	883	972	1934	2379	412	5921	10689	6924	8493	1758	2786
1963 Regional Surplus/Deficit	1330	-360	-124	2700	2955	3647	3483	4666	-172	3018	3810	5074	8149	4559	3219
1964 Regional Surplus/Deficit	2379	324	795	980	1117	408	859	2075	-71	3624	1908	6248	11352	8734	3046
1965 Regional Surplus/Deficit	4630	803	2498	3108	2277	5718	9690	8053	5838	6264	11093	8453	8712	4270	5814
1966 Regional Surplus/Deficit	3482	2038	1551	2333	923	32	2996	506	-619	9565	5596	5455	5939	4742	2855
1967 Regional Surplus/Deficit	2257	150	332	1053	462	968	7624	7176	2192	4082	1159	6029	11173	7180	3976
1968 Regional Surplus/Deficit	3437	647	985	2159	1080	679	4833	4973	4086	498	2258	3403	8360	6164	3332
1969 Regional Surplus/Deficit	3264	1746	3767	3682	4457	2682	9022	4943	3544	10598	10542	9373	8417	5923	5733
1970 Regional Surplus/Deficit	997	-674	587	2075	1135	-625	62	4012	2638	3244	3078	5487	9802	3289	2624
1971 Regional Surplus/Deficit	882	-1192	-132	1146	823	688	8213	8952	6912	8689	9114	9312	11259	10004	5465
1972 Regional Surplus/Deficit	5262	2362	1664	2573	1571	979	8079	8135	11305	11902	8498	9245	11279	9546	6518
1973 Regional Surplus/Deficit	6404	4464	2261	2162	1092	2116	1281	285	42	-1263	1742	2259	1449	1087	1655
1974 Regional Surplus/Deficit	-933	-2023	-215	964	-24	3846	10435	10882	9728	10998	11036	8650	11153	9680	6187
1975 Regional Surplus/Deficit	4595	2714	1384	850	747	-262	3042	2499	4530	1635	4136	7884	11264	9913	4042
1976 Regional Surplus/Deficit	1691	1712	1934	3874	4787	8323	9823	5612	4627	9938	9317	9024	9069	8506	6416
1977 Regional Surplus/Deficit	6978	7180	6486	2019	786	-698	-766	-1222	-492	-946	-2666	-2344	-1748	-745	556
1978 Regional Surplus/Deficit	470	-415	494	-582	-559	1457	1412	1318	2513	8315	5845	7138	5992	4789	2592
1979 Regional Surplus/Deficit	1138	556	3615	2116	933	-322	-735	590	4444	2912	2793	6330	2510	459	1974
1980 Regional Surplus/Deficit	-1355	-1833	-380	817	377	675	-715	-792	166	2693	7515	9063	8087	2215	1925
1981 Regional Surplus/Deficit	411	-1165	746	1137	1409	5456	7717	2277	3452	703	3531	4430	10698	6966	3847
1982 Regional Surplus/Deficit	4683	3121	1030	1795	1695	923	4998	9108	8914	8139	6895	8451	10887	6634	5457
1983 Regional Surplus/Deficit	4795	1686	3255	3593	2241	2126	6907	3929	9534	7098	7666	7425	7875	8466	5509
1984 Regional Surplus/Deficit	4906	1931	2089	2030	5633	1209	8697	2265	8256	8786	8731	5056	9818	7055	5365
1985 Regional Surplus/Deficit	2821	111	1506	1970	2562	269	1255	326	1768	7324	7769	7582	4627	23	2574
1986 Regional Surplus/Deficit	-1788	-2028	382	1912	3294	-1421	4386	5229	10422	9964	7912	4325	6521	3089	3740
1987 Regional Surplus/Deficit	1188	-724	28	946	2116	125	-459	-1254	1669	3759	3469	3459	4220	672	1286
1988 Regional Surplus/Deficit	-866	-1965	-487	316	-97	-570	-2882	-2003	-711	227	2736	1287	-592	1375	-351
1989 Regional Surplus/Deficit	827	-711	-61	32	87	-132	-1089	-1048	1848	7382	8943	6332	4686	1182	1675
1990 Regional Surplus/Deficit	-1410	-1407	-9.6	820	1231	2676	5634	3491	2642	7655	9425	5442	8857	3704	3455
1991 Regional Surplus/Deficit	2016	1042	-221	609	4795	2776	6693	7057	1391	6387	5269	7315	7153	8273	4411
1992 Regional Surplus/Deficit	4469	1559	463	597	440	-390	-1367	-308	1731	1252	2192	1013	486	114	628

