

**2010 BPA Rate Case
Wholesale Power Rate Final Proposal**

**LOADS AND RESOURCES
STUDY**

July 2009

WP-10-FS-BPA-01



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COMMONLY USED ACRONYMS

AC	alternating current
AFUDC	Allowance for Funds Used During Construction
AGC	Automatic Generation Control
ALF	Agency Load Forecast (computer model)
aMW	average megawatt
AMNR	Accumulated Modified Net Revenues
ANR	Accumulated Net Revenues
AOP	Assured Operating Plan
ASC	Average System Cost
ATC	Accrual to Cash
BAA	Balancing Authority Area
BASC	BPA Average System Cost
Bcf	billion cubic feet
BiOp	Biological Opinion
BPA	Bonneville Power Administration
Btu	British thermal unit
CAISO	California Independent System Operator
CBFWA	Columbia Basin Fish & Wildlife Authority
CCCT	combined-cycle combustion turbine
cfs	cubic feet per second
CGS	Columbia Generating Station
CHJ	Chief Joseph
C/M	consumers per mile of line ratio for LDD
COB	California-Oregon Border
COE	U.S. Army Corps of Engineers
COI	California-Oregon Intertie
COSA	Cost of Service Analysis
COU	consumer-owned utility
Council	Northwest Power and Conservation Council
CP	Coincidental Peak
CRAC	Cost Recovery Adjustment Clause
CRC	Conservation Rate Credit
CRFM	Columbia River Fish Mitigation
CRITFC	Columbia River Inter-Tribal Fish Commission
CSP	Customer System Peak
CT	combustion turbine
CY	calendar year (January through December)
DC	direct current
DDC	Dividend Distribution Clause
dec	decremental (pertains to generation movement)
DJ	Dow Jones
DO	Debt Optimization
DOE	Department of Energy
DOP	Debt Optimization Program

DSI	direct-service industrial customer or direct-service industry
DSO	Dispatcher Standing Order
EAF	energy allocation factor
ECC	Energy Content Curve
EIA	Energy Information Administration
EIS	Environmental Impact Statement
EN	Energy Northwest, Inc. (formerly Washington Public Power Supply System)
EPA	Environmental Protection Agency
EPP	Environmentally Preferred Power
EQR	Electric Quarterly Report
ESA	Endangered Species Act
F&O	financial and operating reports
FBS	Federal base system
FCRPS	Federal Columbia River Power System
FCRTS	Federal Columbia River Transmission System
FERC	Federal Energy Regulatory Commission
FELCC	firm energy load carrying capability
FPA	Federal Power Act
FPS	Firm Power Products and Services (rate)
FY	fiscal year (October through September)
GAAP	Generally Accepted Accounting Principles
GARD	Generation and Reserves Dispatch (computer model)
GCL	Grand Coulee
GCPs	General Contract Provisions
GEP	Green Energy Premium
GI	Generation Integration
GRI	Gas Research Institute
GRSPs	General Rate Schedule Provisions
GSP	Generation System Peak
GSU	generator step-up transformers
GTA	General Transfer Agreement
GWh	gigawatthour
HLH	heavy load hour
HOSS	Hourly Operating and Scheduling Simulator (computer model)
HYDSIM	Hydro Simulation (computer model)
IDC	interest during construction
inc	incremental (pertains to generation movement)
IOU	investor-owned utility
IP	Industrial Firm Power (rate)
IPR	Integrated Program Review
IRP	Integrated Resource Plan
ISD	incremental standard deviation
ISO	Independent System Operator
JDA	John Day
kaf	thousand (kilo) acre-feet

kcfs	thousand (kilo) cubic feet per second
K/I	kilowatthour per investment ratio for LDD
ksfd	thousand (kilo) second foot day
kV	kilovolt (1000 volts)
kVA	kilo volt-ampere (1000 volt-amperes)
kVAr	kilo-volt ampere reactive
kW	kilowatt (1000 watts)
kWh	kilowatthour
LDD	Low Density Discount
LGIP	Large Generator Interconnection Procedures
LLH	light load hour
LME	London Metal Exchange
LOLP	loss of load probability
LRA	Load Reduction Agreement
m/kWh	mills per kilowatthour
MAE	mean absolute error
Maf	million acre-feet
MCA	Marginal Cost Analysis
MCN	McNary
Mid-C	Mid-Columbia
MIP	Minimum Irrigation Pool
MMBtu	million British thermal units
MNR	Modified Net Revenues
MOA	Memorandum of Agreement
MOP	Minimum Operating Pool
MORC	Minimum Operating Reliability Criteria
MOU	Memorandum of Understanding
MRNR	Minimum Required Net Revenue
MVA	mega-volt ampere
MVAr	mega-volt ampere reactive
MW	megawatt (1 million watts)
MWh	megawatthour
NCD	non-coincidental demand
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)
NIFC	Northwest Infrastructure Financing Corporation
NLSL	New Large Single Load
NOAA Fisheries	National Oceanographic and Atmospheric Administration Fisheries (officially National Marine Fisheries Service)
NOB	Nevada-Oregon Border
NORM	Non-Operating Risk Model (computer model)
Northwest Power Act	Pacific Northwest Electric Power Planning and Conservation Act
NPCC	Northwest Power and Conservation Council

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
OTC	Operating Transfer Capability
OY	operating year (August through July)
PDP	proportional draft points
PF	Priority Firm Power (rate)
PI	Plant Information
PMA	(Federal) Power Marketing Agency
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
PS	BPA Power Services
PSC	power sales contract
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
Reclamation	U.S. Bureau of Reclamation
RD	Regional Dialogue
REC	Renewable Energy Certificate
REP	Residential Exchange Program
RevSim	Revenue Simulation Model (component of RiskMod)
RFA	Revenue Forecast Application (database)
RFP	Request for Proposal
RiskMod	Risk Analysis Model (computer model)
RiskSim	Risk Simulation Model (component of RiskMod)
RMS	Remote Metering System
RMSE	root-mean squared error
ROD	Record of Decision
RPSA	Residential Purchase and Sale Agreement
RTF	Regional Technical Forum
RTO	Regional Transmission Operator
SCADA	Supervisory Control and Data Acquisition

SCCT	single-cycle combustion turbine
Slice	Slice of the System (product)
SME	subject matter expert
TAC	Targeted Adjustment Charge
TDA	The Dalles
Tcf	trillion cubic feet
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
UAI	Unauthorized Increase
UDC	utility distribution company
URC	Upper Rule Curve
USFWS	U.S. Fish and Wildlife Service
VOR	Value of Reserves
WECC	Western Electricity Coordinating Council (formerly WSCC)
WIT	Wind Integration Team
WPRDS	Wholesale Power Rate Development Study
WREGIS	Western Renewable Energy Generation Information System
WSPP	Western Systems Power Pool

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1 **1. INTRODUCTION**

2 The Loads and Resources Study (Study) represents the compilation of the load and contract
3 obligations, contract purchases, and resource data necessary for developing BPA’s wholesale
4 power rates. The results of this Study are used to: (1) provide data to determine resource costs
5 for the Revenue Requirement Study, WP-10-FS-BPA-02; (2) provide data to derive allocation
6 factors for the cost of service analysis and billing determinants for rate development and the
7 revenue forecast in the Wholesale Power Rate Development Study (WPRDS), WP-10-FS-BPA-
8 05, and in the Section 7(b)(2) Rate Test Study, WP-10-FS-BPA-06; (3) provide load and
9 resource data for use in the Risk Analysis and Mitigation Study, WP-10-FS-BPA-04; (4) provide
10 regional hydro data for use in the electricity market price forecast for the Market Price Forecast
11 Study, WP-10-FS-BPA-03; and (5) provide system capacity data for use in the Generation Inputs
12 Study, WP-10-FS-BPA-08.

