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

## 2007 Wholesale Power Rate Case Initial Proposal

# RISK ANALYSIS STUDY DOCUMENTATION

November 2005

WP-07-E-BPA-04A

**RISK MITIGATION DOCUMENTATION**
**TABLE OF CONTENTS**

Page

**COMMONLY USED ACRONYMS**

| | |
|---|---|
| AANR | Audited Accumulated Net Revenues |
| AC | Alternating Current |
| AER | Actual Energy Regulation |
| Affiliated Tribes | Affiliated Tribes of Northwest Indians |
| AFDUC | Allowance for Funds Used During Construction |
| AGC | Automatic Generation Control |
| aMW | Average Megawatt |
| Alcoa | Alcoa Inc. |
| AMNR | Accumulated Modified Net Revenues |
| ANR | Accumulated Net Revenues |
| ANRT | Accumulated Net Revenue Threshold |
| AOP | Assured Operating Plan |
| APS | Ancillary Products and Services (rate) |
| ASC | Average System Cost |
| Avista | Avista Corporation, Water Power Division |
| BASC | BPA Average System Cost |
| BiOp | Biological Opinion |
| BOR | Bureau of Reclamation |
| 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 |
| CAISO | California Independent System Operator |
| CBFWA | Columbia Basin Fish & Wildlife Authority |
| CBP | Columbia Basin Project |
| CCCT | Combined-Cycle Combustion Turbine |
| CEC | California Energy Commission |
| CFAC | Columbia Falls Aluminum Company |
| Cfs | Cubic feet per second |
| COB | California-Oregon Border |
| COE | U.S. Army Corps of Engineers |
| ConMod | Conservation Modernization Program |
| COSA | Cost of Service Analysis |
| Council | Northwest Power Planning and Conservation Council |
| CP | Coincidental Peak |
| CRAC | Cost Recovery Adjustment Clause |
| CRC | Conservation Rate Credit |
| CRITFC | Columbia River Inter-Tribal Fish Commission |
| CSP | Customer System Peak |
| CSPE | Columbia Storage Power Exchange |
| CT | Combustion Turbine |

| | |
|---|---|
| CWA | Clear Water Act |
| CY | Calendar Year (Jan-Dec) |
| DC | Direct Current |
| DDC | Dividend Distribution Clause |
| DJ | Dow Jones |
| DMP | Data Management Procedures |
| DO | Debt Optimization |
| DOE | Department of Energy |
| DROD | Draft Record of Decision |
| DSIs | Direct Service Industrial Customers |
| DSR | Debt Service Reassignment |
| ECC | Energy Content Curve |
| EFB | Excess Federal Power |
| EIA | Energy Information Administration |
| EIS | Environmental Impact Statement |
| EN | Energy Northwest, Inc. |
| Energy Northwest, Inc. | Formerly Washington Public Power Supply System (Nuclear) |
| Energy Services | Energy Services, Inc. |
| EPA | Environmental Protection Agency |
| EPP | Environmentally Preferred Power |
| ESA | Endangered Species Act |
| EWEB | Eugene Water & Electric Board |
| F&O | Financial and Operating Reports |
| FBPF | Forward Flat-Block Price Forecast |
| FBS | Federal Base System |
| FCCF | Fish Cost Contingency Fund |
| FCRPS | Federal Columbia River Power System |
| FCRTS | Federal Columbia River Transmission System |
| FERC | Federal Energy Regulatory Commission |
| FELCC | Firm Energy Load Carrying Capability |
| Fifth Power Plan | Council's Fifth 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) |
| GAAP | Generally Accepted Accounting Principles |
| 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 |
| HOSS | Hourly Operating and Scheduling Simulator |
| ICNU | Industrial Customers of Northwest Utilities |
| ICUA | Idaho Consumer-Owned Utilities Association, Inc. |
| IOU REP Settlement benefits | Investor-Owned Utilities Residential Exchange Program Settlement benefits |
| IOUs | Investor-Owned Utilities of the Pacific Northwest |
| IP | Industrial Firm Power (rate) |
| IP TAC | Industrial Firm Power Targeted Adjustment Charge |
| IPC | Idaho Power Company |
| ISC | Investment Service Coverage |
| ISO | Independent System Operator |
| KAF | Thousand Acre Feet |
| kcfs | kilo (thousands) of cubic feet per second |
| K/I | Kilowatt-hour/Investment Ratio for Low Density Discount |
| ksfd | thousand second foot day |
| kV | Kilovolt (1000 volts) |
| kW | Kilowatt (1000 watts) |
| kWh | Kilowatt-hour |
| LB CRAC | Load-Based Cost Recovery Adjustment Clause |
| LCP | Least-Cost Plan |
| LDD | Low Density Discount |
| LLH | Light Load Hour |
| LOLP | Loss of Load Probability |
| LRSCP | Lower Snake River Compensation Plan |
| m/kWh | Mills per kilowatt-hour |
| MAC | Market Access Coalition Group |
| MAF | Million Acre Feet |
| MC | Marginal Cost |
| MCA | Marginal Cost Analysis |
| MCS | Model Conservation Standards |
| M/M | Meters/Miles-of-Line Ratio for Low Density Discount |
| Mid-C | Mid-Columbia |
| MIMA | Market Index Monthly Adjustment |
| MIP | Minimum Irrigation Pool |
| MMBTU | Million British Thermal Units |
| MNR | Modified Net Revenues |
| MOA | Memorandum of Agreement |
| MOP | Minimum Operating Pool |
| MORC | Minimum Operating Reliability Criteria |
| MT | Market Transmission (rate) |

| | |
|---|---|
| MW | Megawatt (1 million watts) |
| MWh | Megawatt-hour |
| NCD | Non-coincidental Demand |
| NEC | Northwest Energy Coalition |
| NEPA | National Environmental Policy Act |
| NERC | North American Electric Reliability Council |
| NEW | Northwestern Energy |
| NF | Nonfirm Energy (rate) |
| NFB Adjustment | National Marine Fisheries Service (NMFS) Federal Columbia River Power System (FCRPS) Biological Opinion (BiOp) Adjustment |
| NLSL | New Large Single Load |
| NMFS | National Marine Fisheries Service |
| NOAA Fisheries | National Oceanographic and Atmospheric Administration Fisheries |
| 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 | Northwest Power Planning Council |
| NWPPC C&R | Northwest Power Planning Council Cost and Revenues Analysis |
| O&M | Operation and Maintenance |
| OMB | Office of Management and Budget |
| OPUC | Oregon Public Utility Commission |
| OURCA | Oregon Utility Resource Coordination Association |
| ORC | Operating Reserves Credit |
| 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 |
| PFR | Power Function Review |

| | |
|---|---|
| PGE | Portland General Electric Company |
| PGP | Public Generating Pool |
| PMA | Power Marketing Agencies |
| PNCA | Pacific Northwest Coordination Agreement |
| PNGC | Pacific Northwest Generating Cooperative |
| PNRR | Planned Net Revenues for Risk |
| PNW | Pacific Northwest |
| POD | Point of Delivery |
| POI | Point of Integration/Point of Interconnection |
| POM | Point of Metering |
| PPC | Public Power Council |
| PPLM | PP&L Montana, LLC |
| Project Act | Bonneville Project Act |
| PSA | Power Sales Agreement |
| PSC | Power Sales Contract |
| PSE | Puget Sound Energy |
| PSW | Pacific Southwest |
| PTP | Point-to-Point |
| PUD | Public or People's Utility District |
| RAM | Rate Analysis Model (computer model) |
| RAS | Remedial Action Scheme |
| Reclamation | Bureau of Reclamation |
| Renewable Northwest | Renewable Northwest Project |
| RD | Regional Dialogue |
| REP | Residential Exchange Program |
| RFA | Revenue Forecast Application |
| 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 Operator |
| SCCT | Single-Cycle Combustion Turbine |
| SCRA | Supplemental Contingency Reserve Adjustment |
| Shoshone-Bannock | Shoshone-Bannock Tribes |
| SOS | Save Our Wild Salmon |
| Slice | Slice of the System product |
| STREAM | Short-Term Risk Evaluation and Analysis Model |
| SUB | Springfield Utility Board |
| SUMY | Stepped-Up Multiyear |
| SWPA | Southwestern Power Administration |
| TAC | Targeted Adjustment Charge |

| | |
|---|---|
| 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 |
| USBR | U.S. Bureau of Reclamation |
| USFWS | U.S. Fish and Wildlife Service |
| VOR | Value of Reserves |
| WAPA | Western Area Power Administration |
| WECC | Western Electricity Coordinating Council |
| WPAG | Western Public Agencies Group |
| WPRDS | Wholesale Power Rate Development Study |
| WSPP | Western Systems Power Pool |
| WUTC | Washington Utilities and Transportation Commission |
| WY | Watt-Year |
| Yakama | Confederated Tribes and Bands of the Yakama Nation |

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# RISK ANALYSIS STUDY DOCUMENTATION

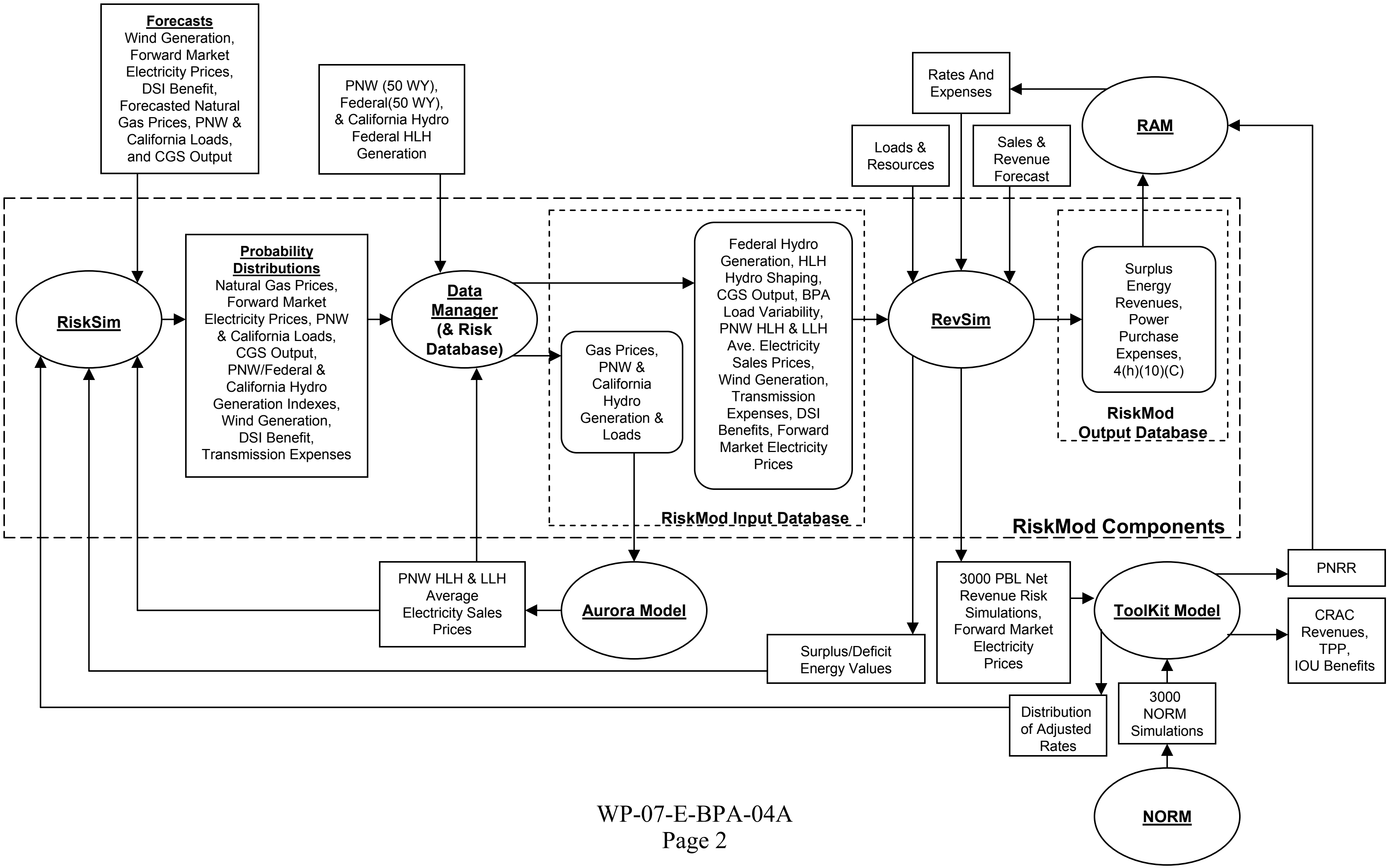
## 1. OPERATIONAL RISK ANALYSIS MODEL (RISKMOD)

### 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 Management Procedures; and RevSim, a model that calculates net revenues. RiskMod interacts with the AURORA Model, the RAM2007, and the ToolKit Model during the process of performing the Risk Analysis Study. AURORA is the computer model being used to perform the Market Price Forecast Study (*see* Market Price Forecast Study, WP-07-E-BPA-03); the RAM2007 is the computer model being used to calculate rates (*see* Wholesale Power Rate Development Study, WP-07-E-BPA-05); and the ToolKit is the computer model being used to develop the risk mitigation package that achieves BPA's 92.6 percent TPP standard (*see* Section 3 in the Risk Analysis Study, WP-07-E-BPA-04)..

Variations in monthly loads, resources, natural gas prices, forward market electricity prices, transmission expenses, and aluminum smelter benefit payments are simulated in RiskSim. Monthly spot market electricity prices for the simulated loads, resources, and natural gas prices are estimated by the AURORA Model. Data Management Procedures facilitate the format and movement of data that flow to and/or from RiskSim, AURORA, and RevSim. RevSim estimates net revenues using risk data from RiskSim, spot market electricity prices from AURORA, loads and resources data from the Load Resource Study, WP-07-E-BPA-01, various revenues from the Revenue Forecast component of the Wholesale Power Rate Development Study, WP-07-E-BPA-05, and rates and expenses from the RAM2007. Annual average surplus energy revenues, purchased power expenses, and section 4(h)(10)(C) credits calculated by RevSim are used in the Revenue Forecast and the RAM2007. Heavy Load Hour (HLH) and Light Load Hour (LLH) surplus and deficit energy values from RevSim are used in the Transmission Expense Risk Model. Net revenues estimated for each simulation by RevSim are input into the ToolKit Model to develop the risk mitigation package that achieves BPA's 92.6 percent TPP standard. The processes and interaction between each of the models and studies are depicted in Graph 1.

# Graph 1: RiskMod Risk Analysis Information Flow



### 1.2 Risk Simulation Models (RiskSim)

To quantify the effects of operational risks, BPA developed risk models that combine the use of 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 were 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, Revenue Requirement, and AURORA Model. *See* the Revenue Forecast component of the Wholesale Power Rate Development Study, WP-07-E-BPA-05; the Revenue Requirement Study, WP-07-E-BPA-02; and discussion of the AURORA Model in the Market Price Forecast Study, WP-07-E-BPA-03.

The monthly output from these risk simulation models are accumulated into a computer file to form a risk database which contains values lower than, higher than, or equal to the base case values used in the Revenue Forecast component of the Wholesale Power Rate Development Study, Revenue Requirement Study, and the AURORA Model. *Id*. 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 database and a consistent set of loads, resources, and spot market electricity prices are used to calculate net revenues in RevSim. The risk models run 3000 games to produce monthly risk data for FY 2007-2009 for this rate filing. Thus, each of the risk models produces 3000 rows and 36 columns of simulated data.

### 1.3 @RISK Computer Software

Most of the risk simulation models developed to quantify operational risks were developed in Microsoft Excel workbooks using the add-in risk simulation computer package @RISK, which 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 hydro system 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 operational risks that increase BPA's risk exposure, including the following: (1) load variability due to changes in load growth and weather; (2) nuclear plant (CGS) generation; (3) wind generation and value of output; (4) transmission expenses; (5) IOU payment benefits; (6) DSI payment benefits; and (7) variability in electricity prices due to load, resource, and natural gas price variability. All these risk factors are quantified in the Risk Analysis Study. One major operational risk that is not quantified in this Risk Analysis Study is the potential impact of the Biological Opinion. There is currently no specific guidance on what the remanded Bi-Op will contain to incorporate this risk in the Initial Proposal.

The following is a discussion of the major risk factors included in RiskMod. Each of these risk factors is used in the AURORA Model, RevSim, or both.

## 1.5 PNW and Federal Hydro Generation Risk Factors

Federal hydro generation risk is 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 Load Resource Study. *See* Load Resource Study, WP-07-E-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 2004 Biological Opinion (2004 Bi-Op) and historical monthly water supply for the 50 water years (1929-1978). *See* Load Resource Study, WP-07-E-BPA-01, regarding HydroSim.

A consistent set of monthly Federal and PNW hydro generation data for hydro operations in FY 2007 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 2004 Bi-Op, 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* Load Resource Study, WP-07-E-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 1-3 and Tables 4-6 contain the 50 x 12 tables of PNW and Federal hydro generation data for each year in the rate period. Similarly, Tables 7-9 contain the 50 x 12 table of HLH ratios from HOSS for each year in the rate period.

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* Load Resource Study, WP-07-E-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.

## Table 1: PNW Hydro Generation (aMW) with Hydro Independents for FY 2007

| Water Year | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | June | July | Aug | Sep |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1929 | 10,972 | 12,854 | 12,337 | 12,716 | 10,423 | 11,234 | 11,078 | 12,240 | 17,423 | 14,611 | 11,456 | 10,278 |
| 1930 | 11,173 | 12,298 | 12,813 | 10,996 | 12,195 | 11,092 | 11,533 | 11,204 | 14,955 | 14,983 | 11,779 | 10,092 |
| 1931 | 11,232 | 12,427 | 12,616 | 10,729 | 10,094 | 10,747 | 11,234 | 10,562 | 14,680 | 14,433 | 11,277 | 10,304 |
| 1932 | 10,571 | 12,233 | 12,704 | 11,059 | 9,940 | 13,798 | 19,500 | 21,081 | 22,210 | 17,371 | 12,726 | 11,260 |
| 1933 | 11,327 | 13,038 | 14,037 | 20,052 | 15,541 | 12,499 | 14,512 | 18,122 | 24,251 | 22,946 | 15,753 | 11,538 |
| 1934 | 13,247 | 15,855 | 23,580 | 25,705 | 22,144 | 18,465 | 21,366 | 20,767 | 14,434 | 15,093 | 10,893 | 9,869 |
| 1935 | 11,212 | 13,069 | 12,636 | 19,206 | 19,296 | 10,836 | 14,566 | 17,535 | 18,927 | 17,337 | 13,136 | 10,588 |
| 1936 | 11,104 | 12,302 | 13,072 | 11,676 | 10,375 | 10,905 | 15,419 | 21,826 | 19,068 | 14,627 | 11,869 | 10,414 |
| 1937 | 11,094 | 12,176 | 13,212 | 10,087 | 9,555 | 10,342 | 11,043 | 13,312 | 16,394 | 14,283 | 11,275 | 10,226 |
| 1938 | 11,523 | 13,152 | 13,511 | 19,533 | 13,614 | 15,576 | 17,771 | 22,849 | 21,131 | 17,337 | 11,518 | 10,904 |
| 1939 | 11,304 | 12,536 | 13,038 | 15,554 | 10,523 | 12,094 | 14,629 | 19,433 | 15,174 | 15,239 | 12,183 | 10,229 |
| 1940 | 11,525 | 12,327 | 13,146 | 14,418 | 12,696 | 15,815 | 15,802 | 17,359 | 15,613 | 14,494 | 10,677 | 9,871 |
| 1941 | 11,120 | 12,090 | 12,801 | 13,851 | 11,251 | 11,028 | 10,836 | 13,967 | 14,880 | 13,967 | 10,685 | 10,951 |
| 1942 | 11,016 | 11,569 | 15,972 | 18,262 | 13,495 | 9,190 | 14,097 | 17,073 | 20,696 | 18,614 | 13,505 | 10,455 |
| 1943 | 11,147 | 12,918 | 13,168 | 18,653 | 17,907 | 17,721 | 22,835 | 22,331 | 21,999 | 20,819 | 13,788 | 10,706 |
| 1944 | 11,368 | 12,894 | 13,645 | 13,772 | 10,774 | 9,662 | 10,176 | 11,518 | 13,414 | 13,902 | 10,376 | 10,212 |
| 1945 | 10,599 | 12,104 | 12,130 | 10,912 | 11,203 | 10,481 | 10,730 | 17,394 | 20,662 | 15,151 | 11,742 | 10,210 |
| 1946 | 11,087 | 13,065 | 13,366 | 17,531 | 14,829 | 18,798 | 18,996 | 23,650 | 20,947 | 18,480 | 13,723 | 11,523 |
| 1947 | 11,115 | 13,044 | 18,788 | 20,493 | 19,282 | 19,398 | 16,433 | 21,248 | 19,893 | 17,976 | 12,347 | 11,212 |
| 1948 | 16,424 | 14,852 | 16,538 | 21,849 | 14,608 | 14,739 | 17,680 | 23,857 | 24,597 | 20,621 | 16,223 | 12,110 |
| 1949 | 12,067 | 13,010 | 13,056 | 14,985 | 13,845 | 19,231 | 18,403 | 23,128 | 20,432 | 14,428 | 11,273 | 9,804 |
| 1950 | 11,333 | 13,126 | 12,038 | 17,881 | 19,840 | 21,817 | 19,898 | 21,096 | 24,272 | 21,704 | 15,066 | 11,481 |
| 1951 | 13,525 | 16,115 | 20,801 | 24,226 | 24,339 | 18,577 | 20,767 | 23,351 | 20,442 | 19,569 | 14,926 | 11,720 |
| 1952 | 15,267 | 13,402 | 16,714 | 19,969 | 16,914 | 15,242 | 20,417 | 24,832 | 20,839 | 16,749 | 12,432 | 10,885 |
| 1953 | 11,148 | 12,472 | 13,143 | 15,333 | 17,781 | 12,512 | 13,216 | 20,698 | 24,489 | 21,189 | 14,134 | 11,404 |
| 1954 | 11,885 | 13,287 | 15,764 | 17,914 | 19,643 | 16,476 | 17,744 | 22,097 | 23,685 | 22,467 | 18,108 | 15,845 |
| 1955 | 12,303 | 13,760 | 15,310 | 15,018 | 10,936 | 9,925 | 12,501 | 17,065 | 23,871 | 22,994 | 15,783 | 10,834 |
| 1956 | 13,313 | 15,109 | 19,902 | 25,125 | 17,526 | 20,095 | 22,503 | 24,652 | 24,657 | 20,779 | 14,698 | 11,572 |
| 1957 | 12,736 | 12,946 | 15,144 | 17,428 | 12,995 | 15,714 | 18,811 | 24,580 | 24,196 | 16,193 | 11,665 | 10,840 |
| 1958 | 11,370 | 12,620 | 13,141 | 15,722 | 17,082 | 15,605 | 17,010 | 23,577 | 22,289 | 16,052 | 11,999 | 11,123 |
| 1959 | 11,412 | 14,009 | 17,715 | 23,609 | 19,496 | 15,886 | 17,663 | 19,917 | 23,682 | 20,997 | 14,057 | 16,311 |
| 1960 | 17,344 | 16,782 | 18,596 | 19,922 | 13,551 | 15,290 | 22,776 | 18,416 | 21,459 | 17,712 | 12,625 | 10,807 |
| 1961 | 11,303 | 13,223 | 13,439 | 18,335 | 18,398 | 16,623 | 16,752 | 20,622 | 23,375 | 16,967 | 12,256 | 10,430 |
| 1962 | 11,479 | 12,951 | 12,261 | 17,796 | 12,759 | 10,748 | 21,785 | 19,722 | 19,479 | 17,289 | 13,551 | 10,834 |
| 1963 | 12,546 | 14,169 | 18,000 | 19,660 | 15,523 | 11,653 | 13,389 | 20,301 | 20,746 | 17,340 | 13,652 | 11,451 |
| 1964 | 11,137 | 13,409 | 13,223 | 16,761 | 12,935 | 11,166 | 14,730 | 18,831 | 24,722 | 22,960 | 15,588 | 12,536 |
| 1965 | 13,332 | 13,084 | 19,735 | 25,427 | 22,015 | 18,875 | 19,161 | 22,576 | 22,082 | 18,076 | 14,903 | 11,150 |
| 1966 | 12,372 | 12,979 | 14,260 | 20,049 | 11,972 | 11,834 | 17,966 | 18,239 | 18,736 | 18,620 | 12,691 | 10,429 |
| 1967 | 11,310 | 12,997 | 13,852 | 21,787 | 20,872 | 13,984 | 13,669 | 19,149 | 24,492 | 21,385 | 14,346 | 11,522 |
| 1968 | 12,280 | 12,938 | 13,756 | 19,094 | 18,419 | 15,800 | 11,474 | 17,481 | 22,357 | 19,410 | 15,173 | 13,614 |
| 1969 | 13,927 | 15,012 | 16,855 | 23,842 | 19,273 | 14,548 | 22,032 | 24,892 | 22,896 | 18,006 | 12,544 | 11,194 |
| 1970 | 11,787 | 13,007 | 12,369 | 18,165 | 15,778 | 12,672 | 12,952 | 20,361 | 22,041 | 16,790 | 11,268 | 10,335 |
| 1971 | 11,393 | 12,958 | 12,540 | 22,171 | 24,725 | 17,997 | 19,752 | 24,414 | 24,561 | 22,044 | 16,842 | 12,072 |
| 1972 | 12,419 | 13,221 | 14,771 | 22,078 | 22,659 | 24,627 | 21,064 | 24,300 | 24,666 | 22,769 | 17,752 | 12,859 |
| 1973 | 12,271 | 13,100 | 15,367 | 19,590 | 11,490 | 10,767 | 10,783 | 14,375 | 15,106 | 14,636 | 11,011 | 9,272 |
| 1974 | 10,733 | 11,901 | 17,353 | 27,488 | 24,355 | 21,374 | 22,453 | 23,662 | 24,597 | 23,274 | 17,158 | 11,930 |
| 1975 | 10,603 | 12,899 | 13,392 | 19,597 | 15,512 | 16,904 | 14,368 | 21,002 | 23,650 | 23,447 | 13,421 | 11,894 |
| 1976 | 13,517 | 15,686 | 22,403 | 24,493 | 19,836 | 16,294 | 20,786 | 23,771 | 20,943 | 22,026 | 20,211 | 17,352 |
| 1977 | 11,813 | 12,681 | 12,486 | 14,308 | 10,830 | 9,231 | 9,500 | 11,918 | 12,368 | 12,738 | 10,892 | 9,600 |
| 1978 | 10,111 | 12,285 | 12,846 | 17,972 | 15,204 | 16,757 | 16,892 | 19,810 | 18,721 | 18,989 | 13,282 | 10,898 |

# Table 2: PNW Hydro Generation (aMW) with Hydro Independents for FY 2008

| Water Year | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | June | July | Aug | Sep |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1929 | 10,987 | 12,870 | 12,354 | 12,735 | 10,435 | 11,250 | 11,144 | 12,405 | 17,617 | 14,029 | 11,500 | 10,282 |
| 1930 | 11,188 | 12,314 | 12,830 | 11,009 | 12,211 | 11,108 | 11,649 | 11,321 | 15,173 | 14,437 | 11,826 | 10,095 |
| 1931 | 11,248 | 12,443 | 12,632 | 10,742 | 10,107 | 10,762 | 11,307 | 10,685 | 14,914 | 13,850 | 11,324 | 10,307 |
| 1932 | 10,587 | 12,248 | 12,719 | 11,071 | 9,952 | 13,819 | 19,529 | 21,114 | 22,238 | 16,949 | 12,778 | 11,264 |
| 1933 | 11,343 | 13,053 | 14,056 | 20,077 | 15,563 | 12,515 | 14,649 | 18,176 | 24,287 | 22,800 | 15,818 | 11,542 |
| 1934 | 13,265 | 15,876 | 23,611 | 25,741 | 22,173 | 18,491 | 21,401 | 20,796 | 14,668 | 14,590 | 10,938 | 9,872 |
| 1935 | 11,227 | 13,084 | 12,653 | 19,230 | 19,320 | 10,850 | 14,704 | 17,653 | 19,050 | 16,915 | 13,192 | 10,592 |
| 1936 | 11,119 | 12,318 | 13,087 | 11,691 | 10,388 | 10,922 | 15,468 | 21,862 | 19,166 | 14,069 | 11,917 | 10,417 |
| 1937 | 11,110 | 12,192 | 13,227 | 10,101 | 9,568 | 10,357 | 11,132 | 13,516 | 16,610 | 13,699 | 11,322 | 10,229 |
| 1938 | 11,538 | 13,167 | 13,527 | 19,559 | 13,632 | 15,599 | 17,796 | 22,883 | 21,158 | 16,916 | 11,563 | 10,907 |
| 1939 | 11,320 | 12,552 | 13,055 | 15,574 | 10,537 | 12,113 | 14,766 | 19,478 | 15,401 | 14,714 | 12,233 | 10,232 |
| 1940 | 11,541 | 12,342 | 13,162 | 14,436 | 12,713 | 15,839 | 15,924 | 17,480 | 15,832 | 13,927 | 10,720 | 9,874 |
| 1941 | 11,136 | 12,106 | 12,819 | 13,871 | 11,264 | 11,045 | 10,945 | 14,176 | 15,091 | 13,404 | 10,730 | 10,954 |
| 1942 | 11,032 | 11,584 | 15,996 | 18,289 | 13,511 | 9,205 | 14,218 | 17,228 | 20,726 | 18,221 | 13,561 | 10,458 |
| 1943 | 11,163 | 12,934 | 13,186 | 18,680 | 17,932 | 17,748 | 22,870 | 22,365 | 22,029 | 20,514 | 13,845 | 10,709 |
| 1944 | 11,383 | 12,910 | 13,662 | 13,792 | 10,788 | 9,676 | 10,224 | 11,711 | 13,626 | 13,317 | 10,418 | 10,215 |
| 1945 | 10,614 | 12,119 | 12,146 | 10,926 | 11,218 | 10,496 | 10,797 | 17,578 | 20,691 | 14,611 | 11,788 | 10,213 |
| 1946 | 11,103 | 13,081 | 13,383 | 17,553 | 14,851 | 18,825 | 19,024 | 23,684 | 20,972 | 18,087 | 13,779 | 11,526 |
| 1947 | 11,131 | 13,060 | 18,816 | 20,521 | 19,309 | 19,424 | 16,525 | 21,282 | 19,919 | 17,582 | 12,398 | 11,215 |
| 1948 | 16,445 | 14,871 | 16,561 | 21,878 | 14,628 | 14,761 | 17,729 | 23,896 | 24,636 | 20,230 | 16,289 | 12,114 |
| 1949 | 12,083 | 13,026 | 13,074 | 15,007 | 13,864 | 19,262 | 18,452 | 23,163 | 20,456 | 13,825 | 11,316 | 9,806 |
| 1950 | 11,349 | 13,142 | 12,054 | 17,903 | 19,867 | 21,849 | 19,928 | 21,126 | 24,309 | 21,319 | 15,127 | 11,484 |
| 1951 | 13,544 | 16,136 | 20,830 | 24,258 | 24,372 | 18,605 | 20,797 | 23,385 | 20,466 | 19,178 | 14,987 | 11,724 |
| 1952 | 15,288 | 13,418 | 16,738 | 19,997 | 16,938 | 15,266 | 20,450 | 24,871 | 20,867 | 16,291 | 12,482 | 10,889 |
| 1953 | 11,163 | 12,488 | 13,159 | 15,354 | 17,808 | 12,530 | 13,357 | 20,727 | 24,525 | 20,803 | 14,191 | 11,408 |
| 1954 | 11,901 | 13,303 | 15,784 | 17,939 | 19,669 | 16,497 | 17,798 | 22,129 | 23,715 | 22,079 | 18,182 | 15,852 |
| 1955 | 12,321 | 13,778 | 15,330 | 15,037 | 10,950 | 9,939 | 12,644 | 17,256 | 23,907 | 23,023 | 15,848 | 10,837 |
| 1956 | 13,330 | 15,127 | 19,931 | 25,159 | 17,551 | 20,126 | 22,536 | 24,692 | 24,695 | 20,388 | 14,757 | 11,575 |
| 1957 | 12,753 | 12,961 | 15,166 | 17,452 | 13,012 | 15,736 | 18,840 | 24,617 | 24,232 | 15,721 | 11,712 | 10,843 |
| 1958 | 11,386 | 12,635 | 13,158 | 15,744 | 17,107 | 15,627 | 17,058 | 23,613 | 22,320 | 15,556 | 12,046 | 11,127 |
| 1959 | 11,428 | 14,027 | 17,739 | 23,641 | 19,523 | 15,908 | 17,731 | 19,944 | 23,715 | 20,606 | 14,114 | 16,317 |
| 1960 | 17,369 | 16,804 | 18,621 | 19,948 | 13,570 | 15,313 | 22,807 | 18,451 | 21,486 | 17,317 | 12,676 | 10,810 |
| 1961 | 11,319 | 13,239 | 13,457 | 18,358 | 18,423 | 16,646 | 16,878 | 20,649 | 23,408 | 16,517 | 12,305 | 10,433 |
| 1962 | 11,495 | 12,966 | 12,276 | 17,820 | 12,776 | 10,764 | 21,816 | 19,749 | 19,503 | 16,870 | 13,606 | 10,837 |
| 1963 | 12,564 | 14,188 | 18,024 | 19,684 | 15,547 | 11,672 | 13,539 | 20,333 | 20,775 | 16,929 | 13,707 | 11,455 |
| 1964 | 11,152 | 13,425 | 13,240 | 16,783 | 12,953 | 11,182 | 14,869 | 18,858 | 24,758 | 22,576 | 15,650 | 12,540 |
| 1965 | 13,350 | 13,100 | 19,766 | 25,464 | 22,049 | 18,904 | 19,190 | 22,612 | 22,114 | 17,687 | 14,965 | 11,154 |
| 1966 | 12,390 | 12,996 | 14,281 | 20,075 | 11,988 | 11,851 | 18,086 | 18,370 | 18,871 | 18,225 | 12,743 | 10,433 |
| 1967 | 11,325 | 13,012 | 13,870 | 21,814 | 20,901 | 14,002 | 13,821 | 19,174 | 24,528 | 20,997 | 14,404 | 11,526 |
| 1968 | 12,297 | 12,954 | 13,777 | 19,120 | 18,444 | 15,822 | 11,635 | 17,614 | 22,386 | 19,018 | 15,235 | 13,619 |
| 1969 | 13,946 | 15,032 | 16,878 | 23,875 | 19,302 | 14,573 | 22,065 | 24,930 | 22,923 | 17,605 | 12,594 | 11,198 |
| 1970 | 11,803 | 13,023 | 12,386 | 18,192 | 15,804 | 12,690 | 13,108 | 20,389 | 22,074 | 16,355 | 11,311 | 10,338 |
| 1971 | 11,410 | 12,974 | 12,558 | 22,204 | 24,762 | 18,026 | 19,781 | 24,453 | 24,597 | 21,662 | 16,910 | 12,076 |
| 1972 | 12,436 | 13,238 | 14,792 | 22,108 | 22,693 | 24,663 | 21,110 | 24,338 | 24,704 | 22,382 | 17,823 | 12,863 |
| 1973 | 12,287 | 13,116 | 15,389 | 19,619 | 11,504 | 10,782 | 10,854 | 14,580 | 15,327 | 14,064 | 11,054 | 9,275 |
| 1974 | 10,748 | 11,917 | 17,379 | 27,528 | 24,390 | 21,405 | 22,487 | 23,699 | 24,635 | 23,306 | 17,226 | 11,934 |
| 1975 | 10,619 | 12,915 | 13,410 | 19,622 | 15,535 | 16,930 | 14,509 | 21,033 | 23,684 | 23,224 | 13,472 | 11,897 |
| 1976 | 13,535 | 15,707 | 22,436 | 24,526 | 19,864 | 16,320 | 20,817 | 23,809 | 20,969 | 21,639 | 20,294 | 17,359 |
| 1977 | 11,830 | 12,697 | 12,503 | 14,329 | 10,843 | 9,244 | 9,548 | 12,149 | 12,602 | 12,112 | 10,935 | 9,603 |
| 1978 | 10,125 | 12,300 | 12,865 | 17,997 | 15,225 | 16,784 | 16,977 | 19,839 | 18,746 | 18,600 | 13,334 | 10,901 |

