# 2002 Final Power Rate Proposal
# Risk Analysis Study Documentation

WP-02-FS-BPA-03A
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BONNEVILLE
POWER ADMINISTRATION

**RISK ANALYSIS STUDY DOCUMENTATION**

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**COMMONLY USED ACRONYMS**

| | |
|---|---|
| AANR | Audited Accumulated Net Revenues |
| AC | Alternating Current |
| AER | Actual Energy Regulation |
| Affiliated Tribes | Affiliated Tribes of Northwest Indians |
| AFUDC | Allowance for Funds Used During Construction |
| AGC | Automatic Generation Control |
| Alcoa | Alcoa, Inc. |
| Alcoa/Vanalco | Joint Alcoa and Vanalco |
| aMW | Average Megawatt |
| ANRT | Accumulated Net Revenue Threshold |
| AOP | Assured Operating Plan |
| APS | Ancillary Products and Services (rate) |
| APS-S | Actual Partial Service-Simple |
| ASC | Average System Cost |
| Avista | Avista Corp |
| BASC | BPA Average System Cost |
| BO | Biological Opinion |
| BPA | Bonneville Power Administration |
| BP EIS | Business Plan Environmental Impact Statement |
| Btu | British Thermal Unit |
| C&R Discount | Conservation and Renewables Discount |
| C&R | Cost and Revenue |
| CalPX | California Power Exchange |
| CBFWA | Columbia Basin Fish & Wildlife Authority |
| CBP | Columbia Basin Project |
| CCCT | Combined-Cycle Combustion Turbine |
| CEC | California Energy Commission |
| CFAL | Columbia Falls Aluminum Company |
| Cfs | cubic feet per second |
| COB | California-Oregon Border |
| COE | U.S. Army Corps of Engineers |
| Con/Mod | Conservation Modernization Program |
| COSA | Cost of Service Analysis |
| CP | Coincidental Peak |
| CRAC | Cost Recovery Adjustment Clause |
| CRC | Critical Rule Curves |
| CRITFC | Columbia River Inter-Tribal Fish Commission |
| CSPE | Columbia Storage Power Exchange |
| CT | Combustion Turbine |
| CTPP | Conditional TPP |
| CWA | Clear Water Act |
| CY | Calendar Year (Jan-Dec) |
| DC | Direct Current |
| DDC | Dividend Distribution Clause |

| | |
|---|---|
| DJ | Dow Jones |
| DMP | Data Management Procedures |
| DOE | Department of Energy |
| DROD | Draft Record of Decision |
| DSI | DSI (only the DSI represented by Murphy under DS) |
| DSIs | Direct Service Industrial Customers |
| ECC | Energy Content Curve |
| EFB | Excess Federal Power |
| EIA | Energy Information Administration |
| EIS | Environmental Impact Statement |
| Energy Northwest | Formerly Washington Public Power Supply System (Nuclear) Project |
| Energy Services | Energy Services, Inc. |
| Enron | Enron Corporation |
| EPA | Environmental Protection Agency |
| EPP | Environmentally Preferred Power |
| ESA | Endangered Species Act |
| EWEB | Eugene Water & Electric Board |
| F&O | Financial and Operating Reports |
| FBS | Federal Base System |
| FCCF | Fish Cost Contingency Fund |
| FCRPS | Federal Columbia River Power System |
| FCRTS | Federal Columbia River Transmission System |
| FELCC | Firm Energy Load Carrying Capability |
| FERC | Federal Energy Regulatory Commission |
| Fourth Power Plan | NWPPC's Fourth Northwest Conservation and Electric Power Plan |
| FPA | Federal Power Act |
| FPS | Firm Power Products and Services (rate) |
| FSEA | Federal Secondary Energy Analysis |
| F&WCA | Fish and Wildlife Coordination Act |
| FY | Fiscal Year (Oct-Sep) |
| 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 |
| HELM | Hourly Electric Load Model |
| HLFG | High Load Factor Group |
| HLH | Heavy Load Hour |
| HNF | Hourly Non-Firm |
| HOSS | Hourly Operating and Scheduling Simulator |
| ICNU | Industrial Customers of Northwest Utilities |
| ICUA | Idaho Consumer-Owned Utilities Association, Inc. |

| | |
|---|---|
| IPC | Idaho Power Company |
| IP | Industrial Firm Power (rate) |
| IPTAC | Industrial Firm Power Targeted Adjustment Charge |
| IJC | International Joint Commission |
| IOU | IOU (the joint IOU filings) |
| IOUs | Investor-Owned Utilities |
| ISC | Investment Service Coverage |
| ISO | Independent System Operator |
| JOA | Joint Operating Agency |
| Joint DSI | Alcoa, Vanalco, and DSI |
| KAF | Thousand Acre Feet |
| kcfs | kilo (thousands) of cubic feet per second |
| ksfd | thousand second foot day |
| kV | Kilovolt (1000 volts) |
| kW | Kilowatt (1000 watts) |
| kWh | Kilowatthour |
| LCP | Least-Cost Plan |
| LDD | Low Density Discount |
| LLH | Light Load Hour |
| LME | London Metal Exchange |
| LOLP | Loss of Load Probability |
| L/R Balance | Load/Resource Balance |
| m/kWh | Mills per kilowatthour |
| MAC | Market Access Coalition Group |
| MAF | Million Acre Feet |
| MC | Marginal Cost |
| MCA | Marginal Cost Analysis |
| MCS | Model Conservation Standards |
| Mid-C | Mid-Columbia |
| MIMA | Market Index Monthly Adjustment |
| MIP | Minimum Irrigation Pool |
| MMBTU | Million British Thermal Units |
| MOA | Memorandum of Agreement |
| MOP | Minimum Operating Pool |
| MORC | Minimum Operating Reliability Criteria |
| MPC | Montana Power Company |
| MT | Market Transmission (rate) |
| MW | Megawatt (1 million watts) |
| MWh | Megawatthour |
| NCD | Non-coincidental Demand |
| NEC | Northwest Energy Coalition |
| NEPA | National Environmental Policy Act |
| NEPOOL | New England Power Pool |
| NERC | North American Electric Reliability Council |
| NF | Nonfirm Energy (rate) |
| NFRAP | Nonfirm Revenue Analysis Program (model) |

| | |
|---|---|
| NLSL | New Large Single Load |
| NMFS | National Marine Fisheries Service |
| NOB | Nevada-Oregon Border |
| NORM | Non-Operating Risk Model |
| Northwest Power Act | Pacific Northwest Electric Power Planning and Conservation Act |
| NPV | Net Present Value |
| NR | New Resource Firm Power (rate) |
| NRU | Northwest Requirements Utilities |
| NT | Network Transmission |
| NTP | Network Integration Transmission (rate) |
| NTSA | Non-Treaty Storage Agreement |
| NUG | Non-Utility Generation |
| NWPP | Northwest Power Pool |
| NWPPC C&R | Northwest Power Planning Council Cost and Revenues Analysis |
| NWPPC | Northwest Power Planning Council |
| O&M | Operation and Maintenance |
| OMB | Office of Management and Budget |
| OPUC | Oregon Public Utility Commission |
| OURCA | Oregon Utility Resource Coordination Association |
| OY | Operating Year (Aug-Jul) |
| PA | Public Agency |
| PacifiCorp | PacifiCorp |
| PATH | Plan for Analyzing and Testing Hypotheses |
| PBL | Power Business Line |
| PDP | Proportional Draft Points |
| PDR | Power Discharge Requirement |
| PF | Priority Firm Power (rate) |
| PFBC | Pressurized Fluidized Bed Combustion |
| PGE | Portland General Electric |
| PGP | Public Generating Pool |
| PMA | Power Marketing Agencies |
| PMDAM | Power Marketing Decision Analysis Model |
| PNCA | Pacific Northwest Coordination Agreement |
| PNGC | Pacific Northwest Generating Cooperative |
| PNRR | Planned Net Revenues for Risk |
| PNUCC | Pacific Northwest Utilities Conference Committee |
| PNW | Pacific Northwest |
| POD | Point of Delivery |
| PPC | Public Power Council |
| PPLM | PP&L Montana, LLC |
| Principles | Fish and Wildlife Funding Principles |
| Project Act | Bonneville Project Act |
| PSE | Puget Sound Energy |
| PSW | Pacific Southwest |
| PTP | Point-to-Point |
| PUD | Public or People’s Utility District |

| | |
|---|---|
| Puget | Puget Sound Energy, Inc. |
| PURPA | Public Utilities Regulatory Policies Act |
| RAM | Rate Analysis Model (computer model) |
| RAS | Remedial Action Scheme |
| Reclamation | Bureau of Reclamation |
| Renewable Northwest | Renewable Northwest Project |
| REP | Residential Exchange Program |
| RFP | Request for Proposal |
| RiskMod | Risk Analysis Model (computer model) |
| RiskSim | Risk Simulation Model |
| RL | Residential Load (rate) |
| RMS | Remote Metering System |
| ROD | Record of Decision |
| RPSA | Residential Purchase and Sale Agreement |
| RTF | Regional Technical Forum |
| RTO | Regional Transmission Organization |
| SCCT | Single-Cycle Combustion Turbine |
| Shoshone-Bannock | Shoshone-Bannock Tribes |
| SOS | Save Our Wild Salmon |
| SPG | Slice Purchasers Group |
| SS | Share-the-Savings Energy (rate) |
| STREAM | Short-Term Evaluation and Analysis Model |
| SUB | Springfield Utility Board |
| SUMY | Stepped-Up Multiyear |
| SWPA | Southwestern Power Administration |
| TAC | Targeted Adjustment Charge |
| TACUL | Targeted Adjustment Charge for Uncommitted Loads |
| TBL | Transmission Business Line |
| tcf | Trillion Cubic Feet |
| TCH | Transmission Contract Holder |
| TDG | Total Dissolved Gas |
| TPP | Treasury Payment Probability |
| Transmission System Act | Federal Columbia River Transmission System Act |
| TRL | Total Retail Load |
| UAI Charge | Unauthorized Increase Charge |
| UAMPS | Utah Associated Municipal Power Systems |
| UCUT | Upper Columbia United Tribes |
| UDC | Utility Distribution Company |
| UP&L | Utah Power & Light |
| URC | Upper Rule Curve |
| USFWS | U.S. Fish and Wildlife Service |
| Vanalco | Vanalco, Inc. |
| VB | Visual Basic |
| VBA | Visual Basic for Applications |
| VI | Variable Industrial Power rate |
| VOR | Value of Reserves |

| | |
|---|---|
| WAPA | Western Area Power Administration |
| WEFA | WEFA Group (Wharton Econometric Forecasting Associates) |
| WPAG | Western Public Agencies Group |
| WPRDS | Wholesale Power Rate Development Study |
| WSCC | Western Systems Coordinating Council |
| WSPP | Western System Power Pool |
| WUTC | Washington Utilities and Transportation Commission |
| WY | Watt-Year |
| Yakama | Confederated Tribes and Bands of the Yakama Nation |

## INTRODUCTION

The electric utility industry is in the midst of deregulation. The Federal Columbia River Power System (FCRPS), operated on behalf of the ratepayers of the Pacific Northwest (PNW) by the Bonneville Power Administration (BPA) and other Federal agencies, faces many uncertainties during the Fiscal Year (FY) 2002–2006 rate period. Among these uncertainties are variable hydro conditions, volatile market prices, and uncertain fish and wildlife recovery costs. BPA must produce revenues from wholesale power rates that are sufficient to cover all its costs during the rate period. These costs include expenses related to recovery efforts for fish and wildlife, which have been impacted by the presence of Federal dams on the rivers and streams of the Columbia River Basin. The expenses associated with these fish and wildlife recovery efforts, in turn, impact BPA's ability to make its annual payments to the U.S. Treasury.

In order to assure that BPA has a high probability of making its annual Treasury payments on time and in full during the rate period, BPA performs a Risk Analysis Study. In this Study, BPA identifies key risks, models their relationships, and then analyzes their impacts on net revenues (revenues less expenses). BPA subsequently evaluates the impact that certain risk mitigation measures have on reducing its net revenue risk so that BPA can develop rates that cover all its costs and provide a high probability of making its Treasury payments on time and in full during the rate period.

In this rate case, BPA is setting its power rates so that it achieves an 88 percent probability that all Treasury payments will be made on time and in full over the five-year rate period. To

accomplish this task, it is necessary to quantify and then mitigate key operating and non-operating risks. The first step in this process is the Risk Analysis Study, which identifies key risk factors, models the relationship among the risk factors, and determines their impacts on net revenues.

The Risk Analysis Study focuses upon two classes of risks and their impacts on BPA's revenues and expenses. The first class of risks is comprised of operating risks--variations in economic conditions, load, and generation resource capability. These operating risks include both the impacts that water supply conditions and alternative hydro operations (including the impact of the 13 Fish and Wildlife Alternatives) have on net revenues. These operating risks are modeled in Risk Analysis Model (RiskMod). The second class of risks is comprised of non-operating risks--uncertainties in capital costs and expenses (but not operational impacts) associated with the 13 Fish and Wildlife Alternatives identified in the Fish and Wildlife Funding Principles (Principles) announced by Vice President Gore in September 1998. This class of non-operating risks also includes uncertainty in achieving cost reductions identified in the Cost Review recommendations, costs associated with business line separation, costs associated with conservation and renewables, and interest rates. These risks are modeled in the Non-Operating Risk Model (NORM). The output from RiskMod and NORM is combined to develop a distribution of net revenue deviations that are input into the ToolKit Model. The ToolKit Model uses the net revenue data to test the effectiveness of implementing various risk mitigation measures in order to meet BPA's Treasury Payment Probability (TPP) standard.

The ToolKit Model assesses the impact that the net revenue deviations have on cash reserve levels, calculates the probability that BPA will make its Treasury payments on time and in full, and determines the combination of risk mitigation tools (*e.g.*, Cost Recovery Adjustment Clause (CRAC), Planned Net Revenues for Risk (PNRR), etc.) that are needed to meet BPA's 88 percent TPP standard. The amount of PNRR calculated by the ToolKit Model is added to the Revenue Requirement in the Rate Analysis Model (RAM) and, thus, impacts the level of the rates calculated by RAM.

BPA included the full range of potential fish and wildlife costs in a manner consistent with the Principles. These costs consist of operational impact costs, expenses, capital costs, and BPA direct program operation and maintenance (O&M). BPA modeled the operational impact costs in RiskMod and the expenses, capital costs, and BPA direct program O&M in NORM. Consistent with the Principles, BPA direct program O&M was modeled in NORM to range from $100 to $179 million. Also, as specified in the Principles, BPA treated each of the 13 Fish and Wildlife Alternatives as equally likely to occur.

The Risk Analysis Study explores the hydrosystem operation implications and net revenue impacts for each of the 13 Fish and Wildlife Alternatives. These 13 Fish and Wildlife Alternatives include 5 Fish and Wildlife Alternatives that involve the breaching of dams. These 5 Alternatives include both adjusted and unadjusted schedule variants, for a total of 18 fish and wildlife scenarios.

Both RiskMod and NORM use the same general simulation methodology and @RISK computer software package to assess the impacts of a distribution of risk factors on net revenues (RiskMod) or anticipated costs (NORM). RiskMod quantifies the operating risks associated with loads and resources performance for California, the Pacific Northwest (PNW), and the Federal system, in addition to those risks associated with natural gas prices. The 13 Fish and Wildlife Alternatives affect hydro performance through the changes in operations that they require. NORM measures the uncertainty surrounding the non-operating costs of the 13 Fish and Wildlife Alternatives and develops distributions of projected costs for each of the 18 fish and wildlife scenarios.

Chapter 1 of this Documentation describes the operation of RiskMod and its quantification of operating risks. Chapter 2 describes the operation of the NORM Model and its use in assessing non-operating risks. The Section 2.2 of the Revenue Requirement Study, WP-02-FS-BPA-02, describes how the results of the Risk Analysis Study are used to assess risk mitigation measures (*i.e.,* develop the level of the CRAC and the amount of PNRR that is included in the Revenue Requirement). A more detailed description of the ToolKit Model is found in Volume 1, Chapter 12 of Revenue Requirement Study Documentation, WP-02-FS-BPA-02A. Further discussion of the RAM can be found in the Wholesale Power Rates Development Study, WP-02-FS-BPA-05.

# 1. OPERATIONAL RISK ANALYSIS MODEL (RISKMOD)

## 1.1 RiskMod

The RiskMod Model is comprised of a set of risk simulation models collectively referred to as RiskSim; a set of computer programs that manages data referred to as Data Manager; and RevSim, a model that calculates net revenues. RiskMod interacts with the AURORA Model, the RAM, and the ToolKit Model during the process of performing the Risk Analysis Study. AURORA is the computer model being used to perform the Marginal Cost Analysis (MCA) (*See* Marginal Cost Analysis Study, WP-02-FS-BPA-04); the RAM is the computer model being used to calculate rates (*see* Wholesale Power Rate Development Study, WP-02-FS-BPA-05); and the ToolKit is the computer model being used to calculate PNRR to achieve BPA's TPP Standard (*see* Revenue Requirement Study, WP-02-FS-BPA-02).

Variations in monthly loads, resources, and natural gas prices are simulated in RiskSim. Monthly spot market electricity prices for the simulated loads, resources, and natural gas prices are estimated by the AURORA Model. The Data Manager facilitates the format and movement of data that flow to and from RiskSim, RevSim, and AURORA. RevSim uses risk data from RiskSim, spot market electricity prices from AURORA, load and resource data from the Loads and Resources Study, WP-02-FS-BPA-01, various revenues from the Revenue Forecast component of the Wholesale Power Rate Development Study, WP-02-FS-BPA-05, and rates and expenses from the RAM to estimate net revenues. Annual average surplus energy revenues, purchased power expenses, section 4(h)(10)(C) credits, and Fish Cost Contingency Fund (FCCF)

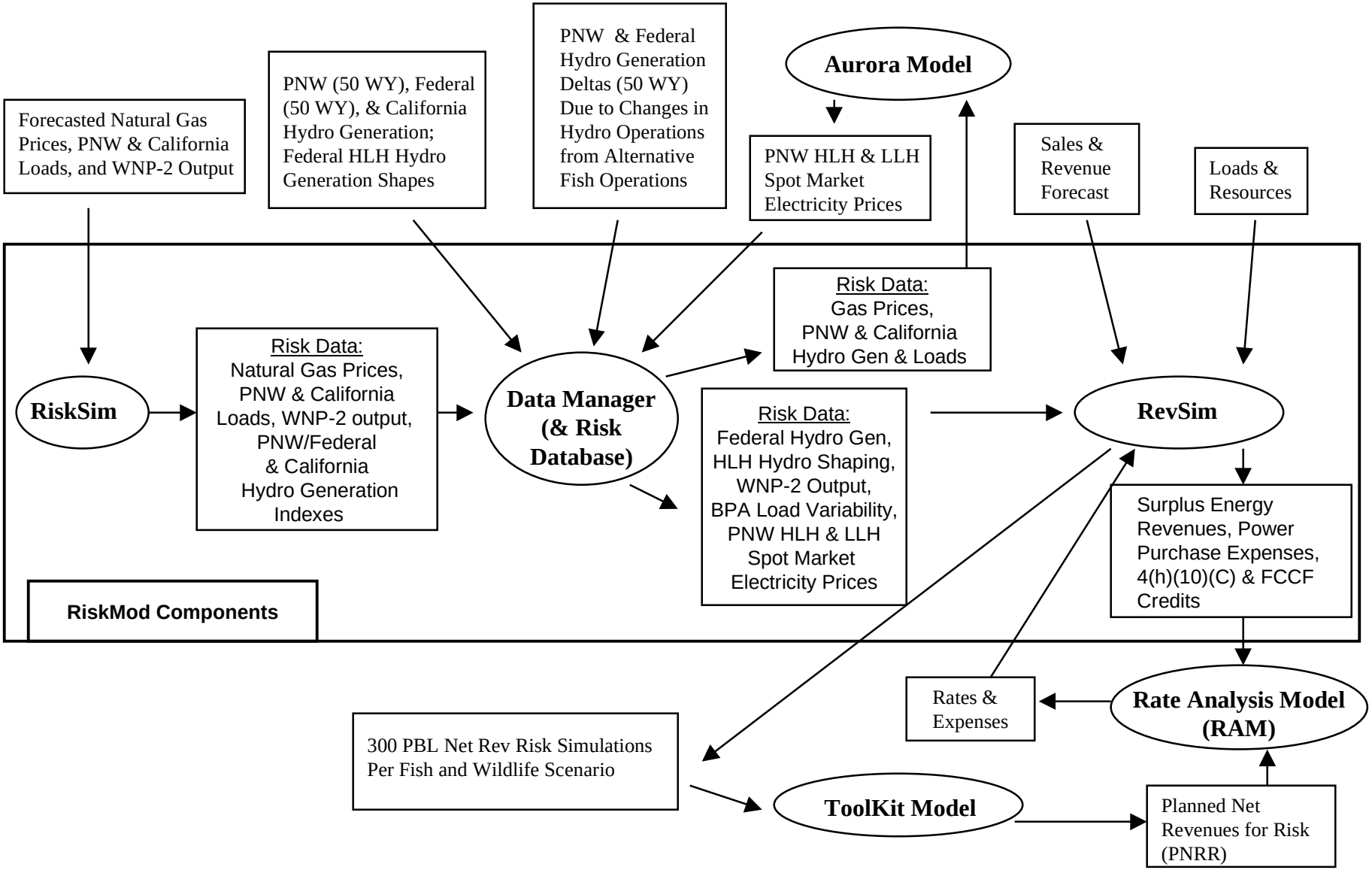
credits calculated by RevSim are used in the Revenue Forecast and the RAM (*see* the Revenue Forecast component and discussion of the RAM Model in the Wholesale Power Rate Development Study, WP-02-FS-BPA-05. Net revenues estimated for each simulation by RevSim are input into the ToolKit Model to calculate PNRR. PNRR is the additional revenue that BPA needs to collect in its rates to meet its 88 percent TPP Standard during the next rate period after assessing the financial impacts of the 18 fish and wildlife scenarios. The processes and interactions between RiskMod and other models and studies are depicted in Graph 1.

### 1.2 Risk Simulation Models (RiskSim)

To quantify the effects of operational risks, BPA has developed risk simulation models that combine logic, econometrics, and probability distributions to quantify the ordinary operational risks that BPA faces. Econometric modeling techniques are used to capture the dependency of values through time. Parameters for the probability distributions are developed from historical data. The values sampled from each probability distribution reflect their relative likelihood of occurrence and are deviations from the base case values used in the Revenue Forecast and the AURORA Model. *See* the Revenue Forecast component of the Wholesale Power Rate Development Study, WP-02-FS-BPA-05; and discussion of the AURORA Model in the Marginal Cost Analysis Study, WP-02-FS-BPA-04.

The monthly output from these risk simulation models are accumulated into a computer file to form a Risk Input Data Base which contains values lower than, higher than, or equal to the forecasted values used in the Revenue Forecast component of the Wholesale Power Rate

# Graph 1: RiskMod Risk Analysis Information Flow



Development Study and the AURORA Model. *See* the Revenue Forecast component of the Wholesale Power Rate Development Study, WP-02-FS-BPA-05; and discussion of the AURORA Model in the Marginal Cost Analysis Study, WP-02-FS-BPA-04. Loads, resources, and natural gas price risk data for each simulation are input into the AURORA Model to estimate monthly Heavy Load Hour (HLH) and Light Load Hour (LLH) spot market electricity prices. The prices estimated by AURORA are then downloaded into the Risk Input Data Base and a consistent set of loads, resources, and spot market electricity prices are used to calculate net revenues in RevSim. The risk models are run 300 times to produce monthly risk data for FY 2002-2006 for this rate filing. Thus, each of the risk models produces 300 rows and 60 columns of simulated data.

### 1.3 @RISK Computer Software

The risk simulation models developed to quantify operational risks were developed in the @RISK computer software package. This software is an add-in computer package to Microsoft Excel and is available from Palisade Corporation. @RISK allows statisticians to develop models incorporating uncertainty in a spreadsheet environment. Uncertainty is incorporated by specifying the type of probability distribution that best reflects the risk, providing the necessary parameters required for developing the probability distribution, and letting @RISK sample values from the probability distributions based on the parameters provided. The values sampled from the probability distributions reflect their relative likelihood of occurrence. The parameters required for appropriately capturing risk are not developed in @RISK, but are developed in analyses external to @RISK.

## 1.4 Operational Risk Factors

In the course of doing business, BPA manages risks that are unique to operating a hydrosystem as large as the FCRPS. The variation in hydro generation due to the volume of water supply from one year to the next can be substantial. BPA also faces other traditional operational risks that increase BPA's risk exposure, including the following: load variability due to load growth and weather; nuclear plant (WNP-2) performance; and variability in spot market electricity prices due to load, resource, and natural gas price variability. Since the 1996 rate case, BPA faces nontraditional risks, including the potential of lower Snake River Dams being breached and increased wholesale electricity price volatility resulting from the deregulation of the west coast wholesale electricity market. The following is a discussion of the major risk factors included in RiskMod.

## 1.5 Federal and Regional (PNW) Hydro Generation Uncertainty

Federal hydro generation risk was incorporated into RiskMod to account for the impact that various Federal hydro generation levels and HLH and LLH hydro generation shaping capability have on the quantity of energy that BPA has to buy and sell during HLH and LLH periods. PNW hydro generation risk is incorporated into the Risk Analysis Study to account for the impact that various PNW hydro generation levels have on monthly HLH and LLH spot market electricity prices estimated by the AURORA Model.

**1.5.1 Modeling Hydro Risk.** Variability in Federal and PNW hydro generation is incorporated into RiskMod by using monthly Federal and PNW hydro generation data for each of the historical 50 water years from the Hydroregulation component of the Loads and Resources Study, WP-02-FS-BPA-01, regarding 50 water years. The monthly hydro generation data for each of the 50 water years are developed in the HydroSim Model using hydro operations specified in the 1998 Supplemental Biological Opinion (BO) and historical monthly water supply for the 50 water years (1929-1978). *See* Loads and Resources Study, WP-02-FS-BPA-01, regarding HydroSim.

A consistent set of monthly Federal and PNW hydro generation data for hydro operations in FY 2004 are randomly sampled, by water year, from tables containing hydro generation values for each of the 50 water years for 12 months of the year (50 X 12 tables). The 50 x 12 tables were derived from 50 x 14 tables by averaging hydro generation data for the first and second half of April and August. The ability of the FCRPS to shape average monthly hydro generation into HLH hydro generation under the 1998 Supplemental BO, for each water year, is incorporated into RiskMod by selecting from a 50 x 12 table of HLH hydro generation ratios produced from a comparable run of the Hourly Operating and Scheduling Simulator (HOSS) Model. *See* section 2.3.3.1 of Loads and Resources Study, WP-02-FS-BPA-01. The HLH ratios used are based on the water year sampled for hydro generation and these ratios reflect the portion of average energy that can be shaped into HLH. Given the HLH ratios from HOSS, LLH ratios are calculated in RevSim. Tables 1 and 2 contain the 50 x 12 tables of Federal and PNW hydro generation data. Table 3 contains the 50 x 12 table of HLH ratios from HOSS.

# Table 1: PNW Hydro Generation (aMW) with Hydro Independents for FY 2004

| Water Year | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | June | July | Aug | Sep |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1929 | 12,675 | 11,251 | 13,293 | 10,733 | 11,758 | 10,371 | 11,463 | 12,399 | 15,791 | 12,861 | 11,081 | 10,157 |
| 1930 | 11,101 | 11,204 | 12,964 | 10,636 | 12,019 | 10,200 | 14,231 | 11,744 | 11,430 | 12,839 | 11,696 | 10,114 |
| 1931 | 11,001 | 11,118 | 12,864 | 10,042 | 9,584 | 10,271 | 11,930 | 14,811 | 12,179 | 12,645 | 10,933 | 9,930 |
| 1932 | 10,934 | 11,173 | 12,696 | 9,830 | 11,902 | 15,111 | 19,323 | 19,056 | 19,199 | 15,191 | 12,479 | 10,755 |
| 1933 | 12,477 | 12,519 | 14,078 | 20,543 | 15,560 | 11,821 | 15,192 | 16,544 | 23,294 | 21,478 | 16,062 | 12,005 |
| 1934 | 15,341 | 15,634 | 21,130 | 25,864 | 21,622 | 18,753 | 21,943 | 20,169 | 14,243 | 11,233 | 9,987 | 9,951 |
| 1935 | 10,848 | 11,886 | 13,370 | 20,174 | 15,297 | 13,698 | 15,625 | 15,546 | 17,859 | 15,421 | 11,562 | 9,967 |
| 1936 | 11,714 | 11,126 | 12,824 | 11,979 | 12,345 | 11,437 | 15,575 | 20,147 | 15,812 | 13,998 | 11,638 | 10,184 |
| 1937 | 11,178 | 11,185 | 12,965 | 10,356 | 11,385 | 9,557 | 10,404 | 13,973 | 13,118 | 12,733 | 11,383 | 10,598 |
| 1938 | 11,637 | 12,736 | 14,640 | 19,030 | 13,788 | 17,000 | 17,017 | 21,035 | 18,842 | 14,193 | 10,636 | 10,248 |
| 1939 | 12,468 | 11,232 | 13,273 | 11,439 | 15,787 | 14,167 | 16,032 | 16,536 | 11,789 | 14,893 | 11,561 | 10,215 |
| 1940 | 12,274 | 11,305 | 13,315 | 12,665 | 14,711 | 16,926 | 15,966 | 14,381 | 10,132 | 12,055 | 11,112 | 10,551 |
| 1941 | 12,241 | 11,173 | 13,047 | 11,968 | 11,459 | 11,881 | 11,417 | 13,125 | 13,805 | 11,222 | 10,521 | 10,127 |
| 1942 | 12,227 | 11,632 | 17,480 | 17,752 | 14,973 | 10,286 | 13,422 | 16,049 | 16,811 | 16,292 | 14,091 | 10,961 |
| 1943 | 12,090 | 11,578 | 13,686 | 18,849 | 18,766 | 17,206 | 22,124 | 20,782 | 19,846 | 18,418 | 14,602 | 10,515 |
| 1944 | 12,689 | 11,266 | 13,642 | 11,071 | 12,548 | 9,688 | 11,005 | 12,490 | 12,863 | 11,371 | 10,603 | 10,229 |
| 1945 | 11,153 | 11,206 | 12,462 | 10,397 | 10,697 | 10,300 | 11,761 | 17,189 | 16,417 | 14,511 | 11,878 | 10,662 |
| 1946 | 11,541 | 11,679 | 15,422 | 20,770 | 14,723 | 16,067 | 18,391 | 22,229 | 19,561 | 16,122 | 12,659 | 11,333 |
| 1947 | 12,938 | 12,271 | 18,113 | 22,334 | 20,790 | 15,684 | 17,171 | 19,154 | 18,217 | 14,972 | 12,645 | 11,009 |
| 1948 | 17,684 | 14,645 | 15,463 | 22,573 | 17,986 | 13,154 | 16,506 | 23,863 | 26,635 | 18,952 | 16,282 | 12,321 |
| 1949 | 13,610 | 11,773 | 13,198 | 16,120 | 14,156 | 20,433 | 19,196 | 20,403 | 18,464 | 11,521 | 10,172 | 10,197 |
| 1950 | 11,916 | 11,692 | 15,091 | 20,531 | 18,088 | 19,281 | 20,029 | 19,485 | 24,772 | 19,826 | 15,099 | 11,579 |
| 1951 | 15,437 | 16,027 | 20,008 | 24,247 | 23,572 | 18,948 | 21,007 | 22,129 | 17,699 | 17,913 | 15,076 | 11,516 |
| 1952 | 16,612 | 13,026 | 16,635 | 21,283 | 17,716 | 14,893 | 20,382 | 23,209 | 19,327 | 14,605 | 12,511 | 10,346 |
| 1953 | 11,772 | 11,256 | 13,272 | 14,126 | 21,894 | 16,327 | 13,729 | 17,916 | 20,673 | 18,090 | 15,157 | 11,371 |
| 1954 | 13,465 | 12,370 | 14,583 | 18,134 | 22,898 | 15,593 | 16,921 | 20,235 | 22,756 | 20,335 | 16,707 | 15,612 |
| 1955 | 14,657 | 13,794 | 14,330 | 15,969 | 14,962 | 10,157 | 14,184 | 14,808 | 21,746 | 21,943 | 15,512 | 11,574 |
| 1956 | 15,037 | 14,809 | 19,211 | 24,654 | 20,891 | 18,764 | 21,581 | 24,485 | 25,133 | 18,436 | 15,521 | 11,301 |
| 1957 | 14,228 | 11,718 | 15,351 | 16,141 | 20,122 | 15,650 | 18,162 | 23,996 | 21,126 | 13,791 | 11,803 | 10,511 |
| 1958 | 12,345 | 11,249 | 13,507 | 16,875 | 22,073 | 13,736 | 16,196 | 22,217 | 19,694 | 13,207 | 11,871 | 10,595 |
| 1959 | 13,169 | 13,537 | 16,646 | 23,718 | 20,608 | 16,311 | 16,689 | 19,042 | 21,813 | 18,235 | 14,802 | 15,754 |
| 1960 | 19,034 | 16,454 | 16,902 | 20,818 | 16,012 | 15,993 | 21,333 | 16,813 | 18,122 | 15,967 | 13,297 | 10,896 |
| 1961 | 13,130 | 12,666 | 12,949 | 19,463 | 22,040 | 16,375 | 14,828 | 19,918 | 22,555 | 14,740 | 12,481 | 10,172 |
| 1962 | 12,777 | 11,181 | 13,074 | 19,369 | 13,109 | 12,332 | 19,319 | 17,108 | 16,159 | 15,927 | 14,118 | 10,457 |
| 1963 | 14,128 | 13,617 | 16,684 | 20,088 | 17,604 | 12,721 | 15,320 | 16,048 | 17,971 | 15,585 | 13,584 | 11,853 |
| 1964 | 12,609 | 11,713 | 13,134 | 15,949 | 19,092 | 11,364 | 15,157 | 16,996 | 23,620 | 20,425 | 15,666 | 12,836 |
| 1965 | 14,688 | 12,591 | 19,730 | 25,514 | 22,286 | 18,336 | 18,705 | 21,185 | 20,691 | 16,148 | 15,405 | 11,584 |
| 1966 | 13,880 | 12,527 | 14,505 | 18,943 | 17,097 | 12,880 | 17,479 | 15,727 | 15,150 | 16,292 | 13,349 | 10,576 |
| 1967 | 12,442 | 11,425 | 14,137 | 21,732 | 20,396 | 15,020 | 14,292 | 16,802 | 22,552 | 19,499 | 14,965 | 11,537 |
| 1968 | 14,038 | 12,490 | 14,516 | 20,545 | 20,933 | 16,764 | 12,590 | 13,426 | 18,127 | 16,161 | 15,512 | 13,871 |
| 1969 | 15,336 | 14,672 | 16,167 | 23,842 | 20,865 | 16,967 | 20,693 | 23,983 | 20,473 | 15,783 | 11,740 | 10,655 |
| 1970 | 13,501 | 11,362 | 13,245 | 15,702 | 20,301 | 14,088 | 13,939 | 17,168 | 18,996 | 14,290 | 12,139 | 10,382 |
| 1971 | 12,310 | 11,321 | 15,216 | 23,984 | 23,628 | 18,672 | 19,735 | 24,127 | 23,527 | 19,626 | 16,440 | 12,293 |
| 1972 | 13,547 | 12,620 | 14,771 | 23,490 | 23,297 | 25,141 | 20,462 | 23,689 | 25,163 | 21,152 | 16,766 | 12,667 |
| 1973 | 13,568 | 11,749 | 16,093 | 15,861 | 13,919 | 12,557 | 11,370 | 12,724 | 12,712 | 12,935 | 11,049 | 10,204 |
| 1974 | 11,581 | 12,364 | 18,992 | 27,013 | 24,252 | 21,395 | 21,489 | 23,236 | 26,644 | 22,815 | 16,023 | 11,856 |
| 1975 | 12,319 | 11,481 | 14,041 | 18,784 | 18,349 | 17,995 | 15,336 | 18,685 | 21,660 | 20,867 | 13,785 | 11,211 |
| 1976 | 14,745 | 15,330 | 21,490 | 24,868 | 21,723 | 16,192 | 20,099 | 23,003 | 18,409 | 19,152 | 18,054 | 17,033 |
| 1977 | 13,133 | 11,227 | 13,347 | 11,559 | 12,991 | 9,497 | 10,806 | 12,151 | 11,925 | 11,065 | 10,562 | 9,705 |
| 1978 | 11,014 | 11,244 | 13,994 | 17,316 | 13,546 | 17,179 | 17,306 | 18,403 | 16,289 | 15,732 | 14,050 | 10,608 |

## Table 2: Federal Hydro Generation (aMW) with Hydro Independents for FY 2004

| Water Year | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | June | July | Aug | Sep |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1929 | 7,133 | 5,841 | 7,361 | 6,039 | 7,077 | 5,891 | 6,537 | 6,883 | 8,910 | 7,543 | 6,590 | 6,108 |
| 1930 | 6,470 | 6,540 | 7,558 | 6,089 | 6,599 | 5,667 | 8,618 | 6,295 | 6,450 | 7,811 | 7,221 | 5,655 |
| 1931 | 6,348 | 6,623 | 7,762 | 5,400 | 5,330 | 5,650 | 7,351 | 9,085 | 7,019 | 7,995 | 6,540 | 5,536 |
| 1932 | 6,441 | 6,529 | 7,000 | 5,446 | 6,772 | 8,875 | 12,090 | 11,747 | 11,277 | 9,139 | 7,610 | 6,428 |
| 1933 | 7,238 | 6,369 | 7,599 | 12,708 | 9,785 | 6,710 | 8,996 | 9,894 | 14,228 | 12,681 | 9,886 | 7,100 |
| 1934 | 8,516 | 8,578 | 12,607 | 16,026 | 13,326 | 11,041 | 13,773 | 12,533 | 8,193 | 6,750 | 5,653 | 5,729 |
| 1935 | 6,129 | 5,998 | 7,166 | 12,089 | 8,862 | 7,969 | 9,865 | 9,046 | 10,218 | 9,327 | 6,826 | 5,842 |
| 1936 | 6,794 | 6,160 | 7,468 | 6,630 | 7,289 | 6,399 | 9,475 | 12,477 | 8,949 | 8,771 | 6,849 | 6,149 |
| 1937 | 6,506 | 6,265 | 7,401 | 6,052 | 6,506 | 5,402 | 5,587 | 8,412 | 7,041 | 7,500 | 6,982 | 6,357 |
| 1938 | 6,621 | 6,707 | 8,001 | 11,277 | 8,019 | 10,375 | 10,264 | 12,724 | 11,113 | 8,288 | 6,333 | 5,993 |
| 1939 | 7,253 | 5,934 | 7,235 | 6,107 | 9,684 | 8,294 | 9,719 | 9,684 | 6,325 | 9,395 | 7,100 | 6,117 |
| 1940 | 7,184 | 6,341 | 7,350 | 7,129 | 8,415 | 10,105 | 9,689 | 8,313 | 5,627 | 7,757 | 6,656 | 6,497 |
| 1941 | 7,370 | 6,222 | 7,380 | 6,926 | 6,649 | 7,007 | 7,007 | 7,901 | 8,539 | 6,756 | 6,524 | 5,990 |
| 1942 | 7,248 | 6,725 | 10,277 | 11,195 | 8,999 | 5,853 | 8,290 | 9,581 | 9,755 | 10,126 | 8,967 | 6,692 |
| 1943 | 7,062 | 6,012 | 7,328 | 11,438 | 11,459 | 10,412 | 13,686 | 12,376 | 11,625 | 10,434 | 8,870 | 6,094 |
| 1944 | 7,278 | 5,912 | 7,372 | 6,130 | 7,374 | 5,319 | 6,352 | 7,457 | 7,618 | 6,698 | 6,517 | 5,568 |
| 1945 | 6,576 | 6,598 | 6,980 | 5,519 | 5,942 | 5,700 | 6,884 | 10,266 | 9,403 | 8,959 | 7,333 | 6,270 |
| 1946 | 6,435 | 6,120 | 8,445 | 12,435 | 8,457 | 9,417 | 11,108 | 13,337 | 11,443 | 9,535 | 7,548 | 6,699 |
| 1947 | 7,347 | 6,268 | 10,279 | 13,783 | 12,637 | 9,093 | 10,021 | 11,988 | 10,922 | 9,100 | 7,714 | 6,470 |
| 1948 | 10,062 | 7,858 | 8,573 | 13,910 | 11,048 | 7,974 | 9,937 | 15,180 | 16,984 | 11,507 | 10,017 | 7,292 |
| 1949 | 7,726 | 6,061 | 7,238 | 9,948 | 8,120 | 12,464 | 11,749 | 12,278 | 10,762 | 6,422 | 5,411 | 5,997 |
| 1950 | 6,657 | 5,793 | 8,242 | 12,340 | 10,983 | 11,534 | 12,289 | 11,779 | 15,222 | 11,348 | 8,782 | 6,683 |
| 1951 | 8,605 | 8,502 | 11,219 | 14,910 | 13,846 | 11,058 | 12,811 | 13,525 | 10,001 | 10,568 | 9,281 | 6,641 |
| 1952 | 9,375 | 6,757 | 9,231 | 13,375 | 10,276 | 8,642 | 12,837 | 14,435 | 11,377 | 8,597 | 7,567 | 6,036 |
| 1953 | 6,778 | 6,004 | 7,523 | 7,256 | 13,624 | 9,835 | 8,040 | 10,295 | 12,237 | 10,610 | 9,258 | 6,740 |
| 1954 | 7,696 | 6,422 | 7,700 | 10,580 | 14,369 | 8,846 | 10,057 | 12,494 | 13,972 | 11,593 | 10,200 | 9,557 |
| 1955 | 8,461 | 7,229 | 7,864 | 9,604 | 8,890 | 5,605 | 8,595 | 8,535 | 13,153 | 12,982 | 9,523 | 6,867 |
| 1956 | 8,238 | 7,674 | 11,079 | 15,165 | 12,626 | 11,212 | 13,206 | 15,462 | 15,016 | 10,802 | 9,431 | 6,545 |
| 1957 | 7,857 | 5,946 | 8,194 | 9,342 | 12,160 | 8,957 | 11,228 | 15,099 | 12,690 | 8,342 | 7,125 | 6,167 |
| 1958 | 7,050 | 5,902 | 7,335 | 9,483 | 13,498 | 7,882 | 9,823 | 13,715 | 11,740 | 7,958 | 7,178 | 6,157 |
| 1959 | 7,553 | 6,993 | 9,234 | 14,818 | 12,760 | 9,826 | 9,643 | 11,549 | 13,175 | 10,755 | 9,128 | 9,405 |
| 1960 | 10,915 | 8,996 | 9,631 | 13,255 | 9,239 | 9,292 | 13,045 | 9,653 | 10,303 | 9,520 | 7,838 | 6,409 |
| 1961 | 7,593 | 6,573 | 6,849 | 11,737 | 13,423 | 9,682 | 8,850 | 12,421 | 13,922 | 8,789 | 7,627 | 5,960 |
| 1962 | 7,314 | 5,808 | 7,083 | 11,736 | 7,631 | 7,013 | 11,826 | 10,014 | 8,946 | 9,914 | 8,768 | 6,127 |
| 1963 | 8,171 | 7,207 | 9,146 | 12,363 | 10,069 | 7,242 | 9,075 | 9,327 | 10,406 | 9,659 | 8,510 | 7,164 |
| 1964 | 7,209 | 5,944 | 6,966 | 9,148 | 12,168 | 6,402 | 8,980 | 9,819 | 14,112 | 12,021 | 9,557 | 7,604 |
| 1965 | 8,535 | 6,631 | 11,518 | 15,930 | 13,504 | 11,155 | 11,386 | 12,960 | 12,423 | 9,482 | 9,399 | 6,728 |
| 1966 | 8,020 | 6,708 | 8,053 | 11,214 | 10,785 | 7,217 | 10,516 | 8,987 | 8,084 | 10,039 | 8,097 | 6,190 |
| 1967 | 7,120 | 5,923 | 7,507 | 13,172 | 12,569 | 9,011 | 7,937 | 9,809 | 13,424 | 11,798 | 9,413 | 6,934 |
| 1968 | 7,786 | 6,461 | 7,951 | 12,170 | 12,464 | 9,609 | 7,116 | 7,347 | 10,579 | 9,749 | 9,589 | 8,291 |
| 1969 | 8,690 | 7,817 | 8,867 | 14,957 | 12,821 | 10,270 | 12,634 | 14,897 | 12,303 | 9,598 | 6,970 | 6,143 |
| 1970 | 7,708 | 5,906 | 7,093 | 8,967 | 12,431 | 8,246 | 8,157 | 9,862 | 11,165 | 8,469 | 7,411 | 5,976 |
| 1971 | 6,971 | 5,827 | 8,425 | 14,556 | 14,458 | 11,153 | 12,202 | 15,240 | 14,081 | 11,259 | 10,082 | 7,312 |
| 1972 | 7,592 | 6,455 | 7,961 | 14,233 | 14,099 | 15,168 | 11,916 | 14,812 | 15,208 | 12,388 | 10,291 | 7,513 |
| 1973 | 7,776 | 6,077 | 8,732 | 9,073 | 8,328 | 7,175 | 6,175 | 7,174 | 7,379 | 8,239 | 6,764 | 5,690 |
| 1974 | 6,742 | 6,634 | 10,776 | 16,609 | 14,675 | 12,963 | 13,263 | 14,540 | 16,303 | 13,257 | 9,549 | 6,951 |
| 1975 | 7,022 | 5,902 | 7,364 | 11,074 | 11,433 | 11,061 | 9,404 | 10,958 | 12,736 | 12,312 | 8,059 | 6,418 |
| 1976 | 8,335 | 8,128 | 12,360 | 15,157 | 13,101 | 9,488 | 12,497 | 14,194 | 10,430 | 11,286 | 11,100 | 10,617 |
| 1977 | 7,591 | 5,910 | 7,444 | 6,512 | 7,785 | 4,848 | 6,407 | 7,214 | 7,161 | 6,725 | 6,527 | 5,235 |
| 1978 | 6,304 | 6,486 | 7,763 | 10,443 | 8,104 | 10,417 | 10,508 | 10,552 | 9,023 | 9,305 | 8,318 | 6,080 |

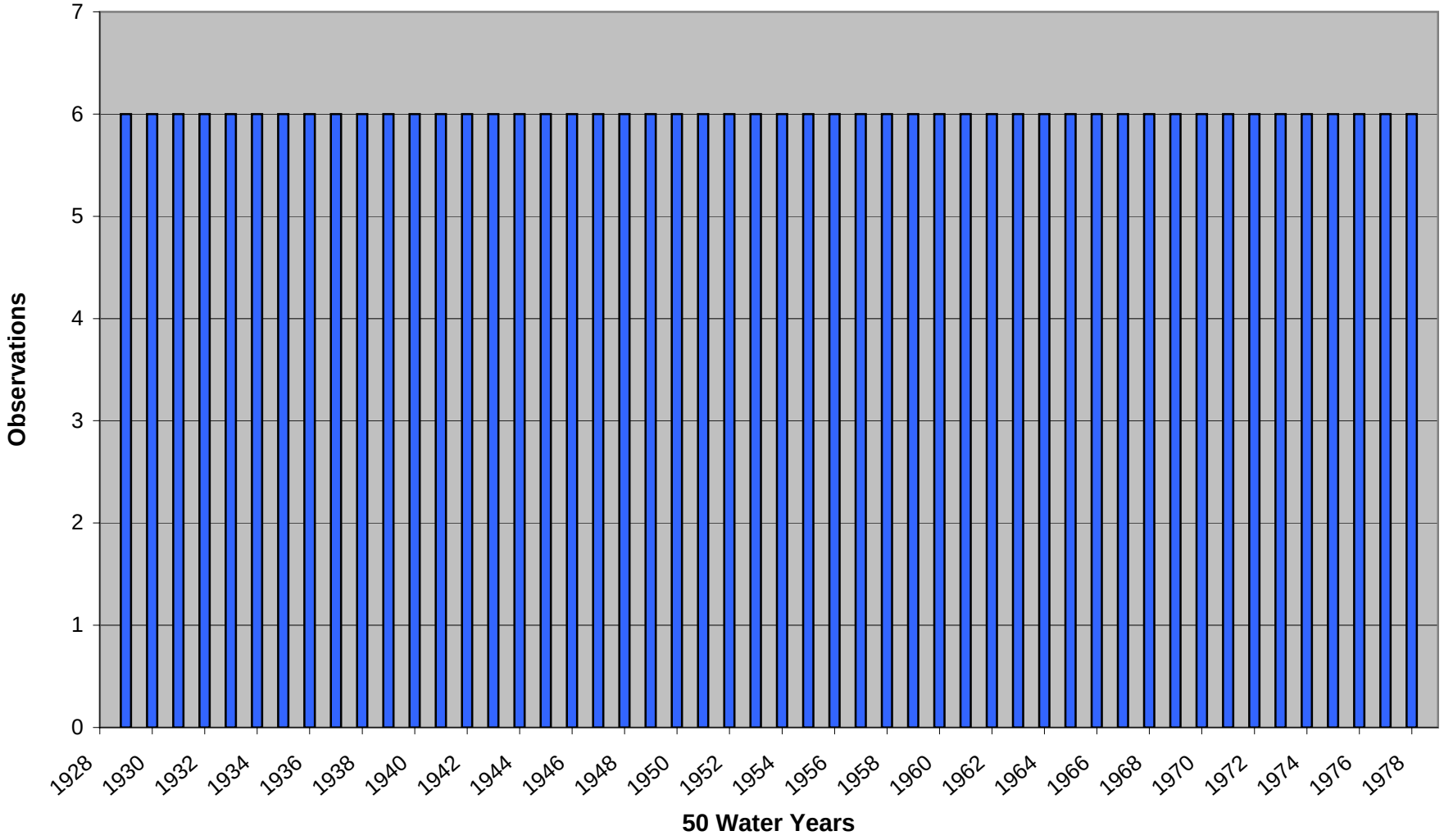
## Table 3: Heavy-Load-Hour Hydro Generation Ratios

| Water Year | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | June | July | Aug | Sep |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1929 | 1.24 | 1.20 | 1.24 | 1.20 | 1.20 | 1.18 | 1.17 | 1.17 | 1.19 | 1.19 | 1.19 | 1.24 |
| 1930 | 1.24 | 1.22 | 1.24 | 1.21 | 1.18 | 1.17 | 1.18 | 1.18 | 1.21 | 1.20 | 1.19 | 1.22 |
| 1931 | 1.23 | 1.22 | 1.26 | 1.17 | 1.17 | 1.17 | 1.19 | 1.21 | 1.22 | 1.22 | 1.20 | 1.23 |
| 1932 | 1.24 | 1.22 | 1.24 | 1.18 | 1.18 | 1.21 | 1.11 | 1.17 | 1.21 | 1.22 | 1.20 | 1.24 |
| 1933 | 1.23 | 1.21 | 1.25 | 1.14 | 1.20 | 1.21 | 1.14 | 1.18 | 1.11 | 1.04 | 1.17 | 1.22 |
| 1934 | 1.23 | 1.22 | 1.22 | 1.05 | 1.12 | 1.17 | 1.05 | 1.03 | 1.19 | 1.19 | 1.21 | 1.23 |
| 1935 | 1.24 | 1.20 | 1.24 | 1.16 | 1.21 | 1.24 | 1.13 | 1.19 | 1.21 | 1.20 | 1.22 | 1.24 |
| 1936 | 1.24 | 1.21 | 1.25 | 1.19 | 1.19 | 1.19 | 1.15 | 1.19 | 1.19 | 1.23 | 1.19 | 1.23 |
| 1937 | 1.24 | 1.21 | 1.25 | 1.20 | 1.17 | 1.14 | 1.12 | 1.18 | 1.19 | 1.19 | 1.19 | 1.23 |
| 1938 | 1.24 | 1.22 | 1.25 | 1.20 | 1.20 | 1.20 | 1.18 | 1.10 | 1.22 | 1.21 | 1.19 | 1.23 |
| 1939 | 1.23 | 1.20 | 1.23 | 1.21 | 1.17 | 1.24 | 1.19 | 1.21 | 1.20 | 1.22 | 1.20 | 1.23 |
| 1940 | 1.24 | 1.22 | 1.24 | 1.21 | 1.18 | 1.23 | 1.18 | 1.19 | 1.19 | 1.20 | 1.19 | 1.23 |
| 1941 | 1.23 | 1.21 | 1.24 | 1.21 | 1.19 | 1.24 | 1.21 | 1.18 | 1.19 | 1.18 | 1.19 | 1.23 |
| 1942 | 1.22 | 1.21 | 1.25 | 1.21 | 1.21 | 1.16 | 1.20 | 1.21 | 1.21 | 1.19 | 1.18 | 1.23 |
| 1943 | 1.23 | 1.20 | 1.23 | 1.20 | 1.20 | 1.21 | 1.12 | 1.11 | 1.21 | 1.21 | 1.20 | 1.22 |
| 1944 | 1.23 | 1.20 | 1.23 | 1.20 | 1.20 | 1.16 | 1.16 | 1.18 | 1.20 | 1.18 | 1.20 | 1.22 |
| 1945 | 1.23 | 1.22 | 1.24 | 1.19 | 1.17 | 1.17 | 1.19 | 1.21 | 1.19 | 1.22 | 1.19 | 1.23 |
| 1946 | 1.23 | 1.20 | 1.25 | 1.19 | 1.20 | 1.21 | 1.16 | 1.07 | 1.20 | 1.21 | 1.21 | 1.23 |
| 1947 | 1.22 | 1.20 | 1.23 | 1.14 | 1.18 | 1.22 | 1.18 | 1.17 | 1.22 | 1.22 | 1.20 | 1.23 |
| 1948 | 1.22 | 1.22 | 1.25 | 1.14 | 1.19 | 1.22 | 1.14 | 1.06 | 1.01 | 1.10 | 1.18 | 1.22 |
| 1949 | 1.22 | 1.20 | 1.24 | 1.20 | 1.20 | 1.16 | 1.14 | 1.19 | 1.21 | 1.18 | 1.20 | 1.23 |
| 1950 | 1.23 | 1.19 | 1.26 | 1.18 | 1.20 | 1.20 | 1.12 | 1.15 | 1.04 | 1.13 | 1.22 | 1.23 |
| 1951 | 1.23 | 1.21 | 1.23 | 1.11 | 1.17 | 1.19 | 1.09 | 1.05 | 1.21 | 1.17 | 1.20 | 1.23 |
| 1952 | 1.23 | 1.22 | 1.24 | 1.14 | 1.22 | 1.23 | 1.13 | 1.06 | 1.22 | 1.21 | 1.21 | 1.23 |
| 1953 | 1.23 | 1.20 | 1.25 | 1.18 | 1.13 | 1.21 | 1.19 | 1.18 | 1.20 | 1.19 | 1.20 | 1.23 |
| 1954 | 1.23 | 1.21 | 1.24 | 1.22 | 1.11 | 1.24 | 1.17 | 1.10 | 1.03 | 1.12 | 1.14 | 1.25 |
| 1955 | 1.23 | 1.22 | 1.25 | 1.23 | 1.22 | 1.19 | 1.20 | 1.19 | 1.17 | 1.02 | 1.19 | 1.23 |
| 1956 | 1.23 | 1.22 | 1.22 | 1.10 | 1.19 | 1.18 | 1.10 | 1.02 | 1.09 | 1.17 | 1.20 | 1.23 |
| 1957 | 1.23 | 1.20 | 1.24 | 1.23 | 1.15 | 1.20 | 1.11 | 1.08 | 1.17 | 1.22 | 1.20 | 1.23 |
| 1958 | 1.23 | 1.20 | 1.23 | 1.22 | 1.12 | 1.23 | 1.19 | 1.14 | 1.21 | 1.20 | 1.19 | 1.23 |
| 1959 | 1.23 | 1.21 | 1.24 | 1.11 | 1.19 | 1.22 | 1.13 | 1.15 | 1.10 | 1.18 | 1.20 | 1.25 |
| 1960 | 1.21 | 1.21 | 1.25 | 1.13 | 1.22 | 1.24 | 1.11 | 1.20 | 1.21 | 1.20 | 1.19 | 1.23 |
| 1961 | 1.23 | 1.21 | 1.23 | 1.19 | 1.13 | 1.23 | 1.17 | 1.10 | 1.04 | 1.23 | 1.21 | 1.23 |
| 1962 | 1.23 | 1.19 | 1.23 | 1.20 | 1.19 | 1.23 | 1.11 | 1.20 | 1.18 | 1.20 | 1.20 | 1.23 |
| 1963 | 1.23 | 1.22 | 1.25 | 1.19 | 1.21 | 1.24 | 1.22 | 1.20 | 1.22 | 1.20 | 1.20 | 1.22 |
| 1964 | 1.23 | 1.20 | 1.24 | 1.23 | 1.14 | 1.20 | 1.18 | 1.19 | 1.10 | 1.08 | 1.19 | 1.22 |
| 1965 | 1.23 | 1.22 | 1.22 | 1.10 | 1.15 | 1.19 | 1.15 | 1.11 | 1.19 | 1.21 | 1.19 | 1.22 |
| 1966 | 1.23 | 1.22 | 1.25 | 1.22 | 1.22 | 1.23 | 1.15 | 1.21 | 1.20 | 1.19 | 1.19 | 1.24 |
| 1967 | 1.24 | 1.20 | 1.24 | 1.13 | 1.19 | 1.23 | 1.15 | 1.16 | 1.11 | 1.08 | 1.18 | 1.23 |
| 1968 | 1.23 | 1.21 | 1.25 | 1.20 | 1.18 | 1.24 | 1.20 | 1.18 | 1.21 | 1.20 | 1.17 | 1.24 |
| 1969 | 1.23 | 1.23 | 1.25 | 1.12 | 1.20 | 1.21 | 1.14 | 1.05 | 1.18 | 1.21 | 1.22 | 1.23 |
| 1970 | 1.23 | 1.20 | 1.23 | 1.20 | 1.16 | 1.24 | 1.19 | 1.20 | 1.20 | 1.22 | 1.21 | 1.22 |
| 1971 | 1.23 | 1.18 | 1.24 | 1.17 | 1.14 | 1.20 | 1.09 | 1.02 | 1.14 | 1.16 | 1.16 | 1.22 |
| 1972 | 1.23 | 1.20 | 1.24 | 1.17 | 1.17 | 1.05 | 1.12 | 1.03 | 1.07 | 1.04 | 1.15 | 1.22 |
| 1973 | 1.23 | 1.19 | 1.23 | 1.21 | 1.23 | 1.24 | 1.18 | 1.18 | 1.21 | 1.21 | 1.22 | 1.22 |
| 1974 | 1.23 | 1.20 | 1.24 | 1.06 | 1.12 | 1.10 | 1.10 | 1.02 | 1.02 | 1.04 | 1.19 | 1.23 |
| 1975 | 1.23 | 1.20 | 1.23 | 1.22 | 1.18 | 1.20 | 1.17 | 1.13 | 1.17 | 1.09 | 1.20 | 1.23 |
| 1976 | 1.23 | 1.22 | 1.23 | 1.12 | 1.18 | 1.21 | 1.10 | 1.05 | 1.21 | 1.11 | 1.08 | 1.20 |
| 1977 | 1.24 | 1.20 | 1.24 | 1.20 | 1.20 | 1.14 | 1.17 | 1.19 | 1.21 | 1.18 | 1.20 | 1.21 |
| 1978 | 1.23 | 1.21 | 1.22 | 1.21 | 1.18 | 1.21 | 1.15 | 1.14 | 1.18 | 1.22 | 1.18 | 1.23 |

Federal and PNW hydro generation data from the Hydroregulation component of the Loads and Resources Study are produced by performing a continuous study with the HydroSim Model. *See* Loads and Resources Study, WP-02-FS-BPA-01, regarding a continuous study by HydroSim. The term "continuous study" refers to calculating hydro generation data sequentially over all 600 months of the 50 water year period. Developing hydro generation data in such a continuous manner captures the risk associated with various dry, normal, and wet weather patterns over time that are reflected in the 50 water year period.

**1.5.2 Sampling Hydro Generation.** Federal and PNW hydro generation variability is modeled in RiskMod by randomly sampling, in the @RISK computer software, each of the 50 water years (1929-1978) and using the associated hydro generation data in the same continuous manner that the data are developed by HydroSim when performing a continuous study. The random selection of the initial water year (for FY 2002) is accomplished by sampling real values ranging from 1929-1978 from a uniform probability distribution in a risk simulation model and subsequently converting each number to the nearest integer values (whole numbers). Given the water year, the corresponding monthly Federal and PNW hydro generation data and the HOSS HLH hydro generation ratios for that water year are selected for the first year of the Rate Period (FY 2002). The uniform probability distribution was selected for modeling hydro generation risk because it appropriately assigns equal probability to each of the 50 water years being sampled. Graph 2 reports the number of times that each of the 50 water years were sampled from a uniform probability distribution for 300 simulations. As shown in this graph, each of the 50 water years was sampled six times.

**Graph 2: Number of Times PNW and Federal Hydro Generation for the 50 Water Years were Sampled Based on 300 Sampled Values**



After an initial water year is selected for FY 2002 for a given simulation, hydro generation data for a sequential set of five water years, starting with the water year selected for FY 2002, are selected from water years 1929-1978. When the end of the 50 water years is reached (at the end of water year 1978), monthly hydro generation data for water year 1929 is subsequently used. Thus, if a simulation starts with water year 1977, the simulation will use water years 1977 and 1978, as well as water years 1929 through 1931, for a total of five sequential water years. Using Federal and PNW hydro generation data in this continuous manner captures the risk associated with various dry, normal, and wet weather patterns over time that are reflected in the 50 water years of hydro generation data.

Surplus energy revenues and power purchase expenses reported in the Revenue Forecast component of the Wholesale Power Rate Development Study and used in setting rates in the RAM are derived by performing a 50 water year run of RiskMod. *See* the Revenue Forecast component of the Wholesale Power Rate Development Study, WP-02-FS-BPA-05; and discussion of the RAM components of Wholesale Power Rate Development Study, WP-02-FS-BPA-05. This 50 water year analysis performed by RiskMod replaces the method used in the 1996 rate case where surplus energy revenues and power purchase expenses were calculated through the use of the Federal Secondary Energy Analysis, Accelerated California Market Estimator Model, and Nonfirm Revenue Analysis Program. *See* Wholesale Power Rate Development Study Documentation, Part 1 of 2, WP-96-FS-BPA-05A.

For the 50 water year run of RiskMod, average surplus energy revenues, 4(h)(10)(C) credits, FCCF credits, and power purchase expenses are estimated using Federal HLH and LLH hydro

generation for the 50 water years under the 1998 Supplemental BO. No other risk factors, except for PNW hydro generation, are allowed to vary when performing the 50 water year run of RiskMod. HLH and LLH spot market electricity prices estimated by the AURORA Model using PNW hydro generation for the 50 water years are input into RevSim and used to calculate surplus energy revenues, 4(h)(10)(C) credits, FCCF credits, and power purchase expenses. Results from the 50 water year run of RiskMod are reported in the Revenue Forecast component of the Wholesale Power Rate Development Study, WP-02-FS-BPA-05. For the Risk Simulation run of RiskMod, Federal, and PNW hydro generation data for each of the 50 water years are combined with additional risk factors, including changes in hydro generation associated with the 13 Fish and Wildlife Alternatives, to quantify net revenue risk.

**1.5.3 Use of PNW Hydro Generation Risk in AURORA.** Variability in PNW hydro generation is incorporated into the AURORA Model by calculating (via the Data Manager), from monthly PNW hydro generation data for each of the 50 water years, PNW annual energy to capacity ratios (using the total capacity value for all of the PNW in the AURORA Model), calculating PNW monthly to annual hydro generation ratios, and inputting this data into the AURORA Model. These sets of ratios are used by AURORA to calculate first the annual, and then the monthly hydro generation for each of the three regions (Oregon/Washington, Idaho, Montana) for the PNW in AURORA. This process results in the sum of the hydro generation for the three regions in AURORA being equal to the PNW hydro generation.

## 1.6 Hydro Generation Impact of the 13 Fish and Wildlife Alternatives

**1.6.1 Federal Hydro Generation.** Federal hydro generation risk associated with the potential adoption of one of the 13 Fish and Wildlife Alternatives specified during the development of the Principles (*See* Volume 1, Chapter 13 of Revenue Requirement Study Documentation, WP-02-FS-BPA-02A) is incorporated into RiskMod to reflect the impact that changes in hydro operations, due to fish and wildlife requirements, have on the quantity of energy that BPA has to buy and sell. Five of these 13 Fish and Wildlife Alternatives have both adjusted and unadjusted schedule variants that reflect uncertainty regarding when the breaching of certain dams might take place. Each of the 13 Fish and Wildlife Alternatives is equally weighted, and within each of the 5 Fish and Wildlife Alternatives that include breaching, the unadjusted schedule is given a 10 percent probability of occurrence and the adjusted schedule is given a 90 percent probability of occurrence.

For the Risk Analysis Study, the inclusion of both the adjusted and unadjusted schedules for 5 of the Fish and Wildlife Alternatives resulted in 18 scenarios and 18 different Risk Simulation runs with RiskMod. Hereafter, the 13 Fish and Wildlife Alternatives, with 5 Fish and Wildlife Alternatives reflecting both adjusted and unadjusted schedules, will be referred to as 18 fish and wildlife scenarios. A description of each of the 13 Fish and Wildlife Alternatives, with the 5 Fish and Wildlife Alternatives having adjusted and unadjusted schedules, is contained in Volume 1, Chapter 13 of Revenue Requirement Study Documentation, WP-02-FS-BPA-02A.

Data reflecting the impact that each of the 18 fish and wildlife scenarios are estimated to have on monthly Federal and PNW hydro generation for each of the 50 water years were obtained from hydro regulation studies performed by BPA and the Northwest Power Planning Council (NWPPC). Table 4 contains the average Federal hydro generation, in average megawatts (aMW), for each of the 18 fish and wildlife scenarios for FY 2002–2006.

For each of the 18 fish and wildlife scenarios, average monthly hydro generation impacts for FY 2002-2006 (for each of the 50 water years) are calculated to reflect differences (deltas) in hydro generation relative to hydro generation for a base case hydro operation. These calculations produced a 50 x 12 table of average monthly hydro generation deltas for each of the 18 fish and wildlife scenarios.

For each of the 18 fish and wildlife scenarios, Federal hydro generation for each of the 50 water years are derived by adding negative and positive average monthly Federal hydro generation deltas to monthly Federal hydro generation data for FY 2004 from the Hydroregulation component of the Loads and Resources Study, WP-02-FS-BPA-01. By transforming the hydro generation impacts into hydro generation deltas, the hydro generation impacts can be applied to the hydro generation data that incorporates the impact of the 1998 Supplemental BO.

For each simulation and run, these hydro generation data for each of the 50 water years are input into RevSim to estimate net revenues. Tables 5-22 contain the five-year, average monthly Federal hydro generation deltas for FY 2002-2006 used for each of the 18 fish and wildlife scenarios.

## Table 4: Federal Hydro Generation (aMW) for 18 Fish & Wildlife Scenarios for FY 2002 - FY 2006

| | | Federal Hydro Generation (aMW) | | | | | |
|---|---|---|---|---|---|---|---|
| | | **FY 2002** | **FY 2003** | **FY 2004** | **FY 2005** | **FY 2006** | **5 Yr Average** |
| 1 | In-River Migration (low option) | 8500 | 8500 | 8500 | 8500 | 8500 | **8500** |
| 2 | In-River Migration (high option) with CWA | 8515 | 8515 | 8515 | 8515 | 8515 | **8515** |
| 3 | Expanded Transport | 8553 | 8553 | 8553 | 8553 | 8553 | **8553** |
| 4 | Expanded Transport (low option) | 8664 | 8664 | 8664 | 8664 | 8664 | **8664** |
| 5 | Transportation Plus | 8500 | 8500 | 8500 | 8500 | 8500 | **8500** |
| 6 | Transportation Plus and CWA | 8500 | 8500 | 8500 | 8500 | 8500 | **8500** |
| 7 | Two Snake River Dams to Natural River | 8500 | 8348 | 7890 | 7890 | 7890 | **8104** |
| 8 | Four Snake River Dams to Natural River | 8500 | 8341 | 7890 | 7732 | 7280 | **7949** |
| 9 | Snake River and JDA Dams to Natural River | 8500 | 8359 | 7887 | 7745 | 7274 | **7953** |
| 10 | John Day Dam to Natural River | 8500 | 8500 | 8500 | 8500 | 8500 | **8500** |
| 11 | John Day Dam to Spillway Crest | 8500 | 8500 | 8500 | 8500 | 8500 | **8500** |
| 12 | Snake River Dams to Natural River and JDA Dam to Spillway Crest | 8500 | 8337 | 7886 | 7724 | 7272 | **7944** |
| 13 | Snake River and JDA Dams to Natural River (high option) plus CWA | 8092 | 7965 | 7532 | 7404 | 6997 | **7598** |
| | | | | | | | |
| 14 | Two Snake River Dams to Natural River - Adj. Sch | 8500 | 8500 | 8500 | 8500 | 8348 | **8470** |
| 15 | Four Snake River Dams to Natural River - Adj Sch | 8500 | 8500 | 8500 | 8500 | 8341 | **8468** |
| 16 | Snake River and JDA Dams to Natural River - Adj Sch | 8500 | 8500 | 8500 | 8500 | 8359 | **8472** |
| 17 | Snake River Dams to Natural River and JDA Dam to Spillway Crest - Adj Sch | 8500 | 8500 | 8500 | 8500 | 8337 | **8467** |
| 18 | Snake River and JDA Dams to Natural River (high option) plus CWA - Adj Sch | 8092 | 8092 | 8092 | 8092 | 7965 | **8067** |
| | | | | | | | |
| | | **8487** | **8481** | **8463** | **8459** | **8394** | **8457** |

# Table 5: Federal Hydro Generation Adjustment for Scenario #1,... In-River (low)

| Water Year | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | June | July | Aug | Sep |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1929 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1930 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1931 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1932 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1933 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1934 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1935 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1936 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1937 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1938 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1939 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1940 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1941 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1942 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1943 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1944 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1945 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1946 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1947 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1948 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1949 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1950 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1951 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1952 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1953 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1954 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1955 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1956 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1957 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1958 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1959 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1960 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1961 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1962 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1963 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1964 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1965 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1966 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1967 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1968 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1969 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1970 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1971 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1972 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1973 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1974 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1975 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1976 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1977 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1978 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

# Table 6: Federal Hydro Generation Adjustment for Scenario #2,... In-River (hi) CWA

| Water Year | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | June | July | Aug | Sep |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1929 | 9 | -77 | 152 | -478 | 673 | -432 | 184 | -1,363 | -1,081 | 1,798 | 1,882 | -517 |
| 1930 | -39 | -117 | -107 | 774 | -501 | -1,161 | 812 | -472 | -1,158 | 1,111 | 596 | -43 |
| 1931 | 38 | -107 | 94 | 719 | -1,307 | -346 | 433 | -710 | -1,534 | 2,142 | 1,274 | -166 |
| 1932 | -229 | -184 | -26 | -840 | -343 | -399 | 354 | 116 | -99 | 677 | 1,275 | -298 |
| 1933 | 20 | -6 | -29 | -567 | -285 | -470 | 360 | -117 | 57 | 392 | 389 | 372 |
| 1934 | -3 | -501 | -20 | -384 | 86 | -21 | -47 | 294 | 446 | 457 | 200 | -27 |
| 1935 | -60 | 8 | -39 | -509 | -353 | -575 | 566 | -80 | -707 | 1,136 | 927 | -19 |
| 1936 | 0 | -16 | -51 | -85 | 492 | -606 | -700 | 131 | -80 | 848 | 808 | -50 |
| 1937 | -22 | -28 | -9 | 1,324 | -1,066 | -643 | -692 | -712 | -1,016 | 1,986 | 1,016 | -353 |
| 1938 | 430 | 20 | -33 | -663 | -612 | -2 | 386 | 95 | -14 | 514 | 847 | 3 |
| 1939 | 69 | -44 | -313 | -563 | -409 | -19 | 286 | 167 | -1,059 | 1,609 | 962 | -73 |
| 1940 | -25 | -5 | -44 | -303 | 160 | -931 | 411 | -99 | -655 | 998 | 602 | -302 |
| 1941 | 341 | -258 | 277 | 568 | -435 | -1,317 | 459 | -1,202 | -738 | 1,636 | 1,053 | -38 |
| 1942 | 66 | 27 | -331 | -390 | 301 | -554 | 1,399 | -373 | -1,012 | -127 | 758 | -38 |
| 1943 | 32 | -5 | 50 | -339 | 142 | -563 | 10 | 53 | 30 | 359 | 636 | -56 |
| 1944 | -150 | 5 | 200 | -470 | 840 | -142 | -413 | -1,193 | -298 | 926 | 1,617 | -730 |
| 1945 | -32 | -35 | -28 | 1,021 | -894 | -907 | -107 | 554 | -319 | -457 | 844 | -3 |
| 1946 | -260 | -58 | 80 | -615 | -342 | -469 | 504 | 45 | -329 | 750 | 1,088 | -65 |
| 1947 | 11 | -140 | -188 | -140 | -80 | -875 | 13 | 108 | -250 | 686 | 919 | -40 |
| 1948 | -77 | -209 | -139 | -81 | -421 | -434 | 88 | 36 | 179 | 91 | 533 | 10 |
| 1949 | 163 | -20 | -38 | -325 | -318 | -302 | 207 | -3 | -126 | 533 | 1,089 | -36 |
| 1950 | 8 | -20 | -14 | -341 | -684 | -771 | 831 | 5 | 58 | 336 | 585 | -179 |
| 1951 | 46 | 190 | -302 | -122 | -458 | -36 | 72 | 4 | -273 | 685 | 745 | -23 |
| 1952 | -449 | -2 | 179 | -256 | 162 | -506 | -254 | 33 | -5 | 487 | 751 | -5 |
| 1953 | 91 | -78 | -38 | -483 | -172 | -323 | 123 | 44 | 36 | 268 | 643 | -49 |
| 1954 | -18 | 39 | 132 | -368 | -622 | -543 | 743 | 71 | 4 | 662 | 225 | 11 |
| 1955 | 16 | -4 | -36 | 289 | -411 | -533 | -90 | 85 | -511 | 346 | 637 | -21 |
| 1956 | 26 | 77 | -266 | -101 | 34 | -46 | -287 | 18 | 26 | 403 | 316 | 547 |
| 1957 | -192 | -110 | 67 | -625 | -213 | -637 | 480 | 79 | 27 | 439 | 929 | 0 |
| 1958 | -119 | -43 | -44 | -608 | -302 | -242 | 291 | 4 | 0 | 408 | 991 | -37 |
| 1959 | 24 | -8 | -370 | -68 | -113 | -877 | 180 | 206 | 52 | 388 | 797 | -205 |
| 1960 | -4 | -718 | -199 | 104 | -29 | -165 | -36 | -53 | 115 | 244 | 1,199 | 74 |
| 1961 | -1 | -7 | -24 | -615 | -60 | -830 | 613 | -178 | 441 | 445 | 439 | -71 |
| 1962 | 40 | -5 | 4 | -744 | -301 | -45 | 343 | -85 | -248 | 701 | 895 | -23 |
| 1963 | 13 | -11 | -246 | -357 | -175 | -432 | 692 | 317 | -974 | 52 | 672 | -44 |
| 1964 | 23 | -5 | -63 | -491 | -632 | 107 | 511 | 36 | 12 | 361 | 572 | -64 |
| 1965 | 49 | 102 | -185 | -81 | -490 | -73 | 34 | 13 | 49 | 124 | 702 | 2 |
| 1966 | 98 | 29 | 0 | -457 | -717 | -148 | 287 | -401 | -689 | 1,762 | 955 | -21 |
| 1967 | 2 | -8 | -44 | -112 | -100 | -1,966 | 856 | 188 | 17 | 706 | 524 | 8 |
| 1968 | -278 | -50 | 108 | -482 | -428 | -622 | 754 | 180 | -438 | -102 | 1,447 | 178 |
| 1969 | -179 | -24 | 15 | -125 | -117 | -777 | 144 | 29 | -26 | 374 | 1,037 | 68 |
| 1970 | 0 | -30 | -162 | -511 | -644 | -300 | 783 | 136 | -166 | 21 | 652 | -141 |
| 1971 | 29 | -41 | 197 | -131 | -266 | -97 | -435 | -3 | 13 | 397 | 590 | -223 |
| 1972 | 13 | 39 | 109 | -98 | -179 | -423 | -159 | -2 | 252 | 234 | 389 | -317 |
| 1973 | 158 | 8 | -32 | -184 | -176 | -664 | 621 | -1,265 | -799 | 1,919 | 1,221 | -420 |
| 1974 | -171 | -91 | -409 | -439 | -160 | -104 | 23 | -29 | 9 | 360 | 456 | -84 |
| 1975 | 96 | 95 | -11 | -397 | -575 | -877 | 1,025 | -26 | 7 | 366 | 536 | -170 |
| 1976 | 84 | 42 | -350 | -344 | 43 | -732 | 536 | 41 | 18 | 452 | 98 | 155 |
| 1977 | -18 | 11 | -10 | -340 | 1,431 | -966 | 172 | -992 | -1,016 | 1,608 | 1,345 | -711 |
| 1978 | -72 | 21 | -116 | -662 | -264 | -574 | 765 | 94 | 72 | 19 | 531 | -40 |

# Table 7: Federal Hydro Generation Adjustment for Scenario #3,... Exp Trns

| Water Year | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | June | July | Aug | Sep |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1929 | 0 | 0 | 0 | 0 | 0 | 0 | 74 | 482 | 222 | 20 | -15 | 60 |
| 1930 | 99 | 67 | 143 | -408 | 0 | 0 | 46 | 92 | 216 | 0 | 0 | 55 |
| 1931 | -51 | 126 | 158 | -312 | 0 | 0 | 65 | 87 | 197 | 0 | 0 | 62 |
| 1932 | -62 | 94 | 102 | -208 | 0 | 0 | 333 | 449 | 299 | 0 | 0 | 0 |
| 1933 | 0 | 0 | 0 | 0 | 0 | 0 | 230 | 0 | 352 | 0 | 0 | 0 |
| 1934 | 0 | 0 | 0 | 0 | 45 | -47 | 325 | 0 | 194 | 25 | -23 | 57 |
| 1935 | -59 | -2 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 1 | 10 |
| 1936 | -12 | 89 | 192 | -296 | 0 | 0 | 87 | 445 | -9 | 14 | 1 | 17 |
| 1937 | -17 | 163 | 52 | -227 | 0 | 2 | 46 | 405 | 202 | 36 | -26 | 11 |
| 1938 | -7 | -10 | 0 | 0 | 0 | 0 | 225 | 449 | 450 | 0 | 3 | -2 |
| 1939 | -3 | 74 | -71 | 0 | 0 | 2 | 150 | 304 | 199 | -1 | -1 | 5 |
| 1940 | -7 | 2 | -1 | 0 | 0 | 0 | 152 | 303 | 219 | 14 | -12 | 46 |
| 1941 | -37 | 118 | -114 | -7 | -24 | 4 | 13 | 33 | 225 | 0 | 0 | 51 |
| 1942 | -52 | 0 | 0 | 0 | 2 | 4 | 147 | 303 | 297 | 0 | 0 | 0 |
| 1943 | 0 | 0 | 0 | 202 | -309 | 0 | 0 | 449 | 434 | 0 | 0 | 0 |
| 1944 | 0 | 44 | -42 | 0 | 0 | 0 | 53 | 114 | 182 | 0 | 0 | 1 |
| 1945 | 46 | 90 | 97 | -147 | -92 | -19 | 75 | 449 | 299 | 0 | 5 | 102 |
| 1946 | -112 | 0 | 0 | 0 | 0 | -5 | 315 | 454 | -3 | 7 | 9 | -13 |
| 1947 | 0 | 0 | 0 | 165 | 110 | -315 | 125 | 435 | 283 | 1 | 1 | -1 |
| 1948 | 0 | 0 | 0 | 125 | -170 | -3 | 224 | 0 | 0 | 0 | 0 | 0 |
| 1949 | 0 | 0 | 0 | 0 | 0 | 0 | 397 | 174 | 0 | 0 | 0 | 7 |
| 1950 | 7 | 69 | -79 | 0 | 0 | 0 | 361 | 450 | 437 | 0 | 0 | 0 |
| 1951 | 0 | 0 | 153 | 59 | -278 | 86 | 376 | 441 | 295 | 0 | 0 | 0 |
| 1952 | 0 | 0 | 0 | 151 | -232 | 0 | 0 | 0 | 450 | 0 | 1 | 5 |
| 1953 | -6 | 149 | -87 | -72 | 133 | -137 | 154 | 451 | 321 | 0 | 0 | 0 |
| 1954 | 0 | 0 | 0 | 0 | 0 | 0 | 323 | 445 | 294 | 0 | 0 | 0 |
| 1955 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 305 | 449 | 0 | 0 | 0 |
| 1956 | 0 | 0 | 0 | 74 | 105 | -148 | 136 | -7 | 428 | 0 | 0 | 0 |
| 1957 | 0 | 0 | 0 | 0 | 0 | 0 | 408 | 0 | 448 | 0 | 1 | 1 |
| 1958 | -2 | 105 | -100 | 0 | 0 | 0 | 225 | 26 | 451 | 0 | 1 | -2 |
| 1959 | 0 | 0 | 0 | 84 | 111 | -229 | 0 | 301 | 449 | 0 | 0 | 0 |
| 1960 | 0 | 0 | 0 | 1 | 0 | 0 | 263 | 301 | 298 | 0 | 11 | 4 |
| 1961 | -21 | 0 | 0 | 0 | 90 | -103 | 20 | 301 | 291 | 0 | 4 | -4 |
| 1962 | -1 | 0 | 0 | 0 | -5 | 4 | 317 | 308 | 298 | 0 | 0 | 0 |
| 1963 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 301 | 450 | 0 | 0 | 0 |
| 1964 | 0 | 0 | 0 | 0 | 0 | 4 | 259 | 450 | -1 | -2 | 0 | 0 |
| 1965 | 0 | 0 | 0 | 97 | -126 | 0 | 146 | 348 | 28 | 0 | 0 | 0 |
| 1966 | 0 | 0 | 0 | 0 | 4 | 0 | -8 | 0 | 16 | 0 | 0 | -1 |
| 1967 | 0 | 0 | 0 | 153 | 136 | -378 | 65 | 448 | 407 | 0 | 0 | 0 |
| 1968 | 0 | 0 | 0 | 0 | 0 | 0 | 39 | 19 | 290 | 0 | 0 | 0 |
| 1969 | 0 | 0 | 0 | 88 | 109 | -234 | 393 | 323 | 0 | 0 | 5 | -2 |
| 1970 | -5 | 0 | 0 | 0 | 0 | 0 | 82 | 449 | 231 | 0 | 1 | 12 |
| 1971 | -13 | 11 | -9 | 73 | -26 | 98 | 207 | 0 | 12 | 0 | 0 | 0 |
| 1972 | 0 | 0 | 0 | 84 | 85 | -116 | 241 | -5 | -1 | 1 | 0 | 0 |
| 1973 | 0 | 0 | 0 | 0 | 0 | 0 | 42 | 36 | 218 | 0 | 0 | 2 |
| 1974 | 76 | -81 | 0 | 1 | 0 | 0 | 235 | 154 | 0 | 0 | 0 | 0 |
| 1975 | 0 | 0 | 0 | 66 | -101 | 0 | 153 | 449 | 0 | 0 | 0 | 0 |
| 1976 | 0 | 0 | 0 | 0 | 120 | -114 | 422 | 16 | 450 | 0 | 79 | -94 |
| 1977 | 0 | 59 | -56 | 0 | 0 | 0 | 51 | 145 | 161 | 0 | 0 | 1 |
| 1978 | 54 | 77 | -147 | 16 | 0 | 0 | 0 | 450 | 451 | 0 | 6 | -8 |