13
14 This Study provides a synopsis of BPA’s loads and resources analysis. This Study illustrates
15 how each component of the analysis is completed, how components relate to each other, and how
16 each component fits into the rate development process. Details and results supporting this Study
17 are contained in the Loads and Resources Study Documentation (Documentation),
18 WP-10-FS-BPA-01A.

1 **2. LOADS AND RESOURCES STUDY**

2 **2.1 Overview of Methodology**

3 This Study includes the following interrelated components: (1) a forecast of the Federal system
4 load obligations, comprised of BPA’s firm requirements power sales contract (PSC) obligations
5 and other BPA contract obligations; (2) Federal system resource estimates, which include the
6 output from hydro and other generating resources purchased by BPA and other BPA contract
7 purchases; (3) the Federal system load-resource balance, which relates Federal system sales,
8 loads, and contract obligations to the Federal system generating resources and contract
9 purchases; (4) total Pacific Northwest (PNW) regional hydro resources; and (5) estimated power
10 purchases, in average megawatts (aMW), that are eligible for section 4(h)(10)(C) credits.

11
12 **2.1.1 Federal System Load Obligations**

13 The Federal system load obligation forecast estimates the firm energy and peak loads that BPA
14 expects to serve during the rate period, fiscal years (FY) 2010-2011, under firm requirements
15 PSCs and other BPA contract obligations. The load estimates are discussed in section 2.2 of this
16 Study and are detailed in the Documentation.

17
18 The Federal system firm requirements PSC forecast is composed of load obligation forecasts for
19 public body and cooperative utilities (consumer-owned utilities) and Federal agencies (together
20 called “Public Agencies”), direct service industrial customers (DSIs), investor-owned utilities
21 (IOUs), and other BPA PSC obligations. These obligations are forecast monthly over the period
22 for the generation system peak (GSP) in MW, energy in aMW, heavy load hour energy in
23 megawatthours (HLH MWh), and light load hour energy in megawatthours (LLH MWh).

1 BPA has other contract obligations in addition to its firm requirements PSC obligations. These
2 other contract obligations include contract sales to utilities and marketers, and power
3 commitments under statute and the Columbia River Treaty. These contract obligations are
4 estimated for monthly energy in aMW, HLH MWh, and LLH MWh.

6 **2.1.2 Federal System Resources**

7 The forecast of Federal system resources includes hydro and non-hydro generation estimates plus
8 power deliveries from BPA contract purchases. The resource estimates are discussed in
9 section 2.3 of this Study and are detailed in the Documentation.

10
11 BPA markets power from generating resources that include Federal and non-Federal hydro
12 projects, other contracted generating projects, and other BPA hydro-related contracts. The
13 combined output from these projects represents most of the Federal system's firm generating
14 resource capability. The Federal system hydro generation is forecast monthly for energy in
15 aMW, and peak generation in MW. The HLH and LLH Federal system regulated hydro
16 generation estimates are combined with HLH and LLH independent hydro generation estimates
17 and are provided to the Risk Analysis and Mitigation Study, WP-10-FS-BPA-04.

18
19 In addition, BPA has other Federal system resources that are comprised of contract purchases
20 and exchanges, return energy associated with BPA's capacity contracts, return and exchange
21 energy associated with capacity-for-energy exchanges, power purchases, and power
22 commitments delivered to BPA under the Columbia River Treaty. These other Federal system
23 resources are estimated for monthly energy in aMW, HLH MWh, and LLH MWh, and for peak
24 generation in MW.

1 **2.1.3 Federal System Load-Resource Balance**

2 The Federal system load-resource balance completes BPA’s load and resource picture by
3 comparing Federal system load obligations to Federal system resource output for FY 2010-2011.
4 Federal system load obligations include BPA’s firm requirements PSC obligations and other
5 Federal contract obligations. Federal system resources include BPA’s regulated and independent
6 hydro resources under 1937 critical water conditions, contract purchases, and non-utility
7 generating (NUG) projects. The result of the Federal system resources less loads yields BPA’s
8 estimated Federal system monthly firm energy surplus or deficit. If there is an annual average
9 firm energy deficit, augmentation is added to Federal system resources as a flat, annual block of
10 power to achieve an annual average balance between loads and resources under 1937 critical
11 water conditions. In this Study, augmentation is needed to balance loads and resources. The
12 load-resource balance is discussed in section 2.4 of this Study and is detailed in the
13 Documentation, Section 2.3.

14
15 **2.1.4 Pacific Northwest Regional Hydro Generation**

16 PNW regional hydro resource energy generation estimates are used in the forecast of electricity
17 market prices in the Market Price Forecast Study, WP-10-FS-BPA-03. The regional hydro data
18 includes all PNW regional utility hydro plus NUG hydro for FY 2010-2011. The regional
19 regulated and independent hydro generation is estimated for each of 70 water years of record
20 (October 1929 through September 1998). The regional NUG hydro generation forecast is
21 assumed not to vary by water year because these small run-of-river projects are located on minor
22 rivers or streams that have little or no storage. Therefore, generation levels at NUG hydro
23 projects typically do not have wide variations in generation due to water year variability. The
24 forecast of PNW regional hydro generation is presented for monthly energy in aMW for each of
25 the 70 water years. The regional hydro estimates are discussed in section 2.5 of this Study and
26 are detailed in the Documentation.

1 **2.1.5 4(h)(10)(C) Credits**

2 BPA funds actions to protect, mitigate, and enhance fish and wildlife affected by Federal hydro
3 operations, as directed by the Pacific Northwest Electric Power Planning and Conservation Act,
4 16 U.S.C. §§ 839-839h (Northwest Power Act). These program costs are then allocated to the
5 various hydro project purposes, that is, power and non-power uses. BPA annually recoups its
6 funding allocated to non-power purposes through credits, known as “4(h)(10)(C) credits” so that
7 ratepayers pay only the power share of the fish and wildlife costs. 16 U.S.C. § 839b(h)(10)(C).
8 BPA uses a specific methodology for annually determining the amount of 4(h)(10)(C) credits
9 that may be available. The resource estimates used to calculate the 4(h)(10)(C) credits are
10 discussed in section 2.6 of this Study and the estimated power purchases eligible for 4(h)(10)(C)
11 credits are detailed in the Documentation, Section 2.8.

12
13 **2.2 Federal System Load Obligation Forecast**

14 **2.2.1 Overview**

15 The Federal System Load Obligations forecast includes BPA’s projected firm requirement PSC
16 obligations to regional Public Agencies, IOUs, and DSIs; contractual obligations to the U.S.
17 Bureau of Reclamation (Reclamation); contract obligations outside the Pacific Northwest region
18 (Exports); and contractual obligations within the Pacific Northwest region (Intra-Regional
19 Transfers (Out)). Summaries of BPA’s forecast of the Public Agencies, IOU, and DSI firm
20 requirements PSC obligations are presented in section 2.2.2 of this Study. BPA’s estimate of
21 Federal system firm requirements PSC obligations and other contract sales components are
22 shown in the Documentation, WP-10-FS-BPA-01A, Section 2.3, Tables 2.3.1 and 2.3.2, *Loads*
23 *and Resources-Federal System*.