## Table 3: PNW Hydro Generation (aMW) with Hydro Independents for FY 2009

| Water Year | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | June | July | Aug | Sep |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1929 | 10,991 | 12,875 | 12,359 | 12,742 | 10,439 | 11,253 | 11,174 | 12,451 | 17,683 | 14,081 | 11,514 | 10,289 |
| 1930 | 11,193 | 12,319 | 12,835 | 11,013 | 12,215 | 11,112 | 11,700 | 11,363 | 15,233 | 14,493 | 11,841 | 10,103 |
| 1931 | 11,252 | 12,449 | 12,638 | 10,746 | 10,111 | 10,766 | 11,339 | 10,728 | 14,972 | 13,903 | 11,339 | 10,315 |
| 1932 | 10,591 | 12,253 | 12,725 | 11,075 | 9,956 | 13,822 | 19,695 | 21,348 | 22,395 | 17,017 | 12,795 | 11,272 |
| 1933 | 11,347 | 13,058 | 14,062 | 20,086 | 15,571 | 12,517 | 14,733 | 18,327 | 24,297 | 22,897 | 15,836 | 11,551 |
| 1934 | 13,271 | 15,882 | 23,621 | 25,752 | 22,183 | 18,497 | 21,537 | 20,928 | 14,717 | 14,651 | 10,952 | 9,880 |
| 1935 | 11,232 | 13,088 | 12,659 | 19,238 | 19,329 | 10,853 | 14,751 | 17,728 | 19,124 | 16,983 | 13,208 | 10,600 |
| 1936 | 11,123 | 12,323 | 13,093 | 11,696 | 10,392 | 10,926 | 15,543 | 22,095 | 19,275 | 14,125 | 11,933 | 10,424 |
| 1937 | 11,114 | 12,197 | 13,233 | 10,106 | 9,573 | 10,361 | 11,164 | 13,569 | 16,673 | 13,752 | 11,336 | 10,237 |
| 1938 | 11,543 | 13,172 | 13,532 | 19,568 | 13,637 | 15,603 | 17,951 | 23,122 | 21,323 | 16,982 | 11,577 | 10,916 |
| 1939 | 11,325 | 12,557 | 13,060 | 15,581 | 10,541 | 12,116 | 14,837 | 19,558 | 15,457 | 14,772 | 12,249 | 10,240 |
| 1940 | 11,546 | 12,347 | 13,168 | 14,443 | 12,718 | 15,844 | 16,010 | 17,553 | 15,898 | 13,980 | 10,735 | 9,882 |
| 1941 | 11,140 | 12,111 | 12,825 | 13,878 | 11,268 | 11,048 | 10,978 | 14,237 | 15,155 | 13,458 | 10,744 | 10,962 |
| 1942 | 11,036 | 11,589 | 16,003 | 18,298 | 13,515 | 9,208 | 14,264 | 17,301 | 20,811 | 18,295 | 13,578 | 10,466 |
| 1943 | 11,167 | 12,938 | 13,191 | 18,687 | 17,937 | 17,752 | 22,927 | 22,585 | 22,200 | 20,595 | 13,861 | 10,716 |
| 1944 | 11,388 | 12,915 | 13,667 | 13,799 | 10,792 | 9,680 | 10,252 | 11,758 | 13,681 | 13,368 | 10,432 | 10,223 |
| 1945 | 10,618 | 12,125 | 12,151 | 10,930 | 11,222 | 10,499 | 10,828 | 17,648 | 20,777 | 14,668 | 11,803 | 10,220 |
| 1946 | 11,107 | 13,086 | 13,388 | 17,559 | 14,857 | 18,830 | 19,193 | 23,930 | 21,099 | 18,157 | 13,795 | 11,535 |
| 1947 | 11,135 | 13,065 | 18,823 | 20,529 | 19,316 | 19,430 | 16,628 | 21,465 | 20,057 | 17,652 | 12,414 | 11,223 |
| 1948 | 16,452 | 14,877 | 16,568 | 21,886 | 14,632 | 14,765 | 17,866 | 24,010 | 24,647 | 20,314 | 16,307 | 12,124 |
| 1949 | 12,088 | 13,030 | 13,080 | 15,014 | 13,869 | 19,267 | 18,613 | 23,279 | 20,591 | 13,876 | 11,329 | 9,813 |
| 1950 | 11,353 | 13,147 | 12,059 | 17,911 | 19,874 | 21,855 | 20,089 | 21,333 | 24,319 | 21,407 | 15,143 | 11,493 |
| 1951 | 13,549 | 16,142 | 20,838 | 24,268 | 24,381 | 18,610 | 20,971 | 23,627 | 20,613 | 19,254 | 15,004 | 11,733 |
| 1952 | 15,293 | 13,423 | 16,745 | 20,005 | 16,944 | 15,270 | 20,520 | 24,881 | 21,030 | 16,354 | 12,498 | 10,896 |
| 1953 | 11,168 | 12,493 | 13,165 | 15,359 | 17,815 | 12,533 | 13,435 | 20,915 | 24,534 | 20,886 | 14,207 | 11,416 |
| 1954 | 11,905 | 13,308 | 15,790 | 17,946 | 19,677 | 16,502 | 17,932 | 22,356 | 23,725 | 22,172 | 18,200 | 15,865 |
| 1955 | 12,326 | 13,784 | 15,337 | 15,043 | 10,954 | 9,943 | 12,701 | 17,326 | 23,918 | 23,035 | 15,865 | 10,846 |
| 1956 | 13,335 | 15,133 | 19,938 | 25,169 | 17,557 | 20,132 | 22,610 | 24,702 | 24,706 | 20,471 | 14,774 | 11,583 |
| 1957 | 12,758 | 12,966 | 15,172 | 17,460 | 13,017 | 15,740 | 18,998 | 24,626 | 24,243 | 15,783 | 11,726 | 10,851 |
| 1958 | 11,390 | 12,640 | 13,163 | 15,751 | 17,113 | 15,632 | 17,202 | 23,728 | 22,485 | 15,616 | 12,061 | 11,135 |
| 1959 | 11,432 | 14,032 | 17,746 | 23,651 | 19,531 | 15,913 | 17,827 | 20,118 | 23,731 | 20,694 | 14,131 | 16,330 |
| 1960 | 17,376 | 16,811 | 18,629 | 19,957 | 13,575 | 15,317 | 22,886 | 18,603 | 21,638 | 17,387 | 12,692 | 10,818 |
| 1961 | 11,324 | 13,244 | 13,464 | 18,367 | 18,429 | 16,651 | 16,957 | 20,821 | 23,420 | 16,582 | 12,321 | 10,441 |
| 1962 | 11,499 | 12,971 | 12,281 | 17,827 | 12,780 | 10,767 | 21,999 | 19,930 | 19,651 | 16,939 | 13,622 | 10,845 |
| 1963 | 12,568 | 14,193 | 18,031 | 19,692 | 15,551 | 11,677 | 13,590 | 20,418 | 20,861 | 16,997 | 13,724 | 11,464 |
| 1964 | 11,156 | 13,430 | 13,246 | 16,791 | 12,958 | 11,185 | 14,983 | 19,047 | 24,768 | 22,670 | 15,667 | 12,550 |
| 1965 | 13,356 | 13,106 | 19,773 | 25,474 | 22,057 | 18,909 | 19,326 | 22,808 | 22,222 | 17,758 | 14,982 | 11,162 |
| 1966 | 12,394 | 13,001 | 14,288 | 20,084 | 11,994 | 11,854 | 18,177 | 18,444 | 18,943 | 18,298 | 12,760 | 10,440 |
| 1967 | 11,330 | 13,017 | 13,876 | 21,823 | 20,910 | 14,007 | 13,874 | 19,370 | 24,538 | 21,086 | 14,421 | 11,535 |
| 1968 | 12,301 | 12,959 | 13,783 | 19,128 | 18,450 | 15,827 | 11,666 | 17,684 | 22,477 | 19,095 | 15,252 | 13,630 |
| 1969 | 13,951 | 15,038 | 16,885 | 23,885 | 19,309 | 14,578 | 22,241 | 24,974 | 23,077 | 17,675 | 12,610 | 11,205 |
| 1970 | 11,808 | 13,029 | 12,392 | 18,199 | 15,810 | 12,693 | 13,152 | 20,608 | 22,183 | 16,420 | 11,326 | 10,345 |
| 1971 | 11,414 | 12,979 | 12,563 | 22,212 | 24,771 | 18,030 | 19,958 | 24,463 | 24,607 | 21,749 | 16,927 | 12,084 |
| 1972 | 12,440 | 13,242 | 14,798 | 22,116 | 22,702 | 24,670 | 21,235 | 24,376 | 24,715 | 22,478 | 17,841 | 12,873 |
| 1973 | 12,292 | 13,121 | 15,395 | 19,627 | 11,508 | 10,786 | 10,883 | 14,638 | 15,388 | 14,117 | 11,068 | 9,282 |
| 1974 | 10,752 | 11,921 | 17,385 | 27,539 | 24,400 | 21,411 | 22,625 | 23,821 | 24,645 | 23,317 | 17,244 | 11,944 |
| 1975 | 10,623 | 12,920 | 13,415 | 19,630 | 15,541 | 16,936 | 14,598 | 21,255 | 23,777 | 23,322 | 13,487 | 11,906 |
| 1976 | 13,540 | 15,712 | 22,444 | 24,535 | 19,872 | 16,324 | 20,987 | 23,914 | 21,142 | 21,729 | 20,314 | 17,374 |
| 1977 | 11,835 | 12,702 | 12,509 | 14,335 | 10,847 | 9,247 | 9,572 | 12,198 | 12,652 | 12,156 | 10,950 | 9,610 |
| 1978 | 10,129 | 12,305 | 12,869 | 18,003 | 15,229 | 16,790 | 17,102 | 20,032 | 18,897 | 18,674 | 13,349 | 10,909 |

## Table 4: Federal Hydro Generation (aMW) with Hydro Independents for FY 2007

| Water Year | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | June | July | Aug | Sep |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1929 | 6,008 | 7,197 | 6,807 | 7,424 | 5,584 | 6,537 | 5,781 | 6,523 | 10,655 | 9,031 | 6,872 | 6,116 |
| 1930 | 6,523 | 7,330 | 7,327 | 5,551 | 6,861 | 6,397 | 6,050 | 6,271 | 9,312 | 9,638 | 7,369 | 5,926 |
| 1931 | 6,547 | 7,301 | 6,920 | 5,617 | 5,545 | 6,120 | 6,148 | 6,154 | 8,869 | 9,249 | 7,215 | 6,293 |
| 1932 | 6,169 | 7,114 | 6,982 | 5,714 | 5,294 | 8,001 | 11,957 | 13,386 | 13,569 | 10,851 | 7,787 | 6,775 |
| 1933 | 6,504 | 6,710 | 7,870 | 12,124 | 9,591 | 7,248 | 8,396 | 11,215 | 14,260 | 14,123 | 9,714 | 6,692 |
| 1934 | 7,140 | 8,742 | 14,366 | 15,833 | 13,490 | 10,816 | 13,144 | 12,951 | 8,193 | 9,738 | 6,508 | 5,876 |
| 1935 | 6,235 | 6,641 | 6,838 | 11,285 | 11,630 | 5,970 | 8,715 | 10,728 | 11,137 | 10,754 | 8,108 | 6,212 |
| 1936 | 6,359 | 7,152 | 7,092 | 6,063 | 5,703 | 6,414 | 9,196 | 14,000 | 11,331 | 9,299 | 7,258 | 6,124 |
| 1937 | 6,476 | 7,210 | 7,186 | 5,452 | 5,568 | 5,899 | 5,967 | 7,752 | 9,367 | 8,717 | 6,878 | 6,035 |
| 1938 | 6,584 | 6,894 | 7,390 | 11,474 | 7,788 | 9,371 | 10,454 | 14,172 | 12,717 | 10,817 | 6,616 | 6,617 |
| 1939 | 6,522 | 7,148 | 7,166 | 8,793 | 5,535 | 6,913 | 8,319 | 12,141 | 8,641 | 9,744 | 7,597 | 6,059 |
| 1940 | 6,712 | 7,089 | 7,460 | 8,076 | 6,913 | 9,375 | 9,234 | 11,082 | 9,799 | 9,048 | 6,289 | 6,020 |
| 1941 | 6,591 | 7,061 | 7,458 | 8,184 | 5,770 | 6,469 | 6,110 | 8,693 | 9,042 | 8,877 | 6,550 | 6,745 |
| 1942 | 6,356 | 6,700 | 9,445 | 11,499 | 7,731 | 5,193 | 8,172 | 10,801 | 12,787 | 11,893 | 8,471 | 6,181 |
| 1943 | 6,435 | 6,890 | 7,241 | 10,895 | 10,545 | 10,724 | 13,670 | 13,733 | 13,201 | 12,588 | 8,303 | 6,177 |
| 1944 | 6,375 | 7,274 | 7,101 | 8,147 | 5,661 | 5,528 | 5,337 | 6,505 | 7,780 | 8,800 | 6,194 | 6,192 |
| 1945 | 6,245 | 7,148 | 6,533 | 5,751 | 6,244 | 5,976 | 5,421 | 10,667 | 12,802 | 9,411 | 6,924 | 6,056 |
| 1946 | 6,200 | 7,122 | 7,317 | 9,745 | 8,487 | 11,310 | 11,199 | 14,622 | 12,376 | 11,351 | 8,421 | 6,818 |
| 1947 | 6,154 | 6,930 | 11,118 | 12,233 | 11,408 | 11,712 | 9,030 | 13,503 | 11,975 | 11,470 | 7,485 | 6,592 |
| 1948 | 9,250 | 7,959 | 9,810 | 13,417 | 8,452 | 8,955 | 10,460 | 15,269 | 14,500 | 13,048 | 10,046 | 7,084 |
| 1949 | 6,695 | 6,981 | 7,432 | 8,676 | 7,711 | 11,719 | 10,865 | 14,376 | 12,036 | 8,210 | 6,330 | 5,777 |
| 1950 | 6,392 | 6,889 | 6,422 | 10,078 | 12,049 | 13,243 | 11,537 | 13,113 | 14,005 | 13,238 | 8,939 | 6,599 |
| 1951 | 7,273 | 8,496 | 11,855 | 14,631 | 14,369 | 10,972 | 12,201 | 14,503 | 12,031 | 12,153 | 9,236 | 6,761 |
| 1952 | 8,510 | 7,065 | 9,807 | 11,755 | 9,732 | 9,028 | 12,439 | 15,793 | 12,498 | 10,370 | 7,504 | 6,364 |
| 1953 | 6,387 | 7,211 | 7,016 | 8,245 | 10,355 | 7,294 | 7,215 | 12,642 | 15,097 | 13,246 | 8,586 | 6,674 |
| 1954 | 6,617 | 7,101 | 8,739 | 9,965 | 11,722 | 9,578 | 10,214 | 13,917 | 14,244 | 13,768 | 11,354 | 9,628 |
| 1955 | 6,843 | 7,276 | 8,868 | 8,785 | 5,852 | 5,468 | 6,808 | 10,708 | 14,058 | 14,028 | 9,827 | 6,248 |
| 1956 | 7,088 | 7,865 | 11,671 | 15,254 | 10,170 | 12,126 | 13,484 | 15,467 | 14,063 | 12,854 | 8,911 | 6,699 |
| 1957 | 6,883 | 6,851 | 8,306 | 10,061 | 6,796 | 8,968 | 11,314 | 15,609 | 14,821 | 10,271 | 6,999 | 6,328 |
| 1958 | 6,408 | 7,087 | 6,842 | 8,754 | 9,803 | 9,313 | 10,032 | 14,868 | 13,810 | 10,113 | 7,232 | 6,510 |
| 1959 | 6,360 | 7,332 | 10,270 | 14,579 | 11,832 | 9,517 | 10,032 | 12,343 | 14,624 | 13,197 | 8,603 | 9,758 |
| 1960 | 9,864 | 9,217 | 11,106 | 12,331 | 7,436 | 8,958 | 13,855 | 11,286 | 13,010 | 11,021 | 7,562 | 6,283 |
| 1961 | 6,367 | 6,956 | 7,757 | 10,391 | 10,711 | 9,933 | 9,866 | 13,166 | 14,304 | 10,721 | 7,530 | 6,113 |
| 1962 | 6,483 | 7,237 | 6,828 | 10,227 | 6,958 | 6,049 | 13,196 | 12,131 | 11,699 | 10,938 | 8,279 | 6,302 |
| 1963 | 7,099 | 7,543 | 10,431 | 11,861 | 8,525 | 6,592 | 7,291 | 12,986 | 12,765 | 11,027 | 8,492 | 6,806 |
| 1964 | 6,179 | 7,144 | 7,380 | 9,371 | 7,462 | 6,296 | 8,382 | 11,498 | 14,450 | 14,403 | 9,612 | 7,365 |
| 1965 | 7,609 | 7,047 | 11,686 | 15,717 | 13,311 | 11,478 | 11,225 | 14,071 | 13,382 | 11,152 | 9,163 | 6,406 |
| 1966 | 6,984 | 7,138 | 8,387 | 11,858 | 6,767 | 6,415 | 10,485 | 11,190 | 11,235 | 11,747 | 7,729 | 6,015 |
| 1967 | 6,361 | 7,083 | 7,496 | 12,873 | 12,808 | 8,147 | 7,303 | 11,436 | 14,332 | 13,600 | 8,950 | 6,816 |
| 1968 | 6,621 | 6,872 | 7,715 | 10,857 | 10,523 | 8,962 | 6,157 | 10,825 | 13,678 | 12,473 | 9,457 | 8,052 |
| 1969 | 7,748 | 8,048 | 9,885 | 14,662 | 11,688 | 8,536 | 13,087 | 15,659 | 14,041 | 11,358 | 7,721 | 6,465 |
| 1970 | 6,555 | 7,140 | 6,878 | 10,401 | 9,191 | 7,255 | 7,199 | 12,542 | 13,189 | 10,589 | 6,575 | 6,047 |
| 1971 | 6,403 | 7,206 | 6,794 | 12,986 | 15,004 | 10,521 | 11,796 | 15,512 | 14,461 | 13,543 | 10,533 | 7,113 |
| 1972 | 6,852 | 6,995 | 8,482 | 12,879 | 13,558 | 14,492 | 11,880 | 15,332 | 14,215 | 14,089 | 11,149 | 7,533 |
| 1973 | 6,907 | 7,159 | 8,539 | 11,379 | 5,880 | 6,017 | 5,507 | 8,608 | 8,908 | 9,154 | 6,601 | 5,519 |
| 1974 | 6,148 | 6,469 | 10,124 | 16,800 | 14,463 | 12,904 | 13,616 | 14,871 | 14,067 | 14,010 | 10,681 | 6,970 |
| 1975 | 5,891 | 7,099 | 7,298 | 11,091 | 9,111 | 10,310 | 8,179 | 12,707 | 14,230 | 14,600 | 7,932 | 6,892 |
| 1976 | 7,492 | 8,378 | 13,026 | 14,668 | 11,809 | 9,584 | 12,406 | 14,832 | 12,110 | 13,847 | 12,806 | 10,758 |
| 1977 | 6,701 | 7,169 | 7,105 | 8,458 | 5,484 | 5,126 | 4,782 | 6,808 | 7,340 | 8,149 | 6,786 | 5,856 |
| 1978 | 5,898 | 6,813 | 7,142 | 10,460 | 9,004 | 10,061 | 9,690 | 11,791 | 11,123 | 11,919 | 7,982 | 6,232 |

## Table 5: Federal Hydro Generation (aMW) with Hydro Independents for FY 2008

| Water Year | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | June | July | Aug | Sep |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1929 | 6,022 | 7,212 | 6,824 | 7,443 | 5,596 | 6,552 | 5,847 | 6,688 | 10,851 | 8,450 | 6,916 | 6,119 |
| 1930 | 6,538 | 7,346 | 7,343 | 5,564 | 6,876 | 6,412 | 6,166 | 6,387 | 9,531 | 9,093 | 7,416 | 5,930 |
| 1931 | 6,563 | 7,317 | 6,936 | 5,630 | 5,557 | 6,135 | 6,222 | 6,276 | 9,104 | 8,668 | 7,263 | 6,297 |
| 1932 | 6,184 | 7,130 | 6,997 | 5,727 | 5,306 | 8,021 | 11,986 | 13,419 | 13,599 | 10,431 | 7,840 | 6,778 |
| 1933 | 6,519 | 6,725 | 7,888 | 12,149 | 9,613 | 7,263 | 8,534 | 11,268 | 14,298 | 13,978 | 9,780 | 6,696 |
| 1934 | 7,158 | 8,762 | 14,398 | 15,868 | 13,518 | 10,841 | 13,178 | 12,980 | 8,429 | 9,236 | 6,553 | 5,879 |
| 1935 | 6,249 | 6,656 | 6,855 | 11,309 | 11,654 | 5,983 | 8,853 | 10,847 | 11,262 | 10,333 | 8,164 | 6,216 |
| 1936 | 6,373 | 7,167 | 7,107 | 6,077 | 5,715 | 6,430 | 9,245 | 14,037 | 11,431 | 8,742 | 7,307 | 6,128 |
| 1937 | 6,490 | 7,226 | 7,201 | 5,466 | 5,580 | 5,914 | 6,055 | 7,956 | 9,584 | 8,135 | 6,925 | 6,038 |
| 1938 | 6,599 | 6,909 | 7,407 | 11,500 | 7,805 | 9,394 | 10,480 | 14,205 | 12,746 | 10,397 | 6,661 | 6,621 |
| 1939 | 6,537 | 7,163 | 7,183 | 8,814 | 5,549 | 6,931 | 8,456 | 12,185 | 8,869 | 9,220 | 7,648 | 6,062 |
| 1940 | 6,727 | 7,105 | 7,476 | 8,094 | 6,930 | 9,399 | 9,357 | 11,202 | 10,020 | 8,482 | 6,333 | 6,023 |
| 1941 | 6,607 | 7,076 | 7,476 | 8,205 | 5,783 | 6,486 | 6,219 | 8,901 | 9,254 | 8,316 | 6,596 | 6,749 |
| 1942 | 6,372 | 6,716 | 9,469 | 11,526 | 7,747 | 5,207 | 8,292 | 10,956 | 12,818 | 11,501 | 8,527 | 6,185 |
| 1943 | 6,450 | 6,906 | 7,258 | 10,921 | 10,570 | 10,751 | 13,705 | 13,767 | 13,233 | 12,284 | 8,360 | 6,180 |
| 1944 | 6,390 | 7,289 | 7,118 | 8,167 | 5,674 | 5,542 | 5,385 | 6,698 | 7,994 | 8,217 | 6,237 | 6,196 |
| 1945 | 6,260 | 7,164 | 6,549 | 5,764 | 6,258 | 5,991 | 5,488 | 10,850 | 12,833 | 8,873 | 6,970 | 6,059 |
| 1946 | 6,215 | 7,138 | 7,334 | 9,768 | 8,509 | 11,337 | 11,227 | 14,655 | 12,402 | 10,959 | 8,477 | 6,822 |
| 1947 | 6,170 | 6,946 | 11,146 | 12,261 | 11,435 | 11,737 | 9,122 | 13,536 | 12,002 | 11,077 | 7,536 | 6,596 |
| 1948 | 9,271 | 7,978 | 9,833 | 13,446 | 8,471 | 8,976 | 10,509 | 15,308 | 14,540 | 12,659 | 10,113 | 7,088 |
| 1949 | 6,711 | 6,996 | 7,451 | 8,698 | 7,729 | 11,750 | 10,915 | 14,411 | 12,062 | 7,608 | 6,374 | 5,780 |
| 1950 | 6,407 | 6,904 | 6,438 | 10,100 | 12,075 | 13,274 | 11,567 | 13,142 | 14,043 | 12,855 | 9,001 | 6,603 |
| 1951 | 7,291 | 8,518 | 11,884 | 14,663 | 14,402 | 10,999 | 12,232 | 14,537 | 12,056 | 11,763 | 9,297 | 6,765 |
| 1952 | 8,530 | 7,081 | 9,831 | 11,782 | 9,756 | 9,051 | 12,472 | 15,833 | 12,528 | 9,913 | 7,554 | 6,367 |
| 1953 | 6,401 | 7,227 | 7,032 | 8,266 | 10,381 | 7,311 | 7,357 | 12,671 | 15,134 | 12,861 | 8,642 | 6,678 |
| 1954 | 6,633 | 7,116 | 8,759 | 9,989 | 11,748 | 9,598 | 10,268 | 13,948 | 14,277 | 13,382 | 11,427 | 9,635 |
| 1955 | 6,860 | 7,294 | 8,888 | 8,803 | 5,865 | 5,481 | 6,951 | 10,898 | 14,097 | 14,060 | 9,892 | 6,251 |
| 1956 | 7,104 | 7,884 | 11,699 | 15,288 | 10,195 | 12,157 | 13,517 | 15,506 | 14,102 | 12,465 | 8,970 | 6,703 |
| 1957 | 6,900 | 6,867 | 8,327 | 10,085 | 6,813 | 8,989 | 11,343 | 15,647 | 14,859 | 9,800 | 7,046 | 6,332 |
| 1958 | 6,423 | 7,102 | 6,859 | 8,776 | 9,827 | 9,335 | 10,080 | 14,904 | 13,843 | 9,618 | 7,280 | 6,514 |
| 1959 | 6,375 | 7,349 | 10,295 | 14,611 | 11,859 | 9,539 | 10,099 | 12,370 | 14,659 | 12,808 | 8,660 | 9,765 |
| 1960 | 9,888 | 9,240 | 11,131 | 12,358 | 7,455 | 8,980 | 13,886 | 11,321 | 13,039 | 10,628 | 7,613 | 6,286 |
| 1961 | 6,382 | 6,972 | 7,775 | 10,414 | 10,736 | 9,956 | 9,991 | 13,194 | 14,339 | 10,272 | 7,579 | 6,117 |
| 1962 | 6,498 | 7,253 | 6,843 | 10,250 | 6,974 | 6,065 | 13,227 | 12,158 | 11,725 | 10,522 | 8,334 | 6,306 |
| 1963 | 7,116 | 7,561 | 10,455 | 11,886 | 8,548 | 6,611 | 7,441 | 13,017 | 12,796 | 10,617 | 8,548 | 6,810 |
| 1964 | 6,194 | 7,160 | 7,397 | 9,393 | 7,479 | 6,311 | 8,522 | 11,524 | 14,488 | 14,020 | 9,674 | 7,369 |
| 1965 | 7,627 | 7,063 | 11,717 | 15,754 | 13,345 | 11,507 | 11,255 | 14,106 | 13,415 | 10,766 | 9,224 | 6,410 |
| 1966 | 7,001 | 7,155 | 8,409 | 11,884 | 6,783 | 6,432 | 10,605 | 11,321 | 11,372 | 11,355 | 7,781 | 6,019 |
| 1967 | 6,376 | 7,099 | 7,514 | 12,900 | 12,837 | 8,165 | 7,455 | 11,460 | 14,370 | 13,214 | 9,009 | 6,820 |
| 1968 | 6,638 | 6,889 | 7,736 | 10,883 | 10,547 | 8,984 | 6,319 | 10,957 | 13,709 | 12,083 | 9,519 | 8,057 |
| 1969 | 7,767 | 8,067 | 9,908 | 14,696 | 11,717 | 8,561 | 13,120 | 15,697 | 14,069 | 10,959 | 7,772 | 6,469 |
| 1970 | 6,571 | 7,156 | 6,895 | 10,427 | 9,216 | 7,273 | 7,354 | 12,570 | 13,223 | 10,155 | 6,619 | 6,050 |
| 1971 | 6,419 | 7,222 | 6,813 | 13,019 | 15,041 | 10,549 | 11,825 | 15,551 | 14,499 | 13,162 | 10,601 | 7,117 |
| 1972 | 6,868 | 7,011 | 8,504 | 12,909 | 13,592 | 14,527 | 11,926 | 15,370 | 14,255 | 13,704 | 11,221 | 7,537 |
| 1973 | 6,923 | 7,175 | 8,561 | 11,407 | 5,894 | 6,032 | 5,578 | 8,814 | 9,131 | 8,584 | 6,645 | 5,522 |
| 1974 | 6,163 | 6,485 | 10,150 | 16,839 | 14,498 | 12,936 | 13,650 | 14,907 | 14,107 | 14,043 | 10,750 | 6,975 |
| 1975 | 5,906 | 7,115 | 7,317 | 11,117 | 9,132 | 10,336 | 8,321 | 12,737 | 14,266 | 14,378 | 7,984 | 6,896 |
| 1976 | 7,510 | 8,399 | 13,059 | 14,701 | 11,836 | 9,610 | 12,437 | 14,870 | 12,139 | 13,461 | 12,889 | 10,766 |
| 1977 | 6,718 | 7,184 | 7,122 | 8,478 | 5,496 | 5,139 | 4,830 | 7,039 | 7,576 | 7,524 | 6,830 | 5,860 |
| 1978 | 5,912 | 6,828 | 7,161 | 10,484 | 9,024 | 10,087 | 9,774 | 11,820 | 11,150 | 11,531 | 8,033 | 6,236 |