# Table 8: Federal Hydro Generation Adjustment for Scenario #4,... Exp Trns (low)

| Water Year | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | June | July | Aug | Sep |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1929 | 713 | 1,097 | 1,367 | -664 | 2,337 | 922 | -1,457 | -2,820 | 1,358 | -2,090 | 1,230 | 1,244 |
| 1930 | 958 | 1,572 | 1,240 | 2,007 | -811 | -23 | -2,165 | -3,636 | 507 | -3,087 | 235 | 800 |
| 1931 | 606 | 601 | 1,213 | 525 | 1 | -38 | -2,032 | -2,998 | -1,799 | -2,223 | -890 | 982 |
| 1932 | -494 | -275 | -435 | -3,272 | -82 | -1,073 | -2,491 | -3,198 | -1,196 | 851 | -1,388 | 691 |
| 1933 | 236 | 1,025 | 314 | 205 | 488 | 1,272 | 994 | 361 | 1,892 | -2,451 | 1,621 | 1,203 |
| 1934 | 1,014 | 1,118 | 18 | 538 | 1,002 | 0 | 178 | 49 | -432 | -3,002 | 2 | 779 |
| 1935 | -31 | 286 | -56 | 205 | 652 | 1,314 | 1,211 | 505 | 1,040 | -3,383 | -761 | 1,210 |
| 1936 | 109 | 1,112 | 1,855 | -311 | 2,111 | 1,379 | -973 | -2,634 | -479 | -353 | 474 | 952 |
| 1937 | 67 | 834 | 1,121 | 489 | 1,739 | 1,298 | -1,898 | -3,227 | 1,177 | -3,579 | -463 | 1,783 |
| 1938 | 688 | 585 | 301 | -168 | 32 | 678 | 598 | 626 | 82 | -1,213 | 31 | 1,453 |
| 1939 | 164 | 1,038 | 761 | 1,136 | 2,425 | 2,288 | -240 | -490 | -722 | -2,464 | 1,417 | 1,627 |
| 1940 | 89 | -90 | 1,233 | 54 | 2,488 | 530 | -1,430 | -2,597 | -805 | -2,634 | 1,029 | 1,612 |
| 1941 | -450 | 391 | 2,139 | -482 | 1,113 | -1,124 | -2,523 | -3,692 | -66 | -1,459 | -1,122 | 456 |
| 1942 | -951 | -296 | -3,609 | -1,987 | -712 | -19 | -2,213 | -2,806 | -187 | -2,354 | -1,343 | 398 |
| 1943 | 194 | 800 | 290 | 353 | 179 | 725 | 846 | 1,096 | -2,742 | 321 | 1,824 | 827 |
| 1944 | 748 | 1,147 | 1,472 | -1,633 | 3,050 | 1,478 | -1,647 | -2,909 | 476 | -703 | -890 | 1,124 |
| 1945 | 604 | 913 | 756 | 1,053 | -610 | -51 | -1,597 | -2,444 | 224 | -3,346 | -1,208 | 1,472 |
| 1946 | 382 | -95 | 179 | -176 | -707 | 9 | -1,370 | -1,001 | 186 | -1,167 | -121 | 545 |
| 1947 | 445 | 1,033 | 602 | -726 | 509 | 1,587 | 912 | 1,624 | 844 | -1,829 | -2,885 | 1,094 |
| 1948 | 1,262 | -267 | 1,168 | 240 | 197 | 113 | 291 | 118 | 762 | -30 | 290 | 559 |
| 1949 | 545 | 1,512 | 1,053 | 188 | 1,865 | 307 | 771 | 990 | 292 | -1,665 | -712 | 1,345 |
| 1950 | 958 | 1,044 | 134 | -114 | 175 | -665 | 601 | -749 | 528 | 129 | -1,628 | 1,045 |
| 1951 | 854 | 1,224 | -242 | -172 | 1,490 | 1,143 | -74 | 140 | 682 | 268 | -109 | 634 |
| 1952 | 1,646 | 229 | 685 | -101 | 385 | 2,347 | 827 | 1,165 | -624 | -2,007 | -1,471 | 1,209 |
| 1953 | 134 | 748 | 1,401 | 371 | 678 | 1,114 | 723 | 8 | -1,789 | 145 | -1,427 | 1,098 |
| 1954 | 667 | 1,532 | 1,132 | -151 | -33 | 1,505 | 318 | -225 | 925 | -30 | -1,680 | 1,690 |
| 1955 | -82 | 524 | 921 | 283 | 2,808 | 828 | -1,601 | -3,790 | 117 | 301 | -2,501 | 282 |
| 1956 | 648 | 1,219 | -174 | -130 | 1,246 | 544 | 277 | 693 | 184 | 54 | -659 | 977 |
| 1957 | 732 | 1,570 | 1,143 | 164 | 410 | 1,181 | 240 | 2,336 | 915 | 288 | -1,234 | 734 |
| 1958 | 7 | 586 | 1,213 | 228 | 419 | 545 | 134 | 5 | 982 | 42 | -1,601 | 1,003 |
| 1959 | -434 | 998 | 583 | -82 | 129 | 479 | -334 | -183 | 184 | 833 | 164 | 2,669 |
| 1960 | 1,092 | 662 | -437 | 248 | 588 | 1,696 | 864 | 824 | 1,126 | -1,865 | -1,573 | 1,264 |
| 1961 | 748 | 1,593 | 1,315 | 97 | -321 | 440 | 404 | -140 | 2,006 | 210 | -1,583 | 1,270 |
| 1962 | 290 | 593 | 684 | 121 | 1,065 | 3,791 | -1,185 | -1,583 | 162 | 26 | -884 | 675 |
| 1963 | 302 | 1,397 | 1,174 | 22 | 493 | 1,920 | 475 | -657 | 444 | -1,034 | -2,088 | 752 |
| 1964 | 302 | 753 | 1,103 | 162 | 727 | 2,407 | -505 | -1,675 | 226 | 497 | -492 | 832 |
| 1965 | 1,056 | 1,151 | -160 | 149 | 425 | 2,215 | 448 | 284 | -827 | -738 | 311 | 1,761 |
| 1966 | 766 | 1,399 | 940 | -2 | 1,915 | 3,029 | -1,201 | -1,139 | 85 | -4,011 | -1,867 | 1,086 |
| 1967 | 204 | 398 | 1,238 | 358 | 885 | 230 | 567 | -5 | -1,343 | 1,565 | -985 | 309 |
| 1968 | 814 | 1,517 | 1,042 | -36 | 313 | 871 | 615 | -985 | 1,635 | -1,901 | -824 | 621 |
| 1969 | 1,184 | 1,011 | 896 | 225 | 640 | 731 | 485 | 864 | 74 | -1,664 | -1,210 | 746 |
| 1970 | 149 | 963 | 1,045 | 351 | 651 | 2,413 | 1,039 | -383 | -30 | -1,112 | -1,968 | 815 |
| 1971 | 194 | 895 | 879 | -507 | 882 | 678 | -259 | 566 | 163 | 1,085 | -2,187 | 585 |
| 1972 | 590 | 1,513 | 986 | -657 | 1,475 | -145 | 199 | 249 | 250 | 503 | 2,445 | 594 |
| 1973 | 510 | 1,318 | 1,178 | 105 | 5,116 | 1,681 | -1,185 | -3,135 | -245 | -2,280 | -2,386 | 1,512 |
| 1974 | 1 | 274 | -3,593 | -2,145 | -654 | 252 | 456 | 517 | 333 | 260 | -1,133 | 504 |
| 1975 | 460 | 1,699 | 932 | -103 | 390 | 1,002 | 802 | 1 | 8 | -255 | -675 | 1,430 |
| 1976 | 1,131 | 1,620 | -103 | 111 | 1,308 | 1,620 | -542 | -167 | 211 | 1,170 | 1,170 | 2,556 |
| 1977 | -846 | 1,365 | 1,107 | 401 | 1,971 | 1,053 | -1,467 | -2,843 | 127 | 90 | -270 | 1,476 |
| 1978 | 490 | 561 | -559 | -4,255 | -2,275 | 302 | -1,483 | -726 | -649 | 329 | 435 | -360 |

# Table 9: Federal Hydro Generation Adjustment for Scenario #5,... TrnsPlus

| Water Year | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | June | July | Aug | Sep |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1929 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1930 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1931 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1932 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1933 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1934 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1935 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1936 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1937 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1938 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1939 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1940 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1941 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1942 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1943 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1944 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1945 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1946 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1947 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1948 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1949 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1950 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1951 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1952 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1953 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1954 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1955 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1956 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1957 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1958 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1959 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1960 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1961 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1962 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1963 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1964 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1965 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1966 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1967 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1968 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1969 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1970 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1971 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1972 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1973 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1974 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1975 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1976 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1977 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1978 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

# Table 10: Federal Hydro Generation Adjustment for Scenario #6,... TrnsPlus CWA

| Water Year | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | June | July | Aug | Sep |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1929 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1930 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1931 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1932 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1933 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1934 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1935 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1936 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1937 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1938 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1939 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1940 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1941 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1942 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1943 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1944 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1945 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1946 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1947 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1948 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1949 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1950 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1951 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1952 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1953 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1954 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1955 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1956 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1957 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1958 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1959 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1960 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1961 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1962 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1963 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1964 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1965 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1966 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1967 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1968 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1969 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1970 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1971 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1972 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1973 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1974 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1975 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1976 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1977 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1978 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

# Table 11: Federal Hydro Generation Adjustment for Scenario #7,... 2 LSN

| Water Year | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | June | July | Aug | Sep |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1929 | -196 | -110 | -251 | -249 | -144 | -290 | -416 | -584 | -615 | -319 | -168 | -98 |
| 1930 | -87 | -78 | -99 | -481 | -240 | -277 | -538 | -633 | -488 | -188 | -169 | -46 |
| 1931 | -195 | -49 | -78 | -461 | -151 | -261 | -462 | -619 | -312 | -132 | -128 | -34 |
| 1932 | -86 | -71 | -80 | -673 | -46 | -381 | -701 | -797 | -608 | -374 | -247 | -118 |
| 1933 | -213 | -172 | -187 | -217 | -261 | -205 | -539 | -661 | -872 | -360 | -261 | -147 |
| 1934 | -179 | -192 | -434 | -503 | -92 | -622 | -722 | -556 | -313 | -158 | -129 | -96 |
| 1935 | -125 | -214 | -164 | -200 | -283 | -217 | -442 | -652 | -486 | -330 | -173 | -38 |
| 1936 | -164 | -40 | -81 | -683 | -29 | -293 | -706 | -787 | -567 | -282 | -175 | -49 |
| 1937 | -134 | -35 | -87 | -503 | -130 | -235 | -391 | -584 | -492 | -187 | -153 | -128 |
| 1938 | -124 | -165 | -246 | -239 | -305 | -456 | -703 | -754 | -650 | -383 | -284 | -53 |
| 1939 | -245 | -84 | -228 | -435 | -276 | -315 | -612 | -583 | -410 | -266 | -162 | -45 |
| 1940 | -289 | -83 | -231 | -230 | -298 | -505 | -645 | -625 | -494 | -255 | -153 | -110 |
| 1941 | -99 | -69 | -198 | -787 | 2 | -303 | -372 | -651 | -537 | -234 | -192 | -164 |
| 1942 | -255 | -221 | -365 | -310 | -311 | -298 | -538 | -601 | -599 | -359 | -275 | -71 |
| 1943 | -252 | -200 | -284 | -327 | -643 | -674 | -1,047 | -752 | -826 | -577 | -324 | -111 |
| 1944 | -307 | -38 | -404 | -301 | -298 | -81 | -455 | -637 | -539 | -239 | -182 | -159 |
| 1945 | -67 | -174 | -56 | -282 | -477 | -285 | -467 | -685 | -639 | -359 | -261 | -54 |
| 1946 | -265 | -156 | -391 | -371 | -468 | -489 | -786 | -748 | -651 | -356 | -211 | -202 |
| 1947 | -263 | -238 | -521 | -102 | -546 | -959 | -689 | -865 | -470 | -475 | -265 | -189 |
| 1948 | -246 | -226 | -314 | -158 | -844 | -428 | -687 | -1,036 | -1,024 | -383 | -310 | -186 |
| 1949 | -213 | -173 | -234 | -294 | -399 | -667 | -791 | -981 | -651 | -321 | -191 | -161 |
| 1950 | -169 | -108 | -366 | -271 | -490 | -585 | -868 | -682 | -823 | -476 | -321 | -200 |
| 1951 | -256 | -316 | -434 | -108 | -542 | -1,030 | -971 | -778 | -546 | -394 | -364 | -186 |
| 1952 | -261 | -198 | -373 | -322 | -528 | -449 | -1,047 | -1,036 | -670 | -394 | -300 | -61 |
| 1953 | -175 | -60 | -112 | -790 | -414 | -428 | -557 | -648 | -884 | -459 | -306 | -189 |
| 1954 | -204 | -151 | -242 | -336 | -504 | -313 | -702 | -704 | -570 | -385 | -300 | -185 |
| 1955 | -201 | -150 | -210 | -238 | -176 | -197 | -551 | -641 | -715 | -381 | -282 | -160 |
| 1956 | -202 | -191 | -512 | -140 | -376 | -1,340 | -948 | -1,043 | -837 | -396 | -313 | -188 |
| 1957 | -234 | -188 | -315 | -264 | -413 | -418 | -844 | -1,035 | -770 | -368 | -266 | -57 |
| 1958 | -299 | -41 | -428 | -290 | -581 | -292 | -689 | -1,029 | -620 | -356 | -270 | -88 |
| 1959 | -319 | -231 | -397 | -132 | -172 | -1,189 | -709 | -667 | -673 | -371 | -241 | -239 |
| 1960 | -368 | -266 | -320 | -300 | -290 | -486 | -707 | -640 | -603 | -327 | -215 | -52 |
| 1961 | -317 | -170 | -198 | -204 | -181 | -696 | -566 | -642 | -571 | -282 | -198 | -56 |
| 1962 | -300 | -156 | -192 | -247 | -387 | -212 | -797 | -700 | -491 | -458 | -227 | -124 |
| 1963 | -327 | -227 | -359 | -300 | -529 | -315 | -517 | -655 | -667 | -364 | -292 | -194 |
| 1964 | -205 | -167 | -209 | -221 | -277 | -278 | -658 | -696 | -1,022 | -413 | -318 | -219 |
| 1965 | -216 | -179 | -617 | -191 | -726 | -1,353 | -988 | -938 | -1,001 | -476 | -361 | -263 |
| 1966 | -256 | -221 | -321 | -323 | -226 | -349 | -616 | -668 | -485 | -207 | -173 | -96 |
| 1967 | -255 | -153 | -219 | -82 | -371 | -717 | -433 | -670 | -854 | -392 | -288 | -173 |
| 1968 | -241 | -211 | -282 | -345 | -481 | -418 | -412 | -683 | -570 | -338 | -226 | -222 |
| 1969 | -265 | -259 | -317 | -148 | -805 | -892 | -806 | -926 | -655 | -358 | -238 | -66 |
| 1970 | -328 | -149 | -232 | -461 | -535 | -353 | -471 | -755 | -917 | -397 | -299 | -108 |
| 1971 | -235 | -176 | -560 | -204 | -347 | -1,236 | -1,407 | -1,053 | -1,031 | -517 | -319 | -228 |
| 1972 | -254 | -238 | -328 | -142 | -366 | -1,741 | -765 | -1,040 | -1,017 | -393 | -309 | -210 |
| 1973 | -229 | -220 | -341 | -444 | -241 | -301 | -391 | -656 | -436 | -196 | -161 | -167 |
| 1974 | -114 | -362 | -446 | -763 | -612 | -785 | -960 | -988 | -1,033 | -530 | -334 | -199 |
| 1975 | -207 | -155 | -325 | -317 | -495 | -476 | -651 | -761 | -1,031 | -610 | -348 | -231 |
| 1976 | -290 | -287 | -448 | -242 | -279 | -1,612 | -883 | -1,039 | -682 | -397 | -233 | -376 |
| 1977 | -228 | -61 | -376 | -244 | -179 | -180 | -340 | -456 | -293 | -144 | -146 | -140 |
| 1978 | -98 | -245 | -450 | -411 | -563 | -409 | -698 | -657 | -489 | -495 | -192 | -174 |

# Table 12: Federal Hydro Generation Adjustment for Scenario #8,... 4 LSN

| Water Year | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | June | July | Aug | Sep |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1929 | -272 | -152 | -348 | -346 | -201 | -402 | -577 | -812 | -854 | -444 | -233 | -137 |
| 1930 | -121 | -108 | -137 | -668 | -333 | -385 | -747 | -879 | -678 | -261 | -236 | -64 |
| 1931 | -271 | -68 | -108 | -640 | -210 | -363 | -641 | -860 | -434 | -183 | -178 | -47 |
| 1932 | -120 | -98 | -111 | -935 | -64 | -530 | -974 | -1,107 | -845 | -519 | -343 | -163 |
| 1933 | -296 | -239 | -260 | -301 | -363 | -285 | -749 | -919 | -1,212 | -501 | -362 | -204 |
| 1934 | -248 | -266 | -603 | -699 | -128 | -864 | -1,004 | -773 | -435 | -219 | -179 | -133 |
| 1935 | -173 | -297 | -229 | -277 | -393 | -302 | -615 | -906 | -676 | -458 | -240 | -52 |
| 1936 | -229 | -55 | -113 | -950 | -41 | -408 | -981 | -1,093 | -788 | -392 | -243 | -68 |
| 1937 | -187 | -49 | -121 | -700 | -181 | -326 | -543 | -812 | -684 | -260 | -212 | -178 |
| 1938 | -172 | -229 | -342 | -332 | -424 | -634 | -977 | -1,047 | -904 | -532 | -395 | -73 |
| 1939 | -341 | -117 | -317 | -605 | -383 | -437 | -850 | -811 | -570 | -369 | -226 | -63 |
| 1940 | -402 | -116 | -322 | -319 | -415 | -701 | -896 | -869 | -686 | -355 | -213 | -152 |
| 1941 | -138 | -96 | -275 | -1,094 | 2 | -420 | -517 | -905 | -746 | -326 | -267 | -228 |
| 1942 | -355 | -307 | -508 | -431 | -432 | -414 | -747 | -836 | -832 | -499 | -382 | -98 |
| 1943 | -350 | -277 | -394 | -454 | -893 | -937 | -1,455 | -1,045 | -1,149 | -801 | -450 | -154 |
| 1944 | -427 | -53 | -562 | -419 | -415 | -112 | -633 | -885 | -749 | -332 | -252 | -221 |
| 1945 | -93 | -242 | -78 | -392 | -663 | -396 | -649 | -952 | -887 | -499 | -363 | -75 |
| 1946 | -368 | -217 | -544 | -516 | -651 | -679 | -1,092 | -1,039 | -905 | -495 | -294 | -281 |
| 1947 | -366 | -331 | -724 | -142 | -759 | -1,332 | -957 | -1,202 | -654 | -660 | -368 | -262 |
| 1948 | -341 | -313 | -437 | -219 | -1,173 | -595 | -954 | -1,439 | -1,424 | -532 | -431 | -258 |
| 1949 | -296 | -240 | -326 | -409 | -554 | -927 | -1,100 | -1,363 | -904 | -446 | -265 | -224 |
| 1950 | -235 | -150 | -508 | -377 | -681 | -813 | -1,207 | -948 | -1,143 | -662 | -446 | -277 |
| 1951 | -356 | -439 | -603 | -149 | -754 | -1,431 | -1,349 | -1,081 | -759 | -548 | -506 | -258 |
| 1952 | -363 | -275 | -518 | -448 | -734 | -625 | -1,455 | -1,440 | -932 | -548 | -417 | -85 |
| 1953 | -243 | -84 | -155 | -1,098 | -575 | -595 | -774 | -901 | -1,228 | -638 | -426 | -262 |
| 1954 | -284 | -210 | -336 | -467 | -700 | -435 | -976 | -978 | -792 | -535 | -418 | -257 |
| 1955 | -280 | -209 | -291 | -331 | -244 | -273 | -766 | -891 | -993 | -529 | -392 | -222 |
| 1956 | -280 | -266 | -712 | -195 | -523 | -1,862 | -1,318 | -1,450 | -1,163 | -550 | -436 | -261 |
| 1957 | -325 | -261 | -437 | -367 | -574 | -581 | -1,172 | -1,438 | -1,069 | -511 | -370 | -79 |
| 1958 | -416 | -57 | -595 | -402 | -808 | -405 | -958 | -1,429 | -861 | -495 | -375 | -122 |
| 1959 | -443 | -322 | -552 | -184 | -238 | -1,653 | -985 | -927 | -935 | -516 | -335 | -332 |
| 1960 | -511 | -370 | -444 | -416 | -403 | -676 | -983 | -889 | -838 | -454 | -298 | -73 |
| 1961 | -440 | -236 | -275 | -284 | -252 | -967 | -787 | -892 | -793 | -392 | -276 | -77 |
| 1962 | -417 | -217 | -267 | -344 | -538 | -294 | -1,107 | -972 | -682 | -636 | -315 | -173 |
| 1963 | -455 | -316 | -499 | -416 | -735 | -437 | -719 | -910 | -927 | -506 | -406 | -270 |
| 1964 | -285 | -232 | -291 | -308 | -385 | -386 | -915 | -968 | -1,420 | -574 | -441 | -304 |
| 1965 | -300 | -248 | -857 | -265 | -1,009 | -1,881 | -1,373 | -1,304 | -1,391 | -661 | -502 | -365 |
| 1966 | -356 | -307 | -446 | -449 | -314 | -485 | -856 | -929 | -674 | -288 | -241 | -133 |
| 1967 | -355 | -213 | -304 | -113 | -516 | -996 | -601 | -930 | -1,186 | -545 | -400 | -241 |
| 1968 | -336 | -293 | -392 | -479 | -668 | -581 | -572 | -949 | -792 | -470 | -314 | -308 |
| 1969 | -368 | -360 | -440 | -205 | -1,119 | -1,240 | -1,120 | -1,286 | -910 | -498 | -331 | -92 |
| 1970 | -456 | -206 | -323 | -641 | -743 | -490 | -655 | -1,049 | -1,274 | -552 | -415 | -150 |
| 1971 | -326 | -244 | -779 | -284 | -482 | -1,718 | -1,955 | -1,464 | -1,433 | -719 | -443 | -316 |
| 1972 | -353 | -331 | -456 | -198 | -509 | -2,419 | -1,063 | -1,445 | -1,414 | -546 | -429 | -292 |
| 1973 | -318 | -306 | -473 | -617 | -335 | -419 | -544 | -912 | -606 | -272 | -224 | -232 |
| 1974 | -159 | -504 | -620 | -1,061 | -851 | -1,091 | -1,334 | -1,373 | -1,435 | -737 | -465 | -276 |
| 1975 | -288 | -215 | -452 | -440 | -688 | -662 | -905 | -1,058 | -1,433 | -848 | -484 | -321 |
| 1976 | -403 | -399 | -622 | -336 | -387 | -2,241 | -1,227 | -1,444 | -948 | -552 | -324 | -523 |
| 1977 | -316 | -84 | -523 | -339 | -249 | -251 | -473 | -634 | -407 | -200 | -202 | -194 |
| 1978 | -136 | -341 | -626 | -572 | -782 | -569 | -970 | -914 | -680 | -688 | -267 | -242 |

# Table 13: Federal Hydro Generation Adjustment for Scenario #9,... LSN & JDA

| Water Year | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | June | July | Aug | Sep |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1929 | -316 | -111 | -372 | -743 | -232 | -369 | -472 | -657 | -666 | -329 | -221 | -219 |
| 1930 | -118 | -248 | -365 | -493 | -359 | -387 | -641 | -709 | -569 | -228 | -226 | -171 |
| 1931 | -206 | -199 | -336 | -505 | -338 | -354 | -574 | -716 | -422 | -189 | -198 | -168 |
| 1932 | -152 | -257 | -288 | -683 | -183 | -563 | -951 | -983 | -808 | -468 | -316 | -184 |
| 1933 | -263 | -412 | -403 | -570 | -463 | -335 | -694 | -794 | -1,112 | -616 | -417 | -290 |
| 1934 | -330 | -405 | -619 | -801 | -347 | -1,244 | -1,036 | -867 | -459 | -214 | -192 | -222 |
| 1935 | -128 | -222 | -574 | -512 | -481 | -394 | -585 | -788 | -678 | -437 | -270 | -154 |
| 1936 | -243 | -203 | -249 | -763 | -166 | -417 | -851 | -970 | -719 | -343 | -246 | -176 |
| 1937 | -189 | -206 | -317 | -639 | -158 | -341 | -477 | -707 | -589 | -232 | -215 | -242 |
| 1938 | -147 | -199 | -368 | -775 | -594 | -498 | -829 | -993 | -841 | -484 | -325 | -192 |
| 1939 | -281 | -183 | -372 | -682 | -454 | -411 | -727 | -748 | -495 | -316 | -253 | -176 |
| 1940 | -245 | -138 | -404 | -823 | -317 | -538 | -817 | -766 | -576 | -290 | -211 | -240 |
| 1941 | -177 | -229 | -394 | -796 | -196 | -431 | -540 | -760 | -613 | -254 | -239 | -281 |
| 1942 | -314 | -264 | -729 | -602 | -512 | -297 | -673 | -756 | -768 | -490 | -355 | -195 |
| 1943 | -205 | -198 | -686 | -687 | -825 | -634 | -1,238 | -979 | -997 | -685 | -407 | -218 |
| 1944 | -250 | -157 | -477 | -716 | -354 | -218 | -557 | -718 | -570 | -259 | -227 | -258 |
| 1945 | -142 | -241 | -349 | -354 | -547 | -393 | -562 | -805 | -778 | -463 | -306 | -183 |
| 1946 | -210 | -204 | -489 | -847 | -639 | -650 | -918 | -1,014 | -839 | -467 | -301 | -258 |
| 1947 | -344 | -399 | -728 | -514 | -787 | -924 | -847 | -1,031 | -711 | -524 | -327 | -217 |
| 1948 | -495 | -400 | -490 | -559 | -906 | -533 | -825 | -1,229 | -1,221 | -603 | -459 | -330 |
| 1949 | -327 | -276 | -387 | -523 | -530 | -859 | -953 | -1,162 | -837 | -363 | -231 | -257 |
| 1950 | -179 | -222 | -434 | -750 | -725 | -780 | -1,015 | -884 | -1,077 | -680 | -434 | -318 |
| 1951 | -378 | -481 | -667 | -287 | -771 | -1,522 | -1,186 | -1,047 | -750 | -525 | -463 | -319 |
| 1952 | -405 | -344 | -534 | -650 | -641 | -544 | -1,238 | -1,229 | -854 | -472 | -346 | -199 |
| 1953 | -206 | -193 | -385 | -812 | -679 | -583 | -622 | -859 | -1,068 | -589 | -390 | -232 |
| 1954 | -386 | -295 | -414 | -639 | -726 | -467 | -855 | -920 | -883 | -585 | -507 | -379 |
| 1955 | -329 | -327 | -394 | -462 | -297 | -311 | -693 | -770 | -913 | -648 | -419 | -287 |
| 1956 | -334 | -371 | -719 | -328 | -981 | -1,352 | -1,158 | -1,236 | -1,086 | -548 | -425 | -293 |
| 1957 | -356 | -291 | -513 | -538 | -578 | -583 | -971 | -1,229 | -1,039 | -399 | -303 | -197 |
| 1958 | -234 | -176 | -476 | -788 | -754 | -438 | -860 | -1,217 | -846 | -373 | -324 | -199 |
| 1959 | -402 | -380 | -580 | -278 | -808 | -1,249 | -891 | -879 | -971 | -535 | -353 | -417 |
| 1960 | -560 | -472 | -540 | -618 | -423 | -607 | -962 | -818 | -789 | -465 | -278 | -183 |
| 1961 | -282 | -409 | -372 | -526 | -533 | -753 | -753 | -856 | -897 | -338 | -280 | -177 |
| 1962 | -348 | -152 | -442 | -577 | -565 | -316 | -957 | -872 | -702 | -505 | -313 | -183 |
| 1963 | -479 | -373 | -546 | -540 | -673 | -443 | -688 | -798 | -808 | -472 | -365 | -309 |
| 1964 | -257 | -300 | -384 | -515 | -458 | -365 | -794 | -836 | -1,219 | -622 | -434 | -339 |
| 1965 | -354 | -324 | -801 | -372 | -1,310 | -1,340 | -1,126 | -1,141 | -1,183 | -578 | -441 | -286 |
| 1966 | -432 | -356 | -470 | -606 | -351 | -454 | -809 | -811 | -649 | -309 | -246 | -183 |
| 1967 | -241 | -190 | -628 | -374 | -784 | -760 | -547 | -872 | -1,099 | -586 | -401 | -293 |
| 1968 | -344 | -347 | -443 | -642 | -642 | -565 | -539 | -779 | -756 | -464 | -321 | -368 |
| 1969 | -392 | -411 | -489 | -463 | -1,110 | -910 | -1,064 | -1,152 | -878 | -447 | -292 | -188 |
| 1970 | -405 | -189 | -440 | -754 | -733 | -394 | -542 | -894 | -1,049 | -477 | -332 | -226 |
| 1971 | -240 | -224 | -647 | -634 | -747 | -1,389 | -1,400 | -1,242 | -1,226 | -658 | -452 | -336 |
| 1972 | -348 | -359 | -470 | -473 | -752 | -1,689 | -1,087 | -1,238 | -1,217 | -665 | -477 | -331 |
| 1973 | -329 | -250 | -572 | -751 | -205 | -348 | -509 | -754 | -527 | -238 | -202 | -256 |
| 1974 | -124 | -325 | -893 | -823 | -954 | -1,387 | -1,202 | -1,209 | -1,227 | -776 | -474 | -318 |
| 1975 | -164 | -165 | -594 | -739 | -644 | -590 | -737 | -966 | -1,219 | -788 | -387 | -242 |
| 1976 | -470 | -438 | -730 | -367 | -934 | -1,440 | -1,085 | -1,232 | -847 | -574 | -454 | -552 |
| 1977 | -320 | -114 | -357 | -807 | -193 | -174 | -463 | -573 | -360 | -168 | -200 | -225 |
| 1978 | -153 | -216 | -498 | -821 | -698 | -576 | -873 | -865 | -688 | -574 | -287 | -197 |

# Table 14: Federal Hydro Generation Adjustment for Scenario #10,... JDA

| Water Year | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | June | July | Aug | Sep |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1929 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1930 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1931 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1932 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1933 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1934 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1935 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1936 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1937 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1938 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1939 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1940 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1941 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1942 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1943 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1944 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1945 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1946 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1947 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1948 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1949 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1950 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1951 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1952 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1953 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1954 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1955 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1956 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1957 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1958 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1959 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1960 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1961 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1962 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1963 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1964 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1965 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1966 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1967 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1968 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1969 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1970 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1971 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1972 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1973 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1974 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1975 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1976 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1977 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1978 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

# Table 15: Federal Hydro Generation Adjustment for Scenario #11,... JDA Spillway

| Water Year | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | June | July | Aug | Sep |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1929 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1930 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1931 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1932 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1933 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1934 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1935 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1936 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1937 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1938 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1939 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1940 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1941 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1942 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1943 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1944 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1945 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1946 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1947 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1948 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1949 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1950 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1951 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1952 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1953 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1954 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1955 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1956 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1957 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1958 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1959 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1960 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1961 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1962 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1963 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1964 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1965 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1966 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1967 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1968 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1969 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1970 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1971 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1972 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1973 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1974 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1975 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1976 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1977 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1978 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

# Table 16: Federal Hydro Generation Adjustment for Scenario #12,... LSN JDA Spillway

| Water Year | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | June | July | Aug | Sep |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1929 | -355 | -128 | -304 | -558 | -224 | -383 | -532 | -725 | -744 | -373 | -224 | -203 |
| 1930 | -107 | -147 | -328 | -548 | -343 | -379 | -678 | -784 | -619 | -241 | -231 | -138 |
| 1931 | -213 | -103 | -263 | -562 | -330 | -352 | -593 | -784 | -437 | -188 | -193 | -133 |
| 1932 | -121 | -170 | -248 | -777 | -140 | -546 | -980 | -1,065 | -855 | -503 | -330 | -149 |
| 1933 | -350 | -311 | -331 | -492 | -423 | -296 | -729 | -865 | -1,187 | -609 | -418 | -273 |
| 1934 | -288 | -351 | -548 | -1,008 | -121 | -1,128 | -1,006 | -881 | -461 | -221 | -186 | -205 |
| 1935 | -141 | -274 | -397 | -440 | -445 | -355 | -594 | -857 | -707 | -461 | -269 | -111 |
| 1936 | -201 | -165 | -174 | -882 | -117 | -406 | -905 | -1,052 | -776 | -353 | -248 | -144 |
| 1937 | -155 | -112 | -292 | -735 | -85 | -329 | -476 | -776 | -636 | -248 | -211 | -233 |
| 1938 | -144 | -283 | -409 | -498 | -469 | -580 | -915 | -1,055 | -897 | -519 | -352 | -158 |
| 1939 | -261 | -122 | -333 | -738 | -450 | -411 | -751 | -799 | -531 | -336 | -250 | -139 |
| 1940 | -324 | -108 | -357 | -540 | -391 | -653 | -856 | -830 | -627 | -315 | -211 | -222 |
| 1941 | -123 | -153 | -373 | -924 | -117 | -421 | -534 | -832 | -672 | -280 | -250 | -276 |
| 1942 | -345 | -240 | -647 | -559 | -545 | -253 | -699 | -812 | -821 | -513 | -374 | -159 |
| 1943 | -261 | -249 | -558 | -605 | -773 | -797 | -1,316 | -1,043 | -1,087 | -750 | -433 | -191 |
| 1944 | -330 | -99 | -415 | -695 | -369 | -175 | -579 | -792 | -640 | -286 | -237 | -257 |
| 1945 | -91 | -199 | -283 | -363 | -618 | -384 | -587 | -884 | -844 | -493 | -328 | -156 |
| 1946 | -275 | -242 | -544 | -627 | -638 | -634 | -1,019 | -1,068 | -897 | -492 | -309 | -318 |
| 1947 | -346 | -342 | -700 | -404 | -790 | -1,058 | -896 | -1,128 | -725 | -587 | -349 | -234 |
| 1948 | -440 | -363 | -465 | -459 | -993 | -547 | -877 | -1,347 | -1,354 | -608 | -470 | -318 |
| 1949 | -303 | -277 | -352 | -465 | -531 | -876 | -1,047 | -1,276 | -894 | -394 | -244 | -259 |
| 1950 | -186 | -133 | -589 | -558 | -720 | -839 | -1,051 | -943 | -1,139 | -705 | -455 | -317 |
| 1951 | -357 | -460 | -653 | -192 | -569 | -1,798 | -1,278 | -1,095 | -786 | -554 | -493 | -311 |
| 1952 | -377 | -312 | -522 | -596 | -665 | -565 | -1,333 | -1,335 | -915 | -514 | -376 | -172 |
| 1953 | -193 | -91 | -381 | -894 | -659 | -605 | -644 | -910 | -1,164 | -629 | -413 | -296 |
| 1954 | -296 | -259 | -380 | -592 | -725 | -449 | -908 | -981 | -897 | -595 | -502 | -351 |
| 1955 | -298 | -278 | -352 | -411 | -272 | -292 | -723 | -838 | -978 | -642 | -428 | -278 |
| 1956 | -302 | -328 | -719 | -223 | -871 | -1,580 | -1,224 | -1,352 | -1,154 | -572 | -444 | -303 |
| 1957 | -324 | -292 | -463 | -482 | -571 | -577 | -1,053 | -1,339 | -1,093 | -440 | -328 | -168 |
| 1958 | -308 | -95 | -594 | -578 | -770 | -419 | -907 | -1,337 | -888 | -417 | -347 | -170 |
| 1959 | -423 | -347 | -566 | -216 | -574 | -1,456 | -949 | -934 | -1,007 | -552 | -358 | -403 |
| 1960 | -543 | -431 | -503 | -562 | -409 | -624 | -979 | -875 | -839 | -481 | -292 | -152 |
| 1961 | -382 | -296 | -316 | -454 | -449 | -841 | -747 | -905 | -895 | -360 | -287 | -142 |
| 1962 | -395 | -198 | -360 | -457 | -521 | -310 | -1,049 | -940 | -725 | -564 | -322 | -154 |
| 1963 | -498 | -345 | -524 | -494 | -689 | -434 | -707 | -866 | -879 | -502 | -388 | -308 |
| 1964 | -284 | -264 | -329 | -439 | -427 | -367 | -844 | -912 | -1,323 | -635 | -454 | -340 |
| 1965 | -322 | -290 | -823 | -267 | -1,247 | -1,578 | -1,233 | -1,243 | -1,299 | -627 | -474 | -371 |
| 1966 | -347 | -332 | -455 | -563 | -332 | -457 | -836 | -881 | -681 | -311 | -247 | -148 |
| 1967 | -331 | -206 | -455 | -220 | -800 | -844 | -562 | -928 | -1,177 | -599 | -414 | -288 |
| 1968 | -328 | -321 | -418 | -599 | -646 | -564 | -545 | -861 | -800 | -485 | -328 | -360 |
| 1969 | -369 | -386 | -466 | -308 | -1,244 | -1,019 | -1,110 | -1,234 | -927 | -481 | -312 | -158 |
| 1970 | -424 | -248 | -353 | -682 | -696 | -462 | -601 | -979 | -1,163 | -520 | -363 | -214 |
| 1971 | -250 | -198 | -817 | -351 | -684 | -1,633 | -1,608 | -1,366 | -1,333 | -704 | -468 | -342 |
| 1972 | -337 | -342 | -458 | -346 | -728 | -1,885 | -1,176 | -1,352 | -1,335 | -659 | -483 | -330 |
| 1973 | -313 | -319 | -477 | -611 | -321 | -403 | -512 | -834 | -566 | -251 | -211 | -260 |
| 1974 | -159 | -417 | -715 | -1,015 | -1,025 | -1,051 | -1,244 | -1,294 | -1,354 | -799 | -491 | -316 |
| 1975 | -216 | -195 | -559 | -578 | -653 | -604 | -802 | -1,037 | -1,340 | -841 | -428 | -317 |
| 1976 | -396 | -417 | -707 | -316 | -811 | -1,726 | -1,154 | -1,340 | -914 | -592 | -427 | -578 |
| 1977 | -306 | -97 | -441 | -699 | -155 | -117 | -462 | -609 | -382 | -180 | -201 | -227 |
| 1978 | -118 | -260 | -647 | -624 | -722 | -568 | -919 | -918 | -715 | -632 | -290 | -202 |

# Table 17: Federal Hydro Generation Adjustment for Scenario #13,... LSN & JDA CWA

| Water Year | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | June | July | Aug | Sep |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1929 | -416 | -727 | -450 | -815 | -379 | -307 | -818 | -1,024 | -1,038 | -1,158 | -240 | -413 |
| 1930 | -440 | -799 | -395 | -596 | -501 | -309 | -1,005 | -1,181 | -1,106 | -990 | -401 | -440 |
| 1931 | -498 | -857 | -256 | -620 | -423 | -180 | -839 | -829 | -1,223 | -576 | -526 | -432 |
| 1932 | -428 | -600 | -509 | -677 | -392 | -960 | -1,536 | -1,507 | -1,326 | -992 | -637 | -410 |
| 1933 | -379 | -756 | -747 | -434 | -656 | -1,073 | -1,471 | -1,301 | -1,139 | -1,601 | -246 | -379 |
| 1934 | -533 | -927 | -1,064 | -1,267 | -953 | -1,149 | -1,514 | -1,500 | -1,184 | -660 | -297 | -228 |
| 1935 | -316 | -554 | -801 | -584 | -768 | -731 | -1,455 | -1,227 | -1,143 | -1,048 | -320 | -410 |
| 1936 | -531 | -647 | -378 | -714 | -330 | -432 | -1,263 | -1,567 | -1,378 | -1,272 | -200 | -402 |
| 1937 | -455 | -817 | -358 | -639 | -389 | -398 | -823 | -824 | -982 | -828 | -506 | -403 |
| 1938 | -450 | -732 | -909 | -428 | -801 | -1,312 | -1,705 | -1,389 | -1,387 | -993 | -345 | -477 |
| 1939 | -449 | -630 | -764 | -781 | -555 | -472 | -1,195 | -1,199 | -1,217 | -831 | -202 | -416 |
| 1940 | -365 | -882 | -494 | -811 | -563 | -960 | -1,237 | -1,154 | -1,297 | -696 | -250 | -459 |
| 1941 | -619 | -727 | -564 | -738 | -596 | -636 | -875 | -935 | -1,406 | -617 | -564 | -502 |
| 1942 | -543 | -880 | -674 | -610 | -1,621 | -374 | -661 | -346 | -1,388 | -1,354 | -919 | -426 |
| 1943 | -370 | -539 | -1,088 | -389 | -1,158 | -1,603 | -1,798 | -1,731 | -1,286 | -1,265 | -320 | -515 |
| 1944 | -409 | -730 | -819 | -834 | -444 | -197 | -903 | -1,172 | -1,069 | -777 | -347 | -542 |
| 1945 | -575 | -784 | -427 | -600 | -561 | -245 | -828 | -950 | -1,328 | -1,158 | -548 | -457 |
| 1946 | -389 | -782 | -768 | -578 | -878 | -1,297 | -1,885 | -1,588 | -1,410 | -1,143 | -453 | -575 |
| 1947 | -468 | -754 | -1,102 | -966 | -1,383 | -1,232 | -1,403 | -1,293 | -1,174 | -1,305 | -501 | -507 |
| 1948 | -449 | -1,295 | -630 | -884 | -878 | -1,074 | -1,567 | -1,432 | -1,671 | -1,777 | -394 | -610 |
| 1949 | -506 | -736 | -718 | -1,016 | -740 | -1,015 | -1,827 | -1,564 | -1,528 | -849 | -652 | -424 |
| 1950 | -463 | -482 | -896 | -640 | -955 | -1,661 | -1,588 | -1,560 | -1,221 | -1,511 | -728 | -592 |
| 1951 | -587 | -1,220 | -1,042 | -1,173 | -1,373 | -1,235 | -1,581 | -1,471 | -1,366 | -1,027 | -581 | -693 |
| 1952 | -483 | -1,174 | -875 | -713 | -1,123 | -904 | -1,739 | -1,667 | -1,662 | -832 | -696 | -598 |
| 1953 | -482 | -763 | -618 | -964 | -974 | -521 | -1,547 | -1,338 | -1,118 | -1,466 | -980 | -536 |
| 1954 | -423 | -831 | -694 | -872 | -1,086 | -713 | -1,730 | -1,674 | -1,273 | -1,114 | -899 | -412 |
| 1955 | -486 | -1,111 | -513 | -830 | -409 | -185 | -1,244 | -1,268 | -1,213 | -1,223 | -947 | -112 |
| 1956 | -516 | -967 | -1,062 | -1,272 | -1,080 | -1,427 | -1,645 | -1,654 | -1,692 | -1,466 | -313 | -633 |
| 1957 | -472 | -716 | -964 | -653 | -872 | -880 | -1,947 | -1,473 | -1,638 | -1,457 | -775 | -441 |
| 1958 | -408 | -763 | -779 | -543 | -970 | -1,124 | -1,460 | -1,393 | -1,609 | -887 | -662 | -534 |
| 1959 | -426 | -912 | -896 | -1,346 | -969 | -1,077 | -1,452 | -1,297 | -1,130 | -1,342 | -323 | -366 |
| 1960 | -1,095 | -1,056 | -1,021 | -894 | -810 | -766 | -1,484 | -1,329 | -1,233 | -1,042 | -448 | -462 |
| 1961 | -480 | -773 | -638 | -684 | -1,136 | -1,050 | -1,278 | -1,141 | -1,053 | -1,303 | -785 | -322 |
| 1962 | -386 | -643 | -741 | -645 | -1,034 | -323 | -1,516 | -1,528 | -1,147 | -948 | -583 | -473 |
| 1963 | -632 | -902 | -809 | -715 | -1,098 | -810 | -986 | -883 | -1,222 | -1,140 | -722 | -563 |
| 1964 | -387 | -643 | -801 | -592 | -824 | -605 | -1,339 | -1,468 | -1,190 | -1,671 | -738 | -765 |
| 1965 | -602 | -842 | -1,268 | -1,440 | -1,470 | -1,243 | -1,659 | -1,668 | -1,509 | -1,460 | -355 | -450 |
| 1966 | -581 | -858 | -750 | -740 | -950 | -629 | -1,425 | -1,151 | -1,175 | -1,035 | -700 | -423 |
| 1967 | -367 | -724 | -798 | -760 | -1,085 | -733 | -1,340 | -1,243 | -1,092 | -1,604 | -395 | -606 |
| 1968 | -416 | -894 | -704 | -715 | -1,061 | -1,276 | -1,077 | -1,411 | -1,261 | -985 | -372 | -705 |
| 1969 | -527 | -1,135 | -655 | -1,269 | -1,117 | -1,233 | -1,562 | -1,511 | -1,649 | -1,025 | -441 | -445 |
| 1970 | -453 | -703 | -726 | -759 | -1,154 | -815 | -948 | -963 | -1,217 | -1,408 | -735 | -513 |
| 1971 | -426 | -647 | -1,073 | -1,070 | -1,953 | -1,357 | -1,556 | -1,424 | -1,726 | -1,647 | -728 | -558 |
| 1972 | -535 | -748 | -949 | -1,090 | -1,517 | -1,618 | -1,424 | -1,230 | -1,655 | -1,728 | -190 | -485 |
| 1973 | -574 | -706 | -750 | -1,081 | -569 | -304 | -751 | -1,014 | -1,223 | -624 | -673 | -469 |
| 1974 | -577 | -668 | -1,237 | -1,614 | -1,305 | -1,491 | -1,687 | -1,660 | -1,631 | -1,766 | -475 | -501 |
| 1975 | -400 | -558 | -979 | -742 | -887 | -903 | -1,967 | -1,741 | -1,323 | -1,387 | -1,063 | -449 |
| 1976 | -611 | -1,037 | -1,332 | -1,278 | -1,063 | -1,236 | -1,549 | -1,415 | -1,638 | -942 | -388 | -390 |
| 1977 | -938 | -669 | -560 | -790 | -401 | -136 | -745 | -962 | -915 | -545 | -713 | -381 |
| 1978 | -427 | -451 | -1,078 | -1,069 | -850 | -790 | -1,627 | -1,447 | -1,037 | -1,002 | -176 | -647 |

# Table 18: Federal Hydro Generation Adjustment for Scenario #14,... 2 LSN - Adj

| Water Year | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | June | July | Aug | Sep |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1929 | -15 | -8 | -19 | -19 | -11 | -22 | -32 | -45 | -47 | -25 | -13 | -8 |
| 1930 | -7 | -6 | -8 | -37 | -18 | -21 | -41 | -49 | -38 | -14 | -13 | -4 |
| 1931 | -15 | -4 | -6 | -35 | -12 | -20 | -36 | -48 | -24 | -10 | -10 | -3 |
| 1932 | -7 | -5 | -6 | -52 | -4 | -29 | -54 | -61 | -47 | -29 | -19 | -9 |
| 1933 | -16 | -13 | -14 | -17 | -20 | -16 | -41 | -51 | -67 | -28 | -20 | -11 |
| 1934 | -14 | -15 | -33 | -39 | -7 | -48 | -56 | -43 | -24 | -12 | -10 | -7 |
| 1935 | -10 | -16 | -13 | -15 | -22 | -17 | -34 | -50 | -37 | -25 | -13 | -3 |
| 1936 | -13 | -3 | -6 | -53 | -2 | -23 | -54 | -61 | -44 | -22 | -13 | -4 |
| 1937 | -10 | -3 | -7 | -39 | -10 | -18 | -30 | -45 | -38 | -14 | -12 | -10 |
| 1938 | -10 | -13 | -19 | -18 | -23 | -35 | -54 | -58 | -50 | -29 | -22 | -4 |
| 1939 | -19 | -6 | -18 | -33 | -21 | -24 | -47 | -45 | -32 | -20 | -12 | -3 |
| 1940 | -22 | -6 | -18 | -18 | -23 | -39 | -50 | -48 | -38 | -20 | -12 | -8 |
| 1941 | -8 | -5 | -15 | -61 | 0 | -23 | -29 | -50 | -41 | -18 | -15 | -13 |
| 1942 | -20 | -17 | -28 | -24 | -24 | -23 | -41 | -46 | -46 | -28 | -21 | -5 |
| 1943 | -19 | -15 | -22 | -25 | -49 | -52 | -81 | -58 | -64 | -44 | -25 | -9 |
| 1944 | -24 | -3 | -31 | -23 | -23 | -6 | -35 | -49 | -41 | -18 | -14 | -12 |
| 1945 | -5 | -13 | -4 | -22 | -37 | -22 | -36 | -53 | -49 | -28 | -20 | -4 |
| 1946 | -20 | -12 | -30 | -29 | -36 | -38 | -60 | -58 | -50 | -27 | -16 | -16 |
| 1947 | -20 | -18 | -40 | -8 | -42 | -74 | -53 | -67 | -36 | -37 | -20 | -15 |
| 1948 | -19 | -17 | -24 | -12 | -65 | -33 | -53 | -80 | -79 | -29 | -24 | -14 |
| 1949 | -16 | -13 | -18 | -23 | -31 | -51 | -61 | -75 | -50 | -25 | -15 | -12 |
| 1950 | -13 | -8 | -28 | -21 | -38 | -45 | -67 | -52 | -63 | -37 | -25 | -15 |
| 1951 | -20 | -24 | -33 | -8 | -42 | -79 | -75 | -60 | -42 | -30 | -28 | -14 |
| 1952 | -20 | -15 | -29 | -25 | -41 | -35 | -81 | -80 | -52 | -30 | -23 | -5 |
| 1953 | -13 | -5 | -9 | -61 | -32 | -33 | -43 | -50 | -68 | -35 | -24 | -15 |
| 1954 | -16 | -12 | -19 | -26 | -39 | -24 | -54 | -54 | -44 | -30 | -23 | -14 |
| 1955 | -15 | -12 | -16 | -18 | -14 | -15 | -42 | -49 | -55 | -29 | -22 | -12 |
| 1956 | -16 | -15 | -39 | -11 | -29 | -103 | -73 | -80 | -64 | -30 | -24 | -14 |
| 1957 | -18 | -14 | -24 | -20 | -32 | -32 | -65 | -80 | -59 | -28 | -20 | -4 |
| 1958 | -23 | -3 | -33 | -22 | -45 | -22 | -53 | -79 | -48 | -27 | -21 | -7 |
| 1959 | -25 | -18 | -31 | -10 | -13 | -91 | -55 | -51 | -52 | -29 | -19 | -18 |
| 1960 | -28 | -20 | -25 | -23 | -22 | -37 | -54 | -49 | -46 | -25 | -17 | -4 |
| 1961 | -24 | -13 | -15 | -16 | -14 | -54 | -44 | -49 | -44 | -22 | -15 | -4 |
| 1962 | -23 | -12 | -15 | -19 | -30 | -16 | -61 | -54 | -38 | -35 | -17 | -10 |
| 1963 | -25 | -17 | -28 | -23 | -41 | -24 | -40 | -50 | -51 | -28 | -22 | -15 |
| 1964 | -16 | -13 | -16 | -17 | -21 | -21 | -51 | -54 | -79 | -32 | -24 | -17 |
| 1965 | -17 | -14 | -47 | -15 | -56 | -104 | -76 | -72 | -77 | -37 | -28 | -20 |
| 1966 | -20 | -17 | -25 | -25 | -17 | -27 | -47 | -51 | -37 | -16 | -13 | -7 |
| 1967 | -20 | -12 | -17 | -6 | -29 | -55 | -33 | -52 | -66 | -30 | -22 | -13 |
| 1968 | -19 | -16 | -22 | -27 | -37 | -32 | -32 | -53 | -44 | -26 | -17 | -17 |
| 1969 | -20 | -20 | -24 | -11 | -62 | -69 | -62 | -71 | -50 | -28 | -18 | -5 |
| 1970 | -25 | -11 | -18 | -35 | -41 | -27 | -36 | -58 | -71 | -31 | -23 | -8 |
| 1971 | -18 | -14 | -43 | -16 | -27 | -95 | -108 | -81 | -79 | -40 | -25 | -18 |
| 1972 | -20 | -18 | -25 | -11 | -28 | -134 | -59 | -80 | -78 | -30 | -24 | -16 |
| 1973 | -18 | -17 | -26 | -34 | -19 | -23 | -30 | -50 | -34 | -15 | -12 | -13 |
| 1974 | -9 | -28 | -34 | -59 | -47 | -60 | -74 | -76 | -79 | -41 | -26 | -15 |
| 1975 | -16 | -12 | -25 | -24 | -38 | -37 | -50 | -59 | -79 | -47 | -27 | -18 |
| 1976 | -22 | -22 | -34 | -19 | -21 | -124 | -68 | -80 | -52 | -31 | -18 | -29 |
| 1977 | -18 | -5 | -29 | -19 | -14 | -14 | -26 | -35 | -23 | -11 | -11 | -11 |
| 1978 | -8 | -19 | -35 | -32 | -43 | -31 | -54 | -51 | -38 | -38 | -15 | -13 |

# Table 19: Federal Hydro Generation Adjustment for Scenario #15,... 4 LSN - Adj

| Water Year | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | June | July | Aug | Sep |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1929 | -16 | -9 | -20 | -20 | -12 | -23 | -34 | -47 | -50 | -26 | -14 | -8 |
| 1930 | -7 | -6 | -8 | -39 | -19 | -22 | -43 | -51 | -39 | -15 | -14 | -4 |
| 1931 | -16 | -4 | -6 | -37 | -12 | -21 | -37 | -50 | -25 | -11 | -10 | -3 |
| 1932 | -7 | -6 | -6 | -54 | -4 | -31 | -57 | -64 | -49 | -30 | -20 | -9 |
| 1933 | -17 | -14 | -15 | -17 | -21 | -17 | -43 | -53 | -70 | -29 | -21 | -12 |
| 1934 | -14 | -15 | -35 | -41 | -7 | -50 | -58 | -45 | -25 | -13 | -10 | -8 |
| 1935 | -10 | -17 | -13 | -16 | -23 | -18 | -36 | -53 | -39 | -27 | -14 | -3 |
| 1936 | -13 | -3 | -7 | -55 | -2 | -24 | -57 | -64 | -46 | -23 | -14 | -4 |
| 1937 | -11 | -3 | -7 | -41 | -11 | -19 | -32 | -47 | -40 | -15 | -12 | -10 |
| 1938 | -10 | -13 | -20 | -19 | -25 | -37 | -57 | -61 | -52 | -31 | -23 | -4 |
| 1939 | -20 | -7 | -18 | -35 | -22 | -25 | -49 | -47 | -33 | -21 | -13 | -4 |
| 1940 | -23 | -7 | -19 | -19 | -24 | -41 | -52 | -50 | -40 | -21 | -12 | -9 |
| 1941 | -8 | -6 | -16 | -64 | 0 | -24 | -30 | -53 | -43 | -19 | -16 | -13 |
| 1942 | -21 | -18 | -29 | -25 | -25 | -24 | -43 | -49 | -48 | -29 | -22 | -6 |
| 1943 | -20 | -16 | -23 | -26 | -52 | -54 | -84 | -61 | -67 | -47 | -26 | -9 |
| 1944 | -25 | -3 | -33 | -24 | -24 | -7 | -37 | -51 | -44 | -19 | -15 | -13 |
| 1945 | -5 | -14 | -5 | -23 | -39 | -23 | -38 | -55 | -52 | -29 | -21 | -4 |
| 1946 | -21 | -13 | -32 | -30 | -38 | -39 | -63 | -60 | -53 | -29 | -17 | -16 |
| 1947 | -21 | -19 | -42 | -8 | -44 | -77 | -56 | -70 | -38 | -38 | -21 | -15 |
| 1948 | -20 | -18 | -25 | -13 | -68 | -35 | -55 | -84 | -83 | -31 | -25 | -15 |
| 1949 | -17 | -14 | -19 | -24 | -32 | -54 | -64 | -79 | -53 | -26 | -15 | -13 |
| 1950 | -14 | -9 | -30 | -22 | -40 | -47 | -70 | -55 | -66 | -38 | -26 | -16 |
| 1951 | -21 | -25 | -35 | -9 | -44 | -83 | -78 | -63 | -44 | -32 | -29 | -15 |
| 1952 | -21 | -16 | -30 | -26 | -43 | -36 | -84 | -84 | -54 | -32 | -24 | -5 |
| 1953 | -14 | -5 | -9 | -64 | -33 | -35 | -45 | -52 | -71 | -37 | -25 | -15 |
| 1954 | -16 | -12 | -20 | -27 | -41 | -25 | -57 | -57 | -46 | -31 | -24 | -15 |
| 1955 | -16 | -12 | -17 | -19 | -14 | -16 | -44 | -52 | -58 | -31 | -23 | -13 |
| 1956 | -16 | -15 | -41 | -11 | -30 | -108 | -77 | -84 | -68 | -32 | -25 | -15 |
| 1957 | -19 | -15 | -25 | -21 | -33 | -34 | -68 | -84 | -62 | -30 | -21 | -5 |
| 1958 | -24 | -3 | -35 | -23 | -47 | -24 | -56 | -83 | -50 | -29 | -22 | -7 |
| 1959 | -26 | -19 | -32 | -11 | -14 | -96 | -57 | -54 | -54 | -30 | -19 | -19 |
| 1960 | -30 | -21 | -26 | -24 | -23 | -39 | -57 | -52 | -49 | -26 | -17 | -4 |
| 1961 | -26 | -14 | -16 | -16 | -15 | -56 | -46 | -52 | -46 | -23 | -16 | -4 |
| 1962 | -24 | -13 | -16 | -20 | -31 | -17 | -64 | -56 | -40 | -37 | -18 | -10 |
| 1963 | -26 | -18 | -29 | -24 | -43 | -25 | -42 | -53 | -54 | -29 | -24 | -16 |
| 1964 | -17 | -13 | -17 | -18 | -22 | -22 | -53 | -56 | -82 | -33 | -26 | -18 |
| 1965 | -17 | -14 | -50 | -15 | -59 | -109 | -80 | -76 | -81 | -38 | -29 | -21 |
| 1966 | -21 | -18 | -26 | -26 | -18 | -28 | -50 | -54 | -39 | -17 | -14 | -8 |
| 1967 | -21 | -12 | -18 | -7 | -30 | -58 | -35 | -54 | -69 | -32 | -23 | -14 |
| 1968 | -19 | -17 | -23 | -28 | -39 | -34 | -33 | -55 | -46 | -27 | -18 | -18 |
| 1969 | -21 | -21 | -26 | -12 | -65 | -72 | -65 | -75 | -53 | -29 | -19 | -5 |
| 1970 | -26 | -12 | -19 | -37 | -43 | -28 | -38 | -61 | -74 | -32 | -24 | -9 |
| 1971 | -19 | -14 | -45 | -16 | -28 | -100 | -114 | -85 | -83 | -42 | -26 | -18 |
| 1972 | -21 | -19 | -26 | -11 | -30 | -141 | -62 | -84 | -82 | -32 | -25 | -17 |
| 1973 | -18 | -18 | -27 | -36 | -19 | -24 | -32 | -53 | -35 | -16 | -13 | -13 |
| 1974 | -9 | -29 | -36 | -62 | -49 | -63 | -77 | -80 | -83 | -43 | -27 | -16 |
| 1975 | -17 | -13 | -26 | -26 | -40 | -38 | -53 | -61 | -83 | -49 | -28 | -19 |
| 1976 | -23 | -23 | -36 | -20 | -22 | -130 | -71 | -84 | -55 | -32 | -19 | -30 |
| 1977 | -18 | -5 | -30 | -20 | -14 | -15 | -27 | -37 | -24 | -12 | -12 | -11 |
| 1978 | -8 | -20 | -36 | -33 | -45 | -33 | -56 | -53 | -39 | -40 | -15 | -14 |

# Table 20: Federal Hydro Generation Adjustment for Scenario #16,... LSN & JDA - Adj

| Water Year | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | June | July | Aug | Sep |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1929 | -16 | -6 | -19 | -38 | -12 | -19 | -24 | -34 | -34 | -17 | -11 | -11 |
| 1930 | -6 | -13 | -19 | -26 | -19 | -20 | -33 | -37 | -29 | -12 | -12 | -9 |
| 1931 | -11 | -10 | -17 | -26 | -17 | -18 | -30 | -37 | -22 | -10 | -10 | -9 |
| 1932 | -8 | -13 | -15 | -35 | -9 | -29 | -49 | -51 | -42 | -24 | -16 | -10 |
| 1933 | -14 | -21 | -21 | -30 | -24 | -17 | -36 | -41 | -58 | -32 | -22 | -15 |
| 1934 | -17 | -21 | -32 | -41 | -18 | -64 | -54 | -45 | -24 | -11 | -10 | -11 |
| 1935 | -7 | -11 | -30 | -26 | -25 | -20 | -30 | -41 | -35 | -23 | -14 | -8 |
| 1936 | -13 | -11 | -13 | -39 | -9 | -22 | -44 | -50 | -37 | -18 | -13 | -9 |
| 1937 | -10 | -11 | -16 | -33 | -8 | -18 | -25 | -37 | -30 | -12 | -11 | -13 |
| 1938 | -8 | -10 | -19 | -40 | -31 | -26 | -43 | -51 | -44 | -25 | -17 | -10 |
| 1939 | -15 | -9 | -19 | -35 | -24 | -21 | -38 | -39 | -26 | -16 | -13 | -9 |
| 1940 | -13 | -7 | -21 | -43 | -16 | -28 | -42 | -40 | -30 | -15 | -11 | -12 |
| 1941 | -9 | -12 | -20 | -41 | -10 | -22 | -28 | -39 | -32 | -13 | -12 | -15 |
| 1942 | -16 | -14 | -38 | -31 | -26 | -15 | -35 | -39 | -40 | -25 | -18 | -10 |
| 1943 | -11 | -10 | -36 | -36 | -43 | -33 | -64 | -51 | -52 | -35 | -21 | -11 |
| 1944 | -13 | -8 | -25 | -37 | -18 | -11 | -29 | -37 | -29 | -13 | -12 | -13 |
| 1945 | -7 | -12 | -18 | -18 | -28 | -20 | -29 | -42 | -40 | -24 | -16 | -9 |
| 1946 | -11 | -11 | -25 | -44 | -33 | -34 | -47 | -52 | -43 | -24 | -16 | -13 |
| 1947 | -18 | -21 | -38 | -27 | -41 | -48 | -44 | -53 | -37 | -27 | -17 | -11 |
| 1948 | -26 | -21 | -25 | -29 | -47 | -28 | -43 | -64 | -63 | -31 | -24 | -17 |
| 1949 | -17 | -14 | -20 | -27 | -27 | -44 | -49 | -60 | -43 | -19 | -12 | -13 |
| 1950 | -9 | -11 | -22 | -39 | -37 | -40 | -53 | -46 | -56 | -35 | -22 | -16 |
| 1951 | -20 | -25 | -35 | -15 | -40 | -79 | -61 | -54 | -39 | -27 | -24 | -17 |
| 1952 | -21 | -18 | -28 | -34 | -33 | -28 | -64 | -64 | -44 | -24 | -18 | -10 |
| 1953 | -11 | -10 | -20 | -42 | -35 | -30 | -32 | -44 | -55 | -30 | -20 | -12 |
| 1954 | -20 | -15 | -21 | -33 | -38 | -24 | -44 | -48 | -46 | -30 | -26 | -20 |
| 1955 | -17 | -17 | -20 | -24 | -15 | -16 | -36 | -40 | -47 | -34 | -22 | -15 |
| 1956 | -17 | -19 | -37 | -17 | -51 | -70 | -60 | -64 | -56 | -28 | -22 | -15 |
| 1957 | -18 | -15 | -27 | -28 | -30 | -30 | -50 | -64 | -54 | -21 | -16 | -10 |
| 1958 | -12 | -9 | -25 | -41 | -39 | -23 | -45 | -63 | -44 | -19 | -17 | -10 |
| 1959 | -21 | -20 | -30 | -14 | -42 | -65 | -46 | -45 | -50 | -28 | -18 | -22 |
| 1960 | -29 | -24 | -28 | -32 | -22 | -31 | -50 | -42 | -41 | -24 | -14 | -9 |
| 1961 | -15 | -21 | -19 | -27 | -28 | -39 | -39 | -44 | -46 | -18 | -14 | -9 |
| 1962 | -18 | -8 | -23 | -30 | -29 | -16 | -49 | -45 | -36 | -26 | -16 | -9 |
| 1963 | -25 | -19 | -28 | -28 | -35 | -23 | -36 | -41 | -42 | -24 | -19 | -16 |
| 1964 | -13 | -16 | -20 | -27 | -24 | -19 | -41 | -43 | -63 | -32 | -22 | -18 |
| 1965 | -18 | -17 | -41 | -19 | -68 | -69 | -58 | -59 | -61 | -30 | -23 | -15 |
| 1966 | -22 | -18 | -24 | -31 | -18 | -24 | -42 | -42 | -34 | -16 | -13 | -9 |
| 1967 | -12 | -10 | -32 | -19 | -41 | -39 | -28 | -45 | -57 | -30 | -21 | -15 |
| 1968 | -18 | -18 | -23 | -33 | -33 | -29 | -28 | -40 | -39 | -24 | -17 | -19 |
| 1969 | -20 | -21 | -25 | -24 | -57 | -47 | -55 | -60 | -45 | -23 | -15 | -10 |
| 1970 | -21 | -10 | -23 | -39 | -38 | -20 | -28 | -46 | -54 | -25 | -17 | -12 |
| 1971 | -12 | -12 | -33 | -33 | -39 | -72 | -72 | -64 | -63 | -34 | -23 | -17 |
| 1972 | -18 | -19 | -24 | -24 | -39 | -87 | -56 | -64 | -63 | -34 | -25 | -17 |
| 1973 | -17 | -13 | -30 | -39 | -11 | -18 | -26 | -39 | -27 | -12 | -10 | -13 |
| 1974 | -6 | -17 | -46 | -43 | -49 | -72 | -62 | -63 | -63 | -40 | -25 | -16 |
| 1975 | -9 | -9 | -31 | -38 | -33 | -31 | -38 | -50 | -63 | -41 | -20 | -13 |
| 1976 | -24 | -23 | -38 | -19 | -48 | -75 | -56 | -64 | -44 | -30 | -23 | -29 |
| 1977 | -17 | -6 | -18 | -42 | -10 | -9 | -24 | -30 | -19 | -9 | -10 | -12 |
| 1978 | -8 | -11 | -26 | -42 | -36 | -30 | -45 | -45 | -36 | -30 | -15 | -10 |

# Table 21: Federal Hydro Generation Adjustment for Scenario #17,... LSN JDA Spillway - Adj

| Water Year | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | June | July | Aug | Sep |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1929 | -21 | -8 | -18 | -33 | -13 | -23 | -32 | -43 | -44 | -22 | -13 | -12 |
| 1930 | -6 | -9 | -19 | -33 | -20 | -23 | -40 | -47 | -37 | -14 | -14 | -8 |
| 1931 | -13 | -6 | -16 | -33 | -20 | -21 | -35 | -47 | -26 | -11 | -11 | -8 |
| 1932 | -7 | -10 | -15 | -46 | -8 | -32 | -58 | -63 | -51 | -30 | -20 | -9 |
| 1933 | -21 | -18 | -20 | -29 | -25 | -18 | -43 | -51 | -70 | -36 | -25 | -16 |
| 1934 | -17 | -21 | -33 | -60 | -7 | -67 | -60 | -52 | -27 | -13 | -11 | -12 |
| 1935 | -8 | -16 | -24 | -26 | -26 | -21 | -35 | -51 | -42 | -27 | -16 | -7 |
| 1936 | -12 | -10 | -10 | -52 | -7 | -24 | -54 | -62 | -46 | -21 | -15 | -9 |
| 1937 | -9 | -7 | -17 | -44 | -5 | -20 | -28 | -46 | -38 | -15 | -13 | -14 |
| 1938 | -9 | -17 | -24 | -30 | -28 | -34 | -54 | -63 | -53 | -31 | -21 | -9 |
| 1939 | -15 | -7 | -20 | -44 | -27 | -24 | -45 | -47 | -32 | -20 | -15 | -8 |
| 1940 | -19 | -6 | -21 | -32 | -23 | -39 | -51 | -49 | -37 | -19 | -13 | -13 |
| 1941 | -7 | -9 | -22 | -55 | -7 | -25 | -32 | -49 | -40 | -17 | -15 | -16 |
| 1942 | -20 | -14 | -38 | -33 | -32 | -15 | -42 | -48 | -49 | -30 | -22 | -9 |
| 1943 | -15 | -15 | -33 | -36 | -46 | -47 | -78 | -62 | -65 | -44 | -26 | -11 |
| 1944 | -20 | -6 | -25 | -41 | -22 | -10 | -34 | -47 | -38 | -17 | -14 | -15 |
| 1945 | -5 | -12 | -17 | -22 | -37 | -23 | -35 | -52 | -50 | -29 | -19 | -9 |
| 1946 | -16 | -14 | -32 | -37 | -38 | -38 | -60 | -63 | -53 | -29 | -18 | -19 |
| 1947 | -21 | -20 | -42 | -24 | -47 | -63 | -53 | -67 | -43 | -35 | -21 | -14 |
| 1948 | -26 | -22 | -28 | -27 | -59 | -32 | -52 | -80 | -80 | -36 | -28 | -19 |
| 1949 | -18 | -16 | -21 | -28 | -32 | -52 | -62 | -76 | -53 | -23 | -14 | -15 |
| 1950 | -11 | -8 | -35 | -33 | -43 | -50 | -62 | -56 | -68 | -42 | -27 | -19 |
| 1951 | -21 | -27 | -39 | -11 | -34 | -107 | -76 | -65 | -47 | -33 | -29 | -18 |
| 1952 | -22 | -19 | -31 | -35 | -39 | -34 | -79 | -79 | -54 | -31 | -22 | -10 |
| 1953 | -11 | -5 | -23 | -53 | -39 | -36 | -38 | -54 | -69 | -37 | -24 | -18 |
| 1954 | -18 | -15 | -23 | -35 | -43 | -27 | -54 | -58 | -53 | -35 | -30 | -21 |
| 1955 | -18 | -17 | -21 | -24 | -16 | -17 | -43 | -50 | -58 | -38 | -25 | -16 |
| 1956 | -18 | -19 | -43 | -13 | -52 | -94 | -73 | -80 | -68 | -34 | -26 | -18 |
| 1957 | -19 | -17 | -27 | -29 | -34 | -34 | -62 | -79 | -65 | -26 | -19 | -10 |
| 1958 | -18 | -6 | -35 | -34 | -46 | -25 | -54 | -79 | -53 | -25 | -21 | -10 |
| 1959 | -25 | -21 | -34 | -13 | -34 | -86 | -56 | -55 | -60 | -33 | -21 | -24 |
| 1960 | -32 | -26 | -30 | -33 | -24 | -37 | -58 | -52 | -50 | -29 | -17 | -9 |
| 1961 | -23 | -18 | -19 | -27 | -27 | -50 | -44 | -54 | -53 | -21 | -17 | -8 |
| 1962 | -23 | -12 | -21 | -27 | -31 | -18 | -62 | -56 | -43 | -33 | -19 | -9 |
| 1963 | -30 | -21 | -31 | -29 | -41 | -26 | -42 | -51 | -52 | -30 | -23 | -18 |
| 1964 | -17 | -16 | -20 | -26 | -25 | -22 | -50 | -54 | -78 | -38 | -27 | -20 |
| 1965 | -19 | -17 | -49 | -16 | -74 | -94 | -73 | -74 | -77 | -37 | -28 | -22 |
| 1966 | -21 | -20 | -27 | -33 | -20 | -27 | -50 | -52 | -40 | -18 | -15 | -9 |
| 1967 | -20 | -12 | -27 | -13 | -47 | -50 | -33 | -55 | -70 | -36 | -25 | -17 |
| 1968 | -19 | -19 | -25 | -36 | -38 | -33 | -32 | -51 | -47 | -29 | -19 | -21 |
| 1969 | -22 | -23 | -28 | -18 | -74 | -60 | -66 | -73 | -55 | -29 | -19 | -9 |
| 1970 | -25 | -15 | -21 | -40 | -41 | -27 | -36 | -58 | -69 | -31 | -22 | -13 |
| 1971 | -15 | -12 | -48 | -21 | -41 | -97 | -95 | -81 | -79 | -42 | -28 | -20 |
| 1972 | -20 | -20 | -27 | -21 | -43 | -112 | -70 | -80 | -79 | -39 | -29 | -20 |
| 1973 | -19 | -19 | -28 | -36 | -19 | -24 | -30 | -50 | -34 | -15 | -13 | -15 |
| 1974 | -9 | -25 | -42 | -60 | -61 | -62 | -74 | -77 | -80 | -47 | -29 | -19 |
| 1975 | -13 | -12 | -33 | -34 | -39 | -36 | -48 | -62 | -80 | -50 | -25 | -19 |
| 1976 | -23 | -25 | -42 | -19 | -48 | -102 | -69 | -80 | -54 | -35 | -25 | -34 |
| 1977 | -18 | -6 | -26 | -41 | -9 | -7 | -27 | -36 | -23 | -11 | -12 | -13 |
| 1978 | -7 | -15 | -38 | -37 | -43 | -34 | -55 | -55 | -42 | -38 | -17 | -12 |

# Table 22: Federal Hydro Generation Adjustment for Scenario #18,... LSN & JDA CWA - Adj

| Water Year | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | June | July | Aug | Sep |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1929 | -200 | -349 | -216 | -392 | -182 | -147 | -393 | -492 | -499 | -556 | -115 | -199 |
| 1930 | -211 | -384 | -190 | -286 | -241 | -148 | -483 | -567 | -531 | -475 | -192 | -211 |
| 1931 | -239 | -411 | -123 | -298 | -203 | -87 | -403 | -398 | -587 | -277 | -252 | -207 |
| 1932 | -205 | -288 | -244 | -325 | -188 | -461 | -738 | -724 | -637 | -476 | -306 | -197 |
| 1933 | -182 | -363 | -359 | -208 | -315 | -515 | -706 | -625 | -547 | -769 | -118 | -182 |
| 1934 | -256 | -445 | -511 | -609 | -458 | -552 | -727 | -720 | -569 | -317 | -143 | -109 |
| 1935 | -152 | -266 | -385 | -281 | -369 | -351 | -699 | -589 | -549 | -503 | -154 | -197 |
| 1936 | -255 | -311 | -181 | -343 | -158 | -207 | -606 | -752 | -662 | -611 | -96 | -193 |
| 1937 | -218 | -393 | -172 | -307 | -187 | -191 | -395 | -396 | -472 | -398 | -243 | -193 |
| 1938 | -216 | -351 | -436 | -206 | -385 | -630 | -819 | -667 | -666 | -477 | -166 | -229 |
| 1939 | -216 | -303 | -367 | -375 | -267 | -227 | -574 | -576 | -584 | -399 | -97 | -200 |
| 1940 | -175 | -424 | -237 | -390 | -270 | -461 | -594 | -554 | -623 | -334 | -120 | -220 |
| 1941 | -297 | -349 | -271 | -354 | -286 | -305 | -420 | -449 | -675 | -296 | -271 | -241 |
| 1942 | -261 | -423 | -324 | -293 | -779 | -180 | -317 | -166 | -667 | -650 | -441 | -205 |
| 1943 | -177 | -259 | -522 | -187 | -556 | -770 | -863 | -831 | -618 | -607 | -154 | -248 |
| 1944 | -196 | -350 | -393 | -401 | -213 | -95 | -434 | -563 | -514 | -373 | -167 | -260 |
| 1945 | -276 | -376 | -205 | -288 | -269 | -117 | -397 | -456 | -638 | -556 | -263 | -220 |
| 1946 | -187 | -376 | -369 | -278 | -422 | -623 | -905 | -762 | -677 | -549 | -218 | -276 |
| 1947 | -225 | -362 | -529 | -464 | -664 | -592 | -674 | -621 | -564 | -627 | -240 | -244 |
| 1948 | -216 | -622 | -303 | -424 | -422 | -516 | -753 | -688 | -802 | -853 | -189 | -293 |
| 1949 | -243 | -353 | -345 | -488 | -355 | -488 | -877 | -751 | -734 | -408 | -313 | -204 |
| 1950 | -222 | -231 | -430 | -307 | -459 | -798 | -763 | -749 | -586 | -726 | -349 | -284 |
| 1951 | -282 | -586 | -500 | -563 | -659 | -593 | -759 | -706 | -656 | -493 | -279 | -333 |
| 1952 | -232 | -564 | -420 | -342 | -539 | -434 | -835 | -801 | -798 | -399 | -334 | -287 |
| 1953 | -231 | -366 | -297 | -463 | -468 | -250 | -743 | -643 | -537 | -704 | -471 | -258 |
| 1954 | -203 | -399 | -333 | -419 | -522 | -342 | -831 | -804 | -611 | -535 | -432 | -198 |
| 1955 | -233 | -534 | -246 | -399 | -197 | -89 | -597 | -609 | -582 | -587 | -455 | -54 |
| 1956 | -248 | -464 | -510 | -611 | -519 | -685 | -790 | -794 | -812 | -704 | -150 | -304 |
| 1957 | -226 | -344 | -463 | -314 | -419 | -422 | -935 | -708 | -787 | -700 | -372 | -212 |
| 1958 | -196 | -367 | -374 | -261 | -466 | -540 | -701 | -669 | -773 | -426 | -318 | -257 |
| 1959 | -205 | -438 | -430 | -647 | -465 | -517 | -697 | -623 | -543 | -644 | -155 | -176 |
| 1960 | -526 | -507 | -490 | -429 | -389 | -368 | -713 | -638 | -592 | -500 | -215 | -222 |
| 1961 | -230 | -371 | -306 | -329 | -546 | -504 | -614 | -548 | -506 | -626 | -377 | -155 |
| 1962 | -185 | -309 | -356 | -310 | -497 | -155 | -728 | -734 | -551 | -455 | -280 | -227 |
| 1963 | -303 | -433 | -389 | -344 | -527 | -389 | -474 | -424 | -587 | -547 | -347 | -270 |
| 1964 | -186 | -309 | -385 | -284 | -396 | -291 | -643 | -705 | -572 | -802 | -354 | -367 |
| 1965 | -289 | -404 | -609 | -691 | -706 | -597 | -797 | -801 | -725 | -701 | -170 | -216 |
| 1966 | -279 | -412 | -360 | -355 | -456 | -302 | -684 | -553 | -564 | -497 | -336 | -203 |
| 1967 | -176 | -347 | -383 | -365 | -521 | -352 | -644 | -597 | -524 | -770 | -190 | -291 |
| 1968 | -200 | -429 | -338 | -343 | -509 | -613 | -517 | -677 | -606 | -473 | -179 | -339 |
| 1969 | -253 | -545 | -314 | -609 | -536 | -592 | -750 | -725 | -792 | -492 | -212 | -214 |
| 1970 | -217 | -338 | -349 | -365 | -554 | -391 | -455 | -462 | -585 | -676 | -353 | -246 |
| 1971 | -204 | -311 | -515 | -514 | -938 | -652 | -747 | -684 | -829 | -791 | -349 | -268 |
| 1972 | -257 | -359 | -456 | -523 | -728 | -777 | -684 | -591 | -795 | -830 | -91 | -233 |
| 1973 | -276 | -339 | -360 | -519 | -273 | -146 | -361 | -487 | -587 | -300 | -323 | -225 |
| 1974 | -277 | -321 | -594 | -775 | -627 | -716 | -810 | -797 | -783 | -848 | -228 | -240 |
| 1975 | -192 | -268 | -470 | -356 | -426 | -434 | -945 | -836 | -635 | -666 | -510 | -215 |
| 1976 | -293 | -498 | -640 | -614 | -511 | -593 | -744 | -680 | -787 | -453 | -186 | -188 |
| 1977 | -451 | -321 | -269 | -380 | -192 | -65 | -358 | -462 | -439 | -262 | -343 | -183 |
| 1978 | -205 | -217 | -518 | -513 | -408 | -379 | -781 | -695 | -498 | -481 | -84 | -311 |

The results of each of the 18 Risk Simulation runs of RiskMod are provided for use in the ToolKit Model. The weighting of 5 of the 18 fish and wildlife scenarios to reflect the probability of occurrence of the adjusted and unadjusted schedules is performed external to RiskMod by ToolKit analysts. The ToolKit analysts accomplish this task by taking a sample of the RiskMod results for those five Fish and Wildlife Alternatives. *See* Volume 1, Chapter 12 of Revenue Requirement Study Documentation, WP-02-FS-BPA-02A.

**1.6.2 PNW Hydro Generation**. PNW hydro generation risk associated with the potential adoption of 1 of the 18 fish and wildlife scenarios is incorporated into RiskMod to account for the impact that changes in hydro operations, due to fish and wildlife requirements, have on monthly HLH and LLH spot market electricity prices. These changes in HLH and LLH spot market electricity prices are estimated by the AURORA Model and they impact BPA's surplus energy revenues and power purchase expenses.

For each of the 18 fish and wildlife scenarios, PNW hydro generation for each of the 50 water years are derived by adding negative and positive average monthly Federal hydro generation deltas for FY 2002–2006 to monthly PNW hydro generation data for FY 2004 from the Hydroregulation component of the Loads and Resources Study, WP-02-FS-BPA-01.

The impact that hydro operations for the 18 fish and wildlife scenarios have on spot market electricity prices is quantified by inputting three different sets of PNW hydro generation data for each of the 50 water years into the AURORA Model to estimate three sets of HLH and LLH monthly spot market electricity prices. The PNW hydro generation data selected to estimate

these three sets of prices are based on sorting the 18 fish and wildlife scenarios into three groups that have similar five-year average Federal hydro generation levels for FY 2002–2006.

After grouping the 18 fish and wildlife scenarios into 8,500, 8,000, and 7,500 aMW of Federal hydro generation, a representative fish alternative for each of the three groups is selected. All the fish alternatives grouped within a group use the same set of spot market electricity prices when calculating net revenues in RevSim. The PNW hydro generation levels associated with each of the three representative fish and wildlife scenarios are input into the AURORA Model to produce three sets of 300 simulated HLH and LLH monthly spot market electricity prices for FY 2002-2006.

Table 23 contains the list of the 18 fish and wildlife scenarios sorted into each of the three groups used for developing the three sets of 300 simulated spot market electricity prices by the AURORA Model. The hydro generation data for 1 Fish and Wildlife Alternative was selected to estimate prices in AURORA for the 8,500 aMW group. Similarly, 9 Fish and Wildlife Alternatives were selected to estimate prices in AURORA for the 8,000 aMW group and 13 Fish and Wildlife Alternative were selected to estimate prices in AURORA for the 7,500 aMW group.