1 **2.2.2 Public Agencies Total Retail Load and Firm Requirement PSC Obligation**

2 **Forecasts**

3 The Public Agencies monthly energy firm requirements PSC obligation forecast for utilities that
4 purchase full or partial service products is based on the sum of the utility-specific firm
5 requirements PSC obligation forecasts, which are customarily produced by BPA analysts. The
6 firm requirements PSC obligation forecasts presented in this Study are updates from the WP-10
7 Initial Proposal, WP-10-E-BPA-01.

8
9 The method used for preparing the firm requirements PSC obligation forecasts is as
10 follows. First, utility-specific forecasts of total retail load are produced using least
11 squares regression-based models on historical monthly energy loads. These models may
12 include several independent variables, such as a time trend, heating degree days, cooling
13 degree days, and monthly indicator variables. Heating and cooling degree days are a
14 measure of temperature effects to account for changes in electricity usage related to
15 temperature changes. Heating degree days are calculated when the temperature is below
16 a base temperature such as 65 degrees, and similarly, cooling degree days are calculated
17 when the temperature is above a base temperature. The results from these computations
18 are monthly forecasts of total retail load.

19
20 The monthly peak loads are forecast in a similar fashion as the energy loads, but the
21 historical data used in the models are the customers' coincidental peak (CP). The peak
22 coincident to the BPA's generation system peak is then obtained by applying
23 relationships between the historical CP and the historical GSP to the forecast CP. These
24 forecasts comprise projections of utility-specific total retail load monthly energy and
25 peak. The total retail energy load is then split into HLH and LLH time periods using
26 recent historical relationships.

1 Second, estimates of customer-owned and consumer-owned dedicated resource
2 generation and contract purchases are subtracted from the appropriate utility-specific total
3 retail load forecasts to produce a firm requirement PSC obligation forecast for each
4 utility. These firm requirement PSC obligation forecasts provide the basis for the Full
5 and Partial Products sales projections incorporated in BPA ratemaking. For those utilities
6 purchasing Slice or Block products, their firm requirement PSC obligation forecast is the
7 contracted purchase amount split into appropriate HLH and LLH time periods.

8
9 Slice is a PSC product that provides firm requirements power and surplus energy to a customer
10 based on its annual net requirements load. The term of the Slice PSC is for the 10-year period
11 October 1, 2001, through September 30, 2011. It differs from traditional power products in that
12 it is comprised of the following components: (1) firm power deliveries based on the level and
13 shape of the Slice resources; and (2) surplus power deliveries on a monthly or seasonal basis as
14 they are generated by the Slice system resources. The Slice product is combined with a sale of a
15 fixed amount of power sold as a Block product.

16
17 Slice contracts for power deliveries are based on 22.63 percent of the Slice system resources.
18 The Slice system resources are comprised of a set of specific Federal resources and contract
19 purchases, net of a specific set of Federal obligations. This particular set of resources and
20 obligations is used only for the Slice product and is a subset of Federal system resources. The
21 Federal resources that comprise the specific set of Slice system resources include the generation
22 from hydro projects (including BPA's purchase of the Idaho Falls Power Bulb turbine projects
23 through September 30, 2011), Columbia Generating Station (CGS), Georgia Pacific
24 Corporation's Wauna Mill, BPA purchases of NUG (including BPA's purchased share of the
25 Klondike III wind project), and power deliveries from the Non-Federal Canadian Entitlement
26 Return (CER) for Canada contracts. The Federal contract obligations that are subtracted from
27 the Slice system resources for this purpose includes, but is not limited to, deliveries for the CER

1 to Canada (shown as an Export) and Federal irrigation pumping loads. The amount of Slice
2 product available for delivery is dependent on the Federal system operating decisions, hydro
3 production that varies by water year, and generation from non-hydro Federal resources.
4

5 The Federal system Slice resource obligations are shown in the Documentation, WP-10-FS-
6 BPA-01A, Section 2.3, Tables 2.3.1 and 2.3.2, *Loads and Resources-Federal System, (NGP Slice*
7 *Sale)* and *(GPU Slice Sale)*.
8

9 The sum of the projected firm requirements PSC obligations for customers purchasing
10 Subscription products comprises the preference customer portion of the Priority Firm Power (PF)
11 sales forecast. (The exchange portion of the PF sales forecast is discussed in section 2.2.6.) This
12 sum is then reduced to reflect expected conservation savings from bilateral contracts beginning
13 with FY 2009 loads. The reductions from these bilateral conservation acquisition agreements are
14 estimated at 29.7 aMW for FY 2010 and 49.5 aMW for FY 2011. Table 2.1, below, presents the
15 PF Preference sales by product and total PF Preference sales adjusted for conservation savings.
16

17 The Full and Partial sales forecasts have been reduced from the Initial Proposal to reflect the
18 current and expected economic conditions. While the Total Retail Load forecasts for individual
19 customers may have decreased due to the recession, the Block and Slice Block sales forecasts are
20 set by contract, and so the current economic situation will not affect those amounts. The Slice
21 sales forecast reflects 22.63 percent of the critical water output of the Slice resources. Therefore,
22 the 22.63 percent is not affected by the economic situation; however, the energy sold to Slice
23 purchasers does change as the forecast generation changes.
24

Table 2.1
PF Preference Sales Forecast by Product
Energy in aMW

A	B	C	D	E	F	G	H
FY	Full	Partial	Block	Slice Block	Slice	Total	Adjusted Total
2010	2,032	1,414	616	1,150	1,634	6,845	6,815
2011	2,073	1,445	610	1,156	1,589	6,873	6,824

BPA also has other PSC obligations that are not subject to the PF rate schedule. BPA’s pre-Subscription contract obligations are not charged PF rates and therefore are not included in the PF sales forecasts presented above in Table 2.1. These contracts do represent BPA PSC obligations and are met by BPA’s resource inventory.

The monthly firm requirements PSC obligation forecasts for energy in aMW, HLH MWh, LLH MWh, and MW for the Full Service, Partial Service, Slice, and Block customer groups are presented in the Documentation, WP-10-E-BPA-01A, Section 2.2, Table 2.2.1, *PF Full and Partial Service Sales Forecast* and Table 2.2.2, *Block/Slice Block Sales Forecast*. The customers purchasing each product (Full Service, Partial Service, Slice/Block, and Block) are listed in the Documentation, WP-10-FS-BPA-01A, Section 2.2, Table 2.2.3, *Full Service Customers*, Table 2.2.4, *Partial Service Customers*, Table 2.2.5, *Slice/Slice Block Customers*, and Table 2.2.6, *PF Block Customers*.

