

2010 BPA Rate Case
Wholesale Power Rate Initial Proposal

LOADS AND RESOURCES STUDY

February 2009

WP-10-E-BPA-01



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TABLE OF CONTENTS

	Page
Commonly Used Acronyms	iii
1. INTRODUCTION	1
2. LOADS AND RESOURCES STUDY	2
2.1 Overview of Methodology	2
2.1.1 Federal System Load Obligations	2
2.1.2 Federal System Resources	3
2.1.3 Federal System Loads and Resources Balance	4
2.1.4 Pacific Northwest Regional Hydro Generation	4
2.1.5 4(h)(10)(C) Credits	4
2.2 Federal System Load Obligation Forecast	5
2.2.1 Overview	5
2.2.2 Public Agencies Total Retail Load and Firm Requirement PSC Obligation Forecasts	5
2.2.3 Investor-Owned Utilities Sales Forecast	9
2.2.4 Direct Service Industry Sales Forecast	10
2.2.5 Other BPA Contract Obligations	10
2.2.6 Forecasts of ASC Total Retail Loads and Residential and Small Farm Loads for Utilities Participating in the Residential Exchange Program	11
2.2.6.1 ASC Contract System Load Forecast for FY 2010-2011	12
2.2.6.2 ASC Total Retail Load Forecast for FY 2012-2015	12
2.2.6.3 Residential and Small Farm Retail Load Forecast for FY 2010-2015	13
2.3 Federal System Resource Forecast	14
2.3.1 Overview	14
2.3.2 Federal System Hydro Generation	15
2.3.2.1 Regulated Hydro Generation Forecast	15
2.3.2.1.1 PNCA and Fish Requirements	17
2.3.2.1.2 Modified Streamflows	19
2.3.2.2 Independent Hydro Generation Forecast	19
2.3.3 Other Federal System Generation	20
2.3.4 Other Federal System Contract Purchases	21
2.4 Federal System Loads and Resources Balance	22
2.4.1 Overview	22
2.4.2 Federal System Energy Loads and Resources Balance	23
2.5 Regional Hydro Resources	24
2.5.1 Overview	24
2.5.2 PNW Regional 70 Water Year Hydro Generation	24
2.6 4(h)(10)(C) Credits	25
2.6.1 Overview	25
2.6.2 Forecast of Power Purchases Eligible for 4(h)(10)(C) Credits	25

TABLES

Table 2.1 PF Sales Forecast by Product.....	8
Table 2.2 Loads and Resources – Federal System.....	23

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 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
DJ	Dow Jones
DO	Debt Optimization
DOE	Department of Energy

DOP	Debt Optimization Program
DSI	direct-service industrial customer or direct-service industry
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
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)
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
MVAr	megavolt 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 (formerly 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. INTRODUCTION

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

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

2. LOADS AND RESOURCES STUDY

2.1 Overview of Methodology

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

2.1.1 Federal System Load Obligations

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

The Federal system firm requirements PSC forecast is composed of load obligation forecasts for public body and cooperative utilities (consumer-owned utilities) and Federal agencies (together called "Public Agencies"), direct service industrial customers (DSIs), investor-owned utilities (IOUs), and other BPA PSC obligations. These obligations are forecast monthly over the period for the generation system peak (GSP) in MW, energy in aMW, heavy load hour energy in 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, marketers, and power commitments
3 under statute and the Columbia River Treaty. These contract obligations are estimated for
4 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.

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 Federal system hydro energy estimate is apportioned to
16 HLH and LLH in the Risk Analysis and Mitigation Study, WP-10-E-BPA-04.

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

2.1.3 Federal System Loads and Resources Balance

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

2.1.4 Pacific Northwest Regional Hydro Generation

PNW regional hydro resource energy generation estimates are used for the secondary revenue analysis in the Market Price Forecast Study, WP-10-E-BPA-03. The regional hydro data includes all PNW regional hydro plus NUG hydro for FY 2010-2011. The larger set of regional regulated and independent hydro generation is estimated for each of 70 water years of record (October 1929 through September 1998). The regional NUG hydro generation forecast does not vary by water year. The forecast of PNW regional hydro generation is presented for monthly energy in aMW for each of the 70 water years. The regional hydro estimates are discussed in Section 2.5 of this Study and are detailed in the Documentation.