### 1.7 PNW and BPA Load Uncertainty

PNW load uncertainty is incorporated into the Risk Analysis Study to account for the impact that PNW load uncertainty has on monthly HLH and LLH spot market electricity prices--which impacts BPA's surplus energy revenues and power purchase expenses. This impact is accounted

# Table 23: Fish and Wildlife Scenario Groups for Estimating Three Sets of AURORA Prices

| | Group 1 (8500 aMW) | Average Federal Generation |
|---|---|---|
| 1 | In-River Migration (low option) | 8500 |
| 2 | In-River Migration (high option) with CWA | 8515 |
| 3 | Expanded Transport | 8553 |
| 4 | Expanded Transport (low option) | 8664 |
| 5 | Transportation Plus | 8500 |
| 6 | Transportation Plus and CWA | 8500 |
| 10 | John Day Dam to Natural River | 8500 |
| 11 | John Day Dam to Spillway Crest | 8500 |
| 14 | Two Snake River Dams to Natural River - Adj. Sch | 8470 |
| 15 | Four Snake River Dams to Natural River - Adj Sch | 8468 |
| 16 | Snake River and JDA Dams to Natural River - Adj Sch | 8472 |
| 17 | Snake River Dams to Natural River and JDA Dam to Spillway Crest - Adj Sch | 8467 |
| | **Group 2 (8000 aMW)** | |
| 7 | Two Snake River Dams to Natural River | 8104 |
| 8 | Four Snake River Dams to Natural River | 7949 |
| 9 | Snake River and JDA Dams to Natural River | 7953 |
| 12 | Snake River Dams to Natural River and JDA Dam to Spillway Crest | 7944 |
| 18 | Snake River and JDA Dams to Natural River (high option) plus CWA - Adj Sch | 8067 |
| | **Group 3 (7500 aMW)** | |
| 13 | Snake River and JDA Dams to Natural River (high option) plus CWA | 7598 |

for by inputting into the AURORA Model various PNW load values and having it estimate the associated HLH and LLH spot market electricity prices.

BPA load uncertainty is incorporated into the Risk Analysis Study to account for the impact that monthly PF load variability has on Priority Firm Power (PF) revenues, surplus energy revenues, and power purchase expenses. This impact is accounted for by inputting into RevSim various monthly load variability values that modify the amount of PF loads served by BPA.

**1.7.1 PNW and BPA Load Variability.** Only monthly PNW load variability is modeled in the PNW Load Risk Model. BPA monthly load variability is derived such that the same percentage changes in PNW loads are used to quantify BPA load variability.

The PNW Load Risk Model is designed to incorporate forecasted monthly load data from the AURORA Model such that, when no risk is being simulated for 1998-2006, the forecasted monthly loads match the sum of the forecasted loads for the three regions (Oregon/Washington, Idaho, and Montana) that comprise the PNW in the AURORA Model. This process results in the simulated loads reflecting variability in loads relative to the forecasted loads that AURORA uses to perform the Marginal Cost Analysis. *See* Marginal Cost Analysis Study, WP-02-FS-BPA-04.

Variability in monthly BPA loads is derived from simulated PNW loads by dividing simulated loads by forecasted PNW loads to obtain ratios that are values relative to 1.00 (when the simulated loads equal the forecasted loads). For instance, a value of 1.05 translates into a 5 percent increase in PNW loads and into a 5 percent increase in BPA loads.

PNW (and indirectly BPA) load variability is modeled in the PNW Load Risk Model such that annual load growth variability and monthly load swings due to weather conditions are both accounted for in one PNW load variability factor. This task is accomplished by first simulating annual load growth for years from FY 1998–2006 and then, subsequently, simulating the impact of monthly load swings due to weather on the simulated monthly loads that include load growth.

**1.7.2 PNW and BPA Annual Load Growth Risk.** PNW (and indirectly BPA) annual load growth risk is modeled using a random-walk technique. This quantitative method simulates various annual average load levels through time with the starting point for simulating annual average load in a given year being the annual average load level from the previous year. Under this method, simulated annual average loads randomly increase and decrease through time from the annual average load level of the prior year with the results including outcomes that represent periods of strong load growth, weak load growth, and vacillating positive and negative load growth.

Input data from the AURORA Model used in the PNW Load Risk Model are the following: (1) annual average 1997 PNW load; (2) forecasted annual load growth (1.52 percent) for 1998-2006; and (3) monthly load shaping factors (values relative to 1.00) that are derived for use in AURORA by dividing historical monthly loads by historical annual average loads. *See* Marginal Cost Analysis Study, WP-02-FS-BPA-04. Inputting the data used by the AURORA Model allows the PNW Load Risk Model to replicate the forecasted monthly PNW loads in AURORA.

Load growth variability is incorporated into the PNW Load Risk Model by sampling values from standard normal distributions (normal distributions with a mean of zero and a standard deviation of one) in @RISK, multiplying the sampled values by an annual load growth standard deviation, and adding the simulated positive and negative values to the annual load level of the prior year. The values sampled from the standard normal distribution are in terms of the number of positive or negative standard deviations. Variability in monthly loads due to load growth risk is derived by multiplying variable annual loads by deterministic monthly load shape factors. The annual load growth standard deviation used in the PNW Load Risk Model is 3 percent, which was the input value used for annual load growth variability in Power Marketing Decision Analysis Model (PMDAM) for the PNW when performing the MCA in the 1996 rate case (*see* Marginal Cost Analysis Study Documentation, WP-96-FS-BPA-04A, Part 2 of 2; page 306).

**1.7.3 PNW and BPA Load Risk Due to Weather Conditions.** Monthly PNW (and indirectly BPA) load variability due to weather conditions is quantified by first sampling values from standard normal distributions in @RISK, then multiplying the sampled values by monthly load standard deviations, and finally adding the resulting positive and negative values to the simulated loads after load growth.

The monthly PNW load standard deviations are derived from utility-specific, monthly historical daily load standard deviations and forecasted 2,005 loads for PNW utilities used as input data in PMDAM when performing the MCA in the 1996 rate case (*see* Marginal Cost Analysis Study Documentation, WP-96-FS-BPA-04A, Part 2 of 2; pages 305 and 257). This derivation is accomplished by calculating composite, load-weighted, monthly load standard deviations from

utility-specific, daily load standard deviations (for the 12 months of the year) and annual average load data.

**1.7.4 Derivation of PNW/BPA Monthly Load Variability Due to Weather.** BPA assumes, for ratesetting purposes, that daily weather patterns over the course of a month are independent and that each day of a given month has the same daily load standard deviation. Accordingly, BPA used the following statistical equation to derive monthly load standard deviations from daily load standard deviations for each month. The statistical equation for calculating the standard deviation for the average of "n" number of independent random variables is the following:

$$\sigma_{\bar{x}} = \frac{\sigma_x}{\sqrt{n}}$$

Where:

$\sigma_x$ is the standard deviation for all independent random variables

$\overline{n}$ is the number of independent random variables

In the case of BPA's analysis, the number of independent random variables is the number of days in a month and the standard deviation for all the independent random variables is the daily load standard deviations for each month. The PNW monthly load standard deviations for each month are derived by inserting values for the number of days in each month and the daily load

standard deviations for each month into the equation above. Table 24 contains the calculations performed to derive PNW monthly load standard deviations from daily load standard deviations for each month. These monthly load standard deviations are input into the PNW Load Risk Model to quantify monthly load variability due to weather. Table 25 contains a copy of the PNW Load Risk Model. Results from this risk model are shown in Graph 3 for the $5^{th}$, $50^{th}$, and $95^{th}$ percentiles.

**1.7.5 Use of Simulated PNW Loads in AURORA.** The HLH and LLH spot market electricity prices associated with changes in PNW monthly loads are estimated in the AURORA Model by inputting PNW load data simulated by the PNW Load Risk Model. This process involves calculating (via the Data Manager) monthly load ratios (monthly loads divided by the annual average loads) from monthly and annual load data simulated by the PNW Load Risk Model and then inputting the monthly ratios and annual average energy loads into the AURORA Model for each simulation. These data are input into AURORA to calculate annual and monthly loads for each of the three PNW regions (Oregon/Washington, Idaho, and Montana) in AURORA. This process results in the sum of the loads for the three PNW regions in AURORA being equal to the simulated PNW loads from the PNW Load Risk Model.

## 1.8 California Hydro Generation Uncertainty

California hydro generation risk is incorporated into the Risk Analysis Study to account for the impact that variability in California hydro generation has on monthly HLH and LLH spot market electricity prices--which impacts BPA's surplus energy revenues and power purchase expenses.

# Table 24: Derivation of Load-Weighted, Monthly Load Standard Deviations for PNW

**PNW**

| | | Loads CY 2005 | Daily Load Standard Deviations | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **Jun** | **Jul** | **Aug** | **Sep** | **Oct** | **Nov** | **Dec** |
| PGE | PGEFRM | 2057 | 0.10 | 0.10 | 0.08 | 0.09 | 0.08 | 0.08 | 0.11 | 0.08 | 0.09 | 0.09 | 0.09 | 0.10 |
| PP&L | PPLFRM | 2462 | 0.12 | 0.13 | 0.10 | 0.13 | 0.12 | 0.10 | 0.16 | 0.11 | 0.12 | 0.12 | 0.12 | 0.13 |
| OIOU | OIOFRM | 2772 | 0.07 | 0.09 | 0.05 | 0.07 | 0.06 | 0.07 | 0.08 | 0.06 | 0.07 | 0.06 | 0.07 | 0.07 |
| GPUB | GPUFRM | 2827 | 0.08 | 0.08 | 0.07 | 0.08 | 0.09 | 0.07 | 0.08 | 0.07 | 0.08 | 0.09 | 0.08 | 0.09 |
| BPA | BPAFRM | 3740 | 0.09 | 0.09 | 0.06 | 0.07 | 0.06 | 0.05 | 0.06 | 0.06 | 0.07 | 0.08 | 0.09 | 0.10 |
| OIOU | PSPL | 2673 | 0.09 | 0.10 | 0.07 | 0.10 | 0.08 | 0.06 | 0.07 | 0.06 | 0.07 | 0.09 | 0.09 | 0.09 |
| GPUB | COPOSN | 1499 | 0.09 | 0.08 | 0.06 | 0.08 | 0.08 | 0.08 | 0.14 | 0.04 | 0.07 | 0.07 | 0.07 | 0.10 |
| BPA | DSIFRM | 1061 | 0.02 | 0.01 | 0.01 | 0.02 | 0.01 | 0.02 | 0.01 | 0.01 | 0.05 | 0.01 | 0.01 | 0.01 |
| BPA | DSI2Q | 2122 | 0.02 | 0.01 | 0.01 | 0.02 | 0.01 | 0.02 | 0.01 | 0.01 | 0.05 | 0.01 | 0.01 | 0.01 |
| BPA | DSINFM | 0 | 0.02 | 0.01 | 0.01 | 0.02 | 0.01 | 0.02 | 0.01 | 0.01 | 0.05 | 0.01 | 0.01 | 0.01 |
| **Total PNW** | | **21213** | | | | | | | | | | | | |

| | | Loads CY 2005 | Daily Load Variances | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **Jun** | **Jul** | **Aug** | **Sep** | **Oct** | **Nov** | **Dec** |
| PGE | PGEFRM | 2057 | 0.0100 | 0.0100 | 0.0064 | 0.0081 | 0.0064 | 0.0064 | 0.0121 | 0.0064 | 0.0081 | 0.0081 | 0.0081 | 0.0100 |
| PP&L | PPLFRM | 2462 | 0.0144 | 0.0169 | 0.0100 | 0.0169 | 0.0144 | 0.0100 | 0.0256 | 0.0121 | 0.0144 | 0.0144 | 0.0144 | 0.0169 |
| OIOU | OIOFRM | 2772 | 0.0049 | 0.0081 | 0.0025 | 0.0049 | 0.0036 | 0.0049 | 0.0064 | 0.0036 | 0.0049 | 0.0036 | 0.0049 | 0.0049 |
| GPUB | GPUFRM | 2827 | 0.0064 | 0.0064 | 0.0049 | 0.0064 | 0.0081 | 0.0049 | 0.0064 | 0.0049 | 0.0064 | 0.0081 | 0.0064 | 0.0081 |
| BPA | BPAFRM | 3740 | 0.0081 | 0.0081 | 0.0036 | 0.0049 | 0.0036 | 0.0025 | 0.0036 | 0.0036 | 0.0049 | 0.0064 | 0.0081 | 0.0100 |
| OIOU | PSPL | 2673 | 0.0081 | 0.0100 | 0.0049 | 0.0100 | 0.0064 | 0.0036 | 0.0049 | 0.0036 | 0.0049 | 0.0081 | 0.0081 | 0.0081 |
| GPUB | COPOSN | 1499 | 0.0081 | 0.0064 | 0.0036 | 0.0064 | 0.0064 | 0.0064 | 0.0196 | 0.0016 | 0.0049 | 0.0049 | 0.0049 | 0.0100 |
| BPA | DSIFRM | 1061 | 0.0004 | 0.0001 | 0.0001 | 0.0004 | 0.0001 | 0.0004 | 0.0001 | 0.0001 | 0.0025 | 0.0001 | 0.0001 | 0.0001 |
| BPA | DSI2Q | 2122 | 0.0004 | 0.0001 | 0.0001 | 0.0004 | 0.0001 | 0.0004 | 0.0001 | 0.0001 | 0.0025 | 0.0001 | 0.0001 | 0.0001 |
| BPA | DSINFM | 0 | 0.0004 | 0.0001 | 0.0001 | 0.0004 | 0.0001 | 0.0004 | 0.0001 | 0.0001 | 0.0025 | 0.0001 | 0.0001 | 0.0001 |
| **Total PNW** | | **21213** | | | | | | | | | | | | |
| Number of Days Per Month | | | 31 | 28 | 31 | 30 | 31 | 30 | 31 | 31 | 30 | 31 | 30 | 31 |
| **Weighted Daily Load Variances** | | | **0.0072** | **0.0080** | **0.0043** | **0.0069** | **0.0058** | **0.0045** | **0.0085** | **0.0044** | **0.0062** | **0.0065** | **0.0068** | **0.0082** |
| **Weighted Daily Load Standard Deviations** | | | **0.0849** | **0.0894** | **0.0654** | **0.0829** | **0.0758** | **0.0669** | **0.0921** | **0.0661** | **0.0784** | **0.0807** | **0.0822** | **0.0903** |
| **Monthly Load Standard Deviations** | | | **0.0153** | **0.0169** | **0.0118** | **0.0151** | **0.0136** | **0.0122** | **0.0165** | **0.0119** | **0.0143** | **0.0145** | **0.0150** | **0.0162** |

# Table 25: PNW Load Risk Model for 2001 - 2006

## PNW Load Variability

### PNW Load Growth Uncertainty:

| | |
|---|---|
| Initial Calendar Year (1997) Annual Average PNW Loads; Sources: AURORA | 24,126 |
| Forecasted PNW Load Growth from 1998-2006; Source: AURORA | 1.52% |
| Load Growth Standard Deviation; Source: PMDAM | 3.00% |

| Estimated Base Case Loads | | Std Normal Dist |
|---|---|---|
| CY 1998 | 24,493 | 0.0 |
| CY 1999 | 24,865 | 0.0 |
| CY 2000 | 25,243 | 0.0 |
| CY 2001 | 25,627 | 0.0 |
| CY 2002 | 26,016 | 0.0 |
| CY 2003 | 26,412 | 0.0 |
| CY 2004 | 26,813 | 0.0 |
| CY 2005 | 27,221 | 0.0 |
| CY 2006 | 27,634 | 0.0 |

| *Load Growth Dev from any specified forecasted load level* | |
|---|---|
| *CY 1998* | *24493* |
| *CY 1999* | *24865* |
| *CY 2000* | *25243* |
| *CY 2001* | *25627* |
| *CY 2002* | *26016* |
| *CY 2003* | *26412* |
| *CY 2004* | *26813* |
| *CY 2005* | *27221* |
| *CY 2006* | *27634* |

### PNW Load Variability Due to Load Growth Uncertainty

| | Calendar Year 2001 | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Jan '01 | Feb '01 | Mar '01 | Apr '01 | May '01 | Jun '01 | Jul '01 | Aug '01 | Sep '01 | Oct '01 | Nov '01 | Dec '01 | Average |
| Average Annual PNW Loads (Average Energy in aMW) | 25627 | 25627 | 25627 | 25627 | 25627 | 25627 | 25627 | 25627 | 25627 | 25627 | 25627 | 25627 | |
| PNW Monthly Load Shapes (Source: AURORA) | 1.137 | 1.108 | 1.007 | 0.938 | 0.917 | 0.936 | 0.961 | 0.947 | 0.912 | 0.940 | 1.063 | 1.134 | |
| ***Simulated Monthly PNW Loads (Average Energy in aMW)*** | 29140 | 28384 | 25817 | 24026 | 23495 | 23989 | 24626 | 24274 | 23380 | 24095 | 27239 | 29055 | **25,627 aMW** |

### PNW Load Variability Due to Load Growth and Weather Uncertainty

| | Jan '01 | Feb '01 | Mar '01 | Apr '01 | May '01 | Jun '01 | Jul '01 | Aug '01 | Sep '01 | Oct '01 | Nov '01 | Dec '01 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PNW Loads after Load Growth (Average Energy in aMW)** | 29140 | 28384 | 25817 | 24026 | 23495 | 23989 | 24626 | 24274 | 23380 | 24095 | 27239 | 29055 | **25,627 aMW** |
| **Monthly Load Standard Deviation (Derived, Via Simulation, from Daily Load Standard Deviations in PMDAM)** | 1.53% | 1.69% | 1.18% | 1.51% | 1.36% | 1.22% | 1.65% | 1.19% | 1.43% | 1.45% | 1.50% | 1.62% | |
| ***Random PNW Loads (Average Energy in aMW)*** | ***29,140*** | ***28,384*** | ***25,817*** | ***24,026*** | ***23,495*** | ***23,989*** | ***24,626*** | ***24,274*** | ***23,380*** | ***24,095*** | ***27,239*** | ***29,055*** | **25,627 aMW** |

# Table 25: PNW Load Risk Model for 2002 (Continued)

## PNW Load Variability

### PNW Load Variability Due to Load Growth Uncertainty

| | Calendar Year 2002 | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Jan '02** | **Feb '02** | **Mar '02** | **Apr '02** | **May '02** | **Jun '02** | **Jul '02** | **Aug '02** | **Sep '02** | **Oct '02** | **Nov '02** | **Dec '02** | **Average** |
| Average Annual PNW Loads (Average Energy in aMW) | 26016 | 26016 | 26016 | 26016 | 26016 | 26016 | 26016 | 26016 | 26016 | 26016 | 26016 | 26016 | |
| PNW Monthly Load Shapes (Source: AURORA) | **1.137** | **1.108** | **1.007** | **0.938** | **0.917** | **0.936** | **0.961** | **0.947** | **0.912** | **0.940** | **1.063** | **1.134** | |
| ***Simulated Monthly PNW Loads (Average Energy in aMW)*** | 29583 | 28815 | 26209 | 24391 | 23853 | 24353 | 25000 | 24643 | 23735 | 24461 | 27653 | 29497 | **26,016 aMW** |

### PNW Load Variability Due to Load Growth and Weather Uncertainty

| | **Jan '02** | **Feb '02** | **Mar '02** | **Apr '02** | **May '02** | **Jun '02** | **Jul '02** | **Aug '02** | **Sep '02** | **Oct '02** | **Nov '02** | **Dec '02** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PNW Loads after Load Growth (Average Energy in aMW)** | 29583 | 28815 | 26209 | 24391 | 23853 | 24353 | 25000 | 24643 | 23735 | 24461 | 27653 | 29497 | **26,016 aMW** |
| **Monthly Load Standard Deviation (Derived, Via Simulation, from Daily Load Standard Deviations in PM** | 1.53% | 1.69% | 1.18% | 1.51% | 1.36% | 1.22% | 1.65% | 1.19% | 1.43% | 1.45% | 1.50% | 1.62% | |
| ***Random PNW Loads (Average Energy in aMW)*** | ***29,583*** | ***28,815*** | ***26,209*** | ***24,391*** | ***23,853*** | ***24,353*** | ***25,000*** | ***24,643*** | ***23,735*** | ***24,461*** | ***27,653*** | ***29,497*** | **26,016 aMW** |

# Table 25: PNW Load Risk Model for 2003 (Continued)

## PNW Load Variability

### PNW Load Variability Due to Load Growth Uncertainty

| | Calendar Year 2003 | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Jan '03** | **Feb '03** | **Mar '03** | **Apr '03** | **May '03** | **Jun '03** | **Jul '03** | **Aug '03** | **Sep '03** | **Oct '03** | **Nov '03** | **Dec '03** | **Average** |
| Average Annual PNW Loads (Average Energy in aMW) | 26412 | 26412 | 26412 | 26412 | 26412 | 26412 | 26412 | 26412 | 26412 | 26412 | 26412 | 26412 | |
| PNW Monthly Load Shapes (Source: AURORA) | **1.137** | **1.108** | **1.007** | **0.938** | **0.917** | **0.936** | **0.961** | **0.947** | **0.912** | **0.940** | **1.063** | **1.134** | |
| ***Simulated Monthly PNW Loads (Average Energy in aMW)*** | 30033 | 29253 | 26608 | 24762 | 24215 | 24723 | 25380 | 25018 | 24096 | 24833 | 28073 | 29945 | **26,412 aMW** |

### PNW Load Variability Due to Load Growth and Weather Uncertainty

| | **Jan '03** | **Feb '03** | **Mar '03** | **Apr '03** | **May '03** | **Jun '03** | **Jul '03** | **Aug '03** | **Sep '03** | **Oct '03** | **Nov '03** | **Dec '03** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PNW Loads after Load Growth (Average Energy in aMW)** | 30033 | 29253 | 26608 | 24762 | 24215 | 24723 | 25380 | 25018 | 24096 | 24833 | 28073 | 29945 | **26,412 aMW** |
| **Monthly Load Standard Deviation (Derived, Via Simulation, from Daily Load Standard Deviations in PM** | 1.53% | 1.69% | 1.18% | 1.51% | 1.36% | 1.22% | 1.65% | 1.19% | 1.43% | 1.45% | 1.50% | 1.62% | |
| ***Random PNW Loads (Average Energy in aMW)*** | ***30,033*** | ***29,253*** | ***26,608*** | ***24,762*** | ***24,215*** | ***24,723*** | ***25,380*** | ***25,018*** | ***24,096*** | ***24,833*** | ***28,073*** | ***29,945*** | **26,412 aMW** |

# Table 25: PNW Load Risk Model for 2004 (Continued)

## PNW Load Variability

### PNW Load Variability Due to Load Growth Uncertainty

| | Calendar Year 2004 | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Jan '04** | **Feb '04** | **Mar '04** | **Apr '04** | **May '04** | **Jun '04** | **Jul '04** | **Aug '04** | **Sep '04** | **Oct '04** | **Nov '04** | **Dec '04** | **Average** |
| Average Annual PNW Loads (Average Energy in aMW) | 26813 | 26813 | 26813 | 26813 | 26813 | 26813 | 26813 | 26813 | 26813 | 26813 | 26813 | 26813 | |
| PNW Monthly Load Shapes (Source: AURORA) | **1.137** | **1.108** | **1.007** | **0.938** | **0.917** | **0.936** | **0.961** | **0.947** | **0.912** | **0.940** | **1.063** | **1.134** | |
| ***Simulated Monthly PNW Loads (Average Energy in aMW)*** | 30490 | 29698 | 27012 | 25138 | 24583 | 25099 | 25766 | 25398 | 24463 | 25211 | 28500 | 30400 | **26,813 aMW** |

### PNW Load Variability Due to Load Growth and Weather Uncertainty

| | **Jan '04** | **Feb '04** | **Mar '04** | **Apr '04** | **May '04** | **Jun '04** | **Jul '04** | **Aug '04** | **Sep '04** | **Oct '04** | **Nov '04** | **Dec '04** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PNW Loads after Load Growth (Average Energy in aMW)** | 30490 | 29698 | 27012 | 25138 | 24583 | 25099 | 25766 | 25398 | 24463 | 25211 | 28500 | 30400 | **26,813 aMW** |
| **Monthly Load Standard Deviation (Derived, Via Simulation, from Daily Load Standard Deviations in PM** | 1.53% | 1.69% | 1.18% | 1.51% | 1.36% | 1.22% | 1.65% | 1.19% | 1.43% | 1.45% | 1.50% | 1.62% | |
| ***Random PNW Loads (Average Energy in aMW)*** | ***30,490*** | ***29,698*** | ***27,012*** | ***25,138*** | ***24,583*** | ***25,099*** | ***25,766*** | ***25,398*** | ***24,463*** | ***25,211*** | ***28,500*** | ***30,400*** | **26,813 aMW** |

# Table 25: PNW Load Risk Model for 2005 (Continued)

## PNW Load Variability

### PNW Load Variability Due to Load Growth Uncertainty

| | Calendar Year 2005 | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Jan '05** | **Feb '05** | **Mar '05** | **Apr '05** | **May '05** | **Jun '05** | **Jul '05** | **Aug '05** | **Sep '05** | **Oct '05** | **Nov '05** | **Dec '05** | **Average** |
| Average Annual PNW Loads (Average Energy in aMW) | 27221 | 27221 | 27221 | 27221 | 27221 | 27221 | 27221 | 27221 | 27221 | 27221 | 27221 | 27221 | |
| PNW Monthly Load Shapes (Source: AURORA) | **1.137** | **1.108** | **1.007** | **0.938** | **0.917** | **0.936** | **0.961** | **0.947** | **0.912** | **0.940** | **1.063** | **1.134** | |
| ***Simulated Monthly PNW Loads (Average Energy in aMW)*** | 30953 | 30149 | 27423 | 25520 | 24957 | 25481 | 26157 | 25784 | 24834 | 25594 | 28933 | 30862 | **27,221 aMW** |

### PNW Load Variability Due to Load Growth and Weather Uncertainty

| | **Jan '05** | **Feb '05** | **Mar '05** | **Apr '05** | **May '05** | **Jun '05** | **Jul '05** | **Aug '05** | **Sep '05** | **Oct '05** | **Nov '05** | **Dec '05** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PNW Loads after Load Growth (Average Energy in aMW)** | 30953 | 30149 | 27423 | 25520 | 24957 | 25481 | 26157 | 25784 | 24834 | 25594 | 28933 | 30862 | **27,221 aMW** |
| **Monthly Load Standard Deviation (Derived, Via Simulation, from Daily Load Standard Deviations in PN** | 1.53% | 1.69% | 1.18% | 1.51% | 1.36% | 1.22% | 1.65% | 1.19% | 1.43% | 1.45% | 1.50% | 1.62% | |
| ***Random PNW Loads (Average Energy in aMW)*** | ***30,953*** | ***30,149*** | ***27,423*** | ***25,520*** | ***24,957*** | ***25,481*** | ***26,157*** | ***25,784*** | ***24,834*** | ***25,594*** | ***28,933*** | ***30,862*** | **27,221 aMW** |

# Table 25: PNW Load Risk Model for 2006 (Continued)

## PNW Load Variability

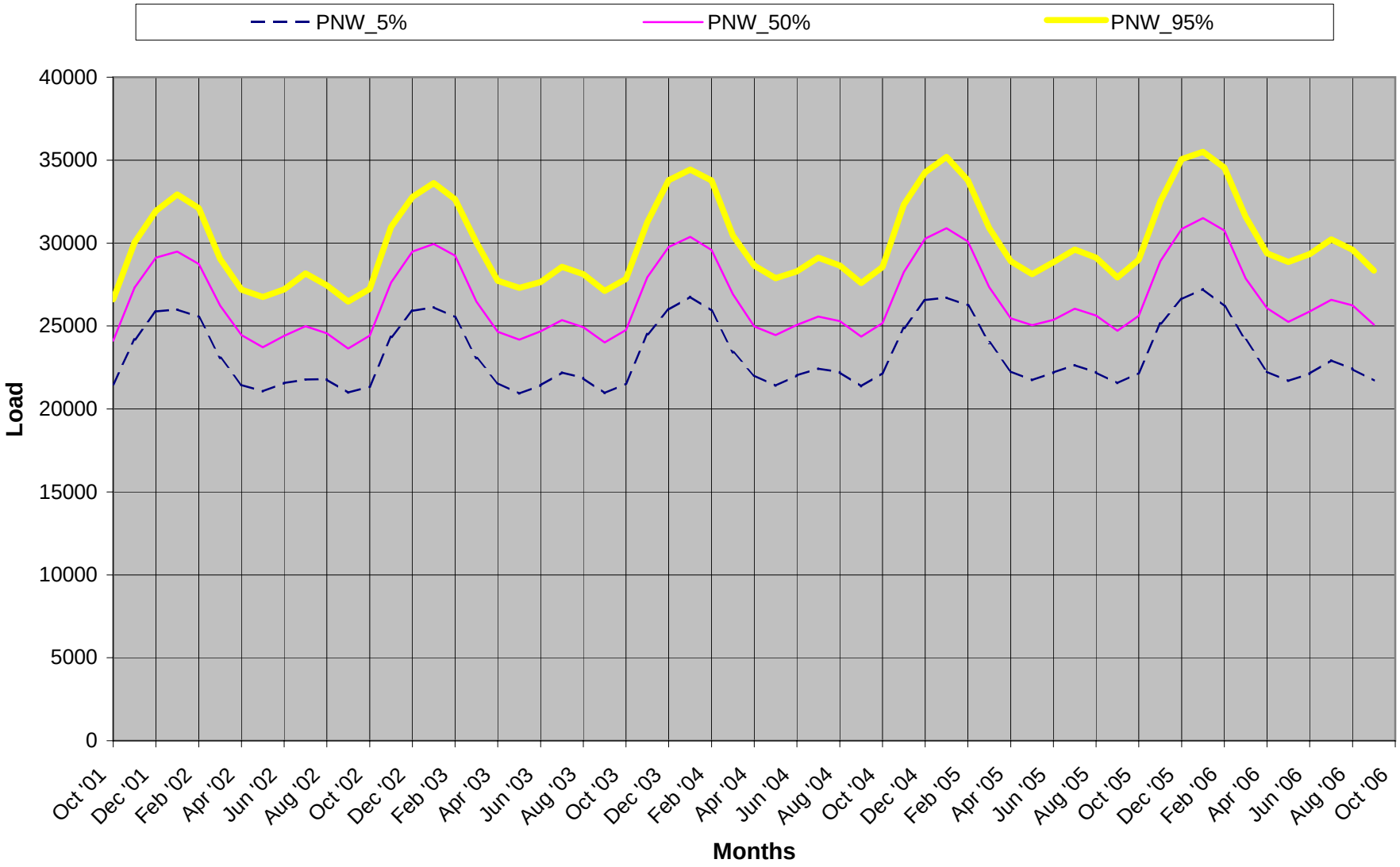
### PNW Load Variability Due to Load Growth Uncertainty

| | Calendar Year 2006 | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Jan '06** | **Feb '06** | **Mar '06** | **Apr '06** | **May '06** | **Jun '06** | **Jul '06** | **Aug '06** | **Sep '06** | **Oct '06** | **Nov '06** | **Dec '06** | **Average** |
| Average Annual PNW Loads (Average Energy in aMW) | 27634 | 27634 | 27634 | 27634 | 27634 | 27634 | 27634 | 27634 | 27634 | 27634 | 27634 | 27634 | |
| PNW Monthly Load Shapes (Source: AURORA) | **1.137** | **1.108** | **1.007** | **0.938** | **0.917** | **0.936** | **0.961** | **0.947** | **0.912** | **0.940** | **1.063** | **1.134** | |
| ***Simulated Monthly PNW Loads (Average Energy in aMW)*** | 31423 | 30608 | 27840 | 25908 | 25336 | 25868 | 26555 | 26176 | 25212 | 25983 | 29373 | 31331 | **27,634 aMW** |

### PNW Load Variability Due to Load Growth and Weather Uncertainty

| | **Jan '06** | **Feb '06** | **Mar '06** | **Apr '06** | **May '06** | **Jun '06** | **Jul '06** | **Aug '06** | **Sep '06** | **Oct '06** | **Nov '06** | **Dec '06** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PNW Loads after Load Growth (Average Energy in aMW)** | 31423 | 30608 | 27840 | 25908 | 25336 | 25868 | 26555 | 26176 | 25212 | 25983 | 29373 | 31331 | **27,634 aMW** |
| **Monthly Load Standard Deviation (Derived, Via Simulation, from Daily Load Standard Deviations in PN** | 1.53% | 1.69% | 1.18% | 1.51% | 1.36% | 1.22% | 1.65% | 1.19% | 1.43% | 1.45% | 1.50% | 1.62% | |
| ***Random PNW Loads (Average Energy in aMW)*** | ***31,423*** | ***30,608*** | ***27,840*** | ***25,908*** | ***25,336*** | ***25,868*** | ***26,555*** | ***26,176*** | ***25,212*** | ***25,983*** | ***29,373*** | ***31,331*** | **27,634 aMW** |

## Graph 3: Simulated PNW Loads for 2002 - 2006



**1.8.1 Modeling Hydro Risk.** California hydro generation risk is incorporated into the Risk Analysis Study by sampling 18 years of historical monthly California hydro generation data and estimating the associated monthly HLH and LLH spot market electricity prices in the AURORA Model. The historical monthly California hydro generation data used to incorporate risk were collected from reports published by the Energy Information Administration (EIA) for 1980-1997 and are reported in Table 26.

**1.8.2 Sampling Hydro Generation.** California hydro generation risk is modeled in RiskMod by randomly sampling, in the @RISK computer software, values from 1 to 18 (which represent each of the 18 hydro generation years) and using the associated hydro generation data in a continuous manner like that used for the 50 water year analysis. The random selection of the initial hydro generation year (for FY 2002) is accomplished by sampling real values ranging from 1 to 18 from a uniform probability distribution in a risk simulation model and subsequently converting each number to the nearest integer value (whole numbers). Given the sampled hydro generation year, the corresponding monthly California hydro generation data for that year are selected for the first year of the rate period (FY 2002).

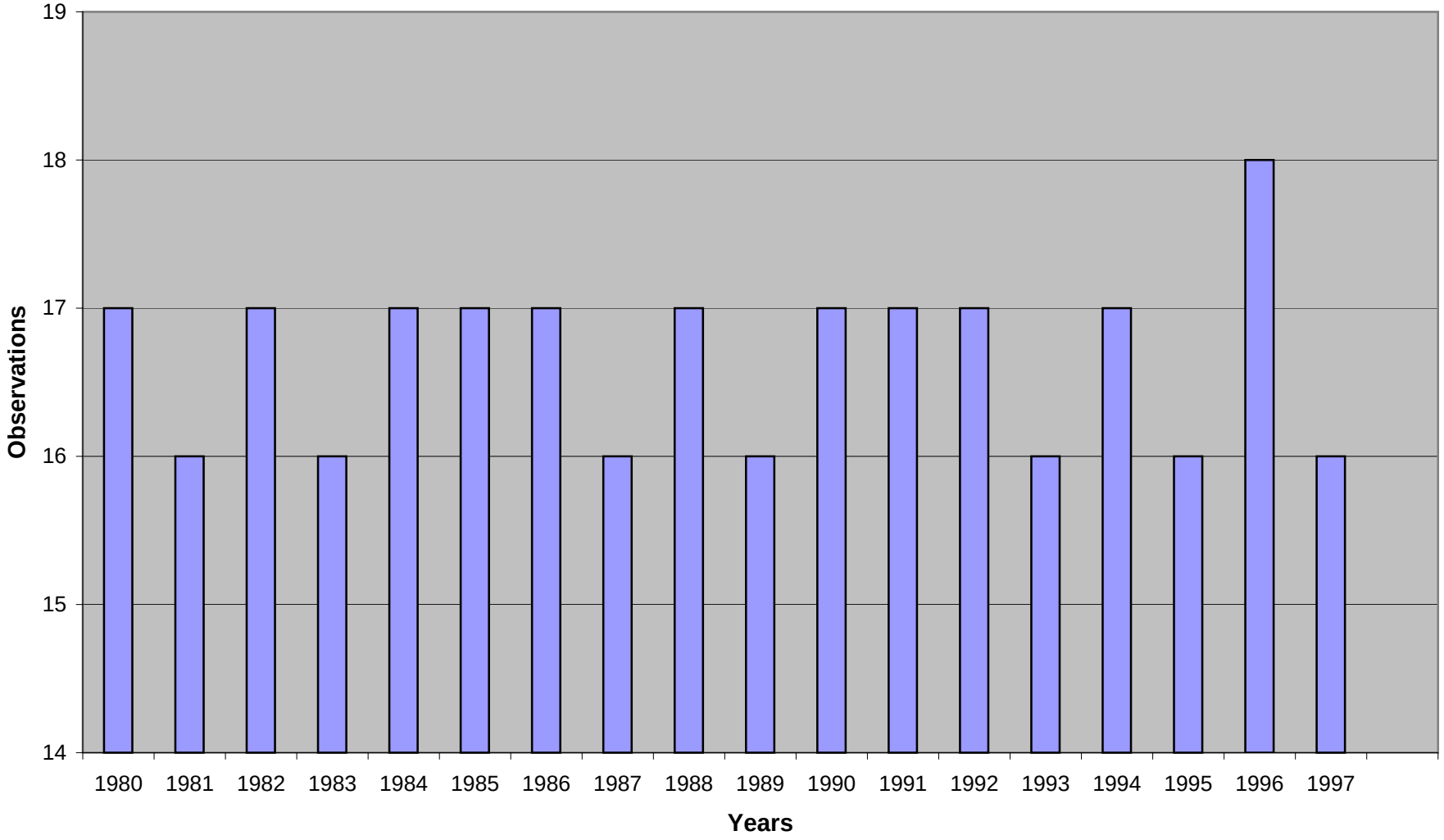
Graph 4 reports the number of times that each of the 18 years of hydro generation data were sampled from a uniform probability distribution for 300 simulations. The uniform probability distribution was selected for use in the risk simulation model because it appropriately assigns equal probability to each of the 18 years of data being sampled. The average number of times that each hydro generation year could have been sampled for 300 simulations is 16.67 (300/18).

# Table 26: California Hydro Generation for 1980 - 1997

| | FY | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1980 | 2983 | 2486 | 3179 | 5011 | 5351 | 6007 | 5438 | 5128 | 4957 | 5087 | 4858 | 4418 |
| 2 | 1981 | 3210 | 3132 | 3142 | 2450 | 2701 | 2894 | 3471 | 3633 | 3931 | 4043 | 3667 | 3243 |
| 3 | 1982 | 2179 | 3167 | 5336 | 5649 | 5884 | 6243 | 6757 | 6800 | 6332 | 5809 | 5587 | 5146 |
| 4 | 1983 | 4036 | 4933 | 5649 | 5778 | 6903 | 7276 | 7075 | 7563 | 7547 | 6945 | 6302 | 5601 |
| 5 | 1984 | 4668 | 5338 | 6956 | 6786 | 5430 | 5250 | 5222 | 5110 | 5375 | 5517 | 5235 | 4501 |
| 6 | 1985 | 3261 | 3315 | 3950 | 3195 | 3594 | 3522 | 4176 | 4366 | 3943 | 4501 | 3962 | 3476 |
| 7 | 1986 | 3114 | 3276 | 3062 | 3215 | 4975 | 6784 | 5851 | 5423 | 5701 | 5621 | 4812 | 4721 |
| 8 | 1987 | 3750 | 3274 | 2710 | 2011 | 2342 | 2446 | 3118 | 3230 | 3322 | 3923 | 3548 | 3081 |
| 9 | 1988 | 2422 | 1951 | 2214 | 2327 | 2115 | 2392 | 2764 | 2792 | 3524 | 4238 | 3687 | 2779 |
| 10 | 1989 | 1677 | 1858 | 1887 | 1421 | 2060 | 3349 | 4318 | 4313 | 4557 | 5048 | 4415 | 3149 |
| 11 | 1990 | 2605 | 2665 | 2454 | 1995 | 1671 | 2656 | 3128 | 3164 | 3428 | 4081 | 3712 | 2692 |
| 12 | 1991 | 2522 | 1828 | 1626 | 1267 | 1146 | 1626 | 1978 | 2293 | 3711 | 3992 | 3398 | 2879 |
| 13 | 1992 | 2157 | 1664 | 1776 | 1478 | 1767 | 1991 | 2369 | 3071 | 2978 | 3106 | 2559 | 2078 |
| 14 | 1993 | 1687 | 1424 | 1704 | 2403 | 3463 | 5177 | 5785 | 6293 | 6650 | 5819 | 5071 | 3604 |
| 15 | 1994 | 2878 | 2515 | 2703 | 1767 | 1708 | 2409 | 2713 | 3226 | 3860 | 3989 | 3599 | 2403 |
| 16 | 1995 | 1875 | 1465 | 2203 | 3738 | 5443 | 6431 | 7339 | 7484 | 7507 | 6694 | 6121 | 4915 |
| 17 | 1996 | 3853 | 2910 | 2591 | 3013 | 5684 | 6597 | 6871 | 6954 | 6089 | 5442 | 4883 | 3688 |
| 18 | 1997 | 3003 | 2926 | 5204 | 5597 | 5923 | 5171 | 4896 | 5321 | 5489 | 5245 | 4796 | 3838 |

Source: Energy Information Administration (EIA) - Electric Power Monthly, Table 11. Electric Utility Hydroelectric Net Generation by Census Division and State, 1980 - 1997

**Graph 4: Number of Times California Hydro Generation for 18 Years were Sampled Based on 300 Sampled Values**



These results in Graph 4 indicate that all years, except for 1996, were sampled either 16 or 17 times. The hydro generation data for 1996 were sampled 18 times.

After the initial year is selected for FY 2002 for a given simulation, hydro generation data for a sequential set of five years of data, starting with the hydro generation year selected for FY 2002, are selected from 1 through 18. When the end of the data is reached (at the end of 18), monthly hydro generation data for hydro generation year one is subsequently used. Thus, if a simulation starts with hydro generation data for hydro generation year 17, the simulation will use hydro generation data for years 17 and 18, as well as years 1 through 3, for a total of five sequential years of hydro generation data. Using historical California hydro generation data in this continuous manner captures the risk associated with various dry, normal, and wet weather patterns over time that are reflected in the 18 years of hydro generation data.

**1.8.3 Use of California Hydro Generation Risk in AURORA.** Variability in California hydro generation is incorporated into the AURORA Model by calculating (via the Data Manager), from monthly California hydro generation data for 18 years, California annual energy to capacity ratios (using the total capacity value for all of California in the AURORA Model), and calculating California monthly to annual hydro generation ratios. These data are input into the AURORA Model. These sets of ratios are used by AURORA to calculate the annual and then the monthly hydro generation for each of the two California regions (northern and southern California) in AURORA. This process results in the sum of the hydro generation for the two California regions in AURORA being equal to the historical monthly California hydro generation.

## 1.9 California Load Uncertainty

California load uncertainty is incorporated into the Risk Analysis Study to account for the impact that California load uncertainty has on monthly HLH and LLH spot market electricity prices--which impacts BPA's surplus energy revenues and power purchase expenses. This impact is accounted for by inputting into the AURORA Model various California load values and having it estimate the associated HLH and LLH spot market electricity prices.

The California Load Risk Model is designed to incorporate forecasted monthly load data from the AURORA Model such that, when no risk is being simulated for 1998-2006, the forecasted monthly loads match the sum of the forecasted loads for the two regions (southern and northern California) that comprise California in the AURORA Model. This process results in the simulated loads reflecting variability in loads relative to the forecasted loads that AURORA uses to perform the MCA (*see* Marginal Cost Analysis Study, WP-02-FS-BPA-04).

California load variability is modeled in the California Load Risk Model such that annual load growth variability and monthly load swings due to weather conditions are both accounted for in one California load variability factor. This task is accomplished by first simulating annual load growth for years from 1998-2006 and then, subsequently, simulating the impact of monthly load swings due to weather on the simulated monthly loads that include load growth.

**1.9.1 Annual California Load Growth Risk.** Annual California load growth risk is modeled using a random-walk technique. This quantitative method simulates various annual average load

levels through time with the starting point for simulating the annual average load in a given year being the annual average load level from the previous year. Under this method, simulated annual average loads randomly increase and decrease through time from the annual average load level of the prior year with the results including outcomes that represent periods of strong load growth, weak load growth, and vacillating positive and negative load growth.

Input data from the AURORA Model used in the California Load Risk Model are the following: (1) annual average FY 1997 California loads; (2) forecasted annual load growth (1.06 percent) for 1998 –2006; and (3) monthly load shaping factors (values relative to 1.00) that are derived for use in AURORA by dividing historical monthly loads by historical annual average loads (*see* Marginal Cost Analysis Study, WP-02-FS-BPA-04). Inputting the data used by the AURORA Model allows the California Load Risk Model to replicate the forecasted monthly California loads in AURORA.

Load growth variability is incorporated into the California Load Risk Model by sampling values from standard normal distributions (normal distributions with a mean of zero and a standard deviation of one) in @RISK, multiplying the sampled values by an annual load growth standard deviation, and adding the simulated positive and negative values to the annual load level of the prior year. The values sampled from the standard normal distribution are in terms of the number of positive or negative standard deviations and they are identical to the values sampled from the standard normal distributions used to estimate load growth risk for the PNW. By using this approach, positive/negative load growth due to the economy in California is directly linked with positive/negative load growth in the PNW due to the economy. Variability in monthly loads due

to load growth variability is derived by multiplying variable annual loads by deterministic monthly load shape factors. The annual load growth standard deviation used in the California Load Risk Model is 3 percent, which was the input value used for annual load growth variability in PMDAM for California when performing the MCA in the 1996 rate case (*see* Marginal Cost Analysis Study Documentation, WP-96-FS-BPA-04A, Part 2 of 2; page 305).

**1.9.2 California Load Risk Due to Weather Conditions.** Monthly California load variability due to weather conditions is quantified by first sampling values from standard normal distributions in @RISK, then multiplying the sampled values sampled by monthly load standard deviations, and finally adding the resulting positive and negative values to the simulated loads after load growth.

The monthly California load standard deviations are derived from utility-specific, monthly historical daily load standard deviations and forecasted 2005 loads for California utilities used as input data in PMDAM when performing the MCA in the 1996 rate case (*see* Marginal Cost Analysis Study Documentation, WP-96-FS-BPA-04A, Part 2 of 2; pages 305 and 256). This derivation is accomplished by calculating composite, load-weighted, monthly load standard deviations from utility specific, daily load standard deviations (for the 12 months of the year) and annual average load data.

**1.9.3 Derivation of California Monthly Load Variability Due to Weather Conditions.** BPA assumes, for ratesetting purposes, that daily weather patterns over the course of a month are independent and that each day of a given month has the same daily load standard deviation.

Accordingly, BPA used the following statistical equation to derive monthly load standard deviations from daily load standard deviations for each month. The statistical equation for calculating the standard deviation for the average of "n" number of independent random variables is the following:

$$\sigma_{\bar{x}} = \frac{\sigma_x}{\sqrt{n}}$$

Where:

$\sigma_x$ is the standard deviation for all independent random variables

$n$ is the number of independent random variables

In the case of BPA's analysis, the number of independent random variables is the number of days in a month and the standard deviation for all the independent random variables is the daily load standard deviations for each month. The California monthly load standard deviations for each month are derived by inserting values for the number of days in each month and the daily load standard deviations for each month into the equation above. Daily California load standard deviations for each month and the resulting California monthly load standard deviations are reported in Table 27. These monthly load standard deviations are input into the California Load Risk Model to quantify monthly load variability due to weather in RiskSim. Table 28 contains a copy of the California Load Risk Model. Results from this risk model are shown in Graph 5 for the 5$^{th}$, 50$^{th}$, and 95$^{th}$ percentiles.

# Table 27: Derivation of Load-Weighted, Monthly Load Standard Deviations for California

## California

| | | Loads CY 2005 | Daily Load Standard Deviations | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **Jun** | **Jul** | **Aug** | **Sep** | **Oct** | **Nov** | **Dec** |
| SCE | SCEFRM | 11497 | 0.09 | 0.09 | 0.09 | 0.09 | 0.10 | 0.10 | 0.10 | 0.09 | 0.11 | 0.09 | 0.09 | 0.09 |
| SCE | AAAFRM | 423 | 0.09 | 0.09 | 0.09 | 0.09 | 0.10 | 0.10 | 0.10 | 0.09 | 0.11 | 0.09 | 0.09 | 0.09 |
| SCE | BCRVFM | 420 | 0.09 | 0.09 | 0.09 | 0.09 | 0.10 | 0.10 | 0.10 | 0.09 | 0.11 | 0.09 | 0.09 | 0.09 |
| SCE | DWRFRM | 910 | 0.09 | 0.09 | 0.09 | 0.09 | 0.10 | 0.10 | 0.10 | 0.09 | 0.11 | 0.09 | 0.09 | 0.09 |
| LADWP | LADFRM | 3366 | 0.09 | 0.09 | 0.10 | 0.10 | 0.10 | 0.11 | 0.12 | 0.11 | 0.12 | 0.11 | 0.10 | 0.09 |
| SDG&E | SDEFRM | 2319 | 0.07 | 0.08 | 0.07 | 0.07 | 0.08 | 0.09 | 0.09 | 0.09 | 0.10 | 0.08 | 0.07 | 0.07 |
| OSC | BGPFRM | 442 | 0.09 | 0.08 | 0.09 | 0.09 | 0.10 | 0.10 | 0.11 | 0.10 | 0.11 | 0.10 | 0.09 | 0.09 |
| OSC | IIDOFM | 474 | 0.09 | 0.08 | 0.09 | 0.09 | 0.10 | 0.10 | 0.11 | 0.10 | 0.11 | 0.10 | 0.09 | 0.09 |
| PG&E | PG&FRM | 10987 | 0.07 | 0.07 | 0.07 | 0.07 | 0.09 | 0.09 | 0.09 | 0.08 | 0.09 | 0.07 | 0.07 | 0.07 |
| ONC | NCPFRM | 393 | 0.07 | 0.07 | 0.07 | 0.07 | 0.09 | 0.09 | 0.09 | 0.08 | 0.09 | 0.07 | 0.07 | 0.07 |
| ONC | REDFRM | 130 | 0.07 | 0.07 | 0.07 | 0.07 | 0.09 | 0.09 | 0.09 | 0.08 | 0.09 | 0.07 | 0.07 | 0.07 |
| ONC | SNCFRM | 305 | 0.07 | 0.07 | 0.07 | 0.07 | 0.09 | 0.09 | 0.09 | 0.08 | 0.09 | 0.07 | 0.07 | 0.07 |
| ONC | MIDFRM | 275 | 0.07 | 0.07 | 0.07 | 0.07 | 0.09 | 0.09 | 0.09 | 0.08 | 0.09 | 0.07 | 0.07 | 0.07 |
| ONC | TIDFRM | 200 | 0.07 | 0.07 | 0.07 | 0.07 | 0.09 | 0.09 | 0.09 | 0.08 | 0.09 | 0.07 | 0.07 | 0.07 |
| ONC | SMUFRM | 1271 | 0.07 | 0.07 | 0.07 | 0.07 | 0.09 | 0.09 | 0.09 | 0.08 | 0.09 | 0.07 | 0.07 | 0.07 |
| **Total Cal** | | **33412** | | | | | | | | | | | | |

| | | Loads CY 2005 | Daily Load Variances | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **Jun** | **Jul** | **Aug** | **Sep** | **Oct** | **Nov** | **Dec** |
| SCE | SCEFRM | 11497 | 0.0081 | 0.0081 | 0.0081 | 0.0081 | 0.0100 | 0.0100 | 0.0100 | 0.0081 | 0.0121 | 0.0081 | 0.0081 | 0.0081 |
| SCE | AAAFRM | 423 | 0.0081 | 0.0081 | 0.0081 | 0.0081 | 0.0100 | 0.0100 | 0.0100 | 0.0081 | 0.0121 | 0.0081 | 0.0081 | 0.0081 |
| SCE | BCRVFM | 420 | 0.0081 | 0.0081 | 0.0081 | 0.0081 | 0.0100 | 0.0100 | 0.0100 | 0.0081 | 0.0121 | 0.0081 | 0.0081 | 0.0081 |
| SCE | DWRFRM | 910 | 0.0081 | 0.0081 | 0.0081 | 0.0081 | 0.0100 | 0.0100 | 0.0100 | 0.0081 | 0.0121 | 0.0081 | 0.0081 | 0.0081 |
| LADWP | LADFRM | 3366 | 0.0081 | 0.0081 | 0.0100 | 0.0100 | 0.0100 | 0.0121 | 0.0144 | 0.0121 | 0.0144 | 0.0121 | 0.0100 | 0.0081 |
| SDG&E | SDEFRM | 2319 | 0.0049 | 0.0064 | 0.0049 | 0.0049 | 0.0064 | 0.0081 | 0.0081 | 0.0081 | 0.0100 | 0.0064 | 0.0049 | 0.0049 |
| OSC | BGPFRM | 442 | 0.0081 | 0.0064 | 0.0081 | 0.0081 | 0.0100 | 0.0100 | 0.0121 | 0.0100 | 0.0121 | 0.0100 | 0.0081 | 0.0081 |
| OSC | IIDOFM | 474 | 0.0081 | 0.0064 | 0.0081 | 0.0081 | 0.0100 | 0.0100 | 0.0121 | 0.0100 | 0.0121 | 0.0100 | 0.0081 | 0.0081 |
| PG&E | PG&FRM | 10987 | 0.0049 | 0.0049 | 0.0049 | 0.0049 | 0.0081 | 0.0081 | 0.0081 | 0.0064 | 0.0081 | 0.0049 | 0.0049 | 0.0049 |
| ONC | NCPFRM | 393 | 0.0049 | 0.0049 | 0.0049 | 0.0049 | 0.0081 | 0.0081 | 0.0081 | 0.0064 | 0.0081 | 0.0049 | 0.0049 | 0.0049 |
| ONC | REDFRM | 130 | 0.0049 | 0.0049 | 0.0049 | 0.0049 | 0.0081 | 0.0081 | 0.0081 | 0.0064 | 0.0081 | 0.0049 | 0.0049 | 0.0049 |
| ONC | SNCFRM | 305 | 0.0049 | 0.0049 | 0.0049 | 0.0049 | 0.0081 | 0.0081 | 0.0081 | 0.0064 | 0.0081 | 0.0049 | 0.0049 | 0.0049 |
| ONC | MIDFRM | 275 | 0.0049 | 0.0049 | 0.0049 | 0.0049 | 0.0081 | 0.0081 | 0.0081 | 0.0064 | 0.0081 | 0.0049 | 0.0049 | 0.0049 |
| ONC | TIDFRM | 200 | 0.0049 | 0.0049 | 0.0049 | 0.0049 | 0.0081 | 0.0081 | 0.0081 | 0.0064 | 0.0081 | 0.0049 | 0.0049 | 0.0049 |
| ONC | SMUFRM | 1271 | 0.0049 | 0.0049 | 0.0049 | 0.0049 | 0.0081 | 0.0081 | 0.0081 | 0.0064 | 0.0081 | 0.0049 | 0.0049 | 0.0049 |
| **Total Cal** | | **33412** | | | | | | | | | | | | |
| Number of Days Per Month | | | 31 | 28 | 31 | 30 | 31 | 30 | 31 | 31 | 30 | 31 | 30 | 31 |
| **Weighted Daily Load Variances** | | | **0.0066** | **0.0066** | **0.0068** | **0.0068** | **0.0090** | **0.0093** | **0.0096** | **0.0079** | **0.0106** | **0.0071** | **0.0068** | **0.0066** |
| **Weighted Daily Load Standard Deviations** | | | **0.0811** | **0.0815** | **0.0823** | **0.0823** | **0.0948** | **0.0965** | **0.0980** | **0.0887** | **0.1028** | **0.0845** | **0.0823** | **0.0811** |
| **Monthly Load Standard Deviations** | | | **0.0146** | **0.0154** | **0.0148** | **0.0150** | **0.0170** | **0.0176** | **0.0176** | **0.0159** | **0.0188** | **0.0152** | **0.0150** | **0.0146** |

# Table 28: California Load Risk Model for 2001 - 2006

## California Load Variability

### California Load Growth Uncertainty:

| | |
|---|---|
| Initial Calendar Year (1997) Annual Average California Loads; Source: AURORA | 28,323 |
| Forecasted California Load Growth from 1998-2006; Source: AURORA | 1.06% |
| Load Growth Std Dev; Source: PMDAM | 3.00% |

| Estimated Base Case Loads | | Std Normal Dist - Using the Same as PNW |
|---|---|---|
| CY 1998 | 28,623 | 0.0 |
| CY 1999 | 28,927 | 0.0 |
| CY 2000 | 29,233 | 0.0 |
| CY 2001 | 29,543 | 0.0 |
| CY 2002 | 29,856 | 0.0 |
| CY 2003 | 30,173 | 0.0 |
| CY 2004 | 30,493 | 0.0 |
| CY 2005 | 30,816 | 0.0 |
| CY 2006 | 31,142 | 0.0 |

| *Load Growth Dev from any specified forecasted load level* | |
|---|---|
| *CY 1998* | *28623* |
| *CY 1999* | *28927* |
| *CY 2000* | *29233* |
| *CY 2001* | *29543* |
| *CY 2002* | *29856* |
| *CY 2003* | *30173* |
| *CY 2004* | *30493* |
| *CY 2005* | *30816* |
| *CY 2006* | *31142* |

### California Load Variability Due to Load Growth Uncertainty

Calendar Year 2001

| | Jan '01 | Feb '01 | Mar '01 | Apr '01 | May '01 | Jun '01 | Jul '01 | Aug '01 | Sep '01 | Oct '01 | Nov '01 | Dec '01 | Average |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Average Annual California Loads (Average Energy in aMW) | 29543 | 29543 | 29543 | 29543 | 29543 | 29543 | 29543 | 29543 | 29543 | 29543 | 29543 | 29543 | |
| California Monthly Load Shapes (Source: AURORA) | **0.952** | **0.933** | **0.921** | **0.928** | **0.954** | **1.061** | **1.125** | **1.169** | **1.075** | **0.976** | **0.945** | **0.960** | |
| ***Simulated Monthly California Loads (Average Energy in aMW)*** | 28132 | 27568 | 27213 | 27425 | 28174 | 31341 | 33249 | 34538 | 31769 | 28834 | 27907 | 28367 | **29,543 aMW** |

### California Load Variability Due to Load Growth and Weather Uncertainty

| | Jan '01 | Feb '01 | Mar '01 | Apr '01 | May '01 | Jun '01 | Jul '01 | Aug '01 | Sep '01 | Oct '01 | Nov '01 | Dec '01 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **California Loads (Average Energy in aMW); (From California Load Growth Worksheet)** | 28132 | 27568 | 27213 | 27425 | 28174 | 31341 | 33249 | 34538 | 31769 | 28834 | 27907 | 28367 | **29,543 aMW** |
| **Monthly Load Standard Deviation (Derived, Via Simulation, from Daily Load Standard Deviations in PMDAM)** | 1.46% | 1.54% | 1.48% | 1.50% | 1.70% | 1.76% | 1.76% | 1.59% | 1.88% | 1.52% | 1.50% | 1.46% | |
| ***Random California Non-Fed Loads (Average Energy in aMW)*** | ***28,132*** | ***27,568*** | ***27,213*** | ***27,425*** | ***28,174*** | ***31,341*** | ***33,249*** | ***34,538*** | ***31,769*** | ***28,834*** | ***27,907*** | ***28,367*** | **29,543 aMW** |

# Table 28: California Load Risk Model for 2002 (Continued)

## California Load Variability

### California Load Variability Due to Load Growth Uncertainty

Calendar Year 2002

| | Jan '02 | Feb '02 | Mar '02 | Apr '02 | May '02 | Jun '02 | Jul '02 | Aug '02 | Sep '02 | Oct '02 | Nov '02 | Dec '02 | Average |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Average Annual California Loads (Average Energy in aMW) | 29856 | 29856 | 29856 | 29856 | 29856 | 29856 | 29856 | 29856 | 29856 | 29856 | 29856 | 29856 | |
| California Monthly Load Shapes (Source: AURORA) | **0.952** | **0.933** | **0.921** | **0.928** | **0.954** | **1.061** | **1.125** | **1.169** | **1.075** | **0.976** | **0.945** | **0.960** | |
| ***Simulated Monthly California Loads (Average Energy in aMW)*** | 28430 | 27861 | 27502 | 27716 | 28473 | 31673 | 33601 | 34904 | 32106 | 29140 | 28203 | 28668 | **29,856 aMW** |

### California Load Variability Due to Load Growth and Weather Uncertainty

| | Jan '02 | Feb '02 | Mar '02 | Apr '02 | May '02 | Jun '02 | Jul '02 | Aug '02 | Sep '02 | Oct '02 | Nov '02 | Dec '02 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **California Loads (Average Energy in aMW); (From California Load Growth Worksheet)** | 28430 | 27861 | 27502 | 27716 | 28473 | 31673 | 33601 | 34904 | 32106 | 29140 | 28203 | 28668 | **29,856 aMW** |
| **Monthly Load Standard Deviation (Derived, Via Simulation, from Daily Load Standard Deviations** | 1.46% | 1.54% | 1.48% | 1.50% | 1.70% | 1.76% | 1.76% | 1.59% | 1.88% | 1.52% | 1.50% | 1.46% | |
| ***Random California Non-Fed Loads (Average Energy in aMW)*** | ***28,430*** | ***27,861*** | ***27,502*** | ***27,716*** | ***28,473*** | ***31,673*** | ***33,601*** | ***34,904*** | ***32,106*** | ***29,140*** | ***28,203*** | ***28,668*** | **29,856 aMW** |

# Table 28: California Load Risk Model for 2003 (Continued)

## California Load Variability

### California Load Variability Due to Load Growth Uncertainty

| | Calendar Year 2003 | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Jan '03** | **Feb '03** | **Mar '03** | **Apr '03** | **May '03** | **Jun '03** | **Jul '03** | **Aug '03** | **Sep '03** | **Oct '03** | **Nov '03** | **Dec '03** | **Average** |
| Average Annual California Loads (Average Energy in aMW) | 30173 | 30173 | 30173 | 30173 | 30173 | 30173 | 30173 | 30173 | 30173 | 30173 | 30173 | 30173 | |
| California Monthly Load Shapes (Source: AURORA) | **0.952** | **0.933** | **0.921** | **0.928** | **0.954** | **1.061** | **1.125** | **1.169** | **1.075** | **0.976** | **0.945** | **0.960** | |
| ***Simulated Monthly California Loads (Average Energy in aMW)*** | 28731 | 28156 | 27793 | 28010 | 28775 | 32009 | 33958 | 35274 | 32446 | 29449 | 28502 | 28972 | **30,173 aMW** |

### California Load Variability Due to Load Growth and Weather Uncertainty

| | **Jan '03** | **Feb '03** | **Mar '03** | **Apr '03** | **May '03** | **Jun '03** | **Jul '03** | **Aug '03** | **Sep '03** | **Oct '03** | **Nov '03** | **Dec '03** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **California Loads (Average Energy in aMW); (From California Load Growth Worksheet)** | 28731 | 28156 | 27793 | 28010 | 28775 | 32009 | 33958 | 35274 | 32446 | 29449 | 28502 | 28972 | **30,173 aMW** |
| **Monthly Load Standard Deviation (Derived, Via Simulation, from Daily Load Standard Deviations** | 1.46% | 1.54% | 1.48% | 1.50% | 1.70% | 1.76% | 1.76% | 1.59% | 1.88% | 1.52% | 1.50% | 1.46% | |
| ***Random California Non-Fed Loads (Average Energy in aMW)*** | ***28,731*** | ***28,156*** | ***27,793*** | ***28,010*** | ***28,775*** | ***32,009*** | ***33,958*** | ***35,274*** | ***32,446*** | ***29,449*** | ***28,502*** | ***28,972*** | **30,173 aMW** |

# Table 28: California Load Risk Model for 2004 (Continued)

## California Load Variability

### California Load Variability Due to Load Growth Uncertainty

Calendar Year 2004

| | Jan '04 | Feb '04 | Mar '04 | Apr '04 | May '04 | Jun '04 | Jul '04 | Aug '04 | Sep '04 | Oct '04 | Nov '04 | Dec '04 | Average |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Average Annual California Loads (Average Energy in aMW) | 30493 | 30493 | 30493 | 30493 | 30493 | 30493 | 30493 | 30493 | 30493 | 30493 | 30493 | 30493 | |
| California Monthly Load Shapes (Source: AURORA) | **0.952** | **0.933** | **0.921** | **0.928** | **0.954** | **1.061** | **1.125** | **1.169** | **1.075** | **0.976** | **0.945** | **0.960** | |
| ***Simulated Monthly California Loads (Average Energy in aMW)*** | 29036 | 28454 | 28088 | 28307 | 29080 | 32348 | 34318 | 35647 | 32790 | 29761 | 28804 | 29279 | **30,493 aMW** |

### California Load Variability Due to Load Growth and Weather Uncertainty

| | Jan '04 | Feb '04 | Mar '04 | Apr '04 | May '04 | Jun '04 | Jul '04 | Aug '04 | Sep '04 | Oct '04 | Nov '04 | Dec '04 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **California Loads (Average Energy in aMW); (From California Load Growth Worksheet)** | 29036 | 28454 | 28088 | 28307 | 29080 | 32348 | 34318 | 35647 | 32790 | 29761 | 28804 | 29279 | **30,493 aMW** |
| **Monthly Load Standard Deviation (Derived, Via Simulation, from Daily Load Standard Deviations** | 1.46% | 1.54% | 1.48% | 1.50% | 1.70% | 1.76% | 1.76% | 1.59% | 1.88% | 1.52% | 1.50% | 1.46% | |
| ***Random California Non-Fed Loads (Average Energy in aMW)*** | ***29,036*** | ***28,454*** | ***28,088*** | ***28,307*** | ***29,080*** | ***32,348*** | ***34,318*** | ***35,647*** | ***32,790*** | ***29,761*** | ***28,804*** | ***29,279*** | **30,493 aMW** |

# Table 28: California Load Risk Model for 2005 (Continued)

## California Load Variability

### California Load Variability Due to Load Growth Uncertainty

Calendar Year 2005

| | Jan '05 | Feb '05 | Mar '05 | Apr '05 | May '05 | Jun '05 | Jul '05 | Aug '05 | Sep '05 | Oct '05 | Nov '05 | Dec '05 | Average |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Average Annual California Loads (Average Energy in aMW) | 30816 | 30816 | 30816 | 30816 | 30816 | 30816 | 30816 | 30816 | 30816 | 30816 | 30816 | 30816 | |
| California Monthly Load Shapes (Source: AURORA) | **0.952** | **0.933** | **0.921** | **0.928** | **0.954** | **1.061** | **1.125** | **1.169** | **1.075** | **0.976** | **0.945** | **0.960** | |
| ***Simulated Monthly California Loads (Average Energy in aMW)*** | 29344 | 28756 | 28386 | 28607 | 29388 | 32691 | 34681 | 36025 | 33137 | 30076 | 29110 | 29589 | **30,816 aMW** |

### California Load Variability Due to Load Growth and Weather Uncertainty

| | Jan '05 | Feb '05 | Mar '05 | Apr '05 | May '05 | Jun '05 | Jul '05 | Aug '05 | Sep '05 | Oct '05 | Nov '05 | Dec '05 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **California Loads (Average Energy in aMW); (From California Load Growth Worksheet)** | 29344 | 28756 | 28386 | 28607 | 29388 | 32691 | 34681 | 36025 | 33137 | 30076 | 29110 | 29589 | **30,816 aMW** |
| **Monthly Load Standard Deviation (Derived, Via Simulation, from Daily Load Standard Deviations** | 1.46% | 1.54% | 1.48% | 1.50% | 1.70% | 1.76% | 1.76% | 1.59% | 1.88% | 1.52% | 1.50% | 1.46% | |
| ***Random California Non-Fed Loads (Average Energy in aMW)*** | ***29,344*** | ***28,756*** | ***28,386*** | ***28,607*** | ***29,388*** | ***32,691*** | ***34,681*** | ***36,025*** | ***33,137*** | ***30,076*** | ***29,110*** | ***29,589*** | **30,816 aMW** |

# Table 28: California Load Risk Model for 2006 (Continued)

## California Load Variability

### California Load Variability Due to Load Growth Uncertainty

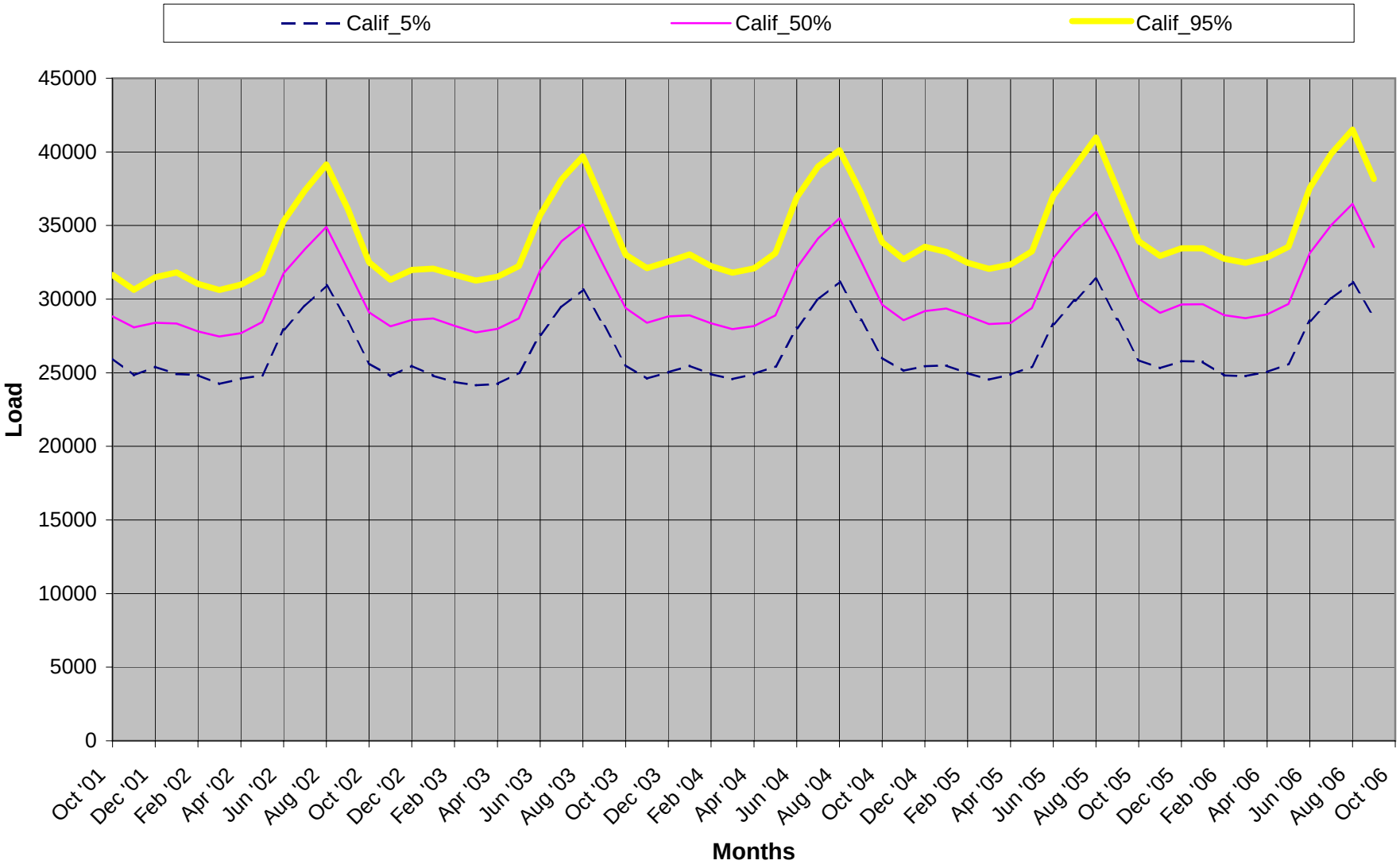
Calendar Year 2006

| | Jan '06 | Feb '06 | Mar '06 | Apr '06 | May '06 | Jun '06 | Jul '06 | Aug '06 | Sep '06 | Oct '06 | Nov '06 | Dec '06 | Average |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Average Annual California Loads (Average Energy in aMW) | 31142 | 31142 | 31142 | 31142 | 31142 | 31142 | 31142 | 31142 | 31142 | 31142 | 31142 | 31142 | |
| California Monthly Load Shapes (Source: AURORA) | **0.952** | **0.933** | **0.921** | **0.928** | **0.954** | **1.061** | **1.125** | **1.169** | **1.075** | **0.976** | **0.945** | **0.960** | |
| ***Simulated Monthly California Loads (Average Energy in aMW)*** | 29655 | 29061 | 28687 | 28910 | 29699 | 33037 | 35049 | 36407 | 33489 | 30395 | 29418 | 29903 | **31,142 aMW** |

### California Load Variability Due to Load Growth and Weather Uncertainty

| | Jan '06 | Feb '06 | Mar '06 | Apr '06 | May '06 | Jun '06 | Jul '06 | Aug '06 | Sep '06 | Oct '06 | Nov '06 | Dec '06 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **California Loads (Average Energy in aMW); (From California Load Growth Worksheet)** | 29655 | 29061 | 28687 | 28910 | 29699 | 33037 | 35049 | 36407 | 33489 | 30395 | 29418 | 29903 | **31,142 aMW** |
| **Monthly Load Standard Deviation (Derived, Via Simulation, from Daily Load Standard Deviations** | 1.46% | 1.54% | 1.48% | 1.50% | 1.70% | 1.76% | 1.76% | 1.59% | 1.88% | 1.52% | 1.50% | 1.46% | |
| ***Random California Non-Fed Loads (Average Energy in aMW)*** | ***29,655*** | ***29,061*** | ***28,687*** | ***28,910*** | ***29,699*** | ***33,037*** | ***35,049*** | ***36,407*** | ***33,489*** | ***30,395*** | ***29,418*** | ***29,903*** | **31,142 aMW** |

## Graph 5: Simulated California Loads for 2002 - 2006



**1.9.4 Use of Simulated California Loads in AURORA.** The HLH and LLH spot market electricity prices associated with changes in California monthly loads are estimated in the AURORA Model by inputting California load data simulated by the California Load Risk Model. This process involves calculating (via the Data Manager) monthly load ratios (monthly loads divided by the annual average loads) from monthly and annual load data simulated by the California Load Risk Model and then inputting the monthly ratios and annual average energy loads into the AURORA Model for each simulation. These data are input into AURORA to calculate annual and monthly loads for each of the two California regions (southern and northern California) in AURORA. This process results in the sum of the loads for the two California regions in AURORA being equal to the simulated California loads from the California Load Risk Model.

## 1.10 Natural Gas Price Uncertainty

Variability in natural gas prices is incorporated into the Risk Analysis Study to account for the impact that natural gas price uncertainty has on monthly HLH and LLH spot market electricity prices--which impacts BPA's surplus energy revenues and power purchase expenses. This impact is accounted for by inputting into the AURORA Model the simulated real monthly natural gas prices from the Natural Gas Price Risk Model and having AURORA estimate the associated nominal monthly HLH and LLH spot market electricity prices for each simulation.

The Natural Gas Price Risk Model is designed to simulate various gas price patterns through time. The modeling method used to simulate gas price patterns through time is a mean-reverting,

random-walk technique. The random-walk technique simulates monthly natural gas prices through time with the starting point for simulating the natural gas price in a given month being the monthly natural gas price from the prior month. Under this method, simulated monthly natural gas prices randomly increase and decrease through time from the natural gas price of the prior month. The mean-reverting technique causes simulated natural gas prices to tend to revert to the mean, or forecasted, prices, as prices move further from forecasted prices (either higher or lower).

**1.10.1 Inputs into the Natural Gas Price Risk Model.** The Natural Gas Price Risk Model is designed to simulate variable natural gas prices based on natural gas prices used in the AURORA Model to perform the MCA (*see* Marginal Cost Analysis Study, WP-02-FS-BPA-04). To accomplish this task, forecasted average annual delivered natural gas prices (in real $) to southern California for 1999-2006 and monthly gas price shape data (values relative to 1.00) from AURORA are input into the Natural Gas Price Risk Model. *Id.* With this data, the deterministic forecasted monthly prices in AURORA are calculated in the Natural Gas Price Risk Model by multiplying the annual average natural gas prices by the monthly gas price shapes. *Id.*

Additional information input into the Natural Gas Price Risk Model are minimum and maximum delivered gas price constraints (in real $) and monthly standard deviations for natural gas prices calculated from historical monthly spot market gas prices in terms of price movements from one month to the next month. Minimum and maximum delivered gas price constraints used in the

Natural Gas Risk Model are $1.25/MMBTU (Million British Thermal Units) and $4.50/MMBTU. These price constraints are determined based on BPA's professional judgment.

Historical monthly spot market gas prices used to calculate the standard deviations for month-to-month price movements are for Ignacio, Colorado, from January 1989 through December 1998. Monthly price variability is estimated in terms of month-to-month price changes so that price movements through time could be modeled using the random-walk technique.

**1.10.2 Modeling Natural Gas Price Variability.** Statistical parameters needed to quantify risk in probability distributions in the Natural Gas Price Risk Model are developed from the Ignacio price data. This quantification allows the variability in the historical natural gas price data for Ignacio to be incorporated into the Natural Gas Price Risk Model. This process is performed in the following manner: (1) the differences (deltas) between gas prices from one month to the next month for all months from January 1989 through December 1998 are calculated; (2) the price deltas according to month are accumulated; (3) the standard deviation for all the price deltas for each month are calculated; and (4) the number of standard deviations for the largest positive and negative price deltas for each month are calculated. This process results in standard deviations being calculated from 10 price deltas for all months of the year except for January (which is derived from a set of nine price deltas) and monthly maximum standard deviation values being calculated for the largest positive and negative price deltas. From the largest monthly positive and negative standard deviation values, the standard deviation value with the largest absolute value is identified for each month. Table 29 contains the

# Table 29: Statistical Parameter Calculations for Natural Gas Price Risk Model

## Ignacio Monthly Spot Gas Prices ($/MMBTU)

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Year** | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **Jun** | **Jul** | **Aug** | **Sep** | **Oct** | **Nov** | **Dec** | **Average** |
| **1989** | 1.70 | 1.63 | 1.56 | 1.67 | 1.67 | 1.62 | 1.64 | 1.63 | 1.57 | 1.55 | 1.68 | 2.26 | **1.68** |
| **1990** | 2.60 | 1.81 | 1.44 | 1.45 | 1.43 | 1.47 | 1.44 | 1.42 | 1.41 | 1.74 | 1.98 | 1.89 | **1.67** |
| **1991** | 1.62 | 1.17 | 1.03 | 1.07 | 1.04 | 1.02 | 1.04 | 1.11 | 1.26 | 1.28 | 1.70 | 1.70 | **1.25** |
| **1992** | 1.25 | 1.13 | 1.20 | 1.37 | 1.45 | 1.51 | 1.59 | 1.82 | 2.16 | 2.12 | 2.09 | 2.14 | **1.65** |
| **1993** | 2.00 | 1.72 | 2.09 | 1.97 | 1.84 | 1.71 | 1.81 | 1.95 | 2.05 | 1.87 | 1.97 | 2.04 | **1.92** |
| **1994** | 1.84 | 2.12 | 1.91 | 1.75 | 1.65 | 1.52 | 1.59 | 1.58 | 1.33 | 1.31 | 1.50 | 1.60 | **1.64** |
| **1995** | 1.28 | 1.11 | 1.10 | 1.14 | 1.16 | 1.15 | 1.02 | 1.22 | 1.28 | 1.20 | 1.25 | 1.28 | **1.18** |
| **1996** | 1.20 | 1.22 | 1.17 | 1.15 | 1.13 | 1.31 | 1.74 | 1.88 | 1.56 | 1.84 | 2.65 | 3.51 | **1.70** |
| **1997** | 3.52 | 2.42 | 1.60 | 1.72 | 1.90 | 1.97 | 2.04 | 2.26 | 2.63 | 2.77 | 2.96 | 2.17 | **2.33** |
| **1998** | 2.00 | 1.94 | 2.08 | 2.18 | 1.95 | 1.70 | 1.90 | 1.79 | 1.72 | 1.72 | 1.94 | 1.71 | **1.89** |
| | | | | | | | | | | | | | |
| **Min** | 1.20 | 1.11 | 1.03 | 1.07 | 1.04 | 1.02 | 1.02 | 1.11 | 1.26 | 1.20 | 1.25 | 1.28 | 1.18 |
| **Avg** | **1.90** | **1.63** | **1.52** | **1.55** | **1.52** | **1.50** | **1.58** | **1.67** | **1.70** | **1.74** | **1.97** | **2.03** | **1.69** |
| **Max** | 3.52 | 2.42 | 2.09 | 2.18 | 1.95 | 1.97 | 2.04 | 2.26 | 2.63 | 2.77 | 2.96 | 3.51 | 2.33 |
| **Stdev** | **0.71** | **0.46** | **0.40** | **0.37** | **0.33** | **0.28** | **0.34** | **0.35** | **0.45** | **0.47** | **0.51** | **0.60** | **0.325** |

## Ignacio Month-to-Month Spot Gas Price Deltas ($/MMBTU)

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1989** | | -0.07 | -0.07 | 0.11 | 0.00 | -0.05 | 0.02 | -0.01 | -0.06 | -0.02 | 0.13 | 0.58 |
| **1990** | 0.34 | -0.79 | -0.37 | 0.01 | -0.02 | 0.04 | -0.03 | -0.02 | -0.01 | 0.33 | 0.24 | -0.09 |
| **1991** | -0.27 | -0.45 | -0.14 | 0.04 | -0.03 | -0.02 | 0.02 | 0.07 | 0.15 | 0.02 | 0.42 | 0.00 |
| **1992** | -0.45 | -0.12 | 0.07 | 0.17 | 0.08 | 0.06 | 0.08 | 0.23 | 0.34 | -0.04 | -0.03 | 0.05 |
| **1993** | -0.14 | -0.28 | 0.37 | -0.12 | -0.13 | -0.13 | 0.10 | 0.14 | 0.10 | -0.18 | 0.10 | 0.07 |
| **1994** | -0.20 | 0.28 | -0.21 | -0.16 | -0.10 | -0.13 | 0.07 | -0.01 | -0.25 | -0.02 | 0.19 | 0.10 |
| **1995** | -0.32 | -0.17 | -0.01 | 0.04 | 0.02 | -0.01 | -0.13 | 0.20 | 0.06 | -0.08 | 0.05 | 0.03 |
| **1996** | -0.08 | 0.02 | -0.05 | -0.02 | -0.02 | 0.18 | 0.43 | 0.14 | -0.32 | 0.28 | 0.81 | 0.86 |
| **1997** | 0.01 | -1.10 | -0.82 | 0.12 | 0.18 | 0.07 | 0.07 | 0.22 | 0.37 | 0.14 | 0.19 | -0.79 |
| **1998** | -0.17 | -0.06 | 0.14 | 0.10 | -0.23 | -0.25 | 0.20 | -0.11 | -0.07 | 0.00 | 0.22 | -0.23 |
| | | | | | | | | | | | | |
| **Average** | **-0.14** | **-0.27** | **-0.11** | **0.03** | **-0.03** | **-0.02** | **0.08** | **0.09** | **0.03** | **0.04** | **0.23** | **0.06** |

# Table 29: (Continued)

## Ignacio Month-to-Month Spot Gas Price Deltas from Average ($/MMBTU)

| Year | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1989** | | 0.20 | 0.04 | 0.08 | 0.03 | -0.03 | -0.06 | -0.10 | -0.09 | -0.06 | -0.10 | 0.52 |
| **1990** | 0.48 | -0.52 | -0.26 | -0.02 | 0.01 | 0.06 | -0.11 | -0.11 | -0.04 | 0.29 | 0.01 | -0.15 |
| **1991** | -0.13 | -0.18 | -0.03 | 0.01 | 0.00 | 0.00 | -0.06 | -0.01 | 0.12 | -0.02 | 0.19 | -0.06 |
| **1992** | -0.31 | 0.15 | 0.18 | 0.14 | 0.11 | 0.08 | 0.00 | 0.15 | 0.31 | -0.08 | -0.26 | -0.01 |
| **1993** | 0.00 | -0.01 | 0.48 | -0.15 | -0.11 | -0.11 | 0.02 | 0.05 | 0.07 | -0.22 | -0.13 | 0.01 |
| **1994** | -0.06 | 0.55 | -0.10 | -0.19 | -0.08 | -0.11 | -0.01 | -0.10 | -0.28 | -0.06 | -0.04 | 0.04 |
| **1995** | -0.18 | 0.10 | 0.10 | 0.01 | 0.05 | 0.01 | -0.21 | 0.12 | 0.03 | -0.12 | -0.18 | -0.03 |
| **1996** | 0.06 | 0.29 | 0.06 | -0.05 | 0.01 | 0.20 | 0.35 | 0.05 | -0.35 | 0.24 | 0.58 | 0.80 |
| **1997** | 0.15 | -0.83 | -0.71 | 0.09 | 0.21 | 0.09 | -0.01 | 0.14 | 0.34 | 0.10 | -0.04 | -0.85 |
| **1998** | -0.03 | 0.21 | 0.25 | 0.07 | -0.21 | -0.23 | 0.12 | -0.20 | -0.10 | -0.04 | -0.01 | -0.29 |
| **Avg** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** | **0.00** |
| **Stdev of Deltas** | **0.225** | **0.426** | **0.339** | **0.108** | **0.119** | **0.130** | **0.157** | **0.120** | **0.235** | **0.168** | **0.248** | **0.424** |
| Max | 0.48 | 0.55 | 0.48 | 0.14 | 0.21 | 0.20 | 0.35 | 0.15 | 0.34 | 0.29 | 0.58 | 0.80 |
| Min | -0.31 | -0.83 | -0.71 | -0.19 | -0.21 | -0.23 | -0.21 | -0.20 | -0.35 | -0.22 | -0.26 | -0.85 |
| **Absolute Value of #Stdev to Max** | 2.14 | 1.30 | 1.41 | 1.30 | 1.72 | 1.57 | 2.21 | 1.21 | 1.44 | 1.71 | 2.33 | 1.89 |
| **Absolute Value of #Stdev to Min** | 1.37 | 1.94 | 2.10 | 1.75 | 1.72 | 1.74 | 1.36 | 1.62 | 1.49 | 1.33 | 1.06 | 2.00 |
| **Largest #Stdev (Absolute Value)** | **2.14** | **1.94** | **2.10** | **1.75** | **1.72** | **1.74** | **2.21** | **1.62** | **1.49** | **1.71** | **2.33** | **2.00** |

historical Ignacio monthly spot market natural gas prices and the calculations used to derive these statistical parameters.