The Federal system firm requirements PSC obligations are summarized in the Documentation, WP-10-FS-BPA-01A, Section 2.3, Tables 2.3.1 and 2.3.2, *Loads and Resources-Federal System (Federal Agencies 2002 PSC), (USBR 2002 PSC), (NGP 2002 PSC), and (GPU 2002 PSC)*. The Federal system Slice resource obligations are summarized in the Documentation, WP-10-FS-BPA-01A, Section 2.3, Tables 2.3.1 and 2.3.2, *Loads and Resources-Federal System, (NGP Slice Sale) and (GPU Slice Sale)*.

1
2 **2.2.3 Investor-Owned Utilities Sales Forecast**

3 No requirements power sales to regional IOUs are forecast for FY 2010-2011 based on BPA's
4 current contracts with the six regional IOUs. The six IOUs in the PNW region are Avista
5 Corporation, Idaho Power Company, NorthWestern Energy Division of NorthWestern
6 Corporation (formerly Montana Power Company), PacifiCorp, Portland General Electric
7 Company, and Puget Sound Energy, Inc. If requested, BPA would serve any net requirements of
8 IOUs, and such sales would be charged the New Resource Firm Power (NR-10) rate. This
9 forecast does not expect any NR sales to the IOUs at this time. IOUs may receive benefits under
10 the Residential Exchange Program, but these benefits are not in the form of actual power
11 deliveries. See WPRDS, Section 6, Average System Cost Forecast, WP-10-FS-BPA-05.
12

13 **2.2.4 Direct Service Industry Sales Forecast**

14 This Final Loads and Resources Study assumes power sales to the DSIs totaling 402 aMW for
15 each year of the forecast period, composed of 385 aMW for aluminum smelter DSIs and
16 17 aMW for Port Townsend Paper Corporation, all sold at the IP rate.
17

18 In the Initial Proposal, a total of 402 aMW of DSI service was assumed; however, only 17 aMW
19 was reflected in the Loads and Resources Study as an intra-regional transfer from BPA to
20 Clallam County PUD to Port Townsend Paper Corporation. Initial Study, WP-10-E-BPA-01, at
21 10; Initial Documentation, WP-10-E-BPA-01A, Section 2.3, Tables 2.3.1 through 2.3.3. Due to
22 time constraints surrounding the publication of the Initial Proposal, the assumption of 385 aMW
23 of service to the aluminum smelters and the associated amount and cost of augmentation were
24 accounted for in the RAM Model. Initial WPRDS, WP-10-E-BPA-05, Section 3.2.1.2.3. For the
25 Final Proposal, the Study includes the entire 402 aMW for DSIs designated as DSI 2002 power
26 sales contracts sold at the IP rate. The 402 aMW of sales to DSIs are included for monthly
27 energy in aMW as a contract obligation on the Federal system, in the Documentation,

1 WP-10-FS-BPA-01A, Section 2.3, Tables 2.3.1 through 2.3.2, *Loads and Resources-Federal*
2 *System, (DSI 2002 PSC)*. A summary of these sales for the rate period is presented monthly for
3 energy in aMW, HLH MWh, and LLH MWh in the Documentation, WP-10-FS-BPA-01A,
4 Sections 2.4 through 2.6, Table A-22, *BPA Power Sales Contracts*.

6 **2.2.5 Other BPA Contract Obligations**

7 BPA provides Federal power to customers under a variety of contract arrangements not included
8 in the Public Agency, IOU, and DSI PSC load obligation forecasts. These contracts are
9 categorized as: (1) power sales; (2) power or energy exchanges; (3) capacity sales or capacity-
10 for-energy exchanges; (4) power payments for services; and (5) power commitments under the
11 Columbia River Treaty. These arrangements, collectively called “Other Contract Obligations,”
12 are specified by individual contract provisions and can have different delivery arrangements and
13 rate structures.

14
15 BPA’s Other Contract Obligations are assumed to be served by Federal system firm resources
16 regardless of weather, water, or economic conditions. These Other Contract Obligations are
17 modeled individually and are specified or estimated for monthly energy in aMW, HLH MWh,
18 and LLH MWh.

19
20 Other Contract Obligations for monthly energy in aMW are summarized in the Documentation,
21 WP-10-FS-BPA-01A, Section 2.3, Tables 2.3.1 and 2.3.2, *Loads and Resources-Federal System,*
22 *(Exports)* and *(Intra-Regional Transfers (Out))* and are detailed for monthly energy in aMW,
23 HLH MWh, and LLH MWh, in the Documentation, WP-10-FS-BPA-01A, Sections 2.4 through
24 2.6, Table A-2, *Federal Exports* and Table A-16, *Intra-Regional Transfers (Out)*.

1 **2.2.6 Forecasts of ASC Total Retail Loads and Residential and Small Farm Loads**
2 **for Utilities Participating in the Residential Exchange Program**

3 As part of the Northwest Power Act, the Residential Exchange Program (REP) was created to
4 provide residential and small farm customers of Pacific Northwest (regional) utilities a form of
5 access to low-cost Federal power. 16 U.S.C. § 839c(c). Under the REP, BPA purchases power
6 from a participating utility at the average system cost (ASC) of that utility's resources (\$/MWh)
7 and sells back to that utility the equivalent amount of power at the lower BPA PF Exchange rate.
8 *See* WPRDS, WP-10-FS-BPA-05, Section 6, Average System Cost Forecast.

9
10 Utility ASCs are not determined in BPA rate proceedings. Instead, ASCs are determined in a
11 separate administrative process that BPA conducts pursuant to the procedural rules of the 2008
12 ASC Methodology (ASCM), which was granted interim approval by the Commission on
13 October 10, 2008. *See* 18 C.F.R. § 301.4, *et seq.* The ASC Review Processes were completed
14 prior to the final WP-10 rate determination. The Final ASC Reports and background
15 information, publications, and procedures regarding the ASC Review Process are located at
16 <http://www.bpa.gov/corporate/finance/ascm/>.

17
18 **2.2.6.1 ASC Contract System Load Forecast for FY 2010-2011**

19 As defined in the 2008 ASCM, utilities planning to participate in the REP for FY 2010-2011
20 were required to submit to BPA in October 2008, as part of their ASC filing, a forecast of their
21 ASC Total Retail Load data for the period covering FY 2010-2015. Avista Utilities, Idaho
22 Power Company, NorthWestern Energy, PacifiCorp, Portland General Electric, Puget Sound
23 Energy, Snohomish County PUD, and Franklin County PUD each submitted ASC filings to
24 BPA. BPA reviewed and evaluated the reasonableness of these utilities' Contract System Load
25 for FY 2010-2011 in the ASC Review processes.

1 **2.2.6.2 ASC Total Retail Load Forecast for FY 2012-2015**

2 To perform the section 7(b)(2) rate test, BPA must forecast ASCs for FY 2012-2015 for utilities
3 participating in the REP. To forecast ASC Total Retail Loads for these utilities, BPA used the
4 FY 2012-2015 load data provided by the utilities filing for ASC determinations. BPA
5 determined that these forecasts were reasonable, including errata if applicable, and made no
6 additional changes to the FY 2012-2015 ASC Total Retail Loads filed by the utilities in October
7 2008.

8
9 As discussed in section 3, Section 7(b)(2) Rate Test Study, WP-10-FS-BPA-06, BPA uses the
10 ASC Total Retail Load forecasts submitted by the utilities to forecast the utilities' ASC Contract
11 System Loads for FY 2012-2015.

