B O N N E V I L L E   P O W E R   A D M I N I S T R A T I O N

2012 BPA Final Rate Proposal

Power Loads and Resources Study

July 2011

BP-12-FS-BPA-03

POWER LOADS AND RESOURCES STUDY

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TABLES

COMMONLY USED ACRONYMS

AGC	Automatic Generation Control
ALF	Agency Load Forecast (computer model)
aMW	average megawatt(s)
AMNR	Accumulated Modified Net Revenues
ANR	Accumulated Net Revenues
ASC	Average System Cost
BiOp	Biological Opinion
BPA	Bonneville Power Administration
Btu	British thermal unit
CDD	cooling degree day(s)
CDQ	Contract Demand Quantity
CGS	Columbia Generating Station
CHWM	Contract High Water Mark
Commission	Federal Energy Regulatory Commission
COSA	Cost of Service Analysis
COU	consumer-owned utility
Council	Northwest Power and Conservation Council
CRAC	Cost Recovery Adjustment Clause
CSP	Customer System Peak
CT	combustion turbine
CY	calendar year (January through December)
DDC	Dividend Distribution Clause
dec	decrease, decrement, or decremental
DERBS	Dispatchable Energy Resource Balancing Service
DFS	Diurnal Flattening Service
DOE	Department of Energy
DSI	direct-service industrial customer or direct-service industry
DSO	Dispatcher Standing Order
EIA	Energy Information Administration
EIS	Environmental Impact Statement
EN	Energy Northwest, Inc.
EPP	Environmentally Preferred Power
ESA	Endangered Species Act
e-Tag	electronic interchange transaction information
FBS	Federal base system
FCRPS	Federal Columbia River Power System
FCRTS	Federal Columbia River Transmission System
FELCC	firm energy load carrying capability
FORS	Forced Outage Reserve Service
FPS	Firm Power Products and Services (rate)
FY	fiscal year (October through September)
GARD	Generation and Reserves Dispatch (computer model)
GEP	Green Energy Premium
GRSPs	General Rate Schedule Provisions

GTA	General Transfer Agreement
GWh	gigawatthour
HDD	heating degree day(s)
HLH	Heavy Load Hour(s)
HOSS	Hourly Operating and Scheduling Simulator (computer model)
HYDSIM	Hydro Simulation (computer model)
ICE	IntercontinentalExchange
inc	increase, increment, or incremental
IOU	investor-owned utility
IP	Industrial Firm Power (rate)
IPR	Integrated Program Review
IRD	Irrigation Rate Discount
JOE	Joint Operating Entity
kW	kilowatt (1000 watts)
kWh	kilowatthour
LDD	Low Density Discount
LLH	Light Load Hour(s)
LRA	Load Reduction Agreement
Maf	million acre-feet
Mid-C	Mid-Columbia
MMBtu	million British thermal units
MNR	Modified Net Revenues
MRNR	Minimum Required Net Revenue
MW	megawatt (1 million watts)
MWh	megawatthour
NEPA	National Environmental Policy Act
NERC	North American Electric Reliability Corporation
NFB	National Marine Fisheries Service (NMFS) Federal Columbia River Power System (FCRPS) Biological Opinion (BiOp)
NLSL	New Large Single Load
NMFS	National Marine Fisheries Service
NOAA Fisheries	National Oceanographic and Atmospheric Administration Fisheries
NORM	Non-Operating Risk Model (computer model)
Northwest Power Act	Pacific Northwest Electric Power Planning and Conservation Act
NPV	net present value
NR	New Resource Firm Power (rate)
NT	Network Transmission
NTSA	Non-Treaty Storage Agreement
NUG	non-utility generation
NWPP	Northwest Power Pool
OATT	Open Access Transmission Tariff
O&M	operation and maintenance
OMB	Office of Management and Budget
OY	operating year (August through July)

PF	Priority Firm Power (rate)
PFp	Priority Firm Public (rate)
PFx	Priority Firm Exchange (rate)
PNCA	Pacific Northwest Coordination Agreement
PNRR	Planned Net Revenues for Risk
PNW	Pacific Northwest
POD	Point of Delivery
POI	Point of Integration or Point of Interconnection
POM	Point of Metering
POR	Point of Receipt
Project Act	Bonneville Project Act
PRS	Power Rates Study
PS	BPA Power Services
PSW	Pacific Southwest
PTP	Point to Point Transmission (rate)
PUD	public or people's utility district
RAM	Rate Analysis Model (computer model)
RAS	Remedial Action Scheme
RD	Regional Dialogue
REC	Renewable Energy Certificate
Reclamation or USBR	U.S. Bureau of Reclamation
REP	Residential Exchange Program
RevSim	Revenue Simulation Model (component of RiskMod)
RFA	Revenue Forecast Application (database)
RHWM	Rate Period High Water Mark
RiskMod	Risk Analysis Model (computer model)
RiskSim	Risk Simulation Model (component of RiskMod)
ROD	Record of Decision
RPSA	Residential Purchase and Sale Agreement
RR	Resource Replacement (rate)
RSS	Resource Support Services
RT1SC	RHWM Tier 1 System Capability
RTO	Regional Transmission Operator
SCADA	Supervisory Control and Data Acquisition
SCS	Secondary Crediting Service
Slice	Slice of the System (product)
T1SFCO	Tier 1 System Firm Critical Output
TCMS	Transmission Curtailment Management Service
TOCA	Tier 1 Cost Allocator
TPP	Treasury Payment Probability
Transmission System Act	Federal Columbia River Transmission System Act
TRL	Total Retail Load
TRM	Tiered Rate Methodology
TS	BPA Transmission Services
TSS	Transmission Scheduling Service
UAI	Unauthorized Increase

ULS	Unanticipated Load Service
USACE	U.S. Army Corps of Engineers
USBR or Reclamation	U.S. Bureau of Reclamation
USFWS	U.S. Fish and Wildlife Service
VERBS	Variable Energy Resources Balancing Service (rate)
VOR	Value of Reserves
WECC	Western Electricity Coordinating Council (formerly WSCC)
WIT	Wind Integration Team
WSPP	Western Systems Power Pool

1. INTRODUCTION AND OVERVIEW

1.1 Introduction

The Power Loads and Resources Study (Study) contains the load and resource data used to develop Bonneville Power Administration's (BPA's) wholesale power rates. This Study illustrates how each component of the loads and resources analysis is completed, how the components relate to each other, and how they fit into the rate development process. The Power Loads and Resources Study Documentation (Documentation), BP-12-FS-BPA-03A, contains details and results supporting this Study.

This Study has two primary purposes: (1) to determine BPA's load and resource balance (load-resource balance), and (2) to calculate various inputs that are used in other studies and calculations within the rate case. The purpose of BPA's load-resource balance analysis is to determine whether BPA's resources meet, are less than, or are greater than BPA's load for the rate period, fiscal years (FY) 2012–2013. If BPA's resources are less than the amount of load forecast for the rate period, some amount of system augmentation is required to achieve load-resource balance.