The monthly standard deviations and the monthly standard deviation values with the largest absolute value were input into truncated standard normal probability distributions in @RISK. A truncated standard normal distribution is a normal distribution having a mean of zero, a standard deviation of one, and a specified maximum and minimum value that sets an upper and lower bound on the values that can be sampled. In the @RISK computer software, this information is entered into a truncated normal probability distribution as follows:

RiskTNormal(Mean = 0, Standard deviation = 1, Min value = , Max value = ).

(Where RiskTNormal = truncated normal probability distribution in @RISK)

Under this methodology, the positive and negative values sampled from the truncated standard normal distributions are the number of standard deviations of a random price movement. The number of standard deviations sampled from the monthly truncated standard normal distributions in the Natural Gas Price Risk Model is multiplied by the monthly standard deviations, and the resulting positive or negative values are added to the simulated natural gas price for the prior month.

The mean-reversion methodology was modeled using an algorithm and a set of monthly mean reversion decay parameters (decay parameters) that adjust the value of the mean in each of the

monthly truncated standard normal distributions from the typical constant of zero. The mean-reversion methodology was modeled as follows:

Simulated monthly price changes = RiskTNormal (Monthly mean-reversion decay parameters * (1 - Simulated mean-reversion ratios), 1 - Maximum monthly standard deviation, + Maximum monthly standard deviation) * monthly standard deviations

Where:

RiskTNormal = Truncated normal probability distribution in @RISK with
Mean = Monthly mean-reversion decay parameters * (1- Simulated mean-reversion ratios)
Standard deviation = 1
Minimum value = - Maximum standard deviation
Maximum value = + Maximum standard deviation
And

Monthly mean-reversion decay parameters = Calibrated monthly price decay values
Simulated mean-reversion ratios = Simulated prior month price / Forecasted prior month price

**1.10.3 Calibrating Natural Gas Price Variability.** The final step in the modeling process is the derivation of monthly decay parameters to better calibrate the natural gas price variability simulated by the Natural Gas Price Risk Model to the historical variability reflected in the Ignacio natural gas price data. This calibration process involves running RiskMod and

modifying the monthly decay parameters. The calibration of the decay values is performed in the following manner: (1) run the model; (2) calculate monthly and annual price standard deviations from the simulated data and compare the results to monthly and annual price standard deviations for the historical data; and (3) revise the decay values to test how well the monthly and annual variability of the simulated prices for a set of monthly decay values approximate the monthly and annual variability in the historical gas price data.

BPA used the statistical approach of minimizing the sum of residuals squared to help objectively determine the relative merits of one set of monthly decay values versus another. The sum of residuals squared is calculated by squaring the difference between each historical monthly natural gas price standard deviation and each simulated monthly natural gas price deviation and summing these squared differences. The lower the sum of residuals squared, the better the simulated monthly gas price variability approximates the historical monthly gas price variability. In addition to calculating the sum of residuals squared on monthly data, a set of decay values was also subjectively assessed to see how closely the annual variability of the simulated natural gas prices approximates the annual variability in the historical natural gas price data. Table 30 contains the results from the final calibration simulation.

The use of decay parameters, coupled with each month having different month-to-month gas price standard deviations, allows the Natural Gas Price Risk Model the flexibility to simulate that natural gas prices are more volatile in some months than others and that gas prices rise and fall at different rates during the year. Thus, the flexibility associated with the methodology utilized in

## Table 30: Simulated Delivered Natural Gas Prices to Southern California for 2002 (Real$/MMBTU)

| Simulation # | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Avg | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1.9840 | 1.9595 | 2.5084 | 2.4159 | 2.3951 | 2.4384 | 2.4715 | 2.3463 | 2.3896 | 2.5521 | 2.4188 | 2.6289 | 2.38 | |
| 2 | 2.0502 | 1.7224 | 1.5027 | 1.3233 | 1.3976 | 1.5242 | 1.4458 | 1.4302 | 1.5911 | 1.3665 | 1.5705 | 2.0959 | 1.59 | |
| 3 | 2.4250 | 2.1949 | 1.6417 | 1.6290 | 1.6559 | 1.6132 | 1.5316 | 1.5868 | 1.5201 | 1.7726 | 1.7068 | 2.1696 | 1.79 | |
| 4 | 2.3423 | 1.7837 | 2.1623 | 2.0517 | 1.9160 | 1.7510 | 1.7347 | 1.9294 | 1.7339 | 1.6720 | 1.8167 | 1.7179 | 1.88 | |
| 5 | 2.6723 | 2.9655 | 2.8422 | 2.6406 | 2.7078 | 2.6462 | 2.7272 | 2.7651 | 2.7941 | 2.9322 | 2.9511 | 2.4758 | 2.76 | |
| 6 | 1.9643 | 1.8788 | 2.1435 | 1.9152 | 1.8628 | 1.9073 | 1.5954 | 1.5042 | 1.3622 | 1.4387 | 1.6775 | 2.0057 | 1.77 | |
| 7 | 3.2740 | 2.4350 | 2.7267 | 2.4391 | 2.3391 | 2.2368 | 2.3291 | 2.4366 | 2.2480 | 2.2379 | 2.2794 | 1.7036 | 2.39 | |
| 8 | 2.2208 | 2.4948 | 2.7871 | 2.6142 | 2.5132 | 2.3505 | 2.3172 | 2.5139 | 2.4182 | 2.5119 | 2.1403 | 2.1106 | 2.42 | |
| 9 | 2.4643 | 1.6415 | 2.0535 | 1.7870 | 1.6536 | 1.7691 | 1.8542 | 2.0083 | 1.8402 | 2.0197 | 2.1336 | 2.7791 | 2.00 | |
| 10 | 2.3137 | 2.8919 | 2.5601 | 2.3437 | 2.3849 | 2.3872 | 2.4376 | 2.6019 | 2.5660 | 2.4514 | 2.3591 | 2.0954 | 2.45 | |
| | | | | | | ▪ | | | | | | | | |
| | | | | | | ▪ | | | | | | | | |
| | | | | | | ▪ | | | | | | | | |
| 290 | 2.1728 | 1.5085 | 1.4264 | 1.3742 | 1.2500 | 1.3103 | 1.3273 | 1.5561 | 1.4683 | 1.6795 | 1.9614 | 1.9939 | 1.59 | |
| 291 | 2.7403 | 2.8542 | 3.3208 | 3.1121 | 2.9290 | 2.8055 | 2.7171 | 2.7444 | 2.6155 | 2.4992 | 2.4784 | 3.2779 | 2.84 | |
| 292 | 2.1167 | 2.5503 | 2.5294 | 2.4428 | 2.3231 | 2.4003 | 2.6027 | 2.5890 | 2.7397 | 2.6303 | 2.4178 | 1.9110 | 2.44 | |
| 293 | 3.2273 | 3.4161 | 2.6570 | 2.4392 | 2.4912 | 2.6373 | 2.6137 | 2.6284 | 2.5582 | 2.5885 | 3.0186 | 2.5841 | 2.74 | |
| 294 | 2.3871 | 2.1615 | 2.0973 | 1.9832 | 2.0058 | 2.0423 | 1.9104 | 2.1297 | 1.7851 | 1.9504 | 1.9442 | 1.7954 | 2.02 | |
| 295 | 2.6980 | 2.3519 | 2.1121 | 2.0168 | 1.8059 | 1.9403 | 1.7871 | 1.8295 | 1.5614 | 1.3610 | 1.4358 | 2.4308 | 1.94 | |
| 296 | 1.8988 | 2.3961 | 2.3348 | 2.1498 | 2.0012 | 1.8829 | 1.9802 | 2.1269 | 1.9815 | 2.0892 | 2.3458 | 2.4004 | 2.13 | |
| 297 | 1.6537 | 2.0214 | 1.9805 | 1.9307 | 1.9560 | 1.8621 | 1.8152 | 2.0690 | 1.7014 | 1.9287 | 1.7462 | 2.5118 | 1.93 | |
| 298 | 2.3427 | 2.7637 | 2.5680 | 2.3183 | 2.2144 | 2.3601 | 2.3620 | 2.4316 | 2.3487 | 2.2353 | 2.0848 | 2.6332 | 2.39 | |
| 299 | 3.4849 | 3.5509 | 2.9610 | 2.6945 | 2.5029 | 2.5111 | 2.7145 | 2.6622 | 2.3039 | 2.3612 | 2.2857 | 2.1781 | 2.68 | |
| 300 | 2.7058 | 2.5720 | 2.5329 | 2.3431 | 2.2153 | 2.3389 | 2.4040 | 2.4099 | 2.0195 | 1.7179 | 2.2119 | 1.9997 | 2.29 | |
| **Avg** | **2.40** | **2.36** | **2.27** | **2.14** | **2.10** | **2.10** | **2.10** | **2.16** | **2.12** | **2.10** | **2.23** | **2.38** | **2.20** | **SIM** |
| **Max** | **3.66** | **4.03** | **3.70** | **3.50** | **3.54** | **3.36** | **3.41** | **3.56** | **3.47** | **3.48** | **3.37** | **3.69** | **3.46** | **SIM** |
| **Min** | **1.28** | **1.25** | **1.31** | **1.25** | **1.25** | **1.25** | **1.25** | **1.25** | **1.25** | **1.25** | **1.25** | **1.25** | **1.38** | **SIM** |

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Avg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Mean Reversion Rate** | **1.00** | **3.00** | **3.25** | **3.25** | **1.75** | **1.00** | **1.00** | **1.00** | **1.00** | **1.00** | **1.00** | **1.00** | |
| **Simulation Stdev** | **0.520** | **0.454** | **0.405** | **0.382** | **0.378** | **0.368** | **0.370** | **0.364** | **0.382** | **0.387** | **0.414** | **0.496** | **0.331** |
| **Historical Data Stdev** | **0.711** | **0.460** | **0.401** | **0.374** | **0.333** | **0.281** | **0.337** | **0.349** | **0.451** | **0.466** | **0.511** | **0.601** | **0.325** |
| **Sim Less Hist Stdev** | **-0.191** | **-0.005** | **0.004** | **0.008** | **0.046** | **0.087** | **0.033** | **0.015** | **-0.068** | **-0.079** | **-0.097** | **-0.105** | **0.005** |
| **Residual ^2** | **0.0366** | **0.0000** | **0.0000** | **0.0001** | **0.0021** | **0.0075** | **0.0011** | **0.0002** | **0.0046** | **0.0062** | **0.0095** | **0.0111** | **0.0000** |
| **Sum of Squares** | **79.10** | | | | | | | | | | | | |

the Natural Gas Price Risk Model allows the model to closely calibrate to the attributes of gas price movements in the historical data.

Table 31 contains a copy of the Natural Gas Price Risk Model. Results from this risk model are shown in Graph 6 for the $5^{th}$, $50^{th}$, and $95^{th}$ percentiles.

**1.10.4 Use of Simulated Natural Gas Prices in AURORA.** The price impacts associated with changes in natural gas prices are estimated in the AURORA model by inputting real monthly gas price data simulated by the Natural Gas Price Risk Model. From each simulation of monthly southern California natural gas prices (in real $), annual gas prices and monthly gas price ratios (monthly gas prices divided by annual gas prices) are derived. From this data, simulated monthly and annual gas prices are derived for each of the 12 regions that represent the Western Systems Coordinating Council (WSCC) region in AURORA. This task is accomplished by adding deterministic positive/negative annual average price basis differences for each of the remaining 11 regions in AURORA to the simulated annual average delivered natural gas prices for southern California to get annual average natural gas prices for all 12 regions. Monthly natural gas prices for each of the remaining 11 regions are derived by using the simulated monthly gas price ratios for southern California to yield monthly natural gas prices for all 12 regions (*see* Marginal Cost Analysis Study, WP-02-FS-BPA-04, for further discussion of AURORA).

# Table 31: Natural Gas Price Risk Model

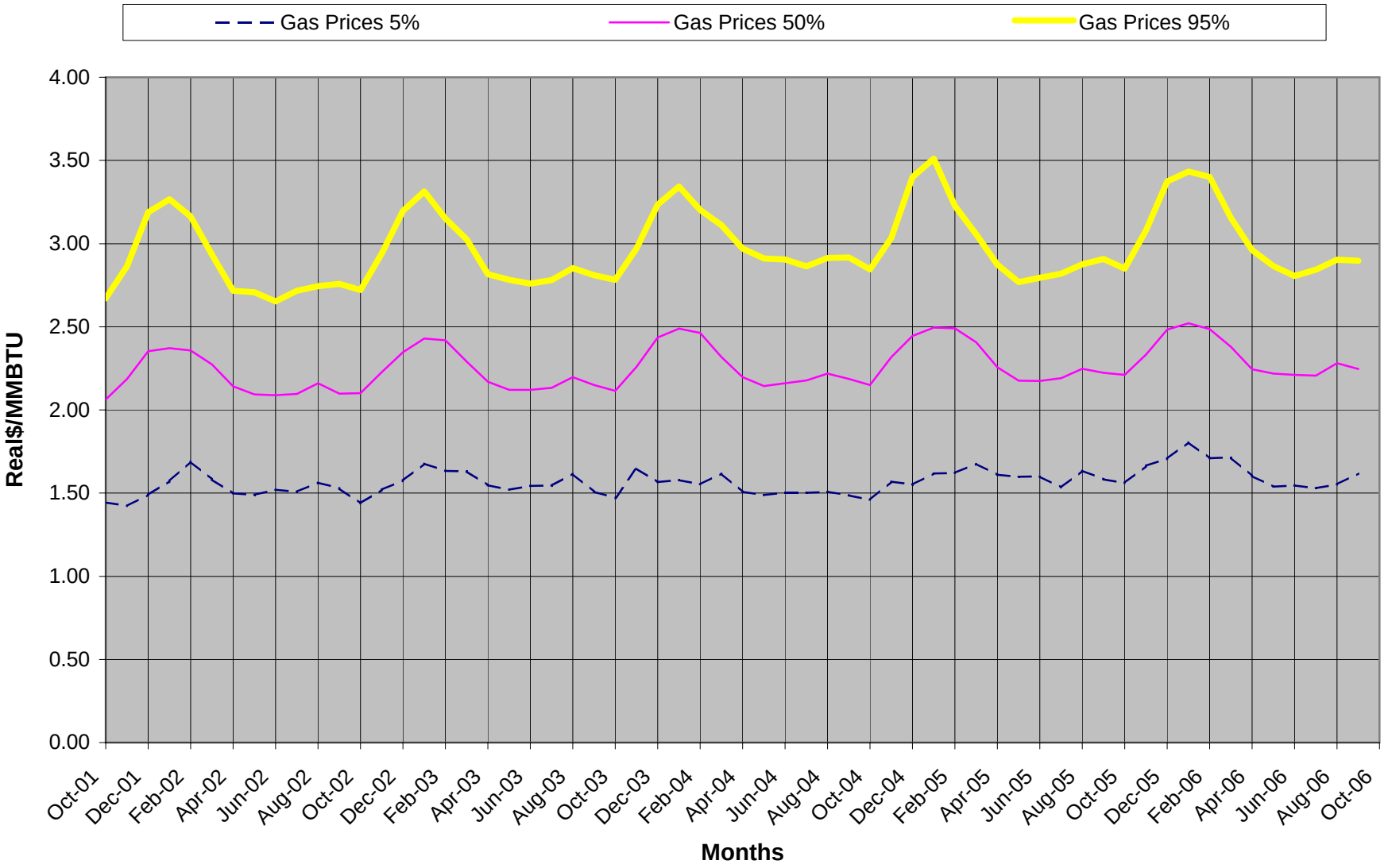
| S. California Real Delivered Prices from AURORA | Base Case | Minimum | Maximum | Sim Unconstrained | Sim Constrained |
|---|---|---|---|---|---|
| CY 1999 Avg | 1.88 | 1.25 | 4.50 | 1.88 | 1.88 |
| CY 2000 Avg | 2.11 | 1.25 | 4.50 | 2.11 | 2.11 |
| CY 2001 Avg | 2.16 | 1.25 | 4.50 | 2.16 | 2.16 |
| CY 2002 Avg | 2.20 | 1.25 | 4.50 | 2.20 | 2.20 |
| CY 2003 Avg | 2.24 | 1.25 | 4.50 | 2.24 | 2.24 |
| CY 2004 Avg | 2.27 | 1.25 | 4.50 | 2.27 | 2.27 |
| CY 2005 Avg | 2.31 | 1.25 | 4.50 | 2.31 | 2.31 |
| CY 2006 Avg | 2.33 | 1.25 | 4.50 | 2.33 | 2.33 |
| CY02-06 Avg | 2.27 | 1.25 | 4.50 | 2.27 | 2.27 |

| | Expected Price ($/MMBTU) | Standard Normal Truncated Distribution N(var mean, 1) | Standard Deviation | Price Risk ($/MMBTU) | Standard Normal Distribution Mean Adjustor (Causes Mean Reversion) | Monthly Standard Deviation | Mean Reversion Adjustor (Use Values >=1) | Monthly Gas Price Shapes | Expected Price ($/MMBTU) | Minimum Price ($/MMBTU) | Maximum Price ($/MMBTU) | Unconstrained Simulated Prices ($/MMBTU) | Constrained Simulated Prices ($/MMBTU) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Initial Value | | | | | *1.00* | | | | | | | | |
| Jan-99 | 2.05 | 0.00 | 0.23 | 2.05 | 1.00 | 0.225 | 1.00 | 1.09 | 2.05 | 1.25 | 4.50 | 2.05 | 2.05 |
| Feb-99 | 2.01 | 0.00 | 0.43 | 2.01 | 1.00 | 0.426 | 3.00 | 1.07 | 2.01 | 1.25 | 4.50 | 2.01 | 2.01 |
| Mar-99 | 1.94 | 0.00 | 0.34 | 1.94 | 1.00 | 0.339 | 3.25 | 1.03 | 1.94 | 1.25 | 4.50 | 1.94 | 1.94 |
| Apr-99 | 1.82 | 0.00 | 0.11 | 1.82 | 1.00 | 0.108 | 3.25 | 0.97 | 1.82 | 1.25 | 4.50 | 1.82 | 1.82 |
| May-99 | 1.79 | 0.00 | 0.12 | 1.79 | 1.00 | 0.119 | 1.75 | 0.95 | 1.79 | 1.25 | 4.50 | 1.79 | 1.79 |
| Jun-99 | 1.79 | 0.00 | 0.13 | 1.79 | 1.00 | 0.130 | 1.00 | 0.95 | 1.79 | 1.25 | 4.50 | 1.79 | 1.79 |
| Jul-99 | 1.79 | 0.00 | 0.16 | 1.79 | 1.00 | 0.157 | 1.00 | 0.95 | 1.79 | 1.25 | 4.50 | 1.79 | 1.79 |
| Aug-99 | 1.84 | 0.00 | 0.12 | 1.84 | 1.00 | 0.120 | 1.00 | 0.98 | 1.84 | 1.25 | 4.50 | 1.84 | 1.84 |
| Sep-99 | 1.80 | 0.00 | 0.24 | 1.80 | 1.00 | 0.235 | 1.00 | 0.96 | 1.80 | 1.25 | 4.50 | 1.80 | 1.80 |
| Oct-99 | 1.79 | 0.00 | 0.17 | 1.79 | 1.00 | 0.168 | 1.00 | 0.95 | 1.79 | 1.25 | 4.50 | 1.79 | 1.79 |
| Nov-99 | 1.90 | 0.00 | 0.25 | 1.90 | 1.00 | 0.248 | 1.00 | 1.01 | 1.90 | 1.25 | 4.50 | 1.90 | 1.90 |
| Dec-99 | 2.03 | 0.00 | 0.42 | 2.03 | 1.00 | 0.424 | 1.00 | 1.08 | 2.03 | 1.25 | 4.50 | 2.03 | 2.03 |
| Jan-00 | 2.30 | 0.00 | 0.23 | 2.30 | 1.00 | 0.225 | 1.00 | 1.09 | 2.30 | 1.25 | 4.50 | 2.30 | 2.30 |
| Feb-00 | 2.26 | 0.00 | 0.43 | 2.26 | 1.00 | 0.426 | 3.00 | 1.07 | 2.26 | 1.25 | 4.50 | 2.26 | 2.26 |
| Mar-00 | 2.17 | 0.00 | 0.34 | 2.17 | 1.00 | 0.339 | 3.25 | 1.03 | 2.17 | 1.25 | 4.50 | 2.17 | 2.17 |
| Apr-00 | 2.05 | 0.00 | 0.11 | 2.05 | 1.00 | 0.108 | 3.25 | 0.97 | 2.05 | 1.25 | 4.50 | 2.05 | 2.05 |
| May-00 | 2.00 | 0.00 | 0.12 | 2.00 | 1.00 | 0.119 | 1.75 | 0.95 | 2.00 | 1.25 | 4.50 | 2.00 | 2.00 |
| Jun-00 | 2.00 | 0.00 | 0.13 | 2.00 | 1.00 | 0.130 | 1.00 | 0.95 | 2.00 | 1.25 | 4.50 | 2.00 | 2.00 |
| Jul-00 | 2.00 | 0.00 | 0.16 | 2.00 | 1.00 | 0.157 | 1.00 | 0.95 | 2.00 | 1.25 | 4.50 | 2.00 | 2.00 |
| Aug-00 | 2.07 | 0.00 | 0.12 | 2.07 | 1.00 | 0.120 | 1.00 | 0.98 | 2.07 | 1.25 | 4.50 | 2.07 | 2.07 |
| Sep-00 | 2.03 | 0.00 | 0.24 | 2.03 | 1.00 | 0.235 | 1.00 | 0.96 | 2.03 | 1.25 | 4.50 | 2.03 | 2.03 |
| Oct-00 | 2.00 | 0.00 | 0.17 | 2.00 | 1.00 | 0.168 | 1.00 | 0.95 | 2.00 | 1.25 | 4.50 | 2.00 | 2.00 |
| Oct-00 | 2.13 | 0.00 | 0.25 | 2.13 | 1.00 | 0.248 | 1.00 | 1.01 | 2.13 | 1.25 | 4.50 | 2.13 | 2.13 |
| Dec-00 | 2.28 | 0.00 | 0.42 | 2.28 | 1.00 | 0.424 | 1.00 | 1.08 | 2.28 | 1.25 | 4.50 | 2.28 | 2.28 |
| Jan-01 | 2.35 | 0.00 | 0.23 | 2.35 | 1.00 | 0.225 | 1.00 | 1.09 | 2.35 | 1.25 | 4.50 | 2.35 | 2.35 |
| Feb-01 | 2.31 | 0.00 | 0.43 | 2.31 | 1.00 | 0.426 | 3.00 | 1.07 | 2.31 | 1.25 | 4.50 | 2.31 | 2.31 |
| Mar-01 | 2.22 | 0.00 | 0.34 | 2.22 | 1.00 | 0.339 | 3.25 | 1.03 | 2.22 | 1.25 | 4.50 | 2.22 | 2.22 |
| Apr-01 | 2.10 | 0.00 | 0.11 | 2.10 | 1.00 | 0.108 | 3.25 | 0.97 | 2.10 | 1.25 | 4.50 | 2.10 | 2.10 |
| May-01 | 2.05 | 0.00 | 0.12 | 2.05 | 1.00 | 0.119 | 1.75 | 0.95 | 2.05 | 1.25 | 4.50 | 2.05 | 2.05 |
| Jun-01 | 2.05 | 0.00 | 0.13 | 2.05 | 1.00 | 0.130 | 1.00 | 0.95 | 2.05 | 1.25 | 4.50 | 2.05 | 2.05 |
| Jul-01 | 2.05 | 0.00 | 0.16 | 2.05 | 1.00 | 0.157 | 1.00 | 0.95 | 2.05 | 1.25 | 4.50 | 2.05 | 2.05 |
| Aug-01 | 2.12 | 0.00 | 0.12 | 2.12 | 1.00 | 0.120 | 1.00 | 0.98 | 2.12 | 1.25 | 4.50 | 2.12 | 2.12 |
| Sep-01 | 2.07 | 0.00 | 0.24 | 2.07 | 1.00 | 0.235 | 1.00 | 0.96 | 2.07 | 1.25 | 4.50 | 2.07 | 2.07 |
| Oct-01 | 2.05 | 0.00 | 0.17 | 2.05 | 1.00 | 0.168 | 1.00 | 0.95 | 2.05 | 1.25 | 4.50 | 2.05 | 2.05 |
| Nov-01 | 2.18 | 0.00 | 0.25 | 2.18 | 1.00 | 0.248 | 1.00 | 1.01 | 2.18 | 1.25 | 4.50 | 2.18 | 2.18 |
| Dec-01 | 2.33 | 0.00 | 0.42 | 2.33 | 1.00 | 0.424 | 1.00 | 1.08 | 2.33 | 1.25 | 4.50 | 2.33 | 2.33 |
| Jan-02 | 2.40 | 0.00 | 0.23 | 2.40 | 1.00 | 0.225 | 1.00 | 1.09 | 2.40 | 1.25 | 4.50 | 2.40 | 2.40 |
| Feb-02 | 2.35 | 0.00 | 0.43 | 2.35 | 1.00 | 0.426 | 3.00 | 1.07 | 2.35 | 1.25 | 4.50 | 2.35 | 2.35 |

# Table 31: Natural Gas Price Risk Model (Continued)

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mar-02 | 2.27 | 0.00 | 0.34 | 2.27 | 1.00 | 0.339 | 3.25 | 1.03 | 2.27 | 1.25 | 4.50 | 2.27 | 2.27 |
| Apr-02 | 2.13 | 0.00 | 0.11 | 2.13 | 1.00 | 0.108 | 3.25 | 0.97 | 2.13 | 1.25 | 4.50 | 2.13 | 2.13 |
| May-02 | 2.09 | 0.00 | 0.12 | 2.09 | 1.00 | 0.119 | 1.75 | 0.95 | 2.09 | 1.25 | 4.50 | 2.09 | 2.09 |
| Jun-02 | 2.09 | 0.00 | 0.13 | 2.09 | 1.00 | 0.130 | 1.00 | 0.95 | 2.09 | 1.25 | 4.50 | 2.09 | 2.09 |
| Jul-02 | 2.09 | 0.00 | 0.16 | 2.09 | 1.00 | 0.157 | 1.00 | 0.95 | 2.09 | 1.25 | 4.50 | 2.09 | 2.09 |
| Aug-02 | 2.16 | 0.00 | 0.12 | 2.16 | 1.00 | 0.120 | 1.00 | 0.98 | 2.16 | 1.25 | 4.50 | 2.16 | 2.16 |
| Sep-02 | 2.11 | 0.00 | 0.24 | 2.11 | 1.00 | 0.235 | 1.00 | 0.96 | 2.11 | 1.25 | 4.50 | 2.11 | 2.11 |
| Oct-02 | 2.09 | 0.00 | 0.17 | 2.09 | 1.00 | 0.168 | 1.00 | 0.95 | 2.09 | 1.25 | 4.50 | 2.09 | 2.09 |
| Nov-02 | 2.22 | 0.00 | 0.25 | 2.22 | 1.00 | 0.248 | 1.00 | 1.01 | 2.22 | 1.25 | 4.50 | 2.22 | 2.22 |
| Dec-02 | 2.38 | 0.00 | 0.42 | 2.38 | 1.00 | 0.424 | 1.00 | 1.08 | 2.38 | 1.25 | 4.50 | 2.38 | 2.38 |
| Jan-03 | 2.44 | 0.00 | 0.23 | 2.44 | 1.00 | 0.225 | 1.00 | 1.09 | 2.44 | 1.25 | 4.50 | 2.44 | 2.44 |
| Feb-03 | 2.40 | 0.00 | 0.43 | 2.40 | 1.00 | 0.426 | 3.00 | 1.07 | 2.40 | 1.25 | 4.50 | 2.40 | 2.40 |
| Mar-03 | 2.31 | 0.00 | 0.34 | 2.31 | 1.00 | 0.339 | 3.25 | 1.03 | 2.31 | 1.25 | 4.50 | 2.31 | 2.31 |
| Apr-03 | 2.17 | 0.00 | 0.11 | 2.17 | 1.00 | 0.108 | 3.25 | 0.97 | 2.17 | 1.25 | 4.50 | 2.17 | 2.17 |
| May-03 | 2.13 | 0.00 | 0.12 | 2.13 | 1.00 | 0.119 | 1.75 | 0.95 | 2.13 | 1.25 | 4.50 | 2.13 | 2.13 |
| Jun-03 | 2.13 | 0.00 | 0.13 | 2.13 | 1.00 | 0.130 | 1.00 | 0.95 | 2.13 | 1.25 | 4.50 | 2.13 | 2.13 |
| Jul-03 | 2.13 | 0.00 | 0.16 | 2.13 | 1.00 | 0.157 | 1.00 | 0.95 | 2.13 | 1.25 | 4.50 | 2.13 | 2.13 |
| Aug-03 | 2.20 | 0.00 | 0.12 | 2.20 | 1.00 | 0.120 | 1.00 | 0.98 | 2.20 | 1.25 | 4.50 | 2.20 | 2.20 |
| Sep-03 | 2.15 | 0.00 | 0.24 | 2.15 | 1.00 | 0.235 | 1.00 | 0.96 | 2.15 | 1.25 | 4.50 | 2.15 | 2.15 |
| Oct-03 | 2.13 | 0.00 | 0.17 | 2.13 | 1.00 | 0.168 | 1.00 | 0.95 | 2.13 | 1.25 | 4.50 | 2.13 | 2.13 |
| Nov-03 | 2.26 | 0.00 | 0.25 | 2.26 | 1.00 | 0.248 | 1.00 | 1.01 | 2.26 | 1.25 | 4.50 | 2.26 | 2.26 |
| Dec-03 | 2.42 | 0.00 | 0.42 | 2.42 | 1.00 | 0.424 | 1.00 | 1.08 | 2.42 | 1.25 | 4.50 | 2.42 | 2.42 |
| Jan-04 | 2.47 | 0.00 | 0.23 | 2.47 | 1.00 | 0.225 | 1.00 | 1.09 | 2.47 | 1.25 | 4.50 | 2.47 | 2.47 |
| Feb-04 | 2.43 | 0.00 | 0.43 | 2.43 | 1.00 | 0.426 | 3.00 | 1.07 | 2.43 | 1.25 | 4.50 | 2.43 | 2.43 |
| Mar-04 | 2.34 | 0.00 | 0.34 | 2.34 | 1.00 | 0.339 | 3.25 | 1.03 | 2.34 | 1.25 | 4.50 | 2.34 | 2.34 |
| Apr-04 | 2.20 | 0.00 | 0.11 | 2.20 | 1.00 | 0.108 | 3.25 | 0.97 | 2.20 | 1.25 | 4.50 | 2.20 | 2.20 |
| May-04 | 2.16 | 0.00 | 0.12 | 2.16 | 1.00 | 0.119 | 1.75 | 0.95 | 2.16 | 1.25 | 4.50 | 2.16 | 2.16 |
| Jun-04 | 2.16 | 0.00 | 0.13 | 2.16 | 1.00 | 0.130 | 1.00 | 0.95 | 2.16 | 1.25 | 4.50 | 2.16 | 2.16 |
| Jul-04 | 2.16 | 0.00 | 0.16 | 2.16 | 1.00 | 0.157 | 1.00 | 0.95 | 2.16 | 1.25 | 4.50 | 2.16 | 2.16 |
| Aug-04 | 2.22 | 0.00 | 0.12 | 2.22 | 1.00 | 0.120 | 1.00 | 0.98 | 2.22 | 1.25 | 4.50 | 2.22 | 2.22 |
| Sep-04 | 2.18 | 0.00 | 0.24 | 2.18 | 1.00 | 0.235 | 1.00 | 0.96 | 2.18 | 1.25 | 4.50 | 2.18 | 2.18 |
| Oct-04 | 2.16 | 0.00 | 0.17 | 2.16 | 1.00 | 0.168 | 1.00 | 0.95 | 2.16 | 1.25 | 4.50 | 2.16 | 2.16 |
| Nov-04 | 2.29 | 0.00 | 0.25 | 2.29 | 1.00 | 0.248 | 1.00 | 1.01 | 2.29 | 1.25 | 4.50 | 2.29 | 2.29 |
| Dec-04 | 2.45 | 0.00 | 0.42 | 2.45 | 1.00 | 0.424 | 1.00 | 1.08 | 2.45 | 1.25 | 4.50 | 2.45 | 2.45 |
| Jan-05 | 2.52 | 0.00 | 0.23 | 2.52 | 1.00 | 0.225 | 1.00 | 1.09 | 2.52 | 1.25 | 4.50 | 2.52 | 2.52 |
| Feb-05 | 2.47 | 0.00 | 0.43 | 2.47 | 1.00 | 0.426 | 3.00 | 1.07 | 2.47 | 1.25 | 4.50 | 2.47 | 2.47 |
| Mar-05 | 2.38 | 0.00 | 0.34 | 2.38 | 1.00 | 0.339 | 3.25 | 1.03 | 2.38 | 1.25 | 4.50 | 2.38 | 2.38 |
| Apr-05 | 2.24 | 0.00 | 0.11 | 2.24 | 1.00 | 0.108 | 3.25 | 0.97 | 2.24 | 1.25 | 4.50 | 2.24 | 2.24 |
| May-05 | 2.19 | 0.00 | 0.12 | 2.19 | 1.00 | 0.119 | 1.75 | 0.95 | 2.19 | 1.25 | 4.50 | 2.19 | 2.19 |
| Jun-05 | 2.19 | 0.00 | 0.13 | 2.19 | 1.00 | 0.130 | 1.00 | 0.95 | 2.19 | 1.25 | 4.50 | 2.19 | 2.19 |
| Jul-05 | 2.19 | 0.00 | 0.16 | 2.19 | 1.00 | 0.157 | 1.00 | 0.95 | 2.19 | 1.25 | 4.50 | 2.19 | 2.19 |
| Aug-05 | 2.26 | 0.00 | 0.12 | 2.26 | 1.00 | 0.120 | 1.00 | 0.98 | 2.26 | 1.25 | 4.50 | 2.26 | 2.26 |
| Sep-05 | 2.22 | 0.00 | 0.24 | 2.22 | 1.00 | 0.235 | 1.00 | 0.96 | 2.22 | 1.25 | 4.50 | 2.22 | 2.22 |
| Oct-05 | 2.19 | 0.00 | 0.17 | 2.19 | 1.00 | 0.168 | 1.00 | 0.95 | 2.19 | 1.25 | 4.50 | 2.19 | 2.19 |
| Nov-05 | 2.33 | 0.00 | 0.25 | 2.33 | 1.00 | 0.248 | 1.00 | 1.01 | 2.33 | 1.25 | 4.50 | 2.33 | 2.33 |
| Dec-05 | 2.49 | 0.00 | 0.42 | 2.49 | 1.00 | 0.424 | 1.00 | 1.08 | 2.49 | 1.25 | 4.50 | 2.49 | 2.49 |
| Jan-06 | 2.54 | 0.00 | 0.23 | 2.54 | 1.00 | 0.225 | 1.00 | 1.09 | 2.54 | 1.25 | 4.50 | 2.54 | 2.54 |
| Feb-06 | 2.49 | 0.00 | 0.43 | 2.49 | 1.00 | 0.426 | 3.00 | 1.07 | 2.49 | 1.25 | 4.50 | 2.49 | 2.49 |
| Mar-06 | 2.40 | 0.00 | 0.34 | 2.40 | 1.00 | 0.339 | 3.25 | 1.03 | 2.40 | 1.25 | 4.50 | 2.40 | 2.40 |
| Apr-06 | 2.26 | 0.00 | 0.11 | 2.26 | 1.00 | 0.108 | 3.25 | 0.97 | 2.26 | 1.25 | 4.50 | 2.26 | 2.26 |
| May-06 | 2.21 | 0.00 | 0.12 | 2.21 | 1.00 | 0.119 | 1.75 | 0.95 | 2.21 | 1.25 | 4.50 | 2.21 | 2.21 |
| Jun-06 | 2.21 | 0.00 | 0.13 | 2.21 | 1.00 | 0.130 | 1.00 | 0.95 | 2.21 | 1.25 | 4.50 | 2.21 | 2.21 |
| Jul-06 | 2.21 | 0.00 | 0.16 | 2.21 | 1.00 | 0.157 | 1.00 | 0.95 | 2.21 | 1.25 | 4.50 | 2.21 | 2.21 |
| Aug-06 | 2.28 | 0.00 | 0.12 | 2.28 | 1.00 | 0.120 | 1.00 | 0.98 | 2.28 | 1.25 | 4.50 | 2.28 | 2.28 |
| Sep-06 | 2.24 | 0.00 | 0.24 | 2.24 | 1.00 | 0.235 | 1.00 | 0.96 | 2.24 | 1.25 | 4.50 | 2.24 | 2.24 |
| Oct-06 | 2.21 | 0.00 | 0.17 | 2.21 | 1.00 | 0.168 | 1.00 | 0.95 | 2.21 | 1.25 | 4.50 | 2.21 | 2.21 |
| Nov-06 | 2.35 | 0.00 | 0.25 | 2.35 | 1.00 | 0.248 | 1.00 | 1.01 | 2.35 | 1.25 | 4.50 | 2.35 | 2.35 |
| Dec-06 | 2.52 | 0.00 | 0.42 | 2.52 | 1.00 | 0.424 | 1.00 | 1.08 | 2.52 | 1.25 | 4.50 | 2.52 | 2.52 |

## Graph 6: Simulated Natural Gas Prices for 2002 - 2006



## 1.11 WNP-2 Nuclear Plant Generation Uncertainty

WNP-2 Nuclear Plant generation risk is incorporated into the Risk Analysis Study to account for the impact that changes in WNP-2 performance have on the amount of BPA's surplus energy revenues and power purchase expenses. WNP-2 Nuclear Plant generation risk is modeled using the following equation:

WNP-2 Output = (WNP-2 capacity * H * RiskUniform(0,1))/(1+(H - 1)*RiskUniform(0,1)), where

WNP-2 capacity = the maximum amount of output that can be produced by WNP-2;

H = calibration factor;

RiskUniform(0,1) = a uniform probability distribution in @RISK that samples real values between 0 and 1.

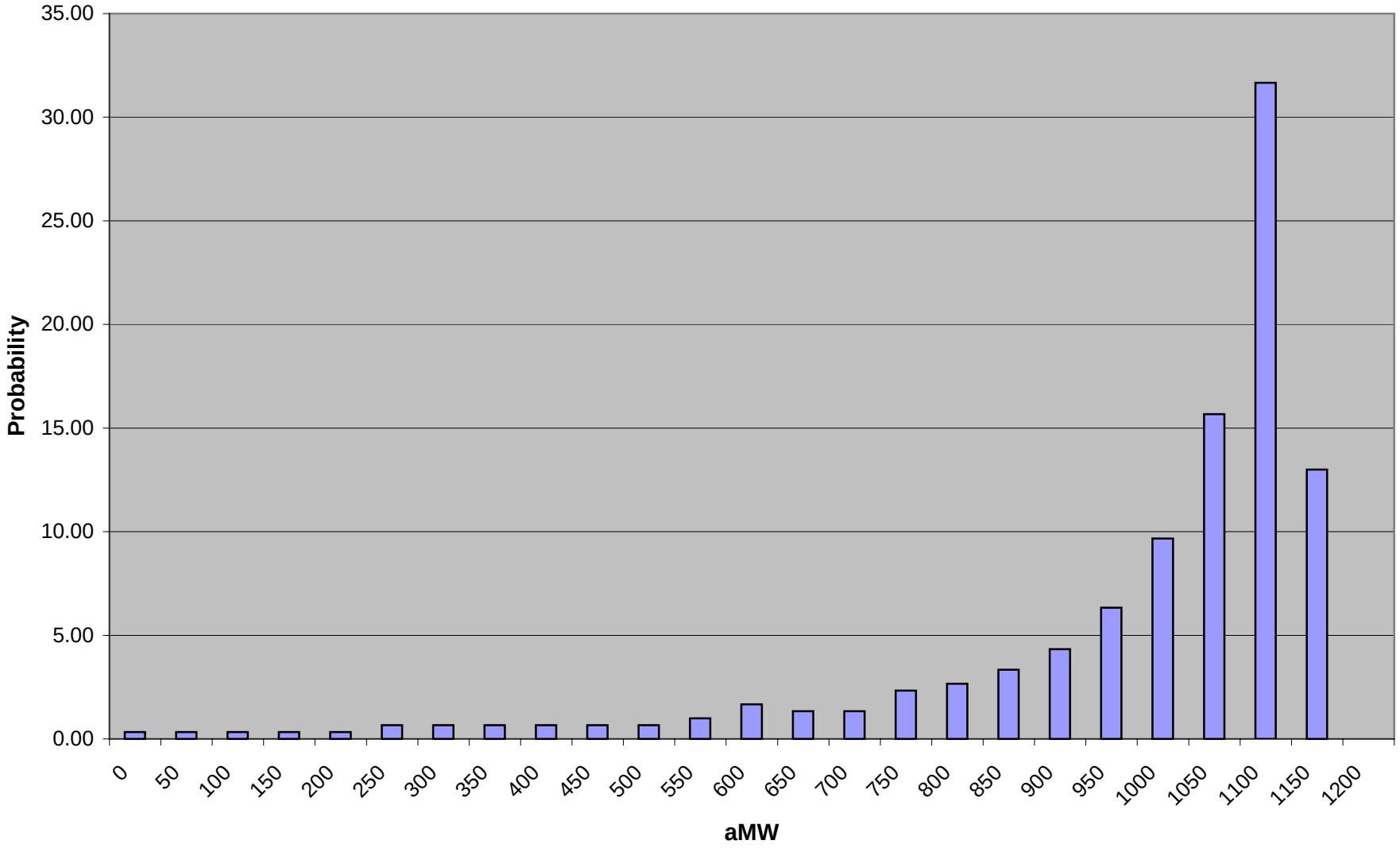
Inputs into the WNP-2 Nuclear Plant Risk Model consist of the forecasted peak capability of WNP-2 (1,162 MW) and expected monthly energy output reported in the Loads and Resources Study, WP-02-FS-BPA-01. The calibration factor (H) is derived by running risk simulations and modifying the factor until the expected monthly WNP-2 output from the risk simulations are equal to the expected monthly values reported in the Loads and Resources Study, WP-02-FS-BPA-01. *Id.*

Using this equation, monthly WNP-2 output varies from zero to peak output capability as values sampled from uniform probability distributions vary from zero to one. Although the values ranging from zero to one sampled from the uniform probability distributions are symmetrical, the frequency distribution of WNP-2 output produced from the equation is negatively skewed with the median value (the value at the $50^{th}$ percentile) being higher than the average. The shape of the frequency distribution reflects that thermal plants (including WNP-2) typically operate at output levels higher than average output levels, but the average output is driven down by occasional forced outages in which monthly output can be substantially lower than the typical monthly output. The simulated frequency distribution for WNP-2 output for October 2002 is shown in Graph 7.

### 1.12 Data Management Procedures

Various computer applications facilitate the movement of data between the Risk Input Data Base and RiskSim, AURORA, and RevSim. These computer applications are collectively referred to as Data Management Procedures. Of the Data Management Procedures, the principal computer program is referred to as the "Data Manager." However, other pieces of computer code (embedded in other modules of RiskMod) are components of the Data Management Procedures. This documentation of the Data Management Procedures discusses the process of inputting forecasted deterministic data and risk data simulated by RiskSim into the Risk Input Data Base, inputting data stored in the Risk Input Data Base into the AURORA Model, and downloading the results from AURORA into the Risk Input Data Base (*see* Marginal Cost Analysis Study, WP-02-FS-BPA-04).

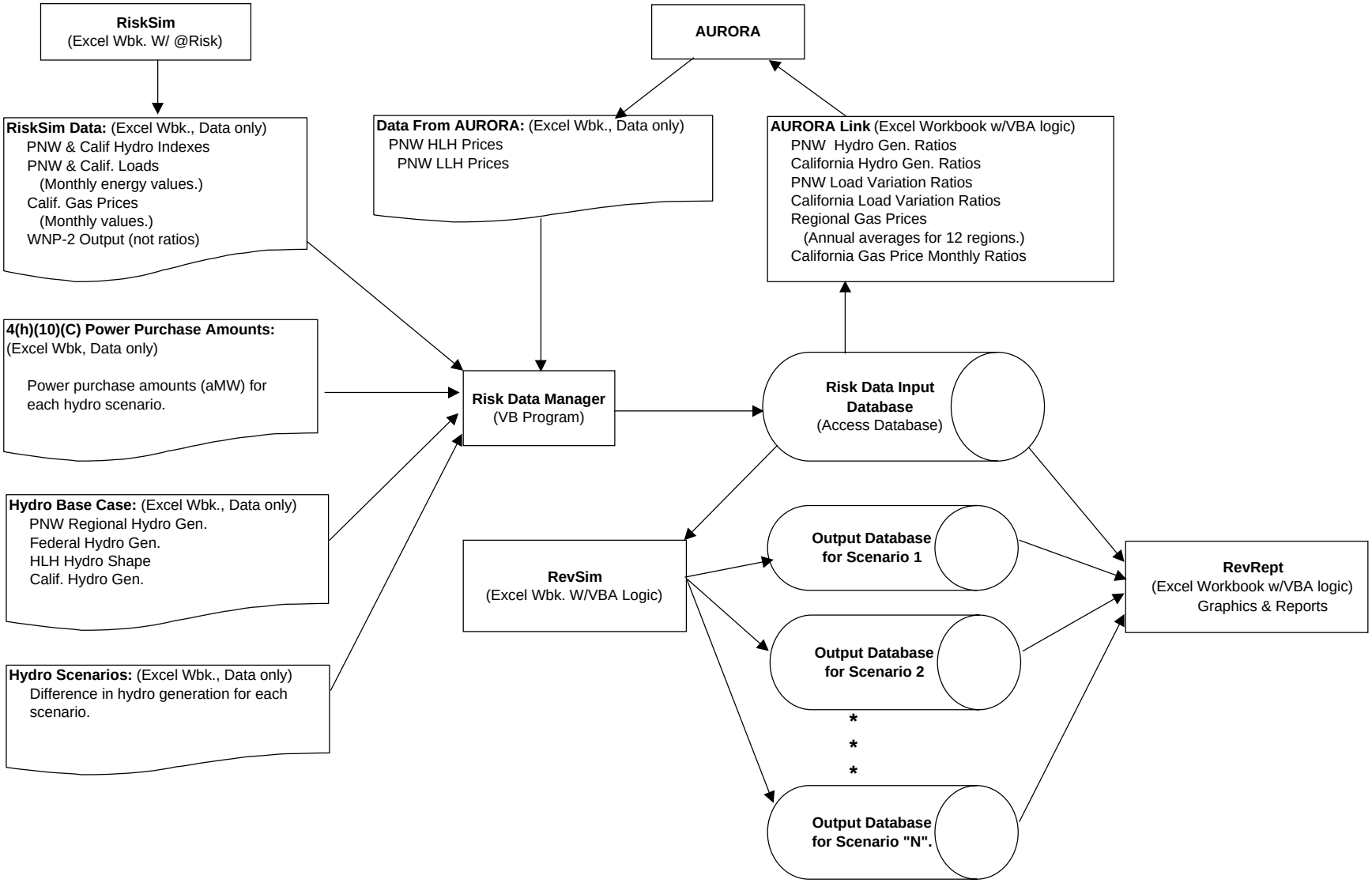
**Graph 7: Simulated WNP-2 Output Distribution for October 2002**



Each of these tasks is accomplished as follows. The Data Manager inputs both deterministic forecasted data and risk data simulated by RiskSim into the Risk Input Data Base. For both the 50 water year run and Risk Simulation run of RiskMod, the Data Manager provides a table of PNW hydro generation values (as ratios) for each of the 50 water years that is input into the AURORA Model to estimate HLH and LLH spot market electricity prices. Once AURORA has completed estimating HLH and LLH spot market electricity prices for a specified number of simulations, the Data Manager downloads the prices from AURORA into the Risk Input Data Base.

For the Risk Simulation run of RiskMod, an Excel workbook called "AURORA Link" is used to provide data from the Risk Input Data Base into AURORA so that it can estimate HLH and LLH spot market electricity prices. Procedures in the AURORA Link workbook provide variable PNW and California hydro generation, PNW and California loads, and natural gas price data for input into AURORA (*see* Marginal Cost Analysis Study, WP-02-FS-BPA-04) so that AURORA is able to estimate HLH and LLH spot market electricity prices for a specified number of simulations. For each simulation, computer code housed within RevSim inputs risk data that impact net revenues. The risk data include: Federal hydro generation (50 water years), Federal HLH hydro generation ratio (50 water years), PNW load variability, WNP-2 output variability, AURORA prices, and 4(h)(10)(C) purchase amounts from the Risk Input Data Base. The computer code runs RiskMod and writes the net revenue results to the Risk Output Data Base. These procedures are represented in Figure 1.

## Figure 1: RiskMod Data Management Procedure for a Risk Simulation Run



The computer code contained in these procedures is comprised of a combination of Microsoft Visual Basic and Structured Query Language. The Visual Basic code may appear as Visual Basic (VB) Script, Visual Basic for Applications (VBA), or VB 5.0.

The Risk Data Bases are composed of one Risk Input Data Base and one or more Risk Output Data Bases. A 50 water year run of RiskMod has only one Risk Output Data Base. A Risk Simulation run of RiskMod has a separate Risk Output Data Base for each of the 18 fish and wildlife scenarios.

Data Management Procedures (DMP) for a 50 water year run of RiskMod are somewhat different than the DMP for a Risk Simulation run of RiskMod. In a 50 water year run, Federal HLH and LLH and PNW hydro generation are the only variables, *i.e.*, deterministic forecasted values are used for all other risk factors for the 50 water year run of RiskMod. Monthly spot market electricity prices are estimated by AURORA for each water year using PNW hydro generation data (*see* Hydroregulation Component of the Loads and Resources Study, WP-02-FS-BPA-01).

In addition to incorporating variability in Federal HLH and LLH and PNW hydro generation, the Risk Simulation run of RiskMod incorporates variability in PNW/BPA and California loads and resources, and natural gas prices. A separate Risk Simulation run is made for each of the 18 fish and wildlife scenarios. Figure 2 depicts a typical Risk Input Data Base and Figure 3 depicts a typical Risk Output Data Base.

**Figure 2: Typical Risk Input Database shown in Microsoft Access**

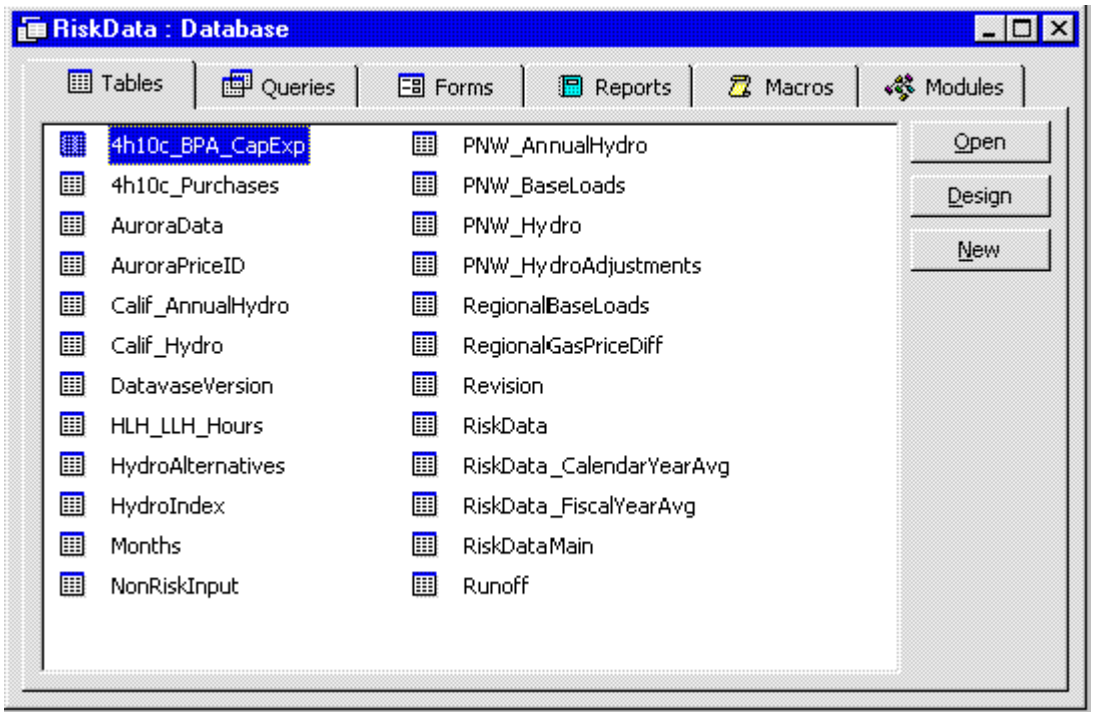
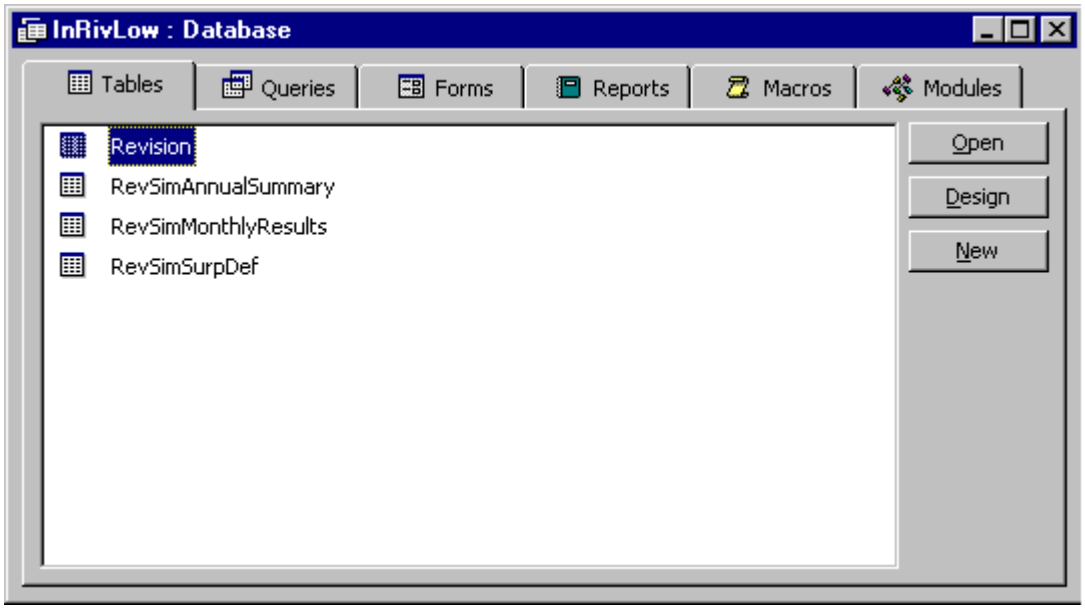



**Figure 3: Typical Risk Output Database shown in Microsoft Access**



## 1.13 Loading Data

**1.13.1 Forecasted Data.** The data for PNW and Federal hydro generation, Federal HLH hydro generation factors, California hydro generation, hydro generation adjustments for each of the 18 fish and wildlife scenarios, and 4(h)(10)(C) purchase amounts (aMW) are considered forecasted data. Forecasted data are loaded into the Risk Input Data Base using the Data Manager. The same procedure is used to load forecasted data into the Risk Input Data Base for both the 50 water year and Risk Simulation runs of RiskMod. For example, California hydro generation is not needed for a 50 water year run, but the data are input into the Risk Input Data Base along with Federal and PNW hydro generation data used in the 50 water year run of RiskMod. Some non-varying data, such as data from the Revenue Forecast component of the Wholesale Power Rate Development Study, WP-02-FS-BPA-05 and the Loads and Resources Study, WP-02-FS-BPA-01, are input directly from Excel worksheets into RevSim. Data that are entered into RevSim in this manner are not considered in this discussion.

**1.13.2 Hydro Generation Data.** The Data Manager is used to input monthly hydro generation data for each of the 50 water years into the Risk Input Data Base and calculate annual average hydro generation data for each calendar year.

**1.13.3 Hydro Generation Adjustments for the 13 Fish and Wildlife Alternatives.** Adjustments to base case hydro generation (from the Loads and Resources Study, WP-02-FS-BPA-01) for each of the 18 fish and wildlife scenarios are input to the Risk Input Data Base using the Data Manager. Calendar year averages are computed as part of this process.

**1.13.4 4(h)(10)(C) Purchase Amounts.** Power purchase amounts (monthly aMW) for the 4(h)(10)(C) calculation are input to the Risk Input Data Base using the Data Manager.

## 1.14 Inputting the RiskSim Results

**1.14.1 Fifty (50) Water Year Run.** Risk data simulated by RiskSim are not used for the 50 water year run of RiskMod. WNP-2 output and PNW/BPA loads are provided to the Risk Input Data Base by repeating the respective forecasted values for each of the 50 simulations. Hydro generation data for water years 1929-1978 are entered sequentially for FY 2002 for each of the 50 simulations.

**1.14.2 Risk Simulation Run.** RiskSim is used to generate variable WNP-2 generation, PNW/BPA and California loads, and natural gas prices. These values are combined with a random selection of PNW, Federal, and California hydro generation data. Hydro generation data used for a given simulation is defined by a "hydro index." The PNW and Federal hydro index is represented by water years 1929-1978. The California hydro index is represented by a number from 1 to 18. This procedure is used to develop 300 sets of five-year outcomes of data which are input into AURORA to estimate HLH and LLH spot market electricity prices and RevSim to estimate BPA's net revenue risk.

The Data Manager loads the monthly data from the 300 simulations into the Risk Input Data Base Calendar Year (CY) and FY averages are computed for WNP-2, PNW loads, California loads, and natural gas prices as part of this procedure.

## 1.15 Interaction with the AURORA Model

AURORA uses an Access data base to supply input data for each variable to its logic. The data base consists of numerous tables, each containing input data. After AURORA has input data from the data base and been run, the results are output to an output Access data base. This process is performed using scripting, which is a VB language built into AURORA that allows the user to run AURORA commands, run the commands of other applications (*i.e.*, Excel), and to build loops to repeat procedures.

AURORA uses calendar year data rather than FY data. The rate case period (FY 2002-2006) starts in October of CY 2001 and ends in September of CY 2006. In order to obtain prices that cover the rate case period, it is necessary to provide AURORA with six CYs of data, *i.e.*, January 2001 through December 2006.

**1.15.1 Fifty (50) Water Year Run.** The only data supplied to and varied in AURORA for the 50 water year run of AURORA is PNW hydro generation. Data are supplied as monthly energy "ratios" and a 13$^{th}$ value, which is the annual average hydro generation capacity factor. The monthly hydro generation ratios supplied to AURORA are computed by the Data Manager and written to an Excel workbook. These monthly hydro generation ratios are computed by dividing the monthly hydro generation by the annual average hydro generation (calendar year average) for each of the 50 water years. The annual capacity factor is calculated by dividing the PNW annual average hydro generation for each of the 50 water years (*see* Loads and Resources Study,

WP-02-FS-BPA-01) by the PNW hydro capacity used in AURORA (*see* Marginal Cost Analysis Study, WP-02-FS-BPA-04).

The first step in preparing AURORA for the 50 water year run is to establish a link between the Access input file used by AURORA and the Excel workbook (produced by the Data Manager) that contains the monthly hydro generation ratios. This link allows AURORA to read the data that is in an Excel workbook. Second, a macro is used to alter values in the Excel workbook. Finally, a script file runs AURORA, writes the output from AURORA to an Excel workbook, revises the input data used by AURORA for the next simulation, and then runs AURORA again. The script file contains a loop that repeats this procedure 50 times (once for each water year). Upon completion of this process, AURORA produces an Excel workbook containing monthly HLH and LLH spot market electricity prices for each of the 50 water years for five years which the Data Manager loads into the Risk Input Data Base.

**1.15.2 Risk Simulation Run.** For the Risk Simulation run of AURORA, variation in PNW and California loads and natural gas prices are considered along with variability in PNW and California hydro generation. Considering the large number of simulated values produced in a Risk Simulation run, the volume of data could not be reasonably loaded into a single workbook, as is done for the 50 water year run. BPA created an Excel workbook which contains data for a single simulation that is refreshed with data from the Risk Input Data Base for each simulation. This workbook is called "AURORA Link." The AURORA Link workbook contains both VBA procedures and data for hydro generation, loads, and natural gas prices. The VBA procedures are designed so that they can be called by the VBA scripting within AURORA.

The modeling process for the Risk Simulation run of AURORA is similar to that used for a 50 water year run of AURORA. Scripting is used to call the VBA procedures in AURORA Link, run AURORA, and write HLH and LLH spot market electricity prices to an Excel Workbook. The script file contains a loop that runs this procedure for 300 simulations. Upon completion of the 300 simulations, an Excel workbook receives HLH and LLH spot market electricity prices estimated by AURORA. These HLH and LLH spot market electricity prices are loaded into the Risk Input Data Base by the Data Manager. This process is repeated using data for three different hydrosystem configurations representing the range of the 18 fish and wildlife scenarios. This process produces three sets of HLH and LLH spot market electricity prices that are input into RevSim to assess the net revenue impact of the scenarios.

### 1.16 Interaction with RevSim

RevSim contains VBA procedures to extract data from the Risk Input Data Base and write results to the Risk Output Data Base.

RevSim uses the following data from the Risk Input Data Base:

(1) Federal hydro generation (adjusted if necessary for alternative hydro operations);

(2) HLH ratios for shaping hydro generation;

(3) BPA load variability (derived from PNW load variability);

(4) WNP-2 output;

(5) AURORA HLH and LLH prices; and

(6) 4(h)(10)(C) purchase amounts (aMW).

Surplus energy sales and purchase amounts (aMW), surplus energy revenues and power purchase expenses, and several other items to be discussed below are calculated by RiskMod and written to the Risk Output Data Base.

**1.16.1 Federal HLH and LLH Hydro Generation.** For a given simulation, Federal hydro generation data and HLH hydro generation ratios from the HOSS Model are determined by the water year sampled for the "hydro index." The hydro index is the water year to use for the first fiscal year, *i.e.,* FY 2002. Successive water years are used for each subsequent FY. For example, if water year 1940 is selected as the hydro index for a given simulation, then hydro generation data for water year 1940 are used for FY 2002, hydro generation data for water year 1941 are used for FY 2003, etc. If water year 1978 is selected as the hydro index, then the data is "wrapped" to water year 1929, *i.e.,* hydro generation data for water year 1978 are used for FY 2002, hydro generation for water year 1929 are used for FY 2003, etc. Given the hydro index (water year) for a simulation, base case Federal hydro generation data and hydro generation adjustments for a given fish and wildlife scenario are retrieved from the Risk Input Data Base. The monthly values are added to get the adjusted Federal hydro generation used by RevSim to calculate monthly BPA surpluses and deficits.

**1.16.2 BPA Load Variability Ratios.** BPA load variability ratios are calculated by dividing simulated PNW loads by the forecasted PNW loads for the corresponding month and year. These ratios are input into RevSim to modify PF loads.

**1.16.3 WNP-2 Output.** Variability in WNP-2 output is input from the Risk Input Data Base into RevSim. These values modify the amount of resources that BPA has available for each simulation.

**1.16.4 AURORA HLH and LLH Prices.** The Risk Input Data Base contains one set of prices for a 50 water year run of RiskMod and three sets of prices for a Risk Simulation run of RiskMod. In a Risk Simulation run, each of the 18 fish and wildlife scenarios is assigned an identifier to indicate which set of AURORA prices to use. The HLH and LLH spot market electricity prices that correspond to the price identifier are read from the Risk Input Data Base and input into RevSim.

**1.16.5 4(h)(10)(C) Purchase Amounts.** The Risk Input Data Base contains the monthly amounts of 4(h)(10)(C) power purchases (aMW) for each of the 18 fish and wildlife scenarios. The power purchase amounts (aMW), identified by scenario, are read from the Risk Input Data Base and input into RevSim to calculate the 4(h)(10)(C) credits ($).

**1.16.6 Risk Output Data Base**. RiskMod produces a separate Risk Output Data Base for each fish and wildlife scenario**.** Each Risk Output Data Base contains annual summary values data for net revenues, total revenues, 4(h)(10)(C) credits, and FCCF credits.

The Risk Output Data Bases also contains monthly HLH and LLH surplus energy data (sales (aMW), prices, and revenues) and monthly HLH and LLH power purchase data (power purchases (aMW), prices, and expenses).

### 1.17 Operational Net Revenue Risk Analysis Model (RevSim)

RevSim is the computer model in which firm and surplus energy revenues and balancing power purchase expenses are calculated under various load, resource, and market price conditions to estimate BPA's operational net revenue risk. Inputs into RevSim consist of deterministic monthly load and resource data, firm load revenues, monthly PF and Industrial Firm Power (IP) rates, and annual expenses (other than purchase power expenses) from the Loads and Resources Study, WP-02-FS-BPA-01, the Revenue Forecast component of the Wholesale Power Rate Development Study, WP-02-FS-BPA-05, and the RAM. To quantify net revenue risk, data are input into RevSim from the Risk Input Data Base which varies the levels of the PF loads, the output of WNP-2, the amount of HLH and LLH Federal hydro generation, and the HLH and LLH spot market electricity prices from the AURORA Model. Using this data, net revenues are calculated for each simulation.

All the risk data, with the exception of PF load variability, are input into RevSim as values. PF load variability is quantified as ratios relative to 1.00. These load variability ratios are multiplied by the forecasted monthly PF loads subject to the load variance charge (*see* Loads and Resources Study, WP-02-FS-BPA-01). The differences between the simulated and forecasted values are added to the forecasted monthly PF loads in the Revenue Forecast component of the

Wholesale Power Rate Development Study, WP-02-FS-BPA-05, to obtain variable PF loads**.** This calculation is reflected in the following equation: Simulated PF load = Forecasted PF load + (PF (LV) load * Ratio) - PF (LV) load), where PF (LV) load is the amount of PF load subject to the load variance charge.

These variable PF loads are multiplied by the PF rate to obtain variable PF energy revenues. In addition to adjusting PF loads (energy), the ratios (relative to 1.00) are multiplied by the forecasted monthly PF demand in the Revenue Forecast component of the Wholesale Power Rate Development Study, WP-02-FS-BPA-05, to obtain variable PF demand. These variable demand values are multiplied by the PF demand charge to obtain variable PF demand revenues.

## 1.18 Details of RevSim Modeling

**1.18.1 Loads and Resources.** A key attribute of RevSim is that it is a HLH and LLH loads and resources model. For each simulation, it estimates BPA's HLH and LLH load and resource condition. HLH and LLH PF, investor-owned utility (IOU), and IP direct service industrial customer (DSI) loads are obtain from the Revenue Forecast component of the Wholesale Power Rate Development Study, WP-02-FS-BPA-05. RevSim uses the total of several miscellaneous Federal firm contract loads (such as Contracts Out and Exports) for FY 2002–2006 from the Loads and Resources Study, WP-02-FS-BPA-01. BPA also developed HLH and LLH energy ratios associated with these miscellaneous Federal firm contract loads. Tables 32-33 contain a list of the miscellaneous Federal firm contracts and the associated average energy and HLH and LLH energy ratios for FY 2002-2006. Tables 34-36 contain similar information for Operating

# Table 32: Miscellaneous Firm Loads and Resources for FY 2002 - FY 2006

| | Fiscal Year 2002 in aMW | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Oct '01** | **Nov '01** | **Dec '01** | **Jan '02** | **Feb '02** | **Mar '02** | **Apr '02** | **May '02** | **Jun '02** | **Jul '02** | **Aug '02** | **Sep '02** |
| **Subset of Federal Firm Resources:** | | | | | | | | | | | | |
| Non-Fed CSPE | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 |
| Non-Fed Entitlement | 80 | 80 | 80 | 80 | 80 | 80 | 79 | 79 | 79 | 79 | 79 | 79 |
| Restoration | -26 | -26 | -26 | -26 | -26 | -26 | -26 | -26 | -26 | -26 | -26 | -26 |
| Renewables | 28 | 29 | 31 | 32 | 31 | 31 | 30 | 27 | 27 | 27 | 27 | 27 |
| Imports | 255 | 255 | 310 | 284 | 240 | 203 | 188 | 82 | 174 | 205 | 197 | 230 |
| Sup & Ent Replacement Energy | 47 | 47 | 47 | 47 | 47 | 47 | 42 | 42 | 42 | 42 | 42 | 42 |
| Contracts In | 387 | 387 | 387 | 387 | 387 | 387 | 387 | 275 | 387 | 275 | 275 | 387 |
| NUG | 13 | 16 | 19 | 19 | 19 | 17 | 16 | 15 | 16 | 13 | 12 | 13 |
| **Total of Subset of Firm Resources (aMW)** | **805** | **809** | **869** | **844** | **799** | **760** | **737** | **515** | **720** | **636** | **627** | **773** |

| | **Oct '01** | **Nov '01** | **Dec '01** | **Jan '02** | **Feb '02** | **Mar '02** | **Apr '02** | **May '02** | **Jun '02** | **Jul '02** | **Aug '02** | **Sep '02** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Subset of Federal Firm Loads:** | | | | | | | | | | | | |
| **Exports** | 1425 | 1316 | 1338 | 1529 | 1531 | 1462 | 1446 | 1533 | 1707 | 1709 | 1649 | 1664 |
| **Sup & Ent Capacity Deliveries** | 48 | 48 | 48 | 48 | 48 | 48 | 42 | 42 | 42 | 42 | 42 | 42 |
| **Contracts Out** | 1346 | 1673 | 1821 | 1814 | 1748 | 1537 | 1498 | 1377 | 1449 | 1488 | 1418 | 1305 |
| **CSPE** | 95 | 95 | 95 | 95 | 95 | 95 | 92 | 92 | 92 | 92 | 92 | 92 |
| **Total of Subset of Loads (aMW)** | **2914** | **3132** | **3302** | **3486** | **3422** | **3142** | **3078** | **3044** | **3290** | **3331** | **3201** | **3103** |

| | | **Oct '01** | **Nov '01** | **Dec '01** | **Jan '02** | **Feb '02** | **Mar '02** | **Apr '02** | **May '02** | **Jun '02** | **Jul '02** | **Aug '02** | **Sep '02** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **USBR Load** | | | | | | | | | | | | | |
| | aMW | 42 | 2 | 2 | 2 | 2 | 4 | 49 | 117 | 151 | 168 | 161 | 109 |

## Table 32: Miscellaneous Firm Loads and Resources for FY 2003 (Continued)

| | Fiscal Year 2003 in aMW | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Oct '02** | **Nov '02** | **Dec '02** | **Jan '03** | **Feb '03** | **Mar '03** | **Apr '03** | **May '03** | **Jun '03** | **Jul '03** | **Aug '03** | **Sep '03** |
| **Subset of Federal Firm Resources:** | | | | | | | | | | | | |
| Non-Fed CSPE | 21 | 21 | 21 | 21 | 21 | 21 | 0 | 0 | 0 | 0 | 0 | 0 |
| Non-Fed Entitlement | 79 | 79 | 79 | 79 | 79 | 79 | 143 | 143 | 143 | 143 | 143 | 143 |
| Restoration | -26 | -26 | -26 | -26 | -26 | -26 | -26 | -26 | -26 | -26 | -26 | -26 |
| Renewables | 28 | 29 | 31 | 32 | 31 | 31 | 30 | 27 | 27 | 27 | 27 | 27 |
| Imports | 255 | 255 | 310 | 284 | 240 | 203 | 188 | 82 | 174 | 205 | 197 | 230 |
| Sup & Ent Replacement Energy | 42 | 42 | 42 | 42 | 42 | 42 | 0 | 0 | 0 | 0 | 0 | 0 |
| Contracts In | 387 | 387 | 387 | 387 | 387 | 387 | 387 | 275 | 387 | 275 | 275 | 387 |
| **NUG** | 13 | 47 | 50 | 50 | 49 | 48 | 46 | 37 | 47 | 44 | 43 | 44 |
| **Total of Subset of Firm Resources (aMW)** | **799** | **834** | **894** | **869** | **823** | **785** | **768** | **538** | **752** | **668** | **659** | **805** |

| | **Oct '02** | **Nov '02** | **Dec '02** | **Jan '03** | **Feb '03** | **Mar '03** | **Apr '03** | **May '03** | **Jun '03** | **Jul '03** | **Aug '03** | **Sep '03** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Subset of Federal Firm Loads:** | | | | | | | | | | | | |
| **Exports** | 1594 | 1486 | 1510 | 1291 | 1291 | 1222 | 1448 | 1535 | 1753 | 1745 | 1671 | 1688 |
| **Sup & Ent Capacity Deliveries** | 42 | 42 | 42 | 42 | 42 | 42 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Contracts Out** | 1353 | 1684 | 1832 | 1754 | 1689 | 1478 | 1438 | 1317 | 1380 | 1417 | 1348 | 1235 |
| **CSPE** | 92 | 92 | 92 | 92 | 92 | 92 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total of Subset of Loads (aMW)** | **3081** | **3304** | **3476** | **3179** | **3114** | **2834** | **2886** | **2852** | **3133** | **3162** | **3019** | **2923** |

| | | **Oct '02** | **Nov '02** | **Dec '02** | **Jan '03** | **Feb '03** | **Mar '03** | **Apr '03** | **May '03** | **Jun '03** | **Jul '03** | **Aug '03** | **Sep '03** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **USBR Load** | | | | | | | | | | | | | |
| | aMW | 42 | 2 | 2 | 2 | 2 | 4 | 49 | 117 | 151 | 168 | 161 | 109 |

## Table 32: Miscellaneous Firm Loads and Resources for FY 2004 (Continued)

| | Fiscal Year 2004 in aMW | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Oct '03** | **Nov '03** | **Dec '03** | **Jan '04** | **Feb '04** | **Mar '04** | **Apr '04** | **May '04** | **Jun '04** | **Jul '04** | **Aug '04** | **Sep '04** |
| **Subset of Federal Firm Resources:** | | | | | | | | | | | | |
| Non-Fed CSPE | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Non-Fed Entitlement | 143 | 143 | 143 | 143 | 148 | 143 | 150 | 150 | 150 | 150 | 150 | 150 |
| Restoration | -26 | -26 | -26 | -26 | -27 | -26 | -26 | -26 | -26 | -26 | -26 | -26 |
| Renewables | 28 | 29 | 31 | 32 | 32 | 31 | 30 | 27 | 27 | 27 | 27 | 27 |
| Imports | 255 | 255 | 310 | 284 | 249 | 203 | 188 | 82 | 174 | 205 | 110 | 143 |
| Sup & Ent Replacement Energy | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Contracts In | 387 | 387 | 387 | 387 | 401 | 387 | 387 | 275 | 387 | 275 | 275 | 387 |
| **NUG** | 42 | 47 | 50 | 50 | 51 | 48 | 46 | 37 | 47 | 44 | 43 | 44 |
| **Total of Subset of Firm Resources (aMW)** | **829** | **835** | **895** | **870** | **853** | **786** | **775** | **545** | **759** | **675** | **579** | **725** |

| | **Oct '03** | **Nov '03** | **Dec '03** | **Jan '04** | **Feb '04** | **Mar '04** | **Apr '04** | **May '04** | **Jun '04** | **Jul '04** | **Aug '04** | **Sep '04** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Subset of Federal Firm Loads:** | | | | | | | | | | | | |
| **Exports** | 1617 | 1512 | 1530 | 1311 | 1358 | 1242 | 1225 | 1313 | 1522 | 1524 | 1380 | 1396 |
| **Sup & Ent Capacity Deliveries** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Contracts Out** | 1282 | 1614 | 1762 | 1760 | 1756 | 1482 | 1444 | 1322 | 1385 | 1422 | 1354 | 1240 |
| **CSPE** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total of Subset of Loads (aMW)** | **2899** | **3126** | **3292** | **3071** | **3113** | **2724** | **2669** | **2635** | **2907** | **2946** | **2734** | **2636** |

| | | **Oct '03** | **Nov '03** | **Dec '03** | **Jan '04** | **Feb '04** | **Mar '04** | **Apr '04** | **May '04** | **Jun '04** | **Jul '04** | **Aug '04** | **Sep '04** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **USBR Load** | | | | | | | | | | | | | |
| | aMW | 42 | 2 | 2 | 2 | 2 | 4 | 49 | 117 | 151 | 168 | 161 | 109 |

## Table 32: Miscellaneous Firm Loads and Resources for FY 2005 (Continued)

| | Fiscal Year 2005 in aMW | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Oct '04** | **Nov '04** | **Dec '04** | **Jan '05** | **Feb '05** | **Mar '05** | **Apr '05** | **May '05** | **Jun '05** | **Jul '05** | **Aug '05** | **Sep '05** |
| **Subset of Federal Firm Resources:** | | | | | | | | | | | | |
| Non-Fed CSPE | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Non-Fed Entitlement | 150 | 150 | 150 | 150 | 150 | 150 | 145 | 145 | 145 | 145 | 144 | 144 |
| Restoration | -26 | -26 | -26 | -26 | -26 | -26 | -26 | -26 | -26 | -26 | -26 | -26 |
| Renewables | 28 | 29 | 31 | 32 | 31 | 31 | 30 | 27 | 27 | 27 | 27 | 27 |
| Imports | 180 | 248 | 303 | 277 | 233 | 203 | 188 | 82 | 100 | 131 | 110 | 143 |
| Sup & Ent Replacement Energy | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Contracts In | 387 | 387 | 387 | 387 | 387 | 387 | 387 | 275 | 387 | 275 | 275 | 387 |
| **NUG** | 42 | 47 | 50 | 50 | 49 | 48 | 46 | 37 | 47 | 44 | 43 | 44 |
| **Total of Subset of Firm Resources (aMW)** | **761** | **835** | **895** | **870** | **824** | **793** | **770** | **540** | **680** | **596** | **573** | **719** |

| | **Oct '04** | **Nov '04** | **Dec '04** | **Jan '05** | **Feb '05** | **Mar '05** | **Apr '05** | **May '05** | **Jun '05** | **Jul '05** | **Aug '05** | **Sep '05** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Subset of Federal Firm Loads:** | | | | | | | | | | | | |
| **Exports** | 1335 | 1304 | 1325 | 1311 | 1313 | 1242 | 1226 | 1314 | 1447 | 1449 | 1381 | 1396 |
| **Sup & Ent Capacity Deliveries** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Contracts Out** | 1287 | 1619 | 1767 | 1765 | 1700 | 1488 | 1449 | 1328 | 1390 | 1428 | 1359 | 1245 |
| **CSPE** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total of Subset of Loads (aMW)** | **2622** | **2923** | **3092** | **3076** | **3013** | **2730** | **2675** | **2642** | **2837** | **2877** | **2740** | **2641** |

| | | **Oct '04** | **Nov '04** | **Dec '04** | **Jan '05** | **Feb '05** | **Mar '05** | **Apr '05** | **May '05** | **Jun '05** | **Jul '05** | **Aug '05** | **Sep '05** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **USBR Load** | | | | | | | | | | | | | |
| | aMW | 42 | 2 | 2 | 2 | 2 | 4 | 49 | 117 | 151 | 168 | 161 | 109 |