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

BPA funds actions to protect, mitigate, and enhance fish and wildlife affected by Federal hydro operations, as directed by the Pacific Northwest Electric Power Planning and Conservation Act, 16 U.S.C. §§ 839-839h (Northwest Power Act). These program costs are then allocated to hydro

1 project purposes, for both power and non-power uses. The Northwest Power Act directs BPA to
2 annually recoup its funding of non-power purposes through credits, known as “4(h)(10)(C)
3 credits” in reference to the specific section of the authorizing statutory provisions, so that
4 ratepayers pay only their power share of the fish and wildlife costs. 16 U.S.C. § 839b(h)(10)(C).
5 BPA uses a specific methodology for annually determining the amount of 4(h)(10)(C) credits
6 that may be available. The resource estimates used to calculate the 4(h)(10)(C) credits are
7 discussed in Section 2.6 of this Study and are detailed in the Documentation.

8 9 **2.2 Federal System Load Obligation Forecast**

10 **2.2.1 Overview**

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

20 21 **2.2.2 Public Agencies Total Retail Load and Firm Requirement PSC Obligation** 22 **Forecasts**

23 The Public Agencies’ monthly energy firm requirements PSC obligation forecast for utilities that
24 purchase full or partial service products is based on the sum of the utility-specific firm
25 requirements PSC obligation forecasts, which are customarily produced by BPA analysts. The

1 firm requirements PSC obligation forecasts presented in this Study are updates from the WP-07
2 Supplemental Final Proposal, WP-07-E-BPA-45.

3
4 The method used for preparing the firm requirements PSC obligation forecasts is as follows:

5
6 First, utility-specific forecasts of total retail load are produced using least squares
7 regression-based models on historical monthly energy loads. These models may
8 include several independent variables, such as a time trend, heating degree days,
9 cooling degree days, and monthly indicator variables. Heating and cooling degree
10 days are a measure of temperature effects to account for changes in electricity
11 usage related to temperature changes. Heating degree days are calculated when
12 the temperature is below a base temperature such as 65 degrees, and similarly,
13 cooling degree days are calculated when the temperature is above a base
14 temperature. The results from these computations are monthly forecasts of total
15 retail load. The monthly peak loads are forecast in a similar fashion as the energy
16 loads, but the historical data used in the models are the customers' coincidental
17 peak (CP). The peak coincident to the BPA's generation system peak (GSP) is
18 then obtained by applying relationships between the historical CP and the
19 historical GSP to the forecast CP. These forecasts comprise projections of utility-
20 specific total retail load monthly energy and peak. The total retail energy load is
21 then split into HLH and LLH time periods using recent historical relationships.

22
23 Second, estimates of customer-owned and consumer-owned dedicated resource
24 generation and contract purchases are subtracted from the appropriate utility-
25 specific total retail load forecasts to produce a firm requirement PSC obligation
26 forecast for each utility. These firm requirement PSC obligation forecasts provide

1 the basis for the Full and Partial Products sales projections incorporated in BPA
2 ratemaking. For those utilities purchasing Slice or Block products, their firm
3 requirement PSC obligation forecast is the contracted purchase amount split into
4 appropriate HLH and LLH time periods.

5
6 Slice is a PSC product that provides firm requirements power and surplus energy to a customer
7 based on its annual net requirements load. The term of the Slice PSC is for the 10-year period
8 October 1, 2001, through September 30, 2011. It differs from traditional power products in that
9 it is comprised of the following components: (1) firm power deliveries based on the level and
10 shape of the Slice resources; and (2) surplus power deliveries on a monthly or seasonal basis as
11 they are generated by the Slice system resources. The Slice product is combined with a sale of a
12 fixed amount of power sold as a Block product.