This Study provides inputs into various other studies and calculations in the ratemaking process. The results of this Study provide data to: (1) the Power Revenue Requirement Study, BP-12-FS-BPA-02; (2) the Power Rates Study (PRS), BP-12-FS-BPA-01; (3) the Power Risk and Market Price Study, BP-12-FS-BPA-04; and (4) the Generation Inputs Study, BP-12-FS-BPA-05.

1.2 Overview of Methodology

This Study includes three main components: (1) load data, including a forecast of the Federal system load and contract obligations; (2) resource data, including Federal system resource and contract purchase estimates, total Pacific Northwest (PNW) regional hydro resource estimates, and the estimated amount of power purchases that are eligible for section 4(h)(10)(C) credits; and (3) the Federal system load-resource balance, which compares Federal system sales, loads, and contract obligations to the Federal system generating resources and contract purchases.

The first component of the Study, the Federal system load obligation forecast, estimates the firm energy that BPA expects to serve during FY 2012–2013 under firm requirements contract obligations and other BPA contract obligations. The load estimates are discussed in section 2 of this Study and are detailed in the Documentation.

The second component of the Study is the resource component, which includes the forecast of (1) Federal system resources, (2) PNW regional hydro resources, and (3) power purchases eligible for 4(h)(10)(C) credits. The Federal system resource forecast includes hydro and non-hydro generation estimates plus power deliveries from BPA contract purchases. The Federal system resource estimates are discussed in section 3.1 of this Study and are detailed in the Documentation. The PNW regional hydro resources include all hydro resources in the Pacific Northwest, whether Federally or non-Federally owned. Energy generation estimates of the PNW regional hydro resources are used in the forecast of electricity market prices in the Power Risk and Market Price Study, BP-12-FS-BPA-04. The regional hydro estimates are discussed in section 3.2 of this Study and are detailed in the Documentation. The resource estimates used to calculate the 4(h)(10)(C) credits are discussed in section 3.3 of this Study, and the estimated power purchases eligible for 4(h)(10)(C) credits are detailed in the Documentation. These 4(h)(10)(C) credits are taken by BPA to offset the non-power share of fish and wildlife costs incurred as mitigation for the impact of the Federal hydro system. See section 3.3.1.

The third component of this Study is the Federal system load-resource balance, which completes BPA's load and resource picture by comparing total Federal system load obligations to Federal system resource output for FY 2012–2013. Federal system resources under critical water conditions minus loads yields BPA's estimated Federal system monthly and annual firm energy surplus or deficit. If there is an annual average firm energy deficit, system augmentation is added to Federal system resources to balance loads and resources. The load-resource balance is discussed in section 4 of this Study and is detailed in the Documentation.

Throughout the Study and Documentation, the loads and resource forecasts are shown using three different measurements. The first, energy in average megawatts (aMW), is the average amount of energy produced or consumed over a month. The second measurement, heavy load hours in megawatthours (MWh), is the total MWh generated or consumed over heavy load hours. Heavy load hours (referred to as either Heavy or HLH) can vary by contract, but generally are hours 6 a.m. to 10 p.m. (or Hour Ending (HE) 0007 to HE 2200), Monday through Saturday, excluding NERC holidays. The third measurement, light load hours in MWh, is the total MWh generated or consumed over light load hours. Light load hours (referred to as either Light or LLH) can vary by contract, but generally are hours 10 p.m. to 6 a.m. (or HE 2300 to HE 0006), Monday through Saturday, all day Sunday, and holidays defined by NERC. These measurements are used to ensure that BPA will have adequate resources to meet the variability of loads.

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2. FEDERAL SYSTEM LOAD OBLIGATION FORECAST

2.1 Overview

The Federal System Load Obligation forecast includes: (1) BPA's projected firm requirements power sales contract (PSC) obligations to consumer-owned utilities (COUs) and Federal agencies (together, for purposes of this Study, called Public Agencies or Public Agency Customers); (2) PSC obligations to investor-owned utilities (IOUs); (3) PSC obligations to direct-service industries (DSIs); (4) contract obligations to the U.S. Bureau of Reclamation (USBR); and (5) other BPA contract obligations, including contract obligations outside the Pacific Northwest region (Exports) and contract obligations within the Pacific Northwest region (Intra-Regional Transfers (Out)). Summaries of BPA's forecast of these obligations follow in this section.

2.2 Public Agencies' Total Retail Load and Firm Requirement PSC Obligation Forecasts

In December of 2008, BPA executed power sales contracts with Public Agencies under which BPA is obligated to provide power deliveries starting on October 1, 2011, and continuing through September 30, 2028. These Contract High Water Mark (CHWM) contracts replace BPA's previous power sales contracts, known as Subscription contracts. Three types of these CHWM contracts were offered to customers: Load-Following, Slice/Block, and Block (with or without Shaping Capacity). One hundred eighteen Public Agency customers signed the Load-Following contracts, 17 signed the Slice/Block contract, and none signed the Block contract.

Under the CHWM contracts, customers must make elections to serve their Above Rate Period High Water Mark (RHWM) load by (1) adding new non-Federal resources, (2) buying power from sources other than BPA, and/or (3) requesting BPA to supply power. Above-RHWM load is the amount of load established by BPA every two years for each customer that is in excess of the customer's right to purchase at Tier 1 rates. Power Rates Study, BP-12-FS-BPA-01, section 1.6. Any Above-RHWM load that customers elect to meet by either adding new non-Federal resources or buying power from sources other than BPA is not included in this Study because BPA does not have an obligation to serve that load. Based on the Public Agency customers' elections, this Study assumes BPA will supply 21 aMW of Above-RHWM load in FY 2012 and 57 aMW in FY 2013.

2.2.1 Load-Following PSC Obligation Forecasts

The Load-Following product provides firm power to meet the customer's total retail load, less the firm power from the customer's non-Federal resource generation amounts and purchases from other suppliers used to serve its total retail load.

The total monthly firm energy requirements PSC obligation forecast for Public Agency customers that purchase the Load-Following product is based on the sum of the utility-specific firm requirements PSC obligation forecasts, which are customarily produced by BPA analysts. The method used for preparing the firm requirements PSC obligation forecasts is as follows.

First, utility-specific forecasts of total retail load are produced using least-squares regression-based models on historical monthly energy loads. These models may include several independent variables, such as a time trend, heating degree days, cooling degree days, and monthly indicator variables. Heating and cooling degree days are measures of temperature effects to account for changes in electricity usage related to temperature changes. Heating degree days are calculated when the temperature is below a base temperature, such as 65 degrees, and similarly, cooling degree days are calculated when the temperature is above a base temperature. The results from these computations are utility-specific monthly forecasts of total retail energy load. The total retail energy load is then split into HLH and LLH time periods using recent historical relationships.

The monthly peak loads are forecast in a similar fashion as the energy loads, including the use of historical data for the customers' peaks.

Second, estimates of customer-owned and consumer-owned dedicated resource generation and contract purchases dedicated to serve retail loads are subtracted from the utility-specific total retail load forecasts to produce a firm requirement PSC obligation forecast for each utility. These firm requirement PSC obligation forecasts provide the basis for the Load-Following product sales projections incorporated in BPA ratemaking.