## Table 6: Federal Hydro Generation (aMW) with Hydro Independents for FY 2009

| Water Year | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | June | July | Aug | Sep |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1929 | 6,026 | 7,217 | 6,829 | 7,449 | 5,599 | 6,556 | 5,876 | 6,734 | 10,917 | 8,503 | 6,930 | 6,128 |
| 1930 | 6,543 | 7,352 | 7,348 | 5,567 | 6,880 | 6,416 | 6,216 | 6,430 | 9,592 | 9,149 | 7,431 | 5,939 |
| 1931 | 6,567 | 7,322 | 6,942 | 5,634 | 5,561 | 6,138 | 6,252 | 6,320 | 9,163 | 8,721 | 7,278 | 6,307 |
| 1932 | 6,188 | 7,135 | 7,003 | 5,731 | 5,309 | 8,024 | 12,151 | 13,652 | 13,756 | 10,498 | 7,857 | 6,788 |
| 1933 | 6,523 | 6,729 | 7,894 | 12,157 | 9,620 | 7,266 | 8,617 | 11,419 | 14,308 | 14,075 | 9,798 | 6,708 |
| 1934 | 7,163 | 8,768 | 14,407 | 15,880 | 13,527 | 10,847 | 13,314 | 13,111 | 8,478 | 9,298 | 6,567 | 5,889 |
| 1935 | 6,254 | 6,661 | 6,860 | 11,317 | 11,662 | 5,986 | 8,899 | 10,921 | 11,336 | 10,401 | 8,180 | 6,226 |
| 1936 | 6,378 | 7,173 | 7,113 | 6,081 | 5,719 | 6,434 | 9,319 | 14,269 | 11,539 | 8,798 | 7,322 | 6,137 |
| 1937 | 6,495 | 7,232 | 7,206 | 5,470 | 5,584 | 5,918 | 6,086 | 8,009 | 9,648 | 8,188 | 6,940 | 6,047 |
| 1938 | 6,604 | 6,914 | 7,411 | 11,509 | 7,809 | 9,399 | 10,633 | 14,444 | 12,911 | 10,464 | 6,675 | 6,631 |
| 1939 | 6,542 | 7,168 | 7,188 | 8,820 | 5,552 | 6,935 | 8,527 | 12,265 | 8,925 | 9,278 | 7,663 | 6,072 |
| 1940 | 6,732 | 7,110 | 7,481 | 8,100 | 6,934 | 9,404 | 9,442 | 11,275 | 10,086 | 8,536 | 6,348 | 6,032 |
| 1941 | 6,611 | 7,081 | 7,481 | 8,211 | 5,786 | 6,489 | 6,250 | 8,962 | 9,318 | 8,369 | 6,610 | 6,759 |
| 1942 | 6,376 | 6,720 | 9,475 | 11,535 | 7,750 | 5,210 | 8,338 | 11,028 | 12,904 | 11,574 | 8,544 | 6,194 |
| 1943 | 6,455 | 6,910 | 7,263 | 10,928 | 10,574 | 10,755 | 13,761 | 13,986 | 13,404 | 12,365 | 8,376 | 6,189 |
| 1944 | 6,394 | 7,294 | 7,123 | 8,173 | 5,677 | 5,545 | 5,412 | 6,744 | 8,049 | 8,268 | 6,250 | 6,205 |
| 1945 | 6,264 | 7,169 | 6,554 | 5,767 | 6,262 | 5,994 | 5,518 | 10,919 | 12,919 | 8,930 | 6,985 | 6,067 |
| 1946 | 6,220 | 7,143 | 7,338 | 9,773 | 8,514 | 11,342 | 11,395 | 14,900 | 12,529 | 11,029 | 8,494 | 6,832 |
| 1947 | 6,174 | 6,951 | 11,152 | 12,269 | 11,440 | 11,743 | 9,225 | 13,719 | 12,140 | 11,147 | 7,552 | 6,606 |
| 1948 | 9,277 | 7,983 | 9,839 | 13,453 | 8,475 | 8,980 | 10,646 | 15,422 | 14,551 | 12,742 | 10,130 | 7,100 |
| 1949 | 6,715 | 7,001 | 7,456 | 8,704 | 7,733 | 11,755 | 11,075 | 14,527 | 12,196 | 7,659 | 6,387 | 5,788 |
| 1950 | 6,411 | 6,909 | 6,442 | 10,107 | 12,082 | 13,281 | 11,728 | 13,349 | 14,053 | 12,943 | 9,017 | 6,614 |
| 1951 | 7,296 | 8,523 | 11,891 | 14,672 | 14,410 | 11,004 | 12,405 | 14,779 | 12,203 | 11,839 | 9,314 | 6,776 |
| 1952 | 8,535 | 7,086 | 9,837 | 11,790 | 9,761 | 9,056 | 12,542 | 15,843 | 12,691 | 9,977 | 7,570 | 6,376 |
| 1953 | 6,406 | 7,232 | 7,037 | 8,271 | 10,387 | 7,314 | 7,434 | 12,858 | 15,144 | 12,944 | 8,659 | 6,688 |
| 1954 | 6,637 | 7,121 | 8,765 | 9,996 | 11,754 | 9,603 | 10,401 | 14,174 | 14,287 | 13,474 | 11,446 | 9,650 |
| 1955 | 6,865 | 7,299 | 8,895 | 8,809 | 5,869 | 5,485 | 7,008 | 10,968 | 14,108 | 14,071 | 9,910 | 6,261 |
| 1956 | 7,109 | 7,889 | 11,706 | 15,297 | 10,200 | 12,163 | 13,590 | 15,516 | 14,113 | 12,548 | 8,987 | 6,713 |
| 1957 | 6,904 | 6,871 | 8,333 | 10,092 | 6,817 | 8,993 | 11,501 | 15,655 | 14,870 | 9,863 | 7,060 | 6,341 |
| 1958 | 6,428 | 7,108 | 6,863 | 8,782 | 9,832 | 9,340 | 10,223 | 15,019 | 14,008 | 9,678 | 7,295 | 6,523 |
| 1959 | 6,379 | 7,355 | 10,301 | 14,620 | 11,866 | 9,543 | 10,194 | 12,543 | 14,675 | 12,896 | 8,677 | 9,780 |
| 1960 | 9,895 | 9,246 | 11,139 | 12,366 | 7,459 | 8,985 | 13,964 | 11,472 | 13,191 | 10,698 | 7,629 | 6,296 |
| 1961 | 6,387 | 6,977 | 7,780 | 10,422 | 10,741 | 9,962 | 10,070 | 13,365 | 14,350 | 10,337 | 7,596 | 6,125 |
| 1962 | 6,502 | 7,258 | 6,847 | 10,257 | 6,978 | 6,068 | 13,410 | 12,339 | 11,872 | 10,590 | 8,350 | 6,315 |
| 1963 | 7,121 | 7,566 | 10,461 | 11,893 | 8,552 | 6,616 | 7,491 | 13,102 | 12,883 | 10,686 | 8,564 | 6,820 |
| 1964 | 6,198 | 7,165 | 7,402 | 9,400 | 7,484 | 6,314 | 8,635 | 11,713 | 14,498 | 14,114 | 9,691 | 7,381 |
| 1965 | 7,632 | 7,068 | 11,723 | 15,763 | 13,352 | 11,512 | 11,389 | 14,302 | 13,523 | 10,836 | 9,241 | 6,419 |
| 1966 | 7,005 | 7,160 | 8,415 | 11,892 | 6,788 | 6,436 | 10,695 | 11,395 | 11,444 | 11,428 | 7,798 | 6,028 |
| 1967 | 6,381 | 7,104 | 7,519 | 12,908 | 12,844 | 8,169 | 7,507 | 11,656 | 14,380 | 13,303 | 9,026 | 6,830 |
| 1968 | 6,642 | 6,894 | 7,741 | 10,890 | 10,553 | 8,989 | 6,349 | 11,027 | 13,800 | 12,161 | 9,536 | 8,070 |
| 1969 | 7,772 | 8,073 | 9,914 | 14,704 | 11,723 | 8,566 | 13,296 | 15,740 | 14,223 | 11,029 | 7,788 | 6,478 |
| 1970 | 6,575 | 7,161 | 6,900 | 10,434 | 9,221 | 7,276 | 7,397 | 12,789 | 13,332 | 10,220 | 6,633 | 6,059 |
| 1971 | 6,423 | 7,227 | 6,817 | 13,026 | 15,049 | 10,553 | 12,001 | 15,561 | 14,508 | 13,249 | 10,619 | 7,127 |
| 1972 | 6,872 | 7,016 | 8,509 | 12,917 | 13,600 | 14,534 | 12,050 | 15,408 | 14,265 | 13,800 | 11,239 | 7,549 |
| 1973 | 6,928 | 7,180 | 8,567 | 11,415 | 5,897 | 6,036 | 5,606 | 8,871 | 9,192 | 8,637 | 6,659 | 5,530 |
| 1974 | 6,167 | 6,489 | 10,156 | 16,850 | 14,507 | 12,942 | 13,788 | 15,029 | 14,117 | 14,055 | 10,768 | 6,986 |
| 1975 | 5,910 | 7,120 | 7,321 | 11,124 | 9,138 | 10,341 | 8,409 | 12,959 | 14,359 | 14,477 | 7,999 | 6,906 |
| 1976 | 7,514 | 8,405 | 13,067 | 14,710 | 11,844 | 9,614 | 12,607 | 14,974 | 12,312 | 13,550 | 12,909 | 10,782 |
| 1977 | 6,722 | 7,190 | 7,127 | 8,485 | 5,499 | 5,142 | 4,853 | 7,088 | 7,626 | 7,569 | 6,845 | 5,869 |
| 1978 | 5,916 | 6,833 | 7,164 | 10,490 | 9,027 | 10,093 | 9,899 | 12,013 | 11,300 | 11,606 | 8,049 | 6,245 |

## Table 7: Heavy-Load-Hour Hydro Generation Ratios for FY 2007

| Water Year | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | June | July | Aug | Sep |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1929 | 1.2140 | 1.1791 | 1.1634 | 1.1803 | 1.1140 | 1.1210 | 1.1067 | 1.1062 | 1.2246 | 1.2198 | 1.2432 | 1.2350 |
| 1930 | 1.2169 | 1.1849 | 1.1640 | 1.1519 | 1.1333 | 1.1295 | 1.1074 | 1.1020 | 1.2644 | 1.2339 | 1.2448 | 1.2361 |
| 1931 | 1.2178 | 1.1840 | 1.1668 | 1.1405 | 1.1142 | 1.1210 | 1.1128 | 1.1704 | 1.2622 | 1.2490 | 1.2501 | 1.2391 |
| 1932 | 1.2168 | 1.1801 | 1.1638 | 1.1402 | 1.1104 | 1.1197 | 1.1176 | 1.1504 | 1.1825 | 1.2104 | 1.2078 | 1.2420 |
| 1933 | 1.2167 | 1.1679 | 1.1839 | 1.1727 | 1.2145 | 1.1132 | 1.1527 | 1.1766 | 1.0864 | 1.1026 | 1.1966 | 1.2342 |
| 1934 | 1.2025 | 1.2105 | 1.1868 | 1.0762 | 1.1604 | 1.2080 | 1.1095 | 1.1277 | 1.2391 | 1.2238 | 1.2450 | 1.2418 |
| 1935 | 1.2145 | 1.1684 | 1.1731 | 1.1969 | 1.1832 | 1.1072 | 1.1754 | 1.2168 | 1.2214 | 1.2156 | 1.2189 | 1.2362 |
| 1936 | 1.2162 | 1.1806 | 1.1657 | 1.1652 | 1.1131 | 1.1249 | 1.0751 | 1.1208 | 1.2375 | 1.2355 | 1.2399 | 1.2332 |
| 1937 | 1.2171 | 1.1828 | 1.1647 | 1.1663 | 1.1244 | 1.1278 | 1.1082 | 1.1168 | 1.2229 | 1.2339 | 1.2444 | 1.2337 |
| 1938 | 1.2197 | 1.1741 | 1.1651 | 1.1643 | 1.1423 | 1.1873 | 1.1630 | 1.1119 | 1.1902 | 1.2242 | 1.2318 | 1.2434 |
| 1939 | 1.2200 | 1.1784 | 1.1640 | 1.1955 | 1.1229 | 1.1293 | 1.1106 | 1.1979 | 1.2638 | 1.2278 | 1.2372 | 1.2342 |
| 1940 | 1.2188 | 1.1799 | 1.1673 | 1.1764 | 1.1364 | 1.1911 | 1.1635 | 1.2142 | 1.2577 | 1.2352 | 1.2450 | 1.2338 |
| 1941 | 1.2187 | 1.1731 | 1.1786 | 1.2033 | 1.1181 | 1.1239 | 1.1081 | 1.2020 | 1.2601 | 1.2397 | 1.2427 | 1.2348 |
| 1942 | 1.2176 | 1.1681 | 1.2331 | 1.1660 | 1.1322 | 1.1131 | 1.1117 | 1.2081 | 1.1747 | 1.1994 | 1.1945 | 1.2319 |
| 1943 | 1.2162 | 1.1698 | 1.1674 | 1.2346 | 1.1815 | 1.1659 | 1.1233 | 1.1059 | 1.1718 | 1.1773 | 1.2019 | 1.2370 |
| 1944 | 1.2175 | 1.1784 | 1.1641 | 1.1941 | 1.1186 | 1.1118 | 1.1033 | 1.1442 | 1.2414 | 1.2361 | 1.2433 | 1.2352 |
| 1945 | 1.2127 | 1.1816 | 1.1630 | 1.1441 | 1.1234 | 1.1216 | 1.1069 | 1.1745 | 1.2174 | 1.2246 | 1.2298 | 1.2308 |
| 1946 | 1.2180 | 1.1770 | 1.1704 | 1.2190 | 1.1810 | 1.1850 | 1.1520 | 1.0802 | 1.1892 | 1.2017 | 1.2077 | 1.2398 |
| 1947 | 1.2164 | 1.1714 | 1.2274 | 1.1807 | 1.1979 | 1.2112 | 1.1672 | 1.1614 | 1.2070 | 1.2135 | 1.2114 | 1.2411 |
| 1948 | 1.1943 | 1.2021 | 1.2211 | 1.2038 | 1.1370 | 1.1680 | 1.1508 | 1.0968 | 1.0053 | 1.1838 | 1.1975 | 1.2326 |
| 1949 | 1.2215 | 1.1766 | 1.1788 | 1.2136 | 1.1453 | 1.1802 | 1.0866 | 1.1480 | 1.2167 | 1.2248 | 1.2411 | 1.2257 |
| 1950 | 1.2170 | 1.1725 | 1.1717 | 1.2295 | 1.2097 | 1.1829 | 1.1502 | 1.1171 | 1.0430 | 1.1704 | 1.2119 | 1.2392 |
| 1951 | 1.2220 | 1.2057 | 1.2362 | 1.1518 | 1.1579 | 1.1846 | 1.1193 | 1.0398 | 1.1978 | 1.1797 | 1.2081 | 1.2342 |
| 1952 | 1.2015 | 1.1815 | 1.2270 | 1.1891 | 1.1947 | 1.2000 | 1.1202 | 1.0710 | 1.2086 | 1.2215 | 1.2196 | 1.2389 |
| 1953 | 1.2137 | 1.1820 | 1.1644 | 1.1973 | 1.2087 | 1.1192 | 1.1268 | 1.1777 | 1.1250 | 1.1851 | 1.2042 | 1.2383 |
| 1954 | 1.2202 | 1.1772 | 1.2058 | 1.2343 | 1.2111 | 1.1945 | 1.1524 | 1.0984 | 1.0348 | 1.1422 | 1.1855 | 1.2384 |
| 1955 | 1.2154 | 1.1962 | 1.2053 | 1.1764 | 1.1322 | 1.1252 | 1.1088 | 1.1852 | 1.0367 | 1.0781 | 1.1887 | 1.2299 |
| 1956 | 1.2203 | 1.2006 | 1.2284 | 1.1532 | 1.1930 | 1.1924 | 1.0885 | 1.0332 | 1.0650 | 1.1725 | 1.2006 | 1.2384 |
| 1957 | 1.2231 | 1.1717 | 1.2118 | 1.2307 | 1.1319 | 1.1287 | 1.1637 | 1.1226 | 1.0843 | 1.2207 | 1.2362 | 1.2407 |
| 1958 | 1.2188 | 1.1777 | 1.1649 | 1.2258 | 1.1910 | 1.1958 | 1.1370 | 1.1469 | 1.1519 | 1.2224 | 1.2359 | 1.2422 |
| 1959 | 1.2164 | 1.1899 | 1.2311 | 1.1511 | 1.1964 | 1.1808 | 1.1947 | 1.1351 | 1.1048 | 1.1550 | 1.2010 | 1.2269 |
| 1960 | 1.1850 | 1.2089 | 1.2376 | 1.2217 | 1.1482 | 1.1777 | 1.1396 | 1.2009 | 1.1984 | 1.2089 | 1.2157 | 1.2430 |
| 1961 | 1.2192 | 1.1792 | 1.1786 | 1.2249 | 1.2082 | 1.1968 | 1.1698 | 1.1640 | 1.0252 | 1.2260 | 1.2399 | 1.2409 |
| 1962 | 1.2156 | 1.1744 | 1.1698 | 1.2328 | 1.1268 | 1.1203 | 1.1288 | 1.1854 | 1.2048 | 1.2067 | 1.2238 | 1.2415 |
| 1963 | 1.2222 | 1.1931 | 1.2347 | 1.2368 | 1.1457 | 1.1649 | 1.1627 | 1.2003 | 1.2185 | 1.2123 | 1.1945 | 1.2369 |
| 1964 | 1.2117 | 1.1741 | 1.1688 | 1.2367 | 1.1438 | 1.1208 | 1.1435 | 1.1942 | 1.0750 | 1.1040 | 1.2037 | 1.2335 |
| 1965 | 1.2202 | 1.1813 | 1.2187 | 1.1464 | 1.1813 | 1.1895 | 1.1440 | 1.1132 | 1.1608 | 1.2003 | 1.2018 | 1.2377 |
| 1966 | 1.2231 | 1.1845 | 1.2009 | 1.2002 | 1.1372 | 1.1274 | 1.2054 | 1.2175 | 1.2485 | 1.1969 | 1.2034 | 1.2360 |
| 1967 | 1.2140 | 1.1767 | 1.1719 | 1.1661 | 1.1676 | 1.1633 | 1.1878 | 1.2015 | 1.0735 | 1.1456 | 1.1996 | 1.2419 |
| 1968 | 1.2215 | 1.1806 | 1.1991 | 1.2152 | 1.2011 | 1.1905 | 1.1468 | 1.2282 | 1.1919 | 1.1645 | 1.1926 | 1.2310 |
| 1969 | 1.2214 | 1.2010 | 1.2231 | 1.1522 | 1.2100 | 1.1698 | 1.1130 | 1.0640 | 1.1831 | 1.2066 | 1.2193 | 1.2437 |
| 1970 | 1.2162 | 1.1812 | 1.1717 | 1.2379 | 1.1906 | 1.1260 | 1.1614 | 1.1970 | 1.1800 | 1.2220 | 1.2313 | 1.2303 |
| 1971 | 1.2153 | 1.1771 | 1.1632 | 1.1996 | 1.1432 | 1.1725 | 1.1354 | 1.0298 | 1.1130 | 1.1698 | 1.1877 | 1.2382 |
| 1972 | 1.2155 | 1.1739 | 1.1961 | 1.1993 | 1.1607 | 1.0931 | 1.1395 | 1.0539 | 1.0317 | 1.1393 | 1.1821 | 1.2340 |
| 1973 | 1.2164 | 1.1729 | 1.2067 | 1.2099 | 1.1219 | 1.1219 | 1.1032 | 1.1830 | 1.2634 | 1.2278 | 1.2475 | 1.2286 |
| 1974 | 1.2141 | 1.1591 | 1.2314 | 1.0965 | 1.1525 | 1.1794 | 1.0792 | 1.0316 | 1.0293 | 1.0689 | 1.1898 | 1.2409 |
| 1975 | 1.2137 | 1.1764 | 1.1711 | 1.2295 | 1.1862 | 1.1929 | 1.1602 | 1.1231 | 1.1320 | 1.1411 | 1.2306 | 1.2415 |
| 1976 | 1.2263 | 1.2049 | 1.2205 | 1.1494 | 1.1960 | 1.1578 | 1.1465 | 1.0831 | 1.1923 | 1.0703 | 1.1493 | 1.2388 |
| 1977 | 1.2198 | 1.1780 | 1.1650 | 1.2010 | 1.1162 | 1.0993 | 1.0963 | 1.1777 | 1.2366 | 1.2511 | 1.2485 | 1.2320 |
| 1978 | 1.2096 | 1.1699 | 1.1572 | 1.2385 | 1.1281 | 1.2103 | 1.1789 | 1.1371 | 1.2001 | 1.1964 | 1.2283 | 1.2424 |

# Table 8: Heavy-Load-Hour Hydro Generation Ratios for FY 2008

| Water Year | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | June | July | Aug | Sep |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1929 | 1.21395 | 1.17862 | 1.16283 | 1.17974 | 1.15190 | 1.12027 | 1.10692 | 1.10580 | 1.22377 | 1.21937 | 1.24251 | 1.23530 |
| 1930 | 1.21688 | 1.18443 | 1.16352 | 1.15155 | 1.17127 | 1.12873 | 1.10766 | 1.10161 | 1.26346 | 1.23351 | 1.24416 | 1.23638 |
| 1931 | 1.21771 | 1.18350 | 1.16627 | 1.14017 | 1.15236 | 1.12019 | 1.11307 | 1.16981 | 1.26135 | 1.24850 | 1.24940 | 1.23938 |
| 1932 | 1.21675 | 1.17967 | 1.16334 | 1.13984 | 1.14836 | 1.11894 | 1.11779 | 1.15000 | 1.18159 | 1.21019 | 1.20702 | 1.24224 |
| 1933 | 1.21666 | 1.16748 | 1.18334 | 1.17225 | 1.25664 | 1.11253 | 1.15282 | 1.17613 | 1.08560 | 1.10266 | 1.19587 | 1.23452 |
| 1934 | 1.20246 | 1.20997 | 1.18623 | 1.07602 | 1.20091 | 1.20702 | 1.10979 | 1.12739 | 1.23829 | 1.22345 | 1.24434 | 1.24209 |
| 1935 | 1.21442 | 1.16799 | 1.17252 | 1.19646 | 1.22436 | 1.10654 | 1.17553 | 1.21627 | 1.22043 | 1.21531 | 1.21818 | 1.23649 |
| 1936 | 1.21619 | 1.18016 | 1.16524 | 1.16474 | 1.15126 | 1.12411 | 1.07532 | 1.12040 | 1.23655 | 1.23516 | 1.23921 | 1.23351 |
| 1937 | 1.21705 | 1.18235 | 1.16420 | 1.16586 | 1.16287 | 1.12702 | 1.10841 | 1.11643 | 1.22214 | 1.23332 | 1.24377 | 1.23399 |
| 1938 | 1.21970 | 1.17362 | 1.16464 | 1.16386 | 1.18174 | 1.18637 | 1.16311 | 1.11160 | 1.18929 | 1.22397 | 1.23109 | 1.24375 |
| 1939 | 1.21993 | 1.17795 | 1.16348 | 1.19505 | 1.16071 | 1.12845 | 1.11091 | 1.19734 | 1.26288 | 1.22746 | 1.23657 | 1.23451 |
| 1940 | 1.21875 | 1.17940 | 1.16684 | 1.17596 | 1.17477 | 1.19006 | 1.16369 | 1.21369 | 1.25669 | 1.23473 | 1.24427 | 1.23411 |
| 1941 | 1.21862 | 1.17265 | 1.17802 | 1.20280 | 1.15643 | 1.12305 | 1.10826 | 1.20162 | 1.25898 | 1.23916 | 1.24203 | 1.23511 |
| 1942 | 1.21754 | 1.16765 | 1.23242 | 1.16559 | 1.17131 | 1.11229 | 1.11194 | 1.20759 | 1.17368 | 1.19922 | 1.19376 | 1.23223 |
| 1943 | 1.21616 | 1.16935 | 1.16680 | 1.23400 | 1.22201 | 1.16499 | 1.12352 | 1.10564 | 1.17085 | 1.17729 | 1.20105 | 1.23730 |
| 1944 | 1.21743 | 1.17796 | 1.16360 | 1.19351 | 1.15650 | 1.11099 | 1.10358 | 1.14377 | 1.24035 | 1.23549 | 1.24265 | 1.23546 |
| 1945 | 1.21266 | 1.18113 | 1.16242 | 1.14375 | 1.16110 | 1.12083 | 1.10716 | 1.17403 | 1.21634 | 1.22424 | 1.22908 | 1.23107 |
| 1946 | 1.21796 | 1.17653 | 1.16986 | 1.21846 | 1.22127 | 1.18415 | 1.15209 | 1.08001 | 1.18826 | 1.20151 | 1.20697 | 1.24013 |
| 1947 | 1.21633 | 1.17097 | 1.22667 | 1.18025 | 1.23900 | 1.21031 | 1.16730 | 1.16091 | 1.20597 | 1.21336 | 1.21062 | 1.24136 |
| 1948 | 1.19433 | 1.20155 | 1.22042 | 1.20331 | 1.17576 | 1.16719 | 1.15095 | 1.09653 | 1.00460 | 1.18360 | 1.19677 | 1.23291 |
| 1949 | 1.22142 | 1.17611 | 1.17820 | 1.21305 | 1.18428 | 1.17923 | 1.08688 | 1.14759 | 1.21577 | 1.22416 | 1.24041 | 1.22605 |
| 1950 | 1.21696 | 1.17205 | 1.17110 | 1.22891 | 1.25120 | 1.18195 | 1.15033 | 1.11678 | 1.04228 | 1.17023 | 1.21110 | 1.23954 |
| 1951 | 1.22193 | 1.20517 | 1.23543 | 1.15142 | 1.19723 | 1.18362 | 1.11948 | 1.03967 | 1.19691 | 1.17956 | 1.20737 | 1.23450 |
| 1952 | 1.20153 | 1.18097 | 1.22631 | 1.18865 | 1.23512 | 1.19896 | 1.12045 | 1.07073 | 1.20758 | 1.22122 | 1.21884 | 1.23919 |
| 1953 | 1.21362 | 1.18158 | 1.16392 | 1.19673 | 1.24921 | 1.11849 | 1.12696 | 1.17722 | 1.12411 | 1.18497 | 1.20351 | 1.23862 |
| 1954 | 1.22016 | 1.17674 | 1.20518 | 1.23369 | 1.25245 | 1.19364 | 1.15252 | 1.09815 | 1.03419 | 1.14214 | 1.18485 | 1.23866 |
| 1955 | 1.21533 | 1.19571 | 1.20473 | 1.17594 | 1.17055 | 1.12439 | 1.10907 | 1.18485 | 1.03596 | 1.07830 | 1.18799 | 1.23022 |
| 1956 | 1.22029 | 1.20011 | 1.22772 | 1.15281 | 1.23386 | 1.19139 | 1.08874 | 1.03306 | 1.06421 | 1.17242 | 1.19982 | 1.23877 |
| 1957 | 1.22304 | 1.17125 | 1.21111 | 1.23015 | 1.17000 | 1.12797 | 1.16386 | 1.12229 | 1.08346 | 1.22044 | 1.23546 | 1.24105 |
| 1958 | 1.21877 | 1.17729 | 1.16432 | 1.22519 | 1.23094 | 1.19490 | 1.13708 | 1.14645 | 1.15104 | 1.22209 | 1.23517 | 1.24251 |
| 1959 | 1.21637 | 1.18932 | 1.23041 | 1.15070 | 1.23794 | 1.17994 | 1.19473 | 1.13472 | 1.10401 | 1.15497 | 1.20018 | 1.22720 |
| 1960 | 1.18507 | 1.20830 | 1.23695 | 1.22115 | 1.18714 | 1.17676 | 1.13974 | 1.20039 | 1.19742 | 1.20868 | 1.21493 | 1.24334 |
| 1961 | 1.21919 | 1.17872 | 1.17810 | 1.22438 | 1.24899 | 1.19590 | 1.16988 | 1.16366 | 1.02458 | 1.22572 | 1.23916 | 1.24121 |
| 1962 | 1.21551 | 1.17398 | 1.16930 | 1.23222 | 1.16552 | 1.11948 | 1.12900 | 1.18500 | 1.20384 | 1.20654 | 1.22304 | 1.24180 |
| 1963 | 1.22213 | 1.19255 | 1.23404 | 1.23630 | 1.18439 | 1.16385 | 1.16289 | 1.19976 | 1.21740 | 1.21207 | 1.19377 | 1.23725 |
| 1964 | 1.21168 | 1.17365 | 1.16826 | 1.23608 | 1.18286 | 1.12001 | 1.14385 | 1.19371 | 1.07416 | 1.10410 | 1.20299 | 1.23378 |
| 1965 | 1.22016 | 1.18085 | 1.21796 | 1.14602 | 1.22194 | 1.18851 | 1.14409 | 1.11285 | 1.15981 | 1.20018 | 1.20108 | 1.23807 |
| 1966 | 1.22299 | 1.18403 | 1.20023 | 1.19973 | 1.17593 | 1.12659 | 1.20552 | 1.21702 | 1.24757 | 1.19675 | 1.20265 | 1.23633 |
| 1967 | 1.21394 | 1.17628 | 1.17139 | 1.16566 | 1.20823 | 1.16250 | 1.18801 | 1.20104 | 1.07274 | 1.14549 | 1.19880 | 1.24223 |
| 1968 | 1.22143 | 1.18005 | 1.19845 | 1.21468 | 1.24172 | 1.18954 | 1.14704 | 1.22768 | 1.19100 | 1.16443 | 1.19195 | 1.23132 |
| 1969 | 1.22133 | 1.20049 | 1.22249 | 1.15184 | 1.25145 | 1.16876 | 1.11323 | 1.06381 | 1.18224 | 1.20643 | 1.21850 | 1.24401 |
| 1970 | 1.21620 | 1.18077 | 1.17107 | 1.23724 | 1.23121 | 1.12525 | 1.16159 | 1.19655 | 1.17892 | 1.22174 | 1.23058 | 1.23061 |
| 1971 | 1.21526 | 1.17660 | 1.16259 | 1.19902 | 1.18266 | 1.17149 | 1.13556 | 1.02970 | 1.11213 | 1.16973 | 1.18701 | 1.23850 |
| 1972 | 1.21547 | 1.17341 | 1.19544 | 1.19876 | 1.19998 | 1.09239 | 1.13967 | 1.05372 | 1.03100 | 1.13924 | 1.18150 | 1.23430 |
| 1973 | 1.21639 | 1.17241 | 1.20604 | 1.20928 | 1.15988 | 1.12105 | 1.10343 | 1.18261 | 1.26245 | 1.22745 | 1.24678 | 1.22890 |
| 1974 | 1.21404 | 1.15863 | 1.23066 | 1.09623 | 1.19232 | 1.17846 | 1.07947 | 1.03145 | 1.02860 | 1.06917 | 1.18912 | 1.24123 |
| 1975 | 1.21368 | 1.17598 | 1.17050 | 1.22896 | 1.22663 | 1.19190 | 1.16047 | 1.12273 | 1.13111 | 1.14106 | 1.22989 | 1.24184 |
| 1976 | 1.22623 | 1.20436 | 1.21979 | 1.14902 | 1.23717 | 1.15683 | 1.14668 | 1.08286 | 1.19133 | 1.07057 | 1.14868 | 1.23912 |
| 1977 | 1.21978 | 1.17759 | 1.16440 | 1.20043 | 1.15408 | 1.09862 | 1.09657 | 1.17727 | 1.23571 | 1.25039 | 1.24785 | 1.23228 |
| 1978 | 1.20960 | 1.16941 | 1.15662 | 1.23788 | 1.16713 | 1.20920 | 1.17892 | 1.13673 | 1.19910 | 1.19633 | 1.22756 | 1.24275 |