## Table 32: Miscellaneous Firm Loads and Resources for FY 2006 (Continued)

| | Fiscal Year 2006 in aMW | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Oct '05** | **Nov '05** | **Dec '05** | **Jan '06** | **Feb '06** | **Mar '06** | **Apr '06** | **May '06** | **Jun '06** | **Jul '06** | **Aug '06** | **Sep '06** |
| **Subset of Federal Firm Resources:** | | | | | | | | | | | | |
| Non-Fed CSPE | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Non-Fed Entitlement | 144 | 144 | 144 | 144 | 144 | 144 | 144 | 144 | 144 | 144 | 144 | 144 |
| Restoration | -26 | -26 | -26 | -26 | -26 | -26 | -26 | -26 | -26 | -26 | -26 | -26 |
| Renewables | 28 | 29 | 31 | 32 | 31 | 31 | 30 | 27 | 27 | 27 | 27 | 27 |
| Imports | 180 | 248 | 303 | 277 | 233 | 203 | 188 | 82 | 100 | 131 | 110 | 143 |
| Sup & Ent Replacement Energy | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Contracts In | 387 | 387 | 387 | 387 | 387 | 387 | 387 | 275 | 387 | 275 | 275 | 387 |
| **NUG** | 42 | 47 | 50 | 50 | 49 | 48 | 46 | 37 | 47 | 44 | 43 | 44 |
| **Total of Subset of Firm Resources (aMW)** | **755** | **829** | **889** | **864** | **818** | **787** | **769** | **539** | **679** | **595** | **573** | **719** |

| | **Oct '05** | **Nov '05** | **Dec '05** | **Jan '06** | **Feb '06** | **Mar '06** | **Apr '06** | **May '06** | **Jun '06** | **Jul '06** | **Aug '06** | **Sep '06** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Subset of Federal Firm Loads:** | | | | | | | | | | | | |
| **Exports** | 1334 | 1305 | 1326 | 1261 | 1262 | 1191 | 1174 | 1262 | 1396 | 1399 | 1330 | 1345 |
| **Sup & Ent Capacity Deliveries** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Contracts Out** | 1292 | 1624 | 1773 | 1673 | 1609 | 1396 | 1306 | 1186 | 1249 | 1287 | 1204 | 1083 |
| **CSPE** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total of Subset of Loads (aMW)** | **2626** | **2929** | **3099** | **2934** | **2871** | **2587** | **2481** | **2448** | **2645** | **2686** | **2534** | **2428** |

| | | **Oct '05** | **Nov '05** | **Dec '05** | **Jan '06** | **Feb '06** | **Mar '06** | **Apr '06** | **May '06** | **Jun '06** | **Jul '06** | **Aug '06** | **Sep '06** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **USBR Load** | | | | | | | | | | | | | |
| | aMW | 42 | 2 | 2 | 2 | 2 | 4 | 49 | 117 | 151 | 168 | 161 | 109 |

# Table 33: Heavy Load Hour (HLH) and Light Load Hour (LLH) Ratios (Relative to Average Energy) for Miscellaneous Resouces and Loads for FY 2002 - FY 2006

NOTE: Revised for data to start in OCT

Fiscal Year 2002

| | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | |
| Subset of Federal Firm Resources Included: | | | | | | | | | | | | |
| Non-Fed CSPE | | | | | | | | | | | | |
| Non-Fed Entitlement | | | | | | | | | | | | |
| Restoration | | | | | | | | | | | | |
| Renewables | | | | | | | | | | | | |
| Imports | | | | | | | | | | | | |
| Sup & Ent Replacement Energy | | | | | | | | | | | | |
| Contracts In | | | | | | | | | | | | |
| NUG | | | | | | | | | | | | |
| Composite HLH Ratios | 0.412 | 0.474 | 0.495 | 0.496 | 0.478 | 0.446 | 0.467 | 0.474 | 0.366 | 0.433 | 0.421 | 0.381 |
| Composite LLH Ratios | 1.784 | 1.701 | 1.674 | 1.672 | 1.695 | 1.739 | 1.710 | 1.702 | 1.845 | 1.756 | 1.772 | 1.826 |
| Check: Calc Avg Ratio | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| Subset of Federal Firm Loads: | | | | | | | | | | | | |
| Exports | | | | | | | | | | | | |
| Sup & Ent Capacity Deliveries | | | | | | | | | | | | |
| Contracts Out | | | | | | | | | | | | |
| CSPE | | | | | | | | | | | | |
| Composite HLH Ratios | 1.410 | 1.329 | 1.296 | 1.318 | 1.356 | 1.342 | 1.365 | 1.360 | 1.321 | 1.311 | 1.337 | 1.333 |
| Composite LLH Ratios | 0.453 | 0.562 | 0.606 | 0.576 | 0.525 | 0.545 | 0.514 | 0.521 | 0.572 | 0.585 | 0.551 | 0.556 |
| Check: Calc Avg Ratio | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| | | | | | | | | | | | | |
| USBR HLH Ratios | 1.050 | 1.050 | 1.050 | 1.050 | 1.050 | 1.050 | 1.050 | 1.050 | 1.050 | 1.050 | 1.050 | 1.050 |
| USBR LLH Ratios | 0.933 | 0.933 | 0.933 | 0.933 | 0.933 | 0.933 | 0.933 | 0.933 | 0.933 | 0.933 | 0.933 | 0.933 |
| Check: Calc Avg Ratio | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |

## Table 33: Heavy Load Hour (HLH) and Light Load Hour (LLH) Ratios for FY 2003 (Continued)

**Fiscal Year 2003**

| | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | |
| **Subset of Federal Firm Resources Included:**<br>Non-Fed CSPE<br>Non-Fed Entitlement<br>Restoration<br>Renewables<br>Imports<br>Sup & Ent Replacement Energy<br>Contracts In<br>NUG | | | | | | | | | | | | |
| Composite HLH Ratios | 0.411 | 0.476 | 0.528 | 0.513 | 0.496 | 0.468 | 0.596 | 0.642 | 0.502 | 0.577 | 0.573 | 0.500 |
| Composite LLH Ratios | 1.786 | 1.699 | 1.629 | 1.650 | 1.672 | 1.709 | 1.538 | 1.478 | 1.663 | 1.564 | 1.569 | 1.666 |
| Check: Calc Avg Ratio | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| **Subset of Federal Firm Loads:**<br>Exports<br>Sup & Ent Capacity Deliveries<br>Contracts Out<br>CSPE | | | | | | | | | | | | |
| Composite HLH Ratios | 1.389 | 1.274 | 1.309 | 1.350 | 1.391 | 1.380 | 1.418 | 1.418 | 1.368 | 1.356 | 1.385 | 1.383 |
| Composite LLH Ratios | 0.482 | 0.635 | 0.588 | 0.534 | 0.479 | 0.493 | 0.442 | 0.442 | 0.510 | 0.525 | 0.487 | 0.490 |
| Check: Calc Avg Ratio | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| | | | | | | | | | | | | |
| USBR HLH Ratios | 1.050 | 1.050 | 1.050 | 1.050 | 1.050 | 1.050 | 1.050 | 1.050 | 1.050 | 1.050 | 1.050 | 1.050 |
| USBR LLH Ratios | 0.933 | 0.933 | 0.933 | 0.933 | 0.933 | 0.933 | 0.933 | 0.933 | 0.933 | 0.933 | 0.933 | 0.933 |
| Check: Calc Avg Ratio | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |

## Table 33: Heavy Load Hour (HLH) and Light Load Hour (LLH) Ratios for FY 2004 (Continued)

**Fiscal Year 2004**

| | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | |
| **Subset of Federal Firm Resources Included:**<br>Non-Fed CSPE<br>Non-Fed Entitlement<br>Restoration<br>Renewables<br>Imports<br>Sup & Ent Replacement Energy<br>Contracts In<br>NUG | | | | | | | | | | | | |
| Composite HLH Ratios | 0.515 | 0.595 | 0.614 | 0.604 | 0.586 | 0.583 | 0.606 | 0.652 | 0.520 | 0.589 | 0.663 | 0.543 |
| Composite LLH Ratios | 1.647 | 1.541 | 1.514 | 1.528 | 1.552 | 1.555 | 1.525 | 1.465 | 1.640 | 1.548 | 1.449 | 1.609 |
| Check: Calc Avg Ratio | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| **Subset of Federal Firm Loads:**<br>Exports<br>Sup & Ent Capacity Deliveries<br>Contracts Out<br>CSPE | | | | | | | | | | | | |
| Composite HLH Ratios | 1.407 | 1.353 | 1.352 | 1.390 | 1.403 | 1.459 | 1.449 | 1.425 | 1.426 | 1.381 | 1.431 | 1.402 |
| Composite LLH Ratios | 0.457 | 0.529 | 0.531 | 0.480 | 0.463 | 0.389 | 0.401 | 0.434 | 0.431 | 0.491 | 0.425 | 0.464 |
| Check: Calc Avg Ratio | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| | | | | | | | | | | | | |
| USBR HLH Ratios | 1.050 | 1.050 | 1.050 | 1.050 | 1.050 | 1.050 | 1.050 | 1.050 | 1.050 | 1.050 | 1.050 | 1.050 |
| USBR LLH Ratios | 0.933 | 0.933 | 0.933 | 0.933 | 0.933 | 0.933 | 0.933 | 0.933 | 0.933 | 0.933 | 0.933 | 0.933 |
| Check: Calc Avg Ratio | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |

## Table 33: Heavy Load Hour (HLH) and Light Load Hour (LLH) Ratios for FY 2005 (Continued)

**Fiscal Year 2005**

| | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | |
| **Subset of Federal Firm Resources Included:**<br>Non-Fed CSPE<br>Non-Fed Entitlement<br>Restoration<br>Renewables<br>Imports<br>Sup & Ent Replacement Energy<br>Contracts In<br>NUG | | | | | | | | | | | | |
| Composite HLH Ratios | 0.564 | 0.592 | 0.609 | 0.577 | 0.600 | 0.583 | 0.602 | 0.648 | 0.572 | 0.643 | 0.660 | 0.545 |
| Composite LLH Ratios | 1.582 | 1.543 | 1.522 | 1.563 | 1.533 | 1.556 | 1.531 | 1.469 | 1.571 | 1.476 | 1.453 | 1.606 |
| Check: Calc Avg Ratio | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| **Subset of Federal Firm Loads:**<br>Exports<br>Sup & Ent Capacity Deliveries<br>Contracts Out<br>CSPE | | | | | | | | | | | | |
| Composite HLH Ratios | 1.430 | 1.382 | 1.377 | 1.360 | 1.431 | 1.458 | 1.450 | 1.424 | 1.416 | 1.337 | 1.431 | 1.401 |
| Composite LLH Ratios | 0.426 | 0.491 | 0.498 | 0.520 | 0.426 | 0.389 | 0.400 | 0.434 | 0.446 | 0.551 | 0.425 | 0.465 |
| Check: Calc Avg Ratio | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| | | | | | | | | | | | | |
| USBR HLH Ratios | 1.050 | 1.050 | 1.050 | 1.050 | 1.050 | 1.050 | 1.050 | 1.050 | 1.050 | 1.050 | 1.050 | 1.050 |
| USBR LLH Ratios | 0.933 | 0.933 | 0.933 | 0.933 | 0.933 | 0.933 | 0.933 | 0.933 | 0.933 | 0.933 | 0.933 | 0.933 |
| Check: Calc Avg Ratio | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |

## Table 33: Heavy Load Hour (HLH) and Light Load Hour (LLH) Ratios for FY 2006 (Continued)

**Fiscal Year 2006**

| | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | |
| **Subset of Federal Firm Resources Included:**<br>Non-Fed CSPE<br>Non-Fed Entitlement<br>Restoration<br>Renewables<br>Imports<br>Sup & Ent Replacement Energy<br>Contracts In<br>NUG | | | | | | | | | | | | |
| Composite HLH Ratios | 0.566 | 0.595 | 0.592 | 0.582 | 0.601 | 0.588 | 0.591 | 0.665 | 0.575 | 0.651 | 0.664 | 0.533 |
| Composite LLH Ratios | 1.579 | 1.540 | 1.544 | 1.558 | 1.533 | 1.549 | 1.546 | 1.447 | 1.566 | 1.466 | 1.448 | 1.622 |
| Check: Calc Avg Ratio | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| **Subset of Federal Firm Loads:**<br>Exports<br>Sup & Ent Capacity Deliveries<br>Contracts Out<br>CSPE | | | | | | | | | | | | |
| Composite HLH Ratios | 1.430 | 1.381 | 1.346 | 1.378 | 1.451 | 1.480 | 1.452 | 1.488 | 1.443 | 1.362 | 1.461 | 1.403 |
| Composite LLH Ratios | 0.426 | 0.492 | 0.538 | 0.496 | 0.399 | 0.360 | 0.397 | 0.349 | 0.410 | 0.517 | 0.385 | 0.463 |
| Check: Calc Avg Ratio | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| | | | | | | | | | | | | |
| USBR HLH Ratios | 1.050 | 1.050 | 1.050 | 1.050 | 1.050 | 1.050 | 1.050 | 1.050 | 1.050 | 1.050 | 1.050 | 1.050 |
| USBR LLH Ratios | 0.933 | 0.933 | 0.933 | 0.933 | 0.933 | 0.933 | 0.933 | 0.933 | 0.933 | 0.933 | 0.933 | 0.933 |
| Check: Calc Avg Ratio | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |

# Table 34: Heavy Load Hour Energy for Miscellaneous Resources and Loads for OY 2002 - OY 2007

**Operating Year 2002 in aMW**

| | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Federal Firm Resources** | | | | | | | | | | | | |
| Non-Fed CSPE | 31 | 30 | 31 | 31 | 30 | 31 | 31 | 31 | 29 | 29 | 29 | 29 |
| Non-Fed Entitlement | 130 | 129 | 130 | 128 | 126 | 128 | 130 | 128 | 128 | 126 | 128 | 126 |
| Restoration | -26 | -24 | -26 | -25 | -24 | -25 | -26 | -25 | -26 | -25 | -25 | -25 |
| Renewables | 27 | 25 | 28 | 28 | 29 | 31 | 31 | 30 | 30 | 26 | 26 | 26 |
| Imports | 100 | 120 | 155 | 207 | 251 | 236 | 197 | 159 | 167 | 73 | 90 | 107 |
| Sup & Ent Replacement Energy | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Contracts In | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NUG | 12 | 12 | 13 | 16 | 18 | 19 | 19 | 17 | 16 | 15 | 16 | 13 |
| **Gross Firm Resources Under Critical Water** | **275** | **291** | **332** | **384** | **430** | **419** | **382** | **339** | **345** | **244** | **263** | **275** |
| | | | | | | | | | | | | |
| **Firm Contracts and Out of Region Contracts** | | | | | | | | | | | | |
| Exports | 2034 | 1934 | 1990 | 1760 | 1779 | 1988 | 2022 | 1878 | 1888 | 2004 | 2211 | 2214 |
| Sup & Ent Capacity Deliveries | 82 | 78 | 82 | 80 | 78 | 80 | 81 | 80 | 72 | 71 | 71 | 71 |
| Contracts Out | 1077 | 1059 | 1872 | 2156 | 2257 | 2361 | 2374 | 2093 | 2082 | 1905 | 1906 | 1925 |
| CSPE | 165 | 165 | 165 | 165 | 165 | 165 | 165 | 165 | 159 | 159 | 159 | 159 |
| **Total Non-Subscription Contracts** | **3357** | **3235** | **4109** | **4161** | **4278** | **4594** | **4642** | **4215** | **4201** | **4138** | **4346** | **4369** |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **USBR Load** | | | | | | | | | | | | |
| **HLH aMW** | 0 | 0 | 44 | 2 | 2 | 2 | 2 | 4 | 51 | 123 | 159 | 176 |

## Table 34: Heavy Load Hour Energy for OY 2003 (Continued)

**Operating Year 2003 aMW**

| | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | |
| **Federal Firm Resources** | | | | | | | | | | | | |
| **Non-Fed CSPE** | 29 | 29 | 29 | 28 | 29 | 29 | 29 | 29 | 0 | 0 | 0 | 0 |
| **Non-Fed Entitlement** | 126 | 128 | 128 | 123 | 128 | 126 | 128 | 128 | 241 | 235 | 241 | 235 |
| **Restoration** | -25 | -25 | -26 | -24 | -25 | -25 | -26 | -25 | -26 | -25 | -25 | -25 |
| **Renewables** | 26 | 26 | 28 | 27 | 30 | 31 | 31 | 30 | 30 | 26 | 26 | 26 |
| **Imports** | 97 | 124 | 155 | 199 | 261 | 236 | 197 | 159 | 167 | 73 | 90 | 107 |
| **Sup & Ent Replacement Energy** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Contracts In** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **NUG** | 12 | 13 | 13 | 44 | 49 | 49 | 49 | 47 | 47 | 36 | 46 | 43 |
| **Gross Firm Resources Under Critical Water** | **264** | **294** | **328** | **397** | **472** | **445** | **408** | **367** | **458** | **345** | **378** | **385** |
| | | | | | | | | | | | | |
| **Firm Contracts and Out of Region Contracts** | | | | | | | | | | | | |
| **Exports** | 2201 | 2185 | 2167 | 1879 | 1979 | 1756 | 1784 | 1644 | 2070 | 2195 | 2445 | 2429 |
| **Sup & Ent Capacity Deliveries** | 71 | 71 | 72 | 70 | 71 | 71 | 72 | 71 | 0 | 0 | 0 | 0 |
| **Contracts Out** | 1847 | 1723 | 1881 | 2102 | 2341 | 2305 | 2317 | 2037 | 2024 | 1850 | 1840 | 1858 |
| **CSPE** | 159 | 159 | 159 | 158 | 159 | 159 | 159 | 159 | 0 | 0 | 0 | 0 |
| **Total Non-Subscription Contracts** | **4278** | **4137** | **4279** | **4209** | **4550** | **4291** | **4332** | **3911** | **4094** | **4045** | **4285** | **4287** |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **USBR Load** | | | | | | | | | | | | |
| **HLH aMW** | 169 | 114 | 44 | 2 | 2 | 2 | 2 | 4 | 51 | 123 | 159 | 176 |

## Table 34: Heavy Load Hour Energy for OY 2004 (Continued)

**Operating Year 2004 in aMW**

| | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | |
| **Federal Firm Resources** | | | | | | | | | | | | |
| **Non-Fed CSPE** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Non-Fed Entitlement** | 238 | 235 | 234 | 241 | 235 | 235 | 249 | 240 | 252 | 249 | 252 | 247 |
| **Restoration** | -25 | -25 | -25 | -25 | -25 | -25 | -26 | -26 | -26 | -24 | -26 | -25 |
| **Renewables** | 26 | 26 | 27 | 28 | 30 | 31 | 31 | 32 | 30 | 25 | 27 | 26 |
| **Imports** | 97 | 124 | 150 | 207 | 261 | 236 | 197 | 165 | 167 | 71 | 94 | 107 |
| **Sup & Ent Replacement Energy** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Contracts In** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **NUG** | 42 | 43 | 41 | 46 | 49 | 49 | 49 | 49 | 47 | 35 | 48 | 43 |
| **Gross Firm Resources Under Critical Water** | **378** | **403** | **427** | **496** | **550** | **525** | **500** | **459** | **470** | **355** | **395** | **397** |
| | | | | | | | | | | | | |
| **Firm Contracts and Out of Region Contracts** | | | | | | | | | | | | |
| **Exports** | 2398 | 2385 | 2317 | 2129 | 2177 | 1955 | 2027 | 1866 | 1834 | 1946 | 2247 | 2206 |
| **Sup & Ent Capacity Deliveries** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Contracts Out** | 1782 | 1657 | 1763 | 2101 | 2274 | 2313 | 2339 | 2107 | 2034 | 1808 | 1900 | 1864 |
| **CSPE** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total Non-Subscription Contracts** | **4180** | **4042** | **4080** | **4230** | **4450** | **4268** | **4367** | **3973** | **3869** | **3754** | **4147** | **4070** |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **USBR Load** | | | | | | | | | | | | |
| **HLH aMW** | 169 | 114 | 44 | 2 | 2 | 2 | 2 | 4 | 51 | 123 | 159 | 176 |

## Table 34: Heavy Load Hour Energy for OY 2005 (Continued)

**Operating Year 2005 in aMW**

| | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | |
| **Federal Firm Resources** | | | | | | | | | | | | |
| **Non-Fed CSPE** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Non-Fed Entitlement** | 250 | 236 | 236 | 246 | 237 | 230 | 251 | 244 | 246 | 244 | 246 | 239 |
| **Restoration** | -26 | -25 | -25 | -25 | -25 | -24 | -26 | -26 | -26 | -24 | -26 | -24 |
| **Renewables** | 27 | 26 | 27 | 28 | 30 | 30 | 31 | 32 | 30 | 25 | 27 | 25 |
| **Imports** | 89 | 114 | 150 | 200 | 254 | 220 | 190 | 165 | 167 | 71 | 94 | 103 |
| **Sup & Ent Replacement Energy** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Contracts In** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **NUG** | 44 | 43 | 41 | 46 | 49 | 47 | 49 | 49 | 47 | 35 | 48 | 41 |
| **Gross Firm Resources Under Critical Water** | **384** | **394** | **429** | **495** | **545** | **502** | **495** | **462** | **464** | **350** | **389** | **383** |
| | | | | | | | | | | | | |
| **Firm Contracts and Out of Region Contracts** | | | | | | | | | | | | |
| **Exports** | 2074 | 2032 | 1978 | 1930 | 1975 | 1932 | 1979 | 1866 | 1836 | 1946 | 2110 | 2029 |
| **Sup & Ent Capacity Deliveries** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Contracts Out** | 1839 | 1663 | 1772 | 2109 | 2282 | 2251 | 2332 | 2116 | 2044 | 1816 | 1907 | 1817 |
| **CSPE** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total Non-Subscription Contracts** | **3913** | **3695** | **3750** | **4039** | **4257** | **4183** | **4311** | **3982** | **3880** | **3763** | **4017** | **3847** |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **USBR Load** | | | | | | | | | | | | |
| **HLH aMW** | 169 | 114 | 44 | 2 | 2 | 2 | 2 | 4 | 51 | 123 | 159 | 176 |

## Table 34: Heavy Load Hour Energy for OY 2006 (Continued)

**Operating Year 2006 in aMW**

| | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | |
| **Federal Firm Resources** | | | | | | | | | | | | |
| **Non-Fed CSPE** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Non-Fed Entitlement** | 244 | 235 | 234 | 245 | 230 | 230 | 247 | 244 | 245 | 248 | 248 | 242 |
| **Restoration** | -26 | -25 | -25 | -25 | -24 | -24 | -26 | -26 | -25 | -25 | -26 | -24 |
| **Renewables** | 27 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 29 | 26 | 27 | 25 |
| **Imports** | 89 | 114 | 150 | 200 | 245 | 220 | 190 | 165 | 161 | 73 | 94 | 103 |
| **Sup & Ent Replacement Energy** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Contracts In** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **NUG** | 44 | 43 | 41 | 46 | 47 | 47 | 49 | 49 | 45 | 36 | 48 | 41 |
| **Gross Firm Resources Under Critical Water** | **378** | **392** | **427** | **494** | **526** | **503** | **491** | **463** | **455** | **358** | **391** | **387** |
| | | | | | | | | | | | | |
| **Firm Contracts and Out of Region Contracts** | | | | | | | | | | | | |
| **Exports** | 2075 | 2031 | 1977 | 1929 | 1952 | 1883 | 1928 | 1812 | 1762 | 1917 | 2057 | 1981 |
| **Sup & Ent Capacity Deliveries** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Contracts Out** | 1846 | 1670 | 1780 | 2117 | 2220 | 2161 | 2237 | 2018 | 1840 | 1727 | 1758 | 1678 |
| **CSPE** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total Non-Subscription Contracts** | **3921** | **3701** | **3756** | **4046** | **4172** | **4044** | **4166** | **3829** | **3602** | **3644** | **3816** | **3659** |
| | | | | | | | | | | | | |
| **USBR Load** | | | | | | | | | | | | |
| **HLH aMW** | 169 | 114 | 44 | 2 | 2 | 2 | 2 | 4 | 51 | 123 | 159 | 176 |

## Table 34: Heavy Load Hour Energy for OY 2007 (Continued)

**Operating Year 2007 in aMW**

| | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | |
| **Federal Firm Resources** | | | | | | | | | | | | |
| **Non-Fed CSPE** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Non-Fed Entitlement** | 246 | 232 | 244 | 245 | 230 | 237 | 247 | 244 | 245 | 248 | 248 | 242 |
| **Restoration** | -26 | -24 | -26 | -25 | -24 | -25 | -26 | -26 | -25 | -25 | -26 | -24 |
| **Renewables** | 27 | 25 | 28 | 28 | 29 | 31 | 31 | 32 | 29 | 26 | 27 | 25 |
| **Imports** | 89 | 109 | 155 | 200 | 245 | 229 | 190 | 165 | 161 | 73 | 94 | 103 |
| **Sup & Ent Replacement Energy** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Contracts In** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **NUG** | 44 | 41 | 43 | 46 | 47 | 49 | 49 | 49 | 45 | 36 | 48 | 41 |
| **Gross Firm Resources Under Critical Water** | **380** | **383** | **444** | **494** | **526** | **521** | **491** | **463** | **455** | **358** | **391** | **387** |
| | | | | | | | | | | | | |
| **Firm Contracts and Out of Region Contracts** | | | | | | | | | | | | |
| **Exports** | 2022 | 1941 | 1849 | 1777 | 1809 | 1603 | 1617 | 1494 | 1456 | 1610 | 1745 | 1690 |
| **Sup & Ent Capacity Deliveries** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Contracts Out** | 1681 | 1466 | 862 | 1126 | 1189 | 1185 | 1185 | 1048 | 1005 | 774 | 799 | 796 |
| **CSPE** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total Non-Subscription Contracts** | **3703** | **3407** | **2711** | **2903** | **2997** | **2787** | **2803** | **2542** | **2461** | **2384** | **2544** | **2487** |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **USBR Load** | | | | | | | | | | | | |
| **HLH aMW** | 169 | 114 | 44 | 2 | 2 | 2 | 2 | 4 | 51 | 123 | 159 | 176 |

# Table 35: Light Load Hour Energy for Miscellaneous Resources and Loads for OY 2002 - OY 2007

**Operating Year 2002 in aMW**

| | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | |
| **Federal Firm Resources** | | | | | | | | | | | | |
| **Non-Fed CSPE** | 7 | 9 | 7 | 8 | 9 | 8 | 8 | 8 | 10 | 11 | 11 | 11 |
| **Non-Fed Entitlement** | 13 | 15 | 13 | 17 | 19 | 16 | 13 | 16 | 13 | 16 | 14 | 16 |
| **Restoration** | -25 | -28 | -25 | -27 | -28 | -27 | -26 | -27 | -26 | -27 | -27 | -27 |
| **Renewables** | 26 | 29 | 27 | 30 | 33 | 33 | 31 | 32 | 29 | 28 | 28 | 28 |
| **Imports** | 326 | 377 | 388 | 319 | 388 | 348 | 297 | 262 | 217 | 93 | 285 | 336 |
| **Sup & Ent Replacement Energy** | 110 | 110 | 110 | 110 | 110 | 110 | 110 | 110 | 98 | 98 | 98 | 98 |
| **Contracts In** | 642 | 903 | 903 | 903 | 903 | 903 | 903 | 903 | 903 | 642 | 903 | 642 |
| **NUG** | 12 | 14 | 13 | 17 | 20 | 20 | 19 | 17 | 16 | 15 | 17 | 13 |
| **Gross Firm Resources Under Critical Water** | **1111** | **1429** | **1436** | **1376** | **1455** | **1411** | **1355** | **1322** | **1261** | **876** | **1329** | **1117** |
| | | | | | | | | | | | | |
| **Firm Contracts and Out of Region Contracts** | | | | | | | | | | | | |
| **Exports** | 665 | 831 | 672 | 724 | 750 | 916 | 877 | 908 | 858 | 906 | 1035 | 1036 |
| **Sup & Ent Capacity Deliveries** | 3 | 8 | 3 | 6 | 8 | 5 | 4 | 5 | 2 | 3 | 4 | 3 |
| **Contracts Out** | 487 | 574 | 644 | 1028 | 1240 | 1085 | 913 | 796 | 719 | 673 | 840 | 906 |
| **CSPE** | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 |
| **Total Non-Subscription Contracts** | **1157** | **1415** | **1321** | **1760** | **2000** | **2009** | **1796** | **1711** | **1582** | **1585** | **1882** | **1948** |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **USBR Load** | | | | | | | | | | | | |
| **LLH aMW** | 0 | 0 | 39 | 2 | 2 | 2 | 2 | 4 | 46 | 109 | 141 | 157 |

# Table 35: Light Load Hour Energy for OY 2003 (Continued)

**Operating Year 2003 in aMW**

| | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | |
| **Federal Firm Resources** | | | | | | | | | | | | |
| **Non-Fed CSPE** | 11 | 11 | 10 | 12 | 11 | 11 | 10 | 11 | 0 | 0 | 0 | 0 |
| **Non-Fed Entitlement** | 16 | 14 | 13 | 20 | 13 | 16 | 13 | 13 | 13 | 21 | 13 | 21 |
| **Restoration** | -27 | -27 | -25 | -28 | -27 | -27 | -26 | -27 | -26 | -27 | -27 | -27 |
| **Renewables** | 28 | 28 | 27 | 32 | 32 | 33 | 31 | 32 | 29 | 28 | 28 | 28 |
| **Imports** | 331 | 371 | 388 | 330 | 375 | 348 | 297 | 262 | 217 | 93 | 285 | 336 |
| **Sup & Ent Replacement Energy** | 98 | 98 | 98 | 98 | 98 | 98 | 98 | 98 | 0 | 0 | 0 | 0 |
| **Contracts In** | 642 | 903 | 903 | 903 | 903 | 903 | 903 | 903 | 903 | 642 | 903 | 642 |
| **NUG** | 12 | 13 | 13 | 51 | 51 | 51 | 49 | 49 | 45 | 38 | 49 | 45 |
| **Gross Firm Resources Under Critical Water** | **1111** | **1411** | **1427** | **1417** | **1457** | **1434** | **1376** | **1342** | **1182** | **795** | **1251** | **1045** |
| | | | | | | | | | | | | |
| **Firm Contracts and Out of Region Contracts** | | | | | | | | | | | | |
| **Exports** | 913 | 969 | 831 | 961 | 885 | 671 | 634 | 659 | 620 | 655 | 831 | 832 |
| **Sup & Ent Capacity Deliveries** | 3 | 4 | 2 | 5 | 3 | 3 | 3 | 3 | 0 | 0 | 0 | 0 |
| **Contracts Out** | 846 | 748 | 650 | 1127 | 1153 | 1019 | 851 | 733 | 656 | 606 | 766 | 829 |
| **CSPE** | 3 | 3 | 2 | 4 | 3 | 3 | 2 | 3 | 0 | 0 | 0 | 0 |
| **Total Non-Subscription Contracts** | **1764** | **1724** | **1484** | **2097** | **2044** | **1697** | **1490** | **1398** | **1276** | **1261** | **1597** | **1661** |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **USBR Load** | | | | | | | | | | | | |
| **LLH aMW** | 150 | 102 | 39 | 2 | 2 | 2 | 2 | 4 | 46 | 109 | 141 | 157 |

# Table 35: Light Load Hour Energy for OY 2004 (Continued)

**Operating Year 2004 in aMW**

| | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | |
| **Federal Firm Resources** | | | | | | | | | | | | |
| **Non-Fed CSPE** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Non-Fed Entitlement** | 17 | 21 | 21 | 13 | 21 | 21 | 13 | 14 | 14 | 18 | 14 | 21 |
| **Restoration** | -27 | -27 | -27 | -27 | -27 | -27 | -28 | -25 | -26 | -28 | -26 | -27 |
| **Renewables** | 28 | 28 | 29 | 30 | 32 | 33 | 34 | 30 | 29 | 29 | 27 | 28 |
| **Imports** | 331 | 371 | 396 | 319 | 375 | 348 | 317 | 254 | 217 | 97 | 281 | 336 |
| **Sup & Ent Replacement Energy** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Contracts In** | 642 | 903 | 903 | 903 | 903 | 903 | 935 | 903 | 903 | 642 | 903 | 642 |
| **NUG** | 44 | 46 | 43 | 49 | 51 | 51 | 53 | 47 | 45 | 40 | 46 | 45 |
| **Gross Firm Resources Under Critical Water** | **1034** | **1341** | **1365** | **1286** | **1355** | **1330** | **1324** | **1223** | **1183** | **798** | **1245** | **1045** |
| | | | | | | | | | | | | |
| **Firm Contracts and Out of Region Contracts** | | | | | | | | | | | | |
| **Exports** | 701 | 759 | 684 | 689 | 668 | 452 | 465 | 410 | 414 | 469 | 556 | 615 |
| **Sup & Ent Capacity Deliveries** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Contracts Out** | 770 | 673 | 640 | 965 | 1080 | 1023 | 977 | 649 | 657 | 674 | 699 | 833 |
| **CSPE** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total Non-Subscription Contracts** | **1471** | **1432** | **1324** | **1654** | **1747** | **1475** | **1442** | **1059** | **1070** | **1143** | **1254** | **1448** |
| | | | | | | | | | | | | |
| **USBR Load** | | | | | | | | | | | | |
| **LLH aMW** | 150 | 102 | 39 | 2 | 2 | 2 | 2 | 4 | 46 | 109 | 141 | 157 |

# Table 35: Light Load Hour Energy for OY 2005 (Continued)

**Operating Year 2005 in aMW**

| | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | |
| **Federal Firm Resources** | | | | | | | | | | | | |
| **Non-Fed CSPE** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Non-Fed Entitlement** | 17 | 35 | 35 | 22 | 34 | 44 | 16 | 25 | 10 | 13 | 10 | 20 |
| **Restoration** | -25 | -27 | -27 | -27 | -27 | -28 | -26 | -25 | -26 | -28 | -26 | -28 |
| **Renewables** | 26 | 28 | 29 | 30 | 32 | 35 | 31 | 30 | 29 | 29 | 27 | 29 |
| **Imports** | 137 | 182 | 221 | 312 | 368 | 353 | 290 | 254 | 217 | 97 | 108 | 169 |
| **Sup & Ent Replacement Energy** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Contracts In** | 642 | 903 | 903 | 903 | 903 | 903 | 903 | 903 | 903 | 642 | 903 | 642 |
| **NUG** | 42 | 46 | 43 | 49 | 51 | 54 | 49 | 47 | 45 | 40 | 46 | 47 |
| **Gross Firm Resources Under Critical Water** | **839** | **1166** | **1204** | **1289** | **1362** | **1360** | **1263** | **1234** | **1179** | **793** | **1068** | **879** |
| | | | | | | | | | | | | |
| **Firm Contracts and Out of Region Contracts** | | | | | | | | | | | | |
| **Exports** | 454 | 548 | 478 | 469 | 458 | 483 | 426 | 411 | 414 | 471 | 563 | 675 |
| **Sup & Ent Capacity Deliveries** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Contracts Out** | 708 | 675 | 640 | 966 | 1081 | 1117 | 857 | 650 | 656 | 677 | 701 | 909 |
| **CSPE** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total Non-Subscription Contracts** | **1162** | **1223** | **1118** | **1435** | **1539** | **1600** | **1283** | **1061** | **1070** | **1148** | **1264** | **1584** |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **USBR Load** | | | | | | | | | | | | |
| **LLH aMW** | 150 | 102 | 39 | 2 | 2 | 2 | 2 | 4 | 46 | 109 | 141 | 157 |

# Table 35: Light Load Hour Energy for OY 2006 (Continued)

**Operating Year 2006 in aMW**

| | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | |
| **Federal Firm Resources** | | | | | | | | | | | | |
| **Non-Fed CSPE** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Non-Fed Entitlement** | 10 | 23 | 23 | 10 | 30 | 30 | 6 | 10 | 9 | 6 | 5 | 13 |
| **Restoration** | -25 | -27 | -27 | -27 | -28 | -28 | -26 | -25 | -27 | -27 | -26 | -28 |
| **Renewables** | 26 | 28 | 29 | 30 | 33 | 35 | 31 | 30 | 31 | 28 | 27 | 29 |
| **Imports** | 137 | 182 | 221 | 312 | 381 | 353 | 290 | 254 | 226 | 93 | 108 | 169 |
| **Sup & Ent Replacement Energy** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Contracts In** | 642 | 903 | 903 | 903 | 903 | 903 | 903 | 903 | 903 | 642 | 903 | 642 |
| **NUG** | 42 | 46 | 43 | 49 | 54 | 54 | 49 | 47 | 48 | 38 | 46 | 47 |
| **Gross Firm Resources Under Critical Water** | **832** | **1155** | **1192** | **1276** | **1373** | **1346** | **1254** | **1219** | **1189** | **780** | **1063** | **872** |
| | | | | | | | | | | | | |
| **Firm Contracts and Out of Region Contracts** | | | | | | | | | | | | |
| **Exports** | 456 | 550 | 477 | 473 | 491 | 431 | 374 | 363 | 391 | 389 | 514 | 623 |
| **Sup & Ent Capacity Deliveries** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Contracts Out** | 710 | 678 | 641 | 967 | 1177 | 1023 | 771 | 567 | 595 | 465 | 570 | 766 |
| **CSPE** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total Non-Subscription Contracts** | **1165** | **1228** | **1119** | **1440** | **1668** | **1454** | **1145** | **930** | **986** | **854** | **1084** | **1389** |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **USBR Load** | | | | | | | | | | | | |
| **LLH aMW** | 150 | 102 | 39 | 2 | 2 | 2 | 2 | 4 | 46 | 109 | 141 | 157 |

# Table 35: Light Load Hour Energy for OY 2007 (Continued)

**Operating Year 2007 in aMW**

| | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | |
| **Federal Firm Resources** | | | | | | | | | | | | |
| **Non-Fed CSPE** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Non-Fed Entitlement** | 8 | 26 | 11 | 10 | 30 | 20 | 6 | 10 | 9 | 6 | 5 | 13 |
| **Restoration** | -25 | -28 | -25 | -27 | -28 | -27 | -26 | -25 | -27 | -27 | -26 | -28 |
| **Renewables** | 26 | 29 | 27 | 30 | 33 | 33 | 31 | 30 | 31 | 28 | 27 | 29 |
| **Imports** | 137 | 188 | 213 | 312 | 381 | 341 | 290 | 254 | 226 | 93 | 108 | 169 |
| **Sup & Ent Replacement Energy** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Contracts In** | 642 | 903 | 903 | 903 | 903 | 903 | 903 | 903 | 903 | 642 | 903 | 642 |
| **NUG** | 42 | 48 | 41 | 49 | 54 | 51 | 49 | 47 | 48 | 38 | 46 | 47 |
| **Gross Firm Resources Under Critical Water** | **830** | **1167** | **1170** | **1276** | **1373** | **1322** | **1254** | **1219** | **1189** | **780** | **1063** | **872** |
| | | | | | | | | | | | | |
| **Firm Contracts and Out of Region Contracts** | | | | | | | | | | | | |
| **Exports** | 407 | 551 | 346 | 374 | 384 | 145 | 128 | 127 | 139 | 135 | 272 | 355 |
| **Sup & Ent Capacity Deliveries** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Contracts Out** | 568 | 572 | 193 | 487 | 564 | 527 | 433 | 247 | 287 | 135 | 162 | 233 |
| **CSPE** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total Non-Subscription Contracts** | **975** | **1123** | **539** | **861** | **948** | **673** | **561** | **374** | **426** | **270** | **434** | **588** |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **USBR Load** | | | | | | | | | | | | |
| **LLH aMW** | 150 | 102 | 39 | 2 | 2 | 2 | 2 | 4 | 46 | 109 | 141 | 157 |

# Table 36: Average Energy for Miscellaneous Resources and Loads for OY 2002 - OY 2007

**Operating Year 2002 in aMW**

| | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | |
| **Federal Firm Resources** | | | | | | | | | | | | |
| **Non-Fed CSPE** | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 |
| **Non-Fed Entitlement** | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 79 | 79 | 79 | 79 |
| **Restoration** | -26 | -26 | -26 | -26 | -26 | -26 | -26 | -26 | -26 | -26 | -26 | -26 |
| **Renewables** | 27 | 27 | 28 | 29 | 31 | 32 | 31 | 31 | 30 | 27 | 27 | 27 |
| **Imports** | 197 | 230 | 255 | 255 | 310 | 284 | 240 | 203 | 188 | 82 | 174 | 205 |
| **Sup & Ent Replacement Energy** | 47 | 47 | 47 | 47 | 47 | 47 | 47 | 47 | 42 | 42 | 42 | 42 |
| **Contracts In** | 275 | 387 | 387 | 387 | 387 | 387 | 387 | 387 | 387 | 275 | 387 | 275 |
| **NUG** | 12 | 13 | 13 | 16 | 19 | 19 | 19 | 17 | 16 | 15 | 16 | 13 |
| **Gross Firm Resources Under Critical Water** | **633** | **779** | **805** | **809** | **869** | **844** | **799** | **760** | **737** | **515** | **720** | **636** |
| | | | | | | | | | | | | |
| **Firm Contracts and Out of Region Contracts** | | | | | | | | | | | | |
| **Exports** | 1447 | 1461 | 1425 | 1316 | 1338 | 1529 | 1531 | 1462 | 1446 | 1533 | 1707 | 1709 |
| **Sup & Ent Capacity Deliveries** | 48 | 48 | 48 | 48 | 48 | 48 | 48 | 48 | 42 | 42 | 42 | 42 |
| **Contracts Out** | 824 | 851 | 1346 | 1673 | 1821 | 1814 | 1748 | 1537 | 1498 | 1377 | 1449 | 1488 |
| **CSPE** | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 92 | 92 | 92 | 92 |
| **Total Non-Subscription Contracts** | **2414** | **2455** | **2914** | **3132** | **3302** | **3486** | **3422** | **3142** | **3078** | **3044** | **3290** | **3331** |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **USBR Load** | | | | | | | | | | | | |
| **aMW** | 161 | 109 | 42 | 2 | 2 | 2 | 2 | 4 | 49 | 117 | 151 | 168 |

# Table 36: Average Energy for OY 2003 (Continued)

**Operating Year 2003 in aMW**

| | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | |
| **Federal Firm Resources** | | | | | | | | | | | | |
| **Non-Fed CSPE** | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 0 | 0 | 0 | 0 |
| **Non-Fed Entitlement** | 79 | 79 | 79 | 79 | 79 | 79 | 79 | 79 | 143 | 143 | 143 | 143 |
| **Restoration** | -26 | -26 | -26 | -26 | -26 | -26 | -26 | -26 | -26 | -26 | -26 | -26 |
| **Renewables** | 27 | 27 | 28 | 29 | 31 | 32 | 31 | 31 | 30 | 27 | 27 | 27 |
| **Imports** | 197 | 230 | 255 | 255 | 310 | 284 | 240 | 203 | 188 | 82 | 174 | 205 |
| **Sup & Ent Replacement Energy** | 42 | 42 | 42 | 42 | 42 | 42 | 42 | 42 | 0 | 0 | 0 | 0 |
| **Contracts In** | 275 | 387 | 387 | 387 | 387 | 387 | 387 | 387 | 387 | 275 | 387 | 275 |
| **NUG** | 12 | 13 | 13 | 47 | 50 | 50 | 49 | 48 | 46 | 37 | 47 | 44 |
| **Gross Firm Resources Under Critical Water** | **627** | **773** | **799** | **834** | **894** | **869** | **823** | **785** | **768** | **538** | **752** | **668** |
| | | | | | | | | | | | | |
| **Firm Contracts and Out of Region Contracts** | | | | | | | | | | | | |
| **Exports** | 1649 | 1664 | 1594 | 1486 | 1510 | 1291 | 1291 | 1222 | 1448 | 1535 | 1753 | 1745 |
| **Sup & Ent Capacity Deliveries** | 42 | 42 | 42 | 42 | 42 | 42 | 42 | 42 | 0 | 0 | 0 | 0 |
| **Contracts Out** | 1418 | 1305 | 1353 | 1684 | 1832 | 1754 | 1689 | 1478 | 1438 | 1317 | 1380 | 1417 |
| **CSPE** | 92 | 92 | 92 | 92 | 92 | 92 | 92 | 92 | 0 | 0 | 0 | 0 |
| **Total Non-Subscription Contracts** | **3201** | **3103** | **3081** | **3304** | **3476** | **3179** | **3114** | **2834** | **2886** | **2852** | **3133** | **3162** |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **USBR Load** | | | | | | | | | | | | |
| **aMW** | 161 | 109 | 42 | 2 | 2 | 2 | 2 | 4 | 49 | 117 | 151 | 168 |

# Table 36: Average Energy for OY 2004 (Continued)

**Operating Year 2004 in aMW**

| | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | |
| **Federal Firm Resources** | | | | | | | | | | | | |
| **Non-Fed CSPE** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Non-Fed Entitlement** | 143 | 143 | 143 | 143 | 143 | 143 | 148 | 143 | 150 | 150 | 150 | 150 |
| **Restoration** | -26 | -26 | -26 | -26 | -26 | -26 | -27 | -26 | -26 | -26 | -26 | -26 |
| **Renewables** | 27 | 27 | 28 | 29 | 31 | 32 | 32 | 31 | 30 | 27 | 27 | 27 |
| **Imports** | 197 | 230 | 255 | 255 | 310 | 284 | 249 | 203 | 188 | 82 | 174 | 205 |
| **Sup & Ent Replacement Energy** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Contracts In** | 275 | 387 | 387 | 387 | 387 | 387 | 401 | 387 | 387 | 275 | 387 | 275 |
| **NUG** | 43 | 44 | 42 | 47 | 50 | 50 | 51 | 48 | 46 | 37 | 47 | 44 |
| **Gross Firm Resources Under Critical Water** | **659** | **805** | **829** | **835** | **895** | **870** | **853** | **786** | **775** | **545** | **759** | **675** |
| | | | | | | | | | | | | |
| **Firm Contracts and Out of Region Contracts** | | | | | | | | | | | | |
| **Exports** | 1671 | 1688 | 1617 | 1512 | 1530 | 1311 | 1358 | 1242 | 1225 | 1313 | 1522 | 1524 |
| **Sup & Ent Capacity Deliveries** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Contracts Out** | 1348 | 1235 | 1282 | 1614 | 1762 | 1760 | 1756 | 1482 | 1444 | 1322 | 1385 | 1422 |
| **CSPE** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total Non-Subscription Contracts** | **3019** | **2923** | **2899** | **3126** | **3292** | **3071** | **3113** | **2724** | **2669** | **2635** | **2907** | **2946** |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **USBR Load** | | | | | | | | | | | | |
| **aMW** | 161 | 109 | 42 | 2 | 2 | 2 | 2.071429 | 4 | 49 | 117 | 151 | 168 |

# Table 36: Average Energy for OY 2005 (Continued)

**Operating Year 2005 in aMW**

| | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | |
| **Federal Firm Resources** | | | | | | | | | | | | |
| **Non-Fed CSPE** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Non-Fed Entitlement** | 150 | 150 | 150 | 150 | 150 | 150 | 150 | 150 | 145 | 145 | 145 | 145 |
| **Restoration** | -26 | -26 | -26 | -26 | -26 | -26 | -26 | -26 | -26 | -26 | -26 | -26 |
| **Renewables** | 27 | 27 | 28 | 29 | 31 | 32 | 31 | 31 | 30 | 27 | 27 | 27 |
| **Imports** | 110 | 143 | 180 | 248 | 303 | 277 | 233 | 203 | 188 | 82 | 100 | 131 |
| **Sup & Ent Replacement Energy** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Contracts In** | 275 | 387 | 387 | 387 | 387 | 387 | 387 | 387 | 387 | 275 | 387 | 275 |
| **NUG** | 43 | 44 | 42 | 47 | 50 | 50 | 49 | 48 | 46 | 37 | 47 | 44 |
| **Gross Firm Resources Under Critical Water** | **579** | **725** | **761** | **835** | **895** | **870** | **824** | **793** | **770** | **540** | **680** | **596** |
| | | | | | | | | | | | | |
| **Firm Contracts and Out of Region Contracts** | | | | | | | | | | | | |
| **Exports** | 1380 | 1396 | 1335 | 1304 | 1325 | 1311 | 1313 | 1242 | 1226 | 1314 | 1447 | 1449 |
| **Sup & Ent Capacity Deliveries** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Contracts Out** | 1354 | 1240 | 1287 | 1619 | 1767 | 1765 | 1700 | 1488 | 1449 | 1328 | 1390 | 1428 |
| **CSPE** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total Non-Subscription Contracts** | **2734** | **2636** | **2622** | **2923** | **3092** | **3076** | **3013** | **2730** | **2675** | **2642** | **2837** | **2877** |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **USBR Load** | | | | | | | | | | | | |
| **aMW** | 161 | 109 | 42 | 2 | 2 | 2 | 2 | 4 | 49 | 117 | 151 | 168 |

# Table 36: Average Energy for OY 2006 (Continued)

**Operating Year 2006 in aMW**

| | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | |
| **Federal Firm Resources** | | | | | | | | | | | | |
| **Non-Fed CSPE** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Non-Fed Entitlement** | 144 | 144 | 144 | 144 | 144 | 144 | 144 | 144 | 144 | 144 | 144 | 144 |
| **Restoration** | -26 | -26 | -26 | -26 | -26 | -26 | -26 | -26 | -26 | -26 | -26 | -26 |
| **Renewables** | 27 | 27 | 28 | 29 | 31 | 32 | 31 | 31 | 30 | 27 | 27 | 27 |
| **Imports** | 110 | 143 | 180 | 248 | 303 | 277 | 233 | 203 | 188 | 82 | 100 | 131 |
| **Sup & Ent Replacement Energy** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Contracts In** | 275 | 387 | 387 | 387 | 387 | 387 | 387 | 387 | 387 | 275 | 387 | 275 |
| **NUG** | 43 | 44 | 42 | 47 | 50 | 50 | 49 | 48 | 46 | 37 | 47 | 44 |
| **Gross Firm Resources Under Critical Water** | **573** | **719** | **755** | **829** | **889** | **864** | **818** | **787** | **769** | **539** | **679** | **595** |
| | | | | | | | | | | | | |
| **Firm Contracts and Out of Region Contracts** | | | | | | | | | | | | |
| **Exports** | 1381 | 1396 | 1334 | 1305 | 1326 | 1261 | 1262 | 1191 | 1174 | 1262 | 1396 | 1399 |
| **Sup & Ent Capacity Deliveries** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Contracts Out** | 1359 | 1245 | 1292 | 1624 | 1773 | 1673 | 1609 | 1396 | 1306 | 1186 | 1249 | 1287 |
| **CSPE** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total Non-Subscription Contracts** | **2740** | **2641** | **2626** | **2929** | **3099** | **2934** | **2871** | **2587** | **2481** | **2448** | **2645** | **2686** |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **USBR Load** | | | | | | | | | | | | |
| **aMW** | 161 | 109 | 42 | 2 | 2 | 2 | 2 | 4 | 49 | 117 | 151 | 168 |

# Table 36: Average Energy for OY 2007 (Continued)

**Operating Year 2007 in aMW**

| | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | |
| **Federal Firm Resources** | | | | | | | | | | | | |
| **Non-Fed CSPE** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Non-Fed Entitlement** | 144 | 144 | 144 | 144 | 144 | 144 | 144 | 144 | 144 | 144 | 144 | 144 |
| **Restoration** | -26 | -26 | -26 | -26 | -26 | -26 | -26 | -26 | -26 | -26 | -26 | -26 |
| **Renewables** | 27 | 27 | 28 | 29 | 31 | 32 | 31 | 31 | 30 | 27 | 27 | 27 |
| **Imports** | 110 | 143 | 180 | 248 | 303 | 277 | 233 | 203 | 188 | 82 | 100 | 131 |
| **Sup & Ent Replacement Energy** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Contracts In** | 275 | 387 | 387 | 387 | 387 | 387 | 387 | 387 | 387 | 275 | 387 | 275 |
| **NUG** | 43 | 44 | 42 | 47 | 50 | 50 | 49 | 48 | 46 | 37 | 47 | 44 |
| **Gross Firm Resources Under Critical Water** | **573** | **719** | **755** | **829** | **889** | **864** | **818** | **787** | **769** | **539** | **679** | **595** |
| | | | | | | | | | | | | |
| **Firm Contracts and Out of Region Contracts** | | | | | | | | | | | | |
| **Exports** | 1330 | 1345 | 1205 | 1176 | 1198 | 978 | 979 | 908 | 891 | 978 | 1114 | 1118 |
| **Sup & Ent Capacity Deliveries** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Contracts Out** | 1204 | 1083 | 575 | 852 | 921 | 903 | 863 | 705 | 697 | 500 | 526 | 555 |
| **CSPE** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total Non-Subscription Contracts** | **2534** | **2428** | **1780** | **2028** | **2119** | **1881** | **1842** | **1613** | **1589** | **1478** | **1640** | **1673** |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **USBR Load** | | | | | | | | | | | | |
| **aMW** | 161 | 109 | 42 | 2 | 2 | 2 | 2 | 4 | 49 | 117 | 151 | 168 |

Year (OY) 2002-2006. The source of the revenues for these miscellaneous Federal firm contract loads is the Revenue Forecast component of the Wholesale Power Rate Development Study, WP-02-FS-BPA-05.

Most of the resource data used in RevSim are obtained from the Loads and Resources Study, WP-02-FS-BPA-01. The shaping of hydro generation into HLHs is measured as a ratio relative to average energy. These HLH ratios are obtain from a computer run of HOSS that is comparable to the Hydroregulation used in the Loads and Resources Study (*see* Section 2.3.3.1 of Loads and Resources Study, WP-02-FS-BPA-01). The HLH shaping ratios from HOSS are multiplied by average monthly hydro generation data for each of the 50 water years from the Hydroregulation component of the Loads and Resources Study, WP-02-FS-BPA-01. Given the ratios for the HLH shaping of hydro generation, the ratios for the LLH shaping of hydro generation are computed in RevSim.

The monthly output for WNP-2 are obtained from the Loads and Resources Study, WP-02-FS-BPA-01, and the output is assumed to be flat across all hours of the day. RevSim uses the total of several miscellaneous Federal firm resources (resources other than hydro and WNP-2) for FY 2002–2006 from the Loads and Resources Study, WP-02-FS-BPA-01. BPA also developed HLH and LLH energy ratios associated with these miscellaneous Federal firm resources for FY 2002-2006. Tables 32-33 contain a list of the miscellaneous Federal firm resources and the associated average energy and HLH and LLH energy ratios for FY 2002–2006. Tables 34-36 contain similar information for OY 2002–2006.

Long-term power purchases associated with System Augmentation were input as a resource into RevSim. These power purchases amounted to 1,309, 1,368, 1,175, 1,315, and 1,243 aMW for FY 2002–2006 (*see* Loads and Resources Study, WP-02-FS-BPA-01) and they are flat block energy purchase across the months of the year and hours of the day (*see* Oliver *et al.*, WP-02-E-BPA-20).

Transmission losses are incorporated into RevSim by reducing Federal hydro generation and WNP-2 output by 2.82 percent. The 2.82 percent loss factor represents the transmission losses on BPA's transmission system, excluding losses on the Southern Intertie. This loss factor is identical to the loss factor used in the Loads and Resources Study, WP-02-FS-BPA-01.

In addition to the resources in the Loads and Resources Study, WP-02-FS-BPA-01, RevSim includes logic that reflects Non-Treaty Storage operations. BPA's ability to store and remove energy from Non-Treaty Storage is modeled via an algorithm. The parameters in the Non-Treaty Storage algorithm are the total amount of energy that can be stored, the beginning Non-Treaty Storage level, and monthly maximum and minimum storage and release constraints.

The algorithm tracks the level of Non-Treaty Storage from month to month and stores and releases energy within operational constraints. A copy of the Non-Treaty Storage algorithm and an example of how it works for a given set of five contiguous water years is provided in Table 37.

# Table 37: Example of Non-Treaty Storage Operations for FY 2002 - FY 2006

## Non-Treaty Storage Operation (FY 2002)

| | |
|---|---|
| Total Non-Treaty Storage Available to BPA (MW-Mo) | 4763 |
| Non-Treaty Storage H/K (Currently Not Being Used) | 145 |
| Initial, Beginning of the Month, Non-Treaty Storage Level (MW-Mo) | **2858** |
| Month of Beginning Non-Treaty Storage Level (MW-Mo); (Oct = 1) | **1** |

| | Oct '01 | Nov '01 | Dec '01 | Jan '02 | Feb '02 | Mar '02 | Apr '02 | May '02 | Jun '02 | Jul '02 | Aug '02 | Sep '02 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Monthly Maximum Storage Constraints (MW-Mo) | 700 | 1400 | 1400 | 1400 | 1400 | 700 | 140 | 350 | 350 | 0 | 0 | 700 |
| Monthly Maximum Release Constraints (MW-Mo) | 700 | 700 | 280 | 280 | 700 | 700 | 0 | 0 | 0 | 350 | 700 | 700 |
| Month Number | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Beginning Monthly Non-Treaty Storage Balance (MW-Mo) | **2858** | **3558** | **3860** | **4763** | **4763** | **4763** | **4763** | **4763** | **4763** | **4763** | **4763** | **4763** |
| Amount of Remaining Storage (MW-Mo) | 1905 | 1205 | 903 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **BPA Monthly Surpluses/Deficits** | 1331 | 302 | 2972 | 7632 | 5396 | 5138 | 5865 | 8368 | 10464 | 7234 | 3810 | 784 |

### Storage Transactions:

| | Oct '01 | Nov '01 | Dec '01 | Jan '02 | Feb '02 | Mar '02 | Apr '02 | May '02 | Jun '02 | Jul '02 | Aug '02 | Sep '02 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BPA Deficit Amount | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Energy Released From NTS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| BPA Surplus Amount | 1331 | 302 | 2972 | 7632 | 5396 | 5138 | 5865 | 8368 | 10464 | 7234 | 3810 | 784 |
| Energy Stored in NTS | 700 | 302 | 903 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ending Monthly Non-Treaty Storage Balance (MW-Mo) | 3558 | 3860 | 4763 | 4763 | 4763 | 4763 | 4763 | 4763 | 4763 | 4763 | 4763 | 4763 |

### Results

| | Oct '01 | Nov '01 | Dec '01 | Jan '02 | Feb '02 | Mar '02 | Apr '02 | May '02 | Jun '02 | Jul '02 | Aug '02 | Sep '02 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Non-Treaty Storage Transactions** | **700** | **302** | **903** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |

# Table 37: Example of Non-Treaty Storage Operations for FY 2003 (Continued)

## Non-Treaty Storage Operation (FY 2003)

| | Oct '02 | Nov '02 | Dec '02 | Jan '03 | Feb '03 | Mar '03 | Apr '03 | May '03 | Jun '03 | Jul '03 | Aug '03 | Sep '03 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Monthly Maximum Storage Constraints (MW-Mo) | 700 | 1400 | 1400 | 1400 | 1400 | 700 | 140 | 350 | 350 | 0 | 0 | 700 |
| Monthly Maximum Release Constraints (MW-Mo) | 700 | 700 | 280 | 280 | 700 | 700 | 0 | 0 | 0 | 350 | 700 | 700 |
| | | | | | | | | | | | | |
| Month Number | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Beginning Monthly Non-Treaty Storage Balance (MW-Mo) | **4763** | 4763 | 4256 | 4121 | 4763 | 4763 | 4763 | 4763 | 4763 | 4763 | 4763 | 4763 |
| Amount of Remaining Storage (MW-Mo) | 0 | 0 | 507 | 642 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **BPA Monthly Surpluses/Deficits** | 1486 | -507 | -136 | 2534 | 2753 | 3619 | 1311 | 3489 | 6577 | 5552 | 2077 | 87 |

**Storage Transactions:**

| | Oct '02 | Nov '02 | Dec '02 | Jan '03 | Feb '03 | Mar '03 | Apr '03 | May '03 | Jun '03 | Jul '03 | Aug '03 | Sep '03 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BPA Deficit Amount | 0 | -507 | -136 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Energy Released From NTS | 0 | 507 | 136 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| BPA Surplus Amount | 1486 | 0 | 0 | 2534 | 2753 | 3619 | 1311 | 3489 | 6577 | 5552 | 2077 | 87 |
| Energy Stored in NTS | 0 | 0 | 0 | 642 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ending Monthly Non-Treaty Storage Balance (MW-Mo) | 4763 | 4256 | 4121 | 4763 | 4763 | 4763 | 4763 | 4763 | 4763 | 4763 | 4763 | 4763 |

**Results**

| | Oct '02 | Nov '02 | Dec '02 | Jan '03 | Feb '03 | Mar '03 | Apr '03 | May '03 | Jun '03 | Jul '03 | Aug '03 | Sep '03 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Non-Treaty Storage Transactions** | **0** | **-507** | **-136** | **642** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |

# Table 37: Example of Non-Treaty Storage Operations for FY 2004 (Continued)

## Non-Treaty Storage Operation (FY 2004)

| | Oct '03 | Nov '03 | Dec '03 | Jan '04 | Feb '04 | Mar '04 | Apr '04 | May '04 | Jun '04 | Jul '04 | Aug '04 | Sep '04 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Monthly Maximum Storage Constraints (MW-Mo) | 700 | 1400 | 1400 | 1400 | 1400 | 700 | 140 | 350 | 350 | 0 | 0 | 700 |
| Monthly Maximum Release Constraints (MW-Mo) | 700 | 700 | 280 | 280 | 700 | 700 | 0 | 0 | 0 | 350 | 700 | 700 |
| | | | | | | | | | | | | |
| Month Number | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Beginning Monthly Non-Treaty Storage Balance (MW-Mo) | **4763** | 4763 | 4763 | 4763 | 4763 | 4763 | 4763 | 4763 | 4763 | 4763 | 4763 | 4763 |
| Amount of Remaining Storage (MW-Mo) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **BPA Monthly Surpluses/Deficits** | 2317 | 934 | 3485 | 5686 | 4310 | 1620 | 4583 | 7860 | 4531 | 5698 | 4967 | 4154 |

**Storage Transactions:**

| | Oct '03 | Nov '03 | Dec '03 | Jan '04 | Feb '04 | Mar '04 | Apr '04 | May '04 | Jun '04 | Jul '04 | Aug '04 | Sep '04 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BPA Deficit Amount | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Energy Released From NTS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| BPA Surplus Amount | 2317 | 934 | 3485 | 5686 | 4310 | 1620 | 4583 | 7860 | 4531 | 5698 | 4967 | 4154 |
| Energy Stored in NTS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ending Monthly Non-Treaty Storage Balance (MW-Mo) | 4763 | 4763 | 4763 | 4763 | 4763 | 4763 | 4763 | 4763 | 4763 | 4763 | 4763 | 4763 |

**Results**

| | Oct '03 | Nov '03 | Dec '03 | Jan '04 | Feb '04 | Mar '04 | Apr '04 | May '04 | Jun '04 | Jul '04 | Aug '04 | Sep '04 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Non-Treaty Storage Transactions** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |

# Table 37: Example of Non-Treaty Storage Operations for FY 2005 (Continued)

## Non-Treaty Storage Operation (FY 2005)

| | Oct '04 | Nov '04 | Dec '04 | Jan '05 | Feb '05 | Mar '05 | Apr '05 | May '05 | Jun '05 | Jul '05 | Aug '05 | Sep '05 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Monthly Maximum Storage Constraints (MW-Mo) | 700 | 1400 | 1400 | 1400 | 1400 | 700 | 140 | 350 | 350 | 0 | 0 | 700 |
| Monthly Maximum Release Constraints (MW-Mo) | 700 | 700 | 280 | 280 | 700 | 700 | 0 | 0 | 0 | 350 | 700 | 700 |
| | | | | | | | | | | | | |
| Month Number | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Beginning Monthly Non-Treaty Storage Balance (MW-Mo) | **4763** | 4763 | 4063 | 3783 | 3503 | 2803 | 2103 | 2103 | 2103 | 2453 | 2453 | 2453 |
| Amount of Remaining Storage (MW-Mo) | 0 | 0 | 700 | 980 | 1260 | 1960 | 2660 | 2660 | 2660 | 2310 | 2310 | 2310 |
| **BPA Monthly Surpluses/Deficits** | 1665 | -732 | -1000 | -2938 | -1639 | -2853 | -1941 | -19 | 1334 | 1152 | 145 | -2154 |

**Storage Transactions:**

| | Oct '04 | Nov '04 | Dec '04 | Jan '05 | Feb '05 | Mar '05 | Apr '05 | May '05 | Jun '05 | Jul '05 | Aug '05 | Sep '05 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BPA Deficit Amount | 0 | -732 | -1000 | -2938 | -1639 | -2853 | -1941 | -19 | 0 | 0 | 0 | -2154 |
| Energy Released From NTS | 0 | 700 | 280 | 280 | 700 | 700 | 0 | 0 | 0 | 0 | 0 | 700 |
| BPA Surplus Amount | 1665 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1334 | 1152 | 145 | 0 |
| Energy Stored in NTS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 350 | 0 | 0 | 0 |
| Ending Monthly Non-Treaty Storage Balance (MW-Mo) | 4763 | 4063 | 3783 | 3503 | 2803 | 2103 | 2103 | 2103 | 2453 | 2453 | 2453 | 1753 |

**Results**

| | Oct '04 | Nov '04 | Dec '04 | Jan '05 | Feb '05 | Mar '05 | Apr '05 | May '05 | Jun '05 | Jul '05 | Aug '05 | Sep '05 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Non-Treaty Storage Transactions** | **0** | **-700** | **-280** | **-280** | **-700** | **-700** | **0** | **0** | **350** | **0** | **0** | **-700** |

# Table 37: Example of Non-Treaty Storage Operations for FY 2006 (Continued)

## Non-Treaty Storage Operation (FY 2006)

| | Oct '05 | Nov '05 | Dec '05 | Jan '06 | Feb '06 | Mar '06 | Apr '06 | May '06 | Jun '06 | Jul '06 | Aug '06 | Sep '06 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Monthly Maximum Storage Constraints (MW-Mo) | 700 | 1400 | 1400 | 1400 | 1400 | 700 | 140 | 350 | 350 | 0 | 0 | 700 |
| Monthly Maximum Release Constraints (MW-Mo) | 700 | 700 | 280 | 280 | 700 | 700 | 0 | 0 | 0 | 350 | 700 | 700 |
| | | | | | | | | | | | | |
| Month Number | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Beginning Monthly Non-Treaty Storage Balance (MW-Mo) | **1753** | 1053 | 353 | 73 | 1079 | 379 | 1079 | 1219 | 1569 | 1919 | 1919 | 1919 |
| Amount of Remaining Storage (MW-Mo) | 3010 | 3710 | 4410 | 4690 | 3684 | 4384 | 3684 | 3544 | 3194 | 2844 | 2844 | 2844 |
| **BPA Monthly Surpluses/Deficits** | -726 | -741 | -894 | 1006 | -1111 | 2586 | 2541 | 4213 | 3531 | 2991 | 2544 | -655 |

**Storage Transactions:**

| | Oct '05 | Nov '05 | Dec '05 | Jan '06 | Feb '06 | Mar '06 | Apr '06 | May '06 | Jun '06 | Jul '06 | Aug '06 | Sep '06 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BPA Deficit Amount | -726 | -741 | -894 | 0 | -1111 | 0 | 0 | 0 | 0 | 0 | 0 | -655 |
| Energy Released From NTS | 700 | 700 | 280 | 0 | 700 | 0 | 0 | 0 | 0 | 0 | 0 | 655 |
| BPA Surplus Amount | 0 | 0 | 0 | 1006 | 0 | 2586 | 2541 | 4213 | 3531 | 2991 | 2544 | 0 |
| Energy Stored in NTS | 0 | 0 | 0 | 1006 | 0 | 700 | 140 | 350 | 350 | 0 | 0 | 0 |
| Ending Monthly Non-Treaty Storage Balance (MW-Mo) | 1053 | 353 | 73 | 1079 | 379 | 1079 | 1219 | 1569 | 1919 | 1919 | 1919 | 1263 |

**Results**

| | Oct '05 | Nov '05 | Dec '05 | Jan '06 | Feb '06 | Mar '06 | Apr '06 | May '06 | Jun '06 | Jul '06 | Aug '06 | Sep '06 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Non-Treaty Storage Transactions** | **-700** | **-700** | **-280** | **1006** | **-700** | **700** | **140** | **350** | **350** | **0** | **0** | **-655** |

Non-Treaty Storage is modeled to have first call on all surplus energy and is withdrawn before any power purchases are made. The storage and withdrawal decisions for Non-Treaty Storage are based on average monthly energy surplus and deficit values. The starting Non-Treaty Storage level for October of FY 2002 was assumed to be 60 percent of full. This value represents the anticipated median starting value for a typical October.

**1.18.2 Adjustments to AURORA Spot Market Electricity Prices.** The underlying source of prices used in RiskMod is HLH and LLH spot market electricity prices estimated by AURORA. However, based on experience in the market, BPA made adjustments to the HLH and LLH spot market electricity prices estimated by AURORA for the purpose of estimating surplus energy revenues, power purchase expenses, 4(h)(10)(C) credits, and FCCF credits (*see* Conger *et al*., WP-02-E-BPA-41, at 7-11 and Conger *et al*., WP-02-E-BPA-15, at 16-17). These adjustments are performed in RevSim via an algorithm that modifies monthly HLH and LLH spot market electricity prices estimated by AURORA for the months of April through June. The adjustments to the monthly HLH and LLH spot market electricity prices for the months of April through June are as follows:

1. All surplus energy is sold at AURORA HLH and LLH spot market prices estimated by AURORA when the quantity sold is less than or equal to 5,500 aMW on HLH and 3,500 aMW on LLH;

2. All surplus energy is sold at a minimum price of $9/megawatthour (MWh) on HLH and $5/MWh on LLH when the quantity sold is more than or equal to 8,000 aMW on HLH and 5,500 aMW on LLH; and

3. All HLH and LLH surplus energy is sold at continuously lower prices (a linear reduction) as the quantity sold increases from 5,500 aMW to 8,000 aMW on HLH and 3,500 aMW to 5,500 aMW on LLH. Prices for these quantities of sales range from slightly below HLH and LLH spot market electricity prices estimated by AURORA to slightly above the minimum prices described above. The HLH and LLH surplus energy prices used in the price algorithm for 5,500 aMW and 3,500 aMW were derived from AURORA HLH and LLH prices for the 50 water years used in the 50 Water Run of RiskMod. Each of these HLH and LLH surplus energy prices for April through June in FY 2002–2006 were estimated via the statistical method of linear regression using surplus energy sales and price data for Water Years in which the amount of surplus energy sales were similar, being somewhat higher or lower, than 5,500 aMW during HLH and 3,500 aMW during LLHs. *See* Conger *et al*., WP-02-E-BPA-41, at 5-7.

**1.18.3 4(h)(10)(C) Credits.** The 4(h)(10)(C) credit is a provision in the 1980 Pacific Northwest Electric Power Planning and Conservation Act that allows BPA and its ratepayers to receive a credit for nonpower fish and wildlife impacts attributable to the Federal projects. The amount of 4(h)(10)(C) credits that BPA can collect for each of the 50 water years for FY 2002-2006 is determined by summing the costs of the operational impacts, the expenses, and

the capital costs associated with fish and wildlife mitigation measures, and then multiplying the total cost by .27 (27 percent).

The costs of the operational impacts are calculated for each of the 50 water years in RiskMod for FY 2002–2006 by multiplying HLH and LLH spot market electricity prices that have been adjusted to reflect BPA's experience in the market by the amount of power purchases (aMW) that qualifies for 4(h)(10)(C) credits. The power purchases (aMW) that qualifies for 4(h)(10)(C) credits vary depending on monthly hydro operations due to fish mitigation measures.

The amounts of power purchases (aMW) that qualifies for 4(h)(10)(C) credits is derived external to RevSim, but are used in RevSim to calculate the dollar amount of the 4(h)(10)(C) credits. A description of the methodology used to derive the amounts of power purchases (aMW) associated with the 4(h)(10)(C) credits is contained in the Wholesale Power Rate Development Study Documentation, WP-02-FS-BPA-05A. The capital costs for FY 2002–2006 are $34.7, $38.3, $35.8. $34.0, $34.2 million and the expenses are $131.7, $138.0, $140.1, $142.9, $144.4 million (*see* Revenue Requirement Study, WP-02-FS-BPA-02).

The 4(h)(10)(C) credits for each of the 50 water years are calculated for FY 2002-2006 in both the 50 water year run and the Risk Simulation run of RiskMod. The 50 water year run of RiskMod calculates the annual 4(h)(10)(C) credits for each of the 50 water years for FY 2002-2006 for inclusion into the Revenue Forecast and RAM components of the Wholesale Power Rate Development Study, WP-02-FS-BPA-05. The 4(h)(10)(C) credits calculated for

each of the 50 water years for each of the 18 fish and wildlife scenarios for FY 2002-2006 are calculated in the Risk Simulation run of RiskMod for use in the Risk Analysis Study.

The amount of the power purchases (aMW) that qualify for 4(h)(10)(C) credits, the dollar amounts of 4(h)(10)(C) credits, and the market prices used to calculate the dollar amounts of the 4(h)(10)(C) credits for the 50 water year run of RiskMod, are reported in the Revenue Forecast component of the Wholesale Power Rate Development Study Documentation, WP-02-FS-BPA-05B. The amount of the power purchases (aMW) that qualify for 4(h)(10)(C) credits for each of the 50 water years for the 18 fish and wildlife scenarios are reported in Tables 38-55.