A list of the 118 Public Agency customers that have purchased the Load-Following product is shown in the Documentation, Table 1.1.1. BPA's forecast of the total Public Agency PSC obligation is summarized in Documentation Table 1.2.1 for energy, Table 1.2.2 for HLH, and Table 1.2.3 for LLH, on lines 2 (Federal Entities) and 8 (Load-Following 2012 PSC). This forecast is also included in the calculation of the load-resource balance, Table 4.1.1 for energy, Table 4.1.2 for HLH, and Table 4.1.3 for LLH, on lines 1 (Federal Entities) and 5 (Load-Following 2012 PSC).

2.2.2 Slice/Block PSC Obligation Forecasts

The Slice/Block product provides firm requirements power to serve the customer's total retail load up to its planned net requirement. For each Fiscal Year, the planned annual Slice amount will be adjusted based on BPA's calculation of the customer's planned net requirement under the contract. The Block portion of the Slice/Block product provides a planned amount of firm requirements power in a fixed monthly shape, while the Slice portion provides planned amounts of firm requirements power in the shape of BPA's generation from the Tier 1 System.

The PSC obligation of the total Slice product monthly energy firm requirements is forecast by multiplying the monthly RHWM Tier 1 System Capability by the sum of the individual customers' Slice Percentages as stated in Slice/Block contracts. The sum of the individual customers' Slice Percentages for FY 2012 and 2013 is 26.8541 percent.

The PSC obligation of the Block product monthly energy firm requirements for each Slice/Block customer is forecast as follows:

1. Forecast the planned annual net requirements load.
2. Compute the planned annual amount of firm requirements power available through the Slice Product by multiplying the annual RHWM Tier 1 System Capability by the Slice Percentage stated in the customer's Slice/Block contract.
3. Compute the annual Block product firm requirements obligation by subtracting the Slice annual amount of firm requirements power (Step 2) from the planned annual net requirement (Step 1).
4. Compute each month's Block product firm requirements obligation by multiplying the annual Block product firm requirements obligation (Step 3) by each month's block shaping factor stated in the customer's Slice/Block contract.

The total monthly Block product firm requirements obligation is computed as the sum of the monthly Block product firm requirements obligations, computed in step 4 above, for each Slice/Block customer.

A list of the 17 Slice/Block customers is shown in the Documentation, Table 1.1.2. BPA's forecast of the total Slice/Block PSC Obligation is summarized in Documentation Table 1.2.1 for energy, in Table 1.2.2 for HLH, and in Table 1.2.3 for LLH, on Lines 12 (Slice 2012 PSC) and 14 (Slice/Block 2012 PSC)). This forecast is also included in the calculation of the load-resource balance, Table 4.1.1 for energy, Table 4.1.2 for HLH, and Table 4.1.3 for LLH, on lines 7 (Slice 2012 PSC) and 8 (Slice/Block 2012 PSC).

2.2.3 Sum of Load-Following and Slice/Block PSC Obligation Forecasts

The sum of the projected firm requirements PSC obligations for customers with CHWM contracts comprises the Public Agencies (Preference) portion of the Priority Firm Public (PFp) load obligation forecast. Each customer's load obligation forecast accounts for the reported amount of conservation that the customer plans to achieve during the FY 2012–2013 rate period. The amount of anticipated BPA-funded conservation beyond what the customers have reported is also accounted for in the total load obligation forecast. Thus, the sum of the projected firm requirements PSC obligations for customers with CHWM contracts is reduced based on the total anticipated BPA-funded conservation savings during the rate period. The total conservation reductions are estimated to be 22.6 aMW for FY 2012 and 29.7 aMW for FY 2013. Table 1 presents the PF load obligation by product and total PF load obligation adjusted for conservation savings.

2.3 Investor-Owned Utilities Sales Forecast

The six IOUs in the PNW region are Avista Corporation, Idaho Power Company, NorthWestern Energy Division of NorthWestern Corporation (formerly Montana Power Company), PacifiCorp, Portland General Electric Company, and Puget Sound Energy, Inc. Most of the IOUs have signed BPA power sales contracts for FY 2011 through 2028; however, no IOUs choose to take service under these contracts. If requested, BPA would serve any net requirements of an IOU at the New Resource Firm Power (NR-12) rate. No net requirements power sales to regional IOUs are forecast for FY 2012–2013 based on BPA's current contracts with the regional IOUs. The IOUs will receive benefits under the settlement of the Residential Exchange Program (REP), but these benefits are not in the form of actual power deliveries.

2.4 Direct Service Industry Sales Forecast

Currently BPA is making power sales deliveries to Alcoa, Inc. (Alcoa) and Port Townsend Paper Corporation (Port Townsend). The Port Townsend contract is for 20 aMW and terminates August 31, 2012. The Alcoa contract is for 320 aMW, and the "initial period" of the contract extends through May 2012. The Alcoa contract also provides for a contingent power sale, if certain conditions are met, that would extend the sale for an additional five years. This Study assumes power sales to the DSIs totaling 340 aMW for each year of the rate period, composed of 320 aMW for Alcoa and 20 aMW for Port Townsend, all sold at the IP-12 rate.

The DSI forecast is summarized in Documentation Table 1.2.1 for energy, Table 1.2.2 for HLH, and Table 1.2.3 for LLH, on Line 6 (Total Direct Service Industry). This forecast is also included in the calculation of the load-resource balance, Table 4.1.1 for energy, Table 4.1.2 for HLH, and Table 4.1.3 for LLH, on Line 3 (DSI Obligation).

2.5 USBR Irrigation District Obligations

BPA is obligated to provide power from the Federal system to several irrigation districts associated with USBR projects in the Pacific Northwest. These irrigation districts have been Congressionally authorized to receive power from specified Federal Columbia River Power System (FCRPS) projects as part of the USBR project authorization. BPA does not contract directly with these irrigation districts; instead, there are several agreements between BPA and USBR that provide details on the power deliveries.

A list of USBR irrigation district obligation customers is shown in Documentation Table 1.1.3. BPA's forecast of the total USBR customer load is summarized in Table 1.2.1 for energy, Table 1.2.2 for HLH, and Table 1.2.3 for LLH, on Line 4 (Total U.S. Bureau of Reclamation). This forecast is also included in the calculation of the load-resource balance, Table 4.1.1 for energy, Table 4.1.2 for HLH, and Table 4.1.3 for LLH, on Line 2 (USBR Obligation).

2.6 Other BPA Contract Obligations

BPA provides Federal power to customers under a variety of contract arrangements not included in the Public Agencies, IOU, DSI, or USBR forecasts. These contracts include obligations outside the Pacific Northwest region (Exports) and obligations within the Pacific Northwest region. Intra-Regional Transfers (Out) are categorized as: (1) power sales; (2) power or energy exchanges; (3) capacity sales or capacity-for-energy exchanges; (4) power payments for services; and (5) power commitments under the Columbia River Treaty. These arrangements, collectively called "Other Contract Obligations," are specified by individual contract provisions and can have different delivery arrangements and rate structures. BPA's Other Contract Obligations are assumed to be served by Federal system firm resources regardless of weather, water, or economic conditions. These Other Contract Obligations are modeled individually and are specified or estimated for monthly energy in aMW, HLH MWh, and LLH MWh.