12
13 The ASC Total Retail Load forecast for the remaining years of the 7(b)(2) rate test period, FY
14 2012-2015, is shown in the Documentation, WP-10-FS-BPA-01A, Section 2.2, Table 2.2.7, *ASC*
15 *Total Retail Load Forecasts*.

16
17 **2.2.6.3 Residential and Small Farm Retail Load Forecast for FY 2010-2015**

18 In general, exchange load is defined as the sum of a utility's small farm and residential consumer
19 loads as determined by the terms of the utility's Residential Purchase and Sales Agreement
20 (RPSA). BPA uses residential and small farm exchange loads to forecast a participating utility's
21 REP purchases and sales of power pursuant to section 5(c) of the Northwest Power Act. *See*
22 Section 7(b)(2) Rate Test Study, WP-10-FS-BPA-06, for additional background information.

23
24 Utilities intending to participate in the REP for FY 2010-2011 were required to submit with their
25 ASC filings a forecast of their residential and small farm retail load, as measured at the meter,
26 for FY 2010-2015. As noted above, eight utilities made such filings. BPA reviewed the
27 residential and small farm retail load forecasts for each utility and determined the data were

1 reasonable. No changes were made to the FY 2010-2015 values as filed by the utilities in
2 October 2008.

3
4 As discussed in the Section 7(b)(2) Rate Test Study, WP-10-FS-BPA-06, Section 3, BPA uses
5 the residential and small farm retail load forecasts submitted by the utilities to forecast the
6 residential and small farm exchange load for both the rate period (FY 2010-2011) and the
7 remaining years of the 7(b)(2) rate test period (FY 2012-2015).

8
9 Participating utilities' Residential and Small Farm retail load forecasts are summarized for both
10 the rate period, FY 2010-2011, and the remaining years of the 7(b)(2) rate test period, FY 2012-
11 2015, in the Documentation, WP-10-FS-BPA-01A, Section 2.2, Table 2.2.8, *Annual Residential*
12 *and Small Farm Retail Load Forecast*.

14 **2.3 Federal System Resource Forecast**

15 **2.3.1 Overview**

16 Federal system resources are comprised of Federal regulated and independent hydro projects,
17 non-Federal independent hydro projects, other non-Federal resources (renewable, thermal, wind,
18 and NUG projects), and other Federal contract purchases.

19
20 The Federal system regulated hydro resource estimates are derived by BPA's hydro regulation
21 model (HYDSIM), which estimates project generation under 70 water years (October 1928
22 through September 1998). Federal system independent hydro project generation estimates are
23 not provided by HYDSIM; rather, they are provided by each project's owner for the same
24 70 water years. Other Federal system resources include non-Federal projects from which BPA
25 has acquired the output. These generation estimates are provided either by BPA or by the
26 project's owners. In addition, BPA has other contract purchases that are considered Federal

1 system resources. They are comprised of the following: (1) contract purchases and exchanges;
2 (2) return energy associated with BPA's capacity contracts; (3) return and exchange energy
3 associated with BPA's capacity-for-energy exchanges; and (4) power commitments delivered to
4 BPA under the Columbia River Treaty. Federal system generating resource and contract
5 purchase estimates used in the Final Proposal are detailed in the Documentation,
6 WP-10-FS-BPA-01A, Sections 2.4 through 2.6.

7 8 **2.3.2 Federal System Hydro Generation**

9 Federal system hydro resources are comprised of the generation from regulated and independent
10 hydro projects. The process used for estimating the generation of regulated hydro projects is
11 detailed in section 2.3.2.1. The methodology for forecasting generation of independent hydro
12 projects is described in section 2.3.2.2. The Federal system also purchases the output from
13 several small NUG hydro projects, with generation estimates provided by the projects' owners.
14 The NUG hydro project output estimates are assumed not to vary by water year.

15 16 **2.3.2.1 Regulated Hydro Generation Forecast**

17 BPA markets the generation from the Federal system regulated hydro projects. The projects
18 themselves are owned and operated by either the U.S. Army Corps of Engineers (COE) or the
19 U.S. Bureau of Reclamation (Reclamation).

20
21 This Study uses HYDSIM to estimate the Federal system energy production that can be expected
22 from specific hydroelectric power projects in the PNW Columbia River Basin when operating in
23 a coordinated fashion and meeting power and non-power requirements for the 70 water years of
24 record (October 1928 through September 1998). The hydro regulation study uses individual
25 project operating characteristics and conditions to determine energy production expected from
26 each specific project. Physical characteristics of each project come from annual Pacific

1 Northwest Coordination Agreement (PNCA) data submittals from regional utilities and
2 government agencies involved in the coordination and operation of regional hydro projects. The
3 HYDSIM model incorporates these operating characteristics along with power and non-power
4 requirements to provide project-by-project monthly energy generation estimates for the Federal
5 system regulated hydro projects that vary by water year.

6
7 This Study's estimates of expected hydro improvement generation increases are due to: 1) hydro
8 improvements from hydro optimization; 2) turbine runner replacement; and 3) reliability
9 increases through BPA's capital improvement programs at specific Federal regulated hydro
10 projects. These generation increases are not captured in the hydro regulation studies. The
11 increased generation associated with these hydro improvements is calculated by multiplying a
12 project's specific hydro improvement generation factor by that project's generation projection.
13 The Federal system hydro improvement forecast varies through time and by water year.

14
15 Separate hydro regulation studies are incorporated for each year of the rate period for this Study.
16 By modeling hydro regulation studies for individual years, the hydro generation estimates
17 capture changes in variables that characterize yearly variations in the hydro operations due to
18 firm loads, firm resources, markets for secondary energy, and project operating limitations and
19 requirements. These variables affect the amount and timing of energy available from the hydro
20 system and are changed as necessary to reflect current expectations. Sections 2.3.2.1.1
21 and 2.3.2.1.2 contain additional details on the process of producing the regulated hydro
22 generation estimates for use in this Study.

23
24 The hydro regulation studies and Federal system hydro improvement estimates presented in this
25 Study are updated from the WP-10 Initial Proposal. The Federal system regulated hydro
26 generation for this Study is summarized in the Documentation, WP-10-FS-BPA-01A,
27 Section 2.3, Tables 2.3.1 and 2.3.2, *Loads and Resources-Federal System, (Regulated Hydro)*.

1 The monthly energy in aMW for the regulated hydro projects is detailed in the Documentation,
2 WP-10-FS-BPA-01A, Section 2.4, Table A-3, *Federal Regulated Hydro Projects*.

3
4 The HLH MWh and LLH MWh split for the regulated hydro generation estimates is developed
5 for each year of the rate period based on Hourly Operating and Scheduling Simulator (HOSS)
6 analyses that incorporate the same HYDSIM hydro regulation studies as its base input. This is
7 detailed in Generation Inputs Study, WP-10-FS-BPA-08, Section 3.3. These HLH and LLH
8 Federal system regulated hydro generation estimates are combined with HLH and LLH
9 independent hydro generation estimates and are provided to the Risk Analysis and Mitigation
10 Study, WP-10-FS-BPA-04.