**1.18.4 Fish Cost Contingency Fund.** The FCCF credit is related to the 4(h)(10)(C) credit. It is an agreement between BPA and the Office of Management and Budget implemented to allow BPA and its ratepayers to obtain limited credit for nonpower fish and wildlife impacts that occurred prior to 1995. The amount of this credit is $325 million (*see* Volume 1, Chapter 12 of Revenue Requirement Study Documentation, WP-02-FS-BPA-02A). The amount of annual FCCF credits that BPA can claim based on the 1998 Supplemental BO, if there were no limitations in the reserve balance of the FCCF, for each of the 50 water years for FY 2002–2006 are calculated external to RevSim. These values are calculated in a spreadsheet using monthly surplus energy revenues and power purchase expenses for each of the 50 water years calculated from the 50 water year run of RiskMod. The calculations in the spreadsheet produce a 50 x 5 (50 water years) (FY 2002–2006) table of annual FCCF credits that are input into RevSim. The 50 x 5 matrices of FCCF credits for FY 2002–2006 are reported in Table 56. A description of

# Table 38: 4(h)(10)(C) Power Purchase Amounts (aMW) for In-River Migration (low option)

| 4(h)(10)(C) Power Purchase Amounts (aMW), … Scenario 1 | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Water Year** | **Oct** | **Nov** | **Dec** | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **Jun** | **Jul** | **Aug** | **Sep** |
| 1929 | 54.0 | 2149.0 | 1723.0 | 3364.0 | 1424.0 | 1995.0 | 461.5 | 1423.0 | -38.0 | 0.0 | 0.0 | 987.0 |
| 1930 | 375.0 | 1403.0 | 1608.0 | 3238.0 | 1429.0 | 2351.0 | -517.5 | 1864.0 | 1434.0 | 0.0 | -128.8 | 302.0 |
| 1931 | 479.0 | 1359.0 | 1246.0 | 3949.0 | 2822.0 | 1801.0 | 130.5 | -395.0 | 561.0 | -262.0 | 0.0 | 486.0 |
| 1932 | 101.0 | 1431.0 | 2057.0 | 3634.0 | 1825.0 | 0.0 | 0.0 | 0.0 | 0.0 | -82.0 | -259.2 | 1189.0 |
| 1933 | 0.0 | 1539.0 | 1560.0 | 0.0 | 0.0 | 1298.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 683.0 |
| 1934 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -619.0 | -19.0 | 0.0 | 86.0 |
| 1935 | 407.0 | 2076.0 | 2086.0 | 0.0 | 0.0 | 34.0 | 0.0 | 0.0 | 0.0 | -330.0 | 559.7 | 597.0 |
| 1936 | 367.0 | 1803.0 | 1545.0 | 2530.0 | 1030.0 | 1589.0 | -15.5 | 0.0 | 0.0 | -107.0 | 82.8 | 1160.0 |
| 1937 | 669.0 | 1670.0 | 1631.0 | 3239.0 | 2099.0 | 2189.0 | 1084.0 | 67.0 | 714.0 | -462.0 | 0.0 | 774.0 |
| 1938 | 52.0 | 886.0 | 831.0 | 0.0 | 621.0 | 0.0 | 0.0 | 0.0 | 0.0 | -227.0 | -214.7 | -622.0 |
| 1939 | 0.0 | 2135.0 | 1722.0 | 3332.0 | 0.0 | -31.0 | 0.0 | 0.0 | 1020.0 | 0.0 | -397.5 | 1114.0 |
| 1940 | 0.0 | 1616.0 | 1379.0 | 2260.0 | 332.0 | 0.0 | -91.5 | 0.0 | 2245.0 | 0.0 | 0.0 | 871.0 |
| 1941 | -230.0 | 1837.0 | 1726.0 | 2514.0 | 1944.0 | 928.0 | -136.0 | 207.0 | 0.0 | 133.0 | -59.3 | -269.0 |
| 1942 | -682.0 | 1153.0 | 0.0 | 0.0 | 0.0 | 2095.0 | 0.0 | 0.0 | 0.0 | 0.0 | -238.3 | 814.0 |
| 1943 | -356.0 | 1984.0 | 1697.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -428.0 |
| 1944 | 36.0 | 2203.0 | 1712.0 | 3121.0 | 1229.0 | 2359.0 | 710.5 | 705.0 | 261.0 | 204.0 | 0.0 | 1041.0 |
| 1945 | 8.0 | 1345.0 | 2048.0 | 3507.0 | 2805.0 | 2347.0 | 64.5 | 0.0 | 0.0 | -356.0 | -412.7 | 1482.0 |
| 1946 | -130.0 | 1613.0 | 633.0 | 0.0 | 285.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -93.8 | -402.0 |
| 1947 | 0.0 | 1956.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 411.0 |
| 1948 | 0.0 | 384.0 | 622.0 | 0.0 | 0.0 | 116.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 644.0 |
| 1949 | 0.0 | 2066.0 | 2032.0 | 0.0 | 603.0 | 0.0 | 0.0 | 0.0 | 0.0 | -125.0 | 0.0 | 0.0 |
| 1950 | -114.0 | 1971.0 | 911.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 526.0 | -85.0 |
| 1951 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 514.0 |
| 1952 | 0.0 | 1437.0 | 102.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 497.0 |
| 1953 | 405.0 | 1968.0 | 1548.0 | 2267.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 986.0 |
| 1954 | 0.0 | 1786.0 | 1681.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 474.0 |
| 1955 | 0.0 | 841.0 | 1270.0 | 0.0 | 0.0 | 2034.0 | -331.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1956 | 0.0 | 588.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 290.0 |
| 1957 | 0.0 | 2179.0 | 1171.0 | 79.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -297.0 | 0.0 | 653.0 |
| 1958 | 156.0 | 2152.0 | 1692.0 | 172.0 | 0.0 | 203.0 | 0.0 | 0.0 | 0.0 | -513.0 | -315.2 | 898.0 |
| 1959 | -218.0 | 1235.0 | 33.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -251.7 | 276.0 |
| 1960 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1961 | 0.0 | 1640.0 | 2316.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 672.0 |
| 1962 | 0.0 | 2262.0 | 1682.0 | 0.0 | 1019.0 | 990.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1008.0 |
| 1963 | 0.0 | 999.0 | 148.0 | 0.0 | 0.0 | 815.0 | -216.5 | 0.0 | 0.0 | 0.0 | 0.0 | 970.0 |
| 1964 | -34.0 | 2185.0 | 2198.0 | 443.0 | 0.0 | 1646.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1965 | 0.0 | 1484.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1966 | 0.0 | 1411.0 | 1065.0 | 0.0 | 0.0 | 858.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 397.0 |
| 1967 | 69.0 | 2008.0 | 1770.0 | 0.0 | 0.0 | 0.0 | 529.0 | 0.0 | 0.0 | 0.0 | 0.0 | 820.0 |
| 1968 | 0.0 | 1648.0 | 1252.0 | 0.0 | 0.0 | 0.0 | -273.0 | 838.0 | 0.0 | 0.0 | 0.0 | 157.0 |
| 1969 | 0.0 | 471.0 | 458.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -397.0 | 0.0 | 0.0 |
| 1970 | 0.0 | 2110.0 | 2104.0 | 696.0 | 0.0 | 0.0 | -391.0 | 0.0 | 0.0 | 0.0 | 28.0 | 803.0 |
| 1971 | 217.0 | 2405.0 | 840.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -179.2 | 997.0 |
| 1972 | 0.0 | 1802.0 | 1392.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1973 | 0.0 | 2035.0 | 611.0 | 509.0 | 356.0 | 444.0 | 733.5 | 1010.0 | 507.0 | 0.0 | 0.0 | 0.0 |
| 1974 | -210.0 | 1121.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 23.8 | 317.0 |
| 1975 | 229.0 | 2172.0 | 1963.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 257.0 |
| 1976 | 0.0 | 105.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -39.3 | 786.0 |
| 1977 | 0.0 | 2118.0 | 1590.0 | 2847.0 | 556.0 | 2707.0 | 567.0 | 965.0 | 720.0 | 154.0 | 0.0 | 0.0 |
| 1978 | 142.0 | 712.0 | 861.0 | -675.0 | 540.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -490.2 | 1482.0 |

# Table 39: 4(h)(10)(C) Power Purchase Amounts (aMW) for In-River Migration (high option) with CWA **

| 4(h)(10)(C) Power Purchase Amounts (aMW), … Scenario 2 | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Water Year** | **Oct** | **Nov** | **Dec** | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **Jun** | **Jul** | **Aug** | **Sep** |
| 1929 | 45.0 | 2226.0 | 1571.0 | 3842.0 | 751.0 | 2427.0 | 1000.0 | 2786.0 | 171.0 | 0.0 | 0.0 | 1027.0 |
| 1930 | 414.0 | 1520.0 | 1715.0 | 2464.0 | 1930.0 | 3512.0 | -517.5 | 2336.0 | 2592.0 | 0.0 | -128.8 | 819.0 |
| 1931 | 441.0 | 1466.0 | 1152.0 | 3230.0 | 4129.0 | 2147.0 | 815.0 | -395.0 | 2095.0 | -262.0 | 0.0 | 529.0 |
| 1932 | 330.0 | 1615.0 | 2083.0 | 4474.0 | 2168.0 | 0.0 | 0.0 | 0.0 | 0.0 | -82.0 | -352.0 | 1355.0 |
| 1933 | -20.0 | 1545.0 | 1589.0 | 0.0 | 0.0 | 1768.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 981.0 |
| 1934 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -658.0 | -476.0 | 0.0 | 86.0 |
| 1935 | 467.0 | 2068.0 | 2125.0 | 0.0 | 0.0 | 609.0 | 0.0 | 0.0 | 0.0 | -330.0 | 376.3 | 624.0 |
| 1936 | 367.0 | 1819.0 | 1596.0 | 2615.0 | 538.0 | 2195.0 | 142.5 | 0.0 | 0.0 | -107.0 | 22.0 | 1179.0 |
| 1937 | 691.0 | 1698.0 | 1640.0 | 1915.0 | 3165.0 | 2832.0 | 1776.0 | 67.0 | 1691.0 | -462.0 | 0.0 | 824.0 |
| 1938 | -378.0 | 866.0 | 864.0 | 0.0 | 621.0 | 0.0 | 0.0 | 0.0 | 0.0 | -227.0 | -350.5 | -269.0 |
| 1939 | -69.0 | 2179.0 | 2035.0 | 3895.0 | 0.0 | -31.0 | 0.0 | 0.0 | 2079.0 | 0.0 | -457.8 | 1111.0 |
| 1940 | 25.0 | 1621.0 | 1423.0 | 2563.0 | 172.0 | 0.0 | -91.5 | 0.0 | 2900.0 | 0.0 | 0.0 | 944.0 |
| 1941 | -490.0 | 2095.0 | 1449.0 | 1946.0 | 2379.0 | 2245.0 | 219.0 | 1335.0 | 197.0 | 133.0 | -246.0 | 33.0 |
| 1942 | -748.0 | 1126.0 | 0.0 | 0.0 | 0.0 | 2649.0 | 0.0 | 0.0 | 0.0 | 0.0 | -492.2 | 852.0 |
| 1943 | -388.0 | 1989.0 | 1647.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -390.0 |
| 1944 | 186.0 | 2198.0 | 1512.0 | 3591.0 | 389.0 | 2501.0 | 1123.5 | 1898.0 | 559.0 | 87.0 | 0.0 | 1097.0 |
| 1945 | 40.0 | 1380.0 | 2076.0 | 2486.0 | 3699.0 | 3254.0 | 526.5 | 0.0 | 0.0 | -356.0 | -633.3 | 2212.0 |
| 1946 | 130.0 | 1671.0 | 553.0 | 0.0 | 285.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -93.8 | -399.0 |
| 1947 | -11.0 | 2096.0 | 0.0 | 0.0 | 0.0 | 875.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 476.0 |
| 1948 | 0.0 | 430.0 | 761.0 | 0.0 | 0.0 | 116.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 684.0 |
| 1949 | 0.0 | 2086.0 | 2070.0 | 0.0 | 603.0 | 0.0 | 0.0 | 0.0 | 0.0 | -216.0 | 0.0 | 0.0 |
| 1950 | -122.0 | 1991.0 | 925.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -170.8 | -49.0 |
| 1951 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 553.0 |
| 1952 | 0.0 | 1439.0 | -77.0 | 0.0 | 0.0 | 506.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 497.0 |
| 1953 | 314.0 | 2046.0 | 1586.0 | 2750.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 991.0 |
| 1954 | 18.0 | 1747.0 | 1549.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 523.0 |
| 1955 | 0.0 | 845.0 | 1306.0 | 0.0 | 411.0 | 2567.0 | -331.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1956 | 0.0 | 511.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 290.0 |
| 1957 | 0.0 | 2289.0 | 1104.0 | 598.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -297.0 | 0.0 | 416.0 |
| 1958 | 275.0 | 2195.0 | 1736.0 | 443.0 | 0.0 | 445.0 | 0.0 | 0.0 | 0.0 | -535.0 | -315.2 | 898.0 |
| 1959 | -218.0 | 1243.0 | 189.0 | 0.0 | 0.0 | 130.0 | 0.0 | 0.0 | 0.0 | 0.0 | -251.7 | 313.0 |
| 1960 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1961 | 1.0 | 1647.0 | 2340.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 598.0 |
| 1962 | -40.0 | 2267.0 | 1678.0 | 0.0 | 1320.0 | 1035.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1079.0 |
| 1963 | 0.0 | 1010.0 | 394.0 | 0.0 | 0.0 | 1247.0 | -216.5 | 0.0 | 0.0 | 0.0 | 0.0 | 993.0 |
| 1964 | -57.0 | 2190.0 | 2261.0 | 874.0 | 0.0 | 1539.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 44.0 |
| 1965 | 0.0 | 1382.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1966 | 0.0 | 1382.0 | 1065.0 | 0.0 | 0.0 | 1006.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 395.0 |
| 1967 | 67.0 | 2016.0 | 1814.0 | 0.0 | 0.0 | 923.0 | -80.5 | 0.0 | 0.0 | 0.0 | 0.0 | 841.0 |
| 1968 | 169.0 | 1698.0 | 1144.0 | 0.0 | 0.0 | 0.0 | -440.0 | 838.0 | 0.0 | 0.0 | 0.0 | 157.0 |
| 1969 | 0.0 | 471.0 | 443.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -397.0 | 0.0 | 0.0 |
| 1970 | 0.0 | 2140.0 | 2266.0 | 1207.0 | 0.0 | 0.0 | -391.0 | 0.0 | 0.0 | 0.0 | 28.0 | 735.0 |
| 1971 | 188.0 | 2446.0 | 643.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -179.2 | 1138.0 |
| 1972 | -13.0 | 1763.0 | 1283.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1973 | 0.0 | 2027.0 | 643.0 | 693.0 | 513.0 | 1108.0 | 902.5 | 2275.0 | 1032.0 | 0.0 | 0.0 | 0.0 |
| 1974 | -39.0 | 1212.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -251.2 | 737.0 |
| 1975 | 133.0 | 2077.0 | 1974.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 257.0 |
| 1976 | 0.0 | 105.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -39.3 | 956.0 |
| 1977 | 0.0 | 2107.0 | 1600.0 | 3187.0 | -459.0 | 3673.0 | 1054.0 | 1957.0 | 1736.0 | 109.0 | 0.0 | 0.0 |
| 1978 | 214.0 | 691.0 | 977.0 | -675.0 | 540.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -634.0 | 2193.0 |

# Table 40: 4(h)(10)(C) Power Purchase Amounts (aMW) for Expanded Transport

| 4(h)(10)(C) Power Purchase Amounts (aMW), … Scenario 3 | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Water Year** | **Oct** | **Nov** | **Dec** | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **Jun** | **Jul** | **Aug** | **Sep** |
| 1929 | 54.0 | 2149.0 | 1723.0 | 3364.0 | 1424.0 | 1995.0 | 461.5 | 941.0 | -38.0 | 0.0 | 0.0 | 995.0 |
| 1930 | 276.0 | 1336.0 | 1465.0 | 3646.0 | 1429.0 | 2351.0 | -517.5 | 1772.0 | 1218.0 | 0.0 | -128.8 | 242.0 |
| 1931 | 530.0 | 1233.0 | 1088.0 | 4261.0 | 2822.0 | 1801.0 | 65.5 | -395.0 | 364.0 | -262.0 | 0.0 | 431.0 |
| 1932 | 163.0 | 1337.0 | 1955.0 | 3842.0 | 1825.0 | 0.0 | 0.0 | 0.0 | 0.0 | -82.0 | -259.2 | 1127.0 |
| 1933 | 0.0 | 1539.0 | 1560.0 | 0.0 | 0.0 | 1298.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 683.0 |
| 1934 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -658.0 | -44.0 | 0.0 | 86.0 |
| 1935 | 466.0 | 2078.0 | 2086.0 | 0.0 | 0.0 | 34.0 | 0.0 | 0.0 | 0.0 | -330.0 | 582.2 | 540.0 |
| 1936 | 379.0 | 1714.0 | 1353.0 | 2826.0 | 1030.0 | 1589.0 | -15.5 | 0.0 | 0.0 | -107.0 | 81.8 | 1150.0 |
| 1937 | 686.0 | 1507.0 | 1579.0 | 3466.0 | 2099.0 | 2187.0 | 1038.0 | 67.0 | 714.0 | -462.0 | 0.0 | 757.0 |
| 1938 | 59.0 | 896.0 | 831.0 | 0.0 | 621.0 | 0.0 | 0.0 | 0.0 | 0.0 | -227.0 | -206.2 | -633.0 |
| 1939 | 3.0 | 2061.0 | 1793.0 | 3332.0 | 0.0 | -31.0 | 0.0 | 0.0 | 821.0 | 0.0 | -400.5 | 1116.0 |
| 1940 | 7.0 | 1614.0 | 1380.0 | 2260.0 | 332.0 | 0.0 | -91.5 | 0.0 | 2026.0 | 0.0 | 0.0 | 866.0 |
| 1941 | -193.0 | 1719.0 | 1840.0 | 2521.0 | 1968.0 | 924.0 | -146.5 | 207.0 | 0.0 | 133.0 | -47.8 | -315.0 |
| 1942 | -630.0 | 1153.0 | 0.0 | 0.0 | 0.0 | 2091.0 | 0.0 | 0.0 | 0.0 | 0.0 | -238.3 | 763.0 |
| 1943 | -356.0 | 1984.0 | 1697.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -428.0 |
| 1944 | 36.0 | 2159.0 | 1754.0 | 3121.0 | 1229.0 | 2359.0 | 658.0 | 591.0 | 79.0 | 204.0 | 0.0 | 1041.0 |
| 1945 | -38.0 | 1255.0 | 1951.0 | 3654.0 | 2897.0 | 2366.0 | 9.5 | 0.0 | 0.0 | -356.0 | -412.7 | 1481.0 |
| 1946 | -18.0 | 1613.0 | 633.0 | 0.0 | 285.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -93.8 | -504.0 |
| 1947 | 0.0 | 1956.0 | 0.0 | 0.0 | 0.0 | 315.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 424.0 |
| 1948 | 0.0 | 384.0 | 622.0 | 0.0 | 0.0 | 116.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 645.0 |
| 1949 | 0.0 | 2066.0 | 2032.0 | 0.0 | 603.0 | 0.0 | 0.0 | 0.0 | 0.0 | -125.0 | 0.0 | 0.0 |
| 1950 | -121.0 | 1902.0 | 990.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 526.0 | -92.0 |
| 1951 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 514.0 |
| 1952 | 0.0 | 1437.0 | 102.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 497.0 |
| 1953 | 411.0 | 1819.0 | 1635.0 | 2339.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 981.0 |
| 1954 | 0.0 | 1786.0 | 1681.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 474.0 |
| 1955 | 0.0 | 841.0 | 1270.0 | 0.0 | 0.0 | 2032.0 | -331.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1956 | 0.0 | 588.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 290.0 |
| 1957 | 0.0 | 2179.0 | 1171.0 | 79.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -297.0 | 0.0 | 653.0 |
| 1958 | 158.0 | 2047.0 | 1792.0 | 172.0 | 0.0 | 203.0 | 0.0 | 0.0 | 0.0 | -513.0 | -315.2 | 897.0 |
| 1959 | -218.0 | 1235.0 | 33.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -251.7 | 278.0 |
| 1960 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1961 | 21.0 | 1640.0 | 2316.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 668.0 |
| 1962 | 1.0 | 2262.0 | 1682.0 | 0.0 | 1024.0 | 986.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1012.0 |
| 1963 | 0.0 | 999.0 | 148.0 | 0.0 | 0.0 | 815.0 | -216.5 | 0.0 | 0.0 | 0.0 | 0.0 | 970.0 |
| 1964 | -34.0 | 2185.0 | 2198.0 | 443.0 | 0.0 | 1642.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1965 | 0.0 | 1484.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1966 | 0.0 | 1411.0 | 1065.0 | 0.0 | 0.0 | 858.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 397.0 |
| 1967 | 69.0 | 2008.0 | 1770.0 | 0.0 | 0.0 | 0.0 | 453.0 | 0.0 | 0.0 | 0.0 | 0.0 | 821.0 |
| 1968 | 0.0 | 1648.0 | 1252.0 | 0.0 | 0.0 | 0.0 | -311.5 | 838.0 | 0.0 | 0.0 | 0.0 | 157.0 |
| 1969 | 0.0 | 471.0 | 458.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -397.0 | 0.0 | 0.0 |
| 1970 | 0.0 | 2110.0 | 2104.0 | 696.0 | 0.0 | 0.0 | -391.0 | 0.0 | 0.0 | 0.0 | 28.0 | 805.0 |
| 1971 | 230.0 | 2394.0 | 849.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -179.2 | 985.0 |
| 1972 | 0.0 | 1802.0 | 1392.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1973 | 0.0 | 2035.0 | 611.0 | 509.0 | 356.0 | 444.0 | 691.5 | 974.0 | 507.0 | 0.0 | 0.0 | 0.0 |
| 1974 | -286.0 | 1202.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 23.8 | 315.0 |
| 1975 | 229.0 | 2172.0 | 1963.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 257.0 |
| 1976 | 0.0 | 105.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -39.3 | 786.0 |
| 1977 | 0.0 | 2059.0 | 1646.0 | 2847.0 | 556.0 | 2707.0 | 567.0 | 820.0 | 559.0 | 154.0 | 0.0 | 0.0 |
| 1978 | 88.0 | 635.0 | 1008.0 | -675.0 | 540.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -490.2 | 1481.0 |

# Table 41: 4(h)(10)(C) Power Purchase Amounts (aMW) for Expanded Transport (low option)

| 4(h)(10)(C) Power Purchase Amounts (aMW), … Scenario 4 | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Water Year** | **Oct** | **Nov** | **Dec** | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **Jun** | **Jul** | **Aug** | **Sep** |
| 1929 | -346.0 | 1052.0 | 356.0 | 4028.0 | 139.0 | 1073.0 | 1912.0 | 4243.0 | -38.0 | 1453.0 | 0.0 | 1347.0 |
| 1930 | -583.0 | -169.0 | 427.0 | 1231.0 | 2240.0 | 2374.0 | 298.5 | 5500.0 | 927.0 | 2230.0 | -128.8 | -673.0 |
| 1931 | -127.0 | 758.0 | 33.0 | 3424.0 | 2821.0 | 1839.0 | 1551.0 | 1342.0 | 2360.0 | 329.0 | 0.0 | -314.0 |
| 1932 | 595.0 | 1706.0 | 2492.0 | 6906.0 | 1907.0 | 242.0 | 0.0 | 0.0 | 0.0 | -82.0 | 569.7 | 207.0 |
| 1933 | -236.0 | 514.0 | 1246.0 | 0.0 | 0.0 | 26.0 | 0.0 | 0.0 | 0.0 | 0.0 | 148.3 | 48.0 |
| 1934 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -187.0 | 2983.0 | 0.0 | 86.0 |
| 1935 | 438.0 | 1790.0 | 2142.0 | 0.0 | 0.0 | -75.0 | 0.0 | 0.0 | 0.0 | 880.0 | 558.2 | -182.0 |
| 1936 | 258.0 | 691.0 | 242.0 | 2841.0 | -23.0 | 210.0 | 412.5 | 0.0 | 0.0 | -107.0 | 463.3 | -16.0 |
| 1937 | 602.0 | 836.0 | 510.0 | 2750.0 | 360.0 | 891.0 | 2982.0 | 2365.0 | 714.0 | 3005.0 | 0.0 | -160.0 |
| 1938 | -636.0 | 301.0 | 530.0 | 0.0 | 621.0 | 0.0 | 0.0 | 0.0 | 0.0 | -227.0 | 67.2 | -1755.0 |
| 1939 | -164.0 | 1097.0 | 961.0 | 2196.0 | 0.0 | -31.0 | 0.0 | 0.0 | 1742.0 | 0.0 | -413.0 | 35.0 |
| 1940 | -89.0 | 1706.0 | 146.0 | 2206.0 | 52.0 | 0.0 | -91.5 | 1221.0 | 3050.0 | 2352.0 | 0.0 | 15.0 |
| 1941 | 220.0 | 1446.0 | 153.0 | 2996.0 | 831.0 | 2052.0 | 2175.5 | 3825.0 | 0.0 | 1473.0 | -246.0 | -1199.0 |
| 1942 | 269.0 | 1449.0 | 2185.0 | 47.0 | 0.0 | 2114.0 | 983.5 | 408.0 | 0.0 | 0.0 | 722.5 | 358.0 |
| 1943 | -550.0 | 1184.0 | 1407.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -826.0 |
| 1944 | -485.0 | 1056.0 | 240.0 | 4754.0 | 279.0 | 881.0 | 2357.0 | 3614.0 | -215.0 | 907.0 | 0.0 | 383.0 |
| 1945 | -596.0 | 432.0 | 1292.0 | 2454.0 | 3415.0 | 2398.0 | 1661.5 | 344.0 | 0.0 | 917.0 | 477.3 | 358.0 |
| 1946 | -512.0 | 1708.0 | 454.0 | 0.0 | 285.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 125.8 | -1172.0 |
| 1947 | -247.0 | 923.0 | 0.0 | 0.0 | 0.0 | -83.0 | 0.0 | 0.0 | 0.0 | 282.0 | 0.0 | 66.0 |
| 1948 | 0.0 | 488.0 | 51.0 | 0.0 | 0.0 | 116.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2099.7 | 62.0 |
| 1949 | 0.0 | 554.0 | 979.0 | 0.0 | 603.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1540.0 | 0.0 | 0.0 |
| 1950 | -1072.0 | 927.0 | 777.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1237.5 | -1430.0 |
| 1951 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 514.0 |
| 1952 | 0.0 | 1208.0 | -484.0 | 0.0 | 0.0 | -506.0 | 0.0 | 0.0 | 0.0 | 453.0 | 0.0 | 497.0 |
| 1953 | 271.0 | 1220.0 | 147.0 | 1896.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 741.7 | -101.0 |
| 1954 | -70.0 | 254.0 | 549.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -126.0 |
| 1955 | 0.0 | 525.0 | 349.0 | 0.0 | -1122.0 | 1206.0 | 18.0 | 2683.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1956 | 0.0 | 396.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 290.0 |
| 1957 | 0.0 | 609.0 | 28.0 | 79.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -297.0 | 0.0 | 416.0 |
| 1958 | 149.0 | 1566.0 | 479.0 | 172.0 | 0.0 | 116.0 | 0.0 | 0.0 | 0.0 | -535.0 | 447.0 | 164.0 |
| 1959 | 176.0 | 242.0 | 33.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 349.9 | -642.0 |
| 1960 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1961 | -404.0 | 232.0 | 1001.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 763.6 | -502.0 |
| 1962 | -235.0 | 1669.0 | 998.0 | 0.0 | 601.0 | 2.0 | 0.0 | 0.0 | 0.0 | 0.0 | 467.6 | 13.0 |
| 1963 | 0.0 | 378.0 | -20.0 | 0.0 | 0.0 | -259.0 | -216.5 | 0.0 | 0.0 | 0.0 | 0.0 | 295.0 |
| 1964 | -336.0 | 1432.0 | 1095.0 | 443.0 | 0.0 | 160.0 | 0.0 | 0.0 | 0.0 | 0.0 | 416.8 | -179.0 |
| 1965 | 0.0 | 803.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1966 | 0.0 | 446.0 | 125.0 | 0.0 | 0.0 | -233.0 | 0.0 | 0.0 | 0.0 | 1488.0 | 0.0 | 302.0 |
| 1967 | -135.0 | 1610.0 | 532.0 | 0.0 | 0.0 | 0.0 | 245.8 | 0.0 | 0.0 | 0.0 | 742.7 | 26.0 |
| 1968 | 0.0 | 417.0 | 210.0 | 0.0 | 0.0 | 0.0 | -440.0 | 1609.0 | 0.0 | 0.0 | 0.0 | 157.0 |
| 1969 | 0.0 | 471.0 | -70.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -397.0 | 0.0 | 0.0 |
| 1970 | 0.0 | 1147.0 | 1059.0 | 608.0 | 0.0 | 0.0 | -391.0 | 0.0 | 0.0 | 0.0 | 575.6 | 57.0 |
| 1971 | 23.0 | 1510.0 | -39.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 644.7 | 182.0 |
| 1972 | -148.0 | 306.0 | 406.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1973 | 0.0 | 717.0 | -567.0 | 409.0 | 356.0 | -616.0 | 1918.5 | 4145.0 | 507.0 | 1819.0 | 0.0 | 0.0 |
| 1974 | -211.0 | 847.0 | 2078.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2106.7 | -1195.0 |
| 1975 | -231.0 | 473.0 | 1031.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 257.0 |
| 1976 | 0.0 | 105.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -39.3 | 114.0 |
| 1977 | 268.0 | 753.0 | 483.0 | 2446.0 | -459.0 | 1654.0 | 1956.0 | 3808.0 | 593.0 | 109.0 | 0.0 | 0.0 |
| 1978 | -348.0 | 151.0 | 1420.0 | 2510.0 | 1809.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -308.8 | 6.0 |

# Table 42: 4(h)(10)(C) Power Purchase Amounts (aMW) for Transportation Plus

| 4(h)(10)(C) Power Purchase Amounts (aMW), … Scenario 5 | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Water Year** | **Oct** | **Nov** | **Dec** | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **Jun** | **Jul** | **Aug** | **Sep** |
| 1929 | 54.0 | 2149.0 | 1723.0 | 3364.0 | 1424.0 | 1995.0 | 461.5 | 1423.0 | -38.0 | 0.0 | 0.0 | 987.0 |
| 1930 | 375.0 | 1403.0 | 1608.0 | 3238.0 | 1429.0 | 2351.0 | -517.5 | 1864.0 | 1434.0 | 0.0 | -128.8 | 302.0 |
| 1931 | 479.0 | 1359.0 | 1246.0 | 3949.0 | 2822.0 | 1801.0 | 130.5 | -395.0 | 561.0 | -262.0 | 0.0 | 486.0 |
| 1932 | 101.0 | 1431.0 | 2057.0 | 3634.0 | 1825.0 | 0.0 | 0.0 | 0.0 | 0.0 | -82.0 | -259.2 | 1189.0 |
| 1933 | 0.0 | 1539.0 | 1560.0 | 0.0 | 0.0 | 1298.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 683.0 |
| 1934 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -619.0 | -19.0 | 0.0 | 86.0 |
| 1935 | 407.0 | 2076.0 | 2086.0 | 0.0 | 0.0 | 34.0 | 0.0 | 0.0 | 0.0 | -330.0 | 559.7 | 597.0 |
| 1936 | 367.0 | 1803.0 | 1545.0 | 2530.0 | 1030.0 | 1589.0 | -15.5 | 0.0 | 0.0 | -107.0 | 82.8 | 1160.0 |
| 1937 | 669.0 | 1670.0 | 1631.0 | 3239.0 | 2099.0 | 2189.0 | 1084.0 | 67.0 | 714.0 | -462.0 | 0.0 | 774.0 |
| 1938 | 52.0 | 886.0 | 831.0 | 0.0 | 621.0 | 0.0 | 0.0 | 0.0 | 0.0 | -227.0 | -214.7 | -622.0 |
| 1939 | 0.0 | 2135.0 | 1722.0 | 3332.0 | 0.0 | -31.0 | 0.0 | 0.0 | 1020.0 | 0.0 | -397.5 | 1114.0 |
| 1940 | 0.0 | 1616.0 | 1379.0 | 2260.0 | 332.0 | 0.0 | -91.5 | 0.0 | 2245.0 | 0.0 | 0.0 | 871.0 |
| 1941 | -230.0 | 1837.0 | 1726.0 | 2514.0 | 1944.0 | 928.0 | -136.0 | 207.0 | 0.0 | 133.0 | -59.3 | -269.0 |
| 1942 | -682.0 | 1153.0 | 0.0 | 0.0 | 0.0 | 2095.0 | 0.0 | 0.0 | 0.0 | 0.0 | -238.3 | 814.0 |
| 1943 | -356.0 | 1984.0 | 1697.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -428.0 |
| 1944 | 36.0 | 2203.0 | 1712.0 | 3121.0 | 1229.0 | 2359.0 | 710.5 | 705.0 | 261.0 | 204.0 | 0.0 | 1041.0 |
| 1945 | 8.0 | 1345.0 | 2048.0 | 3507.0 | 2805.0 | 2347.0 | 64.5 | 0.0 | 0.0 | -356.0 | -412.7 | 1482.0 |
| 1946 | -130.0 | 1613.0 | 633.0 | 0.0 | 285.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -93.8 | -402.0 |
| 1947 | 0.0 | 1956.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 411.0 |
| 1948 | 0.0 | 384.0 | 622.0 | 0.0 | 0.0 | 116.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 644.0 |
| 1949 | 0.0 | 2066.0 | 2032.0 | 0.0 | 603.0 | 0.0 | 0.0 | 0.0 | 0.0 | -125.0 | 0.0 | 0.0 |
| 1950 | -114.0 | 1971.0 | 911.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 526.0 | -85.0 |
| 1951 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 514.0 |
| 1952 | 0.0 | 1437.0 | 102.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 497.0 |
| 1953 | 405.0 | 1968.0 | 1548.0 | 2267.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 986.0 |
| 1954 | 0.0 | 1786.0 | 1681.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 474.0 |
| 1955 | 0.0 | 841.0 | 1270.0 | 0.0 | 0.0 | 2034.0 | -331.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1956 | 0.0 | 588.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 290.0 |
| 1957 | 0.0 | 2179.0 | 1171.0 | 79.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -297.0 | 0.0 | 653.0 |
| 1958 | 156.0 | 2152.0 | 1692.0 | 172.0 | 0.0 | 203.0 | 0.0 | 0.0 | 0.0 | -513.0 | -315.2 | 898.0 |
| 1959 | -218.0 | 1235.0 | 33.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -251.7 | 276.0 |
| 1960 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1961 | 0.0 | 1640.0 | 2316.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 672.0 |
| 1962 | 0.0 | 2262.0 | 1682.0 | 0.0 | 1019.0 | 990.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1008.0 |
| 1963 | 0.0 | 999.0 | 148.0 | 0.0 | 0.0 | 815.0 | -216.5 | 0.0 | 0.0 | 0.0 | 0.0 | 970.0 |
| 1964 | -34.0 | 2185.0 | 2198.0 | 443.0 | 0.0 | 1646.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1965 | 0.0 | 1484.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1966 | 0.0 | 1411.0 | 1065.0 | 0.0 | 0.0 | 858.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 397.0 |
| 1967 | 69.0 | 2008.0 | 1770.0 | 0.0 | 0.0 | 0.0 | 529.0 | 0.0 | 0.0 | 0.0 | 0.0 | 820.0 |
| 1968 | 0.0 | 1648.0 | 1252.0 | 0.0 | 0.0 | 0.0 | -273.0 | 838.0 | 0.0 | 0.0 | 0.0 | 157.0 |
| 1969 | 0.0 | 471.0 | 458.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -397.0 | 0.0 | 0.0 |
| 1970 | 0.0 | 2110.0 | 2104.0 | 696.0 | 0.0 | 0.0 | -391.0 | 0.0 | 0.0 | 0.0 | 28.0 | 803.0 |
| 1971 | 217.0 | 2405.0 | 840.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -179.2 | 997.0 |
| 1972 | 0.0 | 1802.0 | 1392.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1973 | 0.0 | 2035.0 | 611.0 | 509.0 | 356.0 | 444.0 | 733.5 | 1010.0 | 507.0 | 0.0 | 0.0 | 0.0 |
| 1974 | -210.0 | 1121.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 23.8 | 317.0 |
| 1975 | 229.0 | 2172.0 | 1963.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 257.0 |
| 1976 | 0.0 | 105.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -39.3 | 786.0 |
| 1977 | 0.0 | 2118.0 | 1590.0 | 2847.0 | 556.0 | 2707.0 | 567.0 | 965.0 | 720.0 | 154.0 | 0.0 | 0.0 |
| 1978 | 142.0 | 712.0 | 861.0 | -675.0 | 540.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -490.2 | 1482.0 |

# Table 43: 4(h)(10)(C) Power Purchase Amounts (aMW) for Transportation Plus and CWA

| 4(h)(10)(C) Power Purchase Amounts (aMW), … Scenario 6 | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Water Year** | **Oct** | **Nov** | **Dec** | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **Jun** | **Jul** | **Aug** | **Sep** |
| 1929 | 54.0 | 2149.0 | 1723.0 | 3364.0 | 1424.0 | 1995.0 | 461.5 | 1423.0 | -38.0 | 0.0 | 0.0 | 987.0 |
| 1930 | 375.0 | 1403.0 | 1608.0 | 3238.0 | 1429.0 | 2351.0 | -517.5 | 1864.0 | 1434.0 | 0.0 | -128.8 | 302.0 |
| 1931 | 479.0 | 1359.0 | 1246.0 | 3949.0 | 2822.0 | 1801.0 | 130.5 | -395.0 | 561.0 | -262.0 | 0.0 | 486.0 |
| 1932 | 101.0 | 1431.0 | 2057.0 | 3634.0 | 1825.0 | 0.0 | 0.0 | 0.0 | 0.0 | -82.0 | -259.2 | 1189.0 |
| 1933 | 0.0 | 1539.0 | 1560.0 | 0.0 | 0.0 | 1298.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 683.0 |
| 1934 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -619.0 | -19.0 | 0.0 | 86.0 |
| 1935 | 407.0 | 2076.0 | 2086.0 | 0.0 | 0.0 | 34.0 | 0.0 | 0.0 | 0.0 | -330.0 | 559.7 | 597.0 |
| 1936 | 367.0 | 1803.0 | 1545.0 | 2530.0 | 1030.0 | 1589.0 | -15.5 | 0.0 | 0.0 | -107.0 | 82.8 | 1160.0 |
| 1937 | 669.0 | 1670.0 | 1631.0 | 3239.0 | 2099.0 | 2189.0 | 1084.0 | 67.0 | 714.0 | -462.0 | 0.0 | 774.0 |
| 1938 | 52.0 | 886.0 | 831.0 | 0.0 | 621.0 | 0.0 | 0.0 | 0.0 | 0.0 | -227.0 | -214.7 | -622.0 |
| 1939 | 0.0 | 2135.0 | 1722.0 | 3332.0 | 0.0 | -31.0 | 0.0 | 0.0 | 1020.0 | 0.0 | -397.5 | 1114.0 |
| 1940 | 0.0 | 1616.0 | 1379.0 | 2260.0 | 332.0 | 0.0 | -91.5 | 0.0 | 2245.0 | 0.0 | 0.0 | 871.0 |
| 1941 | -230.0 | 1837.0 | 1726.0 | 2514.0 | 1944.0 | 928.0 | -136.0 | 207.0 | 0.0 | 133.0 | -59.3 | -269.0 |
| 1942 | -682.0 | 1153.0 | 0.0 | 0.0 | 0.0 | 2095.0 | 0.0 | 0.0 | 0.0 | 0.0 | -238.3 | 814.0 |
| 1943 | -356.0 | 1984.0 | 1697.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -428.0 |
| 1944 | 36.0 | 2203.0 | 1712.0 | 3121.0 | 1229.0 | 2359.0 | 710.5 | 705.0 | 261.0 | 204.0 | 0.0 | 1041.0 |
| 1945 | 8.0 | 1345.0 | 2048.0 | 3507.0 | 2805.0 | 2347.0 | 64.5 | 0.0 | 0.0 | -356.0 | -412.7 | 1482.0 |
| 1946 | -130.0 | 1613.0 | 633.0 | 0.0 | 285.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -93.8 | -402.0 |
| 1947 | 0.0 | 1956.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 411.0 |
| 1948 | 0.0 | 384.0 | 622.0 | 0.0 | 0.0 | 116.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 644.0 |
| 1949 | 0.0 | 2066.0 | 2032.0 | 0.0 | 603.0 | 0.0 | 0.0 | 0.0 | 0.0 | -125.0 | 0.0 | 0.0 |
| 1950 | -114.0 | 1971.0 | 911.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 526.0 | -85.0 |
| 1951 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 514.0 |
| 1952 | 0.0 | 1437.0 | 102.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 497.0 |
| 1953 | 405.0 | 1968.0 | 1548.0 | 2267.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 986.0 |
| 1954 | 0.0 | 1786.0 | 1681.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 474.0 |
| 1955 | 0.0 | 841.0 | 1270.0 | 0.0 | 0.0 | 2034.0 | -331.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1956 | 0.0 | 588.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 290.0 |
| 1957 | 0.0 | 2179.0 | 1171.0 | 79.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -297.0 | 0.0 | 653.0 |
| 1958 | 156.0 | 2152.0 | 1692.0 | 172.0 | 0.0 | 203.0 | 0.0 | 0.0 | 0.0 | -513.0 | -315.2 | 898.0 |
| 1959 | -218.0 | 1235.0 | 33.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -251.7 | 276.0 |
| 1960 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1961 | 0.0 | 1640.0 | 2316.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 672.0 |
| 1962 | 0.0 | 2262.0 | 1682.0 | 0.0 | 1019.0 | 990.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1008.0 |
| 1963 | 0.0 | 999.0 | 148.0 | 0.0 | 0.0 | 815.0 | -216.5 | 0.0 | 0.0 | 0.0 | 0.0 | 970.0 |
| 1964 | -34.0 | 2185.0 | 2198.0 | 443.0 | 0.0 | 1646.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1965 | 0.0 | 1484.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1966 | 0.0 | 1411.0 | 1065.0 | 0.0 | 0.0 | 858.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 397.0 |
| 1967 | 69.0 | 2008.0 | 1770.0 | 0.0 | 0.0 | 0.0 | 529.0 | 0.0 | 0.0 | 0.0 | 0.0 | 820.0 |
| 1968 | 0.0 | 1648.0 | 1252.0 | 0.0 | 0.0 | 0.0 | -273.0 | 838.0 | 0.0 | 0.0 | 0.0 | 157.0 |
| 1969 | 0.0 | 471.0 | 458.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -397.0 | 0.0 | 0.0 |
| 1970 | 0.0 | 2110.0 | 2104.0 | 696.0 | 0.0 | 0.0 | -391.0 | 0.0 | 0.0 | 0.0 | 28.0 | 803.0 |
| 1971 | 217.0 | 2405.0 | 840.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -179.2 | 997.0 |
| 1972 | 0.0 | 1802.0 | 1392.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1973 | 0.0 | 2035.0 | 611.0 | 509.0 | 356.0 | 444.0 | 733.5 | 1010.0 | 507.0 | 0.0 | 0.0 | 0.0 |
| 1974 | -210.0 | 1121.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 23.8 | 317.0 |
| 1975 | 229.0 | 2172.0 | 1963.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 257.0 |
| 1976 | 0.0 | 105.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -39.3 | 786.0 |
| 1977 | 0.0 | 2118.0 | 1590.0 | 2847.0 | 556.0 | 2707.0 | 567.0 | 965.0 | 720.0 | 154.0 | 0.0 | 0.0 |
| 1978 | 142.0 | 712.0 | 861.0 | -675.0 | 540.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -490.2 | 1482.0 |

# Table 44: 4(h)(10)(C) Power Purchase Amounts (aMW) for Two Snake River Dams to Natural River

| 4(h)(10)(C) Power Purchase Amounts (aMW), … Scenario 7 | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Water Year** | **Oct** | **Nov** | **Dec** | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **Jun** | **Jul** | **Aug** | **Sep** |
| 1929 | 250.0 | 2258.5 | 1973.6 | 3612.9 | 1568.3 | 2284.6 | 870.5 | 2007.3 | -38.0 | 0.0 | 0.0 | 1161.2 |
| 1930 | 461.8 | 1481.0 | 1706.8 | 3719.0 | 1668.8 | 2627.9 | -517.5 | 2496.8 | 1921.8 | 0.0 | -99.7 | 400.5 |
| 1931 | 674.0 | 1407.8 | 1324.0 | 4409.5 | 2973.4 | 2062.3 | 341.8 | -395.0 | 873.3 | -262.0 | 0.0 | 532.2 |
| 1932 | 187.4 | 1501.5 | 2136.9 | 4306.8 | 1870.8 | 0.0 | 0.0 | 0.0 | 0.0 | -82.0 | -180.2 | 1223.1 |
| 1933 | 213.2 | 1710.9 | 1746.9 | 0.0 | 0.0 | 1502.8 | 54.5 | 0.0 | 0.0 | 0.0 | 0.0 | 800.7 |
| 1934 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -306.0 | 138.6 | 0.0 | 86.0 |
| 1935 | 531.8 | 2289.9 | 2250.4 | 0.0 | 0.0 | 251.4 | 0.0 | 0.0 | 0.0 | -330.0 | 688.2 | 692.9 |
| 1936 | 531.5 | 1842.7 | 1626.3 | 3213.5 | 1059.3 | 1882.5 | 140.3 | 0.0 | 0.0 | -107.0 | 143.8 | 1197.7 |
| 1937 | 803.2 | 1705.4 | 1718.4 | 3742.4 | 2229.3 | 2423.6 | 1474.7 | 67.0 | 1167.4 | -386.8 | 31.5 | 822.8 |
| 1938 | 175.8 | 1051.1 | 1077.0 | 0.0 | 621.0 | 0.0 | 0.0 | 0.0 | 0.0 | -227.0 | -121.2 | -493.6 |
| 1939 | 245.1 | 2219.2 | 1950.2 | 3767.2 | 0.0 | -31.0 | 0.0 | 0.0 | 1430.2 | 0.0 | -271.7 | 1166.7 |
| 1940 | 288.9 | 1699.2 | 1610.4 | 2489.8 | 630.3 | 0.0 | -91.5 | 0.0 | 2738.7 | 0.0 | 0.0 | 916.2 |
| 1941 | -130.6 | 1906.2 | 1923.9 | 3301.5 | 1942.4 | 1230.6 | 25.1 | 784.0 | 0.0 | 248.3 | 93.9 | -159.5 |
| 1942 | -426.5 | 1373.7 | 0.0 | 0.0 | 0.0 | 2393.0 | 0.0 | 0.0 | 0.0 | 0.0 | -128.8 | 978.1 |
| 1943 | -104.4 | 2183.6 | 1980.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -357.5 |
| 1944 | 343.5 | 2241.4 | 2116.3 | 3422.3 | 1527.3 | 2439.6 | 1165.8 | 1341.7 | 800.2 | 443.2 | 0.0 | 1151.8 |
| 1945 | 74.9 | 1519.2 | 2104.2 | 3788.8 | 3282.4 | 2631.7 | 531.8 | 0.0 | 0.0 | -356.0 | -231.2 | 1640.9 |
| 1946 | 134.9 | 1769.0 | 1024.3 | 0.0 | 285.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -93.8 | -348.4 |
| 1947 | 263.3 | 2193.9 | 0.0 | 0.0 | 0.0 | 958.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 613.2 |
| 1948 | 0.0 | 446.5 | 936.3 | 0.0 | 0.0 | 116.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 832.5 |
| 1949 | 187.2 | 2238.9 | 2266.3 | 0.0 | 603.0 | 0.0 | 0.0 | 0.0 | 0.0 | 196.1 | 0.0 | 0.0 |
| 1950 | 55.0 | 2078.9 | 1276.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 716.9 | 75.9 |
| 1951 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 573.5 |
| 1952 | 0.0 | 1634.9 | 474.8 | 0.0 | 0.0 | 449.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 497.0 |
| 1953 | 580.2 | 2028.4 | 1659.8 | 3057.1 | 0.0 | 0.0 | 77.1 | 0.0 | 0.0 | 0.0 | 117.9 | 1047.4 |
| 1954 | 204.4 | 1937.1 | 1922.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 662.8 |
| 1955 | 0.0 | 991.2 | 1479.6 | 0.0 | 175.8 | 2230.6 | -331.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1956 | 0.0 | 779.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 290.0 |
| 1957 | 21.7 | 2367.2 | 1485.6 | 236.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -297.0 | 0.0 | 841.2 |
| 1958 | 455.3 | 2193.3 | 2120.0 | 172.0 | 0.0 | 494.5 | 0.0 | 0.0 | 0.0 | -157.1 | -212.0 | 954.9 |
| 1959 | 60.5 | 1466.4 | 216.1 | 0.0 | 0.0 | 442.2 | 0.0 | 0.0 | 0.0 | 0.0 | -251.7 | 363.8 |
| 1960 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1961 | 316.9 | 1810.0 | 2513.6 | 0.0 | 0.0 | 0.0 | 305.3 | 0.0 | 0.0 | 0.0 | 59.7 | 724.3 |
| 1962 | 300.3 | 2418.3 | 1874.1 | 0.0 | 1406.1 | 1201.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1063.6 |
| 1963 | 0.0 | 1226.2 | 507.1 | 0.0 | 0.0 | 1129.6 | -216.5 | 0.0 | 0.0 | 0.0 | 0.0 | 1094.2 |
| 1964 | 171.4 | 2352.1 | 2407.3 | 604.3 | 0.0 | 1923.6 | 68.9 | 0.0 | 0.0 | 0.0 | 0.0 | 194.0 |
| 1965 | 0.0 | 1662.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1966 | 0.0 | 1631.7 | 1385.8 | 0.0 | 0.0 | 1206.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 659.9 |
| 1967 | 324.5 | 2161.4 | 1988.7 | 0.0 | 0.0 | 0.0 | 734.1 | 0.0 | 0.0 | 0.0 | 0.0 | 915.5 |
| 1968 | 132.5 | 1858.6 | 1533.8 | 0.0 | 0.0 | 0.0 | 33.8 | 1306.8 | 0.0 | 0.0 | 0.0 | 224.2 |
| 1969 | 0.0 | 604.0 | 774.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -397.0 | 0.0 | 0.0 |
| 1970 | 287.3 | 2258.5 | 2336.4 | 1157.2 | 0.0 | 20.0 | -391.0 | 0.0 | 0.0 | 0.0 | 52.7 | 869.3 |
| 1971 | 451.6 | 2580.5 | 1400.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -179.2 | 1104.9 |
| 1972 | 254.1 | 2039.9 | 1719.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1973 | 0.0 | 2255.0 | 951.6 | 953.0 | 577.8 | 745.3 | 1124.8 | 1666.2 | 668.8 | 0.0 | 0.0 | 0.0 |
| 1974 | -95.6 | 1483.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 89.8 | 483.7 |
| 1975 | 436.0 | 2327.0 | 2288.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 257.0 |
| 1976 | 136.9 | 346.0 | 0.0 | 0.0 | 0.0 | 808.3 | 0.0 | 0.0 | 0.0 | 0.0 | -39.3 | 1017.1 |
| 1977 | 0.0 | 2178.8 | 1966.0 | 3091.1 | 735.4 | 2887.4 | 829.8 | 1421.3 | 1012.8 | 298.0 | 0.0 | 0.0 |
| 1978 | 239.8 | 957.4 | 1311.4 | -675.0 | 540.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -406.0 | 1621.8 |

# Table 45: 4(h)(10)(C) Power Purchase Amounts (aMW) for Four Snake River Dams to Natural River

| 4(h)(10)(C) Power Purchase Amounts (aMW), … Scenario 8 | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Water Year** | **Oct** | **Nov** | **Dec** | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **Jun** | **Jul** | **Aug** | **Sep** |
| 1929 | 325.4 | 2300.6 | 2069.9 | 3708.7 | 1623.8 | 2395.9 | 1030.3 | 2232.1 | -38.0 | 0.0 | 0.0 | 1228.2 |
| 1930 | 495.1 | 1511.0 | 1744.8 | 3904.0 | 1761.1 | 2734.4 | -476.0 | 2740.1 | 2109.4 | 0.0 | -73.7 | 438.4 |
| 1931 | 749.0 | 1426.5 | 1354.0 | 4586.6 | 3031.7 | 2162.8 | 423.0 | -395.0 | 993.5 | -262.0 | 0.0 | 549.9 |
| 1932 | 220.7 | 1528.7 | 2167.7 | 4565.5 | 1888.4 | 0.0 | 0.0 | 0.0 | 0.0 | -82.0 | -142.1 | 1236.3 |
| 1933 | 295.2 | 1777.1 | 1818.8 | 0.0 | 0.0 | 1581.5 | 180.2 | 0.0 | 0.0 | 0.0 | 0.0 | 845.9 |
| 1934 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -185.6 | 199.3 | 0.0 | 86.0 |
| 1935 | 579.8 | 2372.1 | 2313.7 | 0.0 | 0.0 | 335.0 | 0.0 | 0.0 | 0.0 | -330.0 | 737.6 | 729.8 |
| 1936 | 594.7 | 1857.9 | 1657.5 | 3476.4 | 1070.5 | 1995.3 | 222.8 | 0.0 | 0.0 | -107.0 | 167.2 | 1212.2 |
| 1937 | 854.8 | 1719.1 | 1752.1 | 3936.1 | 2279.4 | 2513.9 | 1624.9 | 67.0 | 1356.8 | -314.8 | 59.2 | 841.5 |
| 1938 | 223.4 | 1114.6 | 1171.7 | 0.0 | 621.0 | 0.0 | 0.0 | 0.0 | 0.0 | -227.0 | -85.3 | -444.3 |
| 1939 | 339.3 | 2251.6 | 2037.9 | 3934.6 | 0.0 | 6.6 | 0.0 | 0.0 | 1587.9 | 0.0 | -223.4 | 1186.9 |
| 1940 | 400.0 | 1731.2 | 1699.4 | 2578.1 | 745.1 | 0.0 | -91.5 | 0.0 | 2928.6 | 71.7 | 7.5 | 933.5 |
| 1941 | -92.3 | 1932.8 | 2000.1 | 3604.4 | 1941.8 | 1346.9 | 168.3 | 1034.3 | 202.4 | 338.5 | 152.8 | -117.3 |
| 1942 | -328.3 | 1458.6 | 0.0 | 0.0 | 0.0 | 2507.6 | 0.0 | 0.0 | 0.0 | 0.0 | -86.7 | 1041.3 |
| 1943 | -7.7 | 2260.3 | 2089.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -330.4 |
| 1944 | 461.7 | 2256.1 | 2271.8 | 3538.1 | 1642.1 | 2470.6 | 1340.9 | 1586.6 | 1007.5 | 535.2 | 0.0 | 1194.4 |
| 1945 | 100.7 | 1586.2 | 2125.9 | 3897.1 | 3466.1 | 2741.2 | 711.6 | 0.0 | 0.0 | -356.0 | -161.3 | 1702.1 |
| 1946 | 236.8 | 1829.0 | 1174.8 | 0.0 | 285.0 | 32.8 | 0.0 | 0.0 | 0.0 | 0.0 | -93.8 | -327.8 |
| 1947 | 364.5 | 2285.4 | 0.0 | 0.0 | 0.0 | 1327.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 690.9 |
| 1948 | 0.0 | 533.3 | 1057.2 | 0.0 | 0.0 | 194.1 | 0.0 | 0.0 | 0.0 | 0.0 | 16.0 | 905.0 |
| 1949 | 269.2 | 2305.4 | 2356.4 | 0.0 | 603.0 | 0.0 | 0.0 | 0.0 | 0.0 | 319.6 | 0.0 | 0.0 |
| 1950 | 120.0 | 2120.4 | 1417.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 790.4 | 137.8 |
| 1951 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 650.3 |
| 1952 | 0.0 | 1711.1 | 618.2 | 0.0 | 0.0 | 622.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 497.0 |
| 1953 | 647.5 | 2051.7 | 1702.8 | 3360.9 | 0.0 | 0.0 | 177.4 | 0.0 | 0.0 | 0.0 | 168.8 | 1071.1 |
| 1954 | 283.0 | 1995.3 | 2015.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 735.5 |
| 1955 | 0.0 | 1048.9 | 1560.3 | 0.0 | 243.4 | 2306.3 | -331.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1956 | 0.0 | 853.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 290.0 |
| 1957 | 111.6 | 2439.6 | 1606.6 | 338.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -297.0 | 0.0 | 913.5 |
| 1958 | 570.5 | 2209.1 | 2284.6 | 235.9 | 0.0 | 606.7 | 0.0 | 0.0 | 0.0 | -20.3 | -172.1 | 976.8 |
| 1959 | 183.0 | 1555.4 | 368.9 | 0.0 | 0.0 | 899.5 | 0.0 | 0.0 | 0.0 | 0.0 | -251.7 | 397.5 |
| 1960 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1961 | 438.8 | 1875.3 | 2589.6 | 0.0 | 0.0 | 0.0 | 423.1 | 0.0 | 0.0 | 0.0 | 91.4 | 744.5 |
| 1962 | 415.8 | 2478.4 | 1947.9 | 0.0 | 1554.9 | 1283.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1084.9 |
| 1963 | 0.0 | 1313.6 | 645.3 | 0.0 | 0.0 | 1250.6 | -216.5 | 0.0 | 0.0 | 0.0 | 0.0 | 1141.9 |
| 1964 | 250.4 | 2416.3 | 2487.8 | 689.5 | 0.0 | 2030.3 | 199.9 | 0.0 | 0.0 | 0.0 | 0.0 | 268.6 |
| 1965 | 0.0 | 1731.5 | 0.0 | 0.0 | 0.0 | 56.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1966 | 0.0 | 1716.6 | 1509.2 | 0.0 | 0.0 | 1340.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 761.0 |
| 1967 | 422.7 | 2220.4 | 2072.9 | 0.0 | 0.0 | 0.0 | 813.0 | 0.0 | 0.0 | 0.0 | 0.0 | 952.3 |
| 1968 | 225.4 | 1939.6 | 1642.2 | 0.0 | 0.0 | 0.0 | 192.1 | 1569.4 | 0.0 | 0.0 | 0.0 | 290.9 |
| 1969 | 0.0 | 703.7 | 896.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -397.0 | 0.0 | 0.0 |
| 1970 | 413.5 | 2315.6 | 2425.8 | 1334.6 | 0.0 | 155.7 | -391.0 | 0.0 | 0.0 | 0.0 | 84.2 | 894.8 |
| 1971 | 541.9 | 2648.0 | 1615.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -161.6 | 1146.4 |
| 1972 | 351.9 | 2131.4 | 1846.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1973 | 0.0 | 2339.6 | 1082.6 | 1123.7 | 670.5 | 861.2 | 1275.3 | 1918.6 | 836.5 | 0.0 | 0.0 | 0.0 |
| 1974 | -51.6 | 1622.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 115.2 | 547.8 |
| 1975 | 515.7 | 2386.6 | 2413.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 257.0 |
| 1976 | 248.4 | 456.4 | 0.0 | 0.0 | 0.0 | 1428.4 | 0.0 | 0.0 | 0.0 | 0.0 | -39.3 | 1105.9 |
| 1977 | 0.0 | 2202.1 | 2110.6 | 3184.9 | 804.4 | 2956.8 | 960.6 | 1596.8 | 1125.4 | 353.4 | 0.0 | 0.0 |
| 1978 | 277.5 | 1051.8 | 1484.7 | -675.0 | 540.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -373.6 | 1675.5 |

# Table 46: 4(h)(10)(C) Power Purchase Amounts (aMW) for Snake River and JDA Dams to Natural River

| 4(h)(10)(C) Power Purchase Amounts (aMW), … Scenario 9 | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Water Year** | **Oct** | **Nov** | **Dec** | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **Jun** | **Jul** | **Aug** | **Sep** |
| 1929 | 370.8 | 2260.5 | 2096.1 | 4109.6 | 1656.8 | 2365.4 | 928.9 | 2082.5 | -38.0 | 0.0 | 0.0 | 1184.6 |
| 1930 | 493.7 | 1652.1 | 1974.2 | 3732.9 | 1788.9 | 2739.5 | -517.5 | 2575.6 | 2004.8 | 0.0 | -69.4 | 522.0 |
| 1931 | 686.2 | 1559.0 | 1582.8 | 4455.8 | 3160.7 | 2156.7 | 414.6 | -395.0 | 984.9 | -262.0 | 0.0 | 657.8 |
| 1932 | 253.5 | 1689.2 | 2346.3 | 4319.3 | 2008.9 | 0.0 | 0.0 | 0.0 | 0.0 | -82.0 | -121.0 | 1358.0 |
| 1933 | 264.0 | 1952.0 | 1964.3 | 0.0 | 0.0 | 1634.4 | 124.4 | 0.0 | 0.0 | 0.0 | 0.0 | 867.8 |
| 1934 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -158.1 | 195.9 | 0.0 | 86.0 |
| 1935 | 535.0 | 2298.8 | 2661.7 | 0.0 | 0.0 | 429.5 | 0.0 | 0.0 | 0.0 | -330.0 | 752.6 | 819.8 |
| 1936 | 611.0 | 2006.7 | 1794.5 | 3295.8 | 1196.4 | 2007.5 | 201.4 | 0.0 | 0.0 | -107.0 | 177.9 | 1314.1 |
| 1937 | 858.5 | 1876.2 | 1948.7 | 3880.5 | 2257.8 | 2531.0 | 1562.6 | 67.0 | 1265.6 | -340.8 | 60.2 | 950.9 |
| 1938 | 199.8 | 1085.5 | 1200.7 | 0.0 | 621.0 | 0.0 | 0.0 | 0.0 | 0.0 | -227.0 | -92.2 | -379.2 |
| 1939 | 282.4 | 2318.7 | 2094.9 | 4016.4 | 0.0 | -16.5 | 0.0 | 0.0 | 1516.8 | 0.0 | -255.3 | 1306.3 |
| 1940 | 245.6 | 1754.3 | 1784.0 | 3085.9 | 649.7 | 0.0 | -91.5 | 0.0 | 2823.2 | 8.5 | 13.2 | 1047.9 |
| 1941 | -51.9 | 2067.0 | 2121.3 | 3312.9 | 2141.2 | 1360.7 | 194.7 | 896.1 | 73.8 | 268.9 | 152.4 | -28.3 |
| 1942 | -367.3 | 1417.7 | 0.0 | 0.0 | 0.0 | 2393.4 | 0.0 | 0.0 | 0.0 | 0.0 | -103.8 | 1095.9 |
| 1943 | -150.2 | 2182.8 | 2385.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -232.0 |
| 1944 | 287.2 | 2360.6 | 2191.1 | 3839.1 | 1584.2 | 2577.3 | 1269.6 | 1425.5 | 832.5 | 463.8 | 0.0 | 1259.3 |
| 1945 | 150.2 | 1586.4 | 2397.9 | 3862.7 | 3353.4 | 2740.9 | 628.5 | 0.0 | 0.0 | -356.0 | -184.9 | 1740.6 |
| 1946 | 80.7 | 1818.1 | 1123.2 | 0.0 | 285.0 | 8.5 | 0.0 | 0.0 | 0.0 | 0.0 | -93.8 | -218.1 |
| 1947 | 345.0 | 2356.6 | 0.0 | 0.0 | 0.0 | 927.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 669.9 |
| 1948 | 0.0 | 622.5 | 1114.1 | 0.0 | 0.0 | 135.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 861.4 |
| 1949 | 302.0 | 2343.2 | 2420.5 | 0.0 | 603.0 | 0.0 | 0.0 | 0.0 | 0.0 | 239.3 | 0.0 | 0.0 |
| 1950 | 65.9 | 2193.3 | 1346.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 758.0 | 173.4 |
| 1951 | 0.0 | 37.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 693.1 |
| 1952 | 0.0 | 1782.0 | 637.4 | 0.0 | 0.0 | 546.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 497.0 |
| 1953 | 611.5 | 2161.4 | 1933.9 | 3082.2 | 0.0 | 0.0 | 79.9 | 0.0 | 0.0 | 0.0 | 130.5 | 1185.3 |
| 1954 | 387.3 | 2081.9 | 2096.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 707.2 |
| 1955 | 0.0 | 1169.0 | 1665.3 | 0.0 | 297.7 | 2346.4 | -331.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1956 | 2.0 | 960.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 337.7 |
| 1957 | 145.6 | 2470.9 | 1685.7 | 512.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -297.0 | 0.0 | 947.2 |
| 1958 | 391.1 | 2328.7 | 2170.1 | 625.3 | 0.0 | 642.3 | 0.0 | 0.0 | 0.0 | -138.7 | -194.2 | 1095.9 |
| 1959 | 145.2 | 1616.1 | 401.4 | 0.0 | 0.0 | 506.8 | 0.0 | 0.0 | 0.0 | 0.0 | -251.7 | 475.5 |
| 1960 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1961 | 282.8 | 2050.4 | 2688.9 | 0.0 | 0.0 | 0.0 | 377.2 | 0.0 | 0.0 | 0.0 | 80.5 | 855.7 |
| 1962 | 348.7 | 2414.2 | 2125.4 | 0.0 | 1585.8 | 1307.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1185.1 |
| 1963 | 0.0 | 1373.3 | 695.7 | 0.0 | 0.0 | 1259.8 | -216.5 | 0.0 | 0.0 | 0.0 | 0.0 | 1153.9 |
| 1964 | 223.7 | 2486.0 | 2583.7 | 899.3 | 0.0 | 2012.2 | 136.9 | 0.0 | 0.0 | 0.0 | 0.0 | 310.3 |
| 1965 | 0.0 | 1808.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1966 | 0.0 | 1768.6 | 1536.8 | 0.0 | 0.0 | 1314.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 683.8 |
| 1967 | 311.3 | 2198.4 | 2399.9 | 0.0 | 0.0 | 0.0 | 832.1 | 0.0 | 0.0 | 0.0 | 0.0 | 1003.7 |
| 1968 | 236.4 | 1996.0 | 1696.6 | 0.0 | 0.0 | 0.0 | 162.9 | 1405.9 | 0.0 | 0.0 | 0.0 | 345.2 |
| 1969 | 0.0 | 757.7 | 949.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -397.0 | 0.0 | 0.0 |
| 1970 | 365.0 | 2299.9 | 2545.8 | 1452.5 | 0.0 | 62.3 | -391.0 | 0.0 | 0.0 | 0.0 | 71.4 | 991.6 |
| 1971 | 458.2 | 2629.4 | 1489.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -179.2 | 1224.0 |
| 1972 | 348.9 | 2162.1 | 1863.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1973 | 0.0 | 2285.5 | 1185.0 | 1262.5 | 542.8 | 792.7 | 1244.2 | 1766.5 | 761.4 | 0.0 | 0.0 | 0.0 |
| 1974 | -85.7 | 1447.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 109.4 | 573.5 |
| 1975 | 394.0 | 2337.7 | 2558.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 257.0 |
| 1976 | 318.6 | 498.5 | 0.0 | 0.0 | 0.0 | 641.3 | 0.0 | 0.0 | 0.0 | 0.0 | -39.3 | 1028.6 |
| 1977 | 0.0 | 2232.1 | 1948.2 | 3657.1 | 749.4 | 2881.1 | 954.5 | 1539.5 | 1080.8 | 322.8 | 0.0 | 0.0 |
| 1978 | 295.4 | 929.0 | 1360.5 | -675.0 | 540.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -376.3 | 1708.3 |

# Table 47: 4(h)(10)(C) Power Purchase Amounts (aMW) for John Day Dam to Natural River

| 4(h)(10)(C) Power Purchase Amounts (aMW), … Scenario 10 | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Water Year** | **Oct** | **Nov** | **Dec** | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **Jun** | **Jul** | **Aug** | **Sep** |
| 1929 | 54.0 | 2149.0 | 1723.0 | 3364.0 | 1424.0 | 1995.0 | 461.5 | 1423.0 | -38.0 | 0.0 | 0.0 | 987.0 |
| 1930 | 375.0 | 1403.0 | 1608.0 | 3238.0 | 1429.0 | 2351.0 | -517.5 | 1864.0 | 1434.0 | 0.0 | -128.8 | 302.0 |
| 1931 | 479.0 | 1359.0 | 1246.0 | 3949.0 | 2822.0 | 1801.0 | 130.5 | -395.0 | 561.0 | -262.0 | 0.0 | 486.0 |
| 1932 | 101.0 | 1431.0 | 2057.0 | 3634.0 | 1825.0 | 0.0 | 0.0 | 0.0 | 0.0 | -82.0 | -259.2 | 1189.0 |
| 1933 | 0.0 | 1539.0 | 1560.0 | 0.0 | 0.0 | 1298.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 683.0 |
| 1934 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -619.0 | -19.0 | 0.0 | 86.0 |
| 1935 | 407.0 | 2076.0 | 2086.0 | 0.0 | 0.0 | 34.0 | 0.0 | 0.0 | 0.0 | -330.0 | 559.7 | 597.0 |
| 1936 | 367.0 | 1803.0 | 1545.0 | 2530.0 | 1030.0 | 1589.0 | -15.5 | 0.0 | 0.0 | -107.0 | 82.8 | 1160.0 |
| 1937 | 669.0 | 1670.0 | 1631.0 | 3239.0 | 2099.0 | 2189.0 | 1084.0 | 67.0 | 714.0 | -462.0 | 0.0 | 774.0 |
| 1938 | 52.0 | 886.0 | 831.0 | 0.0 | 621.0 | 0.0 | 0.0 | 0.0 | 0.0 | -227.0 | -214.7 | -622.0 |
| 1939 | 0.0 | 2135.0 | 1722.0 | 3332.0 | 0.0 | -31.0 | 0.0 | 0.0 | 1020.0 | 0.0 | -397.5 | 1114.0 |
| 1940 | 0.0 | 1616.0 | 1379.0 | 2260.0 | 332.0 | 0.0 | -91.5 | 0.0 | 2245.0 | 0.0 | 0.0 | 871.0 |
| 1941 | -230.0 | 1837.0 | 1726.0 | 2514.0 | 1944.0 | 928.0 | -136.0 | 207.0 | 0.0 | 133.0 | -59.3 | -269.0 |
| 1942 | -682.0 | 1153.0 | 0.0 | 0.0 | 0.0 | 2095.0 | 0.0 | 0.0 | 0.0 | 0.0 | -238.3 | 814.0 |
| 1943 | -356.0 | 1984.0 | 1697.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -428.0 |
| 1944 | 36.0 | 2203.0 | 1712.0 | 3121.0 | 1229.0 | 2359.0 | 710.5 | 705.0 | 261.0 | 204.0 | 0.0 | 1041.0 |
| 1945 | 8.0 | 1345.0 | 2048.0 | 3507.0 | 2805.0 | 2347.0 | 64.5 | 0.0 | 0.0 | -356.0 | -412.7 | 1482.0 |
| 1946 | -130.0 | 1613.0 | 633.0 | 0.0 | 285.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -93.8 | -402.0 |
| 1947 | 0.0 | 1956.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 411.0 |
| 1948 | 0.0 | 384.0 | 622.0 | 0.0 | 0.0 | 116.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 644.0 |
| 1949 | 0.0 | 2066.0 | 2032.0 | 0.0 | 603.0 | 0.0 | 0.0 | 0.0 | 0.0 | -125.0 | 0.0 | 0.0 |
| 1950 | -114.0 | 1971.0 | 911.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 526.0 | -85.0 |
| 1951 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 514.0 |
| 1952 | 0.0 | 1437.0 | 102.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 497.0 |
| 1953 | 405.0 | 1968.0 | 1548.0 | 2267.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 986.0 |
| 1954 | 0.0 | 1786.0 | 1681.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 474.0 |
| 1955 | 0.0 | 841.0 | 1270.0 | 0.0 | 0.0 | 2034.0 | -331.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1956 | 0.0 | 588.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 290.0 |
| 1957 | 0.0 | 2179.0 | 1171.0 | 79.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -297.0 | 0.0 | 653.0 |
| 1958 | 156.0 | 2152.0 | 1692.0 | 172.0 | 0.0 | 203.0 | 0.0 | 0.0 | 0.0 | -513.0 | -315.2 | 898.0 |
| 1959 | -218.0 | 1235.0 | 33.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -251.7 | 276.0 |
| 1960 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1961 | 0.0 | 1640.0 | 2316.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 672.0 |
| 1962 | 0.0 | 2262.0 | 1682.0 | 0.0 | 1019.0 | 990.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1008.0 |
| 1963 | 0.0 | 999.0 | 148.0 | 0.0 | 0.0 | 815.0 | -216.5 | 0.0 | 0.0 | 0.0 | 0.0 | 970.0 |
| 1964 | -34.0 | 2185.0 | 2198.0 | 443.0 | 0.0 | 1646.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1965 | 0.0 | 1484.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1966 | 0.0 | 1411.0 | 1065.0 | 0.0 | 0.0 | 858.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 397.0 |
| 1967 | 69.0 | 2008.0 | 1770.0 | 0.0 | 0.0 | 0.0 | 529.0 | 0.0 | 0.0 | 0.0 | 0.0 | 820.0 |
| 1968 | 0.0 | 1648.0 | 1252.0 | 0.0 | 0.0 | 0.0 | -273.0 | 838.0 | 0.0 | 0.0 | 0.0 | 157.0 |
| 1969 | 0.0 | 471.0 | 458.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -397.0 | 0.0 | 0.0 |
| 1970 | 0.0 | 2110.0 | 2104.0 | 696.0 | 0.0 | 0.0 | -391.0 | 0.0 | 0.0 | 0.0 | 28.0 | 803.0 |
| 1971 | 217.0 | 2405.0 | 840.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -179.2 | 997.0 |
| 1972 | 0.0 | 1802.0 | 1392.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1973 | 0.0 | 2035.0 | 611.0 | 509.0 | 356.0 | 444.0 | 733.5 | 1010.0 | 507.0 | 0.0 | 0.0 | 0.0 |
| 1974 | -210.0 | 1121.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 23.8 | 317.0 |
| 1975 | 229.0 | 2172.0 | 1963.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 257.0 |
| 1976 | 0.0 | 105.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -39.3 | 786.0 |
| 1977 | 0.0 | 2118.0 | 1590.0 | 2847.0 | 556.0 | 2707.0 | 567.0 | 965.0 | 720.0 | 154.0 | 0.0 | 0.0 |
| 1978 | 142.0 | 712.0 | 861.0 | -675.0 | 540.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -490.2 | 1482.0 |

# Table 48: 4(h)(10)(C) Power Purchase Amounts (aMW) for John Day Dam to Spillway Crest

| 4(h)(10)(C) Power Purchase Amounts (aMW), … Scenario 11 | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Water Year** | **Oct** | **Nov** | **Dec** | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **Jun** | **Jul** | **Aug** | **Sep** |
| 1929 | 54.0 | 2149.0 | 1723.0 | 3364.0 | 1424.0 | 1995.0 | 461.5 | 1423.0 | -38.0 | 0.0 | 0.0 | 987.0 |
| 1930 | 375.0 | 1403.0 | 1608.0 | 3238.0 | 1429.0 | 2351.0 | -517.5 | 1864.0 | 1434.0 | 0.0 | -128.8 | 302.0 |
| 1931 | 479.0 | 1359.0 | 1246.0 | 3949.0 | 2822.0 | 1801.0 | 130.5 | -395.0 | 561.0 | -262.0 | 0.0 | 486.0 |
| 1932 | 101.0 | 1431.0 | 2057.0 | 3634.0 | 1825.0 | 0.0 | 0.0 | 0.0 | 0.0 | -82.0 | -259.2 | 1189.0 |
| 1933 | 0.0 | 1539.0 | 1560.0 | 0.0 | 0.0 | 1298.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 683.0 |
| 1934 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -619.0 | -19.0 | 0.0 | 86.0 |
| 1935 | 407.0 | 2076.0 | 2086.0 | 0.0 | 0.0 | 34.0 | 0.0 | 0.0 | 0.0 | -330.0 | 559.7 | 597.0 |
| 1936 | 367.0 | 1803.0 | 1545.0 | 2530.0 | 1030.0 | 1589.0 | -15.5 | 0.0 | 0.0 | -107.0 | 82.8 | 1160.0 |
| 1937 | 669.0 | 1670.0 | 1631.0 | 3239.0 | 2099.0 | 2189.0 | 1084.0 | 67.0 | 714.0 | -462.0 | 0.0 | 774.0 |
| 1938 | 52.0 | 886.0 | 831.0 | 0.0 | 621.0 | 0.0 | 0.0 | 0.0 | 0.0 | -227.0 | -214.7 | -622.0 |
| 1939 | 0.0 | 2135.0 | 1722.0 | 3332.0 | 0.0 | -31.0 | 0.0 | 0.0 | 1020.0 | 0.0 | -397.5 | 1114.0 |
| 1940 | 0.0 | 1616.0 | 1379.0 | 2260.0 | 332.0 | 0.0 | -91.5 | 0.0 | 2245.0 | 0.0 | 0.0 | 871.0 |
| 1941 | -230.0 | 1837.0 | 1726.0 | 2514.0 | 1944.0 | 928.0 | -136.0 | 207.0 | 0.0 | 133.0 | -59.3 | -269.0 |
| 1942 | -682.0 | 1153.0 | 0.0 | 0.0 | 0.0 | 2095.0 | 0.0 | 0.0 | 0.0 | 0.0 | -238.3 | 814.0 |
| 1943 | -356.0 | 1984.0 | 1697.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -428.0 |
| 1944 | 36.0 | 2203.0 | 1712.0 | 3121.0 | 1229.0 | 2359.0 | 710.5 | 705.0 | 261.0 | 204.0 | 0.0 | 1041.0 |
| 1945 | 8.0 | 1345.0 | 2048.0 | 3507.0 | 2805.0 | 2347.0 | 64.5 | 0.0 | 0.0 | -356.0 | -412.7 | 1482.0 |
| 1946 | -130.0 | 1613.0 | 633.0 | 0.0 | 285.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -93.8 | -402.0 |
| 1947 | 0.0 | 1956.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 411.0 |
| 1948 | 0.0 | 384.0 | 622.0 | 0.0 | 0.0 | 116.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 644.0 |
| 1949 | 0.0 | 2066.0 | 2032.0 | 0.0 | 603.0 | 0.0 | 0.0 | 0.0 | 0.0 | -125.0 | 0.0 | 0.0 |
| 1950 | -114.0 | 1971.0 | 911.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 526.0 | -85.0 |
| 1951 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 514.0 |
| 1952 | 0.0 | 1437.0 | 102.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 497.0 |
| 1953 | 405.0 | 1968.0 | 1548.0 | 2267.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 986.0 |
| 1954 | 0.0 | 1786.0 | 1681.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 474.0 |
| 1955 | 0.0 | 841.0 | 1270.0 | 0.0 | 0.0 | 2034.0 | -331.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1956 | 0.0 | 588.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 290.0 |
| 1957 | 0.0 | 2179.0 | 1171.0 | 79.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -297.0 | 0.0 | 653.0 |
| 1958 | 156.0 | 2152.0 | 1692.0 | 172.0 | 0.0 | 203.0 | 0.0 | 0.0 | 0.0 | -513.0 | -315.2 | 898.0 |
| 1959 | -218.0 | 1235.0 | 33.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -251.7 | 276.0 |
| 1960 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1961 | 0.0 | 1640.0 | 2316.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 672.0 |
| 1962 | 0.0 | 2262.0 | 1682.0 | 0.0 | 1019.0 | 990.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1008.0 |
| 1963 | 0.0 | 999.0 | 148.0 | 0.0 | 0.0 | 815.0 | -216.5 | 0.0 | 0.0 | 0.0 | 0.0 | 970.0 |
| 1964 | -34.0 | 2185.0 | 2198.0 | 443.0 | 0.0 | 1646.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1965 | 0.0 | 1484.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1966 | 0.0 | 1411.0 | 1065.0 | 0.0 | 0.0 | 858.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 397.0 |
| 1967 | 69.0 | 2008.0 | 1770.0 | 0.0 | 0.0 | 0.0 | 529.0 | 0.0 | 0.0 | 0.0 | 0.0 | 820.0 |
| 1968 | 0.0 | 1648.0 | 1252.0 | 0.0 | 0.0 | 0.0 | -273.0 | 838.0 | 0.0 | 0.0 | 0.0 | 157.0 |
| 1969 | 0.0 | 471.0 | 458.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -397.0 | 0.0 | 0.0 |
| 1970 | 0.0 | 2110.0 | 2104.0 | 696.0 | 0.0 | 0.0 | -391.0 | 0.0 | 0.0 | 0.0 | 28.0 | 803.0 |
| 1971 | 217.0 | 2405.0 | 840.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -179.2 | 997.0 |
| 1972 | 0.0 | 1802.0 | 1392.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1973 | 0.0 | 2035.0 | 611.0 | 509.0 | 356.0 | 444.0 | 733.5 | 1010.0 | 507.0 | 0.0 | 0.0 | 0.0 |
| 1974 | -210.0 | 1121.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 23.8 | 317.0 |
| 1975 | 229.0 | 2172.0 | 1963.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 257.0 |
| 1976 | 0.0 | 105.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -39.3 | 786.0 |
| 1977 | 0.0 | 2118.0 | 1590.0 | 2847.0 | 556.0 | 2707.0 | 567.0 | 965.0 | 720.0 | 154.0 | 0.0 | 0.0 |
| 1978 | 142.0 | 712.0 | 861.0 | -675.0 | 540.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -490.2 | 1482.0 |

# Table 49: 4(h)(10)(C) Power Purchase Amounts (aMW) for Snake River Dams to Natural River and JDA Dam to Spillway Crest

| 4(h)(10)(C) Power Purchase Amounts (aMW), … Scenario 12 | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Water Year** | **Oct** | **Nov** | **Dec** | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **Jun** | **Jul** | **Aug** | **Sep** |
| 1929 | 408.2 | 2276.7 | 2025.9 | 3920.4 | 1646.8 | 2376.5 | 984.9 | 2145.8 | -38.0 | 0.0 | 0.0 | 1188.6 |
| 1930 | 482.1 | 1549.7 | 1934.9 | 3784.0 | 1770.9 | 2729.1 | -517.1 | 2645.4 | 2050.9 | 0.0 | -74.0 | 504.6 |
| 1931 | 691.4 | 1461.5 | 1507.8 | 4508.8 | 3151.3 | 2151.5 | 415.5 | -395.0 | 996.2 | -262.0 | 0.0 | 623.8 |
| 1932 | 221.3 | 1600.4 | 2304.1 | 4408.3 | 1964.3 | 0.0 | 0.0 | 0.0 | 0.0 | -82.0 | -127.9 | 1321.6 |
| 1933 | 349.3 | 1849.3 | 1890.2 | 0.0 | 0.0 | 1593.6 | 145.7 | 0.0 | 0.0 | 0.0 | 0.0 | 831.5 |
| 1934 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -158.9 | 201.1 | 0.0 | 86.0 |
| 1935 | 547.9 | 2349.1 | 2481.9 | 0.0 | 0.0 | 388.2 | 0.0 | 0.0 | 0.0 | -330.0 | 744.7 | 801.4 |
| 1936 | 567.4 | 1967.2 | 1718.1 | 3409.0 | 1146.6 | 1993.8 | 203.6 | 0.0 | 0.0 | -107.0 | 174.4 | 1270.8 |
| 1937 | 823.1 | 1781.7 | 1921.9 | 3972.2 | 2184.0 | 2517.4 | 1558.5 | 67.0 | 1308.8 | -326.3 | 60.2 | 917.3 |
| 1938 | 195.9 | 1168.4 | 1238.3 | 0.0 | 621.0 | 0.0 | 0.0 | 0.0 | 0.0 | -227.0 | -91.0 | -389.4 |
| 1939 | 260.3 | 2256.2 | 2054.4 | 4067.7 | 0.0 | -19.3 | 0.0 | 0.0 | 1549.7 | 0.0 | -243.9 | 1271.8 |
| 1940 | 322.6 | 1724.0 | 1734.7 | 2798.0 | 721.8 | 0.0 | -91.5 | 0.0 | 2869.9 | 32.3 | 11.5 | 1009.7 |
| 1941 | -107.2 | 1989.8 | 2098.0 | 3435.0 | 2060.9 | 1347.2 | 185.5 | 962.0 | 129.0 | 293.3 | 151.2 | -47.4 |
| 1942 | -338.0 | 1391.8 | 0.0 | 0.0 | 0.0 | 2347.0 | 0.0 | 0.0 | 0.0 | 0.0 | -97.8 | 1089.0 |
| 1943 | -95.7 | 2232.6 | 2253.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -269.9 |
| 1944 | 364.7 | 2301.5 | 2125.4 | 3814.0 | 1597.3 | 2533.6 | 1287.9 | 1494.7 | 899.4 | 488.8 | 0.0 | 1231.3 |
| 1945 | 98.8 | 1543.3 | 2329.7 | 3869.2 | 3421.6 | 2730.0 | 649.9 | 0.0 | 0.0 | -356.0 | -176.5 | 1738.6 |
| 1946 | 144.4 | 1854.2 | 1175.3 | 0.0 | 285.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -93.8 | -246.1 |
| 1947 | 345.0 | 2296.7 | 0.0 | 0.0 | 0.0 | 1054.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 728.0 |
| 1948 | 0.0 | 582.8 | 1086.0 | 0.0 | 0.0 | 146.1 | 0.0 | 0.0 | 0.0 | 0.0 | 4.1 | 877.6 |
| 1949 | 276.3 | 2341.9 | 2382.5 | 0.0 | 603.0 | 0.0 | 0.0 | 0.0 | 0.0 | 268.1 | 0.0 | 0.0 |
| 1950 | 71.4 | 2103.3 | 1498.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 769.2 | 173.1 |
| 1951 | 0.0 | 13.2 | 0.0 | 0.0 | 0.0 | 183.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 689.8 |
| 1952 | 0.0 | 1748.5 | 622.2 | 0.0 | 0.0 | 562.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 497.0 |
| 1953 | 597.4 | 2058.8 | 1927.6 | 3158.3 | 0.0 | 0.0 | 73.2 | 0.0 | 0.0 | 0.0 | 143.6 | 1157.6 |
| 1954 | 295.6 | 2043.8 | 2059.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 768.9 |
| 1955 | 0.0 | 1118.4 | 1620.5 | 0.0 | 271.3 | 2324.9 | -331.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1956 | 0.0 | 914.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 326.8 |
| 1957 | 111.5 | 2470.3 | 1632.6 | 453.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -297.0 | 0.0 | 954.7 |
| 1958 | 462.9 | 2246.5 | 2284.6 | 411.7 | 0.0 | 621.0 | 0.0 | 0.0 | 0.0 | -97.8 | -186.3 | 1065.9 |
| 1959 | 164.0 | 1581.2 | 382.8 | 0.0 | 0.0 | 704.4 | 0.0 | 0.0 | 0.0 | 0.0 | -251.7 | 445.1 |
| 1960 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1961 | 381.2 | 1934.9 | 2631.2 | 0.0 | 0.0 | 0.0 | 387.1 | 0.0 | 0.0 | 0.0 | 86.0 | 823.3 |
| 1962 | 393.8 | 2459.6 | 2040.5 | 0.0 | 1538.6 | 1299.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1149.8 |
| 1963 | 6.6 | 1343.4 | 670.7 | 0.0 | 0.0 | 1247.4 | -216.5 | 0.0 | 0.0 | 0.0 | 0.0 | 1123.1 |
| 1964 | 248.7 | 2448.3 | 2525.8 | 820.7 | 0.0 | 2011.5 | 161.7 | 0.0 | 0.0 | 0.0 | 0.0 | 307.5 |
| 1965 | 0.0 | 1773.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1966 | 0.0 | 1741.5 | 1518.3 | 0.0 | 0.0 | 1314.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 766.5 |
| 1967 | 398.9 | 2213.0 | 2223.3 | 0.0 | 0.0 | 0.0 | 806.8 | 0.0 | 0.0 | 0.0 | 0.0 | 967.9 |
| 1968 | 218.5 | 1967.8 | 1669.1 | 0.0 | 0.0 | 0.0 | 165.5 | 1482.1 | 0.0 | 0.0 | 0.0 | 338.3 |
| 1969 | 0.0 | 729.9 | 922.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -397.0 | 0.0 | 0.0 |
| 1970 | 381.3 | 2357.1 | 2456.0 | 1376.1 | 0.0 | 128.0 | -391.0 | 0.0 | 0.0 | 0.0 | 76.6 | 960.1 |
| 1971 | 466.2 | 2602.0 | 1654.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -179.2 | 1210.0 |
| 1972 | 336.1 | 2143.3 | 1848.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1973 | 0.0 | 2353.0 | 1086.1 | 1118.5 | 657.4 | 845.4 | 1244.0 | 1841.4 | 796.8 | 0.0 | 0.0 | 0.0 |
| 1974 | -51.3 | 1537.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 111.6 | 576.0 |
| 1975 | 444.4 | 2366.6 | 2520.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 257.0 |
| 1976 | 241.7 | 474.9 | 0.0 | 0.0 | 0.0 | 916.2 | 0.0 | 0.0 | 0.0 | 0.0 | -39.3 | 1102.4 |
| 1977 | 0.0 | 2214.7 | 2030.1 | 3544.0 | 710.4 | 2823.3 | 950.3 | 1572.1 | 1101.2 | 333.2 | 0.0 | 0.0 |
| 1978 | 259.9 | 970.7 | 1505.8 | -675.0 | 540.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -375.7 | 1707.9 |

# Table 50: 4(h)(10)(C) Power Purchase Amounts (aMW) for Snake River and JDA Dams to Natural River (high option) plus CWA *

| 4(h)(10)(C) Power Purchase Amounts (aMW), … Scenario 13 | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Water Year** | **Oct** | **Nov** | **Dec** | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **Jun** | **Jul** | **Aug** | **Sep** |
| 1929 | 468.9 | 2874.8 | 2172.5 | 4177.8 | 1802.8 | 2301.0 | 1271.8 | 2445.7 | 126.5 | 518.6 | 0.0 | 1633.3 |
| 1930 | 814.6 | 2200.6 | 2002.7 | 3832.7 | 1929.0 | 2659.5 | -282.4 | 3042.9 | 2537.6 | 131.1 | -47.5 | 714.8 |
| 1931 | 975.9 | 2214.2 | 1501.8 | 4567.4 | 3244.6 | 1980.9 | 549.2 | -395.0 | 1781.9 | -262.0 | 0.0 | 924.9 |
| 1932 | 527.9 | 2030.0 | 2565.2 | 4309.3 | 2216.5 | 127.4 | 0.0 | 0.0 | 0.0 | -82.0 | 204.8 | 1619.8 |
| 1933 | 378.5 | 2293.5 | 2306.0 | 0.0 | 0.0 | 2369.5 | 461.6 | 0.0 | 0.0 | 0.0 | 0.0 | 1091.9 |
| 1934 | 0.0 | 301.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 563.1 | 639.7 | 0.0 | 86.0 |
| 1935 | 722.9 | 2628.7 | 2886.1 | 0.0 | 0.0 | 763.7 | 29.0 | 0.0 | 0.0 | -330.0 | 856.3 | 824.2 |
| 1936 | 897.1 | 2449.0 | 1922.1 | 3243.1 | 1359.4 | 2019.8 | 556.3 | 0.0 | 503.7 | -107.0 | 242.5 | 1569.2 |
| 1937 | 1123.1 | 2486.0 | 1988.3 | 3876.9 | 2487.7 | 2585.8 | 1905.8 | 67.0 | 1655.3 | 252.6 | 59.2 | 1175.4 |
| 1938 | 501.5 | 1616.4 | 1738.1 | 0.0 | 621.0 | 0.0 | 0.0 | 0.0 | 0.0 | -227.0 | 110.2 | -219.9 |
| 1939 | 448.4 | 2764.4 | 2484.6 | 4111.6 | 0.0 | 42.4 | 0.0 | 0.0 | 2234.9 | 0.0 | -225.3 | 1590.4 |
| 1940 | 364.3 | 2496.6 | 1872.0 | 3070.0 | 894.2 | 0.0 | -91.5 | 0.0 | 3539.4 | 412.8 | 17.7 | 1286.6 |
| 1941 | 388.1 | 2562.5 | 2288.6 | 3250.8 | 2539.5 | 1563.0 | 526.4 | 1066.3 | 863.0 | 629.6 | 190.7 | 189.0 |
| 1942 | -139.6 | 2031.9 | 0.0 | 0.0 | 644.5 | 2468.2 | 0.0 | 0.0 | 0.0 | 0.0 | 163.3 | 1315.5 |
| 1943 | 12.9 | 2522.2 | 2782.9 | 0.0 | 0.0 | 369.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -2.5 |
| 1944 | 443.8 | 2931.3 | 2529.7 | 3953.6 | 1672.1 | 2555.8 | 1612.2 | 1875.1 | 1328.6 | 980.0 | 0.0 | 1555.5 |
| 1945 | 581.5 | 2127.4 | 2474.2 | 4106.0 | 3365.1 | 2591.2 | 890.7 | 0.0 | 0.0 | -356.0 | -66.0 | 2023.4 |
| 1946 | 258.4 | 2393.6 | 1399.8 | 0.0 | 285.0 | 651.1 | 0.0 | 0.0 | 0.0 | 0.0 | -93.8 | 54.6 |
| 1947 | 467.2 | 2708.4 | 228.1 | 0.0 | 0.0 | 1230.1 | 0.0 | 0.0 | 0.0 | 0.0 | 14.2 | 985.2 |
| 1948 | 0.0 | 1513.7 | 1251.4 | 0.0 | 0.0 | 672.8 | 142.2 | 0.0 | 0.0 | 0.0 | 123.7 | 1150.4 |
| 1949 | 479.0 | 2800.7 | 2749.0 | 424.2 | 603.0 | 0.0 | 0.0 | 0.0 | 0.0 | 722.4 | 0.0 | 0.0 |
| 1950 | 347.9 | 2452.0 | 1805.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1177.3 | 338.4 |
| 1951 | 0.0 | 772.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 965.2 |
| 1952 | 0.0 | 2609.2 | 975.2 | 0.0 | 0.0 | 902.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 497.0 |
| 1953 | 886.0 | 2729.5 | 2165.0 | 3229.3 | 0.0 | 0.0 | 951.0 | 0.0 | 0.0 | 0.0 | 333.2 | 1582.5 |
| 1954 | 422.6 | 2615.7 | 2374.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1009.4 |
| 1955 | 0.0 | 1950.3 | 1782.1 | 340.0 | 408.5 | 2219.2 | -161.8 | 159.2 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1956 | 181.9 | 1553.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 290.0 |
| 1957 | 258.7 | 2893.5 | 2133.6 | 625.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 573.2 | 0.0 | 1285.2 |
| 1958 | 563.1 | 2913.9 | 2469.4 | 377.1 | 0.0 | 1325.0 | 0.0 | 0.0 | 0.0 | 372.9 | 71.0 | 1338.7 |
| 1959 | 167.1 | 2145.0 | 713.4 | 0.0 | 0.0 | 327.6 | 0.0 | 0.0 | 0.0 | 0.0 | -119.7 | 809.3 |
| 1960 | 0.0 | 0.0 | 0.0 | 0.0 | 353.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1961 | 478.8 | 2411.8 | 2952.4 | 0.0 | 0.0 | 0.0 | 637.0 | 0.0 | 0.0 | 262.8 | 201.1 | 1133.2 |
| 1962 | 384.8 | 2904.1 | 2421.3 | 0.0 | 2051.2 | 1312.3 | 0.0 | 0.0 | 0.0 | 0.0 | 68.0 | 1329.2 |
| 1963 | 140.4 | 1899.4 | 955.8 | 0.0 | 0.0 | 1623.5 | -216.5 | 0.0 | 0.0 | 0.0 | 0.0 | 1442.5 |
| 1964 | 351.9 | 2826.7 | 2998.1 | 974.2 | 0.0 | 2249.9 | 396.9 | 0.0 | 0.0 | 0.0 | 0.0 | 561.9 |
| 1965 | 0.0 | 2324.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1966 | 138.3 | 2267.6 | 1814.2 | 0.0 | 0.0 | 1485.6 | 8.9 | 0.0 | 461.2 | 0.0 | 0.0 | 846.1 |
| 1967 | 435.8 | 2730.3 | 2566.5 | 0.0 | 0.0 | 0.0 | 1227.7 | 0.0 | 0.0 | 0.0 | 158.5 | 1241.9 |
| 1968 | 306.2 | 2540.3 | 1955.2 | 0.0 | 0.0 | 0.0 | 697.0 | 2032.2 | 0.0 | 0.0 | 0.0 | 655.6 |
| 1969 | 0.0 | 1477.9 | 1111.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -397.0 | 0.0 | 0.0 |
| 1970 | 411.0 | 2811.8 | 2828.8 | 1454.0 | 0.0 | 480.1 | -391.0 | 0.0 | 0.0 | 0.0 | 190.9 | 1246.8 |
| 1971 | 641.8 | 3051.3 | 1911.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 27.7 | 1508.7 |
| 1972 | 533.6 | 2548.3 | 2339.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1973 | 194.8 | 2740.0 | 1360.2 | 1588.6 | 904.9 | 747.9 | 1483.6 | 2022.4 | 1453.6 | 161.7 | 0.0 | 0.0 |
| 1974 | 366.0 | 1787.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 392.8 | 785.2 |
| 1975 | 628.0 | 2729.3 | 2940.1 | 0.0 | 0.0 | 0.0 | 465.9 | 0.0 | 0.0 | 0.0 | 0.0 | 257.0 |
| 1976 | 456.9 | 1093.7 | 0.0 | 0.0 | 0.0 | 429.7 | 0.0 | 0.0 | 0.0 | 0.0 | -39.3 | 1233.7 |
| 1977 | 358.5 | 2786.2 | 2149.1 | 3636.1 | 956.0 | 2843.1 | 1233.2 | 1925.1 | 1633.1 | 698.2 | 0.0 | 0.0 |
| 1978 | 568.2 | 1162.6 | 1937.1 | -675.0 | 540.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 133.9 | 1861.9 |