Trading floor sales during the rate period are not included in BPA's load-resource balance used in ratemaking. Revenue impacts of these contract obligations are reflected as presales of secondary energy and are included as secondary revenues credited to non-Slice customers' rates. These contracts are accounted for in the Power Risk and Market Price Study, BP-12-FS-BPA-04, section 2.5.

The Pacific Northwest region Contract Obligations (Exports) are detailed in Documentation Table 1.3.1 for energy, Table 1.3.2 for HLH, and Table 1.3.3 for LLH. The Pacific Northwest Intra-Regional Transfers (Out) Contract Obligations are detailed in Documentation Table 2.8.1 for energy, Table 2.8.2 for HLH, and Table 2.8.3 for LLH, on Line 22 (Total Contracts Out). This forecast is also included in the calculation of the load-resource balance, Table 4.1.1 for energy, Table 4.1.2 for HLH, and Table 4.1.3 for LLH, on Lines 10 (Exports) and 11 (Regional Transfers (Out)).

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3. RESOURCE FORECAST

3.1 Federal System Resource Forecast

3.1.1 Overview

In the Pacific Northwest, 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; rather, BPA markets power from Federal and non-Federal generating resources to meet Federal load obligations. In addition, BPA purchases power through contracts that add to the Federal system generating capability. These resources and contract purchases are collectively called “Federal system resources” in this Study. Federal system resources are classified as Federal regulated and independent hydro projects, non-Federal independent hydro projects, other non-Federal resources (renewable, cogeneration, large thermal, wind, and non-utility generation (NUG) projects), and Federal contract purchases.

3.1.2 Federal System Hydro Generation

Federal system hydro resources are comprised of the generation from regulated and independent hydro projects. Regulated projects and the process used for estimating the generation of regulated hydro projects are detailed in section 3.1.2.1. Independent hydro projects and the methodology for forecasting generation of independent hydro projects are described in section 3.1.2.2. BPA also purchases the output from a small NUG hydro project with generation estimates provided by the project’s owner. NUG hydro project output estimates are assumed not to vary by water year and are described in section 3.1.3.

3.1.2.1 Regulated Hydro Generation Forecast

BPA markets the generation from the Federal system hydro projects, listed in Documentation Table 2.1.1, Lines 1-14. These projects are owned and operated by either the USACE or USBR.

This Study uses BPA's hydro regulation model, HYDSIM, to estimate the Federal system energy production that can be expected from specific hydroelectric power projects in the PNW Columbia River Basin when operating in a coordinated fashion and meeting power and non-power requirements for 70 water years (October 1928 through September 1998). The hydro projects modeled in HYDSIM are called regulated hydro projects. The hydro regulation study uses individual project operating characteristics and conditions to determine energy production expected from each specific project. Physical characteristics of each project come from annual Pacific Northwest Coordination Agreement (PNCA) data submittals from regional utilities and government agencies involved in the coordination and operation of regional hydro projects. The HYDSIM model incorporates the physical characteristics along with power and non-power operating requirements to provide project-by-project monthly energy generation estimates for the Federal system regulated hydro projects that vary by water year.

There are two main steps of the hydro regulation studies that estimate regulated hydro generation production. First, an Actual Energy Regulation study (AER step) is run in HYDSIM to determine the operation of the hydro system under each of the 70 historical water conditions while meeting the Firm Energy Load Carrying Capability (FELCC) produced in the PNCA final hydro regulation. In this step, the Canadian operation is fixed to the best available assured operating plan (AOP) or detailed operating plan (DOP) for the Study, which is the 2012 DOP in this Study. Also in this step, the U.S. Federal, U.S. non-Federal, and Canadian reservoirs draft water to meet the Coordinated System FELCC, while continuing to meet individual reservoir non-power operating requirements. Second, a 70-year operational study (OPER step) is run in HYDSIM with the estimated regional firm loads developed for each year of the Study and with any deviations from the PNCA data submittals necessary to reflect expected operations during the rate period. In the OPER step the non-Federal projects are fixed to their operations from the AER step, and the Federal projects operate differently based on the deviations from PNCA data and the estimated regional firm load. In summary, the AER step is run based on PNCA data to determine the operation of the non-Federal projects, and the OPER step is run to determine the operation of the Federal projects based on PNCA data plus additional assumptions needed to reflect expected operations. The end result of these two steps is generally referred to as the hydro regulation study.

Separate hydro regulation studies are incorporated for each year of the rate period for this Study. By modeling hydro regulation studies for individual years, the hydro generation estimates capture changes in variables that characterize yearly variations in the hydro operations due to firm loads, firm resources, markets for hydro energy products in better than critical water conditions, and project operating limitations and requirements. These variables affect the amount and timing of energy available from the hydro system and are changed as necessary to reflect current expectations. Sections 3.1.2.1.1 through 3.1.2.1.4 contain additional details on the process of producing the regulated hydro generation estimates used in this Study.

BPA's forecast for the Federal system regulated hydro generation is detailed in Documentation Table 2.1.1 for energy. An aggregate of the Federal system regulated hydro generation is summarized for HLH in Table 2.1.2, and for LLH in Table 2.1.3. See Line 8 (Total Regulated Hydro w/Enc.). The HLH and LLH split is based on the aggregated Federal system regulated hydro generation estimates produced by BPA's Hourly Operating and Scheduling Simulator (HOSS) analyses, which incorporates the same HYDSIM hydro regulation studies as its base input. The HOSS model is described in the Generation Inputs Study, BP-12-FS-BPA-05, Section 3.2.4. This forecast is also included in the calculation of the load-resource balance, Table 4.1.1 for energy, Table 4.1.2 for HLH, and Table 4.1.3 for LLH, on Line 15 (Regulated Hydro).

The energy for the net regulated hydro generation is provided to the Power Risk and Market Price Study, BP-12-FS-BPA-04. The HLH and LLH Federal system regulated hydro generation estimates are later combined with the Federal system independent hydro HLH-LLH split in the Power Risk and Market Price Study.

3.1.2.1.1 Assumptions in the HYDSIM Hydro Regulation Study

The HYDSIM studies incorporate the power and non-power operating requirements expected to be in effect during the rate period, including those described in the NOAA Fisheries FCRPS Biological Opinion (BiOp) regarding salmon and steelhead, published May 5, 2008; the U.S. Fish and Wildlife Service (USFWS) FCRPS BiOp regarding bull trout and sturgeon, published December 20, 2000; the USFWS Libby BiOp regarding bull trout and sturgeon, published February 18, 2006; relevant operations described in the Northwest Power and Conservation Council's (NPCC's) Fish and Wildlife Program; and other fish mitigation measures. Each hydro regulation study specifies particular hydroelectric project operations for fish, such as seasonal flow objectives, minimum flow levels for fish, spill for juvenile fish passage, reservoir target elevations and drawdown limitations, and turbine operation efficiency requirements.

Additionally, HYDSIM uses hydro plant operating characteristics in combination with power and non-power requirements to simulate the coordinated operation of the hydro system. These operating requirements include but are not limited to storage content limits determined by rule curves, maximum project draft rates determined by each project owner, and flow and spill objectives described in the NOAA Fisheries and USFWS BiOps listed above and as provided by the 2010 PNCA data submittals. Some deviations from the 2010 PNCA data submittals are necessary in order to more accurately model anticipated operations for the rate period, such as fine-tuning the study to reflect typical in-season management decisions that are not reflected in the 2010 PNCA data submittals.