Table A-30: Regional Surplus/Deficit - By Water Year
PNW Loads and Resource Study
2018 - 2019 Operating Year
[61] 2009 White Book - 30 Minute Wind (Final)

Continued 7/22/2009

Energy (aMW)	Aug1	Aug16	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Avg
1993 Regional Surplus/Deficit	-1804	-1901	-955	400	-49	-519	-2196	-1288	349	2292	1365	5508	2404	2201	497
1994 Regional Surplus/Deficit	802	100	-686	474	828	-426	-1723	-39	-108	148	5397	2051	1507	895	497
1995 Regional Surplus/Deficit	-1170	-1827	-690	230	-149	70	-14	4335	5841	5910	2967	5399	6666	4238	2386
1996 Regional Surplus/Deficit	1389	-349	478	2542	6884	10028	10155	10870	9818	9266	11642	8716	9630	8572	7363
1997 Regional Surplus/Deficit	4262	519	1189	1980	1339	2548	10424	10021	9759	9158	11214	8909	11193	9306	6576
1998 Regional Surplus/Deficit	4494	1863	3810	6734	3469	626	4525	4042	3843	4381	4241	5866	11059	4513	4655
-Ranked Averages-															
Top Ten Percent	2799	867	1024	2689	3358	5468	9756	8573	8300	10148	10430	8861	10132	8779	6573
Middle Eighty Percent	2033	405	1061	1760	1538	1169	2868	2677	3018	5200	6128	6239	7688	4358	3266
Bottom Ten Percent	31	-1232	-113	723	146	-635	-1875	-1889	-707	-270	-99	537	1007	468	-254

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Section 9: Administrator's Record of Decision on the 2009 Pacific Northwest Loads and Resources Study (The White Book)

I. Introduction

The 2009 Pacific Northwest Loads and Resources Study (White Book) is a 10-year guide to the obligations and resources in the Pacific Northwest (PNW) region and BPA's Federal power system. The White Book study is developed as a planning tool for Columbia River Treaty (Treaty) Studies, an information tool for customers and regional interests, and as a published information source used by other planning entities for their analyses. The White Book does not guide day-to-day operations of the Federal Columbia River Power System (FCRPS), nor is it used for determining BPA revenues or rates. The White Book does include projected Federal system and regional loads and resources with detailed technical appendices. The White Book compiles loads, contracts, and resource capability estimates for 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 each 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 is 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 2009 White Book updates the 2007 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. Background

Columbia River Treaty: The Columbia River Treaty requires the U.S. Entity, the Chairman of which is the Bonneville Power Administrator, to plan and determine loads and resources at least six years into the future. *Columbia River Treaty, Annex A (9).* The Treaty, its Annexes, and its Protocol were adopted and memorialized by exchanges of diplomatic notes between Canada and the U.S. Upon final ratification of the Treaty in 1964; its Protocol reiterated the requirements for projecting loads and resources, *Columbia River Treaty, Annex B (1-7),* used in determining Canada's share of the Treaty's Downstream Benefits ("Canadian Entitlement") owed to Canada. *Columbia River Treaty Protocol (VII-X).*

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

In 2001, BPA executed new 10-year take-or-pay Subscription PSCs with its customers. These contracts modified the terms of additions or removal of customers' resources, and will expire on September 30, 2011. For the period beginning October 1, 2011, and extending through September 30, 2028, BPA executed new 2012 Regional Dialog PSCs in December 2008. Power deliveries under these contracts include different provisions and terms from BPA's 2001 PSCs and allow customers to elect to add nonfederal resources or to have BPA supply power for their load growth.

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 PNW 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 PNW 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's existing Subscription Power Sales Contracts (PSCs) with its PNW preference utility and cooperative and federal agency customers extend through September 30, 2011 (2001 PSCs). For the period beginning October 1, 2011, and extending through September 30, 2028, BPA signed new 2012 PSCs with preference customers and with Investor Owned utilities.