11 12 **2.3.2.1.1 PNCA and Fish Requirements**

13 Since the WP-10 Initial Proposal, the HYDSIM studies have been updated to reflect current
14 assumptions. The HYDSIM studies incorporate the power and non-power operating
15 requirements expected to be in effect during the rate period, including those described in the
16 NOAA Fisheries FCRPS Biological Opinion (BiOp) regarding salmon and steelhead, published
17 May 5, 2008; the USFWS FCRPS BiOp regarding bull trout and sturgeon, published
18 December 20, 2000; the USFWS Libby BiOp regarding bull trout and sturgeon, published
19 February 18, 2006; relevant operations described in the NPCC's Fish and Wildlife Program; and
20 other fish mitigation measures. Each hydro regulation study specifies particular hydroelectric
21 project operations for fish, such as seasonal flow objectives, minimum flow levels for fish, spill
22 for juvenile fish passage, reservoir target elevations and drawdown limitations, and turbine
23 operation efficiency requirements.

24
25 The following are major features of the HYDSIM non-power operating requirements BPA
26 expects to be in effect and has modeled for the rate period:

- 1 1) Surface Passage Improvements: Continued operation of specific surface passage
- 2 improvements at COE projects on the lower Columbia and lower Snake Rivers.
- 3 2) Fall Chinook: Continued summer spill and transportation at the Lower Snake
- 4 projects for the passage and continued evaluation of Snake River Fall Chinook.
- 5 3) Residual Hydro Load: Updates to the residual hydro load for FY 2010-2011 from
- 6 the WP-10 Initial Proposal.

7

8 Additionally, HYDSIM uses hydro plant operating characteristics in combination with power

9 and non-power requirements to simulate the coordinated operation of the hydro system. These

10 operating requirements include but are not limited to storage content limits determined by rule

11 curves, maximum project draft rates determined by each project, and flow and spill objectives

12 described in the NOAA Fisheries and USFWS BiOps listed above and as provided by the

13 2008 PNCA data submittals. Deviations from the PNCA data submittals occur when specific

14 operating decisions are made subsequent to the date of submission in order to implement the

15 BiOps or when additional data becomes available and is incorporated to improve study accuracy.

16

17 The hydro regulation studies include sets of power and non-power requirements that vary for

18 each year of the rate period. Specific HYDSIM hydro regulation study assumptions are detailed

19 in the Documentation, WP-10-FS-BPA-01A, Section 2.9.1, *HYDSIM Hydro Regulation Study*

20 *Assumptions*.

21

22 The following updates have been made to the Final Proposal HYDSIM hydro regulation studies

23 since the WP-10 Initial Proposal:

- 24 ○ Hungry Horse and Libby summer draft operations are based on the May final
- 25 forecast for The Dalles April through August runoff volume rather than January
- 26 through July runoff volume to be consistent with the Biological Opinion
- 27 requirement.

- 1 ○ Updated data provided by the Bureau of Reclamation was incorporated to more
2 accurately reflect the estimated water storage at Grand Coulee.
- 3 ○ Libby's minimum flow requirement of 6000 cfs for bull trout was updated to start
4 on May 15th rather than June 1st as required in the Biological Opinion.
- 5 ○ March spill and corner collector operation at Bonneville Dam was removed
6 because it is no longer required for chum salmon.
- 7 ○ The minimum powerhouse flow requirements at Grand Coulee and Chief Joseph
8 were changed back to 30,000 cfs for Grand Coulee (instead of 50,000 cfs) and to
9 no minimum turbine flow requirement at Chief Joseph (instead of 50,000 cfs) to
10 be consistent with PNCA data submittals.
- 11 ○ Albeni Falls winter elevation was changed from 2051 feet to 2053 feet
12 (November through April) to better reflect actual operations, which alternate
13 between elevation 2051 feet and elevation 2055 feet based on biological criteria.
- 14 ○ Spill input files were updated to include 1) 35 percent spring and summer spill at
15 Ice Harbor; 2) extended August spill at Lower Granite, Little Goose, Lower
16 Monumental, and Ice Harbor dams through August 8, 11, 13, and 15,
17 respectively; 50 percent summer spill at McNary; and Bonneville corner collector
18 spill of 5 kcfs April 10 through August 31.
- 19 ○ Chum salmon flow requirements were updated to correct an error in November
20 and December.
- 21 ○ A January through March flow smoothing operation was removed from Grand
22 Coulee because it was causing some modeling anomalies rather than better
23 reflecting actual operations as intended.
- 24 ○ Priest Rapids flow targets for steelhead were modeled with a slightly lower
25 priority during the first half of April and during June, whereas the Initial Proposal
26 modeled the April 1 through June 30 flow targets with a higher priority.

- Hydro Independent generation input to HYDSIM was updated to be consistent with the Loads and Resources Study for the Final Proposal (LARIS Study 57).
- Federal powerhouse availability factors were updated to include the average 2001-2008 powerhouse outages and reflect more recent wind and operating reserve requirement assumptions. See Generation Inputs Study, WP-10-FS-BPA-08, Section 2 and Section 5.4 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. Compared to the WP-10 Initial Proposal, these updates resulted in an overall increase in availability factors in HYDSIM for the Final Proposal.
- Grand Coulee’s target elevation was changed from 1283 feet to 1285 feet at the end of September to better reflect actual operations.

2.3.2.1.2 Modified Streamflows

The HYDSIM model uses streamflows from historical years as the basis for estimating power production of the hydroelectric system. The Actual Energy Regulation (AER) and Operational 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 are developed under a BPA contract funded by the PNCA parties. The modified streamflows are also adjusted to include updated estimates of Grand Coulee irrigation pumping and resulting downstream return flows, using data provided by Reclamation in its 2008 PNCA data submittal. Grand Coulee pumping provides water to the Columbia Basin Project for irrigation.

1 There are two modes of operation for the HYDSIM hydro regulation studies: refill and
2 continuous. Both modes estimate the energy production of the hydro system; however, each
3 mode treats a project's initial reservoir conditions differently. Continuous hydro regulation
4 studies operate from one water year to another, using the previous water year's final reservoir
5 elevations as the initial reservoir elevations for the next water year. Refill hydro regulation
6 studies operate each water year independent of all other water years, using the reservoir's initial
7 storage elevation for each water year. Continuous studies are typically used in BPA mid- to
8 long-range planning to provide expected generation estimates for future years. Refill studies are
9 generally incorporated in short-term planning when information on initial reservoir elevations is
10 known. The FY 2010-2011 hydro regulation studies used in this Study are in continuous mode.

12 **2.3.2.2 Independent Hydro Generation Forecast**

13 Independent hydro includes hydro projects whose generation output typically varies by water
14 conditions; however, the generation forecasts for these projects are not modeled or regulated in
15 the HYDSIM model. BPA markets the power from independent hydro projects that are owned
16 and operated by Reclamation, COE, or other project owners. Federal system independent hydro
17 generation estimates are provided by individual project owners for the 70 water years
18 (October 1928 through September 1998). These include power purchased from hydro projects
19 owned by Lewis County Public Utility District (Cowlitz Falls), Mission Valley (Big Creek), and
20 Idaho Falls Power (Bulb Turbine projects).

21
22 The Federal system independent hydro generation energy estimates used in this Study are
23 summarized in the Documentation, WP-10-FS-BPA-01A, Section 2.3, Tables 2.3.1 and 2.3.2,
24 *Loads and Resources-Federal System, (Independent Hydro)*. The monthly energy in aMW for
25 the independent hydro projects is detailed in the Documentation, WP-10-FS-BPA-01A,
26 Section 2.4, Table A-4, *Federal Independent Hydro Projects*.