The hydro regulation studies include sets of power and non-power requirements for each year of the rate period. Specific assumptions for the HYDSIM hydro regulation study are detailed in the Documentation, BP-12-FS-BPA-03A, section 3.

Several changes have been made to the hydro modeling since the WP-10 Loads and Resources study. These changes have been made as part of BPA's continuous efforts to incorporate the most recent available data in the model and to improve hydro regulation modeling to more accurately reflect operations. The following are the updates to the HYDSIM hydro regulation studies included in this Study:

- All projects have been updated to 2010 PNCA data. These updates are too numerous to list in their entirety and tend to be minor. The following are some of the more noteworthy PNCA data updates:
  - Libby September minimum flows for bull trout decreased to 6000 cfs (previously 7000–9000 cfs in the WP-10 Loads and Resources Study).
  - Hungry Horse maximum outflow decreased to 9500 cfs.
  - Grand Coulee generation table increased 1 percent to account for efficiency improvements that were previously being added in Loads and Resources Studies after HYDSIM modeling.
  - Grand Coulee pumping data have been updated.
  - Mica, Arrow, and Duncan plant data have been updated to better reflect physical project characteristics.
- Flood Control rule curves have been updated to the most recent data provided by the USACE. The new flood control rule curves reflect:
  - BC Hydro's change to Duncan's storage reservation diagram, which results in small differences in February (0–28 ksfd).
  - 1600 cfs minimum outflow at Dworshak, which primarily affects the rule curves in March, April, and May.

- Libby December flood control based on December forecasts when available (1949–1998), while other years are still based on January forecasts.
- Grand Coulee's updated rule curves to account for the Dworshak and Duncan changes.

- Canadian project operations have been updated to the 2012 DOP, which generally decreased Arrow outflow on average in October, December, January, April, May, June, and September and increased Arrow outflow on average in November, February, March, July, and August.
- Loads and Hydro Independents have been updated to the 2010 White Book Study analysis. HYDSIM uses the residual hydro load for the region, which is calculated by subtracting the regional firm non-hydro resources from the total regional firm load. The Total Retail Loads in FY 2012 and FY 2013 have decreased and the non-hydro resources have increased since the WP-10 Loads and Resources Study. As a result, the updated residual hydro loads in HYDSIM are about 1,990 aMW lower in FY 2012 and about 2,120 aMW lower in FY 2013 when compared to the WP-10 Study.
- Miscellaneous updates have been made to better reflect expected actual operations:
  - Libby modeling includes a refill flow calculation in May, improved sturgeon pulse modeling, smoothed summer flows, and slightly reshaped fall draft to completely avoid spill in all years.
  - Dworshak's outflow has been reshaped to reduce spill February through June and to smooth July through August flows.
  - Hungry Horse's summer draft has been reshaped to smooth flows better, avoid a double-peak of flows in the summer, and still reach the Montana proposal end-of-September draft elevations.

- Albeni Falls has been held at the winter elevation (2053 feet) only through April 15 instead of through April 30, allowing Albeni Falls to fill in the second half of April.
- Grand Coulee's January through March operation has been reshaped when possible to spread the secondary energy more evenly and place more secondary energy in January and February.
- Updated modeling has been incorporated to more accurately reflect the frequency of forced drafts for drum gate maintenance at Grand Coulee. This update reduces the frequency of forced drafts for maintenance, as the project drafts deep enough for other reasons to perform the maintenance in most years without forcing the draft specifically for maintenance purposes.
- Kerr's operation has been updated to reflect more recent typical operations.

• There are several minor spill updates compared to the WP-10 Loads and Resources Study:
  - Ice Harbor is assumed to spill 30 percent of the total river discharge during the summer (the WP-10 Study assumed 35 percent) June 16–August 16 (previously assumed June 16–August 15).
  - John Day is assumed to spill 30 percent of the total river discharge during the spring and summer April 10–August 31 (the WP-10 Study assumed 30 percent April 10–19, 35 percent April 20–July 20, and 30 percent July 21–August 31).
  - The Dalles sluiceway is assumed to operate March 1–December 15 using about 3 kcfs flow for fish passage (the WP-10 Study assumed April 1–November 30). This is treated as miscellaneous flow and included as "other" spill in HYDSIM.
  - Bonneville's total dissolved gas cap has been updated to 120 kcfs given the discontinued use of the Camas-Washougal gage for limiting spill. Therefore, Bonneville's spring spill operation of 100 kcfs is no longer limited by the dissolved gas cap (previously 96 kcfs during the spring).

- Bonneville's summer spill operation has been updated to reflect the 2010 test of two different alternating operations June 16–August 31: (1) 95 kcfs spill 24 hours per day, and (2) 85 kcfs day spill and 121 kcfs night spill. These two operations provide roughly the same amount of spill on average as the previous spill assumption of 85 kcfs day spill and dissolved gas cap night spill.

- Federal powerhouse availability factors have been updated to include the average 2001–2009 powerhouse outages, additional large planned outages, and more recent wind and operating reserve requirement assumptions. See Generation Inputs Study, BP-12-FS-BPA-05, sections 2 and 4.5, for details on reserve requirements. These wind and operating reserve requirement updates are incorporated into the availability factors in HYDSIM and reduce the powerhouse generating capability. The additional large planned outages at Chief Joseph are reflected by reducing the 2001–2009 average availability factors by an additional two 88-MW units out of service from April 2010 through August 2014. The additional large planned outages at Grand Coulee are reflected by basing Grand Coulee availability factors on 2009 and 2010 average actual outages and reducing these availability factors by one additional 805 MW unit.
- The method of estimating lack of market spill has been changed from the method used in the WP-10 Loads and Resources Study. The WP-10 Study used a constant 10,000 aMW secondary market limit in all periods of all years in HYDSIM to estimate lack-of-market spill. For BP-12, the AURORAxmp model was used to estimate lack-of-market spill.

These combined changes generally increase annual average Federal generation about 178 aMW in FY 2012 and 175 aMW in FY 2013 under 1937 critical water conditions and increase the 70-year average Federal generation about 161 aMW in FY 2012 and 0 aMW in FY 2013 compared to the WP-10 Loads and Resources Study. The separate effects of each modeling change have not been analyzed; however, it does not appear that any one single change caused significant effects. The increases are probably attributable to a few of the more significant changes, which include the updated Canadian project operations, the updated operations at Libby and Kerr, and the updated estimates of lack-of-market spill.

The differences in the hydro regulation studies for FY 2012 and FY 2013 are:

(1) The hydro availability factors used to model anticipated unit outages and the standard reserve requirements are estimated for each study year. The outages associated with anticipated maintenance are the same in the FY 2012 and FY 2013 studies. The availability factors are adjusted to reflect the different amount of reserve requirements estimated for each year, including the forecast wind reserve requirements (operating reserves and increases and decreases in balancing reserve capacity (*inc*s and *dec*s)). See Generation Inputs Study, BP-12-FS-BPA-05, sections 2 and 4.5, for details on wind reserve assumptions.