13
14 Slice contracts for power deliveries are based on 22.63 percent of the Slice system resources.
15 The Slice system resources are comprised of a set of specific Federal resources and contract
16 purchases, net of a specific set of Federal obligations. This particular set of resources and
17 obligations is used only for the Slice product and is not the same as the set of Federal system
18 resources. The specific set of Federal resources that comprises the Slice system resources
19 includes the generation from specific Federal hydro projects (including BPA's purchase of the
20 Idaho Falls Power Bulb turbine projects through September 30, 2011), Columbia Generating
21 Station (CGS), Georgia Pacific Corporation's Wauna Mill, Federal NUG (including BPA's
22 purchased share of the Klondike III wind project), and power deliveries from the Non-Federal
23 Canadian Entitlement Return (CER) for Canada contracts. The specific set of Federal contract
24 obligations that are subtracted from the Slice system resources for this purpose includes, but is
25 not limited to, deliveries for the CER to Canada (shown as an Export) and Federal pumping
26 loads. The amount of Slice product available for delivery is dependent on the Federal system

operating decisions, hydro production that varies by water year, and generation from non-hydro Federal resources.

The Federal system Slice resource obligations are shown in the Documentation, WP-10-E-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)*.

The sum of the projected firm requirements PSC obligations for customers purchasing Subscription products comprises the aggregate Priority Firm Power (PF) sales forecast. This sum is then reduced by an incremental 21 aMW per year to reflect expected conservation savings from bilateral contracts beginning with FY 2007 loads. The reductions from these bilateral conservation acquisition agreements are estimated at 84 aMW for FY 2010 and 105 aMW for FY 2011. Table 2.1, below, presents the PF sales by product and total PF sales adjusted for conservation savings.

Table 2.1
PF 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	2,171	1,569	616	1,164	1,634	7,153	7,069
2011	2,219	1,614	610	1,169	1,589	7,202	7,097

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.

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

9
10 The Federal system firm requirements PSC obligations are summarized in the Documentation,
11 WP-10-E-BPA-01A, Section 2.3, Tables 2.3.1 and 2.3.2, *Loads and Resources-Federal*
12 *System*, *(Federal Agencies 2002 PSC)*, *(USBR 2002 PSC)*, *(NGP 2002 PSC)*, and *(GPU 2002*
13 *PSC)*. The Federal system Slice resource obligations are summarized in the Documentation,
14 WP-10-E-BPA-01A, Section 2.3, Tables 2.3.1 and 2.3.2, *Loads and Resources-Federal System*,
15 *(NGP Slice Sale)* and *(GPU Slice Sale)*.

16 17 **2.2.3 Investor-Owned Utilities Sales Forecast**

18 No power sales to regional IOUs are forecast for FY 2010-2011 based on BPA's current
19 contracts with the six regional IOUs. The six IOUs in the PNW region are Avista Corporation,
20 Idaho Power Company, NorthWestern Energy Division of NorthWestern Corporation (formerly
21 Montana Power Company), PacifiCorp, Portland General Electric Company, and Puget Sound
22 Energy, Inc. BPA would serve any net requirements of IOUs at the New Resource Firm Power
23 (NR-10) rate. This forecast does not expect any NR sales to the IOUs at this time. IOUs may
24 receive benefits under the Residential Exchange Program but these benefits are not in the form of
25 actual power deliveries. See WPRDS section 6, Average System Cost Forecast,
26 WP-10-E-BPA-05.

2.2.4 Direct Service Industry Sales Forecast

Currently the only power sale delivery BPA is making to DSIs is a 17 aMW Firm Power Products and Services (FPS) sale to Clallam County PUD for Port Townsend Paper Corporation through September 30, 2011. This delivery is shown as an Intra-regional transfer from BPA to Clallam County PUD and is not included as a DSI PSC load obligation because it is not charged the Industrial Firm Power (IP) rate. The Clallam contract for Port Townsend Paper is included for monthly energy in aMW as a contract obligation on the Federal system, in the Documentation, WP-10-E-BPA-01A, Section 2.3, Tables 2.3.1 through 2.3.3, *Loads and Resources-Federal System, (Intra-Regional Transfers (Out))*. The details of this delivery are presented monthly for energy in aMW, HLH MWh, and LLH MWh in the Documentation, WP-10-E-BPA-01A, Sections 2.4 through 2.6, Table A-16, *Intra-Regional Transfers (Out)* for the rate period.