## Table 9: Heavy-Load-Hour Hydro Generation Ratios for FY 2009

| Water Year | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | June | July | Aug | Sep |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1929 | 1.21382 | 1.17795 | 1.16322 | 1.17959 | 1.11364 | 1.12020 | 1.10686 | 1.10509 | 1.22420 | 1.21924 | 1.24197 | 1.23493 |
| 1930 | 1.21674 | 1.18374 | 1.16387 | 1.15143 | 1.13292 | 1.12865 | 1.10760 | 1.10092 | 1.26385 | 1.23336 | 1.24361 | 1.23597 |
| 1931 | 1.21757 | 1.18281 | 1.16662 | 1.14007 | 1.11386 | 1.12011 | 1.11300 | 1.16899 | 1.26167 | 1.24835 | 1.24885 | 1.23897 |
| 1932 | 1.21660 | 1.17900 | 1.16368 | 1.13975 | 1.11005 | 1.11889 | 1.11775 | 1.14936 | 1.18201 | 1.21004 | 1.20653 | 1.24185 |
| 1933 | 1.21653 | 1.16682 | 1.18370 | 1.17212 | 1.21390 | 1.11247 | 1.15278 | 1.17552 | 1.08618 | 1.10259 | 1.19546 | 1.23409 |
| 1934 | 1.20232 | 1.20924 | 1.18658 | 1.07595 | 1.15996 | 1.20690 | 1.10977 | 1.12680 | 1.23862 | 1.22328 | 1.24378 | 1.24166 |
| 1935 | 1.21429 | 1.16732 | 1.17290 | 1.19630 | 1.18271 | 1.10648 | 1.17547 | 1.21560 | 1.22086 | 1.21516 | 1.21768 | 1.23608 |
| 1936 | 1.21605 | 1.17948 | 1.16558 | 1.16462 | 1.11275 | 1.12403 | 1.07528 | 1.11967 | 1.23694 | 1.23500 | 1.23868 | 1.23313 |
| 1937 | 1.21691 | 1.18166 | 1.16454 | 1.16573 | 1.12402 | 1.12693 | 1.10836 | 1.11580 | 1.22254 | 1.23318 | 1.24323 | 1.23361 |
| 1938 | 1.21955 | 1.17296 | 1.16500 | 1.16372 | 1.14193 | 1.18627 | 1.16308 | 1.11102 | 1.18973 | 1.22383 | 1.23056 | 1.24334 |
| 1939 | 1.21980 | 1.17728 | 1.16387 | 1.19490 | 1.12249 | 1.12837 | 1.11084 | 1.19662 | 1.26327 | 1.22732 | 1.23605 | 1.23411 |
| 1940 | 1.21861 | 1.17872 | 1.16719 | 1.17583 | 1.13599 | 1.18995 | 1.16361 | 1.21301 | 1.25709 | 1.23459 | 1.24368 | 1.23373 |
| 1941 | 1.21849 | 1.17201 | 1.17841 | 1.20264 | 1.11774 | 1.12298 | 1.10819 | 1.20097 | 1.25946 | 1.23905 | 1.24147 | 1.23473 |
| 1942 | 1.21741 | 1.16697 | 1.23279 | 1.16546 | 1.13191 | 1.11222 | 1.11190 | 1.20694 | 1.17418 | 1.19909 | 1.19332 | 1.23183 |
| 1943 | 1.21603 | 1.16870 | 1.16722 | 1.23385 | 1.18102 | 1.16492 | 1.12349 | 1.10502 | 1.17133 | 1.17718 | 1.20059 | 1.23691 |
| 1944 | 1.21729 | 1.17731 | 1.16401 | 1.19336 | 1.11826 | 1.11091 | 1.10351 | 1.14308 | 1.24084 | 1.23539 | 1.24210 | 1.23507 |
| 1945 | 1.21252 | 1.18045 | 1.16282 | 1.14366 | 1.12309 | 1.12075 | 1.10708 | 1.17336 | 1.21681 | 1.22410 | 1.22854 | 1.23071 |
| 1946 | 1.21782 | 1.17586 | 1.17026 | 1.21833 | 1.18048 | 1.18406 | 1.15205 | 1.07945 | 1.18868 | 1.20137 | 1.20650 | 1.23974 |
| 1947 | 1.21621 | 1.17028 | 1.22707 | 1.18012 | 1.19736 | 1.21020 | 1.16724 | 1.16027 | 1.20642 | 1.21322 | 1.21011 | 1.24098 |
| 1948 | 1.19421 | 1.20082 | 1.22076 | 1.20319 | 1.13665 | 1.16710 | 1.15091 | 1.09589 | 1.00527 | 1.18350 | 1.19639 | 1.23249 |
| 1949 | 1.22129 | 1.17544 | 1.17859 | 1.21288 | 1.14484 | 1.17914 | 1.08683 | 1.14693 | 1.21618 | 1.22403 | 1.23987 | 1.22569 |
| 1950 | 1.21682 | 1.17138 | 1.17152 | 1.22875 | 1.20912 | 1.18186 | 1.15031 | 1.11619 | 1.04289 | 1.17014 | 1.21065 | 1.23912 |
| 1951 | 1.22179 | 1.20443 | 1.23581 | 1.15131 | 1.15740 | 1.18353 | 1.11947 | 1.03909 | 1.19733 | 1.17943 | 1.20692 | 1.23408 |
| 1952 | 1.20141 | 1.18028 | 1.22669 | 1.18851 | 1.19416 | 1.19884 | 1.12042 | 1.07008 | 1.20806 | 1.22109 | 1.21832 | 1.23881 |
| 1953 | 1.21349 | 1.18090 | 1.16430 | 1.19661 | 1.20802 | 1.11843 | 1.12690 | 1.17660 | 1.12462 | 1.18485 | 1.20307 | 1.23823 |
| 1954 | 1.22002 | 1.17607 | 1.20552 | 1.23352 | 1.21053 | 1.19353 | 1.15248 | 1.09758 | 1.03472 | 1.14205 | 1.18451 | 1.23824 |
| 1955 | 1.21518 | 1.19496 | 1.20505 | 1.17582 | 1.13177 | 1.12430 | 1.10899 | 1.18428 | 1.03660 | 1.07822 | 1.18760 | 1.22982 |
| 1956 | 1.22015 | 1.19940 | 1.22810 | 1.15270 | 1.19247 | 1.19130 | 1.08869 | 1.03242 | 1.06483 | 1.17230 | 1.19938 | 1.23838 |
| 1957 | 1.22291 | 1.17058 | 1.21151 | 1.22996 | 1.13154 | 1.12791 | 1.16385 | 1.12165 | 1.08402 | 1.22030 | 1.23494 | 1.24067 |
| 1958 | 1.21864 | 1.17661 | 1.16473 | 1.22501 | 1.19039 | 1.19478 | 1.13705 | 1.14582 | 1.15150 | 1.22197 | 1.23464 | 1.24212 |
| 1959 | 1.21624 | 1.18860 | 1.23077 | 1.15059 | 1.19582 | 1.17985 | 1.19467 | 1.13413 | 1.10451 | 1.15485 | 1.19971 | 1.22682 |
| 1960 | 1.18496 | 1.20756 | 1.23728 | 1.22100 | 1.14776 | 1.17666 | 1.13969 | 1.19975 | 1.19786 | 1.20853 | 1.21442 | 1.24292 |
| 1961 | 1.21905 | 1.17801 | 1.17846 | 1.22420 | 1.20766 | 1.19579 | 1.16979 | 1.16313 | 1.02516 | 1.22557 | 1.23860 | 1.24082 |
| 1962 | 1.21538 | 1.17332 | 1.16966 | 1.23205 | 1.12644 | 1.11940 | 1.12897 | 1.18439 | 1.20430 | 1.20639 | 1.22255 | 1.24140 |
| 1963 | 1.22201 | 1.19182 | 1.23438 | 1.23614 | 1.14527 | 1.16372 | 1.16280 | 1.19908 | 1.21788 | 1.21192 | 1.19332 | 1.23685 |
| 1964 | 1.21155 | 1.17298 | 1.16862 | 1.23589 | 1.14335 | 1.11994 | 1.14377 | 1.19313 | 1.07474 | 1.10402 | 1.20259 | 1.23338 |
| 1965 | 1.22002 | 1.18014 | 1.21840 | 1.14592 | 1.18074 | 1.18841 | 1.14405 | 1.11222 | 1.16032 | 1.20006 | 1.20066 | 1.23766 |
| 1966 | 1.22286 | 1.18332 | 1.20063 | 1.19959 | 1.13678 | 1.12652 | 1.20544 | 1.21631 | 1.24793 | 1.19661 | 1.20214 | 1.23594 |
| 1967 | 1.21381 | 1.17561 | 1.17176 | 1.16554 | 1.16716 | 1.16240 | 1.18791 | 1.20055 | 1.07332 | 1.14540 | 1.19835 | 1.24181 |
| 1968 | 1.22130 | 1.17933 | 1.19887 | 1.21452 | 1.20051 | 1.18943 | 1.14694 | 1.22705 | 1.19144 | 1.16430 | 1.19155 | 1.23090 |
| 1969 | 1.22120 | 1.19976 | 1.22283 | 1.15174 | 1.20937 | 1.16867 | 1.11320 | 1.06319 | 1.18264 | 1.20629 | 1.21798 | 1.24361 |
| 1970 | 1.21607 | 1.18007 | 1.17148 | 1.23708 | 1.18999 | 1.12518 | 1.16149 | 1.19598 | 1.17944 | 1.22163 | 1.23003 | 1.23026 |
| 1971 | 1.21513 | 1.17592 | 1.16308 | 1.19889 | 1.14281 | 1.17140 | 1.13556 | 1.02907 | 1.11269 | 1.16962 | 1.18664 | 1.23812 |
| 1972 | 1.21534 | 1.17271 | 1.19584 | 1.19863 | 1.16020 | 1.09233 | 1.13965 | 1.05310 | 1.03165 | 1.13916 | 1.18117 | 1.23391 |
| 1973 | 1.21626 | 1.17173 | 1.20645 | 1.20913 | 1.12155 | 1.12098 | 1.10336 | 1.18200 | 1.26286 | 1.22730 | 1.24622 | 1.22852 |
| 1974 | 1.21391 | 1.15794 | 1.23105 | 1.09615 | 1.15202 | 1.17837 | 1.07943 | 1.03086 | 1.02926 | 1.06910 | 1.18876 | 1.24079 |
| 1975 | 1.21355 | 1.17529 | 1.17092 | 1.22880 | 1.18565 | 1.19179 | 1.16042 | 1.12214 | 1.13162 | 1.14098 | 1.22942 | 1.24145 |
| 1976 | 1.22610 | 1.20361 | 1.22020 | 1.14891 | 1.19546 | 1.15675 | 1.14668 | 1.08223 | 1.19180 | 1.07050 | 1.14842 | 1.23872 |
| 1977 | 1.21964 | 1.17691 | 1.16482 | 1.20026 | 1.11586 | 1.09854 | 1.09650 | 1.17653 | 1.23611 | 1.25026 | 1.24730 | 1.23189 |
| 1978 | 1.20947 | 1.16875 | 1.15710 | 1.23773 | 1.12775 | 1.20907 | 1.17886 | 1.13611 | 1.19960 | 1.19620 | 1.22704 | 1.24236 |

**1.5.2 Adjustments to Federal Hydro Generation Tables.** The following two sections will discuss adjustments made to Federal hydro generation to account for refilling non-treaty storage in Canada and to reconcile differences between the HYDSIM study for FY 2006 and the HYDSIM study for FY 2007. These storage adjustments are added to the values presented in Tables 4-6 to get the final hydro generation for each of the 50 water years

**1.5.3 Non-Treaty Storage.** Adjustments to hydro generation were made for each water year during FY 2007-2009 to reflect the return of non-treaty storage. Since the non-treaty storage agreement expired in FY 2004, BPA is under an obligation to ensure that the storage balance is full by June 30, 2011. Since the current storage balance is 96 ksfd (thousand second foot days) and a full balance is 1134 ksfd, there is a significant amount of water that needs to be stored in the next six years.

The method constructed to model the return of non-treaty storage attempts to minimize the total cost of this return. For purposes of this analysis, it is assumed that a modest amount (87 ksfd) is returned in FY 2006 and that the analysis will focus on FY 2007-2011.

The basic model constructs 50 water year sequences that start in October 2006 and end in July 2011, with each water year incrementing after each October. For FY 2007-2009, hydro generation output from the HYDSIM rate case studies and electricity prices estimated by AURORA were used. For FY 2010-2011, the results from the FY 2009 HYDSIM study and electricity prices estimated by AURORA for FY 2009 were used.

The first step in each water year sequence is to identify opportunities for returning non-treaty storage flows under extremely high flows. The metric chosen for this step is to determine when spill exceeds 150 kcfs, which results in total dissolved gases violating the gas cap at Bonneville dam. Storage under these conditions would occur up to 200 ksfd per month, subject to operational limits in Canada. The median amount of this type of storage over the 50 sequences is 242 ksfd with 2% of the sequences able to return the full amount. This is the only storage that is allowed in the April-September period, since additional storage would inhibit Biological Opinion flow objectives.

For sequences in which high flow returns did not return the full amount, the objective of the next step is to find the lowest cost time to return by July 2011 between October and March. To do this, AURORA prices were averaged for each month in each water year sequence and daily price distributions were constructed by applying daily price variability forecasts to the monthly prices. Averaging price variability results from AURORA over FY 2007-2009 gives the following standard deviations in daily prices as a percentage of monthly average price.

| | Oct | Nov | Dec | Jan | Feb | Mar |
|---|---|---|---|---|---|---|
| Avg | 3.2% | 2.8% | 7.5% | 18.3% | 14.5% | 12.9% |

Given these daily price distributions, the amount of storage that needs to be returned, a maximal amount that can be stored each day (5 ksfd) and project/operational limitations (Chum, Vernita

Bar, Canadian constraints), a daily plan for returning non-treaty storage can be developed for each sequence. These daily storage amounts are then averaged for each day of the month to yield average monthly storage amounts. The median balance over all 50 sequences is 800 ksfd at the end of FY09 with a range of 192 – 1134 ksfd.

Given that BC Hydro also needs to return its storage, it is assumed that the amounts of these returns are doubled. Even if BC Hydro does not match BPA's storage return over the course of the month, there will be an energy delivery from BPA to BC hydro that is roughly equivalent to the amount of lost Federal generation that would have occurred had they matched.
These average monthly storage amounts are then multiplied by the Federal h/k (a measure of electrical energy produced per unit of streamflow) reported by HYDSIM to create a matrix of monthly adjustments to Federal hydro generation.

An additional effect of not having returned storage is that the storage elevation of Mica is lower than it would have been had all of the storage been returned. Since the h/k of a hydro project is proportional to the storage elevation, the energy production per unit of streamflow has been reduced at Mica. This energy reduction is called head loss and BPA must also deliver this additional energy to BC Hydro. The amounts for these energy deliveries are computed for each month of each sequence based upon the amount of non-treaty storage returned. Given these storage return computations, the hydro generation adjustments associated with refilling non-treaty storage during FY 2007-2009 are provided in Tables 10-12.

## Table 10: Federal Hydro Generation Adjustment for Refill of Non-Treaty Storage, FY 2007

| Water Year | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | June | July | Aug | Sep |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1929 | 0 | 0 | 0 | -114 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1930 | 0 | 0 | 0 | 0 | -43 | 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 | -141 | -103 | -111 | 0 | 0 | -288 | 0 | 0 | 0 |
| 1934 | 0 | 0 | -416 | -220 | -333 | -333 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1935 | 0 | 0 | 0 | -240 | -385 | 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 | -191 | -103 | -331 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1939 | 0 | 0 | 0 | -114 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1940 | 0 | 0 | 0 | -97 | 0 | -330 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1941 | 0 | 0 | 0 | -115 | 0 | -135 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1942 | 0 | 0 | -98 | -155 | -83 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1943 | 0 | 0 | 0 | -133 | -152 | -230 | -195 | 0 | 0 | 0 | 0 | 0 |
| 1944 | 0 | 0 | 0 | -19 | 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 | -19 | 0 | -15 | 0 | -303 | 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 | -277 | 0 | 0 | 0 | 0 |
| 1949 | 0 | 0 | 0 | 0 | 0 | -15 | 0 | -405 | 0 | 0 | 0 | 0 |
| 1950 | 0 | 0 | 0 | 0 | 0 | -300 | 0 | 0 | -53 | 0 | 0 | 0 |
| 1951 | 0 | 0 | 0 | -158 | -421 | 0 | 0 | -63 | 0 | 0 | 0 | 0 |
| 1952 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | -280 | 0 | 0 | 0 | 0 |
| 1953 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | -267 | 0 | 0 | 0 |
| 1954 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | -61 | 0 | 0 | 0 |
| 1955 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | -61 | 0 | 0 | 0 |
| 1956 | 0 | 0 | 0 | 0 | 0 | 0 | -124 | -68 | -295 | 0 | 0 | 0 |
| 1957 | 0 | 0 | 0 | -19 | 0 | -19 | 0 | -289 | -302 | 0 | 0 | 0 |
| 1958 | 0 | 0 | 0 | -38 | -41 | -93 | 0 | -451 | 0 | 0 | 0 | 0 |
| 1959 | 0 | 0 | 0 | -257 | -118 | -201 | 0 | 0 | -316 | 0 | 0 | 0 |
| 1960 | 0 | 0 | 0 | -172 | -43 | -214 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1961 | 0 | 0 | 0 | -76 | -95 | -130 | 0 | 0 | -66 | 0 | 0 | 0 |
| 1962 | 0 | 0 | 0 | -114 | -42 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1963 | 0 | 0 | 0 | -94 | -42 | -39 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1964 | 0 | 0 | 0 | -38 | -21 | 0 | 0 | 0 | -290 | 0 | 0 | 0 |
| 1965 | 0 | 0 | 0 | -223 | -240 | -135 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1966 | 0 | 0 | 0 | -63 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1967 | 0 | 0 | 0 | -47 | -50 | 0 | 0 | 0 | -227 | 0 | 0 | 0 |
| 1968 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1969 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | -279 | 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 | -260 | -232 | 0 | 0 | 0 |
| 1972 | 0 | 0 | 0 | 0 | 0 | -429 | 0 | -204 | 0 | 0 | 0 | 0 |
| 1973 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1974 | 0 | 0 | 0 | -513 | -24 | 0 | -38 | -64 | 0 | 0 | 0 | 0 |
| 1975 | 0 | 0 | 0 | -114 | -62 | -237 | 0 | 0 | -408 | 0 | 0 | 0 |
| 1976 | 0 | 0 | -290 | -418 | -354 | -368 | 0 | -257 | 0 | 0 | 0 | 0 |
| 1977 | -137 | -40 | 0 | -227 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1978 | 0 | 0 | 0 | -496 | -559 | -498 | 0 | 0 | 0 | 0 | 0 | 0 |

## Table 11: Federal Hydro Generation Adjustment for Refill of Non-Treaty Storage, FY 2008

| Water Year | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | June | July | Aug | Sep |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1929 | -118 | 0 | 0 | 0 | -319 | 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 | -219 | -185 | -166 | 0 | 0 | -288 | 0 | 0 | 0 |
| 1933 | 0 | 0 | -430 | -220 | -345 | -393 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1934 | 0 | 0 | 0 | -292 | -368 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1935 | -20 | 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 | -334 | -269 | -478 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1938 | 0 | 0 | 0 | -266 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1939 | 0 | 0 | 0 | -195 | 0 | -485 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1940 | 0 | 0 | 0 | -192 | 0 | -160 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1941 | 0 | 0 | -39 | -328 | -289 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1942 | 0 | 0 | 0 | -342 | -381 | -430 | -195 | 0 | 0 | 0 | 0 | 0 |
| 1943 | 0 | 0 | 0 | -133 | 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 | -77 | -41 | -180 | 0 | -303 | 0 | 0 | 0 | 0 |
| 1946 | 0 | 0 | 0 | -47 | -38 | -45 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1947 | 0 | 0 | 0 | -31 | 0 | 0 | 0 | -277 | 0 | 0 | 0 | 0 |
| 1948 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | -405 | 0 | 0 | 0 | 0 |
| 1949 | 0 | 0 | 0 | -19 | -17 | -315 | 0 | 0 | -53 | 0 | 0 | 0 |
| 1950 | 0 | 0 | 0 | -158 | -214 | 0 | 0 | -63 | 0 | 0 | 0 | 0 |
| 1951 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | -280 | 0 | 0 | 0 | 0 |
| 1952 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | -267 | 0 | 0 | 0 |
| 1953 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | -61 | 0 | 0 | 0 |
| 1954 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | -61 | 0 | 0 | 0 |
| 1955 | 0 | 0 | 0 | 0 | 0 | 0 | -124 | -68 | -295 | 0 | 0 | 0 |
| 1956 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | -289 | -302 | 0 | 0 | 0 |
| 1957 | 0 | 0 | 0 | -19 | -21 | -37 | 0 | -451 | 0 | 0 | 0 | 0 |
| 1958 | 0 | 0 | 0 | -257 | -152 | -164 | 0 | 0 | -316 | 0 | 0 | 0 |
| 1959 | -65 | 0 | 0 | -207 | -87 | -253 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1960 | 0 | 0 | 0 | -228 | -324 | -391 | 0 | 0 | -66 | 0 | 0 | 0 |
| 1961 | 0 | 0 | 0 | -170 | -63 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1962 | 0 | 0 | -19 | -235 | -232 | -174 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1963 | 0 | 0 | 0 | -133 | -62 | 0 | 0 | 0 | -290 | 0 | 0 | 0 |
| 1964 | 0 | 0 | 0 | -223 | -315 | -270 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1965 | 0 | 0 | 0 | -110 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1966 | 0 | 0 | 0 | -234 | -251 | -147 | 0 | 0 | -227 | 0 | 0 | 0 |
| 1967 | 0 | 0 | 0 | -57 | -57 | -56 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1968 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | -279 | 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 | -260 | -232 | 0 | 0 | 0 |
| 1971 | 0 | 0 | 0 | 0 | 0 | -429 | 0 | -204 | 0 | 0 | 0 | 0 |
| 1972 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1973 | 0 | 0 | 0 | -513 | -24 | 0 | -38 | -64 | 0 | 0 | 0 | 0 |
| 1974 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | -408 | 0 | 0 | 0 |
| 1975 | 0 | 0 | -161 | -418 | -269 | -349 | 0 | -257 | 0 | 0 | 0 | 0 |
| 1976 | 0 | 0 | 0 | -189 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1977 | 0 | 0 | 0 | -496 | -538 | -498 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1978 | 0 | 0 | 0 | -477 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

## Table 12: Federal Hydro Generation Adjustment for Refill of Non-Treaty Storage, FY 2009

| Water Year | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | June | July | Aug | Sep |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1929 | -588 | 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 | -19 | -281 | -246 | -222 | 0 | 0 | -288 | 0 | 0 | 0 |
| 1932 | -176 | 0 | -430 | -220 | -308 | -409 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1933 | -118 | 0 | 0 | -351 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1934 | -196 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1935 | -353 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1936 | -308 | 0 | -157 | -398 | -393 | -534 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1937 | -569 | 0 | 0 | -361 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1938 | -549 | 0 | 0 | -312 | 0 | -563 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1939 | -392 | 0 | -59 | -250 | 0 | -160 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1940 | -432 | 0 | -254 | -362 | -351 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1941 | -550 | 0 | -156 | -437 | -514 | -461 | -195 | 0 | 0 | 0 | 0 | 0 |
| 1942 | -243 | -20 | 0 | -247 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1943 | -39 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1944 | 0 | 0 | 0 | -191 | -145 | -285 | 0 | -306 | 0 | 0 | 0 | 0 |
| 1945 | 0 | 0 | 0 | -157 | -190 | -224 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1946 | 0 | 0 | 0 | -110 | -21 | -37 | 0 | -277 | 0 | 0 | 0 | 0 |
| 1947 | 0 | 0 | 0 | -19 | 0 | -15 | 0 | -405 | 0 | 0 | 0 | 0 |
| 1948 | 0 | 0 | 0 | 0 | 0 | -90 | 0 | 0 | -53 | 0 | 0 | 0 |
| 1949 | 0 | 0 | 0 | -198 | -80 | 0 | 0 | -63 | 0 | 0 | 0 | 0 |
| 1950 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | -280 | 0 | 0 | 0 | 0 |
| 1951 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | -269 | 0 | 0 | 0 |
| 1952 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | -61 | 0 | 0 | 0 |
| 1953 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | -61 | 0 | 0 | 0 |
| 1954 | 0 | 0 | 0 | 0 | 0 | 0 | -124 | -68 | -295 | 0 | 0 | 0 |
| 1955 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | -289 | -302 | 0 | 0 | 0 |
| 1956 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | -453 | 0 | 0 | 0 | 0 |
| 1957 | 0 | 0 | 0 | -198 | -84 | -110 | 0 | 0 | -318 | 0 | 0 | 0 |
| 1958 | -407 | 0 | -18 | -207 | -87 | -86 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1959 | 0 | 0 | 0 | -247 | -324 | -410 | 0 | 0 | -66 | 0 | 0 | 0 |
| 1960 | -39 | 0 | 0 | -303 | -168 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1961 | -20 | 0 | -78 | -251 | -211 | -174 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1962 | 0 | 0 | 0 | -285 | -186 | 0 | 0 | 0 | -290 | 0 | 0 | 0 |
| 1963 | -20 | 0 | -146 | -223 | -315 | -360 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1964 | 0 | 0 | 0 | -220 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1965 | 0 | 0 | 0 | -234 | -201 | -128 | 0 | 0 | -227 | 0 | 0 | 0 |
| 1966 | 0 | 0 | 0 | -247 | -305 | -317 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1967 | 0 | 0 | 0 | -238 | -95 | -74 | 0 | -279 | 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 | -260 | -232 | 0 | 0 | 0 |
| 1970 | 0 | 0 | 0 | 0 | 0 | -429 | 0 | -204 | 0 | 0 | 0 | 0 |
| 1971 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1972 | 0 | 0 | 0 | -293 | 0 | 0 | -38 | -64 | 0 | 0 | 0 | 0 |
| 1973 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | -408 | 0 | 0 | 0 |
| 1974 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | -257 | 0 | 0 | 0 | 0 |
| 1975 | -20 | 0 | 0 | -170 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1976 | 0 | 0 | 0 | -381 | -414 | -339 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1977 | 0 | 0 | 0 | -419 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1978 | -256 | 0 | 0 | 0 | -596 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

**1.5.4 FY 2007 Storage Adjustment.** The HYDSIM study for FY 2006, which was completed after the rate case HYDSIM study for FY 2007, showed September 2006 ending reservoir storage contents for reservoirs in Canada that were different than the values assumed in the FY 2007 HYDSIM study. To reconcile these differences between the FY 2006 and 2007 HYDSIM studies, generation adjustments were applied to the FY 2007 hydro generation table. These generation adjustments to the FY 2007 HYDSIM study are shown in Table 13.

## Table 13: Federal Hydro Generation Storage Adjustment for FY 2007

| Water Year | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | June | July | Aug | Sep |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1929 | -95 | -95 | -95 | -95 | -95 | -95 | -95 | -95 | -95 | -95 | 0 | 0 |
| 1930 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 0 | 0 |
| 1931 | 136 | 136 | 136 | 136 | 136 | 136 | 136 | 136 | 136 | 136 | 0 | 0 |
| 1932 | 703 | 703 | 703 | 703 | 703 | 703 | 703 | 703 | 703 | 703 | 0 | 0 |
| 1933 | -30 | -30 | -30 | -30 | -30 | -30 | -30 | -30 | -30 | -30 | 0 | 0 |
| 1934 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | 0 | 0 |
| 1935 | 68 | 68 | 68 | 68 | 68 | 68 | 68 | 68 | 68 | 68 | 0 | 0 |
| 1936 | -57 | -57 | -57 | -57 | -57 | -57 | -57 | -57 | -57 | -57 | 0 | 0 |
| 1937 | -21 | -21 | -21 | -21 | -21 | -21 | -21 | -21 | -21 | -21 | 0 | 0 |
| 1938 | 316 | 316 | 316 | 316 | 316 | 316 | 316 | 316 | 316 | 316 | 0 | 0 |
| 1939 | -36 | -36 | -36 | -36 | -36 | -36 | -36 | -36 | -36 | -36 | 0 | 0 |
| 1940 | -34 | -34 | -34 | -34 | -34 | -34 | -34 | -34 | -34 | -34 | 0 | 0 |
| 1941 | 141 | 141 | 141 | 141 | 141 | 141 | 141 | 141 | 141 | 141 | 0 | 0 |
| 1942 | 363 | 363 | 363 | 363 | 363 | 363 | 363 | 363 | 363 | 363 | 0 | 0 |
| 1943 | -65 | -65 | -65 | -65 | -65 | -65 | -65 | -65 | -65 | -65 | 0 | 0 |
| 1944 | -83 | -83 | -83 | -83 | -83 | -83 | -83 | -83 | -83 | -83 | 0 | 0 |
| 1945 | 512 | 512 | 512 | 512 | 512 | 512 | 512 | 512 | 512 | 512 | 0 | 0 |
| 1946 | 290 | 290 | 290 | 290 | 290 | 290 | 290 | 290 | 290 | 290 | 0 | 0 |
| 1947 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | 0 | 0 |
| 1948 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | 0 | 0 |
| 1949 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | 0 | 0 |
| 1950 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 0 | 0 |
| 1951 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | 0 | 0 |
| 1952 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | 0 | 0 |
| 1953 | -55 | -55 | -55 | -55 | -55 | -55 | -55 | -55 | -55 | -55 | 0 | 0 |
| 1954 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | 0 | 0 |
| 1955 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | 0 | 0 |
| 1956 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | 0 | 0 |
| 1957 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | 0 | 0 |
| 1958 | -49 | -49 | -49 | -49 | -49 | -49 | -49 | -49 | -49 | -49 | 0 | 0 |
| 1959 | -70 | -70 | -70 | -70 | -70 | -70 | -70 | -70 | -70 | -70 | 0 | 0 |
| 1960 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | 0 | 0 |
| 1961 | -99 | -99 | -99 | -99 | -99 | -99 | -99 | -99 | -99 | -99 | 0 | 0 |
| 1962 | -63 | -63 | -63 | -63 | -63 | -63 | -63 | -63 | -63 | -63 | 0 | 0 |
| 1963 | -86 | -86 | -86 | -86 | -86 | -86 | -86 | -86 | -86 | -86 | 0 | 0 |
| 1964 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | 0 | 0 |
| 1965 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | 0 | 0 |
| 1966 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | 0 | 0 |
| 1967 | -79 | -79 | -79 | -79 | -79 | -79 | -79 | -79 | -79 | -79 | 0 | 0 |
| 1968 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | 0 | 0 |
| 1969 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | 0 | 0 |
| 1970 | -78 | -78 | -78 | -78 | -78 | -78 | -78 | -78 | -78 | -78 | 0 | 0 |
| 1971 | -47 | -47 | -47 | -47 | -47 | -47 | -47 | -47 | -47 | -47 | 0 | 0 |
| 1972 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | 0 | 0 |
| 1973 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | 0 | 0 |
| 1974 | 139 | 139 | 139 | 139 | 139 | 139 | 139 | 139 | 139 | 139 | 0 | 0 |
| 1975 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | 0 | 0 |
| 1976 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | 0 | 0 |
| 1977 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | -100 | 0 | 0 |
| 1978 | 746 | 746 | 746 | 746 | 746 | 746 | 746 | 746 | 746 | 746 | 0 | 0 |

**1.5.5 Variable 4(h)(10)(C) Fish 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 non-power 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 2007-2009 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 0.223 (22.3 percent).

The costs of the operational impacts are calculated for each of the 50 water years in RiskMod for FY 2007-2009 by multiplying HLH and LLH spot market electricity prices from AURORA by the amount of power purchases (aMW) that qualifies for 4(h)(10)(C) credits. The amounts of power purchases (aMW) that qualifies for 4(h)(10)(C) credits are derived external to RiskMod, but are used in RiskMod to calculate the dollar amount of the 4(h)(10)(C) credits. Documentation of the power purchases used for FY 2007 – 2009, along with a description of the methodology used to derive the amounts of power purchases (aMW) associated with the 4(h)(10)(C) credits, are contained in the Load Resource Study Documentation, WP-07-E-BPA-01A. The capital costs for FY 2007-2009 are $36 million per year and the expenses are $143 million per year (*see* Revenue Requirement Study, WP-07-E-BPA-02).

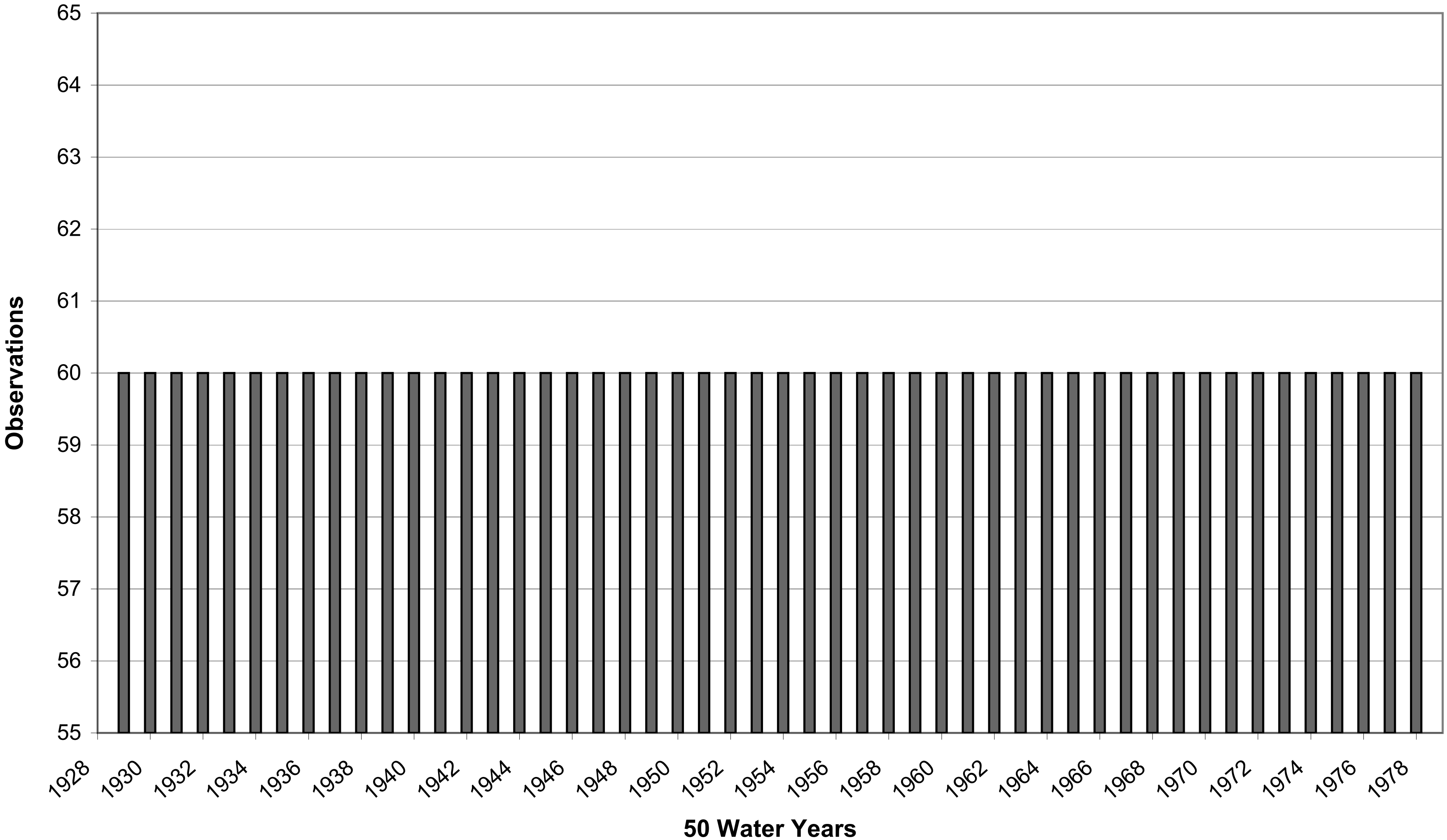
**1.5.6 Sampling Hydro Generation.** Federal and PNW hydro generation variability is modeled in RiskMod by randomly sampling, in the @RISK computer software, each of the 50 water years (1929-1978) and using the associated hydro generation data in the same continuous manner that the data are developed by HydroSim when performing a continuous study. The random selection of the initial water year (for FY 2007) 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 2007). 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 3000 simulations. As shown in this graph, each of the 50 water years was sampled 60 times.

After an initial water year is selected for FY 2007 for a given simulation, hydro generation data for a sequential set of three water years, starting with the water year selected for FY 2007, 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 year 1929, for a total of three 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 RAM2007 are derived by performing a 50 water year run of RiskMod. *See* the Revenue Forecast component of the Wholesale Power Rate Development Study, WP-07-E-BPA-05; and discussion of the RAM2007 components of the Wholesale Power Rate Development Study, WP-07-E-BPA-05.

For the 50 water year run of RiskMod, average surplus energy revenues, 4(h)(10)(C) credits and power purchase expenses are estimated using Federal HLH and LLH hydro generation for the 50 water years under the 2004 Bi-Op. 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, 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-07-E-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 to quantify net revenue risk.

**Graph 2: Number of Times PNW and Federal Hydro Generation for the 50 Water Years were Sampled Based on 3,000 Sampled Values**



**1.5.7 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, and 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 PNW and BPA Load Risk Factor

PNW load risk is incorporated into the Risk Analysis Study to account for the impact that PNW load variability, which is simulated in the PNW Load Risk Model, has on monthly HLH and LLH spot market electricity prices, which impacts PBL's surplus energy revenues and power purchase expenses. This impact is accounted 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 risk 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.

**1.6.1 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 CY 2005-2009, 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 Market Price Forecast Study. *See* Market Price Forecast Study, WP-07-E-BPA-03.

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 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 CY 2005-2009 and then, subsequently, simulating the impact of monthly load swings due to weather on the simulated monthly loads that include load growth.

**1.6.2 Annual PNW and BPA Load Growth Risk.** Annual PNW (and indirectly BPA) load growth risk is modeled to simulate various load patterns through time using a mean-reverting, random-walk technique. The random-walk technique 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. The mean-reverting technique causes simulated annual loads to tend to revert to the forecasted loads as loads move further from forecasted loads (either higher or lower).