(2) The residual hydro loads assumed in HYDSIM are different in the two hydro regulation studies. The loads incorporated in the FY 2013 hydro regulation study are slightly higher than the loads projected for the FY 2012 hydro regulation study, mainly due to load growth, but also due to changes in regional thermal resources.

(3) The amounts of spill due to lack of market are different in the two hydro regulation studies. These differences come from the AURORAxmp model, which simulated the different anticipated market conditions in the two years.

3.1.2.1.2 70-Year Modified Streamflows

The HYDSIM model uses streamflows from historical years as the basis for estimating power production of the hydroelectric system. The AER step and OPER step HYDSIM studies are developed using the year-2000 level of modified historical streamflows. Historical streamflows are modified to reflect the changes over time due to the effects of irrigation and consumptive diversion demand, return flow, and changes in contents of upstream reservoirs and lakes. These modified streamflows were developed under a BPA contract funded by the PNCA parties. The modified streamflows are also adjusted in this study to include updated estimates of Grand Coulee irrigation pumping and resulting downstream return flows, using data provided by USBR in its 2010 PNCA data submittal.

Seventy years of streamflow data are used because hydro is a variable resource with a high degree of variability in output from year to year. The Study uses a 70-year hydro regulation study to forecast the expected operations of the regulated hydro projects for varying hydro conditions. Approximately 80 percent of BPA's Federal system resource stack is comprised of hydro generation, which can vary annually by about 5,000 aMW depending on water conditions. The hydro regulation simulation model HYDSIM estimates regulated hydro project generation for varying water conditions, which takes into account specific flows, volumes of water, elevations at dams, biological opinions, and many other aspects of the hydro system. Given the variability of hydro generation, as many years as possible should be modeled; 70 years is the largest number of years for which all the historical data are available as needed by HYDSIM.

Additionally, BPA has generation estimates for other hydro projects that are based on 70 historical water conditions, October 1928 through September 1998. These projects are called "independent hydro" projects because their operations are not regulated in this HYDSIM study, primarily because they have much less storage capability than the hydro projects in the Columbia River Basin regulated in the HYDSIM study. The independent hydro projects usually have generation estimates for each of the 70 water years of record. Most of these hydro projects are not Federally owned, and their generation estimates are updated with the cooperation of each project owner. For those independent hydro projects that did not have data for all 70 water years, generation estimates were expanded using the project's median generation to estimate generation for the additional water years.

3.1.2.1.3 1937 Critical Water for Firm Planning

To ensure that it has sufficient generation to meet load, BPA bases its resource planning on critical water conditions. Under critical water conditions, the PNW hydro system would produce the least amount of power while taking into account the historical streamflow record, power and non-power operating constraints, the planned operation of non-hydro resources, and system load requirements. For operational purposes, BPA assumes critical water conditions during the eight-month critical period of September 1936 through April 1937. For planning purposes and to align with the fiscal years used in this Study, however, the Study uses the historical streamflows from October 1936 through September 1937 water conditions as the critical period. This is termed "1937 critical water conditions." The hydro generation estimates under 1937 critical water conditions determine the critical period firm energy for the regulated and independent hydro projects. This is called the FELCC, or firm energy load carrying capability.

3.1.2.1.4 Generation Performance Curves

The HYDSIM generation forecast for this analysis incorporates updated generation performance curves for the regulated hydro Federal hydro projects, and therefore no generation additions for additional efficiency improvements are needed.

3.1.2.2 Independent Hydro Generation Forecast

Federal system independent hydro includes hydro projects whose generation output typically varies by water conditions; however, the generation forecasts for these projects are not modeled or regulated in the HYDSIM model. BPA markets the power from independent hydro projects that are owned and operated by USBR, USACE, or other project owners. Federal system independent hydro generation estimates are provided by individual project owners for 70 water years (October 1928 through September 1998). These include power purchased from hydro projects owned by Lewis County Public Utility District (Cowlitz Falls), Mission Valley (Big Creek), and Idaho Falls Power (Bulb Turbine projects). Tables 2.2.1, 2.2.2, and 2.2.3, lines 1-21, list the hydro projects included in BPA's Independent Hydro Generation forecast.

The energy estimates for Federal system independent hydro generation used in this Study are described in the Documentation, Section 2.2, Table 2.2.1 for energy, Table 2.2.2 for HLH, and Table 2.2.3 for LLH. This forecast is also included in the calculation of the load-resource balance, Table 4.1.1 for energy, Table 4.1.2 for HLH, and Table 4.1.3 for LLH, on Line 16 (Independent Hydro).

The HLH-LLH split for the independent hydro generation estimates is developed based on actual historical data. This Study provides the HLH and LLH Federal system independent hydro generation to the Power Risk and Market Price Study, BP-12-FS-BPA-04.

3.1.3 Other Federal System Generation

Other Federal system generation includes the purchased output from non-Federally owned projects and project generation that is directly assigned to BPA. Other Federal system generation estimates are detailed for monthly energy in aMW and HLH and LLH megawatthours as follows.

(1) Renewable resources, which include wind resources (Federal purchases of shares of the Condon Wind Project; Foote Creek 1, 2, and 4 Wind Projects; Klondike I Wind Project; Klondike III Wind Project; and Stateline Wind project). These projects are detailed in the Documentation, Section 2.4, Table 2.4.1 for energy, Table 2.4.2 for HLH, and Table 2.4.3 for LLH. This forecast is also included in the calculation of the

load-resource balance, Table 4.1.1 for energy, Table 4.1.2 for HLH, and Table 4.1.3 for LLH, on Line 21 (Renewables).

(2) Cogeneration resources include the Georgia Pacific (Wauna) project. This project is detailed in the Documentation, Table 2.5.1 for energy, Table 2.5.2 for HLH, and Table 2.5.3 for LLH. This forecast is also included in the calculation of the load-resource balance, Table 4.1.1 for energy, Table 4.1.2 for HLH, and Table 4.1.3 for LLH, on Line 22 (Cogeneration).

(3) Columbia Generating Station (CGS), which incorporates facility improvements and a two-year refueling cycle. CGS details are shown in the Documentation, Table 2.6.1 for energy, Table 2.6.2 for HLH, and Table 2.6.3 for LLH. This forecast is also included in the calculation of the load-resource balance, Table 4.1.1 for energy, Table 4.1.2 for HLH, and Table 4.1.3 for LLH, on Line 27 (Large Thermal).

(4) Non-Utility Generation, which includes: solar resources (Ashland Solar Project and White Bluffs Solar); and small hydro (Dworshak/Clearwater Small Hydro project). Non-Utility Generation is detailed in the Documentation, Table 2.9.1 for energy, Table 2.9.2 for HLH, and Table 2.9.3 for LLH. This forecast is also included in the calculation of the load-resource balance, Table 4.1.1 for energy, Table 4.1.2 for HLH, and Table 4.1.3 for LLH, on Line 28 (Non-Utility Generation).

The decommissioning of the Elwha and Glines Canyon hydro projects began on June 1, 2011, which is before the beginning of the rate period. Therefore, generation estimates for these projects are not included in the Study.