On December 17, 2008, the Court of Appeals for the Ninth Circuit issued an opinion in *PNGC v. DOE*, Case No. 05-75638 (9th Cir. 2008), regarding BPA's contracts with the DSIs. Possible implications of this decision are discussed in the Policy testimony, Bliven *et al.*, WP-10-E-BPA-10, Section 5. As the Policy testimony states, this court ruling was too late to include any changes to DSI sales in this Study. *Id.* The Final Study will be updated to include any change of assumptions for DSI sales. *Id.*

2.2.5 Other BPA Contract Obligations

BPA provides Federal power to customers under a variety of contract arrangements not included in the Public Agency, IOU, and DSI PSC load obligation forecasts. These contracts 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

1 Columbia River Treaty. These arrangements, collectively called “Other Contract Obligations,”
2 are specified by individual contract provisions and can have different delivery arrangements and
3 rate structures.

4
5 BPA’s Other Contract Obligations are assumed to be served by Federal system firm resources
6 regardless of weather, water, or economic conditions. These Other Contract Obligations are
7 modeled individually and are specified or estimated for monthly energy in aMW, HLH MWh,
8 and LLH MWh.

9
10 Other Contract Obligations for monthly energy in aMW are summarized in the Documentation,
11 WP-10-E-BPA-01A, Section 2.3, Tables 2.3.1 and 2.3.2, *Loads and Resources-Federal System*,
12 *(Exports)* and *(Intra-Regional Transfers (Out))* and are detailed, for monthly energy in aMW,
13 HLH MWh, and LLH MWh, in the Documentation, WP-10-E-BPA-01A, Sections 2.4 through
14 2.6, Table A-2, *Federal Exports* and Table A-16, *Intra-Regional Transfers (Out)*.

15 16 **2.2.6 Forecasts of ASC Total Retail Loads and Residential and Small Farm Loads** 17 **for Utilities Participating in the Residential Exchange Program**

18 As part of the Northwest Power Act, the Residential Exchange Program (REP) was created to
19 provide residential and small farm customers of Pacific Northwest (regional) utilities a form of
20 access to low-cost Federal power. 16 U.S.C. § 839c(c). Under the REP, BPA purchases power
21 from a participating utility at the average system cost (ASC) of that utility’s resources (\$/MWh)
22 and sells back to that utility the equivalent amount of power at the lower BPA PF Exchange rate.
23 See WPRDS section 6, Average System Cost Forecast.

24
25 Utility ASCs are not determined in BPA rate proceedings. Instead, ASCs are determined in a
26 separate administrative process that BPA conducts pursuant to the procedural rules of the 2008

1 ASC Methodology. See Proposed ASCM at II.B.2. BPA is currently conducting such processes
2 to review the ASCs filed by eight utilities. At the conclusion of these review processes, BPA
3 will publish final ASCs for these utilities for the rate period, FY 2010-2011. BPA will
4 incorporate into this proceeding the final ASCs to calculate final rates. Background information,
5 publications, procedures and review schedules, participating utilities' data and ASC filings, and
6 BPA's published reports are located at <http://www.bpa.gov/corporate/finance/ascm/>.

8 **2.2.6.1 ASC Contract System Load Forecast for FY 2010-2011**

9 As defined in the 2008 ASC Methodology, a utility's ASC is calculated by dividing the utility's
10 total system cost (ASC Contract System Cost), by the utility's total system load (ASC Contract
11 System Load. The ASC Contract System Load forecast is the sum of the ASC Total Retail Load
12 of a utility, as measured at the meter, plus distribution losses, less projected new large single
13 loads. (See WPRDS section 6, Average System Cost Forecast). Utilities planning to participate
14 in the REP for FY 2010-11 were required to submit to BPA in October 2008, as part of their
15 ASC filing, a forecast of their ASC Total Retail Load data for the period covering FY 2010-
16 2015. Avista, Idaho Power Company, NorthWestern, PacifiCorp, Portland General Electric,
17 Puget Sound Energy, Snohomish County PUD and Franklin County PUD each submitted ASC
18 filings to BPA. BPA will evaluate the reasonableness of these utilities' Contract System Load
19 for FY 2010-2011 in the ASC Review processes.