1
2 The HLH MWh and LLH MWh split for the independent hydro generation estimates are
3 developed based on historical actuals. As discussed in section 2.3.2.1, the HLH and LLH
4 Federal system independent hydro generation is combined with HLH and LLH regulated hydro
5 generation estimates, which are provided to the Risk Analysis and Mitigation Study, WP-10-
6 FS-BPA-04.

7 8 **2.3.3 Other Federal System Generation**

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

- 12 1) Renewable resources, which include cogeneration (Georgia Pacific (Wauna)) and
13 wind (Federal purchases of shares of the Condon Wind Project; Foote Creek 1, 2,
14 and 4 Wind Projects; Klondike I Wind Project; Klondike III Wind Project; and
15 Stateline Wind project). These projects are detailed in the Documentation, WP-
16 10-FS-BPA-01A, Sections 2.4 through 2.6, Table A-8, *Federal Renewable*
17 *Resources*.
- 18 2) CGS, which incorporates facility improvements and a two-year refueling cycle.
19 CGS details are shown in the Documentation, WP-10-FS-BPA-01A, Sections 2.4
20 through 2.6, Table A-10, *Federal Large Thermal*.
- 21 3) Other projects that BPA has acquired the output from include small hydro (Elwha
22 and Glines Hydro through September 30, 2011, and Dworshak/Clearwater Small
23 Hydropower) and a small amount of solar resources (Ashland Solar Project and
24 White Bluffs Solar). These projects are detailed in the Documentation, WP-10-
25 FS-BPA-01A, Sections 2.4 through 2.6, Table A-24, *Federal Non-Utility*
26 *Generating Resources by Project*.

1 The other Federal system generation estimates are summarized for monthly energy in aMW in
2 the Documentation, WP-10-FS-BPA-01A, Tables 2.3.1 and 2.3.2, *Loads and Resources-Federal*
3 *System, (Renewables), (Large Thermal), and (Non-Utility Generation)*.
4

5 **2.3.4 Other Federal System Contract Purchases**

6 BPA purchases power under a variety of contractual arrangements to help meet Federal load
7 obligations. The contracts are categorized as: (1) power purchases; (2) power or energy
8 exchange purchases; (3) capacity sales or capacity-for-energy exchange contracts; and (4) power
9 purchased or assigned to BPA under the Columbia River Treaty. These arrangements are
10 collectively called “Other Contract Purchases.” BPA’s Other Contract Purchases are considered
11 firm resources that are delivered to the Federal system regardless of weather, water, or economic
12 conditions.
13

14 BPA retained Excess Requirements Energy (ERE) from some Slice customers that is included in
15 Other Contract Purchases. BPA considers this Slice ERE as part of its firm augmentation for the
16 rate period. The availability of Slice ERE for FY 2010 is 10.3 aMW and for FY 2011 is
17 7.6 aMW. Slice ERE is a result of a Letter Agreement that settled the implementation of
18 Exhibit N of the Block and Slice Power Sales Agreement for FY 2008-2011.
19

20 BPA’s expected Other Contract Purchases are summarized for monthly energy in aMW in the
21 Documentation, WP-10-FS-BPA-01A, Section 2.3, Tables 2.3.1 and 2.3.2, *Loads and*
22 *Resources-Federal System, (Imports), (Non-Federal Canadian Entitlement Return for Canada),*
23 *and (Intra-Regional Transfers (In))*. The monthly energy in aMW, HLH MWh, and LLH MWh
24 is detailed in the Documentation, WP-10-FS-BPA-01A, Sections 2.4 through 2.6, Table A-5,
25 *Federal Imports, Table A-15, Canadian Entitlement Return for Canada, and Table A-16,*
26 *Federal Intra-Regional Transfers (In)* for the rate period.
27

1 Since the WP-10 Initial Proposal, BPA made several long-term winter hedging balancing
2 purchases to cover increasing amounts of forecast HLH energy deficits during winter months
3 (October through April). These winter hedging balancing purchases provide 822,000 MWh of
4 energy for delivery on HLH during the winter months in FY 2010, or 94 aMW of annual energy,
5 and 734,400 MWh of energy for delivery on HLH during the months of November through April
6 in FY 2011, or 84 aMW of annual energy. Because these contracts are considered long-term
7 balancing purchases, and to avoid double counting, they are not included this Study's *Intra-*
8 *Regional Transfers (In)*; rather, these contracts are incorporated in the Risk Analysis and
9 Mitigation Study, WP 10-FS-BPA-04, to offset balancing purchases calculations.

11 **2.4 Federal System Load-Resource Balance**

12 **2.4.1 Overview**

13 The Federal system load-resource balance and the supporting data constitute a portion of the data
14 used in this Study. The load-resource balance compiles the monthly energy amounts of BPA's
15 resources, which include hydro, non-hydro, and contract purchases; less BPA's load obligations,
16 which are comprised of BPA's PSC obligations and Other Contract Obligations. This
17 determines BPA's monthly and annual energy load-resource balance. BPA determines the
18 amount of its annual forecast firm energy resources under 1937 critical water conditions. If
19 BPA's expected firm energy resources under critical water conditions are sufficient to serve
20 BPA's expected load obligations, then BPA is considered to be in load-resource balance. If
21 BPA's resources are less than its load obligations, BPA is assumed to purchase power or
22 otherwise secure resources to cure Federal system annual energy deficits. Purchases to meet
23 these annual firm energy deficits are called augmentation purchases. Annual augmentation
24 purchases may not fully meet monthly Federal system HLH or LLH energy deficits. Additional
25 purchases made to meet these monthly HLH or LLH energy deficits are called balancing
26 purchases.

1
2 **2.4.2 Federal System Energy Load-Resource Balance**

3 Table 2.2 shows that the Federal system is expected to be in firm annual energy load-resource
4 balance, under 1937 critical water conditions, for FY 2010-2011 after including annual
5 augmentation purchases of 476 aMW for FY 2010 and 680 aMW for FY 2011. The net change
6 of this Study’s load-resource balance when compared to the WP-10 Initial Proposal shows
7 increased augmentation purchase estimates. This is mainly due to including power sales to the
8 aluminum smelter DSIs of 385 aMW during the rate period, which were not included in the
9 Loads and Resources Study for the Initial Proposal, as explained in section 2.2.4.

10
11 **Table 2.2**
12 **Loads and Resources – Federal System**
13 **Federal Firm Energy Surplus/Deficit**
14 **Including Estimated Augmentation Purchases**
15 **Energy in Average Megawatts**
16 **Under 1937 Critical Water Conditions**

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A	B	C
Fiscal Year	2010	2011
Loads		
Firm Obligations	8,896	8,836
Resources		
Resources less Transmission Losses	8,420	8,156
Augmentation Purchases	476	680
Net Total Resources (Line 5 + Line 6)	8,896	8,836
Surplus/Deficit		
Firm Surplus/Deficit (Line 7 - Line 3)	0	0

28 The components of the Federal system load-resource balance are shown in the Documentation,
29 WP-10-FS-BPA-01A, Section 2.3, Tables 2.3.1 and 2.3.2, *Loads and Resources-Federal System*,

1 (*Total Firm Surplus/Deficit*). Specific augmentation purchase estimates are detailed in the
2 Documentation, WP-10-FS-BPA-01A, Section 2.3, Tables 2.3.1 and 2.3.2, *Loads and*
3 *Resources-Federal System, (Augmentation Purchases)*. The supporting data for the Federal
4 system hydro resources, non-hydro resources, and contracts are shown in tables in the
5 Documentation, WP-10-FS-BPA-01A, Sections 2.4 through 2.6.