3.1.4 Other Federal System Contract Purchases

BPA purchases or receives power under a variety of contractual arrangements to help meet Federal load obligations. The contracts are categorized as: (1) power purchases; (2) power or energy exchange purchases; (3) capacity sales or capacity-for-energy exchange contracts;

(4) power purchased or assigned to BPA under the Columbia River Treaty; and (5) transmission loss returns under Slice/Block contracts. These arrangements are collectively called "Other Contract Purchases." BPA's Other Contract Purchases are considered firm resources that are delivered to the Federal system regardless of weather, water, or economic conditions. The transmission loss returns category captures the return of Slice transmission losses to the Federal system as part of the Slice/Block contracts, which acts as a Federal system resource.

BPA's within-year balancing and trading floor purchases during the rate case period are not included in BPA's load-resource balance. Revenue impacts for within-year balancing purchases are reflected in the Power Risk and Market Price Study, BPA-12-FS-BPA-04, section 2.6.3. Revenue impacts from trading floor purchases are reflected in the Power Risk and Market Price Study, section 2.5.

BPA's expected Other Contract Purchases are detailed in the Documentation as follows: Imports are found in Table 2.3.1 for energy, Table 2.3.2 for HLH, and Table 2.3.3 for LLH; Canadian Entitlement Returns are found in Table 2.7.1 for energy, Table 2.7.2 for HLH, and Table 2.7.3 for LLH; and Intra-Regional Transfers are found in Table 2.8.1 for energy, Table 2.8.2 for HLH, and Table 2.8.3 for LLH. (Federal Transmission Loss Returns does not have its own table but is included in the load-resource balance calculation described below.)

The forecast for Other Contract Purchases is also included in the calculation of the load-resource balance, Table 4.1.1 for energy, Table 4.1.2 for HLH, and Table 4.1.3 for LLH, on lines 23 (Imports), 24 (Regional Transfers (In)), 25 (Non-Fed CER (Canada)), and 26 (Transmission Loss Returns).

3.2 Regional Hydro Resources

3.2.1 Overview

This Study produces total PNW regional hydro resource estimates for FY 2012–2013 to provide input into the AURORAxmp model for the Power Risk and Market Price Study, BP-12-FS-BPA-04.

3.2.2 PNW Regional 70 Water Year Hydro Generation

PNW regional hydro resource estimates are one of the inputs into the AURORAxmp model and are comprised of regulated and independent hydro, plus NUG hydro for FY 2012–2013 for all PNW hydro resources, federal and nonfederal. Regulated hydro project generation estimates for this Study are developed, by month, for each of the 70 water years (October 1928 through September 1998) using the same HYDSIM study described in section 3.1.2.1. Independent hydro generation estimates were provided by the project owners for the same 70 water years. Generation estimates for the NUG hydro projects are provided by the individual project owners and are assumed not to vary by water year.

The regional regulated, independent, and NUG hydro totals are summarized for 70 water years for FY 2012–2013 and are shown in the Documentation, section 2.9, Tables 2.9.1, 2.9.2, and 2.9.3.

3.3 4(h)(10)(C) Credits

3.3.1 Overview

The Pacific Northwest Electric Power Planning and Conservation Act (Northwest Power Act) directs BPA to make expenditures to protect, mitigate, and enhance fish and wildlife affected by the development and operation of Federal hydroelectric projects in the Columbia River Basin and its tributaries in a manner consistent with the Power Plan and Fish and Wildlife Program developed by the NPCC and other purposes of the Northwest Power Act. 16 U.S.C. §§ 839–

839h. BPA recovers, through power rates, the power costs for the Federal hydro projects from which BPA markets power. However, pursuant to section 4(h)(10)(C) of the Northwest Power Act, BPA ratepayers are not required to pay for costs allocated to non-power uses of the projects. These non-power uses include flood control, irrigation, recreation, and navigation. The percentage of costs attributable to non-power purposes is 22.3 percent. The 22.3 percent is the systemwide average cost allocation for non-power purposes of the FCRPS such as flood control, recreation, irrigation, and navigation. These cost allocations are provided by the USBR and USACE for their hydropower projects.

The Northwest Power Act allows BPA to annually recoup the portion of costs associated with fish measures that should be allocated to other non-power uses of the dams through section 4(h)(10)(C) credits against BPA's payments to the U.S. Treasury. This Study estimates the replacement power purchases resulting from changes in hydro system operations to benefit fish and wildlife, and these power purchases are part of the calculation of estimated 4(h)(10)(C) credits. These operations to benefit fish and wildlife are described in section 3.1.2.1.1.

3.3.2 Forecast of Power Purchases Eligible for 4(h)(10)(C) Credits

BPA receives section 4(h)(10)(C) credits for the non-power portion of additional power purchases made as a result of operations to benefit fish and wildlife. These power purchases are estimated by comparing power purchase estimates between two HYDSIM hydro regulation studies. The first hydro regulation study, termed the "with-fish" study, models hydro system operations using current requirements for fish mitigation and wildlife enhancement under 70 historical water year conditions (October 1928 through September 1998). The FY 2012 HYDSIM study is used as the "with-fish" study. The second hydro regulation study, called the "no-fish" study, models the hydro system operation assuming no operational changes were made to benefit fish and wildlife, using the same 70 historical water-year conditions.

BPA estimates the power purchases that would be required to meet a specific firm load (described later) under the with-fish study and the power purchases that would be required to meet the same specific firm load under the no-fish study. The 4(h)(10)(C) credits do not pertain to the entire generation difference between the with-fish study and the no-fish study, but instead the credits pertain only to a portion of the additional power purchases in the with-fish study compared to the power purchases in the no-fish study. BPA receives section 4(h)(10)(C) credits for the non-power portion of the additional power purchases it must make in the with-fish study relative to the no-fish study. The non-power portion is 22.3 percent, which represents the non-power purposes of the hydro system.

The specific firm load used in the calculation of 4(h)(10)(C) credits was a part of the original negotiated arrangement between the U.S. Department of Energy and U.S. Department of Treasury allowing BPA to claim the credits. A fundamental principle of this arrangement for claiming section 4(h)(10)(C) credits is that the calculation is not to be affected by BPA's marketing decisions. In order to separate the credit calculation from BPA marketing decisions, 4(h)(10)(C) credits are calculated using the load that could have been served with certainty while drafting the system from full to empty without fish operations and under the worst energy-producing water conditions in the 70-year record (referred to as the critical period, which is 1929–1932 in the no-fish study). This FELCC is the amount of firm load that BPA would have been entitled to sell without fish operations and is used as the firm load in the section 4(h)(10)(C) power purchases analysis. The differences between the Federal FELCC and the Federal generation in the with-fish study determine the power purchases under the with-fish study. The differences between the Federal FELCC and the Federal generation in the no-fish study determine the power purchases under the no-fish study. The instances where power purchases are greater in the with-fish study compared to the no-fish study result in power purchases eligible for section 4(h)(10)(C) credits. Alternatively, when power purchases are less in the with-fish study than in the no-fish study, the difference constitutes a negative section 4(h)(10)(C) credit.