Input data from the AURORA Model used in the PNW Load Risk Model are the following: (1) annual average CY 2004 PNW load; (2) forecasted annual load growth for CY 2005-2009; 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* Market Price Forecast Study, WP-07-E-BPA-03. 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.

The annual load growth standard deviation used in the PNW Load Risk Model is 3.26 percent with cumulative annual load growth standard deviations over two, three, four, and five year durations being 4.23, 5.16, 6.00, and 6.87 percent. These values were derived from historical annual Western Electricity Coordinating Council (WECC) load data for the Northwest Power Pool Area during 1982-2004. The source of this data was a publication by the WECC titled, 10-Year Coordinated Plan Summary, Planning and Operation for Electric System Reliability, Western Electricity Coordinating Council, June 2005, at 56. Variability in monthly loads due to load growth risk is derived by multiplying variable annual loads by deterministic monthly load shape factors. The historical WECC load data and the cumulative annual load growth standard deviation calculations by BPA for the PNW are reported in Table 14.

# Table 14: PNW and California Load Growth Standard Deviation Calculations for One to Seven Years

**Pacific Northwest (NWPP)**

| Year | NWPP | % Change Over 1 Yr | % Change Over 2 Yrs | % Change Over 3 Yrs | % Change Over 4 Yrs | % Change Over 5 Yrs | % Change Over 6 Yrs | % Change Over 7 Yrs |
|---|---|---|---|---|---|---|---|---|
| 1982 | 26,804 | | | | | | | |
| 1983 | 26,861 | 0.21% | | | | | | |
| 1984 | 28,642 | 6.63% | 6.86% | | | | | |
| 1985 | 29,372 | 2.55% | 9.35% | 9.58% | | | | |
| 1986 | 28,927 | -1.52% | 1.00% | 7.69% | 7.92% | | | |
| 1987 | 29,954 | 3.55% | 1.98% | 4.58% | 11.52% | 11.75% | | |
| 1988 | 31,986 | 6.78% | 10.58% | 8.90% | 11.68% | 19.08% | 19.34% | |
| 1989 | 33,265 | 4.00% | 11.05% | 15.00% | 13.25% | 16.14% | 23.84% | 24.11% |
| 1990 | 34,372 | 3.33% | 7.46% | 14.75% | 18.82% | 17.02% | 20.01% | 27.96% |
| 1991 | 34,840 | 1.36% | 4.74% | 8.92% | 16.31% | 20.44% | 18.62% | 21.64% |
| 1992 | 35,114 | 0.79% | 2.16% | 5.56% | 9.78% | 17.23% | 21.39% | 19.55% |
| 1993 | 35,708 | 1.69% | 2.49% | 3.89% | 7.34% | 11.63% | 19.21% | 23.44% |
| 1994 | 36,107 | 1.12% | 2.83% | 3.64% | 5.05% | 8.54% | 12.88% | 20.54% |
| 1995 | 36,336 | 0.63% | 1.76% | 3.48% | 4.29% | 5.71% | 9.23% | 13.60% |
| 1996 | 38,151 | 5.00% | 5.66% | 6.84% | 8.65% | 9.50% | 10.99% | 14.69% |
| 1997 | 37,911 | -0.63% | 4.34% | 5.00% | 6.17% | 7.96% | 8.81% | 10.30% |
| 1998 | 39,144 | 3.25% | 2.60% | 7.73% | 8.41% | 9.62% | 11.48% | 12.35% |
| 1999 | 39,829 | 1.75% | 5.06% | 4.40% | 9.61% | 10.31% | 11.54% | 13.43% |
| 2000 | 40,479 | 1.63% | 3.41% | 6.78% | 6.10% | 11.40% | 12.11% | 13.36% |
| 2001 | 36,998 | -8.60% | -7.11% | -5.48% | -2.41% | -3.02% | 1.82% | 2.47% |
| 2002 | 39,121 | 5.74% | -3.36% | -1.78% | -0.06% | 3.19% | 2.54% | 7.67% |
| 2003 | 38,881 | -0.61% | 5.09% | -3.95% | -2.38% | -0.67% | 2.56% | 1.92% |
| 2004 | 39,646 | 1.97% | 1.34% | 7.16% | -2.06% | -0.46% | 1.28% | 4.58% |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Avg** | **0.018** | **0.038** | **0.056** | **0.073** | **0.097** | **0.122** | **0.145** |
| **StDev** | **0.0326** | **0.0423** | **0.0516** | **0.0600** | **0.0687** | **0.0732** | **0.0792** |
| **Min** | **-0.086** | **-0.071** | **-0.055** | **-0.024** | **-0.030** | **0.013** | **0.019** |
| **Max** | **0.068** | **0.111** | **0.150** | **0.188** | **0.204** | **0.238** | **0.280** |

| | |
|---|---|
| **NWPP & Cal/Mex Correlation (Post 1986)** | **0.8943** |

**California (Cal/Mex)**

| Year | CAL/MEX | % Change Over 1 Yr | % Change Over 2 Yrs | % Change Over 3 Yrs | % Change Over 4 Yrs | % Change Over 5 Yrs | % Change Over 6 Yrs | % Change Over 7 Yrs |
|---|---|---|---|---|---|---|---|---|
| 1987 | 24,498 | | | | | | | |
| 1988 | 25,491 | 4.05% | | | | | | |
| 1989 | 26,153 | 2.60% | 6.76% | | | | | |
| 1990 | 27,021 | 3.32% | 6.00% | 10.30% | | | | |
| 1991 | 26,324 | -2.58% | 0.65% | 3.27% | 7.46% | | | |
| 1992 | 27,021 | 2.65% | 0.00% | 3.32% | 6.00% | 10.30% | | |
| 1993 | 26,895 | -0.46% | 2.17% | -0.46% | 2.84% | 5.51% | 9.79% | |
| 1994 | 27,820 | 3.44% | 2.96% | 5.68% | 2.96% | 6.37% | 9.14% | 13.56% |
| 1995 | 27,454 | -1.31% | 2.08% | 1.61% | 4.29% | 1.61% | 4.98% | 7.70% |
| 1996 | 28,390 | 3.41% | 2.05% | 5.56% | 5.07% | 7.85% | 5.07% | 8.56% |
| 1997 | 29,326 | 3.30% | 6.82% | 5.42% | 9.04% | 8.53% | 11.41% | 8.53% |
| 1998 | 29,064 | -0.90% | 2.37% | 5.86% | 4.47% | 8.06% | 7.56% | 10.41% |
| 1999 | 29,943 | 3.02% | 2.10% | 5.47% | 9.06% | 7.63% | 11.33% | 10.82% |
| 2000 | 31,461 | 5.07% | 8.25% | 7.28% | 10.82% | 14.59% | 13.09% | 16.98% |
| 2001 | 30,708 | -2.39% | 2.55% | 5.66% | 4.71% | 8.16% | 11.85% | 10.38% |
| 2002 | 31,689 | 3.20% | 0.73% | 5.83% | 9.03% | 8.06% | 11.62% | 15.43% |
| 2003 | 31,632 | -0.18% | 3.01% | 0.54% | 5.64% | 8.84% | 7.86% | 11.42% |
| 2004 | 32,945 | 4.15% | 3.96% | 7.29% | 4.72% | 10.03% | 13.35% | 12.34% |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Avg** | **0.018** | **0.033** | **0.048** | **0.062** | **0.081** | **0.098** | **0.115** |
| **StDev** | **0.0248** | **0.0243** | **0.0278** | **0.0251** | **0.0294** | **0.0287** | **0.0292** |
| **Min** | **-0.026** | **0.000** | **-0.005** | **0.028** | **0.016** | **0.050** | **0.077** |
| **Max** | **0.051** | **0.082** | **0.103** | **0.108** | **0.146** | **0.134** | **0.170** |

**Note: For the reason describe below, California load growth variability was calculated using data that starts in 1987.**

**Prior to 1997, the Southern Nevada reporting-area data were included in the California sub-area data.**
**The Arizona-New Mexico-Southern Nevada Power Area and California-Mexico Power Area data, prior to 1987,**
**have not been adjusted for the Southern Nevada reporting-area change**

**1.6.3 PNW and BPA Load Risk Due to Weather.** 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 CY 2005 loads for PNW utilities, which were 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.

**1.6.4 Derivation of PNW/BPA Monthly Load Variability Due to Weather.** BPA assumes, for rate setting 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:

$\underline{\sigma_x}$ 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 15 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 15: 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** |

### 1.6.5 Modeling Methodology.

In order for the PNW Load Risk Model to simulate the cumulative annual load growth standard deviations reflected in the historical data over various time durations, mean-reversion decay parameters were developed so that the simulated cumulative annual load growth standard deviations for years two through five (CY 2006-2009) would be calibrated to the values in the historical data. No mean-reversion decay parameter was developed for year 1, since the load growth standard deviation used in the probability distributions is the annual load growth standard deviation for a year.

<u>The mean-reversion methodology incorporated into the standard normal probability distributions is as follows:</u>

Sampled positive or negative standard deviation = RiskNormal (Annual mean-reversion decay parameters * (1 - Simulated mean-reversion ratios), 1)

Where:

RiskNormal = Normal probability distribution in @RISK with
Mean = Annual mean-reversion decay parameters * (1 - Simulated mean-reversion ratios)
Standard deviation = 1
Mean-reversion decay parameters = Calibrated annual load decay values
Simulated mean-reversion ratios = Simulated prior annual load / Forecasted annual load

<u>Annual load movements through time were modeled as follows:</u>

Annual load for time t = Annual load for time t-1 * (1 + (Forecasted load growth from time t-1 to time t + (Sampled positive or negative standard deviation * annual load growth standard deviation)))

**1.6.6 Calibrating Annual Load Variability.** The final step in the modeling process is the derivation of annual decay parameters to better calibrate the cumulative annual load variability simulated by the PNW Load Risk Model to the historical cumulative annual load variability reflected in the WECC annual load data. The calibration of the annual decay values is performed in the following manner: (1) run the model; (2) calculate the cumulative annual load standard deviations for the simulated data and compare these results to the cumulative annual load standard deviations derived by multiplying the forecasted annual loads times the historical cumulative annual load standard deviations; and (3) revise the annual decay values for CY 2006-2009 to test how well the values computed in step (2) compare.

BPA used the statistical approach of minimizing the sum of residuals squared to help objectively determine the relative merits of one set of annual decay values versus another. The sum of residuals squared is calculated by squaring the difference between the values computed in Step (2) above and summing these squared differences. The lower the sum of residuals squared, the better the results.

**1.6.7 Model and Results.** Tables 16 and 17 contain copies of the results of the calibration process for PNW load variability and the PNW Load Risk Model. Graph 3 shows the simulated PNW loads at the 5th, 50th, and 95th percentiles.

## Table 16: PNW and California Load Variability Calibration

| Mean-Reversion Calibration Section | CY05 | CY06 | CY07 | CY08 | CY09 |
|---|---|---|---|---|---|
| Mean Reversion Rate | N/A | 4.000 | 1.200 | 0.300 | 0.001 |
| Additional California Annual Load Volatility Adjustment Factors | 1.016 | 0.150 | 0.460 | 0.001 | 0.535 |
| Sum of Residuals ^2 for PNW (CY05-09) | 435 | | | | |
| Sum of Residuals ^2 for California (CY05-09) | 4,485 | | | | |
| Sum of Residuals ^2 for PNW & California (CY05-09) | 4,920 | | | | |

| PNW Load Risk Result Section | Avg 05-09 | CY 2005 | CY 2006 | CY 2007 | CY 2008 | CY 2009 |
|---|---|---|---|---|---|---|
| Simulated Annual PNW Loads (aMW) | 23,520 | 22,560 | 23,030 | 23,536 | 24,084 | 24,389 |
| Forecasted Annual PNW Loads (aMW) | 23,513 | 22,550 | 23,023 | 23,530 | 24,078 | 24,384 |
| Sim Less Forecast | 7 | 11 | 7 | 6 | 6 | 5 |
| | **Avg 05-09** | **CY 2005** | **CY 2006** | **CY 2007** | **CY 2008** | **CY 2009** |
| Sim Load Stdev | 1,207 | 728 | 974 | 1,216 | 1,458 | 1,660 |
| Historical Load Stdev Applied to Current Load Forecast | 1,209 | 735 | 975 | 1,215 | 1,444 | 1,674 |
| Sim Less Hist Stdev | (2) | (8) | (1) | 1 | 13 | (14) |

| California Load Risk Result Section | Avg 05-09 | CY 2005 | CY 2006 | CY 2007 | CY 2008 | CY 2009 |
|---|---|---|---|---|---|---|
| Simulated Annual Calif Loads (aMW) | 35,023 | 33,250 | 34,114 | 35,001 | 35,904 | 36,844 |
| Forecasted Annual Calif Loads (aMW) | 35,041 | 33,267 | 34,132 | 35,019 | 35,923 | 36,864 |
| Sim Less Forecast | (19) | (17) | (18) | (19) | (19) | (20) |
| | **Avg 05-09** | **CY 2005** | **CY 2006** | **CY 2007** | **CY 2008** | **CY 2009** |
| Sim Load Stdev | 923 | 820 | 835 | 927 | 947 | 1,083 |
| Historical Load Stdev Applied to Current Load Forecast | 922 | 826 | 829 | 974 | 900 | 1,083 |
| Sim Less Hist Stdev | 0 | (6) | 6 | (47) | 47 | 0 |

## Table 17: PNW Load Risk Model for 2005 - 2009

### PNW Load Variability

#### PNW Load Growth Uncertainty:

| | |
|---|---|
| Forecasted Calendar Year (2004) Annual Average PNW Loads | 22,121 |
| Forecasted PNW Load Growth for 2005; Source: Aurora | 1.94% |
| Forecasted PNW Load Growth for 2006; Source: Aurora | 2.10% |
| Forecasted PNW Load Growth for 2007; Source: Aurora | 2.20% |
| Forecasted PNW Load Growth for 2008; Source: Aurora | 2.33% |
| Forecasted PNW Load Growth for 2009; Source: Aurora | 1.27% |
| Annual Load Growth Std Dev; Source: WECC Load Data (1982-2004) | 3.26% |

| Estimated Base Case Loads | | *Std Normal Dist* | Base MR | Additional MR Decay Factors |
|---|---|---|---|---|
| CY 2005 | 22,550 | *0.0* | N/A | |
| CY 2006 | 23,023 | *0.0* | 1.00 | 4.00 |
| CY 2007 | 23,530 | *0.0* | 1.00 | 1.20 |
| CY 2008 | 24,078 | *0.0* | 1.00 | 0.30 |
| CY 2009 | 24,384 | *0.0* | 1.00 | 0.00 |

| *Load Growth Dev from any specified forecasted load level* | |
|---|---|
| CY 2005 | *22550* |
| CY 2006 | *23023* |
| CY 2007 | *23530* |
| CY 2008 | *24078* |
| CY 2009 | *24384* |

#### 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 | Simple Avg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Average Annual PNW Loads (Average Energy in aMW) | 22550 | 22550 | 22550 | 22550 | 22550 | 22550 | 22550 | 22550 | 22550 | 22550 | 22550 | 22550 | |
| PNW Monthly Load Shapes (Source: AURORA) | **1.138** | **1.108** | **1.010** | **0.940** | **0.921** | **0.935** | **0.959** | **0.942** | **0.911** | **0.940** | **1.063** | **1.139** | |
| *Simulated Monthly PNW Loads (Average Energy in aMW)* | 25666 | 24982 | 22780 | 21200 | 20777 | 21079 | 21615 | 21231 | 20549 | 21189 | 23980 | 25674 | **22,560 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 | Simple Avg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PNW Loads after Load Growth (Average Energy in aMW)** | 25666 | 24982 | 22780 | 21200 | 20777 | 21079 | 21615 | 21231 | 20549 | 21189 | 23980 | 25674 | **22,560 aMW** |
| **Monthly Load Standard Deviation** | 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)*** | ***25,666*** | ***24,982*** | ***22,780*** | ***21,200*** | ***20,777*** | ***21,079*** | ***21,615*** | ***21,231*** | ***20,549*** | ***21,189*** | ***23,980*** | ***25,674*** | **22,560 aMW** |

## Table 17: 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 | Simple Avg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Average Annual PNW Loads (Average Energy in aMW) | 23023 | 23023 | 23023 | 23023 | 23023 | 23023 | 23023 | 23023 | 23023 | 23023 | 23023 | 23023 | |
| PNW Monthly Load Shapes (Source: AURORA) | **1.138** | **1.108** | **1.010** | **0.940** | **0.921** | **0.935** | **0.959** | **0.942** | **0.911** | **0.940** | **1.063** | **1.139** | |
| ***Simulated Monthly PNW Loads (Average Energy in aMW)*** | 26205 | 25506 | 23258 | 21645 | 21213 | 21522 | 22069 | 21677 | 20980 | 21634 | 24484 | 26213 | **23,034 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 | Simple Avg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PNW Loads after Load Growth (Average Energy in aMW)** | 26205 | 25506 | 23258 | 21645 | 21213 | 21522 | 22069 | 21677 | 20980 | 21634 | 24484 | 26213 | **23,034 aMW** |
| **Monthly Load Standard Deviation** | 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)*** | ***26,205*** | ***25,506*** | ***23,258*** | ***21,645*** | ***21,213*** | ***21,522*** | ***22,069*** | ***21,677*** | ***20,980*** | ***21,634*** | ***24,484*** | ***26,213*** | **23,034 aMW** |

## Table 17: PNW Load Risk Model for 2007 (Continued)

### PNW Load Variability

**PNW Load Variability Due to Load Growth Uncertainty**

**Calendar Year 2007**

| | Jan '07 | Feb '07 | Mar '07 | Apr '07 | May '07 | Jun '07 | Jul '07 | Aug '07 | Sep '07 | Oct '07 | Nov '07 | Dec '07 | Simple Avg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Average Annual PNW Loads (Average Energy in aMW) | 23530 | 23530 | 23530 | 23530 | 23530 | 23530 | 23530 | 23530 | 23530 | 23530 | 23530 | 23530 | |
| PNW Monthly Load Shapes (Source: AURORA) | **1.138** | **1.108** | **1.010** | **0.940** | **0.921** | **0.935** | **0.959** | **0.942** | **0.911** | **0.940** | **1.063** | **1.139** | |
| ***Simulated Monthly PNW Loads (Average Energy in aMW)*** | 26782 | 26067 | 23770 | 22121 | 21680 | 21995 | 22554 | 22154 | 21442 | 22110 | 25022 | 26790 | **23,541 aMW** |

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

| | Jan '07 | Feb '07 | Mar '07 | Apr '07 | May '07 | Jun '07 | Jul '07 | Aug '07 | Sep '07 | Oct '07 | Nov '07 | Dec '07 | Simple Avg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PNW Loads after Load Growth (Average Energy in aMW)** | 26782 | 26067 | 23770 | 22121 | 21680 | 21995 | 22554 | 22154 | 21442 | 22110 | 25022 | 26790 | **23,541 aMW** |
| **Monthly Load Standard Deviation** | 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)*** | ***26,782*** | ***26,067*** | ***23,770*** | ***22,121*** | ***21,680*** | ***21,995*** | ***22,554*** | ***22,154*** | ***21,442*** | ***22,110*** | ***25,022*** | ***26,790*** | **23,541 aMW** |

## Table 17: PNW Load Risk Model for 2008 (Continued)

### PNW Load Variability

**PNW Load Variability Due to Load Growth Uncertainty**

**Calendar Year 2008**

| | Jan '08 | Feb '08 | Mar '08 | Apr '08 | May '08 | Jun '08 | Jul '08 | Aug '08 | Sep '08 | Oct '08 | Nov '08 | Dec '08 | Simple Avg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Average Annual PNW Loads (Average Energy in aMW) | 24078 | 24078 | 24078 | 24078 | 24078 | 24078 | 24078 | 24078 | 24078 | 24078 | 24078 | 24078 | |
| PNW Monthly Load Shapes (Source: AURORA) | **1.138** | **1.108** | **1.010** | **0.940** | **0.921** | **0.935** | **0.959** | **0.942** | **0.911** | **0.940** | **1.063** | **1.139** | |
| ***Simulated Monthly PNW Loads (Average Energy in aMW)*** | 27406 | 26675 | 24324 | 22637 | 22185 | 22508 | 23080 | 22670 | 21941 | 22625 | 25605 | 27414 | **24,089 aMW** |

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

| | Jan '08 | Feb '08 | Mar '08 | Apr '08 | May '08 | Jun '08 | Jul '08 | Aug '08 | Sep '08 | Oct '08 | Nov '08 | Dec '08 | Simple Avg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PNW Loads after Load Growth (Average Energy in aMW)** | 27406 | 26675 | 24324 | 22637 | 22185 | 22508 | 23080 | 22670 | 21941 | 22625 | 25605 | 27414 | **24,089 aMW** |
| **Monthly Load Standard Deviation** | 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)*** | ***27,406*** | ***26,675*** | ***24,324*** | ***22,637*** | ***22,185*** | ***22,508*** | ***23,080*** | ***22,670*** | ***21,941*** | ***22,625*** | ***25,605*** | ***27,414*** | **24,089 aMW** |

## Table 17: PNW Load Risk Model for 2009 (Continued)

### PNW Load Variability

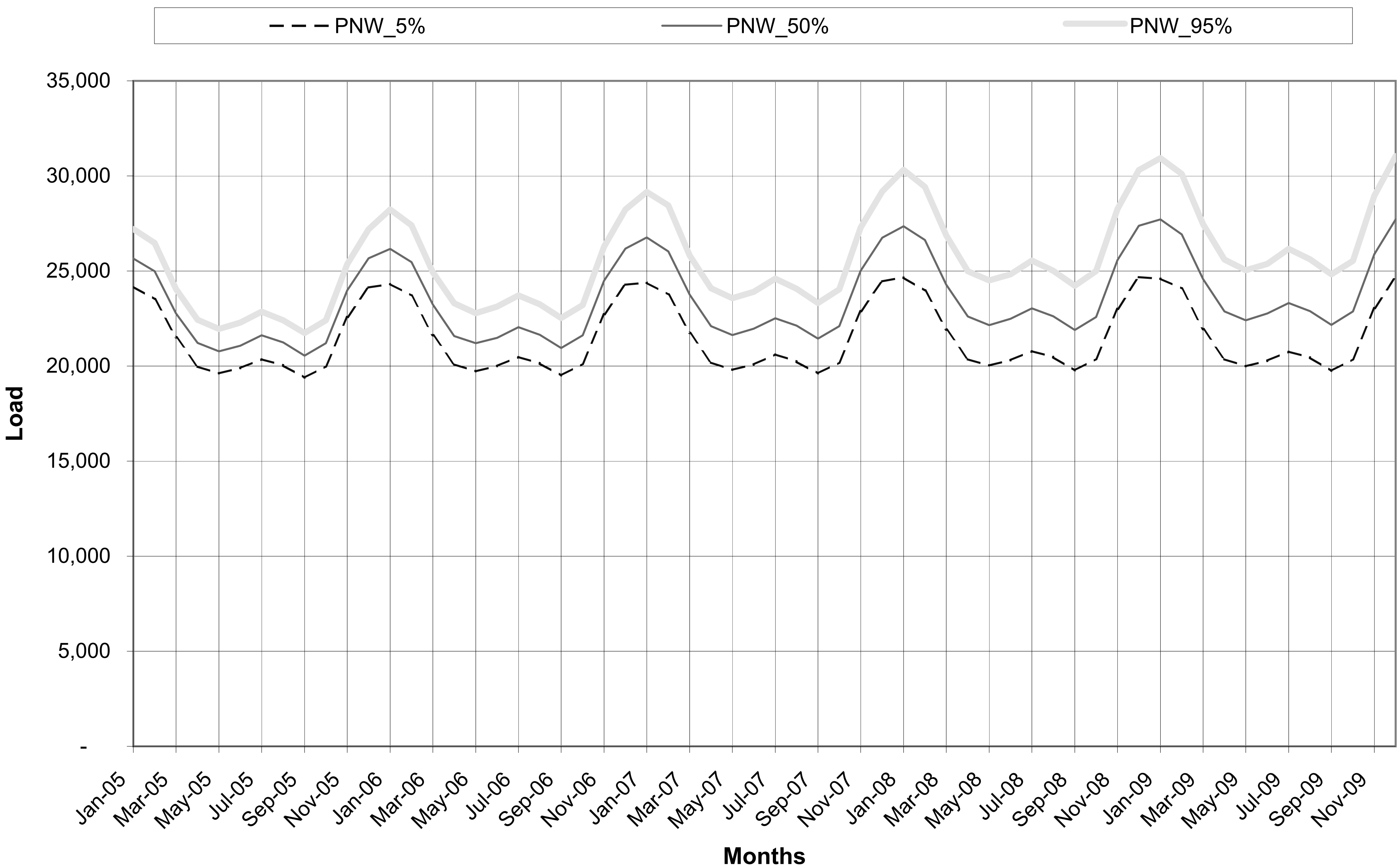
**PNW Load Variability Due to Load Growth Uncertainty**

| | Calendar Year 2009 | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Jan '09** | **Feb '09** | **Mar '09** | **Apr '09** | **May '09** | **Jun '09** | **Jul '09** | **Aug '09** | **Sep '09** | **Oct '09** | **Nov '09** | **Dec '09** | **Simple Avg** |
| Average Annual PNW Loads (Average Energy in aMW) | 24384 | 24384 | 24384 | 24384 | 24384 | 24384 | 24384 | 24384 | 24384 | 24384 | 24384 | 24384 | |
| PNW Monthly Load Shapes (Source: AURORA) | **1.138** | **1.108** | **1.010** | **0.940** | **0.921** | **0.935** | **0.959** | **0.942** | **0.911** | **0.940** | **1.063** | **1.139** | |
| ***Simulated Monthly PNW Loads (Average Energy in aMW)*** | 27754 | 27013 | 24633 | 22924 | 22467 | 22794 | 23373 | 22958 | 22220 | 22913 | 25931 | 27762 | **24,395 aMW** |

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

| | **Jan '09** | **Feb '09** | **Mar '09** | **Apr '09** | **May '09** | **Jun '09** | **Jul '09** | **Aug '09** | **Sep '09** | **Oct '09** | **Nov '09** | **Dec '09** | Simple Avg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PNW Loads after Load Growth (Average Energy in aMW)** | 27754 | 27013 | 24633 | 22924 | 22467 | 22794 | 23373 | 22958 | 22220 | 22913 | 25931 | 27762 | **24,395 aMW** |
| **Monthly Load Standard Deviation** | 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)*** | ***27,754*** | ***27,013*** | ***24,633*** | ***22,924*** | ***22,467*** | ***22,794*** | ***23,373*** | ***22,958*** | ***22,220*** | ***22,913*** | ***25,931*** | ***27,762*** | **24,395 aMW** |

## Graph 3: Simulated PNW Loads for CYs 2005 - 2009



**1.6.8 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.

## 1.7 California Hydro Generation Risk Factor

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.

**1.7.1 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 was collected from reports published by the Energy Information Administration (EIA) for 1980-1997 and they are reported in Table 18.

## Table 18:  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 |

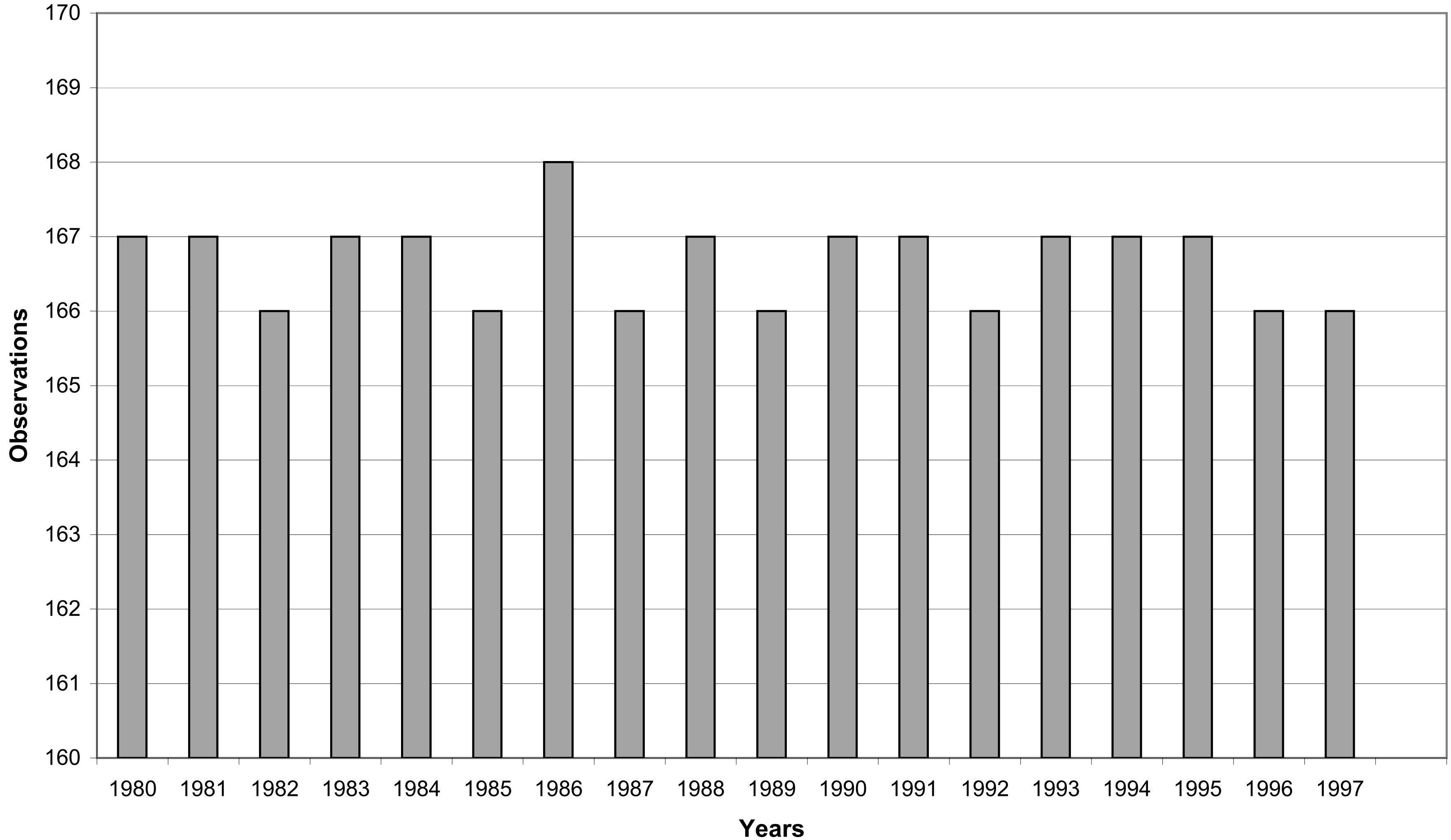
Source:  Energy Information Administration (EIA) - Electric Power Monthly, Table 11.  Electric Utility Hydroelectric Net Generation by Census Division and State, 1980 - 1997

**1.7.2 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 2007) 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 2007).

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 3000 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 3000 simulations is 166.7 (3000/18). These results in Graph 4 indicate that all years, except for 1986, were sampled either 166 or 167 times. The hydro generation data for 1986 were sampled 168 times.

After the initial year is selected for FY 2007 for a given simulation, hydro generation data for a sequential set of three years of data, starting with the hydro generation year selected for FY 2007, 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 year 1, for a total of three 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.

**Graph 4: Number of Times California Hydro Generation for 18 Years were Sampled Based on 3,000 Sampled Values**



**1.7.3 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.

### 1.8 California Load Risk Factor

California load risk is incorporated into the Risk Analysis Study to account for the impact that California load variability 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.

**1.8.1 California Load Variability.** 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 CY 2005-2009, 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 Market Price Forecast Study. *See* Market Price Forecast Study, WP-07-E-BPA-03.

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 CY 2005-2009 and then, subsequently, simulating the impact of monthly load swings due to weather on the simulated monthly loads that include load growth.

**1.8.2 Annual California Load Growth Risk.** Annual California load growth risk is modeled to simulate various load patterns through time using a mean-reverting, random-walk technique. The random-walk technique 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. The mean-reverting technique causes simulated annual loads to tend to revert to the forecasted loads as loads move further from forecasted loads (either higher or lower).

Input data from the AURORA Model used in the California Load Risk Model are the following: (1) annual average CY 2004 California loads; (2) forecasted annual load growth for CY 2005-2009; 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* Market Price Forecast Study, WP-07-E-BPA-03). 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 multiplying an annual load growth standard deviation by values sampled from standard normal distributions (normal probability distributions with a mean of zero and a standard deviation of one) in @RISK 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.

The annual load growth standard deviation used in the California Load Risk Model is 2.48 percent with cumulative annual load growth standard deviations over two, three, four, and five years being 2.43, 2.78, 2.51, and 2.94 percent. These values were derived from historical annual Western Electricity Coordinating Council (WECC) load data for the California/Mexico Power Area during 1987-2004. The source of this data was a publication by the WECC titled, 10-Year Coordinated Plan Summary, Planning and Operation for Electric System Reliability, Western Electricity Coordinating Council, June 2005, at 56. Variability in monthly loads due to load growth variability is derived by multiplying variable annual loads by deterministic monthly load shape factors. The historical WECC load data and the cumulative annual load growth standard deviation calculations by BPA for California, along with the PNW, are reported in Table 14.

**1.8.3 California Load Risk Due to Weather.** 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 CY 2005 loads for California utilities, which were 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.

**1.8.4 Derivation of California Monthly Load Variability Due to Weather.** BPA assumes, for rate-setting 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 19. These monthly load standard deviations are input into the California Load Risk Model to quantify monthly load variability due to weather.