The Regional Dialog PSCs include terms and conditions which are different from the Subscription contract provisions and terms. Most notably, customers can elect to have BPA serve additional load and load growth during the term of the contract by specifying amounts of additional federal power they will buy from BPA during certain defined periods of the contract. Alternatively customers may elect to supply the load growth from their own nonfederal resources or purchases.

Additionally, BPA's only Direct Service Industry contract obligation assumed here is service to Port Townsend Paper Corporation (17 aMW) through September 30, 2011. However, since finalizing this document, BPA is evaluating its options for long-term DSI service contracts, including service to Port Townsend, due to recent court opinions in *Pacific Northwest Generating Cooperative v. Bonneville Power Administration*, 550 F.3d 846 (2008) ("*PNGC I*") and *Pacific Northwest Generating Cooperative v. BPA*, Slip Op. 09-70228 (August 28, 2009) (*"PNGC II"*).

IV. Excess Federal Power

This 2009 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 (Regional Preference Act), 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 2009 White Book reflects Federal system load obligations, resources, and contracts that were finalized as of July 22, 2009. Changes to the Federal system obligations over 2007 White Book results are as follows:

- Federal agency, public agency, cooperative, and USBR PSC obligations were updated using BPA's agency load forecasting tool (ALF) based on:
    - 2001 PSCs through September 30, 2011; and
    - BPA's 2012 PSCs that begin October 1, 2011, and assume that BPA serves all of the customer's net requirements, including load growth;
- Public agency, and cooperative Slice customer obligations were updated to include the 2012 Slice and Block PSCs that begin October 1, 2011; and
- Updated Federal system contract sales.

The 2009 White Book also includes the following changes to the Federal system resource projections since 2007:

- The hydro regulation study was BPA's most recent estimate of power requirements, non-power requirements, and hydro improvements expected to be in effect during the study period. The regulated hydro generation projections reflect operating reserve levels associated with 30-minute wind persistence scheduling accuracy forecasts;
- The generation forecast were updated for several Federal system independent hydro projects;
- This White Book assumes BPA's acquired the output from the Idaho Falls Power Bulb Turbine hydro projects through September 30, 2011. Since finalizing numbers for this document, BPA signed an extension for the continued purchase of the output from the Idaho Falls Power Bulb Turbine hydro projects through September 30, 2021. This will be reflected in future White Book studies;
- Fourmile Hill geothermal facility start date updated to October 1, 2015;
- Capacity credit for wind projects is assumed 5 percent of the project's installed capacity, following the latest Council Regional Resource Adequacy standards guidelines; 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, assumptions and results in the 2009 White Book are adopted and approved.

Issued in Portland, Oregon on November 5, 2009.

/s/ Stephen J. Wright

Stephen J. Wright

Administrator and Chief Executive Officer

Section 10: Glossary and Acronyms

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Non-utility Generation – A 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 2009 is August 1, 2008, through July 31, 2009.

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

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

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

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

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

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

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

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

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

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.

Total Retail Load (TRL) – TRL is all electric power consumption including distribution system losses, within a utility's distribution system as measured at metering points, adjusted for unmetered loads or generation. No distinction is made between load that is served with BPA power and load that is served with power from other sources.

White Book Document Acronyms

aMW	Average megawatt
BiOp	Biological Opinion
BPA	Bonneville Power Administration
CER	Canadian Entitlement Return
Council	Pacific Northwest Power and Conservation Council
DSI	Direct Service Industry (Industries)
ENW	Energy Northwest, Inc. (formerly Washington Public Power Supply System)
FCRPS	Federal Columbia River Power System
FERC	Federal Energy Regulatory Commission
FPS	Federal Power System
FY	Fiscal Year
HOSS	Hourly Operating and Scheduling Simulator
IOU	Investor-Owned Utility
IPP	Independent Power Producer
LOLP	Loss of Load Probability
Council RA	Council Resource Adequacy Standard
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	Pacific Power and Light Company, a business unit of PacifiCorp
PSC	Power Sales Contract
PUD	Public Utility District
RPSA	Residential Purchase and Sales Agreement
ROD	Record of Decision
TRL	Total Retail Load
USACE	U.S. Army Corps of Engineers
USBR	U.S. Bureau of Reclamation

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