21 **2.2.6.2 ASC Total Retail Load Forecast for FY 2012-2015**

22 To perform the section 7(b)(2) rate test, BPA must have forecast ASCs for FY 2012-2015 for
23 utilities participating in the REP. To forecast the ASC Total Retail Load component for these
24 ASCs, BPA used the FY 2012-2015 load data provided by the utilities participating in the ASC

1 Review Process. BPA determined that these forecasts were reasonable and made no changes to
2 the FY 2012-2015 ASC Total Retail Loads filed by the utilities in October 2008.

3
4 As discussed in section 2.1.3, Section 7(b)(2) Rate Test Study, WP-10-E-BPA-06, BPA used the
5 ASC Total Retail Load forecasts submitted by the utilities to forecast the utilities' ASC Contract
6 System Loads for FY 2012-2015.

7
8 The ASC Total Retail Load forecast for the 7(b)(2) rate test period, FY 2012-2015, is available
9 in the Documentation, WP-10-E-BPA-01A, Section 2.2, Table 2.2.7, *ASC Total Retail Load*
10 *Forecasts*.

11 12 **2.2.6.3 Residential and Small Farm Retail Load Forecast for FY 2010-2015**

13 In general, a residential and small farm exchange load is defined as the sum of a utility's small
14 farm and residential consumer loads as determined by the terms of the utility's Residential
15 Purchase and Sales Agreement (RPSA). BPA uses residential and small farm exchange loads to
16 forecast a utility's REP payments by comparing the utility's ASC with BPA's PF Exchange rate,
17 and then multiplying the difference by the utility's residential and small farm exchange load. *See*
18 *Section 7(b)(2) Rate Test Study, WP-10-E-BPA-06*, for additional background information.

19
20 Utilities intending to participate in the REP for FY 2010-2011 were required to submit with their
21 ASC filings a forecast of their residential and small farm retail load, as measured at the meter,
22 for FY 2010-2015. As noted above, eight utilities made such filings. BPA reviewed the
23 residential and small farm retail loads for each utility and determined the data were reasonable.
24 No changes were made to the 2010-2015 values as filed by the utilities in October 2008.

As discussed in the Section 7(b)(2) Rate Test Study, WP-10-E-BPA-06, section 2.1.3, BPA used the residential and small farm retail load forecasts submitted by the utilities to forecast the residential and small farm exchange load for both the rate period (FY 2010-2011) and the remaining years of the 7(b)(2) rate test period (FY 2012-2015).

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

2.3 Federal System Resource Forecast

2.3.1 Overview

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

The Federal system regulated hydro resource estimates are derived by BPA's hydro regulation model (HYDSIM), which estimates project generation under 70 water years (October 1928 through September 1998). Federal system independent hydro project generation estimates are not provided by HYDSIM; rather, they are provided by each project's owner for the same 70 water years. Other Federal system resources include non-Federal projects from which BPA has acquired the output. These generation estimates are provided either by BPA or by the project's owners. In addition, BPA has other contract purchases that are considered Federal system resources. They are comprised of the following: (1) contract purchases and exchanges; (2) return energy associated with BPA's capacity contracts; (3) return and exchange energy

1 associated with BPA's capacity-for-energy exchanges; and (4) power commitments delivered to
2 BPA under the Columbia River Treaty. Federal system generating resource and contract
3 purchase estimates used in the Initial Proposal are detailed in the Documentation,
4 WP-10-E-BPA-01A, Sections 2.4 through 2.6.