## Table 19: 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** |

**1.8.5 Modeling Methodology.** Based on a correlation analysis of PNW and California loads from 1987-2004 that indicates they are highly correlated (the correlation coefficient between these loads is 0.8943 (*See* Table 14), the values sampled from the standard normal distributions for California are identical (including the mean-reversion impacts) to the values sampled from the standard normal distributions used to estimate annual 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. With the strong relationship between these loads modeled, additional annual load variability adjustment factors were developed for years one through five (CY 2005-2009) in the California Load Risk Model to more closely match the simulated load growth standard deviations for California to the load growth standard deviations in the historical data.
<u>Annual load movements through time were modeled as follows:</u>

Annual load for time t = Annual load for time t-1 * (1 + (Forecasted load growth from time t-1 to time t + (Sampled positive or negative standard deviation * annual load growth standard deviation)))

Where,

The sampled positive or negative standard deviation is the same as for the PNW, but is adjusted by additional annual load variability adjustment factors.

**1.8.6 Calibrating Annual Load Variability.** The final step in the modeling process is the derivation of annual load variability adjustment factors, which are used to better calibrate the cumulative annual load variability simulated by the California Load Risk Model to the historical annual variability reflected in the WECC annual load data. The calibration of the cumulative annual load variability adjustment factors is performed in the following manner: (1) run the model; (2) calculate the cumulative annual load standard deviations for the simulated data and compare these results to the annual load standard deviations derived by multiplying the forecasted annual loads times the historical cumulative annual load standard deviations; and (3) revise the annual load variability adjustment factors for CY 2006-2009 to test how well the values computed in step (2) compare.

BPA used the statistical approach of minimizing the sum of residuals squared to help objectively determine the relative merits of one set of annual decay values versus another. The sum of residuals squared is calculated by squaring the difference between the values computed in Step (2) above and summing these squared differences. The lower the sum of residuals squared, the better the results.

**1.8.7 Model and Results.** Table 16 and Table 20 contain copies of the results of the calibration process for California load variability and the California Load Risk Model. Graph 5 shows the simulated California loads at the 5th, 50th, and 95th percentiles.

# Table 20: California Load Risk Model for 2005 - 2009

## California Load Variability

### California Load Growth Uncertainty:

| | | | |
|---|---|---|---|
| **Forecasted Calendar Year (2004) Annual Average California Loads** | **31,836** | | |
| **Forecasted California Load Growth for 2005; Source: Aurora** | **4.50%** | | |
| **Forecasted California Load Growth for 2006; Source: Aurora** | **2.60%** | | |
| **Forecasted California Load Growth for 2007; Source: Aurora** | **2.60%** | | |
| **Forecasted California Load Growth for 2008; Source: Aurora** | **2.58%** | | |
| **Forecasted California Load Growth for 2009; Source: Aurora** | **2.62%** | | |
| **Annual Load Growth Std Dev; Source: WECC Load Data (1987-2004)** | **2.48%** | | |
| | | ***Std Normal Dist*** | **Additional Adj** |
| **Estimated Base Case Loads** | | ***(Same as PNW)*** | **Factors** |
| **CY 2005** | **33,267** | ***0.0*** | **1.016** |
| **CY 2006** | **34,132** | ***0.0*** | **0.150** |
| **CY 2007** | **35,019** | ***0.0*** | **0.460** |
| **CY 2008** | **35,923** | ***0.0*** | **0.001** |
| **CY 2009** | **36,864** | ***0.0*** | **0.535** |

| | |
|---|---|
| ***Load Growth Dev from any specified forecasted load level*** | |
| **CY 2005** | ***33267*** |
| **CY 2006** | ***34132*** |
| **CY 2007** | ***35019*** |
| **CY 2008** | ***35923*** |
| **CY 2009** | ***36864*** |

### 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** | **Simple Avg** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Average Annual California Loads (Average Energy in aMW) | 33267 | 33267 | 33267 | 33267 | 33267 | 33267 | 33267 | 33267 | 33267 | 33267 | 33267 | 33267 | |
| California Monthly Load Shapes (Source: AURORA) | **0.954** | **0.934** | **0.919** | **0.925** | **0.955** | **1.063** | **1.126** | **1.167** | **1.074** | **0.971** | **0.944** | **0.962** | |
| ***Simulated Monthly California Loads (Average Energy in aMW)*** | 31720 | 31055 | 30585 | 30780 | 31778 | 35377 | 37452 | 38817 | 35745 | 32305 | 31388 | 31995 | **33,250 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** | Simple Avg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **California Loads after Load Growth (Average Energy in aMW)** | 31720 | 31055 | 30585 | 30780 | 31778 | 35377 | 37452 | 38817 | 35745 | 32305 | 31388 | 31995 | **33,250 aMW** |
| **Monthly Load Standard Deviation** | 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 Loads (Average Energy in aMW)*** | ***31,720*** | ***31,055*** | ***30,585*** | ***30,780*** | ***31,778*** | ***35,377*** | ***37,452*** | ***38,817*** | ***35,745*** | ***32,305*** | ***31,388*** | ***31,995*** | **33,250 aMW** |

## Table 20: California Load Risk Model for 2006 (Continued)

### California Load Variability

### California Load Variability Due to Load Growth 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 | Simple Avg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Calendar Year 2006 | | | | | | | | | | | | | |
| Average Annual California Loads (Average Energy in aMW) | 34132 | 34132 | 34132 | 34132 | 34132 | 34132 | 34132 | 34132 | 34132 | 34132 | 34132 | 34132 | |
| California Monthly Load Shapes (Source: AURORA) | **0.954** | **0.934** | **0.919** | **0.925** | **0.955** | **1.063** | **1.126** | **1.167** | **1.074** | **0.971** | **0.944** | **0.962** | |
| ***Simulated Monthly California Loads (Average Energy in aMW)*** | 32545 | 31863 | 31381 | 31581 | 32604 | 36297 | 38426 | 39826 | 36674 | 33145 | 32204 | 32827 | **34,114 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 | Simple Avg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **California Loads after Load Growth (Average Energy in aMW)** | 32545 | 31863 | 31381 | 31581 | 32604 | 36297 | 38426 | 39826 | 36674 | 33145 | 32204 | 32827 | **34,114 aMW** |
| **Monthly Load Standard Deviation** | 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 Loads (Average Energy in aMW)*** | ***32,545*** | ***31,863*** | ***31,381*** | ***31,581*** | ***32,604*** | ***36,297*** | ***38,426*** | ***39,826*** | ***36,674*** | ***33,145*** | ***32,204*** | ***32,827*** | **34,114 aMW** |

## Table 20: California Load Risk Model for 2007 (Continued)

### California Load Variability

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

| | Calendar Year 2007 | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Jan '07** | **Feb '07** | **Mar '07** | **Apr '07** | **May '07** | **Jun '07** | **Jul '07** | **Aug '07** | **Sep '07** | **Oct '07** | **Nov '07** | **Dec '07** | **Simple Avg** |
| Average Annual California Loads (Average Energy in aMW) | 35019 | 35019 | 35019 | 35019 | 35019 | 35019 | 35019 | 35019 | 35019 | 35019 | 35019 | 35019 | |
| California Monthly Load Shapes (Source: AURORA) | **0.954** | **0.934** | **0.919** | **0.925** | **0.955** | **1.063** | **1.126** | **1.167** | **1.074** | **0.971** | **0.944** | **0.962** | |
| ***Simulated Monthly California Loads (Average Energy in aMW)*** | 33391 | 32691 | 32197 | 32402 | 33452 | 37241 | 39425 | 40861 | 37628 | 34007 | 33041 | 33681 | **35,001 aMW** |

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

| | **Jan '07** | **Feb '07** | **Mar '07** | **Apr '07** | **May '07** | **Jun '07** | **Jul '07** | **Aug '07** | **Sep '07** | **Oct '07** | **Nov '07** | **Dec '07** | Simple Avg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **California Loads after Load Growth (Average Energy in aMW)** | 33391 | 32691 | 32197 | 32402 | 33452 | 37241 | 39425 | 40861 | 37628 | 34007 | 33041 | 33681 | **35,001 aMW** |
| **Monthly Load Standard Deviation** | 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 Loads (Average Energy in aMW)*** | ***33,391*** | ***32,691*** | ***32,197*** | ***32,402*** | ***33,452*** | ***37,241*** | ***39,425*** | ***40,861*** | ***37,628*** | ***34,007*** | ***33,041*** | ***33,681*** | **35,001 aMW** |

# Table 20: California Load Risk Model for 2008 (Continued)

## California Load Variability

### California Load Variability Due to Load Growth Uncertainty

| Calendar Year 2008 | Jan '08 | Feb '08 | Mar '08 | Apr '08 | May '08 | Jun '08 | Jul '08 | Aug '08 | Sep '08 | Oct '08 | Nov '08 | Dec '08 | Simple Avg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Average Annual California Loads (Average Energy in aMW) | 35923 | 35923 | 35923 | 35923 | 35923 | 35923 | 35923 | 35923 | 35923 | 35923 | 35923 | 35923 | |
| California Monthly Load Shapes (Source: AURORA) | **0.954** | **0.934** | **0.919** | **0.925** | **0.955** | **1.063** | **1.126** | **1.167** | **1.074** | **0.971** | **0.944** | **0.962** | |
| ***Simulated Monthly California Loads (Average Energy in aMW)*** | 34253 | 33535 | 33028 | 33238 | 34315 | 38202 | 40442 | 41916 | 38599 | 34885 | 33894 | 34550 | **35,905 aMW** |

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

| | Jan '08 | Feb '08 | Mar '08 | Apr '08 | May '08 | Jun '08 | Jul '08 | Aug '08 | Sep '08 | Oct '08 | Nov '08 | Dec '08 | Simple Avg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **California Loads after Load Growth (Average Energy in aMW)** | 34253 | 33535 | 33028 | 33238 | 34315 | 38202 | 40442 | 41916 | 38599 | 34885 | 33894 | 34550 | **35,905 aMW** |
| **Monthly Load Standard Deviation** | 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 Loads (Average Energy in aMW)*** | ***34,253*** | ***33,535*** | ***33,028*** | ***33,238*** | ***34,315*** | ***38,202*** | ***40,442*** | ***41,916*** | ***38,599*** | ***34,885*** | ***33,894*** | ***34,550*** | **35,905 aMW** |

# Table 20: California Load Risk Model for 2009 (Continued)

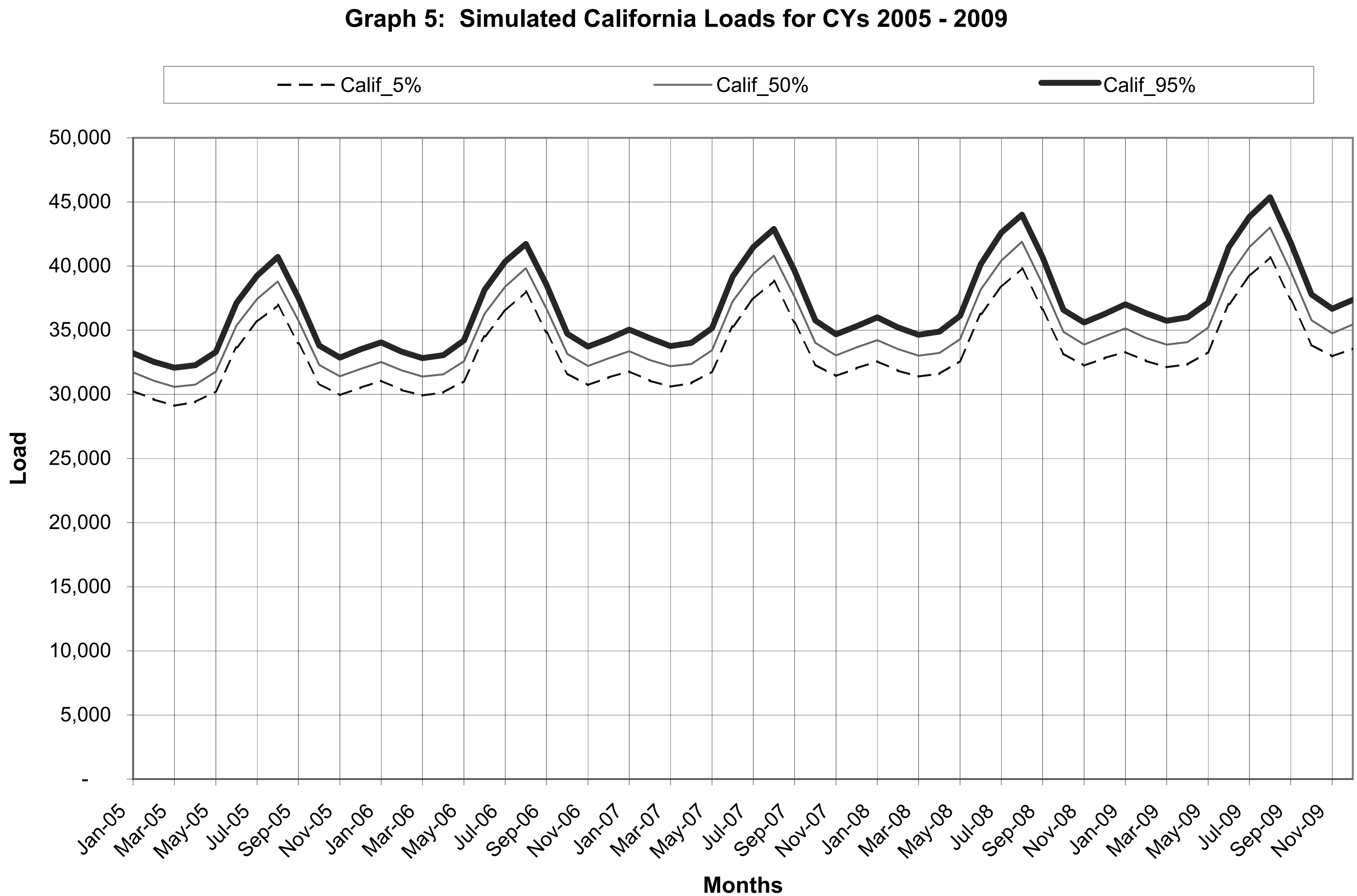
## California Load Variability

### California Load Variability Due to Load Growth Uncertainty

| | Calendar Year 2009 | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Jan '09** | **Feb '09** | **Mar '09** | **Apr '09** | **May '09** | **Jun '09** | **Jul '09** | **Aug '09** | **Sep '09** | **Oct '09** | **Nov '09** | **Dec '09** | **Simple Avg** |
| Average Annual California Loads (Average Energy in aMW) | 36864 | 36864 | 36864 | 36864 | 36864 | 36864 | 36864 | 36864 | 36864 | 36864 | 36864 | 36864 | |
| California Monthly Load Shapes (Source: AURORA) | **0.954** | **0.934** | **0.919** | **0.925** | **0.955** | **1.063** | **1.126** | **1.167** | **1.074** | **0.971** | **0.944** | **0.962** | |
| ***Simulated Monthly California Loads (Average Energy in aMW)*** | 35150 | 34413 | 33893 | 34109 | 35214 | 39202 | 41501 | 43014 | 39610 | 35798 | 34782 | 35455 | **36,845 aMW** |

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

| | **Jan '09** | **Feb '09** | **Mar '09** | **Apr '09** | **May '09** | **Jun '09** | **Jul '09** | **Aug '09** | **Sep '09** | **Oct '09** | **Nov '09** | **Dec '09** | Simple Avg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **California Loads after Load Growth (Average Energy in aMW)** | 35150 | 34413 | 33893 | 34109 | 35214 | 39202 | 41501 | 43014 | 39610 | 35798 | 34782 | 35455 | **36,845 aMW** |
| **Monthly Load Standard Deviation** | 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 Loads (Average Energy in aMW)*** | ***35,150*** | ***34,413*** | ***33,893*** | ***34,109*** | ***35,214*** | ***39,202*** | ***41,501*** | ***43,014*** | ***39,610*** | ***35,798*** | ***34,782*** | ***35,455*** | **36,845 aMW** |


Graph 5: Simulated California Loads for CYs 2005 - 2009
Calif_5%
Calif_50%
Calif_95%
50,000
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
-
Load
Jan-05
Mar-05
May-05
Jul-05
Sep-05
Nov-05
Jan-06
Mar-06
May-06
Jul-06
Sep-06
Nov-06
Jan-07
Mar-07
May-07
Jul-07
Sep-07
Nov-07
Jan-08
Mar-08
May-08
Jul-08
Sep-08
Nov-08
Jan-09
Mar-09
May-09
Jul-09
Sep-09
Nov-09
Months

**1.8.8 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.

### 1.9 Natural Gas Price Risk Factor

Natural gas price risk is incorporated into the Risk Analysis Study to account for the impact that natural gas price variability 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 AURORA the simulated monthly natural gas prices (in real 2000 dollars) 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 forecasted prices as prices move further from forecasted prices (either higher or lower).

**1.9.1 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 AURORA to perform the Market Price Forecast Study (*see* Market Price Forecast Study, WP-07-E-BPA-03). To accomplish this task, forecasted annual median delivered natural gas prices (in real 2000 dollars) to southern California for CY 2005-2009 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 median 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 natural gas price constraints (in real 2000 dollars) and monthly price volatilities for natural gas prices, which were derived from historical monthly spot market natural gas prices by computing the standard deviations of all the natural log (ln) price ratio changes from one month to the next month. These natural log price ratio changes (ln(price at time t/price at time t-1)) are commonly referred to as "returns" in the technical literature. Accordingly, they will be referred to as returns in this study.

Minimum and maximum delivered gas price constraints used in the Natural Gas Risk Model are \$1.50/MMBTU (Million British Thermal Units) and \$50.00/MMBTU. The minimum price constraint was set based on reviewing the historical real 2005 dollar prices at Ignacio, Colorado (See Table 21 in the Risk Analysis Study Documentation, WP-07-E-BPA-04A) and adding an additional charge for delivery from Ignacio to southern California and the maximum price constraint was set such that no simulated prices would be constrained.

Historical monthly spot market gas prices in real 2005 dollars for Ignacio, Colorado, from December 1989 through December 2004 were used to calculate the monthly price volatilities for month-to-month price movements. Monthly price volatilities were estimated in terms of month-to-month price changes so that price movements through time could be modeled using the random-walk technique.

**1.9.2 Modeling Natural Gas Price Volatility and 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 volatility 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) all the returns from one month to the next month for all months from December 1989 through December 2004 are calculated; (2) all the returns are accumulated, by month, for each of the 12 months in a year; and (3) the standard deviation of all the returns from one month to the next month for each month are calculated. This process results in monthly price volatilities being calculated from a set of 15 price changes for all months of the year. Using a similar approach with annual price data, cumulative annual price volatilities over several years duration were computed to quantify how much annual prices could deviate in the future from the current natural gas price forecast.

Table 21 contains the historical Ignacio monthly spot market natural gas prices, the calculations of the month-to-month returns, and the derivation of the monthly price volatilities. Comparisons between the average and median prices for the monthly and annual historical price data indicate that average prices are greater than median prices. Additional comparisons indicate that the differences between the maximum prices and the median prices are greater than the differences between the minimum prices and the median prices. These asymmetrical differences were accounted for in this study by modeling natural gas price risk in lognormal probability distributions that differ in skewness depending on the size of the differences.

A comparison of the month-to-month volatilities in Table 21 reveals that, in general, month-to-month price movements, either upward or downward, are greatest during the wintertime. At the bottom of this table, the month-to-month returns are applied to the CY 2005 natural gas price forecast to compute monthly price variability, annual price variability, and the annual price volatility for CY 2005. As the values in this table indicate, price variability (as measured by standard deviation) is impacted by both the volatility and the price level with price variability increasing the higher the volatility and/or the price level.

The results reported in Table 21 indicate that monthly price variability at forecasted CY 2005 prices is substantial, with, for instance, the month of December having a monthly price standard deviation of $1.09/MMBTU. Annual CY 2005 price variability of $0.28/MMBTU, which translates into an annual price volatility of 5%, was estimated to be smaller than monthly price variability. The relatively smaller price variability for annual prices is as expected, since larger price movements upward or downward in a given month are often followed by price movements in subsequent months in the opposite direction, thus, reflecting mean-reversion. The results reported in Table 21 for CY 2005 reflect how much natural gas prices can vary from a gas price forecast made at the beginning of CY 2005. Consistent with the 3rd Quarter Financial Review, natural gas price variability was turned off in the Natural Gas Price Risk Model for the months of January thru May of 2005 to account for the fact that there is less natural gas price risk for the remainder of the year than for a full year.

Table 22 contains the calculations of the cumulative annual price returns for one to four years duration after the current calendar year (CY 2005) and the derivation of the associated cumulative annual price volatilities. The cumulative annual price returns for one to four years duration were derived by computing all the annual price returns over one, two, three, and four year increments and calculating the associated standard deviations to get the cumulative annual price volatilities. These values were computed so that the simulated prices over various durations in time would have values to calibrate to, rather than move through time in an unconstrained manner. The cumulative annual price volatilities for one to four years duration after the current calendar year (CY 2005) were calculated to be 31.7% for one year, 39.9% for two years, 27.3% for three years, and 31.6% for four years. These results reflect that cumulative annual price volatilities over various annual time durations are large and exhibit cyclical behavior.

At the bottom of Table 22, the cumulative annual price returns for one to four years duration after the current calendar year (CY 2005) were applied to the CY 2006-2009 natural gas price forecast to compute the cumulative annual price variability over these years. This price variability (as measured by standard deviation) is impacted by both the volatility and the price level with price variability increasing the higher the volatility and/or the price level.

Monthly gas price variability was incorporated into the Natural Gas Price Risk Model by sampling positive and negative standard deviation values from truncated standard normal probability distributions in @RISK, multiplying the sampled standard deviation values by monthly price volatility values, and multiplying the natural gas price of the prior month by the exponential of the simulated positive and negative values (which transforms values that are in terms of natural logs into unlogged values). 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 standard deviation values that can be sampled. For this study, the specified maximum and minimum values were set at +5 and -5 standard deviations (which results in them having no impact), since controlling the maximum and minimum standard deviations was not needed.

In the @RISK computer software, this information is entered into a truncated standard normal probability distribution (RiskTNormal) as follows:

RiskTNormal (Mean = 0, Standard deviation = 1, Min value = -5, Max value = +5).

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 standard deviations sampled from the monthly truncated standard normal distributions in the Natural Gas Price Risk Model are multiplied by the monthly volatilities as part of the price movement computations reported in the equation below.

<u>Prices movements through time are modeled as follows:</u>

Price t = Price t-1 * EXP (Sampled positive or negative standard deviation * monthly volatility) + (FP t minus FP t-1)

Where:
Price t = Simulated price at time t
Price t-1 = Simulated price at time t-1
FP t = Forecasted price for time t
FP t-1 = Forecasted price for time t-1
EXP = Exponential Function (used to take the antilog of the returns; which are in logs)

The mean-reversion methodology was modeled using an algorithm and a set of monthly and annual 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.

<u>The mean-reversion methodology incorporated into the monthly truncated standard normal probability distributions is as follows:</u>

Sampled positive or negative standard deviation = RiskTNormal (Mean-reversion decay parameters * (1 - Simulated mean-reversion ratios), 1, Maximum negative monthly standard deviation, Maximum positive monthly standard deviation)

Where:

RiskTNormal = Truncated normal probability distribution in @RISK with
Mean = Mean-reversion decay parameters * (1- Simulated mean-reversion ratios)
Standard deviation = 1
Minimum value = - 5 standard deviations
Maximum value = + 5 standard deviations
Mean-reversion decay parameters = Calibrated price decay values

Simulated mean-reversion ratios = Simulated prior month price / Forecasted prior month price

## Table 21: Estimated Monthly Price Volatilities, Annual CY 2005 Price Volatility, and Annual CY 2005 Price Variability Based on the Gas Price Forecast

### Input Calculations for Gas Price Risk Model

**Dec-89** 2.83

**Ignacio Monthly Spot Gas Prices in real 2005$**

| | 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 |
| 1990 | 3.25 | 2.25 | 1.79 | 1.79 | 1.76 | 1.81 | 1.76 | 1.74 | 1.72 | 2.11 | 2.40 | 2.28 | 2.06 |
| 1991 | 1.95 | 1.41 | 1.23 | 1.28 | 1.24 | 1.21 | 1.23 | 1.31 | 1.49 | 1.51 | 2.00 | 1.99 | 1.49 |
| 1992 | 1.46 | 1.32 | 1.40 | 1.59 | 1.68 | 1.75 | 1.84 | 2.10 | 2.49 | 2.44 | 2.40 | 2.45 | 1.91 |
| 1993 | 2.29 | 1.96 | 2.38 | 2.24 | 2.09 | 1.94 | 2.05 | 2.20 | 2.31 | 2.10 | 2.21 | 2.29 | 2.17 |
| 1994 | 2.06 | 2.37 | 2.13 | 1.95 | 1.83 | 1.69 | 1.76 | 1.75 | 1.47 | 1.44 | 1.65 | 1.76 | 1.82 |
| 1995 | 1.40 | 1.22 | 1.20 | 1.24 | 1.26 | 1.25 | 1.11 | 1.32 | 1.39 | 1.30 | 1.35 | 1.38 | 1.28 |
| 1996 | 1.29 | 1.31 | 1.25 | 1.23 | 1.21 | 1.40 | 1.85 | 2.00 | 1.66 | 1.95 | 2.81 | 3.71 | 1.81 |
| 1997 | 3.72 | 2.55 | 1.69 | 1.81 | 2.00 | 2.07 | 2.14 | 2.37 | 2.75 | 2.90 | 3.09 | 2.26 | 2.44 |
| 1998 | 2.08 | 2.02 | 2.16 | 2.27 | 2.03 | 1.76 | 1.97 | 1.85 | 1.78 | 1.78 | 2.00 | 1.83 | 1.96 |
| 1999 | 1.82 | 1.70 | 1.56 | 1.84 | 2.07 | 2.10 | 2.08 | 2.46 | 2.45 | 2.59 | 2.32 | 2.29 | 2.11 |
| 2000 | 2.26 | 2.43 | 2.61 | 2.77 | 3.07 | 4.36 | 3.74 | 3.45 | 4.16 | 4.55 | 5.16 | 7.72 | 3.86 |
| 2001 | 8.08 | 5.62 | 4.76 | 4.55 | 3.49 | 2.64 | 2.41 | 2.53 | 1.81 | 2.07 | 2.17 | 2.24 | 3.53 |
| 2002 | 2.03 | 2.05 | 2.61 | 2.55 | 2.42 | 2.24 | 2.47 | 2.36 | 2.33 | 2.69 | 3.28 | 3.76 | 2.57 |
| 2003 | 4.27 | 4.92 | 5.09 | 3.39 | 4.27 | 4.65 | 4.30 | 4.35 | 4.02 | 4.04 | 3.85 | 5.03 | 4.35 |
| 2004 | 5.09 | 4.52 | 4.43 | 4.76 | 4.93 | 4.89 | 4.86 | 4.66 | 4.00 | 4.60 | 5.08 | 5.59 | 4.78 |
| Annual Average | 2.87 | 2.51 | 2.42 | 2.35 | 2.36 | 2.38 | 2.37 | 2.43 | 2.39 | 2.54 | 2.78 | 3.11 | 2.54 |
| Median | 2.08 | 2.05 | 2.13 | 1.95 | 2.03 | 1.94 | 2.05 | 2.20 | 2.31 | 2.11 | 2.40 | 2.29 | 2.11 |
| Annual Standard Deviation | | | | | | | | | | | | | 1.07 |

**Ignacio Monthly Spot Gas Price Natural Log (Ln) Ratio Deltas (Returns) and Volatility Computations; Reflects Month-To-Month Price Changes**

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1990 | 0.14 | -0.37 | -0.23 | 0.00 | -0.02 | 0.02 | -0.02 | -0.02 | -0.01 | 0.21 | 0.13 | -0.05 |
| 1991 | -0.16 | -0.33 | -0.13 | 0.04 | -0.03 | -0.02 | 0.02 | 0.06 | 0.12 | 0.01 | 0.28 | 0.00 |
| 1992 | -0.31 | -0.10 | 0.06 | 0.13 | 0.05 | 0.04 | 0.05 | 0.13 | 0.17 | -0.02 | -0.02 | 0.02 |
| 1993 | -0.07 | -0.15 | 0.19 | -0.06 | -0.07 | -0.08 | 0.05 | 0.07 | 0.05 | -0.09 | 0.05 | 0.03 |
| 1994 | -0.10 | 0.14 | -0.11 | -0.09 | -0.06 | -0.08 | 0.04 | -0.01 | -0.17 | -0.02 | 0.13 | 0.06 |
| 1995 | -0.22 | -0.14 | -0.01 | 0.03 | 0.02 | -0.01 | -0.12 | 0.18 | 0.05 | -0.07 | 0.04 | 0.02 |
| 1996 | -0.07 | 0.01 | -0.04 | -0.02 | -0.02 | 0.15 | 0.28 | 0.08 | -0.19 | 0.16 | 0.36 | 0.28 |
| 1997 | 0.00 | -0.38 | -0.42 | 0.07 | 0.10 | 0.03 | 0.03 | 0.10 | 0.15 | 0.05 | 0.07 | -0.31 |
| 1998 | -0.08 | -0.03 | 0.07 | 0.05 | -0.11 | -0.14 | 0.11 | -0.06 | -0.04 | 0.00 | 0.12 | -0.09 |
| 1999 | -0.01 | -0.07 | -0.08 | 0.16 | 0.12 | 0.01 | -0.01 | 0.16 | 0.00 | 0.05 | -0.11 | -0.01 |
| 2000 | -0.01 | 0.07 | 0.07 | 0.06 | 0.10 | 0.35 | -0.15 | -0.08 | 0.19 | 0.09 | 0.12 | 0.40 |
| 2001 | 0.05 | -0.36 | -0.17 | -0.05 | -0.26 | -0.28 | -0.09 | 0.05 | -0.33 | 0.13 | 0.04 | 0.03 |
| 2002 | -0.10 | 0.01 | 0.24 | -0.02 | -0.05 | -0.08 | 0.10 | -0.05 | -0.01 | 0.14 | 0.20 | 0.13 |
| 2003 | 0.13 | 0.14 | 0.03 | -0.41 | 0.23 | 0.09 | -0.08 | 0.01 | -0.08 | 0.00 | -0.05 | 0.27 |
| 2004 | 0.01 | -0.12 | -0.02 | 0.07 | 0.04 | -0.01 | -0.01 | -0.04 | -0.15 | 0.14 | 0.10 | 0.10 |
| Volatilities (Std Devs of Ln Ratio Deltas) | 0.120 | 0.179 | 0.165 | 0.131 | 0.116 | 0.139 | 0.107 | 0.082 | 0.149 | 0.090 | 0.121 | 0.169 |
| Average of Ln Ratio Deltas | -0.05 | -0.11 | -0.04 | 0.00 | 0.00 | 0.00 | 0.01 | 0.04 | -0.02 | 0.05 | 0.10 | 0.06 |

**Monthly Price Standard Deviation Computations for Gas Price Forecast (Impacted by Both Price Level and Volatility)**

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual Avg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CY05 Price Forecast | 5.17 | 5.17 | 5.85 | 5.97 | 5.25 | 5.15 | 5.26 | 5.28 | 5.29 | 5.31 | 5.88 | 6.26 | 5.49 |
| CY05 Avg Prices for Log Normal Dist | 5.20 | 5.25 | 5.92 | 6.02 | 5.28 | 5.20 | 5.29 | 5.29 | 5.35 | 5.33 | 5.92 | 6.35 | 5.53 |

| Year | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual | Annual (LN) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1990 | 6.26 | 4.02 | 4.81 | 6.01 | 5.15 | 5.28 | 5.07 | 4.99 | 5.33 | 6.19 | 6.05 | 5.62 | 5.40 | 1.69 |
| 1991 | 4.66 | 4.17 | 5.33 | 6.20 | 5.07 | 5.04 | 5.28 | 5.40 | 6.10 | 5.10 | 7.06 | 5.89 | 5.44 | 1.69 |
| 1992 | 4.00 | 5.22 | 6.43 | 6.82 | 5.53 | 5.35 | 5.45 | 5.79 | 6.38 | 4.93 | 5.24 | 6.03 | 5.60 | 1.72 |
| 1993 | 5.09 | 4.97 | 7.36 | 5.63 | 4.88 | 4.78 | 5.48 | 5.45 | 5.65 | 4.58 | 5.60 | 6.10 | 5.46 | 1.70 |
| 1994 | 4.91 | 6.65 | 5.46 | 5.47 | 4.93 | 4.74 | 5.42 | 5.03 | 4.53 | 4.95 | 6.09 | 6.29 | 5.37 | 1.68 |
| 1995 | 4.35 | 5.01 | 6.00 | 6.19 | 5.32 | 5.10 | 4.59 | 6.06 | 5.64 | 4.71 | 5.54 | 6.03 | 5.38 | 1.68 |
| 1996 | 5.10 | 5.87 | 5.81 | 5.87 | 5.14 | 5.96 | 6.88 | 5.47 | 4.46 | 5.93 | 7.66 | 7.81 | 6.00 | 1.79 |
| 1997 | 5.46 | 3.97 | 4.01 | 6.42 | 5.78 | 5.33 | 5.37 | 5.61 | 6.26 | 5.29 | 5.69 | 4.32 | 5.29 | 1.67 |
| 1998 | 5.02 | 5.61 | 6.50 | 6.27 | 4.68 | 4.49 | 5.79 | 4.77 | 5.17 | 5.02 | 6.00 | 5.41 | 5.39 | 1.69 |
| 1999 | 5.42 | 5.39 | 5.58 | 7.04 | 5.90 | 5.22 | 5.16 | 5.98 | 5.38 | 5.31 | 4.78 | 5.81 | 5.58 | 1.72 |
| 2000 | 5.39 | 6.21 | 6.51 | 6.36 | 5.79 | 7.31 | 4.45 | 4.68 | 6.50 | 5.50 | 6.04 | 8.84 | 6.13 | 1.81 |
| 2001 | 5.71 | 4.02 | 5.14 | 5.71 | 4.02 | 3.90 | 4.74 | 5.31 | 3.86 | 5.75 | 5.57 | 6.11 | 4.99 | 1.61 |
| 2002 | 4.93 | 5.86 | 7.72 | 5.84 | 4.97 | 4.78 | 5.72 | 4.85 | 5.31 | 5.81 | 6.50 | 6.75 | 5.75 | 1.75 |
| 2003 | 6.19 | 6.67 | 6.28 | 3.99 | 6.59 | 5.61 | 4.79 | 5.14 | 4.97 | 5.06 | 5.08 | 7.72 | 5.67 | 1.74 |
| 2004 | 5.52 | 5.13 | 5.95 | 6.42 | 5.43 | 5.10 | 5.16 | 4.87 | 4.62 | 5.78 | 5.89 | 6.50 | 5.53 | 1.71 |
| Standard Deviations | 0.614 | 0.919 | 0.947 | 0.706 | 0.604 | 0.759 | 0.590 | 0.438 | 0.772 | 0.479 | 0.738 | 1.092 | 0.281 | 0.050 |

**Table 22: Estimated CYs 2006-2009 Price Statistics Based on Applying Historical Volatility to the Gas Price Forecast**

| | | Annual Gas Price Forecast | | | |
|---|---|---|---|---|---|
| | | CY06 | CY07 | CY08 | CY09 |
| | | 5.84 | 5.48 | 4.52 | 4.07 |

**Ignacio Annual Spot Gas Price Natural Log (Ln) Ratio Deltas (Returns) and Volatility Computations; Reflects Cumulative Annual Price Changes Over Time**

| Year | Annual Average Historical Real Prices | 1 Yr LN Ratio Changes | 2 Yr LN Ratio Changes | 3 Yr LN Ratio Changes | 4 Yr LN Ratio Changes |
|---|---|---|---|---|---|
| 1990 | 2.06 | | | | |
| 1991 | 1.49 | -0.32 | | | |
| 1992 | 1.91 | 0.25 | -0.07 | | |
| 1993 | 2.17 | 0.13 | 0.38 | 0.06 | |
| 1994 | 1.82 | -0.18 | -0.05 | 0.20 | -0.12 |
| 1995 | 1.28 | -0.35 | -0.53 | -0.40 | -0.15 |
| 1996 | 1.81 | 0.34 | -0.01 | -0.18 | -0.06 |
| 1997 | 2.44 | 0.30 | 0.64 | 0.29 | 0.12 |
| 1998 | 1.96 | -0.22 | 0.08 | 0.42 | 0.07 |
| 1999 | 2.11 | 0.07 | -0.15 | 0.15 | 0.49 |
| 2000 | 3.86 | 0.61 | 0.68 | 0.46 | 0.76 |
| 2001 | 3.53 | -0.09 | 0.52 | 0.59 | 0.37 |
| 2002 | 2.57 | -0.32 | -0.41 | 0.20 | 0.27 |
| 2003 | 4.35 | 0.53 | 0.21 | 0.12 | 0.72 |
| 2004 | 4.78 | 0.10 | 0.62 | 0.30 | 0.22 |
| Volatilities (Std Devs of Ln Ratio Deltas) | | 0.317 | 0.399 | 0.273 | 0.316 |

| | | Gas Price Standard Deviations for Gas Price Forecast and Historical Volatility | | | |
|---|---|---|---|---|---|
| Year | | CY06 | CY07 | CY08 | CY09 |
| 1990 | | | | | |
| 1991 | | 3.98 | | | |
| 1992 | | 7.07 | 4.40 | | |
| 1993 | | 6.25 | 6.91 | 3.98 | |
| 1994 | | 4.61 | 4.51 | 4.61 | 2.82 |
| 1995 | | 3.88 | 2.80 | 2.53 | 2.75 |
| 1996 | | 7.73 | 4.69 | 3.13 | 3.01 |
| 1997 | | 7.44 | 9.01 | 5.05 | 3.59 |
| 1998 | | 4.41 | 5.14 | 5.74 | 3.43 |
| 1999 | | 5.91 | 4.08 | 4.39 | 5.22 |
| 2000 | | 10.07 | 9.31 | 5.94 | 6.81 |
| 2001 | | 5.03 | 7.94 | 6.77 | 4.60 |
| 2002 | | 4.00 | 3.15 | 4.58 | 4.17 |
| 2003 | | 9.31 | 5.83 | 4.24 | 6.58 |
| 2004 | | 6.05 | 8.82 | 5.09 | 3.95 |
| Standard Deviation | | 1.99 | 2.27 | 1.18 | 1.42 |

**1.9.3 Calibrating Future Natural Gas Price Volatility.** The final step in the modeling process is the derivation of monthly and annual decay parameters to better calibrate the natural gas price volatility simulated by the Natural Gas Price Risk Model to the historical volatility reflected in the Ignacio natural gas price data. The calibration of the decay values is performed in the following manner: (1) run the model; (2) calculate monthly and cumulative annual price volatilities from the simulated data and compare the results to monthly and cumulative annual price volatilities for the historical data; and (3) revise the decay values to test how well the monthly and cumulative annual price volatilities of the simulated prices approximate the monthly and cumulative annual price volatilities 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 decay values versus another. The sum of residuals squared is calculated by squaring the differences between historical monthly and annual natural gas price volatilities and simulated monthly and annual natural gas price volatilities and summing these squared differences. The lower the sum of residuals squared, the better the simulated gas price volatilities approximate the historical gas price volatilities. Table 23 contains the final calibration results for natural gas price volatility along with additional summary statistical information.