The differences in energy purchase amounts between the with-fish and no-fish hydro studies are calculated for each period and water condition of the 70 water year studies. The differences are shown in the Documentation, Table 2.11. These power purchases are used as inputs to the Power Risk and Market Price Study, BP-12-FS-BPA-04, where, combined with AURORAxmp market price estimates, they are used to calculate the 4(h)(10)(C) credits for power purchases. The non-power portion (22.3 percent) of the average expense for these purchases is used as the forecast of section 4(h)(10)(C) credits for Federal hydro system fish operations.

3.4 Use of Tier 1 System Firm Critical Output Calculation

The Tier 1 System Firm Critical Output (T1SFCO) is calculated pursuant to section 3.1 of the Tiered Rate Methodology. Pursuant to the TRM, the T1SFCO is used to calculate each customer's RHWM, as well as various billing determinants and other rate components set out in the Power Rate Study, BP-12-FS-BPA-01. The determination of T1SFCO is not part of this rate case, and in the future, the T1SFCO will be calculated in advance of the start of the rate case pursuant to the TRM. However, this year the T1SFCO was used to calculate customers' RHWMs determined in the CHWM Process that was completed in May 2011. See Power Rate Study, BP-12-FS-BPA-01, section 1.6. Supporting tables are provided in the Documentation, section 2.12. Table 2.12.1 contains the summary of the T1SFCO for FY 2012–2013. Table 2.12.2 contains the Federal System Hydro Generation. Table 2.12.3 contains the Designated Non-Federally Owned Resources. Table 2.12.4 contains the Designated BPA Contract Purchases. Table 2.12.5 contains the Designated BPA System Obligations. In tables 2.12.2 through 2.12.5, edits to the categories from the September 2009 TRM tables 3.1 through 3.4 are shown in blue.

4. FEDERAL SYSTEM LOAD-RESOURCE BALANCE

4.1 Overview

In order for BPA to do operational planning and set power rates, the Federal system must be in load and resource balance; that is, BPA must forecast that it has enough resources available to serve its forecast loads during critical water conditions. The load-resource balance is composed of the monthly energy amounts of BPA's resources, which include hydro, non-hydro, and contract purchases; less BPA's load obligations, which are comprised of BPA's PSC obligations and Other Contract Obligations.

To determine whether the Federal system is in load-resource balance, the amount of BPA's annual forecast firm energy resources under 1937 critical water conditions is estimated. If BPA's expected firm energy resources under critical water conditions are sufficient to serve BPA's expected load obligations, then BPA is considered to be in load-resource balance. If BPA's resources under critical water conditions are less than its load obligations, BPA is assumed to purchase power or otherwise secure resources to avoid Federal system annual energy deficits. Purchases to meet these annual firm energy deficits are called system augmentation purchases. Annual system augmentation purchases may not fully meet monthly Federal system HLH or LLH energy deficits. Additional purchases made to meet these monthly HLH or LLH energy deficits are called balancing purchases.

BPA has purchased within-year balancing purchases to cover increasing amounts of forecast winter HLH energy deficits for FY 2012 and 2013. These purchases are called "winter hedging purchases." In addition, BPA has made some surplus purchases and sales that continue into FY 2012 and 2013. These winter hedging purchases and trading floor activities are not included in the calculation of BPA's firm annual load and resource balance in the Loads and Resources Study. Rather, they are reflected in the Power Risk and Market Price Study, BP-12-FS-BPA-04.

4.2 Federal System Energy Load-Resource Balance

Table 2 shows a summary of the Federal system annual energy load-resource balance. Under 1937 critical water conditions, the Federal system is expected to be in firm annual energy surplus of 25 aMW for FY 2012 and in load-resource balance for FY 2013 assuming 176 aMW of augmentation purchases. The components of the Federal system load-resource balance are shown in Table 3, for energy; and in the Documentation, section 4, Table 4.1.1 for energy, Table 4.2.1 for HLH, and Table 4.3.1 for LLH. Specific system augmentation purchase estimates are detailed in Documentation Tables 4.1.1, 4.2.1, and 4.3.1, Line 29 (Augmentation Purchases).

Table 1
Regional Dialogue Preference Load Obligation
Forecast By Product
Annual Energy in aMW

A	B	C
Fiscal Year	**2012**	**2013**
1. Load-Following Customers (Including Federal Agencies and reduced for BPA-funded conservation) 1/	3,167	3,219
2. Block Only	0	0
3. Slice	1,934	1,898
4. Slice/Block	1,773	1,849
5. Total Preference Load Obligations (sum of Lines 1 through 5)	6,874	6,966

1/ BPA-Funded conservation is estimated at 22.6 aMW for FY 2012 and 29.7 aMW for FY 2013.

Table 2
Loads and Resources – Federal System Summary
Annual Energy in aMW

A	B	C
Fiscal Year	**2012**	**2013**
1. Loads		
2. Firm Obligations	8,305	8,379
3. Resources		
4. Total Resources w/o System Augmentation	8,572	8,446
5. System Augmentation Purchases	0	176
6. Federal System Transmission Losses	-242	-243
7. Net Total Resources (line 4 +line 5 + Line 6)	8,330	8,379
8. Surplus/Deficit		
9. Firm Surplus/Defict (Line 7 - Line 2)	25	0

Table 3
Loads and Resources – Federal System Components
Annual Energy in aMW

A	B	C
Energy (aMW)	**2012**	**2013**
Non-Utility Obligations		
1. Fed. Agencies 2012 PSC	116	119
2. USBR Obligation	173	174
3. DSI Obligation	341	341
4. Total Firm Non-Utility Obligations	**630**	**633**
Transfers Out		
5. Load Following 2012 PSC	3,051	3,100
6. Block Only 2012 PSC	0	0
7. Slice 2012 PSC	1,934	1,898
8. Slice/Block 2012 PSC	1,773	1,849
9. IOU 2012 PSC	0	0
10. Exports	625	608
11. Regional Transfers (Out)	291	291
12. Federal Diversity	0	0
13. Total Transfers Out	**7,675**	**7,746**
14. Total Firm Obligations	**8,305**	**8,379**
Hydro Resources		
15. Regulated Hydro	6,565	6,563
16. Independent Hydro	378	379
17. Hydro Maintenance	0	0
18. Total Hydro Resources	**6,943**	**6,942**
Other Resources		
19. Small Thermal & Misc.	0	0
20. Combustion Turbines	0	0
21. Renewables	67	67
22. Cogeneration	19	19
23. Imports	241	241
24. Regional Transfers (In)	91	122
25. Non-Fed CER (Canada)	141	138
26. Transmission Loss Returns	37	36
27. Large Thermal	1,030	878
28. Non-Utility Generation	3	3
29. Augmentation Purchases	0	176
30. Augmentation Resources	0	0
31. Total Other Resources	**1,629**	**1,680**
32. Total Resources	**8,572**	**8,622**
Reserves & Losses		
33. Contingency Reserves (Non-Spinning)	0	0
34. Contingency Reserves (Spinning)	0	0
35. Generation Imbalance Reserves	0	0
36. Load Following Reserves	0	0
37. Federal Transmission Losses	-242	-243
38. Total Reserves & Losses	**-242**	**-243**
39. Total Net Resources	**8,330**	**8,379**
40. Total Firm Surplus/Deficit	**25**	**0**

BONNEVILLE POWER ADMINISTRATION

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