# Table 51: 4(h)(10)(C) Power Purchase Amounts (aMW) for Two Snake River Dams to Natural River - Adj. Sch

| 4(h)(10)(C) Power Purchase Amounts (aMW), … Scenario 14 | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Water Year** | **Oct** | **Nov** | **Dec** | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **Jun** | **Jul** | **Aug** | **Sep** |
| 1929 | 69.1 | 2157.4 | 1742.3 | 3383.1 | 1435.1 | 2017.3 | 487.0 | 1467.9 | -38.0 | 0.0 | 0.0 | 1000.4 |
| 1930 | 381.7 | 1409.0 | 1615.6 | 3275.0 | 1447.4 | 2372.3 | -517.5 | 1912.7 | 1471.5 | 0.0 | -128.8 | 309.6 |
| 1931 | 494.0 | 1362.8 | 1252.0 | 3984.4 | 2833.6 | 1821.1 | 146.8 | -395.0 | 585.0 | -262.0 | 0.0 | 489.5 |
| 1932 | 107.7 | 1436.4 | 2063.1 | 3685.8 | 1828.5 | 0.0 | 0.0 | 0.0 | 0.0 | -82.0 | -253.1 | 1191.6 |
| 1933 | 16.4 | 1552.2 | 1574.4 | 0.0 | 0.0 | 1313.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 692.0 |
| 1934 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -594.9 | -6.9 | 0.0 | 86.0 |
| 1935 | 416.6 | 2092.4 | 2098.6 | 0.0 | 0.0 | 50.7 | 0.0 | 0.0 | 0.0 | -330.0 | 569.6 | 604.4 |
| 1936 | 379.6 | 1806.1 | 1551.3 | 2582.6 | 1032.3 | 1611.6 | -15.5 | 0.0 | 0.0 | -107.0 | 87.5 | 1162.9 |
| 1937 | 679.3 | 1672.7 | 1637.7 | 3277.7 | 2109.0 | 2207.1 | 1114.1 | 67.0 | 714.0 | -462.0 | 0.0 | 777.8 |
| 1938 | 61.5 | 898.7 | 849.9 | 0.0 | 621.0 | 0.0 | 0.0 | 0.0 | 0.0 | -227.0 | -207.5 | -612.1 |
| 1939 | 18.9 | 2141.5 | 1739.6 | 3365.5 | 0.0 | -31.0 | 0.0 | 0.0 | 1051.6 | 0.0 | -387.8 | 1118.1 |
| 1940 | 22.2 | 1622.4 | 1396.8 | 2277.7 | 355.0 | 0.0 | -91.5 | 0.0 | 2283.0 | 0.0 | 0.0 | 874.5 |
| 1941 | -222.4 | 1842.3 | 1741.2 | 2574.6 | 1943.9 | 951.3 | -124.1 | 207.0 | 0.0 | 133.0 | -47.5 | -260.6 |
| 1942 | -662.3 | 1170.0 | 0.0 | 0.0 | 0.0 | 2117.9 | 0.0 | 0.0 | 0.0 | 0.0 | -229.9 | 826.6 |
| 1943 | -336.6 | 1999.3 | 1718.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -422.6 |
| 1944 | 59.7 | 2205.9 | 1743.1 | 3144.2 | 1251.9 | 2365.2 | 745.5 | 754.0 | 302.5 | 222.4 | 0.0 | 1049.5 |
| 1945 | 13.1 | 1358.4 | 2052.3 | 3528.7 | 2841.7 | 2368.9 | 100.5 | 0.0 | 0.0 | -356.0 | -398.7 | 1494.2 |
| 1946 | -109.6 | 1625.0 | 663.1 | 0.0 | 285.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -93.8 | -397.9 |
| 1947 | 20.3 | 1974.3 | 0.0 | 0.0 | 0.0 | 73.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 426.5 |
| 1948 | 0.0 | 384.0 | 646.2 | 0.0 | 0.0 | 116.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 658.5 |
| 1949 | 0.0 | 2079.3 | 2050.0 | 0.0 | 603.0 | 0.0 | 0.0 | 0.0 | 0.0 | -100.3 | 0.0 | 0.0 |
| 1950 | -101.0 | 1979.3 | 939.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 540.7 | -72.6 |
| 1951 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 514.0 |
| 1952 | 0.0 | 1452.2 | 130.7 | 0.0 | 0.0 | 34.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 497.0 |
| 1953 | 418.5 | 1972.7 | 1556.6 | 2327.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 990.7 |
| 1954 | 15.7 | 1797.6 | 1699.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 488.5 |
| 1955 | 0.0 | 852.5 | 1286.1 | 0.0 | 13.5 | 2049.1 | -331.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1956 | 0.0 | 602.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 290.0 |
| 1957 | 0.0 | 2193.5 | 1195.2 | 79.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -297.0 | 0.0 | 667.5 |
| 1958 | 179.0 | 2155.2 | 1724.9 | 172.0 | 0.0 | 225.4 | 0.0 | 0.0 | 0.0 | -485.6 | -307.8 | 902.4 |
| 1959 | -218.0 | 1252.8 | 33.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -251.7 | 282.8 |
| 1960 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1961 | 24.4 | 1653.1 | 2331.2 | 0.0 | 0.0 | 0.0 | 22.6 | 0.0 | 0.0 | 0.0 | 0.0 | 676.0 |
| 1962 | 23.1 | 2274.0 | 1696.8 | 0.0 | 1048.8 | 1006.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1012.3 |
| 1963 | 0.0 | 1016.5 | 175.6 | 0.0 | 0.0 | 839.2 | -216.5 | 0.0 | 0.0 | 0.0 | 0.0 | 979.5 |
| 1964 | -18.2 | 2197.9 | 2214.1 | 443.0 | 0.0 | 1667.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 14.9 |
| 1965 | 0.0 | 1497.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1966 | 0.0 | 1428.0 | 1089.7 | 0.0 | 0.0 | 884.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 417.2 |
| 1967 | 88.7 | 2019.8 | 1786.8 | 0.0 | 0.0 | 0.0 | 544.8 | 0.0 | 0.0 | 0.0 | 0.0 | 827.3 |
| 1968 | 0.0 | 1664.2 | 1273.7 | 0.0 | 0.0 | 0.0 | -256.4 | 838.0 | 0.0 | 0.0 | 0.0 | 157.0 |
| 1969 | 0.0 | 471.0 | 482.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -397.0 | 0.0 | 0.0 |
| 1970 | 0.0 | 2121.4 | 2121.9 | 731.5 | 0.0 | 0.0 | -391.0 | 0.0 | 0.0 | 0.0 | 28.0 | 808.1 |
| 1971 | 235.1 | 2418.5 | 883.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -179.2 | 1005.3 |
| 1972 | 19.5 | 1820.3 | 1417.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1973 | 0.0 | 2051.9 | 637.2 | 543.2 | 356.0 | 467.2 | 763.6 | 1060.5 | 507.0 | 0.0 | 0.0 | 0.0 |
| 1974 | -201.2 | 1148.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 28.9 | 329.8 |
| 1975 | 244.9 | 2183.9 | 1988.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 257.0 |
| 1976 | 0.0 | 105.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -39.3 | 803.8 |
| 1977 | 0.0 | 2122.7 | 1618.9 | 2865.8 | 569.8 | 2720.9 | 578.0 | 1000.1 | 742.5 | 165.1 | 0.0 | 0.0 |
| 1978 | 149.5 | 730.9 | 895.7 | -675.0 | 540.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -483.7 | 1492.8 |

# Table 52: 4(h)(10)(C) Power Purchase Amounts (aMW) for Four Snake River Dams to Natural River - Adj. Sch

| 4(h)(10)(C) Power Purchase Amounts (aMW), … Scenario 15 | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Water Year** | **Oct** | **Nov** | **Dec** | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **Jun** | **Jul** | **Aug** | **Sep** |
| 1929 | 69.1 | 2157.4 | 1742.3 | 3383.1 | 1435.1 | 2017.3 | 487.0 | 1467.9 | -38.0 | 0.0 | 0.0 | 1000.4 |
| 1930 | 381.7 | 1409.0 | 1615.6 | 3275.0 | 1447.4 | 2372.3 | -517.5 | 1912.7 | 1471.5 | 0.0 | -128.8 | 309.6 |
| 1931 | 494.0 | 1362.8 | 1252.0 | 3984.4 | 2833.6 | 1821.1 | 146.8 | -395.0 | 585.0 | -262.0 | 0.0 | 489.5 |
| 1932 | 107.7 | 1436.4 | 2063.1 | 3685.8 | 1828.5 | 0.0 | 0.0 | 0.0 | 0.0 | -82.0 | -253.1 | 1191.6 |
| 1933 | 16.4 | 1552.2 | 1574.4 | 0.0 | 0.0 | 1313.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 692.0 |
| 1934 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -594.9 | -6.9 | 0.0 | 86.0 |
| 1935 | 416.6 | 2092.4 | 2098.6 | 0.0 | 0.0 | 50.7 | 0.0 | 0.0 | 0.0 | -330.0 | 569.6 | 604.4 |
| 1936 | 379.6 | 1806.1 | 1551.3 | 2582.6 | 1032.3 | 1611.6 | -15.5 | 0.0 | 0.0 | -107.0 | 87.5 | 1162.9 |
| 1937 | 679.3 | 1672.7 | 1637.7 | 3277.7 | 2109.0 | 2207.1 | 1114.1 | 67.0 | 714.0 | -462.0 | 0.0 | 777.8 |
| 1938 | 61.5 | 898.7 | 849.9 | 0.0 | 621.0 | 0.0 | 0.0 | 0.0 | 0.0 | -227.0 | -207.5 | -612.1 |
| 1939 | 18.9 | 2141.5 | 1739.6 | 3365.5 | 0.0 | -31.0 | 0.0 | 0.0 | 1051.6 | 0.0 | -387.8 | 1118.1 |
| 1940 | 22.2 | 1622.4 | 1396.8 | 2277.7 | 355.0 | 0.0 | -91.5 | 0.0 | 2283.0 | 0.0 | 0.0 | 874.5 |
| 1941 | -222.4 | 1842.3 | 1741.2 | 2574.6 | 1943.9 | 951.3 | -124.1 | 207.0 | 0.0 | 133.0 | -47.5 | -260.6 |
| 1942 | -662.3 | 1170.0 | 0.0 | 0.0 | 0.0 | 2117.9 | 0.0 | 0.0 | 0.0 | 0.0 | -229.9 | 826.6 |
| 1943 | -336.6 | 1999.3 | 1718.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -422.6 |
| 1944 | 59.7 | 2205.9 | 1743.1 | 3144.2 | 1251.9 | 2365.2 | 745.5 | 754.0 | 302.5 | 222.4 | 0.0 | 1049.5 |
| 1945 | 13.1 | 1358.4 | 2052.3 | 3528.7 | 2841.7 | 2368.9 | 100.5 | 0.0 | 0.0 | -356.0 | -398.7 | 1494.2 |
| 1946 | -109.6 | 1625.0 | 663.1 | 0.0 | 285.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -93.8 | -397.9 |
| 1947 | 20.3 | 1974.3 | 0.0 | 0.0 | 0.0 | 73.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 426.5 |
| 1948 | 0.0 | 384.0 | 646.2 | 0.0 | 0.0 | 116.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 658.5 |
| 1949 | 0.0 | 2079.3 | 2050.0 | 0.0 | 603.0 | 0.0 | 0.0 | 0.0 | 0.0 | -100.3 | 0.0 | 0.0 |
| 1950 | -101.0 | 1979.3 | 939.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 540.7 | -72.6 |
| 1951 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 514.0 |
| 1952 | 0.0 | 1452.2 | 130.7 | 0.0 | 0.0 | 34.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 497.0 |
| 1953 | 418.5 | 1972.7 | 1556.6 | 2327.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 990.7 |
| 1954 | 15.7 | 1797.6 | 1699.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 488.5 |
| 1955 | 0.0 | 852.5 | 1286.1 | 0.0 | 13.5 | 2049.1 | -331.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1956 | 0.0 | 602.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 290.0 |
| 1957 | 0.0 | 2193.5 | 1195.2 | 79.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -297.0 | 0.0 | 667.5 |
| 1958 | 179.0 | 2155.2 | 1724.9 | 172.0 | 0.0 | 225.4 | 0.0 | 0.0 | 0.0 | -485.6 | -307.8 | 902.4 |
| 1959 | -218.0 | 1252.8 | 33.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -251.7 | 282.8 |
| 1960 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1961 | 24.4 | 1653.1 | 2331.2 | 0.0 | 0.0 | 0.0 | 22.6 | 0.0 | 0.0 | 0.0 | 0.0 | 676.0 |
| 1962 | 23.1 | 2274.0 | 1696.8 | 0.0 | 1048.8 | 1006.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1012.3 |
| 1963 | 0.0 | 1016.5 | 175.6 | 0.0 | 0.0 | 839.2 | -216.5 | 0.0 | 0.0 | 0.0 | 0.0 | 979.5 |
| 1964 | -18.2 | 2197.9 | 2214.1 | 443.0 | 0.0 | 1667.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 14.9 |
| 1965 | 0.0 | 1497.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1966 | 0.0 | 1428.0 | 1089.7 | 0.0 | 0.0 | 884.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 417.2 |
| 1967 | 88.7 | 2019.8 | 1786.8 | 0.0 | 0.0 | 0.0 | 544.8 | 0.0 | 0.0 | 0.0 | 0.0 | 827.3 |
| 1968 | 0.0 | 1664.2 | 1273.7 | 0.0 | 0.0 | 0.0 | -256.4 | 838.0 | 0.0 | 0.0 | 0.0 | 157.0 |
| 1969 | 0.0 | 471.0 | 482.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -397.0 | 0.0 | 0.0 |
| 1970 | 0.0 | 2121.4 | 2121.9 | 731.5 | 0.0 | 0.0 | -391.0 | 0.0 | 0.0 | 0.0 | 28.0 | 808.1 |
| 1971 | 235.1 | 2418.5 | 883.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -179.2 | 1005.3 |
| 1972 | 19.5 | 1820.3 | 1417.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1973 | 0.0 | 2051.9 | 637.2 | 543.2 | 356.0 | 467.2 | 763.6 | 1060.5 | 507.0 | 0.0 | 0.0 | 0.0 |
| 1974 | -201.2 | 1148.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 28.9 | 329.8 |
| 1975 | 244.9 | 2183.9 | 1988.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 257.0 |
| 1976 | 0.0 | 105.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -39.3 | 803.8 |
| 1977 | 0.0 | 2122.7 | 1618.9 | 2865.8 | 569.8 | 2720.9 | 578.0 | 1000.1 | 742.5 | 165.1 | 0.0 | 0.0 |
| 1978 | 149.5 | 730.9 | 895.7 | -675.0 | 540.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -483.7 | 1492.8 |

# Table 53: 4(h)(10)(C) Power Purchase Amounts (aMW) for Snake River and JDA Dams to Natural River - Adj. Sch

| 4(h)(10)(C) Power Purchase Amounts (aMW), … Scenario 16 | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Water Year** | **Oct** | **Nov** | **Dec** | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **Jun** | **Jul** | **Aug** | **Sep** |
| 1929 | 71.6 | 2155.2 | 1743.7 | 3405.4 | 1436.9 | 2015.6 | 481.3 | 1459.6 | -38.0 | 0.0 | 0.0 | 998.0 |
| 1930 | 381.6 | 1416.8 | 1628.3 | 3265.5 | 1449.0 | 2372.6 | -517.5 | 1903.5 | 1465.7 | 0.0 | -128.8 | 314.2 |
| 1931 | 490.5 | 1370.1 | 1264.7 | 3977.2 | 2840.8 | 1820.8 | 146.3 | -395.0 | 584.6 | -262.0 | 0.0 | 495.5 |
| 1932 | 109.5 | 1445.3 | 2073.1 | 3672.1 | 1835.2 | 0.0 | 0.0 | 0.0 | 0.0 | -82.0 | -252.7 | 1198.4 |
| 1933 | 14.7 | 1561.9 | 1582.5 | 0.0 | 0.0 | 1316.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 693.3 |
| 1934 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -593.4 | -7.1 | 0.0 | 86.0 |
| 1935 | 414.1 | 2088.4 | 2118.0 | 0.0 | 0.0 | 56.0 | 0.0 | 0.0 | 0.0 | -330.0 | 570.4 | 609.4 |
| 1936 | 380.6 | 1814.3 | 1558.9 | 2572.6 | 1039.2 | 1612.3 | -15.5 | 0.0 | 0.0 | -107.0 | 88.1 | 1168.6 |
| 1937 | 679.5 | 1681.5 | 1648.7 | 3274.6 | 2107.8 | 2208.0 | 1110.6 | 67.0 | 714.0 | -462.0 | 0.0 | 783.8 |
| 1938 | 60.2 | 897.1 | 851.5 | 0.0 | 621.0 | 0.0 | 0.0 | 0.0 | 0.0 | -227.0 | -207.9 | -608.5 |
| 1939 | 15.7 | 2145.2 | 1742.7 | 3370.0 | 0.0 | -31.0 | 0.0 | 0.0 | 1047.6 | 0.0 | -389.6 | 1124.7 |
| 1940 | 13.6 | 1623.7 | 1401.5 | 2305.9 | 349.7 | 0.0 | -91.5 | 0.0 | 2277.1 | 0.0 | 0.0 | 880.8 |
| 1941 | -220.1 | 1849.8 | 1748.0 | 2558.4 | 1955.0 | 952.0 | -123.6 | 207.0 | 0.0 | 133.0 | -47.6 | -255.6 |
| 1942 | -664.5 | 1167.7 | 0.0 | 0.0 | 0.0 | 2111.6 | 0.0 | 0.0 | 0.0 | 0.0 | -230.9 | 829.7 |
| 1943 | -344.6 | 1995.0 | 1735.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -417.1 |
| 1944 | 50.0 | 2211.8 | 1738.6 | 3160.9 | 1248.7 | 2371.1 | 741.6 | 745.0 | 292.8 | 218.4 | 0.0 | 1053.1 |
| 1945 | 15.9 | 1358.4 | 2067.4 | 3526.8 | 2835.5 | 2368.9 | 95.8 | 0.0 | 0.0 | -356.0 | -400.0 | 1496.4 |
| 1946 | -118.3 | 1624.4 | 660.2 | 0.0 | 285.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -93.8 | -391.8 |
| 1947 | 19.2 | 1978.3 | 0.0 | 0.0 | 0.0 | 51.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 425.4 |
| 1948 | 0.0 | 384.0 | 649.3 | 0.0 | 0.0 | 116.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 656.1 |
| 1949 | 0.0 | 2081.4 | 2053.6 | 0.0 | 603.0 | 0.0 | 0.0 | 0.0 | 0.0 | -104.8 | 0.0 | 0.0 |
| 1950 | -104.0 | 1983.4 | 935.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 538.9 | -70.6 |
| 1951 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 514.0 |
| 1952 | 0.0 | 1456.2 | 131.8 | 0.0 | 0.0 | 30.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 497.0 |
| 1953 | 416.5 | 1978.7 | 1569.4 | 2312.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 997.1 |
| 1954 | 21.5 | 1802.4 | 1704.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 487.0 |
| 1955 | 0.0 | 859.2 | 1292.0 | 0.0 | 16.5 | 2051.4 | -331.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1956 | 0.0 | 608.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 290.0 |
| 1957 | 0.0 | 2195.2 | 1199.6 | 79.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -297.0 | 0.0 | 669.4 |
| 1958 | 169.1 | 2161.8 | 1718.6 | 172.0 | 0.0 | 227.4 | 0.0 | 0.0 | 0.0 | -492.2 | -309.1 | 909.0 |
| 1959 | -218.0 | 1256.2 | 33.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -251.7 | 287.1 |
| 1960 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1961 | 15.7 | 1662.8 | 2336.7 | 0.0 | 0.0 | 0.0 | 20.0 | 0.0 | 0.0 | 0.0 | 0.0 | 682.2 |
| 1962 | 19.4 | 2270.5 | 1706.6 | 0.0 | 1050.5 | 1007.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1017.8 |
| 1963 | 0.0 | 1019.8 | 178.4 | 0.0 | 0.0 | 839.7 | -216.5 | 0.0 | 0.0 | 0.0 | 0.0 | 980.2 |
| 1964 | -19.7 | 2201.7 | 2219.4 | 443.0 | 0.0 | 1666.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 17.2 |
| 1965 | 0.0 | 1502.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1966 | 0.0 | 1430.9 | 1091.2 | 0.0 | 0.0 | 883.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 412.9 |
| 1967 | 82.5 | 2018.6 | 1805.0 | 0.0 | 0.0 | 0.0 | 545.8 | 0.0 | 0.0 | 0.0 | 0.0 | 830.2 |
| 1968 | 0.0 | 1667.3 | 1276.7 | 0.0 | 0.0 | 0.0 | -256.4 | 838.0 | 0.0 | 0.0 | 0.0 | 157.0 |
| 1969 | 0.0 | 471.0 | 485.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -397.0 | 0.0 | 0.0 |
| 1970 | 0.0 | 2120.6 | 2128.6 | 738.0 | 0.0 | 0.0 | -391.0 | 0.0 | 0.0 | 0.0 | 28.0 | 813.5 |
| 1971 | 230.4 | 2417.5 | 876.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -179.2 | 1009.6 |
| 1972 | 19.4 | 1822.0 | 1418.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1973 | 0.0 | 2048.9 | 642.9 | 550.9 | 356.0 | 463.4 | 761.9 | 1052.0 | 507.0 | 0.0 | 0.0 | 0.0 |
| 1974 | -203.1 | 1139.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 28.6 | 331.3 |
| 1975 | 238.2 | 2181.2 | 1996.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 257.0 |
| 1976 | 0.0 | 105.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -39.3 | 799.5 |
| 1977 | 0.0 | 2124.3 | 1609.9 | 2892.0 | 566.7 | 2716.7 | 577.6 | 996.9 | 740.0 | 163.4 | 0.0 | 0.0 |
| 1978 | 150.5 | 724.1 | 888.8 | -675.0 | 540.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -483.8 | 1494.6 |

# Table 54: 4(h)(10)(C) Power Purchase Amounts (aMW) for Snake River Dams to Natural River and JDA Dam to Spillway Crest - Adj. Sch

| 4(h)(10)(C) Power Purchase Amounts (aMW), … Scenario 17 | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Water Year** | **Oct** | **Nov** | **Dec** | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **Jun** | **Jul** | **Aug** | **Sep** |
| 1929 | 73.7 | 2156.1 | 1739.8 | 3394.9 | 1436.4 | 2016.2 | 484.4 | 1463.1 | -38.0 | 0.0 | 0.0 | 998.2 |
| 1930 | 380.9 | 1411.1 | 1626.2 | 3268.3 | 1448.0 | 2372.0 | -517.5 | 1907.4 | 1468.3 | 0.0 | -128.8 | 313.3 |
| 1931 | 490.8 | 1364.7 | 1260.5 | 3980.1 | 2840.3 | 1820.5 | 146.3 | -395.0 | 585.2 | -262.0 | 0.0 | 493.7 |
| 1932 | 107.7 | 1440.4 | 2070.7 | 3677.0 | 1832.7 | 0.0 | 0.0 | 0.0 | 0.0 | -82.0 | -252.8 | 1196.4 |
| 1933 | 19.4 | 1556.2 | 1578.3 | 0.0 | 0.0 | 1314.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 691.3 |
| 1934 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -593.4 | -6.8 | 0.0 | 86.0 |
| 1935 | 414.8 | 2091.2 | 2108.0 | 0.0 | 0.0 | 53.7 | 0.0 | 0.0 | 0.0 | -330.0 | 569.9 | 608.4 |
| 1936 | 378.1 | 1812.1 | 1554.6 | 2578.8 | 1036.5 | 1611.5 | -15.5 | 0.0 | 0.0 | -107.0 | 87.9 | 1166.2 |
| 1937 | 677.6 | 1676.2 | 1647.2 | 3279.7 | 2103.7 | 2207.2 | 1110.4 | 67.0 | 714.0 | -462.0 | 0.0 | 782.0 |
| 1938 | 60.0 | 901.7 | 853.6 | 0.0 | 621.0 | 0.0 | 0.0 | 0.0 | 0.0 | -227.0 | -207.8 | -609.1 |
| 1939 | 14.5 | 2141.7 | 1740.5 | 3372.9 | 0.0 | -31.0 | 0.0 | 0.0 | 1049.4 | 0.0 | -389.0 | 1122.8 |
| 1940 | 17.9 | 1622.0 | 1398.8 | 2289.9 | 353.6 | 0.0 | -91.5 | 0.0 | 2279.7 | 0.0 | 0.0 | 878.7 |
| 1941 | -223.2 | 1845.5 | 1746.7 | 2565.2 | 1950.5 | 951.3 | -123.9 | 207.0 | 0.0 | 133.0 | -47.6 | -256.7 |
| 1942 | -662.9 | 1166.3 | 0.0 | 0.0 | 0.0 | 2109.0 | 0.0 | 0.0 | 0.0 | 0.0 | -230.5 | 829.3 |
| 1943 | -341.5 | 1997.8 | 1727.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -419.2 |
| 1944 | 54.3 | 2208.5 | 1735.0 | 3159.5 | 1249.5 | 2368.7 | 742.6 | 748.9 | 296.5 | 219.8 | 0.0 | 1051.6 |
| 1945 | 13.0 | 1356.0 | 2063.6 | 3527.1 | 2839.2 | 2368.3 | 97.0 | 0.0 | 0.0 | -356.0 | -399.5 | 1496.3 |
| 1946 | -114.8 | 1626.4 | 663.1 | 0.0 | 285.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -93.8 | -393.3 |
| 1947 | 19.2 | 1974.9 | 0.0 | 0.0 | 0.0 | 58.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 428.6 |
| 1948 | 0.0 | 384.0 | 647.8 | 0.0 | 0.0 | 116.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 657.0 |
| 1949 | 0.0 | 2081.3 | 2051.5 | 0.0 | 603.0 | 0.0 | 0.0 | 0.0 | 0.0 | -103.2 | 0.0 | 0.0 |
| 1950 | -103.7 | 1978.3 | 943.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 539.5 | -70.7 |
| 1951 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 514.0 |
| 1952 | 0.0 | 1454.3 | 130.9 | 0.0 | 0.0 | 31.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 497.0 |
| 1953 | 415.7 | 1973.0 | 1569.1 | 2316.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 995.5 |
| 1954 | 16.4 | 1800.3 | 1702.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 490.4 |
| 1955 | 0.0 | 856.4 | 1289.5 | 0.0 | 15.1 | 2050.2 | -331.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1956 | 0.0 | 606.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 290.0 |
| 1957 | 0.0 | 2195.2 | 1196.6 | 79.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -297.0 | 0.0 | 669.8 |
| 1958 | 173.0 | 2157.3 | 1724.9 | 172.0 | 0.0 | 226.2 | 0.0 | 0.0 | 0.0 | -489.9 | -308.6 | 907.3 |
| 1959 | -218.0 | 1254.2 | 33.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -251.7 | 285.4 |
| 1960 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1961 | 21.2 | 1656.4 | 2333.5 | 0.0 | 0.0 | 0.0 | 20.6 | 0.0 | 0.0 | 0.0 | 0.0 | 680.4 |
| 1962 | 21.9 | 2273.0 | 1701.9 | 0.0 | 1047.9 | 1007.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1015.9 |
| 1963 | 0.0 | 1018.1 | 177.0 | 0.0 | 0.0 | 839.0 | -216.5 | 0.0 | 0.0 | 0.0 | 0.0 | 978.5 |
| 1964 | -18.3 | 2199.6 | 2216.2 | 443.0 | 0.0 | 1666.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 17.1 |
| 1965 | 0.0 | 1500.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1966 | 0.0 | 1429.4 | 1090.2 | 0.0 | 0.0 | 883.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 417.5 |
| 1967 | 87.3 | 2019.4 | 1795.2 | 0.0 | 0.0 | 0.0 | 544.4 | 0.0 | 0.0 | 0.0 | 0.0 | 828.2 |
| 1968 | 0.0 | 1665.8 | 1275.2 | 0.0 | 0.0 | 0.0 | -256.6 | 838.0 | 0.0 | 0.0 | 0.0 | 157.0 |
| 1969 | 0.0 | 471.0 | 483.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -397.0 | 0.0 | 0.0 |
| 1970 | 0.0 | 2123.7 | 2123.6 | 733.8 | 0.0 | 0.0 | -391.0 | 0.0 | 0.0 | 0.0 | 28.0 | 811.7 |
| 1971 | 230.8 | 2415.9 | 885.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -179.2 | 1008.8 |
| 1972 | 18.7 | 1821.0 | 1417.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1973 | 0.0 | 2052.7 | 637.4 | 542.9 | 356.0 | 466.3 | 761.9 | 1056.2 | 507.0 | 0.0 | 0.0 | 0.0 |
| 1974 | -201.2 | 1144.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 28.7 | 331.4 |
| 1975 | 241.0 | 2182.8 | 1994.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 257.0 |
| 1976 | 0.0 | 105.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -39.3 | 803.6 |
| 1977 | 0.0 | 2123.4 | 1614.4 | 2885.7 | 564.6 | 2713.5 | 577.5 | 998.7 | 741.2 | 164.0 | 0.0 | 0.0 |
| 1978 | 148.5 | 726.4 | 896.8 | -675.0 | 540.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -483.8 | 1494.5 |

# Table 55: 4(h)(10)(C) Power Purchase Amounts (aMW)
# for Snake River and JDA Dams to Natural River (high option) plus CWA - Adj. Sch **

| 4(h)(10)(C) Power Purchase Amounts (aMW), … Scenario 18 | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Water Year** | **Oct** | **Nov** | **Dec** | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **Jun** | **Jul** | **Aug** | **Sep** |
| 1929 | 251.4 | 2494.3 | 1936.8 | 3751.2 | 1604.2 | 2140.6 | 843.6 | 1909.5 | -38.0 | 0.0 | 0.0 | 1294.5 |
| 1930 | 584.1 | 1782.4 | 1795.8 | 3520.9 | 1666.9 | 2497.8 | -517.5 | 2424.8 | 1959.0 | 0.0 | -110.4 | 498.4 |
| 1931 | 715.4 | 1765.8 | 1367.7 | 4243.2 | 3023.1 | 1886.6 | 329.7 | -395.0 | 1141.8 | -262.0 | 0.0 | 694.8 |
| 1932 | 304.1 | 1716.0 | 2298.8 | 3955.3 | 2011.3 | 0.0 | 0.0 | 0.0 | 0.0 | -82.0 | -70.3 | 1393.9 |
| 1933 | 180.1 | 1897.9 | 1914.9 | 0.0 | 0.0 | 1807.7 | 76.7 | 0.0 | 0.0 | 0.0 | 0.0 | 877.5 |
| 1934 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -56.6 | 294.4 | 0.0 | 86.0 |
| 1935 | 557.3 | 2338.9 | 2466.6 | 0.0 | 0.0 | 381.2 | 0.0 | 0.0 | 0.0 | -330.0 | 700.8 | 705.1 |
| 1936 | 619.2 | 2110.3 | 1724.4 | 2869.3 | 1186.7 | 1793.9 | 225.9 | 0.0 | 0.0 | -107.0 | 158.8 | 1354.7 |
| 1937 | 885.0 | 2058.2 | 1801.0 | 3542.5 | 2283.9 | 2377.8 | 1475.0 | 67.0 | 1141.4 | -180.8 | 6.8 | 965.0 |
| 1938 | 265.8 | 1233.5 | 1262.6 | 0.0 | 621.0 | 0.0 | 0.0 | 0.0 | 0.0 | -227.0 | -94.4 | -430.7 |
| 1939 | 213.3 | 2434.4 | 2084.8 | 3702.9 | 0.0 | -31.0 | 0.0 | 0.0 | 1598.0 | 0.0 | -315.6 | 1340.6 |
| 1940 | 173.3 | 2035.0 | 1613.5 | 2645.3 | 599.5 | 0.0 | -91.5 | 0.0 | 2860.8 | 48.5 | 0.0 | 1068.7 |
| 1941 | 64.0 | 2182.1 | 1993.6 | 2864.5 | 2227.3 | 1230.1 | 71.8 | 577.0 | 126.9 | 306.9 | 59.6 | -51.1 |
| 1942 | -423.9 | 1571.1 | 0.0 | 0.0 | 0.0 | 2272.5 | 0.0 | 0.0 | 0.0 | 0.0 | -104.5 | 1052.6 |
| 1943 | -180.5 | 2240.0 | 2213.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -225.6 |
| 1944 | 230.0 | 2549.5 | 2101.0 | 3517.1 | 1439.8 | 2452.6 | 1139.5 | 1261.6 | 768.9 | 573.2 | 0.0 | 1285.8 |
| 1945 | 280.9 | 1717.2 | 2250.8 | 3792.0 | 3071.5 | 2463.2 | 457.6 | 0.0 | 0.0 | -356.0 | -247.7 | 1739.6 |
| 1946 | 54.8 | 1984.4 | 997.8 | 0.0 | 285.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -93.8 | -184.8 |
| 1947 | 222.3 | 2313.9 | 0.0 | 0.0 | 0.0 | 585.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 684.2 |
| 1948 | 0.0 | 836.0 | 921.4 | 0.0 | 0.0 | 116.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 884.9 |
| 1949 | 214.2 | 2415.5 | 2373.1 | 0.0 | 603.0 | 0.0 | 0.0 | 0.0 | 0.0 | 278.1 | 0.0 | 0.0 |
| 1950 | 105.7 | 2199.8 | 1336.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 835.8 | 116.4 |
| 1951 | 0.0 | 134.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 655.3 |
| 1952 | 0.0 | 1994.6 | 517.4 | 0.0 | 0.0 | 429.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 497.0 |
| 1953 | 633.8 | 2330.3 | 1841.5 | 2724.8 | 0.0 | 0.0 | 227.9 | 0.0 | 0.0 | 0.0 | 151.1 | 1269.8 |
| 1954 | 201.1 | 2180.7 | 2010.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 728.7 |
| 1955 | 0.0 | 1368.7 | 1513.6 | 0.0 | 194.3 | 2122.1 | -331.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1956 | 0.0 | 1047.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 290.0 |
| 1957 | 11.9 | 2518.9 | 1629.0 | 283.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -189.2 | 0.0 | 953.8 |
| 1958 | 349.7 | 2514.5 | 2061.9 | 172.0 | 0.0 | 736.8 | 0.0 | 0.0 | 0.0 | -91.5 | -131.8 | 1107.6 |
| 1959 | -55.8 | 1667.9 | 244.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -251.7 | 529.7 |
| 1960 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1961 | 227.8 | 2007.2 | 2618.8 | 0.0 | 0.0 | 0.0 | 302.5 | 0.0 | 0.0 | 0.0 | 83.8 | 891.4 |
| 1962 | 183.1 | 2567.5 | 2033.7 | 0.0 | 1510.1 | 1143.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1160.8 |
| 1963 | 0.0 | 1427.4 | 532.3 | 0.0 | 0.0 | 1199.7 | -216.5 | 0.0 | 0.0 | 0.0 | 0.0 | 1194.8 |
| 1964 | 149.6 | 2490.3 | 2578.6 | 664.3 | 0.0 | 1933.3 | 46.5 | 0.0 | 0.0 | 0.0 | 0.0 | 267.3 |
| 1965 | 0.0 | 1883.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1966 | 0.0 | 1818.5 | 1421.4 | 0.0 | 0.0 | 1156.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 610.7 |
| 1967 | 243.5 | 2351.6 | 2148.9 | 0.0 | 0.0 | 0.0 | 847.2 | 0.0 | 0.0 | 0.0 | 0.0 | 1020.7 |
| 1968 | 88.5 | 2072.5 | 1586.6 | 0.0 | 0.0 | 0.0 | 133.4 | 1294.0 | 0.0 | 0.0 | 0.0 | 338.7 |
| 1969 | 0.0 | 884.0 | 768.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -397.0 | 0.0 | 0.0 |
| 1970 | 174.0 | 2443.9 | 2448.8 | 1056.6 | 0.0 | 53.8 | -391.0 | 0.0 | 0.0 | 0.0 | 75.5 | 1014.2 |
| 1971 | 419.1 | 2712.5 | 1349.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -164.7 | 1240.4 |
| 1972 | 253.9 | 2157.1 | 1842.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1973 | 0.0 | 2370.4 | 967.4 | 1022.6 | 607.2 | 588.6 | 1090.3 | 1491.7 | 813.7 | 0.0 | 0.0 | 0.0 |
| 1974 | 64.0 | 1438.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 183.7 | 539.8 |
| 1975 | 418.8 | 2437.1 | 2427.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 257.0 |
| 1976 | 137.2 | 551.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -39.3 | 999.0 |
| 1977 | 0.0 | 2435.9 | 1856.0 | 3222.4 | 746.3 | 2771.7 | 843.3 | 1421.8 | 1154.4 | 412.9 | 0.0 | 0.0 |
| 1978 | 344.8 | 926.4 | 1372.9 | -675.0 | 540.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -239.5 | 1662.7 |

# Table 56: Annual FCCF Credit Algorithm

| | | | |
|---|---|---|---|
| **Beginning Reserve Balance** | 202.6 | **202.6** | **Ending Reserve Level** |
| **Credit for Fiscal year '02 :** | 0.0 | **202.6** | |
| **Credit for Fiscal year '03 :** | 202.6 | **0.0** | |
| **Credit for Fiscal year '04 :** | 0.0 | **0.0** | |
| **Credit for Fiscal year '05 :** | 0.0 | **0.0** | |
| **Credit for Fiscal year '06 :** | 0.0 | **0.0** | |

**Note: Beginning Reserve Balance Reflects Potential Reserve Reductions during FY 2001**

| Water Year | Reserves Beginning FY02 | FY 02 | FY 03 | FY 04 | FY 05 | FY 06 |
|---|---|---|---|---|---|---|
| 1929 | 291.12 | 339.51 | 332.91 | 355.19 | 367.04 | 391.77 |
| 1930 | 122.48 | 357.38 | 343.84 | 352.59 | 379.79 | 401.18 |
| 1931 | 135.93 | 459.09 | 418.30 | 458.40 | 451.51 | 485.82 |
| 1932 | 90.65 | 177.72 | 145.04 | 170.85 | 186.12 | 205.24 |
| 1933 | 179.32 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1934 | 325.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1935 | 325.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1936 | 325.00 | 149.57 | 131.70 | 168.33 | 153.32 | 181.47 |
| 1937 | 204.87 | 403.64 | 397.69 | 409.54 | 437.21 | 459.30 |
| 1938 | 136.93 | 0.00 | 4.11 | 11.07 | 9.34 | 20.71 |
| 1939 | 325.00 | 137.43 | 115.15 | 133.64 | 139.55 | 153.04 |
| 1940 | 221.76 | 149.19 | 142.79 | 148.75 | 150.80 | 178.42 |
| 1941 | 261.31 | 255.85 | 271.56 | 266.89 | 288.40 | 315.09 |
| 1942 | 180.24 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1943 | 318.70 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1944 | 325.00 | 372.75 | 363.76 | 378.71 | 402.85 | 438.70 |
| 1945 | 162.87 | 312.65 | 297.52 | 312.86 | 330.44 | 349.63 |
| 1946 | 147.83 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1947 | 325.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1948 | 325.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1949 | 325.00 | 65.81 | 48.22 | 68.74 | 52.15 | 93.19 |
| 1950 | 325.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1951 | 325.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1952 | 325.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1953 | 325.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1954 | 325.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1955 | 325.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1956 | 325.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1957 | 325.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1958 | 325.00 | 3.37 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1959 | 325.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1960 | 325.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1961 | 325.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1962 | 325.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1963 | 325.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1964 | 325.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1965 | 325.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1966 | 325.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1967 | 325.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1968 | 325.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1969 | 325.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1970 | 325.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1971 | 325.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1972 | 325.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1973 | 325.00 | 151.19 | 130.88 | 131.87 | 132.75 | 145.13 |
| 1974 | 303.59 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1975 | 325.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1976 | 325.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1977 | 325.00 | 370.29 | 356.81 | 368.44 | 394.04 | 427.02 |
| 1978 | 202.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **AVERAGE** | **286.7** | **74.1** | **70.0** | **74.7** | **77.5** | **84.9** |

the FCCF and the process used to calculate the credits are reported in Volume 1, Chapter 12 of Revenue Requirement Study Documentation, WP-02-FS-BPA-02A.

The FCCF credits for each of the 50 water years, given the limitation in the FCCF reserve balance of $325 million, are determined by running RiskMod. These FCCF values are determined by inputting into RevSim the annual FCCF credits for each of the 50 water years for FY 2002–2006, inputting a set of FCCF reserve levels at the beginning of FY 2002 for each of the 50 water years, and running a 50 water year run of RiskMod. This 50 water year run was performed to account for the fact that FCCF credits are available only to the extent that the FCCF reserve has not been depleted.

The set of FCCF reserve levels at the beginning of FY 2002 for each of the 50 water years are computed external to RevSim in a spreadsheet. These values are calculated to account for the possibility that the current FCCF reserve balance of $325 million could be drawn upon in FY 2001. The FCCF reserve balances at the beginning of FY 2002 for each of the 50 water years are calculated by starting the FCCF reserve balance at the beginning of FY 2001 at $325 million and reducing the FCCF reserve balances using annual FCCF credits for each of the 50 water years calculated for FY 2001 in the 1996 Final Rate Proposal. These values were used in the ToolKit Model during the 1996 rate case (*see* Revenue Requirement Study Documentation, Volume 1, Part 2 of 2, WP-96-FS-BPA-02A). More specifically, the FCCF reserve balances at the beginning of FY 2002 for each of the 50 water years were calculated by reducing the $325 million by the FCCF credits for the prior water year. In the case of water

year 1929, the previous water year is 1978. Table 57 reports the results of these computations for each of the 50 water years.

Given this data, the 50 water year run of RiskMod is performed to calculate the average annual FCCF credits for the 50 water years for FY 2002–2006 that BPA could claim depending on the FCCF fund balance. The average values (annual average FCCF credits) are supplied for use in the Revenue Forecast component of the Wholesale Power Rate Development Study Documentation, WP-02-FS-BPA-05A, and the RAM (*see* Wholesale Power Rate Development Study Documentation, WP-02-FS-BPA-05A) and are reported in Table 58. For the Risk Simulation run of RiskMod, the same logic and values are used for each of the 50 water years for all fish and wildlife scenarios. However, when calculating net revenues, the FCCF credit used for a given simulation is based on the water year sampled for Federal hydro generation.

### 1.19 Interaction with the Rate Analysis Model (RAM) and ToolKit Model

Two sequential runs of RiskMod are performed to develop Subscription rates (*see* Burns *et al.*, WP-02-E-BPA-08) in the RAM. These two distinct runs correspond to two steps in the rate development process in RAM (*see* Wholesale Power Rate Development Study, WP-02-FS-BPA-05) and yield different PNRR values. The results from the first run of RiskMod are used to determine the amount of PNRR that is needed to get an 88 percent TPP in an intermediate rate development step, the Rate Design step, in the RAM. *Id.* Results from the second run of RiskMod are used to determine the amount of PNRR that is needed to get an 88 percent TPP in the final rate development step, the Subscription step, in the RAM. *Id.* After

## Table 57: Computations for Starting FCCF Reserves for FY 2002

**Beginning FY 01 FCCF Reserves** **325**

| Water Year | FCCF Credits FY 01 | Beginning FCCF Bal FY 02 |
|---|---|---|
| **1929** | 202.5 | **291.1** |
| **1930** | 189.1 | **122.5** |
| **1931** | 234.3 | **135.9** |
| **1932** | 145.7 | **90.7** |
| **1933** | 0.0 | **179.3** |
| **1934** | 0.0 | **325.0** |
| **1935** | 0.0 | **325.0** |
| **1936** | 120.1 | **325.0** |
| **1937** | 188.1 | **204.9** |
| **1938** | 0.0 | **136.9** |
| **1939** | 103.2 | **325.0** |
| **1940** | 63.7 | **221.8** |
| **1941** | 144.8 | **261.3** |
| **1942** | 6.3 | **180.2** |
| **1943** | 0.0 | **318.7** |
| **1944** | 162.1 | **325.0** |
| **1945** | 177.2 | **162.9** |
| **1946** | 0.0 | **147.8** |
| **1947** | 0.0 | **325.0** |
| **1948** | 0.0 | **325.0** |
| **1949** | 0.0 | **325.0** |
| **1950** | 0.0 | **325.0** |
| **1951** | 0.0 | **325.0** |
| **1952** | 0.0 | **325.0** |
| **1953** | 0.0 | **325.0** |
| **1954** | 0.0 | **325.0** |
| **1955** | 0.0 | **325.0** |
| **1956** | 0.0 | **325.0** |
| **1957** | 0.0 | **325.0** |
| **1958** | 0.0 | **325.0** |
| **1959** | 0.0 | **325.0** |
| **1960** | 0.0 | **325.0** |
| **1961** | 0.0 | **325.0** |
| **1962** | 0.0 | **325.0** |
| **1963** | 0.0 | **325.0** |
| **1964** | 0.0 | **325.0** |
| **1965** | 0.0 | **325.0** |
| **1966** | 0.0 | **325.0** |
| **1967** | 0.0 | **325.0** |
| **1968** | 0.0 | **325.0** |
| **1969** | 0.0 | **325.0** |
| **1970** | 0.0 | **325.0** |
| **1971** | 0.0 | **325.0** |
| **1972** | 0.0 | **325.0** |
| **1973** | 21.4 | **325.0** |
| **1974** | 0.0 | **303.6** |
| **1975** | 0.0 | **325.0** |
| **1976** | 0.0 | **325.0** |
| **1977** | 122.4 | **325.0** |
| **1978** | 33.9 | **202.6** |
| **AVERAGE** | **38.3** | **286.7** |

## Table 58: Average Annual FCCF Credits for FY 2002 - FY 2006

| FCCF Credits ($Million) | | | | | |
|---|---|---|---|---|---|
| **Water Year** | **FY 2002** | **FY 2003** | **FY 2004** | **FY 2005** | **FY 2006** |
| 1929 | 291.1 | 202.6 | 0.0 | 0.0 | 0.0 |
| 1930 | 122.5 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1931 | 135.9 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1932 | 90.7 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1933 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1934 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1935 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1936 | 149.6 | 131.7 | 168.3 | 153.3 | 0.0 |
| 1937 | 204.9 | 175.4 | 193.3 | 156.7 | 26.0 |
| 1938 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1939 | 137.4 | 115.2 | 0.0 | 0.0 | 0.0 |
| 1940 | 149.2 | 142.8 | 21.8 | 0.0 | 0.0 |
| 1941 | 255.9 | 72.6 | 44.8 | 0.0 | 0.0 |
| 1942 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1943 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1944 | 325.0 | 318.7 | 180.2 | 5.5 | 0.0 |
| 1945 | 162.9 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1946 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1947 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1948 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1949 | 65.8 | 48.2 | 68.7 | 52.1 | 0.0 |
| 1950 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1951 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1952 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1953 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1954 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1955 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1956 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1957 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1958 | 3.4 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1959 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1960 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1961 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1962 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1963 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1964 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1965 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1966 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1967 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1968 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1969 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1970 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1971 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1972 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1973 | 151.2 | 130.9 | 131.9 | 132.8 | 145.1 |
| 1974 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1975 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1976 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1977 | 325.0 | 325.0 | 325.0 | 303.6 | 173.8 |
| 1978 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Average** | **51.4** | **33.3** | **22.7** | **16.1** | **6.9** |

determining Subscription rates that include PNRR, a final run of RiskMod is performed to substantiate that rates produce an 88 percent TPP in the ToolKit Model without any more changes in PNRR.

The looping process between the RAM, RiskMod, and ToolKit Model involve various pieces of information being passed to and from each of these models. The initial step in the process is to input into RAM the annual average surplus energy revenues, power purchase expenses, 4(h)(10)(C) credits, and FCCF credits estimated by RiskMod. These values are based on the 50 water year Run of RiskMod. With this information, RAM calculates an initial set of rates and annual expenses for FY 2002–2006, which is input into RevSim (*see* Wholesale Power Rate Development Study, WP-02-FS-BPA-05). RiskMod is run and produces, for each of the 18 fish and wildlife scenarios, 300 net revenues for each fiscal year from FY 2002–2006. These results are input into the ToolKit Model to calculate the amount of PNRR needed to obtain an 88 percent TPP for the Rate Design step in RAM (*see* Revenue Requirement Study, WP-02-FS-BPA-02, and Wholesale Power Rate Development Study, WP-02-FS-BPA-05).

The amount of PNRR from the Rate Design step in RAM and Subscription Strategy specific expenses and credits are added to the ratemaking data in RAM and new sets of rates and expenses are produced for input into RevSim. RiskMod is run again and a new set of net revenues is calculated. These net revenues are input into the ToolKit Model (*see* Revenue Requirement Study, WP-02-FS-BPA-02), which uses them to calculate the amount of PNRR that would be needed to obtain an 88 percent TPP for the final Subscription rates in RAM (*see* Wholesale Power Rate Development Study, WP-02-FS-BPA-05). The amount of PNRR is

revised and added to the expenses in RAM prior to calculating the final set of rates. The final set of proposed Subscription rates and expenses is input into RevSim. RiskMod is run for the final time to substantiate that the Subscription rates provide an 88 percent TPP in the ToolKit Model.

The RevSim component of RiskMod has numerous flags that allow various options to be turned on and off for a given run. In order to produce results from RiskMod that are consistent with values used when calculating rates in RAM for both the Rate Design and Subscription steps, a flag that alters the rates at which IOU revenues should be calculated is turned on and off in RevSim. To run RiskMod for the Rate Design step, a flag is turned on in RevSim that calculates IOU revenues from selling 1,000 aMW of power using PF-96 rates. To run RiskMod for the Subscription step, the flag is turned off in RevSim, and IOU revenues are calculated using the Residential Load rate (which equals the PF preference rate in the Subscription step) calculated in the Subscription step (*see* Doubleday *et al*., WP-02-E-BPA-18, on IOU Rate for Rate Design and Subscription step adjustments). Also, turning the flag off in RevSim for the Subscription step results in an additional 450 aMW of DSI specific power purchases to serve the increase in DSI loads from 990 aMW for the Rate Design step to 1440 aMW for the Subscription step.

Tables 59 and 60 contain the expenses used in RiskMod to calculate net revenues for the Rate Design and Subscription steps. These expenses are derived by subtracting and adding expense items to the rate making data used by RAM to develop rates (*see* Wholesale Power Rate Development Study, WP-02-FS-BPA-05). For both the Rate Design and the Subscription steps, the Power Business Line (PBL) Revenue Requirement is reduced by the average annual

## Table 59: Expense Calculations for RiskMod, Rate Design Step Run for FY 2002 - FY 2006

**Source: RAM**

**Rate Case Base**

| | 2002 | 2003 | 2004 | 2005 | 2006 | Average |
|---|---|---|---|---|---|---|
| PBL Revenue Requirement | $ 2,288,095 | $ 2,329,111 | $ 2,283,724 | $ 2,299,801 | $ 2,313,714 | |
| Balancing Purchase Power Costs | $ 74,125 | $ 66,178 | $ 74,842 | $ 76,316 | $ 85,366 | |
| Net Exchange Costs | $ 31,416 | $ 40,027 | $ 49,557 | $ 61,440 | $ 72,037 | |
| Canadian Entitlement Trans Expense Credit | $ (1,000) | $ (1,000) | $ (1,000) | $ (1,000) | $ (1,000) | |
| RiskMod Bottom Line Expenses | $ 2,244,385 | $ 2,301,960 | $ 2,257,439 | $ 2,283,924 | $ 2,299,385 | |
| **RiskMod Bottom Line Expenses Millions** | **$ 2,244.4** | **$ 2,302.0** | **$ 2,257.4** | **$ 2,283.9** | **$ 2,299.4** | **$ 2,277.4** |

## Table 60: Expense Calculations for RiskMod, Subscription Step Run for FY 2002 - FY 2006

**Source: RAM**

**Rate Case Base**

| | 2002 | 2003 | 2004 | 2005 | 2006 | Average |
|---|---|---|---|---|---|---|
| PBL Revenue Requirement | $ 2,287,888 | $ 2,330,105 | $ 2,285,186 | $ 2,300,748 | $ 2,313,238 | |
| Balancing Purchase Power Costs | $ 74,125 | $ 66,178 | $ 74,842 | $ 76,316 | $ 85,366 | |
| Subscription Settlement Costs, 900aMWs Net | $ 69,737 | $ 69,737 | $ 69,737 | $ 69,737 | $ 69,737 | |
| Canadian Entitlement Trans Expense Credit | $ (1,000) | $ (1,000) | $ (1,000) | $ (1,000) | $ (1,000) | |
| Rate Design Step PNRR | $ 99,000 | $ 99,000 | $ 99,000 | $ 99,000 | $ 99,000 | |
| Subscription Step PNRR | $ - | $ - | $ - | $ - | $ - | |
| DSI Augmentation, 450 aMWs @ 28.1 | $ 113,894 | $ 113,894 | $ 113,894 | $ 113,894 | $ 113,894 | |
| RiskMod Bottom Line Expenses | $ 2,297,394 | $ 2,347,558 | $ 2,293,974 | $ 2,308,063 | $ 2,311,503 | |
| **RiskMod Bottom Line Expenses Millions** | **$ 2,297.4** | **$ 2,347.6** | **$ 2,294.0** | **$ 2,308.1** | **$ 2,311.5** | **$ 2,311.7** |

balancing power purchase expenses and the Canadian Entitlement Transmission Expenses Credit.

Additionally, for the Rate Design step, the PBL Revenue Requirement is increased by adding Net Residential Exchange Costs. For the Subscription step, the PBL Revenue Requirement is adjusted by adding the dollar equivalent of supplying 900 aMW of energy to the participating IOUs (which replaces the Net Exchange Costs in the Rate Design step), adding the cost of system augmentation for the DSI load, and subtracting the PNRR for the Rate Design and Subscription steps (*see* Doubleday *et al*., WP-02-E-BPA-18, on expense adjustment).

### 1.20 Results from RiskMod

RiskMod results are used in an iterative process with the ToolKit Model and the RAM to calculate PNRR and, ultimately, rates that provide BPA with an 88 percent TPP for the five-year rate period. The net revenues estimated for each RiskMod run depend on the level of the PF and IP rates developed by the RAM at different levels of PNNR. RiskMod estimates several temporary, intermediate sets of net revenues during the process of developing rates that yield an 88 percent TPP for the five-year rate period for both the Rate Design and Subscription steps in RAM. Given this situation, the only set of net revenues that represent the final set of net revenues from RiskMod are the net revenues that are estimated when the Subscription rates that yield an 88 percent TPP for the five-year rate period are input into RiskMod and Riskmod is run. A summary of the average annual net revenues for all 18 fish and wildlife scenarios for FY 2002-2006 from RiskMod using Proposed Rates is reported in Table 61. These values only

## Table 61: Average Annual Net Revenues for 18 Fish and Wildlife Scenearios for FY 2002 - FY 2006

| Net Revenues ($ Thousand) | | | | | | |
|---|---|---|---|---|---|---|
| **Scenarios** | **FY 2002** | **FY 2003** | **FY 2004** | **FY 2005** | **FY 2006** | **5 Yr Average** |
| 1 - In-River (low) | 104,419 | 56,698 | 52,809 | 59,202 | 52,261 | 65,078 |
| 2 - In-River (hi) CWA | 129,858 | 79,393 | 75,821 | 85,407 | 79,694 | 90,035 |
| 3 - Exp Trns | 105,746 | 59,749 | 54,563 | 61,369 | 54,435 | 67,173 |
| 4 - Exp Trns (low) | 111,022 | 84,824 | 79,277 | 86,250 | 76,643 | 87,603 |
| 5 - TrnsPlus | 104,419 | 56,698 | 52,809 | 59,202 | 52,261 | 65,078 |
| 6 - TrnsPlus CWA | 104,419 | 56,698 | 52,809 | 59,202 | 52,261 | 65,078 |
| 7 - 2 LSN | 37,880 | -20,404 | -14,674 | -14,191 | -15,582 | -5,394 |
| 8 - 4 LSN | 11,410 | -49,962 | -43,975 | -45,786 | -46,315 | -34,926 |
| 9 - LSN & JDA | 10,182 | -52,604 | -47,015 | -48,035 | -50,211 | -37,537 |
| 10 - JDA | 104,419 | 56,698 | 52,809 | 59,202 | 52,261 | 65,078 |
| 11 - JDA Spillway | 104,419 | 56,698 | 52,809 | 59,202 | 52,261 | 65,078 |
| 12 - LSN JDA Spillway | 9,396 | -52,420 | -46,810 | -48,107 | -49,871 | -37,563 |
| 13 - LSN & JDA CWA | -61,070 | -133,535 | -128,657 | -127,388 | -132,503 | -116,630 |
| 14 - 2 LSN - Adj | 99,427 | 51,284 | 47,681 | 53,405 | 46,501 | 59,660 |
| 15 - 4 LSN - Adj | 99,140 | 50,983 | 47,356 | 53,095 | 46,185 | 59,352 |
| 16 - LSN & JDA - Adj | 99,723 | 51,561 | 47,910 | 53,737 | 46,629 | 59,912 |
| 17 - LSN JDA Spillway - Adj | 98,904 | 50,676 | 47,148 | 52,771 | 45,845 | 59,069 |
| 18 - LSN & JDA CWA - Adj | 26,310 | -34,884 | -30,389 | -29,521 | -32,655 | -20,228 |
| | | | | | | |
| | | | | | | |
| The revenue requirement used in calculating these net revenues includes $99 million in PNRR. | | | | | | |

represent the operational net revenues calculated in RiskMod and do not reflect additional net revenues adjustments in the ToolKit Model, such as the NORM output, interest earned on cash reserves, Cost Recovery Adjustment Clause (CRAC), and Dividend Distribution Clause (DDC). *See* Volume 1, Chapter 12 of Revenue Requirement Study Documentation, WP-02-FS-BPA-02A.

In Table 61, the average annual net revenues reported for each of the fish and wildlife scenarios have been calculated with $99 million in PNRR. The five-year, average annual net revenues from RiskMod ranged from a low of -$116.6 million for fish and wildlife scenario 13 (Snake River and John Day Dams to Natural River (high option) + Clean Water Act (CWA)), which reflects the unadjusted schedule, to a high of $90.0 million for fish and wildlife scenario 2 (In-River Migration (high option) + CWA). Additional information on the means, medians, standard deviations, and detailed statistics about the net revenue distributions as percentiles for each of the fish and wildlife scenarios are reported in Tables 62-79.

A summary of Federal hydro generation (aMW) for all 18 fish and wildlife scenarios for FY 2002–2006 are reported in Table 4. A comparison of the net revenues reported in Table 61 and the Federal hydro generation (aMW) reported in Table 4 indicate that most of the differences in average annual net revenues between each of the fish and wildlife scenarios are due to differences in five-year, annual average hydro generation.

## Table 62: Net Revenue Statistics For Scenario 1 - In-River (low)

| | FY 2002 | FY 2003 | FY 2004 | FY 2005 | FY 2006 | 5 Yr Average |
|---|---|---|---|---|---|---|
| **Average** | 104,419 | 56,698 | 52,809 | 59,202 | 52,261 | 65,078 |
| **Median** | 71,127 | 42,557 | 46,452 | 45,998 | 62,252 | |
| **StDev** | 193,522 | 226,110 | 248,761 | 268,661 | 274,553 | |
| | | | | | | |
| **1% <=** | -335,196 | -491,891 | -645,560 | -723,284 | -652,282 | |
| **2.5% <=** | -235,433 | -414,699 | -442,014 | -423,083 | -427,786 | |
| **5% <=** | -177,760 | -305,688 | -343,481 | -368,418 | -365,031 | |
| **10% <=** | -115,146 | -218,642 | -253,099 | -304,224 | -300,597 | |
| **15% <=** | -76,217 | -157,678 | -183,076 | -219,569 | -227,393 | |
| **20% <=** | -47,355 | -94,721 | -131,702 | -132,878 | -178,784 | |
| **25% <=** | -17,615 | -64,292 | -79,326 | -86,786 | -139,947 | |
| **30% <=** | -3,099 | -47,228 | -56,877 | -59,347 | -88,649 | |
| **35% <=** | 17,875 | -23,462 | -30,133 | -29,983 | -40,820 | |
| **40% <=** | 36,715 | -5,185 | -7,016 | -3,549 | -3,033 | |
| **45% <=** | 51,653 | 14,152 | 15,625 | 23,526 | 28,054 | |
| **50% <=** | 70,326 | 42,143 | 45,827 | 45,873 | 61,885 | |
| **55% <=** | 100,591 | 69,432 | 80,581 | 72,997 | 93,726 | |
| **60% <=** | 127,553 | 95,631 | 99,652 | 99,762 | 133,521 | |
| **65% <=** | 156,928 | 134,890 | 129,386 | 136,288 | 163,211 | |
| **70% <=** | 190,540 | 155,052 | 172,696 | 179,507 | 189,349 | |
| **75% <=** | 211,998 | 182,053 | 198,528 | 217,530 | 237,852 | |
| **80% <=** | 245,482 | 243,090 | 218,713 | 262,138 | 261,289 | |
| **85% <=** | 298,872 | 280,619 | 262,615 | 313,283 | 300,180 | |
| **90% <=** | 365,190 | 360,456 | 340,748 | 390,283 | 368,772 | |
| **95% <=** | 449,528 | 431,185 | 426,087 | 518,405 | 497,653 | |
| **97.5% <=** | 528,889 | 483,680 | 580,298 | 628,578 | 588,866 | |
| **99% <=** | 640,092 | 579,823 | 723,160 | 696,762 | 731,713 | |
| | | | | | | |

## Table 63: Net Revenue Statistics For Scenario 2 - In-River (hi) CWA

| | FY 2002 | FY 2003 | FY 2004 | FY 2005 | FY 2006 | 5 Yr Average |
|---|---|---|---|---|---|---|
| **Average** | 129,858 | 79,393 | 75,821 | 85,407 | 79,694 | 90,035 |
| **Median** | 104,320 | 62,515 | 67,930 | 70,987 | 77,235 | |
| **StDev** | 186,808 | 218,850 | 241,868 | 258,011 | 261,430 | |
| | | | | | | |
| **1% <=** | -273,936 | -484,483 | -582,997 | -611,269 | -557,722 | |
| **2.5% <=** | -179,573 | -360,021 | -396,267 | -377,857 | -370,227 | |
| **5% <=** | -153,605 | -278,111 | -301,165 | -312,300 | -323,122 | |
| **10% <=** | -80,883 | -183,337 | -221,123 | -240,114 | -250,822 | |
| **15% <=** | -54,263 | -115,064 | -137,005 | -190,255 | -185,665 | |
| **20% <=** | -24,672 | -81,594 | -90,066 | -109,508 | -144,126 | |
| **25% <=** | 13,411 | -52,285 | -59,418 | -66,963 | -111,227 | |
| **30% <=** | 39,486 | -23,034 | -22,502 | -34,947 | -72,355 | |
| **35% <=** | 50,423 | 1,450 | -6,520 | 105 | -36,529 | |
| **40% <=** | 75,103 | 22,672 | 15,475 | 16,964 | 18,344 | |
| **45% <=** | 91,813 | 39,598 | 49,869 | 46,760 | 53,160 | |
| **50% <=** | 104,016 | 62,012 | 64,852 | 70,976 | 75,834 | |
| **55% <=** | 124,274 | 93,379 | 96,541 | 94,743 | 114,867 | |
| **60% <=** | 139,112 | 122,154 | 110,570 | 127,102 | 147,592 | |
| **65% <=** | 175,095 | 143,985 | 144,752 | 155,791 | 175,974 | |
| **70% <=** | 197,220 | 174,650 | 182,479 | 193,038 | 216,754 | |
| **75% <=** | 226,109 | 202,863 | 209,424 | 234,227 | 261,735 | |
| **80% <=** | 262,930 | 254,989 | 230,725 | 278,065 | 281,566 | |
| **85% <=** | 318,979 | 294,131 | 282,201 | 327,204 | 315,269 | |
| **90% <=** | 380,684 | 374,228 | 367,421 | 440,950 | 396,930 | |
| **95% <=** | 476,626 | 450,558 | 453,822 | 531,956 | 499,818 | |
| **97.5% <=** | 557,348 | 497,237 | 594,262 | 643,072 | 604,577 | |
| **99% <=** | 649,147 | 599,880 | 752,224 | 724,380 | 727,488 | |

## Table 64: Net Revenue Statistics For Scenario 3 - Exp Trns

| | FY 2002 | FY 2003 | FY 2004 | FY 2005 | FY 2006 | 5 Yr Average |
|---|---|---|---|---|---|---|
| **Average** | 105,746 | 59,749 | 54,563 | 61,369 | 54,435 | 67,173 |
| **Median** | 72,815 | 45,840 | 49,492 | 49,881 | 65,066 | |
| **StDev** | 193,962 | 224,165 | 247,979 | 266,340 | 273,407 | |
| | | | | | | |
| **1% <=** | -344,528 | -483,114 | -630,729 | -670,015 | -628,644 | |
| **2.5% <=** | -234,719 | -409,134 | -429,994 | -413,184 | -426,434 | |
| **5% <=** | -178,843 | -300,956 | -345,910 | -361,293 | -368,305 | |
| **10% <=** | -110,711 | -210,695 | -250,016 | -298,355 | -295,593 | |
| **15% <=** | -73,255 | -151,921 | -180,495 | -215,944 | -238,964 | |
| **20% <=** | -45,439 | -103,734 | -121,013 | -139,518 | -177,435 | |
| **25% <=** | -16,315 | -62,286 | -74,748 | -83,568 | -132,204 | |
| **30% <=** | 632 | -41,273 | -54,256 | -55,279 | -85,587 | |
| **35% <=** | 22,475 | -20,376 | -29,074 | -25,733 | -43,550 | |
| **40% <=** | 35,713 | -865 | -10,452 | -2,827 | -4,412 | |
| **45% <=** | 50,144 | 15,641 | 12,328 | 24,237 | 33,104 | |
| **50% <=** | 70,713 | 45,822 | 48,485 | 49,003 | 62,872 | |
| **55% <=** | 103,466 | 72,170 | 82,886 | 70,100 | 93,994 | |
| **60% <=** | 128,871 | 95,352 | 107,610 | 102,234 | 129,478 | |
| **65% <=** | 162,561 | 136,226 | 129,911 | 137,544 | 162,218 | |
| **70% <=** | 186,338 | 158,014 | 172,569 | 183,114 | 197,056 | |
| **75% <=** | 213,952 | 185,261 | 194,618 | 219,404 | 243,952 | |
| **80% <=** | 243,002 | 244,540 | 222,885 | 265,784 | 260,159 | |
| **85% <=** | 299,388 | 287,240 | 260,400 | 312,536 | 298,542 | |
| **90% <=** | 365,137 | 361,967 | 334,949 | 379,607 | 369,356 | |
| **95% <=** | 454,071 | 432,792 | 430,153 | 524,314 | 494,507 | |
| **97.5% <=** | 536,451 | 487,573 | 587,293 | 627,310 | 590,937 | |
| **99% <=** | 641,214 | 578,662 | 728,775 | 695,125 | 740,346 | |

## Table 65: Net Revenue Statistics For Scenario 4 - Exp Trns (low)

| | FY 2002 | FY 2003 | FY 2004 | FY 2005 | FY 2006 | 5 Yr Average |
|---|---|---|---|---|---|---|
| **Average** | 111,022 | 84,824 | 79,277 | 86,250 | 76,643 | 87,603 |
| **Median** | 110,791 | 87,813 | 77,438 | 83,947 | 69,575 | |
| **StDev** | 252,942 | 287,083 | 303,114 | 323,431 | 324,744 | |
| | | | | | | |
| **1% <=** | -450,842 | -715,825 | -755,915 | -678,331 | -681,496 | |
| **2.5% <=** | -377,414 | -560,358 | -541,157 | -510,919 | -580,538 | |
| **5% <=** | -296,638 | -392,188 | -440,172 | -448,695 | -467,938 | |
| **10% <=** | -195,129 | -309,164 | -343,223 | -333,711 | -357,740 | |
| **15% <=** | -143,914 | -167,203 | -195,041 | -257,402 | -285,889 | |
| **20% <=** | -63,314 | -103,746 | -131,731 | -188,400 | -178,902 | |
| **25% <=** | -28,894 | -61,767 | -83,979 | -89,453 | -119,554 | |
| **30% <=** | -10,620 | -28,714 | -35,303 | -37,259 | -55,921 | |
| **35% <=** | 13,495 | 4,678 | -6,867 | -3,136 | -18,681 | |
| **40% <=** | 33,857 | 30,423 | 25,969 | 35,049 | 10,223 | |
| **45% <=** | 70,071 | 58,030 | 45,482 | 57,190 | 39,846 | |
| **50% <=** | 110,481 | 87,772 | 76,749 | 82,140 | 68,804 | |
| **55% <=** | 137,762 | 107,515 | 124,546 | 109,039 | 115,887 | |
| **60% <=** | 160,417 | 150,014 | 151,021 | 147,300 | 151,648 | |
| **65% <=** | 184,229 | 182,840 | 182,577 | 177,711 | 186,542 | |
| **70% <=** | 219,239 | 212,823 | 214,282 | 213,286 | 235,819 | |
| **75% <=** | 252,977 | 245,443 | 252,550 | 254,531 | 263,607 | |
| **80% <=** | 284,797 | 301,977 | 288,345 | 311,837 | 312,799 | |
| **85% <=** | 326,862 | 353,290 | 327,815 | 363,412 | 358,882 | |
| **90% <=** | 428,789 | 424,788 | 398,798 | 493,092 | 481,307 | |
| **95% <=** | 537,307 | 542,681 | 539,958 | 626,561 | 606,938 | |
| **97.5% <=** | 660,544 | 639,885 | 698,912 | 781,460 | 750,970 | |
| **99% <=** | 746,386 | 760,295 | 884,529 | 906,999 | 869,111 | |

## Table 66: Net Revenue Statistics For Scenario 5 - TrnsPlus

| | FY 2002 | FY 2003 | FY 2004 | FY 2005 | FY 2006 | 5 Yr Average |
|---|---|---|---|---|---|---|
| **Average** | 104,419 | 56,698 | 52,809 | 59,202 | 52,261 | 65,078 |
| **Median** | 71,127 | 42,557 | 46,452 | 45,998 | 62,252 | |
| **StDev** | 193,522 | 226,110 | 248,761 | 268,661 | 274,553 | |
| | | | | | | |
| **1% <=** | -335,196 | -491,891 | -645,560 | -723,284 | -652,282 | |
| **2.5% <=** | -235,433 | -414,699 | -442,014 | -423,083 | -427,786 | |
| **5% <=** | -177,760 | -305,688 | -343,481 | -368,418 | -365,031 | |
| **10% <=** | -115,146 | -218,642 | -253,099 | -304,224 | -300,597 | |
| **15% <=** | -76,217 | -157,678 | -183,076 | -219,569 | -227,393 | |
| **20% <=** | -47,355 | -94,721 | -131,702 | -132,878 | -178,784 | |
| **25% <=** | -17,615 | -64,292 | -79,326 | -86,786 | -139,947 | |
| **30% <=** | -3,099 | -47,228 | -56,877 | -59,347 | -88,649 | |
| **35% <=** | 17,875 | -23,462 | -30,133 | -29,983 | -40,820 | |
| **40% <=** | 36,715 | -5,185 | -7,016 | -3,549 | -3,033 | |
| **45% <=** | 51,653 | 14,152 | 15,625 | 23,526 | 28,054 | |
| **50% <=** | 70,326 | 42,143 | 45,827 | 45,873 | 61,885 | |
| **55% <=** | 100,591 | 69,432 | 80,581 | 72,997 | 93,726 | |
| **60% <=** | 127,553 | 95,631 | 99,652 | 99,762 | 133,521 | |
| **65% <=** | 156,928 | 134,890 | 129,386 | 136,288 | 163,211 | |
| **70% <=** | 190,540 | 155,052 | 172,696 | 179,507 | 189,349 | |
| **75% <=** | 211,998 | 182,053 | 198,528 | 217,530 | 237,852 | |
| **80% <=** | 245,482 | 243,090 | 218,713 | 262,138 | 261,289 | |
| **85% <=** | 298,872 | 280,619 | 262,615 | 313,283 | 300,180 | |
| **90% <=** | 365,190 | 360,456 | 340,748 | 390,283 | 368,772 | |
| **95% <=** | 449,528 | 431,185 | 426,087 | 518,405 | 497,653 | |
| **97.5% <=** | 528,889 | 483,680 | 580,298 | 628,578 | 588,866 | |
| **99% <=** | 640,092 | 579,823 | 723,160 | 696,762 | 731,713 | |
| | | | | | | |

## Table 67: Net Revenue Statistics For Scenario 6 - TrnsPlus CWA

| | FY 2002 | FY 2003 | FY 2004 | FY 2005 | FY 2006 | 5 Yr Average |
|---|---|---|---|---|---|---|
| **Average** | 104,419 | 56,698 | 52,809 | 59,202 | 52,261 | 65,078 |
| **Median** | 71,127 | 42,557 | 46,452 | 45,998 | 62,252 | |
| **StDev** | 193,522 | 226,110 | 248,761 | 268,661 | 274,553 | |
| | | | | | | |
| **1% <=** | -335,196 | -491,891 | -645,560 | -723,284 | -652,282 | |
| **2.5% <=** | -235,433 | -414,699 | -442,014 | -423,083 | -427,786 | |
| **5% <=** | -177,760 | -305,688 | -343,481 | -368,418 | -365,031 | |
| **10% <=** | -115,146 | -218,642 | -253,099 | -304,224 | -300,597 | |
| **15% <=** | -76,217 | -157,678 | -183,076 | -219,569 | -227,393 | |
| **20% <=** | -47,355 | -94,721 | -131,702 | -132,878 | -178,784 | |
| **25% <=** | -17,615 | -64,292 | -79,326 | -86,786 | -139,947 | |
| **30% <=** | -3,099 | -47,228 | -56,877 | -59,347 | -88,649 | |
| **35% <=** | 17,875 | -23,462 | -30,133 | -29,983 | -40,820 | |
| **40% <=** | 36,715 | -5,185 | -7,016 | -3,549 | -3,033 | |
| **45% <=** | 51,653 | 14,152 | 15,625 | 23,526 | 28,054 | |
| **50% <=** | 70,326 | 42,143 | 45,827 | 45,873 | 61,885 | |
| **55% <=** | 100,591 | 69,432 | 80,581 | 72,997 | 93,726 | |
| **60% <=** | 127,553 | 95,631 | 99,652 | 99,762 | 133,521 | |
| **65% <=** | 156,928 | 134,890 | 129,386 | 136,288 | 163,211 | |
| **70% <=** | 190,540 | 155,052 | 172,696 | 179,507 | 189,349 | |
| **75% <=** | 211,998 | 182,053 | 198,528 | 217,530 | 237,852 | |
| **80% <=** | 245,482 | 243,090 | 218,713 | 262,138 | 261,289 | |
| **85% <=** | 298,872 | 280,619 | 262,615 | 313,283 | 300,180 | |
| **90% <=** | 365,190 | 360,456 | 340,748 | 390,283 | 368,772 | |
| **95% <=** | 449,528 | 431,185 | 426,087 | 518,405 | 497,653 | |
| **97.5% <=** | 528,889 | 483,680 | 580,298 | 628,578 | 588,866 | |
| **99% <=** | 640,092 | 579,823 | 723,160 | 696,762 | 731,713 | |

## Table 68: Net Revenue Statistics For Scenario 7 - 2 LSN

| | FY 2002 | FY 2003 | FY 2004 | FY 2005 | FY 2006 | 5 Yr Average |
|---|---|---|---|---|---|---|
| **Average** | 37,880 | -20,404 | -14,674 | -14,191 | -15,582 | -5,394 |
| **Median** | 14,908 | -33,116 | -11,558 | -8,968 | 7,303 | |
| **StDev** | 186,265 | 221,378 | 252,325 | 263,577 | 273,972 | |
| | | | | | | |
| **1% <=** | -420,599 | -629,064 | -798,818 | -899,953 | -806,914 | |
| **2.5% <=** | -327,349 | -480,873 | -629,537 | -540,868 | -549,840 | |
| **5% <=** | -244,799 | -410,797 | -424,146 | -445,894 | -455,975 | |
| **10% <=** | -171,733 | -301,811 | -330,899 | -380,409 | -391,350 | |
| **15% <=** | -135,362 | -200,582 | -255,204 | -285,852 | -308,265 | |
| **20% <=** | -98,394 | -149,683 | -187,743 | -207,136 | -230,898 | |
| **25% <=** | -75,158 | -130,119 | -131,635 | -142,505 | -192,864 | |
| **30% <=** | -57,558 | -110,799 | -99,383 | -115,036 | -126,834 | |
| **35% <=** | -37,291 | -89,377 | -78,281 | -81,314 | -98,136 | |
| **40% <=** | -23,584 | -73,823 | -66,323 | -60,591 | -68,147 | |
| **45% <=** | -4,804 | -59,615 | -40,745 | -40,852 | -31,582 | |
| **50% <=** | 13,534 | -33,423 | -12,053 | -9,711 | 5,917 | |
| **55% <=** | 32,026 | -6,431 | 12,262 | 7,418 | 31,523 | |
| **60% <=** | 70,992 | 25,448 | 39,124 | 34,365 | 63,752 | |
| **65% <=** | 84,263 | 53,216 | 67,107 | 64,844 | 84,206 | |
| **70% <=** | 116,963 | 85,619 | 92,842 | 95,692 | 118,925 | |
| **75% <=** | 142,058 | 110,741 | 129,471 | 146,354 | 164,708 | |
| **80% <=** | 175,568 | 157,951 | 164,655 | 190,701 | 207,132 | |
| **85% <=** | 225,525 | 195,174 | 200,999 | 233,848 | 246,401 | |
| **90% <=** | 284,143 | 253,321 | 278,435 | 317,921 | 303,171 | |
| **95% <=** | 364,967 | 337,190 | 349,939 | 410,087 | 405,696 | |
| **97.5% <=** | 444,005 | 368,829 | 468,858 | 524,922 | 479,701 | |
| **99% <=** | 552,268 | 454,552 | 616,679 | 577,060 | 613,800 | |

## Table 69: Net Revenue Statistics For Scenario 8 - 4 LSN

| | FY 2002 | FY 2003 | FY 2004 | FY 2005 | FY 2006 | 5 Yr Average |
|---|---|---|---|---|---|---|
| **Average** | 11,410 | -49,962 | -43,975 | -45,786 | -46,315 | -34,926 |
| **Median** | -13,852 | -62,569 | -36,260 | -39,655 | -15,112 | |
| **StDev** | 184,108 | 220,765 | 250,803 | 260,957 | 272,855 | |
| | | | | | | |
| **1% <=** | -457,331 | -678,492 | -838,782 | -949,910 | -852,300 | |
| **2.5% <=** | -372,865 | -522,945 | -680,638 | -590,178 | -586,228 | |
| **5% <=** | -271,927 | -441,181 | -455,407 | -474,137 | -479,317 | |
| **10% <=** | -193,988 | -336,315 | -363,220 | -406,247 | -420,201 | |
| **15% <=** | -154,240 | -215,993 | -274,784 | -308,033 | -337,772 | |
| **20% <=** | -116,848 | -176,548 | -214,634 | -248,255 | -256,229 | |
| **25% <=** | -98,159 | -157,406 | -159,967 | -176,190 | -205,648 | |
| **30% <=** | -83,758 | -137,050 | -119,489 | -142,747 | -156,040 | |
| **35% <=** | -61,147 | -113,265 | -103,868 | -107,320 | -118,577 | |
| **40% <=** | -45,335 | -98,964 | -89,126 | -84,743 | -98,070 | |
| **45% <=** | -31,518 | -85,174 | -59,738 | -65,044 | -49,741 | |
| **50% <=** | -14,247 | -63,451 | -36,472 | -41,129 | -17,775 | |
| **55% <=** | 7,426 | -35,461 | -14,088 | -16,279 | 5,803 | |
| **60% <=** | 41,160 | -3,432 | 12,582 | 2,766 | 29,683 | |
| **65% <=** | 60,930 | 27,999 | 38,854 | 36,064 | 49,461 | |
| **70% <=** | 92,202 | 59,894 | 65,505 | 66,496 | 90,228 | |
| **75% <=** | 113,522 | 88,171 | 105,949 | 113,966 | 126,817 | |
| **80% <=** | 146,225 | 125,090 | 138,407 | 150,616 | 171,335 | |
| **85% <=** | 195,861 | 164,228 | 174,893 | 194,636 | 219,613 | |
| **90% <=** | 255,452 | 209,691 | 238,347 | 272,499 | 271,920 | |
| **95% <=** | 331,811 | 303,556 | 318,492 | 374,099 | 378,009 | |
| **97.5% <=** | 408,822 | 327,441 | 421,821 | 488,630 | 438,706 | |
| **99% <=** | 521,290 | 406,223 | 568,619 | 527,749 | 567,990 | |