The use of monthly and annual 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 natural gas prices that are more volatile in some months than others, as well as to simulate gas prices that rise and fall at different rates during the year and across years. Thus, the flexibility associated with the methodology utilized in the Natural Gas Price Risk Model allows the model to closely calibrate to the attributes of gas price movements in the historical data.

# Table 23: Natural Gas Price Volatility Calibration

## Mean-Reversion Calibration Section:

| CY 2005 | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mean Reversion Rate | 2.50 | 5.00 | 3.00 | 6.00 | 7.00 | 7.00 | 8.00 | 9.00 | 9.00 | 9.00 | 2.00 | 2.00 |
| Max/Min Std Dev. | 5.000 | 5.000 | 5.000 | 5.000 | 5.000 | 5.000 | 5.000 | 5.000 | 5.000 | 5.000 | 5.000 | 5.000 |

| CY 2006 | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mean Reversion Rate | 0.21 | 0.21 | 0.21 | 0.21 | 0.21 | 0.21 | 0.21 | 0.21 | 0.21 | 0.21 | 0.21 | 0.21 |
| Max/Min Std Dev. | 5.000 | 5.000 | 5.000 | 5.000 | 5.000 | 5.000 | 5.000 | 5.000 | 5.000 | 5.000 | 5.000 | 5.000 |

| CY 2007 | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mean Reversion Rate | 0.40 | 0.40 | 0.40 | 0.40 | 0.40 | 0.40 | 0.40 | 0.40 | 0.40 | 0.40 | 0.40 | 0.40 |
| Max/Min Std Dev. | 5.000 | 5.000 | 5.000 | 5.000 | 5.000 | 5.000 | 5.000 | 5.000 | 5.000 | 5.000 | 5.000 | 5.000 |

| CY 2008 | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mean Reversion Rate | 1.23 | 1.23 | 1.23 | 1.23 | 1.23 | 1.23 | 1.23 | 1.23 | 1.23 | 1.23 | 1.23 | 1.23 |
| Max/Min Std Dev. | 5.000 | 5.000 | 5.000 | 5.000 | 5.000 | 5.000 | 5.000 | 5.000 | 5.000 | 5.000 | 5.000 | 5.000 |

| CY 2009 | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mean Reversion Rate | 0.46 | 0.46 | 0.46 | 0.46 | 0.46 | 0.46 | 0.46 | 0.46 | 0.46 | 0.46 | 0.46 | 0.46 |
| Max/Min Std Dev. | 5.000 | 5.000 | 5.000 | 5.000 | 5.000 | 5.000 | 5.000 | 5.000 | 5.000 | 5.000 | 5.000 | 5.000 |

## Volatility Reporting & Calibration Section:

| | Sum 05-09 | CY 2005 | CY 2006 | CY 2007 | CY 2008 | CY 2009 |
|---|---|---|---|---|---|---|
| Simulated Price Volatilities for FY05-09 | | 0.050 | 0.316 | 0.400 | 0.274 | 0.316 |
| Historical Price Volatilities Over 1, 2, 3, and 4 Year Periods | | 0.050 | 0.317 | 0.399 | 0.273 | 0.316 |
| Simulated Less Historical Volatilities | | 0.000 | -0.001 | 0.001 | 0.001 | 0.000 |
| Residual ^2 | 0.0000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

## Statistical Reporting Section:

| | Sum 05-09 | CY 2005 | CY 2006 | CY 2007 | CY 2008 | CY 2009 |
|---|---|---|---|---|---|---|
| Simulated FY05-09 Price Standard Deviations | | 0.277 | 1.956 | 2.230 | 1.123 | 1.270 |
| Estimated FY05-09 Price Standard Deviations; Derived By Applying Historical LN Price Changes to the Price Forecast | | 0.281 | 1.993 | 2.268 | 1.177 | 1.415 |
| Simulated Less Estimated Standard Deviations | | -0.004 | -0.037 | -0.038 | -0.054 | -0.145 |
| Residual ^2 | 0.0268 | 0.000 | 0.001 | 0.001 | 0.003 | 0.021 |

| | Avg 05-09 | CY 2005 | CY 2006 | CY 2007 | CY 2008 | CY 2009 |
|---|---|---|---|---|---|---|
| Simulated Avg Price | 5.17 | 5.50 | 6.13 | 5.72 | 4.42 | 4.09 |
| Simulated Median Price | 5.03 | 5.49 | 5.88 | 5.42 | 4.40 | 3.96 |
| Gas Price Forecast | 5.08 | 5.49 | 5.84 | 5.48 | 4.52 | 4.07 |
| Sim Average Price Less Forecast Price | 0.09 | 0.01 | 0.29 | 0.24 | -0.10 | 0.01 |
| Sim Median Price Less Forecast Price | -0.05 | 0.01 | 0.04 | -0.06 | -0.12 | -0.11 |

| CY 2005 | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Simulated Monthly Price Volatilities | 0.120 | 0.179 | 0.165 | 0.134 | 0.135 | 0.142 | 0.107 | 0.087 | 0.151 | 0.094 | 0.127 | 0.176 | 0.050 |
| Historical Monthly Price Volatilities | 0.120 | 0.179 | 0.165 | 0.131 | 0.116 | 0.139 | 0.107 | 0.082 | 0.149 | 0.090 | 0.121 | 0.169 | 0.050 |
| Simulated Less Historical Monthly Price Volatiles | 0.000 | 0.000 | 0.000 | 0.003 | 0.020 | 0.003 | 0.000 | 0.005 | 0.003 | 0.004 | 0.006 | 0.007 | 0.000 |
| Residual ^2 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0004 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Sum of Squares | 0.0005 | | | | | | | | | | | | 0.0000 |
| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual |
| Simulated Monthly Price Standard Deviations | 0.628 | 0.943 | 0.979 | 0.799 | 0.708 | 0.737 | 0.562 | 0.458 | 0.812 | 0.497 | 0.756 | 1.123 | 0.277 |
| Estimated Price Std Devs; Derived From Historical LN Price Changes and the Price Fore | 0.614 | 0.919 | 0.947 | 0.706 | 0.604 | 0.759 | 0.590 | 0.438 | 0.772 | 0.479 | 0.738 | 1.092 | 0.281 |
| Simulated Less Estimated Price Standard Deviations | 0.014 | 0.024 | 0.031 | 0.093 | 0.103 | -0.023 | -0.029 | 0.020 | 0.040 | 0.018 | 0.018 | 0.031 | -0.004 |
| Residual ^2 | 0.0002 | 0.0006 | 0.0010 | 0.0087 | 0.0107 | 0.0005 | 0.0008 | 0.0004 | 0.0016 | 0.0003 | 0.0003 | 0.0009 | 0.0000 |
| Sum of Squares | 0.0261 | | | | | | | | | | | | 0.0000 |

**1.9.4 Model and Results.** Table 24 contains a copy of the Natural Gas Price Risk Model. Results from this risk model on a monthly basis over time are shown in Graph 6 for the 5th, 50th, and 95th percentiles. As can be noted in this graph, gas price variability started being simulated in June 2005. This was the first month that prices were forecasted in the Natural Gas Price Forecast, June 2005, which was used for BPA's 3rd Quarter Financial Review. The monthly natural gas price variability patterns shown in this graph for CY 2006-2009 reflect the computations previously calculated in Table 22, which indicate that gas price variability is highest in CY 2006-2007 and lowest in CY 2008-2009. This is due to CY 2006-2007 having both higher forecasted prices and higher cumulative annual price volatilities.

The prices in Graph 6 include month-specific price level adjustments during FY 2007 - CY 2009 that perfectly align the median monthly simulated gas prices to the monthly prices in the natural gas price forecast. These adjustments were made based on simulated median prices rather than average prices because BPA's natural gas price forecast represents its assessment that there is a 50% probability that natural gas prices could go higher or lower than its forecast. *See* Petty, *et al.*, WP-07-E-BPA-11. Because each of these monthly price level adjustments is applied to all simulated prices for that month, such adjustments do not alter the simulated price volatility values.

# Table 24: Natural Gas Price Risk Model

Forecasted Real 2000$ Delivered Natural Gas Prices Per MMBTU to Southern California

| | | |
|---|---|---|
| CY 2005 Avg | $ | 5.49 |
| CY 2006 Avg | $ | 5.84 |
| CY 2007 Avg | $ | 5.48 |
| CY 2008 Avg | $ | 4.52 |
| CY 2009 Avg | $ | 4.07 |
| CY05-06 Avg | $ | 5.66 |
| CY07-09 Avg | $ | 4.69 |

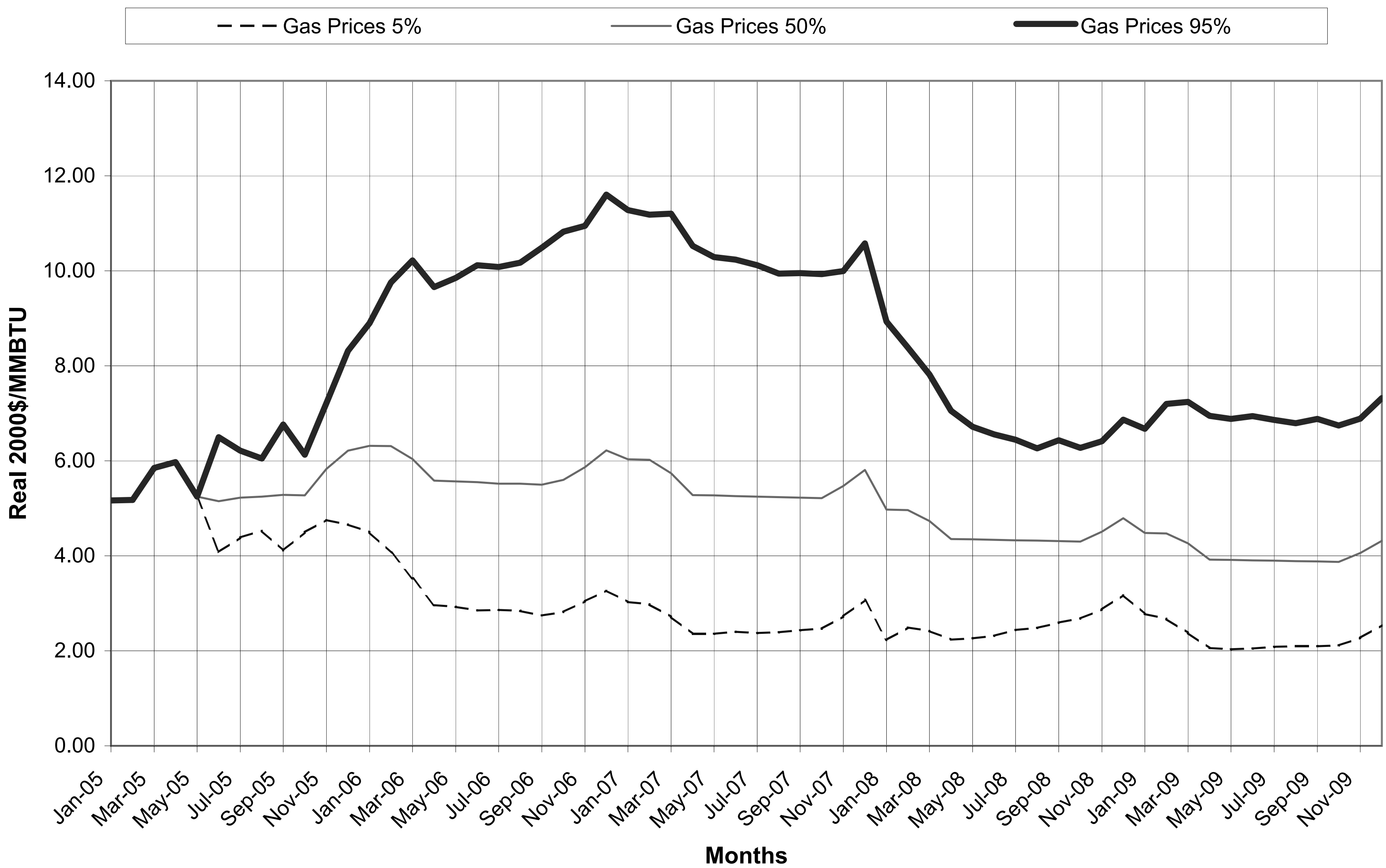
| | Price Forecast ($/MMBTU) | Standard Normal Truncated Distribution N(var mean, 1); Includes Max and Min Std Devs | Monthly Volatility | Price Risk ($/MMBTU) | Standard Normal Distribution Mean Adjustor (Causes Mean Reversion) | Actuals | | Monthly Volatility | Mean Reversion Decay Parameters | Maximum and Minimum Standard Deviations | Monthly Gas Price Shapes | Price Forecast ($/MMBTU) | Minimum Price ($/MMBTU) | Maximum Price ($/MMBTU) | Unconstrained Simulated Prices ($/MMBTU) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Initial Value | | | | | 1.00 | | | | | | | | | | |
| Jan-05 | 5.17 | 0.00 | 0.120 | 5.17 | 1.00 | Y | Jan-05 | 0.120 | 2.50 | 5.00 | 0.94 | 5.17 | 1.50 | 50.00 | 5.17 |
| Feb-05 | 5.17 | 0.00 | 0.179 | 5.17 | 1.00 | Y | Feb-05 | 0.179 | 5.00 | 5.00 | 0.94 | 5.17 | 1.50 | 50.00 | 5.17 |
| Mar-05 | 5.85 | 0.00 | 0.165 | 5.85 | 1.00 | Y | Mar-05 | 0.165 | 3.00 | 5.00 | 1.07 | 5.85 | 1.50 | 50.00 | 5.85 |
| Apr-05 | 5.97 | 0.00 | 0.131 | 5.97 | 1.00 | Y | Apr-05 | 0.131 | 6.00 | 5.00 | 1.09 | 5.97 | 1.50 | 50.00 | 5.97 |
| May-05 | 5.25 | 0.00 | 0.116 | 5.25 | 1.00 | Y | May-05 | 0.116 | 7.00 | 5.00 | 0.96 | 5.25 | 1.50 | 50.00 | 5.25 |
| Jun-05 | 5.15 | 0.00 | 0.139 | 5.15 | 1.00 | N | Jun-05 | 0.139 | 7.00 | 5.00 | 0.94 | 5.15 | 1.50 | 50.00 | 5.15 |
| Jul-05 | 5.26 | 0.00 | 0.107 | 5.26 | 1.00 | N | Jul-05 | 0.107 | 8.00 | 5.00 | 0.96 | 5.26 | 1.50 | 50.00 | 5.26 |
| Aug-05 | 5.28 | 0.00 | 0.082 | 5.28 | 1.00 | N | Aug-05 | 0.082 | 9.00 | 5.00 | 0.96 | 5.28 | 1.50 | 50.00 | 5.28 |
| Sep-05 | 5.29 | 0.00 | 0.149 | 5.29 | 1.00 | N | Sep-05 | 0.149 | 9.00 | 5.00 | 0.96 | 5.29 | 1.50 | 50.00 | 5.29 |
| Oct-05 | 5.31 | 0.00 | 0.090 | 5.31 | 1.00 | N | Oct-05 | 0.090 | 9.00 | 5.00 | 0.97 | 5.31 | 1.50 | 50.00 | 5.31 |
| Nov-05 | 5.88 | 0.00 | 0.121 | 5.88 | 1.00 | N | Nov-05 | 0.121 | 2.00 | 5.00 | 1.07 | 5.88 | 1.50 | 50.00 | 5.88 |
| Dec-05 | 6.26 | 0.00 | 0.169 | 6.26 | 1.00 | N | Dec-05 | 0.169 | 2.00 | 5.00 | 1.14 | 6.26 | 1.50 | 50.00 | 6.26 |
| Jan-06 | 6.36 | 0.00 | 0.120 | 6.36 | 1.00 | | Jan-06 | 0.120 | 0.21 | 5.00 | 1.09 | 6.36 | 1.50 | 50.00 | 6.36 |
| Feb-06 | 6.35 | 0.00 | 0.179 | 6.35 | 1.00 | | Feb-06 | 0.179 | 0.21 | 5.00 | 1.09 | 6.35 | 1.50 | 50.00 | 6.35 |
| Mar-06 | 6.07 | 0.00 | 0.165 | 6.07 | 1.00 | | Mar-06 | 0.165 | 0.21 | 5.00 | 1.04 | 6.07 | 1.50 | 50.00 | 6.07 |
| Apr-06 | 5.61 | 0.00 | 0.131 | 5.61 | 1.00 | | Apr-06 | 0.131 | 0.21 | 5.00 | 0.96 | 5.61 | 1.50 | 50.00 | 5.61 |
| May-06 | 5.61 | 0.00 | 0.116 | 5.61 | 1.00 | | May-06 | 0.116 | 0.21 | 5.00 | 0.96 | 5.61 | 1.50 | 50.00 | 5.61 |
| Jun-06 | 5.61 | 0.00 | 0.139 | 5.61 | 1.00 | | Jun-06 | 0.139 | 0.21 | 5.00 | 0.96 | 5.61 | 1.50 | 50.00 | 5.61 |
| Jul-06 | 5.60 | 0.00 | 0.107 | 5.60 | 1.00 | | Jul-06 | 0.107 | 0.21 | 5.00 | 0.96 | 5.60 | 1.50 | 50.00 | 5.60 |
| Aug-06 | 5.60 | 0.00 | 0.082 | 5.60 | 1.00 | | Aug-06 | 0.082 | 0.21 | 5.00 | 0.96 | 5.60 | 1.50 | 50.00 | 5.60 |
| Sep-06 | 5.60 | 0.00 | 0.149 | 5.60 | 1.00 | | Sep-06 | 0.149 | 0.21 | 5.00 | 0.96 | 5.60 | 1.50 | 50.00 | 5.60 |
| Oct-06 | 5.60 | 0.00 | 0.090 | 5.60 | 1.00 | | Oct-06 | 0.090 | 0.21 | 5.00 | 0.96 | 5.60 | 1.50 | 50.00 | 5.60 |
| Nov-06 | 5.86 | 0.00 | 0.121 | 5.86 | 1.00 | | Nov-06 | 0.121 | 0.21 | 5.00 | 1.00 | 5.86 | 1.50 | 50.00 | 5.86 |
| Dec-06 | 6.22 | 0.00 | 0.169 | 6.22 | 1.00 | | Dec-06 | 0.169 | 0.21 | 5.00 | 1.07 | 6.22 | 1.50 | 50.00 | 6.22 |
| Jan-07 | 6.03 | 0.00 | 0.120 | 6.03 | 1.00 | | Jan-07 | 0.120 | 0.40 | 5.00 | 1.10 | 6.03 | 1.50 | 50.00 | 6.03 |
| Feb-07 | 6.02 | 0.00 | 0.179 | 6.02 | 1.00 | | Feb-07 | 0.179 | 0.40 | 5.00 | 1.10 | 6.02 | 1.50 | 50.00 | 6.02 |
| Mar-07 | 5.74 | 0.00 | 0.165 | 5.74 | 1.00 | | Mar-07 | 0.165 | 0.40 | 5.00 | 1.05 | 5.74 | 1.50 | 50.00 | 5.74 |
| Apr-07 | 5.28 | 0.00 | 0.131 | 5.28 | 1.00 | | Apr-07 | 0.131 | 0.40 | 5.00 | 0.96 | 5.28 | 1.50 | 50.00 | 5.28 |
| May-07 | 5.27 | 0.00 | 0.116 | 5.27 | 1.00 | | May-07 | 0.116 | 0.40 | 5.00 | 0.96 | 5.27 | 1.50 | 50.00 | 5.27 |
| Jun-07 | 5.26 | 0.00 | 0.139 | 5.26 | 1.00 | | Jun-07 | 0.139 | 0.40 | 5.00 | 0.96 | 5.26 | 1.50 | 50.00 | 5.26 |
| Jul-07 | 5.25 | 0.00 | 0.107 | 5.25 | 1.00 | | Jul-07 | 0.107 | 0.40 | 5.00 | 0.96 | 5.25 | 1.50 | 50.00 | 5.25 |
| Aug-07 | 5.24 | 0.00 | 0.082 | 5.24 | 1.00 | | Aug-07 | 0.082 | 0.40 | 5.00 | 0.95 | 5.24 | 1.50 | 50.00 | 5.24 |
| Sep-07 | 5.23 | 0.00 | 0.149 | 5.23 | 1.00 | | Sep-07 | 0.149 | 0.40 | 5.00 | 0.95 | 5.23 | 1.50 | 50.00 | 5.23 |
| Oct-07 | 5.22 | 0.00 | 0.090 | 5.22 | 1.00 | | Oct-07 | 0.090 | 0.40 | 5.00 | 0.95 | 5.22 | 1.50 | 50.00 | 5.22 |
| Nov-07 | 5.47 | 0.00 | 0.121 | 5.47 | 1.00 | | Nov-07 | 0.121 | 0.40 | 5.00 | 1.00 | 5.47 | 1.50 | 50.00 | 5.47 |
| Dec-07 | 5.81 | 0.00 | 0.169 | 5.81 | 1.00 | | Dec-07 | 0.169 | 0.40 | 5.00 | 1.06 | 5.81 | 1.50 | 50.00 | 5.81 |
| Jan-08 | 4.98 | 0.00 | 0.120 | 4.98 | 1.00 | | Jan-08 | 0.120 | 1.23 | 5.00 | 1.10 | 4.98 | 1.50 | 50.00 | 4.98 |
| Feb-08 | 4.97 | 0.00 | 0.179 | 4.97 | 1.00 | | Feb-08 | 0.179 | 1.23 | 5.00 | 1.10 | 4.97 | 1.50 | 50.00 | 4.97 |
| Mar-08 | 4.73 | 0.00 | 0.165 | 4.73 | 1.00 | | Mar-08 | 0.165 | 1.23 | 5.00 | 1.05 | 4.73 | 1.50 | 50.00 | 4.73 |
| Apr-08 | 4.35 | 0.00 | 0.131 | 4.35 | 1.00 | | Apr-08 | 0.131 | 1.23 | 5.00 | 0.96 | 4.35 | 1.50 | 50.00 | 4.35 |

## Table 24: Natural Gas Price Risk Model (Continued)

| | Price Forecast ($/MMBTU) | Standard Normal Truncated Distribution N(var mean, 1); Includes Max and Min Std Devs | Monthly Volatility | Price Risk ($/MMBTU) | Standard Normal Distribution Mean Adjustor (Causes Mean Reversion) |
|---|---|---|---|---|---|
| May-08 | 4.35 | 0.00 | 0.116 | 4.35 | 1.00 |
| Jun-08 | 4.34 | 0.00 | 0.139 | 4.34 | 1.00 |
| Jul-08 | 4.33 | 0.00 | 0.107 | 4.33 | 1.00 |
| Aug-08 | 4.32 | 0.00 | 0.082 | 4.32 | 1.00 |
| Sep-08 | 4.31 | 0.00 | 0.149 | 4.31 | 1.00 |
| Oct-08 | 4.30 | 0.00 | 0.090 | 4.30 | 1.00 |
| Nov-08 | 4.51 | 0.00 | 0.121 | 4.51 | 1.00 |
| Dec-08 | 4.79 | 0.00 | 0.169 | 4.79 | 1.00 |
| Jan-09 | 4.48 | 0.00 | 0.120 | 4.48 | 1.00 |
| Feb-09 | 4.47 | 0.00 | 0.179 | 4.47 | 1.00 |
| Mar-09 | 4.26 | 0.00 | 0.165 | 4.26 | 1.00 |
| Apr-09 | 3.92 | 0.00 | 0.131 | 3.92 | 1.00 |
| May-09 | 3.91 | 0.00 | 0.116 | 3.91 | 1.00 |
| Jun-09 | 3.90 | 0.00 | 0.139 | 3.90 | 1.00 |
| Jul-09 | 3.90 | 0.00 | 0.107 | 3.90 | 1.00 |
| Aug-09 | 3.89 | 0.00 | 0.082 | 3.89 | 1.00 |
| Sep-09 | 3.88 | 0.00 | 0.149 | 3.88 | 1.00 |
| Oct-09 | 3.87 | 0.00 | 0.090 | 3.87 | 1.00 |
| Nov-09 | 4.06 | 0.00 | 0.121 | 4.06 | 1.00 |
| Dec-09 | 4.31 | 0.00 | 0.169 | 4.31 | 1.00 |

| | Monthly Log Standard Deviation | Mean Reversion Decay Parameters | Maximum and Minimum Standard Deviations | Monthly Gas Price Shapes | Price Forecast ($/MMBTU) | Minimum Price ($/MMBTU) | Maximum Price ($/MMBTU) | Unconstrained Simulated Prices ($/MMBTU) |
|---|---|---|---|---|---|---|---|---|
| May-08 | 0.116 | 1.23 | 5.00 | 0.96 | 4.35 | 1.50 | 50.00 | 4.35 |
| Jun-08 | 0.139 | 1.23 | 5.00 | 0.96 | 4.34 | 1.50 | 50.00 | 4.34 |
| Jul-08 | 0.107 | 1.23 | 5.00 | 0.96 | 4.33 | 1.50 | 50.00 | 4.33 |
| Aug-08 | 0.082 | 1.23 | 5.00 | 0.95 | 4.32 | 1.50 | 50.00 | 4.32 |
| Sep-08 | 0.149 | 1.23 | 5.00 | 0.95 | 4.31 | 1.50 | 50.00 | 4.31 |
| Oct-08 | 0.090 | 1.23 | 5.00 | 0.95 | 4.30 | 1.50 | 50.00 | 4.30 |
| Nov-08 | 0.121 | 1.23 | 5.00 | 1.00 | 4.51 | 1.50 | 50.00 | 4.51 |
| Dec-08 | 0.169 | 1.23 | 5.00 | 1.06 | 4.79 | 1.50 | 50.00 | 4.79 |
| Jan-09 | 0.120 | 0.46 | 5.00 | 1.10 | 4.48 | 1.50 | 50.00 | 4.48 |
| Feb-09 | 0.179 | 0.46 | 5.00 | 1.10 | 4.47 | 1.50 | 50.00 | 4.47 |
| Mar-09 | 0.165 | 0.46 | 5.00 | 1.05 | 4.26 | 1.50 | 50.00 | 4.26 |
| Apr-09 | 0.131 | 0.46 | 5.00 | 0.96 | 3.92 | 1.50 | 50.00 | 3.92 |
| May-09 | 0.116 | 0.46 | 5.00 | 0.96 | 3.91 | 1.50 | 50.00 | 3.91 |
| Jun-09 | 0.139 | 0.46 | 5.00 | 0.96 | 3.90 | 1.50 | 50.00 | 3.90 |
| Jul-09 | 0.107 | 0.46 | 5.00 | 0.96 | 3.90 | 1.50 | 50.00 | 3.90 |
| Aug-09 | 0.082 | 0.46 | 5.00 | 0.95 | 3.89 | 1.50 | 50.00 | 3.89 |
| Sep-09 | 0.149 | 0.46 | 5.00 | 0.95 | 3.88 | 1.50 | 50.00 | 3.88 |
| Oct-09 | 0.090 | 0.46 | 5.00 | 0.95 | 3.87 | 1.50 | 50.00 | 3.87 |
| Nov-09 | 0.121 | 0.46 | 5.00 | 1.00 | 4.06 | 1.50 | 50.00 | 4.06 |
| Dec-09 | 0.169 | 0.46 | 5.00 | 1.06 | 4.31 | 1.50 | 50.00 | 4.31 |

## Graph 6: Simulated Natural Gas Prices for 2005 - 2009



**1.9.5 Use of Simulated Natural Gas Prices in AURORA.** The spot market electricity 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 2000 dollars), annual average gas prices and monthly gas price ratios (monthly gas prices divided by annual average gas prices) are derived. From this data, simulated monthly and annual gas prices are derived for each of the 13 regions that represent the WECC region in the AURORA Model. This task is accomplished by adding deterministic positive/negative annual average price basis differences for each of the remaining 12 regions modeled in AURORA to the simulated annual average delivered natural gas prices for southern California to get simulated annual average natural gas prices for all 13 regions. Monthly natural gas prices for each of the remaining 12 regions are derived by using the simulated monthly gas price ratios for southern California to yield simulated monthly natural gas prices for all 13 regions (*see* Market Price Forecast Study, WP-07-E-BPA-03, for further discussion of AURORA).

**1.10 Nuclear Plant Generation Risk Factor.** Nuclear plant generation risk is incorporated into the Risk Analysis Study to account for the impact that changes in CGS generation have on the amount of BPA's surplus energy revenues and power purchase expenses. CGS generation risk is modeled in the CGS Nuclear Plant Risk Model.

**1.10.1 Data and Modeling Methodology.** Inputs into the CGS Nuclear Plant Risk Model consist of the forecasted peak capability of CGS (1,162 MW) and expected monthly energy output reported in the Load Resource Study, WP-07-E-BPA-01. Nuclear plant generation risk is modeled using the following equation:

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

> CGS capacity = the maximum amount of output that can be produced by CGS;
> H = calibration factor;
> RiskUniform(0,1) = a uniform probability distribution in @RISK that samples real values between 0 and 1.