6 **2.3.2 Federal System Hydro Generation**

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

14 **2.3.2.1 Regulated Hydro Generation Forecast**

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

18
19 This Study uses HYDSIM to estimate the Federal system energy production that can be expected
20 from specific hydroelectric power projects in the PNW Columbia River Basin when operating in
21 a coordinated fashion and meeting power and non-power requirements for the 70 water years of
22 record (October 1928 through September 1998). The hydro regulation study uses individual
23 project operating characteristics and conditions to determine energy production expected from
24 each specific project. Physical characteristics of each project come from annual Pacific
25 Northwest Coordination Agreement (PNCA) data submittals from regional utilities and

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

5
6 This Study's estimates of expected hydro improvement generation increases are due to: 1) hydro
7 improvements from hydro optimization; 2) turbine runner replacement; and 3) reliability
8 increases through BPA's capital improvement programs at specific Federal regulated hydro
9 projects. These generation increases are not captured in the hydro regulation studies. The
10 increased generation associated with these hydro improvements is calculated by multiplying a
11 project's specific hydro improvement generation factor by that project's generation projection.
12 The Federal system hydro improvement forecast varies through time and by water year.

13
14 Separate hydro regulation studies are incorporated for each year of the rate period for this Study.
15 By modeling hydro regulation studies for individual years, the hydro generation estimates
16 capture changes in variables that characterize yearly variations in the hydro operations due to
17 firm loads, firm resources, markets for secondary energy, and project-by-project operating
18 requirements. These variables affect the amount and timing of energy available from the hydro
19 system and are changed as necessary to reflect current expectations. Sections 2.3.2.1.1
20 and 2.3.2.1.2 contain additional details on the process of producing the regulated hydro
21 generation estimates for use in this Study.

22
23 The hydro regulation studies and Federal system hydro improvement estimates presented in this
24 Study are updated from the WP-07 Supplemental Final Proposal. The Federal system regulated
25 hydro generation for this Study is summarized in the Documentation, WP-10-E-BPA-01A,
26 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-E-BPA-01A, Section 2.4, Table A-3, *Federal Regulated Hydro Projects*. The combined
3 Federal system regulated and independent hydro energy is provided to the Risk Analysis and
4 Mitigation Study, WP 10-E-BPA-04, which apportions the Federal system hydro energy estimate
5 into HLH and LLH.

7 **2.3.2.1.1 PNCA and Fish Requirements**

8 Since the WP-07 Supplemental Final Proposal, the HYDSIM studies have been updated to
9 reflect current assumptions. The HYDSIM studies incorporate the power and non-power
10 operating requirements expected to be in effect during the rate period, including those described
11 in the National Oceanographic and Atmospheric Administration Fisheries (NOAA Fisheries)
12 FCRPS Biological Opinion (BiOp) regarding salmon and steelhead, published May 5, 2008; the
13 United States Fish and Wildlife Service (USFWS) FCRPS BiOp regarding bull trout and
14 sturgeon, published December 20, 2000; the USFWS Libby BiOp regarding sturgeon, published
15 February 18, 2006; relevant operations described in the Northwest Power and Conservation
16 Council's Fish and Wildlife Program; and other fish mitigation measures. Each hydro regulation
17 study specifies particular hydroelectric project operations for fish, such as seasonal flow
18 objectives, minimum flow levels for fish, spill for juvenile fish passage, reservoir target
19 elevations and drawdown limitations, and turbine operation efficiency requirements.

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

- 23 1) Surface Passage Improvements: Continued operation of specific surface passage
24 improvements at COE projects on the lower Columbia and lower Snake Rivers.

- 2) Fall Chinook Transport: Continued spill at the Lower Snake projects for the passage and continued evaluation of Snake River Fall Chinook.
- 3) Residual Hydro Load: Updated the residual hydro load for FY 2010-2011 using regional loads that conform to those published in the draft 2008 Pacific Northwest Loads and Resources Study (draft 2008 White Book).

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, and flow and spill objectives described in the NOAA Fisheries and USFWS BiOps listed above as provided by the 2008 PNCA data submittals. Deviations from the PNCA data submittals occur when specific operating decisions are made subsequent to the date of submission in order to implement the BiOps.