## Table 70: Net Revenue Statistics For Scenario 9 - LSN & JDA

| | FY 2002 | FY 2003 | FY 2004 | FY 2005 | FY 2006 | 5 Yr Average |
|---|---|---|---|---|---|---|
| **Average** | 10,182 | -52,604 | -47,015 | -48,035 | -50,211 | -37,537 |
| **Median** | -11,144 | -64,640 | -41,576 | -44,045 | -22,338 | |
| **StDev** | 180,952 | 219,833 | 248,812 | 259,009 | 270,639 | |
| | | | | | | |
| **1% <=** | -451,108 | -692,004 | -846,907 | -965,514 | -862,647 | |
| **2.5% <=** | -368,489 | -533,337 | -680,161 | -593,817 | -588,267 | |
| **5% <=** | -263,647 | -435,482 | -462,367 | -471,465 | -478,633 | |
| **10% <=** | -191,345 | -332,242 | -361,668 | -397,385 | -422,905 | |
| **15% <=** | -154,582 | -220,194 | -273,142 | -306,478 | -333,409 | |
| **20% <=** | -120,224 | -184,261 | -216,845 | -243,369 | -260,623 | |
| **25% <=** | -99,497 | -157,999 | -157,144 | -170,744 | -209,878 | |
| **30% <=** | -82,609 | -137,530 | -122,872 | -144,336 | -158,697 | |
| **35% <=** | -63,323 | -118,273 | -103,764 | -104,807 | -118,571 | |
| **40% <=** | -48,062 | -104,141 | -91,913 | -86,965 | -100,979 | |
| **45% <=** | -26,786 | -86,263 | -66,359 | -69,424 | -57,028 | |
| **50% <=** | -11,888 | -65,473 | -42,796 | -45,602 | -22,706 | |
| **55% <=** | 3,153 | -35,221 | -20,234 | -21,090 | -1,432 | |
| **60% <=** | 37,969 | -4,764 | 6,387 | -151 | 22,689 | |
| **65% <=** | 55,641 | 20,537 | 32,456 | 33,993 | 48,398 | |
| **70% <=** | 85,727 | 51,843 | 66,050 | 66,544 | 84,927 | |
| **75% <=** | 112,442 | 83,473 | 103,806 | 107,810 | 127,483 | |
| **80% <=** | 140,358 | 118,841 | 133,817 | 147,418 | 161,307 | |
| **85% <=** | 193,822 | 160,333 | 176,569 | 185,713 | 215,790 | |
| **90% <=** | 247,698 | 205,936 | 228,808 | 276,969 | 267,145 | |
| **95% <=** | 321,582 | 297,654 | 315,966 | 369,201 | 360,139 | |
| **97.5% <=** | 397,432 | 328,975 | 418,311 | 471,626 | 435,301 | |
| **99% <=** | 506,816 | 400,950 | 551,240 | 518,779 | 561,953 | |

## Table 71: Net Revenue Statistics For Scenario 10 - JDA

| | FY 2002 | FY 2003 | FY 2004 | FY 2005 | FY 2006 | 5 Yr Average |
|---|---|---|---|---|---|---|
| **Average** | 104,419 | 56,698 | 52,809 | 59,202 | 52,261 | 65,078 |
| **Median** | 71,127 | 42,557 | 46,452 | 45,998 | 62,252 | |
| **StDev** | 193,522 | 226,110 | 248,761 | 268,661 | 274,553 | |
| | | | | | | |
| **1% <=** | -335,196 | -491,891 | -645,560 | -723,284 | -652,282 | |
| **2.5% <=** | -235,433 | -414,699 | -442,014 | -423,083 | -427,786 | |
| **5% <=** | -177,760 | -305,688 | -343,481 | -368,418 | -365,031 | |
| **10% <=** | -115,146 | -218,642 | -253,099 | -304,224 | -300,597 | |
| **15% <=** | -76,217 | -157,678 | -183,076 | -219,569 | -227,393 | |
| **20% <=** | -47,355 | -94,721 | -131,702 | -132,878 | -178,784 | |
| **25% <=** | -17,615 | -64,292 | -79,326 | -86,786 | -139,947 | |
| **30% <=** | -3,099 | -47,228 | -56,877 | -59,347 | -88,649 | |
| **35% <=** | 17,875 | -23,462 | -30,133 | -29,983 | -40,820 | |
| **40% <=** | 36,715 | -5,185 | -7,016 | -3,549 | -3,033 | |
| **45% <=** | 51,653 | 14,152 | 15,625 | 23,526 | 28,054 | |
| **50% <=** | 70,326 | 42,143 | 45,827 | 45,873 | 61,885 | |
| **55% <=** | 100,591 | 69,432 | 80,581 | 72,997 | 93,726 | |
| **60% <=** | 127,553 | 95,631 | 99,652 | 99,762 | 133,521 | |
| **65% <=** | 156,928 | 134,890 | 129,386 | 136,288 | 163,211 | |
| **70% <=** | 190,540 | 155,052 | 172,696 | 179,507 | 189,349 | |
| **75% <=** | 211,998 | 182,053 | 198,528 | 217,530 | 237,852 | |
| **80% <=** | 245,482 | 243,090 | 218,713 | 262,138 | 261,289 | |
| **85% <=** | 298,872 | 280,619 | 262,615 | 313,283 | 300,180 | |
| **90% <=** | 365,190 | 360,456 | 340,748 | 390,283 | 368,772 | |
| **95% <=** | 449,528 | 431,185 | 426,087 | 518,405 | 497,653 | |
| **97.5% <=** | 528,889 | 483,680 | 580,298 | 628,578 | 588,866 | |
| **99% <=** | 640,092 | 579,823 | 723,160 | 696,762 | 731,713 | |

## Table 72: Net Revenue Statistics For Scenario 11 - JDA Spillway

| | FY 2002 | FY 2003 | FY 2004 | FY 2005 | FY 2006 | 5 Yr Average |
|---|---|---|---|---|---|---|
| **Average** | 104,419 | 56,698 | 52,809 | 59,202 | 52,261 | 65,078 |
| **Median** | 71,127 | 42,557 | 46,452 | 45,998 | 62,252 | |
| **StDev** | 193,522 | 226,110 | 248,761 | 268,661 | 274,553 | |
| | | | | | | |
| **1% <=** | -335,196 | -491,891 | -645,560 | -723,284 | -652,282 | |
| **2.5% <=** | -235,433 | -414,699 | -442,014 | -423,083 | -427,786 | |
| **5% <=** | -177,760 | -305,688 | -343,481 | -368,418 | -365,031 | |
| **10% <=** | -115,146 | -218,642 | -253,099 | -304,224 | -300,597 | |
| **15% <=** | -76,217 | -157,678 | -183,076 | -219,569 | -227,393 | |
| **20% <=** | -47,355 | -94,721 | -131,702 | -132,878 | -178,784 | |
| **25% <=** | -17,615 | -64,292 | -79,326 | -86,786 | -139,947 | |
| **30% <=** | -3,099 | -47,228 | -56,877 | -59,347 | -88,649 | |
| **35% <=** | 17,875 | -23,462 | -30,133 | -29,983 | -40,820 | |
| **40% <=** | 36,715 | -5,185 | -7,016 | -3,549 | -3,033 | |
| **45% <=** | 51,653 | 14,152 | 15,625 | 23,526 | 28,054 | |
| **50% <=** | 70,326 | 42,143 | 45,827 | 45,873 | 61,885 | |
| **55% <=** | 100,591 | 69,432 | 80,581 | 72,997 | 93,726 | |
| **60% <=** | 127,553 | 95,631 | 99,652 | 99,762 | 133,521 | |
| **65% <=** | 156,928 | 134,890 | 129,386 | 136,288 | 163,211 | |
| **70% <=** | 190,540 | 155,052 | 172,696 | 179,507 | 189,349 | |
| **75% <=** | 211,998 | 182,053 | 198,528 | 217,530 | 237,852 | |
| **80% <=** | 245,482 | 243,090 | 218,713 | 262,138 | 261,289 | |
| **85% <=** | 298,872 | 280,619 | 262,615 | 313,283 | 300,180 | |
| **90% <=** | 365,190 | 360,456 | 340,748 | 390,283 | 368,772 | |
| **95% <=** | 449,528 | 431,185 | 426,087 | 518,405 | 497,653 | |
| **97.5% <=** | 528,889 | 483,680 | 580,298 | 628,578 | 588,866 | |
| **99% <=** | 640,092 | 579,823 | 723,160 | 696,762 | 731,713 | |

## Table 73: Net Revenue Statistics For Scenario 12 - LSN JDA Spillway

| | FY 2002 | FY 2003 | FY 2004 | FY 2005 | FY 2006 | 5 Yr Average |
|---|---|---|---|---|---|---|
| **Average** | 9,396 | -52,420 | -46,810 | -48,107 | -49,871 | -37,563 |
| **Median** | -15,877 | -64,453 | -40,039 | -44,377 | -21,244 | |
| **StDev** | 181,975 | 219,301 | 249,054 | 259,241 | 270,635 | |
| | | | | | | |
| **1% <=** | -455,512 | -680,420 | -845,678 | -961,125 | -859,980 | |
| **2.5% <=** | -371,095 | -526,910 | -682,107 | -592,752 | -588,086 | |
| **5% <=** | -266,247 | -439,925 | -459,494 | -473,126 | -477,605 | |
| **10% <=** | -192,863 | -334,563 | -363,664 | -401,601 | -421,661 | |
| **15% <=** | -155,380 | -220,599 | -275,572 | -308,699 | -332,783 | |
| **20% <=** | -122,094 | -183,514 | -215,203 | -246,490 | -258,599 | |
| **25% <=** | -98,813 | -156,158 | -159,135 | -176,415 | -209,234 | |
| **30% <=** | -83,440 | -133,650 | -119,596 | -144,402 | -158,047 | |
| **35% <=** | -65,989 | -119,002 | -105,412 | -106,331 | -123,574 | |
| **40% <=** | -47,230 | -102,742 | -91,829 | -86,303 | -100,235 | |
| **45% <=** | -29,133 | -87,744 | -63,468 | -67,599 | -53,104 | |
| **50% <=** | -16,594 | -64,789 | -40,139 | -45,606 | -22,478 | |
| **55% <=** | 3,552 | -36,535 | -18,777 | -19,708 | 2,278 | |
| **60% <=** | 39,425 | -6,199 | 8,773 | 3,208 | 24,130 | |
| **65% <=** | 57,196 | 19,766 | 32,433 | 33,568 | 47,585 | |
| **70% <=** | 86,250 | 53,460 | 65,670 | 56,691 | 80,133 | |
| **75% <=** | 111,555 | 83,216 | 102,770 | 109,814 | 127,229 | |
| **80% <=** | 140,706 | 118,913 | 133,955 | 150,024 | 160,730 | |
| **85% <=** | 191,827 | 160,204 | 176,458 | 184,324 | 215,386 | |
| **90% <=** | 250,248 | 204,911 | 231,897 | 277,791 | 266,397 | |
| **95% <=** | 323,676 | 295,367 | 313,898 | 367,520 | 362,728 | |
| **97.5% <=** | 398,863 | 327,328 | 421,261 | 478,055 | 435,911 | |
| **99% <=** | 509,244 | 398,176 | 557,935 | 522,303 | 559,338 | |

## Table 74: Net Revenue Statistics For Scenario 13 - LSN & JDA CWA

| | FY 2002 | FY 2003 | FY 2004 | FY 2005 | FY 2006 | 5 Yr Average |
|---|---|---|---|---|---|---|
| **Average** | -61,070 | -133,535 | -128,657 | -127,388 | -132,503 | -116,630 |
| **Median** | -84,313 | -142,678 | -118,252 | -110,954 | -101,479 | |
| **StDev** | 178,209 | 222,997 | 244,903 | 261,876 | 274,205 | |
| | | | | | | |
| **1% <=** | -583,264 | -842,465 | -944,157 | -1,103,790 | -993,743 | |
| **2.5% <=** | -474,473 | -680,434 | -808,693 | -728,141 | -704,743 | |
| **5% <=** | -310,112 | -529,625 | -536,705 | -547,402 | -619,949 | |
| **10% <=** | -236,427 | -393,522 | -424,480 | -464,526 | -494,181 | |
| **15% <=** | -202,295 | -298,277 | -337,620 | -374,281 | -396,670 | |
| **20% <=** | -183,554 | -254,945 | -299,995 | -327,644 | -335,539 | |
| **25% <=** | -165,641 | -222,861 | -255,214 | -233,607 | -274,385 | |
| **30% <=** | -146,923 | -207,502 | -199,800 | -215,457 | -241,537 | |
| **35% <=** | -131,182 | -188,875 | -178,296 | -183,200 | -199,070 | |
| **40% <=** | -115,835 | -170,126 | -154,148 | -156,474 | -169,187 | |
| **45% <=** | -97,771 | -155,685 | -132,569 | -134,431 | -135,386 | |
| **50% <=** | -84,547 | -144,197 | -118,440 | -112,069 | -102,753 | |
| **55% <=** | -66,233 | -121,804 | -93,503 | -98,865 | -83,380 | |
| **60% <=** | -51,485 | -96,329 | -78,497 | -79,332 | -58,842 | |
| **65% <=** | -25,409 | -66,220 | -49,976 | -46,816 | -31,709 | |
| **70% <=** | 14,285 | -18,533 | -22,071 | -19,299 | -6,666 | |
| **75% <=** | 36,868 | 5,598 | 17,106 | 16,932 | 32,385 | |
| **80% <=** | 69,850 | 33,334 | 46,316 | 58,345 | 78,022 | |
| **85% <=** | 110,047 | 77,080 | 90,740 | 117,968 | 136,594 | |
| **90% <=** | 183,589 | 122,904 | 146,697 | 188,381 | 175,432 | |
| **95% <=** | 252,728 | 206,113 | 231,725 | 295,505 | 292,476 | |
| **97.5% <=** | 316,015 | 245,411 | 317,472 | 389,983 | 351,363 | |
| **99% <=** | 418,422 | 321,970 | 378,013 | 439,682 | 429,698 | |

## Table 75: Net Revenue Statistics For Scenario 14 - 2 LSN - Adj

| | FY 2002 | FY 2003 | FY 2004 | FY 2005 | FY 2006 | 5 Yr Average |
|---|---|---|---|---|---|---|
| **Average** | 99,427 | 51,284 | 47,681 | 53,405 | 46,501 | 59,660 |
| **Median** | 67,537 | 36,216 | 41,962 | 41,064 | 57,086 | |
| **StDev** | 192,739 | 225,667 | 248,346 | 267,898 | 274,062 | |
| | | | | | | |
| **1% <=** | -340,082 | -500,971 | -657,528 | -738,910 | -671,073 | |
| **2.5% <=** | -239,566 | -421,767 | -456,807 | -429,222 | -432,519 | |
| **5% <=** | -180,207 | -313,667 | -350,749 | -373,639 | -369,948 | |
| **10% <=** | -118,204 | -221,812 | -254,700 | -310,098 | -306,086 | |
| **15% <=** | -82,307 | -159,812 | -186,650 | -223,711 | -233,454 | |
| **20% <=** | -50,750 | -99,458 | -133,901 | -138,027 | -180,966 | |
| **25% <=** | -23,551 | -69,024 | -86,325 | -92,130 | -146,655 | |
| **30% <=** | -7,417 | -52,054 | -61,129 | -64,830 | -92,270 | |
| **35% <=** | 12,079 | -28,069 | -34,775 | -35,565 | -45,181 | |
| **40% <=** | 32,903 | -9,646 | -10,731 | -7,871 | -7,939 | |
| **45% <=** | 46,780 | 8,373 | 9,891 | 17,850 | 21,213 | |
| **50% <=** | 65,821 | 35,825 | 41,484 | 40,748 | 56,519 | |
| **55% <=** | 94,100 | 65,578 | 75,629 | 68,838 | 88,776 | |
| **60% <=** | 120,543 | 89,813 | 94,242 | 95,611 | 126,795 | |
| **65% <=** | 152,352 | 129,907 | 124,492 | 129,519 | 156,643 | |
| **70% <=** | 186,565 | 149,631 | 167,062 | 166,814 | 182,586 | |
| **75% <=** | 207,834 | 176,391 | 191,203 | 210,619 | 234,293 | |
| **80% <=** | 240,731 | 237,593 | 214,053 | 255,877 | 257,550 | |
| **85% <=** | 291,871 | 274,161 | 258,119 | 309,107 | 295,064 | |
| **90% <=** | 359,442 | 349,226 | 336,222 | 381,348 | 364,774 | |
| **95% <=** | 441,593 | 423,778 | 422,589 | 509,685 | 490,130 | |
| **97.5% <=** | 521,070 | 474,844 | 570,871 | 619,640 | 579,328 | |
| **99% <=** | 632,064 | 570,840 | 713,968 | 687,018 | 722,201 | |

## Table 76: Net Revenue Statistics For Scenario 15 - 4 LSN - Adj

| | FY 2002 | FY 2003 | FY 2004 | FY 2005 | FY 2006 | 5 Yr Average |
|---|---|---|---|---|---|---|
| **Average** | 99,140 | 50,983 | 47,356 | 53,095 | 46,185 | 59,352 |
| **Median** | 67,344 | 35,868 | 41,537 | 40,790 | 56,867 | |
| **StDev** | 192,715 | 225,656 | 248,484 | 267,875 | 274,055 | |
| | | | | | | |
| **1% <=** | -340,383 | -501,500 | -658,323 | -739,838 | -672,097 | |
| **2.5% <=** | -239,818 | -422,190 | -457,767 | -429,575 | -432,909 | |
| **5% <=** | -180,698 | -314,162 | -351,201 | -373,981 | -370,190 | |
| **10% <=** | -118,370 | -221,965 | -254,803 | -310,553 | -306,455 | |
| **15% <=** | -82,470 | -159,931 | -186,771 | -223,808 | -233,590 | |
| **20% <=** | -50,896 | -99,773 | -133,932 | -138,318 | -181,109 | |
| **25% <=** | -23,957 | -69,376 | -86,433 | -92,319 | -146,965 | |
| **30% <=** | -7,633 | -52,260 | -61,348 | -65,365 | -92,474 | |
| **35% <=** | 11,716 | -28,405 | -35,018 | -35,837 | -45,369 | |
| **40% <=** | 32,675 | -9,927 | -10,998 | -8,143 | -8,209 | |
| **45% <=** | 46,446 | 8,057 | 9,470 | 17,537 | 20,857 | |
| **50% <=** | 65,589 | 35,414 | 41,221 | 40,429 | 56,221 | |
| **55% <=** | 93,751 | 65,469 | 75,359 | 68,620 | 88,259 | |
| **60% <=** | 120,199 | 89,502 | 94,011 | 95,390 | 126,372 | |
| **65% <=** | 152,115 | 129,511 | 124,184 | 129,317 | 156,246 | |
| **70% <=** | 186,286 | 149,245 | 166,683 | 166,522 | 182,303 | |
| **75% <=** | 207,342 | 176,094 | 190,568 | 210,443 | 234,015 | |
| **80% <=** | 240,285 | 237,291 | 213,846 | 255,702 | 257,434 | |
| **85% <=** | 291,513 | 273,887 | 257,867 | 308,892 | 294,772 | |
| **90% <=** | 358,962 | 348,540 | 335,987 | 380,855 | 364,157 | |
| **95% <=** | 441,198 | 423,482 | 421,913 | 509,205 | 489,738 | |
| **97.5% <=** | 520,704 | 474,389 | 570,404 | 619,197 | 578,855 | |
| **99% <=** | 631,640 | 570,386 | 713,508 | 686,530 | 721,726 | |

## Table 77: Net Revenue Statistics For Scenario 16 - LSN & JDA - Adj

| | FY 2002 | FY 2003 | FY 2004 | FY 2005 | FY 2006 | 5 Yr Average |
|---|---|---|---|---|---|---|
| **Average** | 99,723 | 51,561 | 47,910 | 53,737 | 46,629 | 59,912 |
| **Median** | 67,630 | 36,292 | 42,070 | 41,490 | 57,051 | |
| **StDev** | 192,655 | 225,592 | 248,286 | 267,822 | 274,024 | |
| | | | | | | |
| **1% <=** | -339,433 | -500,628 | -656,262 | -738,833 | -670,599 | |
| **2.5% <=** | -238,930 | -420,874 | -455,107 | -428,998 | -432,321 | |
| **5% <=** | -179,452 | -312,882 | -349,672 | -373,203 | -369,358 | |
| **10% <=** | -117,977 | -221,662 | -255,844 | -308,717 | -305,945 | |
| **15% <=** | -82,534 | -160,327 | -186,484 | -222,725 | -233,355 | |
| **20% <=** | -50,460 | -99,598 | -133,974 | -137,673 | -180,898 | |
| **25% <=** | -23,110 | -68,982 | -86,083 | -91,869 | -146,258 | |
| **30% <=** | -7,203 | -52,403 | -60,678 | -63,993 | -92,016 | |
| **35% <=** | 12,169 | -28,050 | -34,600 | -34,990 | -45,563 | |
| **40% <=** | 33,809 | -9,502 | -11,036 | -7,143 | -8,282 | |
| **45% <=** | 47,501 | 11,340 | 10,752 | 17,428 | 21,910 | |
| **50% <=** | 65,918 | 36,187 | 41,638 | 41,481 | 56,584 | |
| **55% <=** | 94,170 | 65,579 | 75,164 | 68,971 | 89,425 | |
| **60% <=** | 121,050 | 89,133 | 94,542 | 95,752 | 125,026 | |
| **65% <=** | 152,537 | 130,046 | 124,842 | 129,626 | 155,202 | |
| **70% <=** | 186,461 | 149,260 | 167,374 | 167,333 | 182,535 | |
| **75% <=** | 208,509 | 176,631 | 191,413 | 210,922 | 234,725 | |
| **80% <=** | 239,703 | 237,299 | 214,342 | 256,401 | 257,325 | |
| **85% <=** | 292,151 | 273,985 | 258,400 | 309,339 | 295,789 | |
| **90% <=** | 360,339 | 349,818 | 336,501 | 381,822 | 365,498 | |
| **95% <=** | 442,037 | 423,816 | 424,235 | 510,324 | 489,992 | |
| **97.5% <=** | 520,808 | 474,771 | 570,988 | 620,077 | 579,405 | |
| **99% <=** | 632,252 | 571,087 | 714,242 | 688,188 | 722,635 | |

## Table 78: Net Revenue Statistics For Scenario 17 - LSN JDA Spillway - Adj

| | FY 2002 | FY 2003 | FY 2004 | FY 2005 | FY 2006 | 5 Yr Average |
|---|---|---|---|---|---|---|
| **Average** | 98,904 | 50,676 | 47,148 | 52,771 | 45,845 | 59,069 |
| **Median** | 67,108 | 35,365 | 40,985 | 40,629 | 56,664 | |
| **StDev** | 192,593 | 225,562 | 248,272 | 267,773 | 273,918 | |
| | | | | | | |
| **1% <=** | -340,509 | -502,070 | -658,660 | -740,631 | -673,296 | |
| **2.5% <=** | -239,826 | -422,236 | -458,030 | -429,907 | -433,324 | |
| **5% <=** | -180,848 | -314,320 | -351,169 | -374,348 | -370,203 | |
| **10% <=** | -118,423 | -221,990 | -255,633 | -310,294 | -306,678 | |
| **15% <=** | -82,981 | -160,389 | -186,858 | -222,906 | -233,685 | |
| **20% <=** | -50,903 | -100,268 | -133,891 | -138,540 | -181,300 | |
| **25% <=** | -24,293 | -69,853 | -86,370 | -92,447 | -147,136 | |
| **30% <=** | -7,878 | -52,911 | -61,394 | -65,616 | -92,617 | |
| **35% <=** | 11,234 | -28,783 | -35,087 | -35,880 | -46,009 | |
| **40% <=** | 32,975 | -10,318 | -11,288 | -8,055 | -8,937 | |
| **45% <=** | 46,285 | 7,922 | 9,631 | 16,711 | 20,704 | |
| **50% <=** | 65,244 | 34,991 | 40,884 | 40,426 | 56,056 | |
| **55% <=** | 93,243 | 65,344 | 74,574 | 68,383 | 88,009 | |
| **60% <=** | 119,975 | 88,431 | 93,593 | 95,166 | 124,517 | |
| **65% <=** | 151,819 | 129,061 | 123,867 | 128,969 | 154,922 | |
| **70% <=** | 185,808 | 148,550 | 166,303 | 166,413 | 181,811 | |
| **75% <=** | 207,453 | 175,806 | 190,123 | 210,420 | 233,864 | |
| **80% <=** | 239,299 | 236,529 | 213,808 | 255,377 | 257,059 | |
| **85% <=** | 291,187 | 273,179 | 257,746 | 308,744 | 294,942 | |
| **90% <=** | 358,787 | 347,786 | 335,861 | 380,428 | 363,758 | |
| **95% <=** | 440,826 | 422,976 | 422,094 | 508,869 | 488,944 | |
| **97.5% <=** | 519,859 | 473,535 | 569,648 | 618,690 | 578,054 | |
| **99% <=** | 631,155 | 569,739 | 712,911 | 686,593 | 721,074 | |

## Table 79: Net Revenue Statistics For Scenario 18 - LSN & JDA CWA - Adj

| | FY 2002 | FY 2003 | FY 2004 | FY 2005 | FY 2006 | 5 Yr Average |
|---|---|---|---|---|---|---|
| **Average** | 26,310 | -34,884 | -30,389 | -29,521 | -32,655 | -20,228 |
| **Median** | 288 | -45,820 | -30,106 | -30,151 | -10,373 | |
| **StDev** | 184,209 | 222,961 | 250,799 | 262,782 | 273,554 | |
| | | | | | | |
| **1% <=** | -433,273 | -683,044 | -821,908 | -920,895 | -837,413 | |
| **2.5% <=** | -339,750 | -498,178 | -646,809 | -573,149 | -573,935 | |
| **5% <=** | -250,512 | -427,585 | -432,907 | -457,958 | -465,173 | |
| **10% <=** | -169,805 | -314,563 | -339,932 | -377,859 | -406,283 | |
| **15% <=** | -140,485 | -210,519 | -260,945 | -289,225 | -321,990 | |
| **20% <=** | -108,201 | -167,471 | -207,175 | -223,726 | -244,368 | |
| **25% <=** | -85,797 | -136,746 | -148,488 | -155,295 | -200,088 | |
| **30% <=** | -69,735 | -123,340 | -114,394 | -127,892 | -139,567 | |
| **35% <=** | -53,329 | -109,356 | -95,167 | -96,148 | -116,796 | |
| **40% <=** | -35,112 | -86,873 | -72,212 | -76,232 | -83,387 | |
| **45% <=** | -14,277 | -77,776 | -49,390 | -53,559 | -49,622 | |
| **50% <=** | -353 | -47,375 | -30,333 | -30,902 | -10,412 | |
| **55% <=** | 12,364 | -21,213 | -1,542 | -5,421 | 12,299 | |
| **60% <=** | 47,385 | 618 | 15,993 | 15,703 | 41,218 | |
| **65% <=** | 75,099 | 42,482 | 41,356 | 45,488 | 64,549 | |
| **70% <=** | 101,021 | 71,691 | 74,018 | 70,867 | 92,568 | |
| **75% <=** | 130,130 | 101,469 | 112,921 | 122,713 | 154,526 | |
| **80% <=** | 158,858 | 136,803 | 150,999 | 172,408 | 183,155 | |
| **85% <=** | 210,976 | 184,310 | 187,534 | 208,648 | 228,979 | |
| **90% <=** | 277,487 | 235,436 | 252,780 | 301,582 | 290,040 | |
| **95% <=** | 347,350 | 323,191 | 347,388 | 409,949 | 386,210 | |
| **97.5% <=** | 430,109 | 365,823 | 446,566 | 507,331 | 467,522 | |
| **99% <=** | 540,008 | 444,819 | 593,341 | 553,963 | 594,368 | |

# 2. NON-OPERATING RISK MODEL (NORM)

## 2.1 NORM

The NORM is being introduced in this rate case. NORM is a tool that was developed to capture risks other than operational risks in the ratesetting process. This model is an extension of the risk modeling that has been used in previous rate cases. It uses the same general simulation methodology and @RISK computer software package that is used in RiskMod.

Whereas RiskMod is used to quantify risks having to do with various economic and generation resource capability variations, NORM is used to model the impact on expected costs associated with a set of 16 distinct risks surrounding projections of non-operations related revenue or expense levels associated with the generation function in the revenue requirement.

NORM was developed to address important risks stemming from uncertainties in areas other than operational risks. These non-operating risks were not modeled in prior rate cases. A prominent example of these non-operating risks is the uncertainty over fish and wildlife program costs. The output from NORM, along with the output from RiskMod, are input into the ToolKit model to assess the TPP.

## 2.2 Methodology

BPA's traditional approach to modeling risks is to use simulation methodology. In this technique, the model runs through a number of games. In each game, each of the uncertainties is randomly assigned a value based on input specifications for that uncertainty. After all of the games have been run, the output data on the set of games can be analyzed and summarized in various ways, or passed to other tools.

NORM is a straightforward extension of this approach to a new set of risks. NORM is written in Excel 97 with the @RISK add-in package.

Each of the risks is specified on the main worksheet of NORM, titled "Main," with additional data for the fish and wildlife uncertainties on a separate worksheet titled "F&W Data." Most uncertainties are modeled using @RISK's "RiskDiscrete" function. This function takes two arrays as inputs, one listing the possible values the uncertain variable can take, the other the respective probabilities of those values. In other words, for an uncertainty having to do with expense levels, the input consists of a series of dollar amounts by which the expense level in the revenue requirement could vary, and the probability, as a percentage, that each amount of variation could occur. For example, when rolling dice, the operation of a single die would be described as follows (fractions rounded off):

**<die> =RiskDiscrete(A1:F1,A2:F2)**

with the values 1, 2, 3, 4, 5, and 6 in cells A1 to F1, and identical probabilities of 17 percent in each of the cells A2 to F2. When @RISK is run, each game will have a value for the function drawn randomly from the set of six possible values according to those probabilities. If 1,000 games are run, there should be about 167 games (1,000 / 6) where the value is 1, and about the same number with each of the other values. The actual number may vary slightly, but probably not by much. The larger the number of games, the more closely the actual count is likely to approach the expected number, which equals the probability times the number of games.

The entire five-year rate period (FY 2002–2006) is simulated in each game so that correlations across years can be correctly reflected. For example, when the model randomly selects a fish and wildlife scenario for the first year, it will continue to use the expenses associated with that fish and wildlife scenario for the other four years in that game. When the next game begins, another random selection of a fish and wildlife scenario will be made.

### 2.3 Input

The input for NORM consists of the following for each risk identified and modeled: (1) various deviations, on an annual average basis, from cost or revenue levels included in the revenue requirement that are considered to be possible outcomes (in other words, the amount by which costs or revenues may turn out to be higher or lower than those projected in the revenue requirement); (2) an estimate of the probability that each potential deviation will be the actual outcome; and (3) an @RISK risk function (generally "RiskDiscrete") which identifies, for the model, the relationship of the inputs to each other. The RiskDiscrete function indicates that the

uncertainty is being modeled as a set of discrete possibilities. It is possible to use @RISK and NORM to model continuous probability distributions, such as the Normal probability distribution. To do that, the parameters of the distribution are entered (*e.g.*, mean and standard deviation for the Normal distribution).

Deviations are expressed in annual average amounts. Negative amounts indicate a decrease in net revenues, *i.e.*, either a decrease in revenue or an increase in expense. Positive amounts indicate an increase in net revenues, *i.e.*, either an increase in revenue or a decrease in expense. BPA developed the distributions of the risks (possible values and associated probabilities). For instance, the probabilities of the generation function's transmission expenses deviating from the costs included in the revenue requirement are distributed as follows:

40 percent probability that costs will deviate $0 (in other words, be the same as the level projected in the revenue requirement

20 percent probability that costs will be $10 M higher (shown as -$10 M in NORM)

20 percent probability that costs will be $10 M lower (shown as $10 M in NORM)

10 percent probability that costs will be $25 M higher

10 percent probability that costs will be $25 M lower

NORM models the risks of the generation function, as well as the risks of the Corporate costs which are the responsibility of the generation function. Transmission function risks are not included in the analysis. NORM includes the generation function expense uncertainty due to the rates yet to be developed for transmission services. However, the impacts of transmission

function revenue uncertainty on BPA's financial picture are excluded. All NORM risk values represent deviations or changes from the deterministic values in the revenue requirement (*see* Revenue Requirement Study, WP-02-FS-BPA-02).

The risks modeled are input to NORM and included in Attachments 1 and 2. The associated deviations and probabilities assumed are shown in Table 80.

## 2.4 Output

The output is an Excel file containing the aggregate totals of all of the individual risks that are modeled. A typical run has 300 games, each reported on one line of the file. Each line contains the results from each of the five years in the FY 2002–2006 rate period. A sample of one of the output files is shown in Attachment 3.

## 2.5 Fish and Wildlife Obligation Uncertainty

At this time, there is no single plan for BPA's fish and wildlife obligations for the FY 2002–2006 rate period. When the Clinton Administration adopted the Principles in the Fall of 1998, an approach for reflecting this uncertainty in BPA's rate case was also adopted (*see* Volume 1, Chapter 13 of Revenue Requirement Study Documentation, WP-02-FS-BPA-02A). This approach uses the 13 Fish and Wildlife Alternatives developed in the Three Sovereigns Process, and assigns each of them an equal weight. Five of these 13 Fish and Wildlife Alternatives involve breaching of one or more dams, and due to the complexity of Congressional funding

# Attachment 1: Non-Operating Risk Model

## NORM - the Non-Operating Risk Model

The risk numbers represent deltas from the deterministic values in the Revenue Requirement; positive numbers indicate an increase in net revenue re Rev Req (either a decrease in costs or an increase in revenue)

**@Risk requires that some cells be designated as "output cells" - these are marked with this color.**

**F&W Approach = (below, in the pop-up window)**

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | 2 | | | | |
| **Risk** | **2002** | **2003** | **2004** | **2005** | **2006** | | | | | | | | | | | |
| | | | | | | | Alt 1 | Alt 2 | Alt 3 | Alt 4 | Alt 5 | Alt 6 | Alt 7u | | Alt 13a |
| "Fish Key" for F&W Alts (C,O&M,Ops) | **1** | | | | | Key | 1 | 2 | 3 | 4 | 5 | 6 | 7 | ... | 18 |
| | | | | | | 1 | 100.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | | 0.0% |
| F&W - Capital Program | 1.6 | 1.3 | -1.5 | -2.4 | -1.4 | | | | | | | | | | |
| F&W - Other Entities' O&M | 2.7 | 2.7 | 2.3 | 3.3 | 3.2 | | | | | | | | | | |
| Fish - BPA Direct Program | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | Key | | lo end | hi end | | | | | | |
| includes change in 4h10C | | | | | | 139.4 | | 100.0 | 178.8 | | | | | | |
| F&W Subtotal - not including Ops impacts | 4.3 | 4.0 | 0.7 | 0.9 | 1.7 | | | | | | | | | | |
| only Capital, BPA Direct, Oth. Ent. O&M | | | | | | | | | | | | | | | |
| Legislative efficiencies | 0 | 0 | 0 | 0 | 0 | 0 | 7 | | | | | | | | |
| | | | | | | 70% | 30% | | | | | | | | |
| WNP-2 Cost Review Expenses | -4 | -4 | -4 | -4 | -4 | 0 | -4 | -14 | | | | | | | |
| | | | | | | 10% | 50% | 40% | | | | | | | |
| WNP-2 Cost Review Revenues | 7 | 7 | 7 | 7 | 7 | 4 | 7 | 12 | | | | | | | |
| | | | | | | 20% | 40% | 40% | | | | | | | |
| Corps/Bur Cost Review Exp | -5.7 | -5.7 | -5.7 | -5.7 | -5.7 | 0 | -5.7 | -18.7 | | | | | | | |
| | | | | | | 15% | 75% | 10% | | | | | | | |
| Corps/Bur Cost Review Rev | 5 | 5 | 5 | 5 | 5 | 0 | 5 | 15 | | | | | | | |
| | | | | | | 50% | 35% | 15% | | | | | | | |
| PBL Staffing Cost Review | -4.5 | -4.5 | -4.5 | -4.5 | -4.5 | 0 | -4.5 | -8.9 | | | | | | | |
| | | | | | | 25% | 50% | 25% | | | | | | | |
| Support/Admin Cost Review (Shrd Srvc) | -4 | -4 | -4 | -4 | -4 | -1 | -2 | -4 | -7 | | | | | | |
| | | | | | | 10% | 50% | 30% | 10% | | | | | | |
| C&R Make Good Funds | 0 | -2 | -2 | -2 | -2 | 0 | -1 | -2 | -3 | -4 | -5 | -6 | | | |
| | | | | | | 25% | 25% | 30% | 10% | 10% | 0% | 0% | | | |
| Interest rate unc. for future obligations | - | - | - | - | - | -2.00% | -1.25% | -0.75% | 0.00% | 0.75% | 1.25% | 2.00% | | | |
| | | | | | | 5% | 10% | 20% | 30% | 20% | 10% | 5% | | | |
| WNP-2 Decommissioning Fund | -2 | -2 | -2 | -2 | -2 | 0 | -2 | -4 | | | | | | | |
| | | | | | | 30% | 50% | 20% | | | | | | | |
| PBL Tx Expenses | 0 | 0 | 0 | 0 | 0 | -25 | -10 | 0 | 10 | 25 | | | | | |
| | | | | | | 10% | 20% | 40% | 20% | 10% | | | | | |
| Separation Costs | -2 | -2 | -2 | -2 | -2 | 0 | -2 | -4 | | | | | | | |
| | | | | | | 50% | 30% | 20% | | | | | | | |
| Aggregate | -5.9 | -8.2 | -11.5 | -11.3 | -10.5 | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| Interest rate details | | | | | | | | | | | | | | | |
| Amounts of new obligations effective in yr | 1,010.6 | 203.1 | 238.4 | 246.8 | 208.4 | | | | | | | | | | |

# Attachment 2: NORM Input, Fish and Wildlife Data

## Weights

### Schedule

| | |
|---|---|
| 10% | Unadjusted schedule |
| 90% | Adjusted schedule |

**F&W Alternative from 3 Sovereigns process**

| Alt. | Weight | |
|---|---|---|
| 1 | 7.69% | In-River Migration (low option) |
| 2 | 7.69% | In-River Migration (high option) with CWA ** |
| 3 | 7.69% | Expanded Transport |
| 4 | 7.69% | Expanded Transport (low option) |
| 5 | 7.69% | Transportation Plus |
| 6 | 7.69% | Transportation Plus and CWA |
| 7 | 7.69% | Two Snake River Dams to Natural River |
| 8 | 7.69% | Four Snake River Dams to Natural River |
| 9 | 7.69% | Snake River and JDA Dams to Natural River |
| 10 | 7.69% | John Day Dam to Natural River |
| 11 | 7.69% | John Day Dam to Spillway Crest |
| 12 | 7.69% | Snake River Dams to Natural River and JDA Dam to Spillway Crest |
| 13 | 7.69% | Snake River and JDA Dams to Natural River (high option) plus CWA ** |

# Attachment 2: NORM Input, Fish and Wildlife Data (Continued)

**NORM Input: BPA Fish and Wildlife O&M (a)**

| | **F&W "Approach"** | BPA Dir. Prog. | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ("N"a = Alt. N, Adjusted Schedule; "M"u = Alt. M, Unadjusted Schedule; colors match pairs of Adj-Unadj alts.) | Low | High | Alt 1 | Alt 2 | Alt 3 | Alt 4 | Alt 5 | Alt 6 | Alt 7u | Alt 7a | Alt 8u |
| 1 | Probabilistic treatment of all 4 F&W components (BPA Direct, Ops, Cap, Oth Ent O&M) | 100.0 | 178.8 | 7.69% | 7.69% | 7.69% | 7.69% | 7.69% | 7.69% | 0.77% | 6.92% | 0.77% |
| 2 | Alt 1: In-River Migration (low option), BPA Direct Probabilistic | 100.0 | 178.8 | 100% | | | | | | | | |
| 3 | Alt 2: In-River Migration (high option) with CWA, BPA Direct Probabilistic | 100.0 | 178.8 | | 100% | | | | | | | |
| 4 | Alt 3: Expanded Transport, BPA Direct Probabilistic | 100.0 | 178.8 | | | 100% | | | | | | |
| 5 | Alt 4: Expanded Transport (low option), BPA Direct Probabilistic | 100.0 | 178.8 | | | | 100% | | | | | |
| 6 | Alt 5: Transportation Plus, BPA Direct Probabilistic | 100.0 | 178.8 | | | | | 100% | | | | |
| 7 | Alt 6: Transportation Plus and CWA, BPA Direct Probabilistic | 100.0 | 178.8 | | | | | | 100% | | | |
| 8 | Alt 7u: Two Snake River Dams to Natural River, Unadj. Sched., BPA Direct Probabilistic | 100.0 | 178.8 | | | | | | | 100% | | |
| 9 | Alt 7a: Two Snake River Dams to Natural River, Adj. Sched., BPA Direct Probabilistic | 100.0 | 178.8 | | | | | | | | 100% | |
| 10 | Alt 8u: Four Snake River Dams to Natural River, Unadj. Sched., BPA Direct Probabilistic | 100.0 | 178.8 | | | | | | | | | 100% |
| 11 | Alt 8a: Four Snake River Dams to Natural River, Adj. Sched., BPA Direct Probabilistic | 100.0 | 178.8 | | | | | | | | | |
| 12 | Alt 9u: Snake River and JDA Dams to Natural River, Unadj. Sched., BPA Direct Probabilistic | 100.0 | 178.8 | | | | | | | | | |
| 13 | Alt 9a: Snake River and JDA Dams to Natural River, Adj. Sched., BPA Direct Probabilistic | 100.0 | 178.8 | | | | | | | | | |
| 14 | Alt 10: John Day Dam to Natural River, BPA Direct Probabilistic | 100.0 | 178.8 | | | | | | | | | |
| 15 | Alt 11: John Day Dam to Spillway Crest, BPA Direct Probabilistic | 100.0 | 178.8 | | | | | | | | | |
| 16 | Alt 12u: Snake R. Dams to Nat. River and JDA Dam to Spillway Crest, Unadj. Sched., BPA Direct Probabilistic | 100.0 | 178.8 | | | | | | | | | |
| 17 | Alt 12a: Snake R. Dams to Nat. River and JDA Dam to Spillway Crest, Adj. Sched., BPA Direct Probabilistic | 100.0 | 178.8 | | | | | | | | | |
| 18 | Alt 13u: Snake R. and JDA Dams to Nat. River (high option) plus CWA, Unadj. Sched., BPA Direct Probabilistic | 100.0 | 178.8 | | | | | | | | | |
| 19 | Alt 13a: Snake R. and JDA Dams to Nat. River (high option) plus CWA, Adj. Sched., BPA Direct Probabilistic | 100.0 | 178.8 | | | | | | | | | |
| 20 | Alt 1: In-River Migration (low option), BPA Direct High (179) | 178.8 | 178.8 | 100% | | | | | | | | |
| 21 | Alt 2: In-River Migration (high option) with CWA, BPA Direct High (179) | 178.8 | 178.8 | | 100% | | | | | | | |
| 22 | Alt 3: Expanded Transport, BPA Direct High (179) | 178.8 | 178.8 | | | 100% | | | | | | |
| 23 | Alt 4: Expanded Transport (low option), BPA Direct Low (100) | 100.0 | 100.0 | | | | 100% | | | | | |
| 24 | Alt 5: Transportation Plus, BPA Direct High (179) | 178.8 | 178.8 | | | | | 100% | | | | |
| 25 | Alt 6: Transportation Plus and CWA, BPA Direct High (179) | 178.8 | 178.8 | | | | | | 100% | | | |
| 26 | Alt 7u: Two Snake River Dams to Natural River, Unadj. Sched., BPA Direct High (179) | 178.8 | 178.8 | | | | | | | 100% | | |
| 27 | Alt 7a: Two Snake River Dams to Natural River, Adj. Sched., BPA Direct High (179) | 178.8 | 178.8 | | | | | | | | 100% | |
| 28 | Alt 8u: Four Snake River Dams to Natural River, Unadj. Sched., BPA Direct High (179) | 178.8 | 178.8 | | | | | | | | | 100% |
| 29 | Alt 8a: Four Snake River Dams to Natural River, Adj. Sched., BPA Direct High (179) | 178.8 | 178.8 | | | | | | | | | |
| 30 | Alt 9u: Snake River and JDA Dams to Natural River, Unadj. Sched., BPA Direct High (179) | 178.8 | 178.8 | | | | | | | | | |
| 31 | Alt 9a: Snake River and JDA Dams to Natural River, Adj. Sched., BPA Direct High (179) | 178.8 | 178.8 | | | | | | | | | |
| 32 | Alt 10: John Day Dam to Natural River, BPA Direct High (179) | 178.8 | 178.8 | | | | | | | | | |
| 33 | Alt 11: John Day Dam to Spillway Crest, BPA Direct High (179) | 178.8 | 178.8 | | | | | | | | | |
| 34 | Alt 12u: Snake R. Dams to Nat. River and JDA Dam to Spillway Crest, Unadj. Sched., BPA Direct High (179) | 178.8 | 178.8 | | | | | | | | | |
| 35 | Alt 12a: Snake R. Dams to Nat. River and JDA Dam to Spillway Crest, Adj. Sched., BPA Direct High (179) | 178.8 | 178.8 | | | | | | | | | |
| 36 | Alt 13u: Snake R. and JDA Dams to Nat. River (high option) plus CWA, Unadj. Sched., BPA Direct High (179) | 178.8 | 178.8 | | | | | | | | | |
| 37 | Alt 13a: Snake R. and JDA Dams to Nat. River (high option) plus CWA, Adj. Sched., BPA Direct High (179) | 178.8 | 178.8 | | | | | | | | | |
| 38 | Replicate 'Probabilistic Mix' from Red-Yellow-Green charts, summer 1998 | 100.0 | 178.8 | 80.1% | | | 7.7% | | | | | |
| 39 | Alt 4: Expanded Transport (low option), BPA Direct High (179) | 178.8 | 178.8 | | | | 100% | | | | | |
| 40 | Other: enter data in row 44 of "F&W Approach" table on 'F&W Data' sheet | | | | | | | | | | | |
| 41 | Other: enter data in row 45 of "F&W Approach" table on 'F&W Data' sheet | | | | | | | | | | | |

# Attachment 2: NORM Input, Fish and Wildlife Data (Continued)

**NORM Input: BPA Fish and Wildlife O&M (b)**

| | **F&W "Approach"** | BPA Dir. Prog. | | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ("N"a = Alt. N, Adjusted Schedule; "M"u = Alt. M, Unadjusted Schedule; colors match pairs of Adj-Unadj alts.) | Low | High | Alt 8a | Alt 9u | Alt 9a | Alt 10 | Alt 11 | Alt 12u | Alt12a | Alt 13u | Alt 13a |
| 1 | Probabilistic treatment of all 4 F&W components (BPA Direct, Ops, Cap, Oth Ent O&M) | 100.0 | 178.8 | 6.92% | 0.77% | 6.92% | 7.69% | 7.69% | 0.77% | 6.92% | 0.77% | 6.92% |
| 2 | Alt 1: In-River Migration (low option), BPA Direct Probabilistic | 100.0 | 178.8 | | | | | | | | | |
| 3 | Alt 2: In-River Migration (high option) with CWA, BPA Direct Probabilistic | 100.0 | 178.8 | | | | | | | | | |
| 4 | Alt 3: Expanded Transport, BPA Direct Probabilistic | 100.0 | 178.8 | | | | | | | | | |
| 5 | Alt 4: Expanded Transport (low option), BPA Direct Probabilistic | 100.0 | 178.8 | | | | | | | | | |
| 6 | Alt 5: Transportation Plus, BPA Direct Probabilistic | 100.0 | 178.8 | | | | | | | | | |
| 7 | Alt 6: Transportation Plus and CWA, BPA Direct Probabilistic | 100.0 | 178.8 | | | | | | | | | |
| 8 | Alt 7u: Two Snake River Dams to Natural River, Unadj. Sched., BPA Direct Probabilistic | 100.0 | 178.8 | | | | | | | | | |
| 9 | Alt 7a: Two Snake River Dams to Natural River, Adj. Sched., BPA Direct Probabilistic | 100.0 | 178.8 | | | | | | | | | |
| 10 | Alt 8u: Four Snake River Dams to Natural River, Unadj. Sched., BPA Direct Probabilistic | 100.0 | 178.8 | | | | | | | | | |
| 11 | Alt 8a: Four Snake River Dams to Natural River, Adj. Sched., BPA Direct Probabilistic | 100.0 | 178.8 | 100% | | | | | | | | |
| 12 | Alt 9u: Snake River and JDA Dams to Natural River, Unadj. Sched., BPA Direct Probabilistic | 100.0 | 178.8 | | 100% | | | | | | | |
| 13 | Alt 9a: Snake River and JDA Dams to Natural River, Adj. Sched., BPA Direct Probabilistic | 100.0 | 178.8 | | | 100% | | | | | | |
| 14 | Alt 10: John Day Dam to Natural River, BPA Direct Probabilistic | 100.0 | 178.8 | | | | 100% | | | | | |
| 15 | Alt 11: John Day Dam to Spillway Crest, BPA Direct Probabilistic | 100.0 | 178.8 | | | | | 100% | | | | |
| 16 | Alt 12u: Snake R. Dams to Nat. River and JDA Dam to Spillway Crest, Unadj. Sched., BPA Direct Probabilistic | 100.0 | 178.8 | | | | | | 100% | | | |
| 17 | Alt 12a: Snake R. Dams to Nat. River and JDA Dam to Spillway Crest, Adj. Sched., BPA Direct Probabilistic | 100.0 | 178.8 | | | | | | | 100% | | |
| 18 | Alt 13u: Snake R. and JDA Dams to Nat. River (high option) plus CWA, Unadj. Sched., BPA Direct Probabilistic | 100.0 | 178.8 | | | | | | | | 100% | |
| 19 | Alt 13a: Snake R. and JDA Dams to Nat. River (high option) plus CWA, Adj. Sched., BPA Direct Probabilistic | 100.0 | 178.8 | | | | | | | | | 100% |
| 20 | Alt 1: In-River Migration (low option), BPA Direct High (179) | 178.8 | 178.8 | | | | | | | | | |
| 21 | Alt 2: In-River Migration (high option) with CWA, BPA Direct High (179) | 178.8 | 178.8 | | | | | | | | | |
| 22 | Alt 3: Expanded Transport, BPA Direct High (179) | 178.8 | 178.8 | | | | | | | | | |
| 23 | Alt 4: Expanded Transport (low option), BPA Direct Low (100) | 100.0 | 100.0 | | | | | | | | | |
| 24 | Alt 5: Transportation Plus, BPA Direct High (179) | 178.8 | 178.8 | | | | | | | | | |
| 25 | Alt 6: Transportation Plus and CWA, BPA Direct High (179) | 178.8 | 178.8 | | | | | | | | | |
| 26 | Alt 7u: Two Snake River Dams to Natural River, Unadj. Sched., BPA Direct High (179) | 178.8 | 178.8 | | | | | | | | | |
| 27 | Alt 7a: Two Snake River Dams to Natural River, Adj. Sched., BPA Direct High (179) | 178.8 | 178.8 | | | | | | | | | |
| 28 | Alt 8u: Four Snake River Dams to Natural River, Unadj. Sched., BPA Direct High (179) | 178.8 | 178.8 | | | | | | | | | |
| 29 | Alt 8a: Four Snake River Dams to Natural River, Adj. Sched., BPA Direct High (179) | 178.8 | 178.8 | 100% | | | | | | | | |
| 30 | Alt 9u: Snake River and JDA Dams to Natural River, Unadj. Sched., BPA Direct High (179) | 178.8 | 178.8 | | 100% | | | | | | | |
| 31 | Alt 9a: Snake River and JDA Dams to Natural River, Adj. Sched., BPA Direct High (179) | 178.8 | 178.8 | | | 100% | | | | | | |
| 32 | Alt 10: John Day Dam to Natural River, BPA Direct High (179) | 178.8 | 178.8 | | | | 100% | | | | | |
| 33 | Alt 11: John Day Dam to Spillway Crest, BPA Direct High (179) | 178.8 | 178.8 | | | | | 100% | | | | |
| 34 | Alt 12u: Snake R. Dams to Nat. River and JDA Dam to Spillway Crest, Unadj. Sched., BPA Direct High (179) | 178.8 | 178.8 | | | | | | 100% | | | |
| 35 | Alt 12a: Snake R. Dams to Nat. River and JDA Dam to Spillway Crest, Adj. Sched., BPA Direct High (179) | 178.8 | 178.8 | | | | | | | 100% | | |
| 36 | Alt 13u: Snake R. and JDA Dams to Nat. River (high option) plus CWA, Unadj. Sched., BPA Direct High (179) | 178.8 | 178.8 | | | | | | | | 100% | |
| 37 | Alt 13a: Snake R. and JDA Dams to Nat. River (high option) plus CWA, Adj. Sched., BPA Direct High (179) | 178.8 | 178.8 | | | | | | | | | 100% |
| 38 | Replicate 'Probabilistic Mix' from Red-Yellow-Green charts, summer 1998 | 100.0 | 178.8 | | | | | | 11.2% | | 0.8% | |
| 39 | Alt 4: Expanded Transport (low option), BPA Direct High (179) | 178.8 | 178.8 | | | | | | | | | |
| 40 | Other: enter data in row 44 of "F&W Approach" table on 'F&W Data' sheet | | | | | | | | | | | |
| 41 | Other: enter data in row 45 of "F&W Approach" table on 'F&W Data' sheet | | | | | | | | | | | |

# Attachment 2: NORM Input, Fish and Wildlife Data (Continued)

**NORM Input for Fish and Wildlife Capital Program & Other Entities O&M (a)**

## Expenses in the F&W Alternatives - the 4 Components

These figures are from "3SVSum10.xls", maintained by Phil Thor, BPA

The baseline numbers are compared to the alternative-specific numbers; deltas are then calculated on worksheet "Main"

***BPA Direct Program (aka BPA O&M)***

| | | The 4(h)(10)(C) credits are reflected in calculations on worksheet "Main" | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | Ave. 02-06 |
|---|---|---|---|---|---|---|---|---|---|
| | | "Baseline" numbers from the Revenue Requirement [weighted average] | 105.6 | 131.7 | 138.0 | 140.1 | 142.9 | 144.4 | 139.4 |
| | | The Low Case - from the "Expanded Transport (low option)" alternative | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| | | The High Case - from the CBFWA list of projects | 111.2 | 163.4 | 175.9 | 180.1 | 185.8 | 188.8 | 178.8 |

***Capital Program***

| | | The 4(h)(10)(C) credits have already been accounted for in these numbers (colors match pairs of Adj-Unadj alts.) | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | Ave. 02-06 |
|---|---|---|---|---|---|---|---|---|---|
| | | "Baseline" numbers from the Revenue Requirement [weighted average] {note 1} | 103.9 | 121.1 | 128.8 | 140.6 | 153.2 | 161.6 | 141.1 |
| 1 | Alt 1 | In-River Migration (low option) | 102.6 | 119.6 | 127.5 | 142.1 | 155.6 | 163.1 | 141.6 |
| 2 | Alt 2 | In-River Migration (high option) with CWA, Unadj. Sched. | 117.8 | 147.0 | 157.6 | 173.1 | 206.6 | 238.0 | 184.4 |
| 4 | Alt 3 | Expanded Transport | 102.6 | 120.1 | 128.6 | 140.0 | 150.4 | 155.9 | 139.0 |
| 5 | Alt 4 | Expanded Transport (low option) | 97.2 | 111.5 | 117.8 | 124.2 | 131.1 | 135.1 | 124.0 |
| 6 | Alt 5 | Transportation Plus | 102.6 | 120.1 | 128.6 | 142.5 | 156.8 | 165.6 | 142.7 |
| 7 | Alt 6 | Transportation Plus and CWA, Unadj. Sched. | 105.9 | 126.1 | 135.0 | 151.1 | 169.4 | 182.4 | 152.8 |
| 9 | Alt 7u | Two Snake River Dams to Natural River, Unadj. Sched. | 102.6 | 118.4 | 125.1 | 153.2 | 179.8 | 184.5 | 152.2 |
| 10 | Alt 7a | Two Snake River Dams to Natural River, Adj. Sched. | 102.6 | 118.4 | 125.1 | 136.2 | 146.2 | 151.4 | 135.5 |
| 11 | Alt 8u | Four Snake River Dams to Natural River, Unadj. Sched. | 101.9 | 116.6 | 122.1 | 148.7 | 174.2 | 193.2 | 151.0 |
| 12 | Alt 8a | Four Snake River Dams to Natural River, Adj. Sched. | 101.9 | 116.6 | 122.1 | 131.7 | 140.6 | 144.0 | 131.0 |
| 13 | Alt 9u | Snake River and JDA Dams to Natural River, Unadj. Sched. | 101.9 | 116.4 | 121.7 | 143.3 | 163.7 | 181.8 | 145.4 |
| 14 | Alt 9a | Snake River and JDA Dams to Natural River, Adj. Sched. | 101.9 | 116.4 | 121.7 | 126.4 | 130.1 | 132.6 | 125.4 |
| 15 | Alt 10 | John Day Dam to Natural River | 102.6 | 119.3 | 127.0 | 136.8 | 145.1 | 151.7 | 136.0 |
| 16 | Alt 11 | John Day Dam to Spillway Crest | 102.6 | 119.6 | 127.5 | 142.1 | 155.6 | 162.4 | 141.4 |
| 17 | Alt 12u | Snake R. Dams to Nat. River and JDA Dam to Spillway Crest, Unadj. Sched. | 101.9 | 116.6 | 122.1 | 148.7 | 174.2 | 192.5 | 150.8 |
| 18 | Alt 12a | Snake R. Dams to Nat. River and JDA Dam to Spillway Crest, Adj. Sched. | 101.9 | 116.6 | 122.1 | 131.7 | 140.6 | 143.3 | 130.9 |
| 19 | Alt 13u | Snake R. and JDA Dams to Nat. River (high option) plus CWA, Unadj. Sched. | 109.1 | 126.9 | 140.6 | 163.9 | 186.8 | 209.0 | 165.4 |
| 20 | Alt 13a | Snake R. and JDA Dams to Nat. River (high option) plus CWA, Adj. Sched. | 108.7 | 123.1 | 133.4 | 140.7 | 146.6 | 151.7 | 139.1 |

***Other Entities' O&M (formerly called Reimbursable O&M or Corps/Bureau O&M)***

| | | The 4(h)(10)(C) credits have already been accounted for in these numbers (colors match pairs of Adj-Unadj alts.) | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | Ave. 02-06 |
|---|---|---|---|---|---|---|---|---|---|
| | | "Baseline" numbers from the Revenue Requirement [In-River Migration, low option] {note 1} | 46.5 | 48.1 | 51.0 | 51.3 | 54.0 | 56.2 | 52.1 |
| 1 | Alt 1 | In-River Migration (low option) | 43.9 | 45.4 | 48.3 | 49.0 | 50.7 | 53.0 | 49.3 |
| 2 | Alt 2 | In-River Migration (high option) with CWA, Unadj. Sched. | 44.3 | 45.9 | 48.7 | 49.5 | 55.0 | 57.6 | 51.3 |
| 4 | Alt 3 | Expanded Transport | 47.0 | 48.7 | 51.6 | 52.1 | 53.9 | 56.0 | 52.5 |
| 5 | Alt 4 | Expanded Transport (low option) | 47.0 | 48.6 | 51.4 | 51.8 | 55.5 | 57.7 | 53.0 |
| 6 | Alt 5 | Transportation Plus | 47.0 | 48.7 | 51.6 | 52.7 | 56.4 | 59.2 | 53.7 |
| 7 | Alt 6 | Transportation Plus and CWA, Unadj. Sched. | 47.2 | 48.8 | 51.8 | 52.8 | 56.5 | 59.3 | 53.8 |
| 9 | Alt 7u | Two Snake River Dams to Natural River, Unadj. Sched. | 47.0 | 48.4 | 51.2 | 43.1 | 40.6 | 42.4 | 45.2 |
| 10 | Alt 7a | Two Snake River Dams to Natural River, Adj. Sched. | 47.0 | 48.6 | 51.4 | 51.8 | 55.5 | 57.7 | 53.0 |
| 11 | Alt 8u | Four Snake River Dams to Natural River, Unadj. Sched. | 47.0 | 48.4 | 51.2 | 43.1 | 40.6 | 35.9 | 43.9 |
| 12 | Alt 8a | Four Snake River Dams to Natural River, Adj. Sched. | 47.0 | 48.6 | 51.4 | 51.8 | 55.5 | 57.7 | 53.0 |
| 13 | Alt 9u | Snake River and JDA Dams to Natural River, Unadj. Sched. | 47.0 | 48.4 | 51.2 | 43.1 | 40.6 | 35.9 | 43.9 |
| 14 | Alt 9a | Snake River and JDA Dams to Natural River, Adj. Sched. | 47.0 | 48.6 | 51.4 | 51.8 | 55.5 | 57.7 | 53.0 |
| 15 | Alt 10 | John Day Dam to Natural River | 47.0 | 48.7 | 51.6 | 52.4 | 50.5 | 52.8 | 51.2 |
| 16 | Alt 11 | John Day Dam to Spillway Crest | 47.0 | 48.7 | 51.6 | 52.5 | 54.2 | 56.7 | 52.8 |
| 17 | Alt 12u | Snake R. Dams to Nat. River and JDA Dam to Spillway Crest, Unadj. Sched. | 47.0 | 48.4 | 51.2 | 43.1 | 40.6 | 35.9 | 43.9 |
| 18 | Alt 12a | Snake R. Dams to Nat. River and JDA Dam to Spillway Crest, Adj. Sched. | 47.0 | 48.6 | 51.4 | 51.8 | 55.5 | 57.7 | 53.0 |
| 19 | Alt 13u | Snake R. and JDA Dams to Nat. River (high option) plus CWA, Unadj. Sched. | 40.4 | 41.7 | 44.3 | 40.0 | 37.4 | 33.1 | 39.3 |
| 20 | Alt 13a | Snake R. and JDA Dams to Nat. River (high option) plus CWA, Adj. Sched. | 47.0 | 48.6 | 51.4 | 51.8 | 55.5 | 57.7 | 53.0 |

***Operational Impacts (effects of non-power constraints)***

Operational Impacts are reflected in ToolKit or Riskmod

No 4(h)(10)(C) credits are reflected in NORM or ToolKit for operations (recent BPA calculations of annual 4(h)(10)(C) credits have been very low or zero; this is a conservative approach, avoiding over-optimism).

# Attachment 2: NORM Input, Fish and Wildlife Data (Continued)

**NORM Input for Fish and Wildlife Capital Program & Other Entities O&M (b)**

## Expenses in the F&W Alternatives - the 4 Components

These figures are from "3SVSum10.xls", maintained by Phil Thor, BPA

The baseline numbers are compared to the alternative-specific numbers; deltas are then calculated on worksheet "Main"

| | | | | | | | | | Ave. |
|---|---|---|---|---|---|---|---|---|---|
| | | ***BPA Direct Program (aka BPA O&M)*** | | | | | | | |
| | | The 4(h)(10)(C) credits are reflected in calculations on worksheet "Main" | **2007** | **2008** | **2009** | **2010** | **2011** | **2012** | **07-11** |
| | | "Baseline" numbers from the Revenue Requirement [weighted average] | 147.3 | 150.2 | 153.2 | 156.3 | 159.5 | 162.7 | 153.3 |
| | | The Low Case - from the "Expanded Transport (low option)" alternative | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| | | The High Case - from the CBFWA list of projects | 194.5 | 200.3 | 206.3 | 212.5 | 218.9 | 225.5 | 206.5 |
| | | ***Capital Program*** | | | | | | | **Ave.** |
| | | The 4(h)(10)(C) credits have already been accounted for in these numbers (colors match pairs of Adj-Unadj alts.) | **2007** | **2008** | **2009** | **2010** | **2011** | **2012** | **07-11** |
| | | "Baseline" numbers from the Revenue Requirement [weighted average] {note 1} | 172.1 | 213.1 | 254.0 | 256.2 | 249.7 | 250.4 | 229.0 |
| 1 | Alt 1 | In-River Migration (low option) | 168.0 | 165.6 | 166.6 | 167.1 | 162.7 | 158.6 | 166.0 |
| 2 | Alt 2 | In-River Migration (high option) with CWA, Unadj. Sched. | 246.9 | 392.9 | 535.9 | 526.1 | 516.2 | 506.6 | 443.6 |
| 4 | Alt 3 | Expanded Transport | 159.0 | 156.7 | 157.8 | 158.4 | 154.2 | 150.2 | 157.2 |
| 5 | Alt 4 | Expanded Transport (low option) | 136.3 | 134.4 | 131.2 | 127.6 | 123.9 | 120.4 | 130.7 |
| 6 | Alt 5 | Transportation Plus | 170.5 | 168.1 | 169.0 | 169.5 | 165.1 | 160.9 | 168.4 |
| 7 | Alt 6 | Transportation Plus and CWA, Unadj. Sched. | 189.6 | 331.9 | 475.7 | 471.5 | 462.5 | 453.7 | 386.2 |
| 9 | Alt 7u | Two Snake River Dams to Natural River, Unadj. Sched. | 187.2 | 184.1 | 184.2 | 183.3 | 177.2 | 171.5 | 183.2 |
| 10 | Alt 7a | Two Snake River Dams to Natural River, Adj. Sched. | 172.9 | 188.4 | 188.5 | 187.5 | 181.4 | 175.6 | 183.7 |
| 11 | Alt 8u | Four Snake River Dams to Natural River, Unadj. Sched. | 210.0 | 206.2 | 205.3 | 203.3 | 196.1 | 189.5 | 204.2 |
| 12 | Alt 8a | Four Snake River Dams to Natural River, Adj. Sched. | 163.7 | 179.0 | 195.9 | 211.4 | 204.1 | 197.5 | 190.8 |
| 13 | Alt 9u | Snake River and JDA Dams to Natural River, Unadj. Sched. | 198.1 | 227.0 | 258.5 | 255.6 | 247.6 | 240.3 | 237.4 |
| 14 | Alt 9a | Snake River and JDA Dams to Natural River, Adj. Sched. | 151.9 | 199.9 | 249.0 | 263.7 | 255.6 | 248.2 | 224.0 |
| 15 | Alt 10 | John Day Dam to Natural River | 156.2 | 186.4 | 219.7 | 219.4 | 214.3 | 209.3 | 199.2 |
| 16 | Alt 11 | John Day Dam to Spillway Crest | 166.7 | 164.3 | 165.3 | 165.8 | 161.5 | 201.9 | 164.7 |
| 17 | Alt 12u | Snake R. Dams to Nat. River and JDA Dam to Spillway Crest, Unadj. Sched. | 208.7 | 204.9 | 204.1 | 202.1 | 194.9 | 232.8 | 202.9 |
| 18 | Alt 12a | Snake R. Dams to Nat. River and JDA Dam to Spillway Crest, Adj. Sched. | 162.4 | 177.8 | 194.6 | 210.2 | 202.9 | 240.8 | 189.6 |
| 19 | Alt 13u | Snake R. and JDA Dams to Nat. River (high option) plus CWA, Unadj. Sched. | 227.6 | 344.1 | 457.3 | 446.8 | 435.9 | 425.7 | 382.3 |
| 20 | Alt 13a | Snake R. and JDA Dams to Nat. River (high option) plus CWA, Adj. Sched. | 172.9 | 313.5 | 449.3 | 456.5 | 445.7 | 435.4 | 367.6 |
| | | ***Other Entities' O&M (formerly called Reimbursable O&M or Corps/Bureau O&M)*** | | | | | | | **Ave.** |
| | | The 4(h)(10)(C) credits have already been accounted for in these numbers (colors match pairs of Adj-Unadj alts.) | **2007** | **2008** | **2009** | **2010** | **2011** | **2012** | **07-11** |
| | | "Baseline" numbers from the Revenue Requirement [In-River Migration, low option] {note 1} | 54.7 | 52.3 | 51.5 | 51.6 | 53.2 | 54.4 | 52.6 |
| 1 | Alt 1 | In-River Migration (low option) | 55.8 | 57.4 | 59.1 | 60.9 | 62.7 | 64.6 | 59.2 |
| 2 | Alt 2 | In-River Migration (high option) with CWA, Unadj. Sched. | 60.5 | 62.3 | 64.1 | 66.1 | 68.0 | 70.1 | 64.2 |
| 4 | Alt 3 | Expanded Transport | 58.9 | 60.7 | 62.5 | 64.4 | 66.3 | 68.3 | 62.5 |
| 5 | Alt 4 | Expanded Transport (low option) | 60.6 | 62.4 | 64.3 | 66.2 | 68.2 | 70.2 | 64.3 |
| 6 | Alt 5 | Transportation Plus | 62.1 | 64.0 | 65.8 | 67.8 | 69.8 | 71.9 | 65.9 |
| 7 | Alt 6 | Transportation Plus and CWA, Unadj. Sched. | 62.2 | 64.1 | 65.9 | 67.9 | 70.0 | 72.1 | 66.0 |
| 9 | Alt 7u | Two Snake River Dams to Natural River, Unadj. Sched. | 44.9 | 46.2 | 47.6 | 49.0 | 50.5 | 52.0 | 47.6 |
| 10 | Alt 7a | Two Snake River Dams to Natural River, Adj. Sched. | 49.0 | 46.2 | 47.6 | 49.0 | 50.5 | 52.0 | 48.5 |
| 11 | Alt 8u | Four Snake River Dams to Natural River, Unadj. Sched. | 33.5 | 34.5 | 35.6 | 36.6 | 37.7 | 38.9 | 35.6 |
| 12 | Alt 8a | Four Snake River Dams to Natural River, Adj. Sched. | 51.1 | 44.1 | 40.5 | 36.6 | 37.7 | 38.9 | 42.0 |
| 13 | Alt 9u | Snake River and JDA Dams to Natural River, Unadj. Sched. | 33.5 | 26.0 | 20.1 | 20.7 | 21.3 | 21.9 | 24.3 |
| 14 | Alt 9a | Snake River and JDA Dams to Natural River, Adj. Sched. | 51.1 | 36.0 | 25.0 | 20.7 | 21.3 | 21.9 | 30.8 |
| 15 | Alt 10 | John Day Dam to Natural River | 55.5 | 48.6 | 50.1 | 51.6 | 53.1 | 54.7 | 51.8 |
| 16 | Alt 11 | John Day Dam to Spillway Crest | 59.5 | 61.3 | 63.9 | 65.8 | 67.8 | 65.4 | 63.7 |
| 17 | Alt 12u | Snake R. Dams to Nat. River and JDA Dam to Spillway Crest, Unadj. Sched. | 33.5 | 34.5 | 35.6 | 36.6 | 37.7 | 38.9 | 35.6 |
| 18 | Alt 12a | Snake R. Dams to Nat. River and JDA Dam to Spillway Crest, Adj. Sched. | 47.0 | 44.1 | 40.5 | 36.6 | 37.7 | 38.9 | 41.2 |
| 19 | Alt 13u | Snake R. and JDA Dams to Nat. River (high option) plus CWA, Unadj. Sched. | 30.6 | 22.2 | 16.9 | 17.4 | 17.9 | 18.4 | 21.0 |
| 20 | Alt 13a | Snake R. and JDA Dams to Nat. River (high option) plus CWA, Adj. Sched. | 44.1 | 32.3 | 21.8 | 17.4 | 18.0 | 18.5 | 26.7 |

***Operational Impacts (effects of non-power constraints)***

Operational Impacts are reflected in ToolKit or Riskmod

No 4(h)(10)(C) credits are reflected in NORM or ToolKit for operations (recent BPA calculations of annual 4(h)(10)(C) credits have been very low or zero; this is a conservative approach, avoiding over-optimism).

# Table 80: INPUTS TO NON-OPERATING RISK MODEL (NORM)

- Deviations are expressed in annual average amounts. Negative amounts indicate a decrease in net revenues, positive amounts indicate an increase in net revenues.
- This is a PBL-only risk analysis.

| | Probability | Deviation ($ Millions) |
|---|---|---|
| Achievement of Cost Review Recommendation #1 re: Reduce staffing and support costs of power marketing and other PBL functions not directly related to operation of the federal power system | 25%<br>50%<br>25% | $0<br>–$4.5<br>–$8.9 |
| Achievement of Cost Review Recommendation#6 re: development of a consolidated/integrated capital asset management strategy for the FCRPS: managing COE/Bureau of Reclamation O&M expense | 15%<br>75%<br>10% | $0<br>-$5.7<br>-$18.7 |
| Achievement of Cost Review Recommendation#6 re: development of a consolidated/integrated capital asset management strategy for the FCRPS: enhancing COE/Bureau of Reclamation revenues | 50%<br>35%<br>15% | $0<br>$5<br>$15 |
| Achievement of Cost Review Recommendation #7 re: WNP-2: Aggressive cost management, flexible response to market conditions – O&M Expenses | 10%<br>40%<br>50% | $0<br>-$14<br>-$4 |
| Achievement of Cost Review Recommendation #7 re: WNP-2: Aggressive cost management, flexible response to market conditions – Revenue enhancements | 40%<br>40%<br>20% | $12<br>$7<br>$4 |
| Potential for required increase in payments to WNP-2 De-commissioning fund | 30%<br>50%<br>20% | $0<br>-$2<br>-$4 |
| Uncertainty re: PBL's costs for transmission, since transmission business line will re-set rates before FY 2002 | 40%<br>20%<br>10%<br>20%<br>10% | $0<br>-$10<br>-$25<br>$10<br>$25 |
| Achievement of Cost Review Recommendation #9 re: Potential achievement of some legislative efficiencies (AEP) | 70%<br>30% | $0<br>$7 |
| Achievement of Cost Review Recommendation #8 re: Reduction of administrative and other internal support service costs | 10%<br>50%<br>30%<br>10% | -$1<br>-$2<br>-$4<br>-$7 |
| Costs of separation | 50%<br>30%<br>20% | $0<br>-$2<br>-$4 |
| C&R"make good" funds for renewables and low income weatherization | 25%<br>25%<br>30%<br>10%<br>10%<br>0%<br>0% | $0<br>-$1<br>-$2<br>-$3<br>-$4<br>-$5<br>-$6 |
| Interest rate risk – Potential change in interest expense due to uncertainty re: interest rates (This risk is a new addition to the model, with variability expressed in percentage points rather than dollars) | 5%<br>10%<br>20%<br>30%<br>20%<br>10%<br>5% | -2%<br>-1.25%<br>-.75%<br>0.00%<br>.75%<br>1.25%<br>2.00% |
| • Deviation from the weighted average (the point estimate included in the revenue requirement) of the 13 system configuration alternatives:<br>  • Corps plant investment related to fish and wildlife<br>  • "Other entities" O&M related to fish and wildlife<br>  • Deviation from the mean for BPA direct program costs | Each alternative weighted equally | |

# Attachment 3: Sample of NORM Output

**@RISK Simulation of NORM**

Simulations= 1 Iterations= 300

| Name Description Iteration# / | Aggregate / 2002 Output | Aggregate / 2003 Output | Aggregate / 2004 Output | Aggregate / 2005 Output | Aggregate / 2006 Output | Key Discrete(I11:Z11,I12:Z12) |
|---|---|---|---|---|---|---|
| 1 | -54.22 | -59.25 | -57.17 | -56.17 | -51.37 | 1 |
| 2 | 20.36 | 24.43 | 24.84 | 25.46 | 29.48 | 1 |
| 3 | -19.68 | -23.98 | -30.56 | -30.91 | -32.50 | 1 |
| 4 | -17.53 | -22.97 | -27.48 | -30.81 | -29.35 | 1 |
| 5 | -62.56 | -67.63 | -68.37 | -70.86 | -68.83 | 1 |
| 6 | 51.20 | 54.48 | 53.32 | 61.42 | 63.16 | 1 |
| 7 | -5.60 | -12.70 | -14.31 | -15.63 | -12.04 | 1 |
| 8 | 14.18 | 18.10 | 12.23 | 18.41 | 19.76 | 1 |
| 9 | -0.43 | -10.09 | -15.83 | -13.54 | -14.24 | 1 |
| 10 | -17.76 | -19.74 | -28.57 | -29.25 | -27.45 | 1 |
| 11 | 41.54 | 42.57 | 36.75 | 43.23 | 41.63 | 1 |
| 12 | 22.99 | 21.66 | 23.11 | 24.27 | 29.20 | 1 |
| 13 | 4.01 | 8.69 | 6.34 | 9.94 | 13.11 | 1 |
| 14 | -21.01 | -16.50 | -20.70 | -22.11 | -18.55 | 1 |
| 15 | 0.70 | -4.04 | -5.86 | -6.09 | -3.94 | 1 |
| 16 | -0.63 | 0.86 | -6.62 | -8.63 | -6.99 | 1 |
| 17 | 21.75 | 24.98 | 26.96 | 29.36 | 27.22 | 1 |
| 18 | -29.46 | -34.90 | -40.08 | -38.01 | -37.44 | 1 |
| 19 | -13.97 | -17.07 | -15.72 | -19.91 | -18.94 | 1 |
| 20 | -20.65 | -20.79 | -17.77 | -14.91 | -12.32 | 1 |
| | | | . | | | |
| | | | . | | | |
| | | | . | | | |
| 280 | -11.75 | -18.17 | -24.78 | -30.18 | -29.36 | 1 |
| 281 | 6.87 | 5.81 | 3.86 | 2.45 | 2.35 | 1 |
| 282 | -2.49 | -4.54 | -5.94 | -9.75 | -3.45 | 1 |
| 283 | -36.12 | -41.16 | -49.52 | -55.75 | -56.75 | 1 |
| 284 | -0.41 | -0.86 | 0.12 | 1.05 | 1.14 | 1 |
| 285 | -39.53 | -39.24 | -43.20 | -43.07 | -39.17 | 1 |
| 286 | 1.42 | -0.11 | -3.03 | -4.57 | -1.10 | 1 |
| 287 | -28.74 | -30.69 | -30.75 | -29.72 | -31.04 | 1 |
| 288 | 2.92 | 1.63 | 2.61 | 0.61 | 1.14 | 1 |
| 289 | -5.27 | -7.43 | -14.65 | -18.11 | -21.72 | 1 |
| 290 | -20.91 | -22.96 | -27.83 | -23.23 | -20.60 | 1 |
| 291 | 8.40 | 8.66 | 3.95 | 5.98 | 5.17 | 1 |
| 292 | 0.44 | 0.76 | 0.82 | -0.51 | 1.52 | 1 |
| 293 | -2.84 | -1.31 | -8.16 | -5.54 | -4.46 | 1 |
| 294 | -6.23 | -12.05 | -17.32 | -19.61 | -18.13 | 1 |
| 295 | -7.72 | -12.33 | -17.39 | -20.26 | -19.62 | 1 |
| 296 | -12.73 | -18.35 | -21.26 | -23.06 | -21.72 | 1 |
| 297 | 9.34 | 10.39 | 12.35 | 18.36 | 20.05 | 1 |
| 298 | 10.45 | 3.65 | 1.02 | 4.83 | 2.76 | 1 |
| 299 | 20.63 | 24.09 | 18.53 | 20.73 | 20.03 | 1 |
| 300 | -14.58 | -18.91 | -19.46 | -17.82 | -19.22 | 1 |

processes, there is uncertainty about how quickly any breaching plan could be implemented. Reflecting this uncertainty, there are two schedules, "unadjusted" and "adjusted," for the five breaching Alternatives. The adjusted schedule is assigned a probability of 90 percent, and the unadjusted schedule is assigned a probability of 10 percent. Thus, there are a total of 18 fish and wildlife scenarios (*see* Volume1, Chapter 13 of Revenue Requirement Study Documentation, WP-02-FS-BPA-02A, and DeWolf *et al*., WP-02-E-BPA-13).

There are four components of BPA's fish and wildlife costs: Capital Recovery Expenses, BPA's O&M (also called the BPA Direct Program), Other Entities' O&M (formerly called Reimbursable Expenses), and Operations. The financial impacts of the Operations component are modeled in RiskMod; the other three components are modeled in NORM. Each of the 18 fish and wildlife scenarios specifies a particular cost for Capital Recovery, Other Entities' O&M, and Operations. BPA fish and wildlife O&M expense is modeled independently. NORM is run 18 times, once for each of the 18 fish and wildlife scenarios.

In each of the 18 NORM runs, a single fish and wildlife scenario is used throughout the run, reflecting the Capital Recovery and Other Entities' O&M expenses. BPA fish and wildlife O&M is modeled by a uniform probability distribution with the upper bound the highest submission, averaging $179 million per year, and the lower bound $100 million, about the current level of BPA O&M expenses.

Each run comprises 300 games. In each of the 300 games, the expenses for the Capital Recovery and Other Entities' O&M are the same, but the expenses for BPA O&M expenses vary from

game to game. The probability distribution for BPA fish and wildlife O&M expenses is the same for each of the 18 fish and wildlife scenarios. The values output by NORM are deviations from the deterministic values in the revenue requirement. For example, the revenue requirement uses the expected value of the cost of BPA fish and wildlife O&M (five-year average of $139.4 million). If the random value drawn by NORM for BPA O&M expense is $149.9 million (five-year average), then the value actually reported in the NORM output would be -$10.5 million (the higher cost implies a reduction in net revenues).

The outputs from the 18 runs are combined in a large file of 3,900 games, which are weighted so that each of the Fish and Wildlife Alternatives appears as a percentage of the total games called for by the weighting described above. For the non-breaching Fish and Wildlife Alternatives there is only one schedule; each of the NORM runs for non-breaching Fish and Wildlife Alternatives contributes 300 games to the aggregate file. For the 5 breaching Fish and Wildlife Alternatives, 30 games (10 percent of 300) are taken from the unadjusted schedule and 270 (90 percent of 300) from the adjusted schedule. These outputs are then used in the ToolKit model, which determines the TPP (*see* Volume 1, Chapter 12 of Revenue Requirement Study Documentation, WP-02-FS-BPA-02A).

Attachments:

1. NORM inputs – "Main,"
2. NORM inputs – "F&W_Data,"
3. A sample of NORM output