6 7 **2.5 Regional Hydro Resources**

8 **2.5.1 Overview**

9 This Study produces total PNW regional hydro resource estimates for FY 2010-2011 to provide
10 input into the AURORA^{xmp®} model for the Market Price Forecast Study, WP-10-FS-BPA-03.

11 12 **2.5.2 PNW Regional 70 Water Year Hydro Generation**

13 PNW regional hydro resource estimates are one of the inputs into the AURORA^{xmp®} model and
14 are comprised of regulated and independent hydro, plus NUG hydro for FY 2010-2011 for all
15 PNW hydro resources without respect to what entity owns the resource. Regulated hydro project
16 generation estimates for this Study are developed, by month, for each of the 70 water years of
17 record (October 1928 through September 1998) using BPA's HYDSIM model. The regional
18 regulated hydro generation estimates also include projected hydro improvement generation
19 increases from certain Federal system hydro projects. *See* section 2.3.2.1. Independent hydro
20 generation estimates were provided by the project owners for the same 70 water years.
21 Generation estimates for the NUG hydro projects are provided by the individual project owners
22 and are assumed not to vary by water year.

23
24 The regional regulated, independent, and NUG hydro totals are summarized for 70 water years
25 for FY 2010-2011 and are shown in the Documentation, WP-10-FS-BPA-01A, Section 2.7,
26 Tables 2.7.1 and 2.7.2, *Total PNW Regional Hydro Resources*.

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2.6 4(h)(10)(C) Credits

2.6.1 Overview

The 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. BPA recovers, through rates, the power costs for the Federal 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 fish and wildlife. 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 Treasury payment. There are three types of section 4(h)(10)(C) credits:

- 1) Direct fish and wildlife program expenditures;
- 2) Capital expenditures for fish and wildlife; and
- 3) Replacement power purchase expenditures resulting from changes in hydro system operations to benefit fish and wildlife.

The non-power purpose portion of these costs is currently calculated at 22.3 percent. The direct fish and wildlife program expenditures and capital expenditures for fish and wildlife are presented in the Revenue Requirement Study, WP-10-FS-BPA-02, section 4. This Study estimates the replacement power purchases resulting from changes in hydro system operations to benefit fish and wildlife, described in section 2.6.2.

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

BPA receives section 4(h)(10)(C) credits for any portion of additional power purchases it must make to implement fish and wildlife actions. This is done by comparing power purchase estimates between two HYDSIM hydro regulation studies. The first hydro regulation study, termed “With Fish,” models hydro system operations using current requirements for fish mitigation and wildlife enhancement under 70 historical water conditions (October 1928 through September 1998). The second hydro regulation study, called “Without Fish,” models the hydro system assuming no operational changes were made to benefit fish and wildlife, using the same 70 historical water conditions. BPA receives section 4(h)(10)(C) credits for the non-power portion of the additional power purchases it must make in order to implement the “With Fish” alternative as compared to the “Without Fish” alternative. The non-power portion is 22.3 percent, which represents the non-power purposes of the hydrosystem.

A fundamental principle of section 4(h)(10)(C) credits is that it not be affected by BPA’s marketing decisions. In order that BPA’s surplus/deficit situation not be a function of BPA marketing decisions, this Study uses the load that could have been served with certainty under the “Without Fish” measure operations under the worst energy-producing water condition (referred to as the critical period, which is water year 1937 in this Study). The load BPA can serve with certainty in the critical period is known as the Firm Energy Load Carrying Capability (FELCC) of the hydro system in the PNCA planning process. Therefore, it is also the amount of firm load that BPA would have been entitled to sell and is used as a surrogate for load in the section 4(h)(10)(C) power purchases analysis. The Federal load less generation produces Federal surplus/deficit energy amounts under the “Without Fish” and “With Fish” alternatives. Energy deficits result in power purchases. The instances where power purchases are increased from the “Without Fish” alternative to the “With Fish” alternative result in the power purchases eligible for section 4(h)(10)(C) credits.

1 The comparison of BPA's surplus/deficit estimates using the FELCC load obligation assumption
2 for the 70 different streamflow scenarios in the “Without Fish” hydro study is compared to
3 BPA’s surplus/deficit situation using the “With Fish” hydro study. The six possible scenarios for
4 each period and water condition are as follows:

- 5 1) “Without Fish” study is deficit and “With Fish” study is more deficit:
6 Leads to more purchases in the “With Fish” study.
- 7 2) “Without Fish” study is deficit and “With Fish” study is less deficit:
8 Leads to fewer purchases in the “With Fish” study.
- 9 3) “Without Fish” study is surplus and “With Fish” study is more surplus:
10 Leads to more revenues in the “With Fish” study.
- 11 4) “Without Fish” study is surplus and “With Fish” study is less surplus:
12 Leads to fewer revenues in the “With Fish” study.
- 13 5) “Without Fish” study is surplus and “With Fish” study is deficit:
14 Leads to fewer revenues and more purchases in the “With Fish” study.
- 15 6) “Without Fish” study is deficit and “With Fish” study is surplus:
16 Leads to fewer purchases and more revenues in the “With Fish” study.

17 Scenarios 1, 2, 5, and 6 result in changing the amount of expected power purchases between the
18 “Without Fish” and “With Fish” hydro study alternatives. The monthly increases and decreases
19 in energy purchase amounts, in aMW, between these hydro studies are calculated for each
20 monthly period and water condition. They are shown in the Documentation,
21 WP-10-FS-BPA-01A, Section 2.8, Table 2.8.1, 4(h)(10)(C) *Power Purchase Amounts*. These
22 monthly power purchase amounts for each of the 70 water years are used as inputs to the Risk
23 Analysis and Mitigation Study, WP-10-FS-BPA-04, where, combined with AURORA^{xmp®}
24 market price estimates from the Market Price Forecast Study, WP-10-FS-BPA-03, they are used
25 to calculate the power purchase expenses. The 70 water year average expense is the forecast
26 section 4(h)(10)(C) credits for Federal hydro system fish operations.

1 The 4(h)(10)(C) power purchase amounts have increased in the Final Proposal compared to the
2 Initial Proposal. In the Initial Proposal, there was an incorrect load input used in the HYDSIM
3 study “Without Fish” operating requirements; this is corrected in the Final Proposal.
4 Specifically, the incorrect load input that was used was the residual hydro load from the Loads
5 and Resources Study, and the correct load input that replaces the incorrect input is the FELCC of
6 the system “Without Fish” operating requirements. The impact of this correction is an increase
7 in the Final Proposal’s projected 4(h)(10)(C) credit for power purchases. This Study and the
8 Documentation contain the corrected input. *See* WP-10-FS-BPA-01A, Section 2.8.

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