For the Initial Proposal, the Federal hydro plant operating characteristics are updated to include increased reserve requirements associated with new wind generating plants. These reserve requirements are incorporated into the availability factors in HYDSIM and reduce the powerhouse capacity available for generation.

The hydro regulation studies include sets of power and non-power requirements that vary for each year of the rate period. Specific HYDSIM hydro regulation study assumptions are detailed in the Documentation, WP-10-E-BPA-01A, Section 2.9.1, *HYDSIM Hydro Regulation Study Assumptions*.

2.3.2.1.2 Modified Streamflows

The HYDSIM model used 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.

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

2.3.2.2 Independent Hydro Generation Forecast

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 Reclamation, COE, or other project owners. Federal system independent hydro generation estimates are provided by individual project owners for the 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).

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

2.3.3 Other Federal System Generation

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

- 1) Renewable resources, which include cogeneration (Georgia Pacific (Wauna)) and wind (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, WP-10-E-BPA-01A, Sections 2.4 through 2.6, Table A-8, *Federal Renewable Resources*.
- 2) CGS, which incorporates facility improvements and a two-year refueling cycle. CGS details are shown in the Documentation, WP-10-E-BPA-01A, Sections 2.4 through 2.6, Table A-10, *Federal Large Thermal*.

- 1 3) Other projects that BPA has acquired the output from include small hydro (Elwha
2 and Glines Hydro through September 30, 2011, and Dworshak/Clearwater Small
3 Hydropower) and a small amount of solar resources (Ashland Solar Project and
4 White Bluffs Solar). These projects are detailed in the Documentation, WP-10-
5 E-BPA-01A, Sections 2.4 through 2.6, Table A-24, *Federal Non-Utility*
6 *Generating Resources by Project*.

7
8 The other Federal system generation estimates are summarized for monthly energy in aMW in
9 the Documentation, WP-10-E-BPA-01A, Tables 2.3.1 and 2.3.2, *Loads and Resources-Federal*
10 *System, (Renewables), (Large Thermal), and (Non-Utility Generation)*.

11 12 **2.3.4 Other Federal System Contract Purchases**

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

20
21 BPA retained Excess Requirements Energy (ERE) from some Slice customers that are included
22 in Other Contract Purchases. BPA considers this Slice ERE energy as part of its firm
23 augmentation for the rate period. The availability of Slice ERE for FY 2010 is 10.3 aMW and
24 for FY 2011 is 7.6 aMW. Slice ERE is a result of a Letter Agreement that settled the
25 implementation of Exhibit N of the Block and Slice Power Sales Agreement for FYs 2008-2011.

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

2.4 Federal System Loads and Resources Balance

2.4.1 Overview

The Federal system loads and resources balance and the supporting data constitute a portion of the data used in this Study. The loads and resources balance compiles 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. This determines BPA's monthly and annual energy loads and resources balance. BPA determines the amount of its annual forecasted firm energy resources under 1937 critical water conditions. 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 are less than its load obligations, BPA can purchase power or otherwise secure resources to meet Federal system annual energy deficits. Purchases to meet these annual firm energy deficits are called augmentation purchases. Annual augmentation purchases, however, 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.

2.4.2 Federal System Energy Loads and Resources Balance

Table 2.2 shows that the Federal system is expected to be in firm annual energy loads and resources balance, under 1937 critical water conditions, for FY 2010-2011 after including annual augmentation purchases from 372 aMW for FY 2010 and 599 aMW for FY 2011.

Table 2.2
Loads and Resources – Federal System
Federal Firm Energy Surplus/Deficit
Including Estimated Augmentation Purchases
Energy in Average Megawatts
Under 1937 Critical Water Conditions

A	B	C
Fiscal Year	2010	2011
Loads		
Firm Obligations	8,681	8,643
Resources		
Resources less Transmission Losses	8,309	8,044
Augmentation Purchases	372	599
Net Total Resources (Line 5 + Line 6)	8,681	8,643
Surplus/Deficit		
Firm Surplus/Deficit (Line 7 - Line 3)	0	0

The components of the Federal system loads and resources balance are shown in the Documentation, WP-10-E-BPA-01A, Section 2.3, Tables 2.3.1 and 2.3.2, *Loads and Resources-Federal System, (Total Firm Surplus/Deficit)*. Specific augmentation purchase estimates are detailed in the Documentation, WP-10-E-BPA-01A, Section 2.3, Tables 2.3.1 and 2.3.2, *Loads and Resources-Federal System, (Augmentation Purchases)*. The supporting data for the Federal

1 system hydro resources, non-hydro resources, and contracts are shown in tables in the
2 Documentation, WP-10-E-BPA-01A, Sections 2.4 through 2.6.

3 4 **2.5 Regional Hydro Resources**

5 **2.5.1 Overview**

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

8 9 **2.5.2 PNW Regional 70 Water Year Hydro Generation**

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

20
21 The regional regulated, independent, and NUG hydro totals are summarized for 70 water years
22 for FY 2010-2011 and are shown in the Documentation, WP-10-E-BPA-01A, Section 2.7,
23 Tables 2.7.1 and 2.7.2, *Total PNW Regional Hydro Resources*.

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 Council and other purposes of the Northwest Power Act. BPA recovers, through rates, the power costs for the Federal dams 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 dams. These non-power uses include flood control, irrigation, recreation, and fish and wildlife. The Northwest Power Act calls for 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-E-BPA-02. 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

1 estimates between two HYDSIM hydro regulation studies. The first hydro regulation study,
2 termed “With Fish,” models hydro system operations using current requirements for fish
3 mitigation and wildlife enhancement under 70 historical water conditions (October 1928 through
4 September 1998). The second hydro regulation study, called “Without Fish,” models the hydro
5 system assuming no operational changes were made to benefit fish and wildlife, using the same
6 70 historical water conditions. BPA receives section 4(h)(10)(C) credits for a portion of
7 additional power purchases it must make in order to implement the “With Fish” alternative as
8 compared to the “Without Fish” alternative.

9
10 A fundamental principle of section 4(h)(10)(C) credits is that it not be affected by BPA’s
11 marketing decisions. In order that BPA's surplus/deficit situation not be a function of BPA
12 marketing decisions, this Study uses the load that could have been served with certainty under
13 the “Without Fish” measure operations under the worst energy-producing water condition
14 (referred to as the critical period, which is water year 1937). The load BPA can serve with
15 certainty in the critical period is known as the Firm Energy Load Carrying Capability (FELCC)
16 of the hydro system in the PNCA planning process. Therefore, it is also the amount of firm load
17 that BPA would have been entitled to sell and is used as a surrogate for load in the
18 section 4(h)(10)(C) power purchases analysis. The Federal load less generation produces
19 Federal surplus/deficit energy amounts under the “Without Fish” and “With Fish” alternatives.
20 Energy deficits result in power purchases. The instances where power purchases are increased
21 from the “Without Fish” alternative in the “With Fish” alternative result in the additional power
22 purchases available for section 4(h)(10)(C) credits.

23
24 The comparison of BPA's surplus/deficit estimates using the FELCC load obligation assumption
25 for the 70 different streamflow scenarios in the “Without Fish” hydro study was compared to

BPA's surplus/deficit situation using the "With Fish" hydro study. The six possible scenarios for each period and water condition are as follows:

- 1) "Without Fish" study is deficit and "With Fish" study is more deficit:
Leads to more purchases in the "With Fish" study.
- 2) "Without Fish" study is deficit and "With Fish" study is less deficit:
Leads to fewer purchases in the "With Fish" study.
- 3) "Without Fish" study is surplus and "With Fish" study is more surplus:
Leads to more revenues in the "With Fish" study.
- 4) "Without Fish" study is surplus and "With Fish" study is less surplus:
Leads to fewer revenues in the "With Fish" study.
- 5) "Without Fish" study is surplus and "With Fish" study is deficit:
Leads to fewer revenues and more purchases in the "With Fish" study.
- 6) "Without Fish" study is deficit and "With Fish" study is surplus:
Leads to fewer purchases and more revenues in the "With Fish" study.

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

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