The calibration factor (H) is derived by running risk simulations and modifying the factor until the expected monthly CGS output from the risk simulations are equal to the expected monthly values reported in the Load Resource Study, WP-07-E-BPA-01.

Using this equation, monthly CGS 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 CGS 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 CGS) 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.

**1.10.2 Model and Results.** Table 25 contains a copy of the CGS Nuclear Plant Risk Model. The simulated frequency distribution for CGS output for October 2006 is shown in Graph 7.

# Table 25: CGS Nuclear Plant Risk Model

| | H Factor: | Capacity |
|---|---|---|
| CGS Input Parameters | 14.40 | 1162 |

| CY 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Simulated CGS Output (aMW)* | 1087 | 1087 | 1087 | 1087 | 386 | 181 | 1087 | 1087 | 1087 | 1087 | 1087 | 1087 |
| *CGS L&R Study (Average Energy in aMW)* | 1000 | 1000 | 1000 | 1000 | 355 | 167 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 |
| *Simulated Mean Values* | 1000 | 1000 | 1000 | 1000 | 355 | 167 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 |
| *Risk Uniform Distribution* | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |

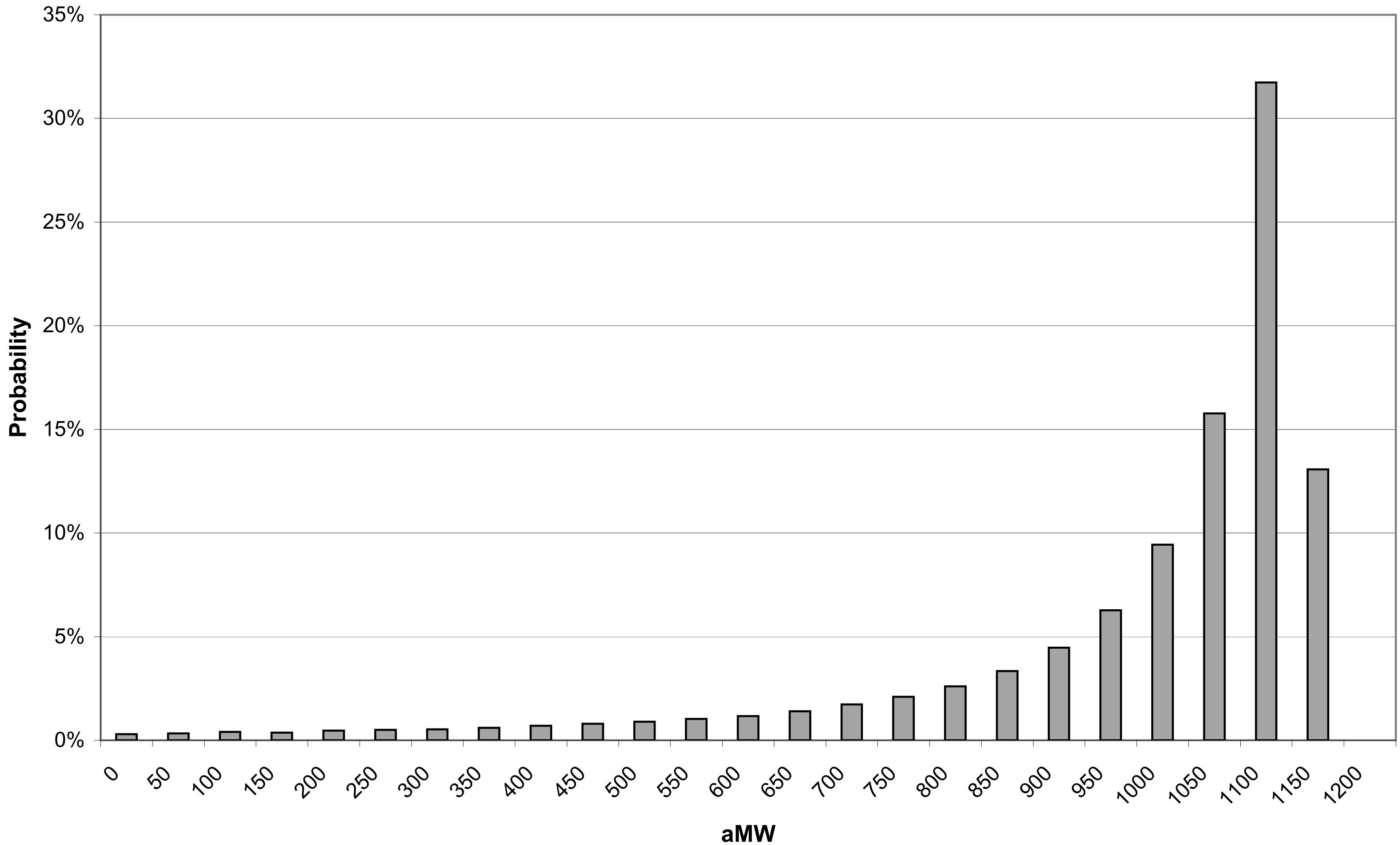
| CY 2006 | Jan '06 | Feb '06 | Mar '06 | Apr '06 | May '06 | Jun '06 | Jul '06 | Aug '06 | Sep '06 | Oct '06 | Nov '06 | Dec '06 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Simulated CGS Output (aMW)* | 1087 | 1087 | 1087 | 1087 | 1087 | 1087 | 1087 | 1087 | 1087 | 1087 | 1087 | 1087 |
| *CGS L&R Study (Average Energy in aMW)* | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 |
| *Simulated Mean Values* | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 |
| *Risk Uniform Distribution* | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |

| CY 2007 | Jan '07 | Feb '07 | Mar '07 | Apr '07 | May '07 | Jun '07 | Jul '07 | Aug '07 | Sep '07 | Oct '07 | Nov '07 | Dec '07 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Simulated CGS Output (aMW)* | 1087 | 1087 | 1087 | 1087 | 386 | 181 | 1087 | 1087 | 1087 | 1087 | 1087 | 1087 |
| *CGS L&R Study (Average Energy in aMW)* | 1000 | 1000 | 1000 | 1000 | 355 | 167 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 |
| *Simulated Mean Values* | 1000 | 1000 | 1000 | 1000 | 355 | 167 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 |
| *Risk Uniform Distribution* | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |

| CY 2008 | Jan '08 | Feb '08 | Mar '08 | Apr '08 | May '08 | Jun '08 | Jul '08 | Aug '08 | Sep '08 | Oct '08 | Nov '08 | Dec '08 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Simulated CGS Output (aMW)* | 1087 | 1087 | 1087 | 1087 | 1087 | 1087 | 1087 | 1087 | 1087 | 1087 | 1087 | 1087 |
| *CGS L&R Study (Average Energy in aMW)* | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 |
| *Simulated Mean Values* | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 |
| *Risk Uniform Distribution* | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |

| CY 2009 | Jan '09 | Feb '09 | Mar '09 | Apr '09 | May '09 | Jun '09 | Jul '09 | Aug '09 | Sep '09 | Oct '09 | Nov '09 | Dec '09 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Simulated CGS Output (aMW)* | 1087 | 1087 | 1087 | 1087 | 386 | 181 | 1087 | 1087 | 1087 | 1087 | 1087 | 1087 |
| *CGS L&R Study (Average Energy in aMW)* | 1000 | 1000 | 1000 | 1000 | 355 | 167 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 |
| *Simulated Mean Values* | 1000 | 1000 | 1000 | 1000 | 355 | 167 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 |
| *Risk Uniform Distribution* | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |

Graph 7:  Simulated CGS Output Distribution for October 2006



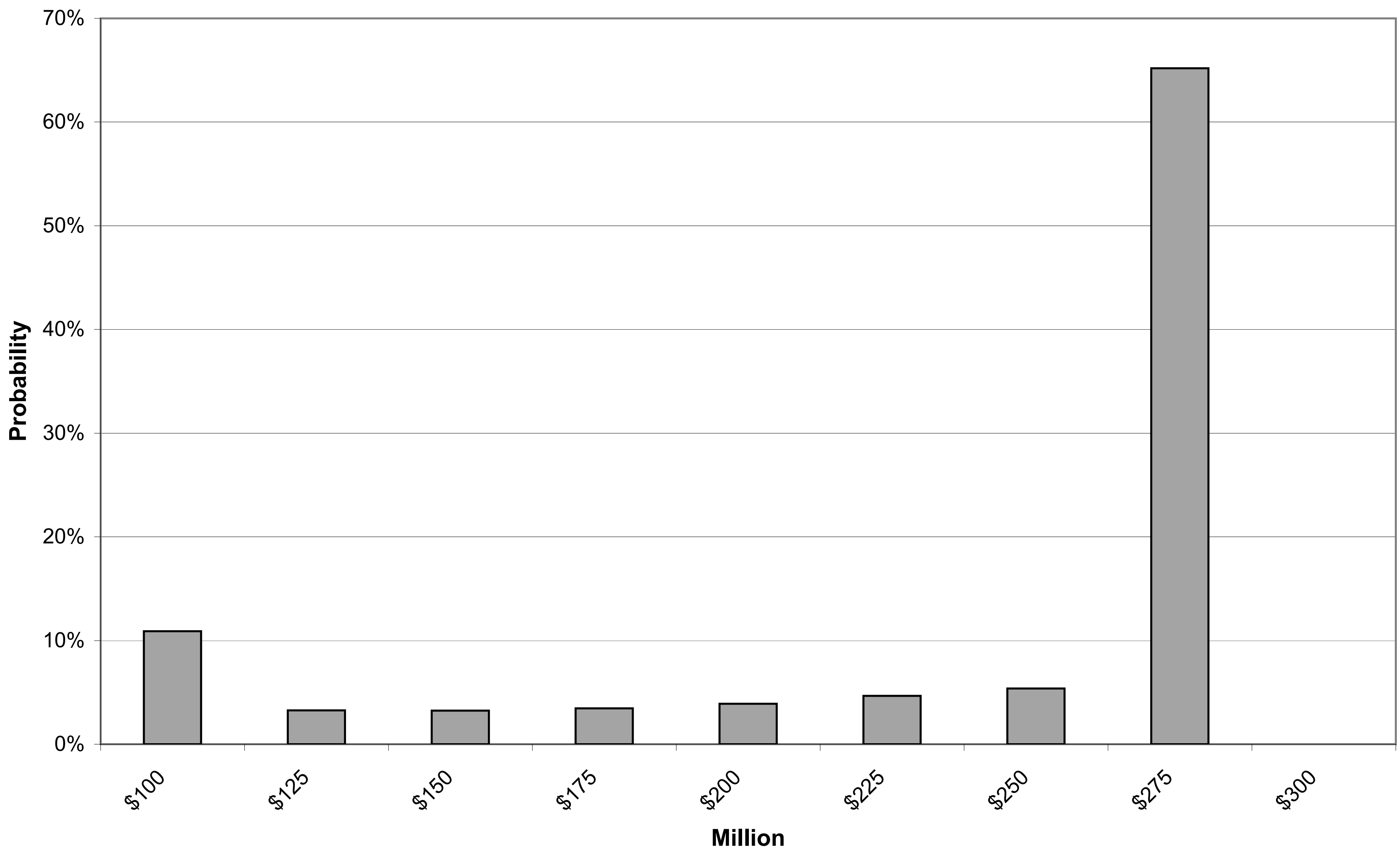
## 1.11 Investor Owned Utility (IOU) Benefits Risk Factor

This risk factor reflects the uncertainty in the amount of IOU REP Settlement benefits paid to the IOUs in FY 2008-2009, relative to the $300 million/year benefits included in the Revenue Requirement when setting rates. *See* Revenue Requirement Study, WP-07-E-BPA-02**.** The quantification of this risk reflects the contract terms set forth in the IOU REP Settlement Agreements entered into in May 25, 2004. This settlement provides 2200 aMW of financial benefits based on the difference between forward market electricity prices and the lowest cost flat PF rate with a maximum (capped) value of $300 million/year and a minimum (floor) value of $100 million/year. For more detail on the proposal, please refer to the Residential Exchange Program Settlement Agreements with Pacific Northwest Investor-Owned Utilities, Administrator's Record of Decision, signed October 4, 2000, as amended, Administrator's Record of Decision, signed May 25, 2004.

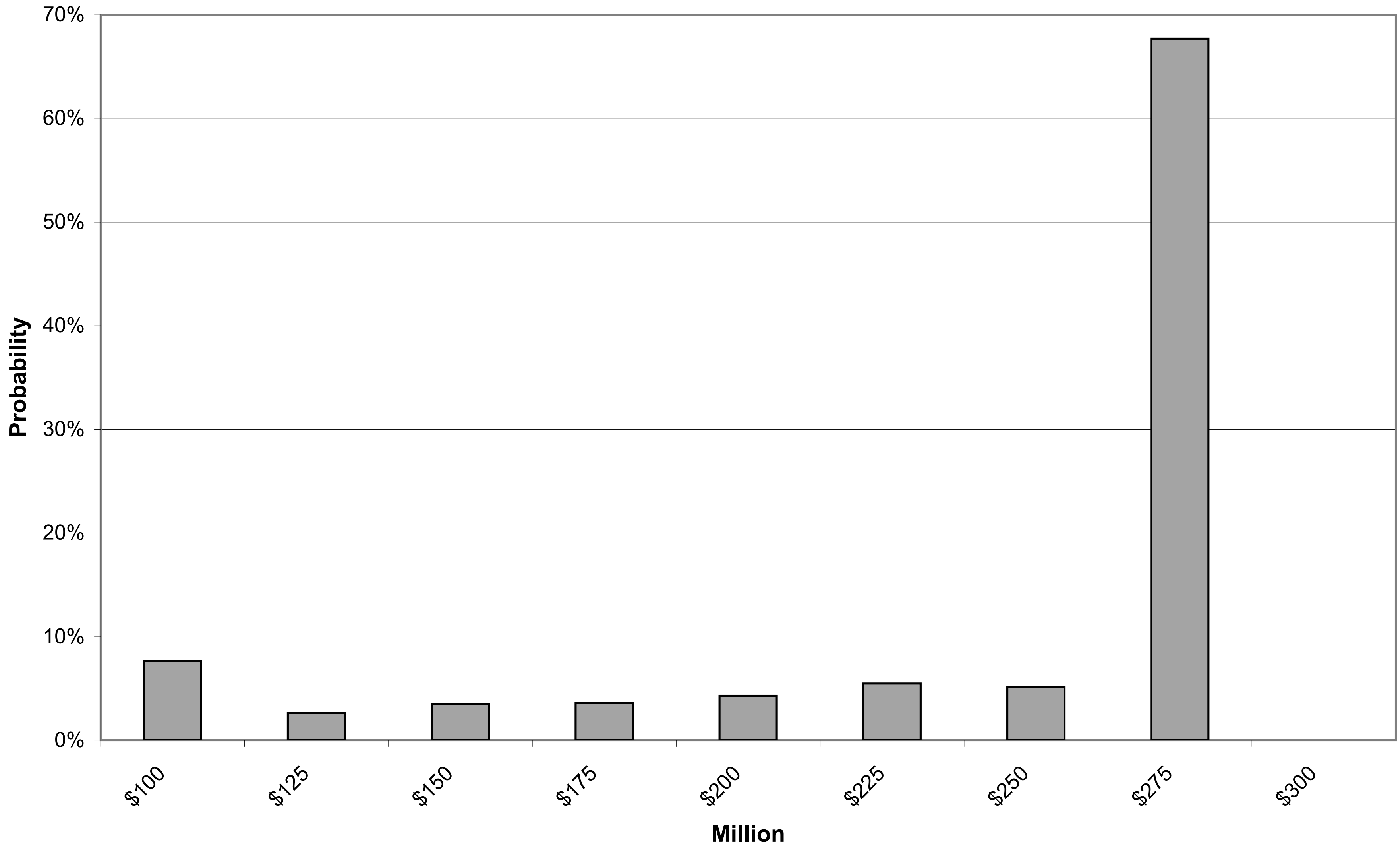
**1.11.1 Data and Modeling Methodology.** There will be no uncertainty in the amount of IOU REP Settlement benefits paid to the IOUs in FY 2007, relative to the benefits included in the Revenue Requirement (which are $300 million in the Initial Proposal) when setting rates, since by the Final Rate Proposal the actual benefit payments for FY 2007 will be known. The forward market price risk for a 12 month strip of power was simulated 3000 times per FY for FY 2007-2009 by the Forward Market Price Risk Model. See Section 1.15 of this Study Documentation, regarding simulated forward market prices in the Forward Market Price Risk Model. These 3000 price outcomes for each FY are input into ToolKit, which calculates the IOU benefits risk for FY 2008-2009 on an iteration-by-iteration basis based on iteration-by-iteration rate computations. S*ee* Section 3 in the Risk Analysis Study, WP-07-E-BPA-04, regarding the ToolKit Model.

**1.11.2 Results.** Graphs 8-9 show the probability distributions for the IOU REP Settlement Benefits for FY 2008-2009.

**Graph 8:  IOU Benefit Distribution for FY 2008**



Graph 9: IOU Benefit Distribution for FY 2009



## 1.12 Direct Service Industry (DSI) Benefits Risk Factor

This risk factor reflects the uncertainty in the amount of DSI benefit payments during FY 2007-2009, relative to the $58.9 million/year benefits included in the Revenue Requirement when setting rates. *See* Revenue Requirement Study, WP-07-E-BPA-02**.** BPA is proposing to offer 560 aMW of service benefits to the aluminum smelters, capped at $58.9 million, and 17 aMW to Port Townsend Paper Corporation for the FY 2007-2011 period. BPA is structuring the offer to the aluminum smelters as a surplus power sale but with an option BPA may exercise if it is unable to meet the $58.9 million cap with a power sale. BPA will be partnering with the local preference utility to provide these service benefits to the DSI. For more detail on the proposal please refer to the BPA Service to DSI Customers for Fiscal Years 2007-2011, Administrator's Record of Decision, signed June 30, 2005 (DSI ROD).

**1.12.1 Data and Modeling Methodology.** For the Initial Proposal, the quantification of DSI benefit risk reflects providing the aluminum smelters with financial benefits equivalent to 560 aMW based on the difference between forward market electricity prices and the lowest cost flat PF rate up to a maximum of $12.00/MWh or $58.9 million/year and an FPS sale of 17 aMW to the Port Townsend Paper Company via its local PUD at a PF-equivalent flat rate. BPA is modeling the risk associated with service to the aluminum smelters in the DSI Benefit Risk Model and service to Port Townsend in RiskMod, which are both components of the Risk Analysis Study.

The risk associated with making an FPS sale of 17 aMW to Port Townsend (PT) at the flat PF rate is quantified in RiskMod by BPA selling this power at a PF-equivalent flat rate rather than as a surplus energy sale at variable prices on the wholesale power market. The revenues and loads associated with this FPS sale are included under West Hub FPS Sales in the Revenue Forecast component of the WPRDS and under Interregional Transfers Out in the Load Resource Study, which are both inputs into RiskMod. *See* the Revenue Forecast component of the Wholesale Power Rate Development Study, WP-07-E-BPA-05 and Load Resource Study, WP-07-E-BPA-01. The reduction in surplus energy sales and revenues are computed via the load and resource values in RiskMod.

For the Initial Proposal, BPA assumes in the DSI Benefit Risk Model that the benefits to the aluminum smelters (560 aMW) will be monetized and the aluminum smelters will maximize their benefits and adjust their energy usage (to as low as 280 aMW) to minimize their per aMW effective (after BPA payments) electricity prices. Because any unused service benefits will be reallocated to the other DSIs, it is assumed that, to the extent that a less efficient smelter cannot operate economically, the more efficient smelters will acquire the freed up service benefits via this reallocation. The DSI ROD contains more detail on the reallocation of service benefits and the minimum operating level of 280 aMW for DSI service benefits.

Benefit computations are based on comparisons between forward market electricity prices and the lowest cost flat PF rates, assuming a complete shutdown of all smelters at forward market electricity prices of $70.00/MWh or more (no benefit payments) and no benefit payments for prices below the lowest cost flat PF rates. The forward market price risk for a 12 month strip of power was simulated 3000 times per FY for FY 2007-2009 by the Forward Market Price Risk Model. See Section 1.15 of this Study Documentation, regarding simulated forward market prices in the Forward Market Price Risk Model. The rates for 3000 outcomes per FY for FY 2007-2009 were calculated by the ToolKit Model. See Section 3 in the Risk Analysis Study, WP-07-E-BPA-04), regarding the ToolKit Model. These prices and rates were copied into the DSI Benefit Risk Model to compute DSI benefits.

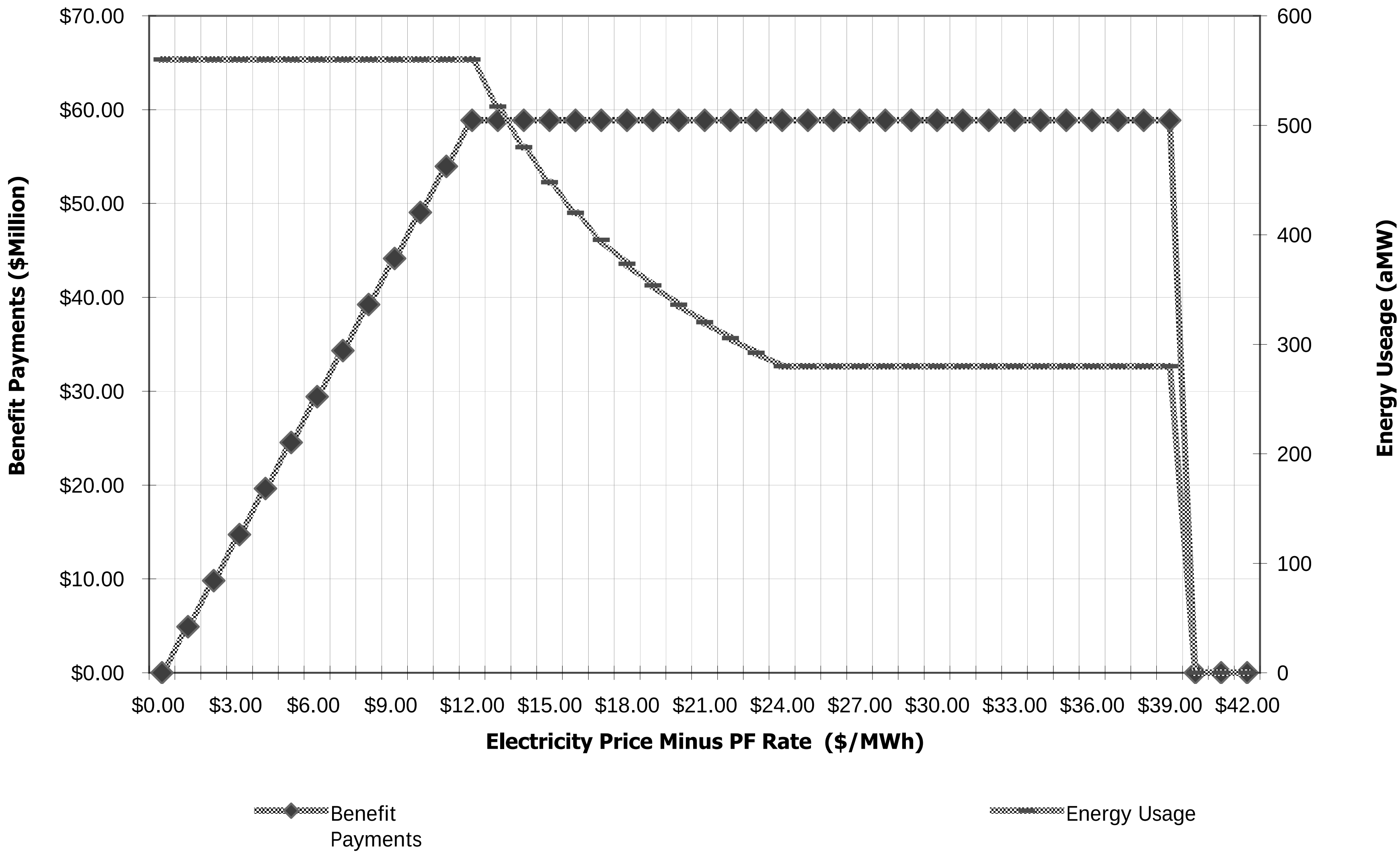
While the DSI contract terms have not been negotiated yet, it was assumed for the Initial Proposal that there is only uncertainty in the amount of aluminum smelter benefits paid in FY 2008-2009, relative to the benefits included in the Revenue Requirement when setting rates. For FY 2007, it was assumed that there is no uncertainty in the amount of aluminum smelter benefits paid to the DSIs, relative to the benefits included in the Revenue Requirement (which are $59 million in the Initial Proposal) when setting rates, since by the Final Rate Proposal the actual benefit payments for FY 2007 will be known. The assumption regarding service to the DSIs will be revisited and revised as needed for the Final Rate Proposal

Table 26 contains a copy of the algorithm used to compute the aluminum smelter benefits in the DSI Benefit Risk Model. This algorithm computes the aluminum smelter benefits, energy usage, and effective electricity prices (after BPA benefit payments) for forward market electricity prices ranging from the lowest cost flat PF rates to over $70.00/MWh. Under this algorithm, DSI benefits and energy usage can range from a minimum of $0M to $58.9M and from 560 aMW to 280 aMW depending on the differences between forward market electricity prices and the lowest cost flat PF rates. The interrelationships between these factors are shown in Graph 10.

## Table 26: Aluminum Smelter Benefit Payments and Energy Usage Algorithm Results Reflect an Effective PF Rate of $30.00/MWh

| Electricity Prices ($/MWh) | Electricity Prices Minus PF Rate ($/MWh) | Alum Smelter Energy Usage (aMW) | Alum Smelter Payments ($Million) | Smelter Effective Electricity Price ($/MWh) |
|---|---|---|---|---|
| $ 30.00 | $ - | 560 | $ - | $ 30.00 |
| $ 31.00 | $ 1.00 | 560 | $ 4.9 | $ 30.00 |
| $ 32.00 | $ 2.00 | 560 | $ 9.8 | $ 30.00 |
| $ 33.00 | $ 3.00 | 560 | $ 14.7 | $ 30.00 |
| $ 34.00 | $ 4.00 | 560 | $ 19.6 | $ 30.00 |
| $ 35.00 | $ 5.00 | 560 | $ 24.5 | $ 30.00 |
| $ 36.00 | $ 6.00 | 560 | $ 29.4 | $ 30.00 |
| $ 37.00 | $ 7.00 | 560 | $ 34.3 | $ 30.00 |
| $ 38.00 | $ 8.00 | 560 | $ 39.2 | $ 30.00 |
| $ 39.00 | $ 9.00 | 560 | $ 44.2 | $ 30.00 |
| $ 40.00 | $ 10.00 | 560 | $ 49.1 | $ 30.00 |
| $ 41.00 | $ 11.00 | 560 | $ 54.0 | $ 30.00 |
| $ 42.00 | $ 12.00 | 560 | $ 58.9 | $ 30.00 |
| $ 43.00 | $ 13.00 | 517 | $ 58.9 | $ 30.00 |
| $ 44.00 | $ 14.00 | 480 | $ 58.9 | $ 30.00 |
| $ 45.00 | $ 15.00 | 448 | $ 58.9 | $ 30.00 |
| $ 46.00 | $ 16.00 | 420 | $ 58.9 | $ 30.00 |
| $ 47.00 | $ 17.00 | 395 | $ 58.9 | $ 30.00 |
| $ 48.00 | $ 18.00 | 373 | $ 58.9 | $ 30.00 |
| $ 49.00 | $ 19.00 | 354 | $ 58.9 | $ 30.00 |
| $ 50.00 | $ 20.00 | 336 | $ 58.9 | $ 30.00 |
| $ 51.00 | $ 21.00 | 320 | $ 58.9 | $ 30.00 |
| $ 52.00 | $ 22.00 | 305 | $ 58.9 | $ 30.00 |
| $ 53.00 | $ 23.00 | 292 | $ 58.9 | $ 30.00 |
| $ 54.00 | $ 24.00 | 280 | $ 58.9 | $ 30.00 |
| $ 55.00 | $ 25.00 | 280 | $ 58.9 | $ 31.00 |
| $ 56.00 | $ 26.00 | 280 | $ 58.9 | $ 32.00 |
| $ 57.00 | $ 27.00 | 280 | $ 58.9 | $ 33.00 |
| $ 58.00 | $ 28.00 | 280 | $ 58.9 | $ 34.00 |
| $ 59.00 | $ 29.00 | 280 | $ 58.9 | $ 35.00 |
| $ 60.00 | $ 30.00 | 280 | $ 58.9 | $ 36.00 |
| $ 61.00 | $ 31.00 | 280 | $ 58.9 | $ 37.00 |
| $ 62.00 | $ 32.00 | 280 | $ 58.9 | $ 38.00 |
| $ 63.00 | $ 33.00 | 280 | $ 58.9 | $ 39.00 |
| $ 64.00 | $ 34.00 | 280 | $ 58.9 | $ 40.00 |
| $ 65.00 | $ 35.00 | 280 | $ 58.9 | $ 41.00 |
| $ 66.00 | $ 36.00 | 280 | $ 58.9 | $ 42.00 |
| $ 67.00 | $ 37.00 | 280 | $ 58.9 | $ 43.00 |
| $ 68.00 | $ 38.00 | 280 | $ 58.9 | $ 44.00 |
| $ 69.00 | $ 39.00 | 280 | $ 58.9 | $ 45.00 |
| $ 70.00 | $ 40.00 | 0 | $ - | $ 46.00 |
| $ 71.00 | $ 41.00 | 0 | $ - | $ 47.00 |
| $ 72.00 | $ 42.00 | 0 | $ - | $ 48.00 |

## Graph 10: Aluminum Smelter Benefit Payments And Energy Usage



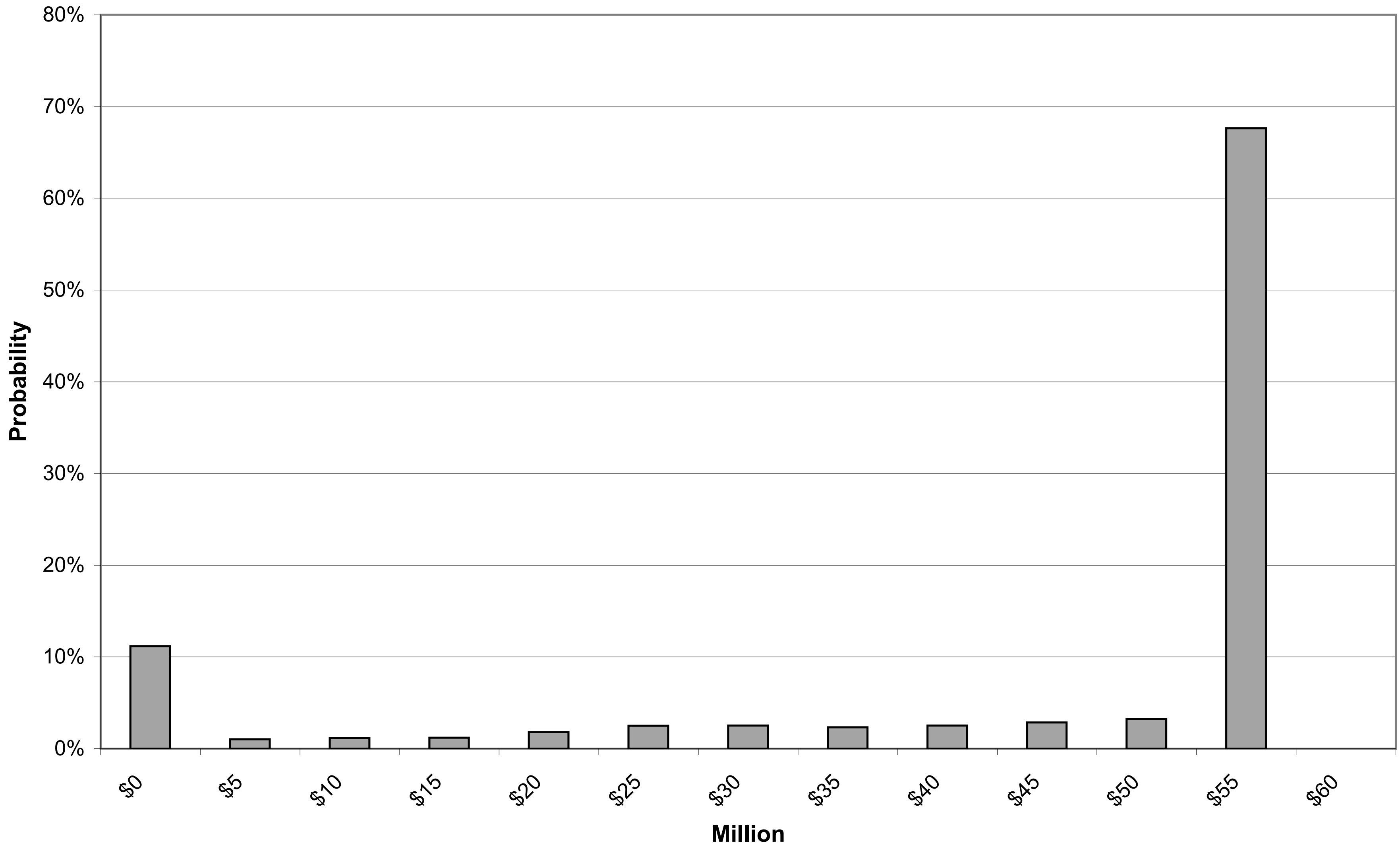
**1.12.2 Model and Results.** Table 27 contains a copy of the top portion of the DSI Benefit Risk Model, which provides examples of how computations for 3000 outcomes per FY are performed throughout the entire Excel workbook. Results of the model, which are based on rates from a preliminary run of ToolKit, indicate that the average DSI Benefits during FY 2007-2009 are $58.9/M, $47.2/M, and $52.8/M. Graphs 11-12 show the probability distributions for the DSI benefits for FY 2008-2009 (FY 2007 is a constant value for all outcomes).

# Table 27: DSI Benefit Risk Model

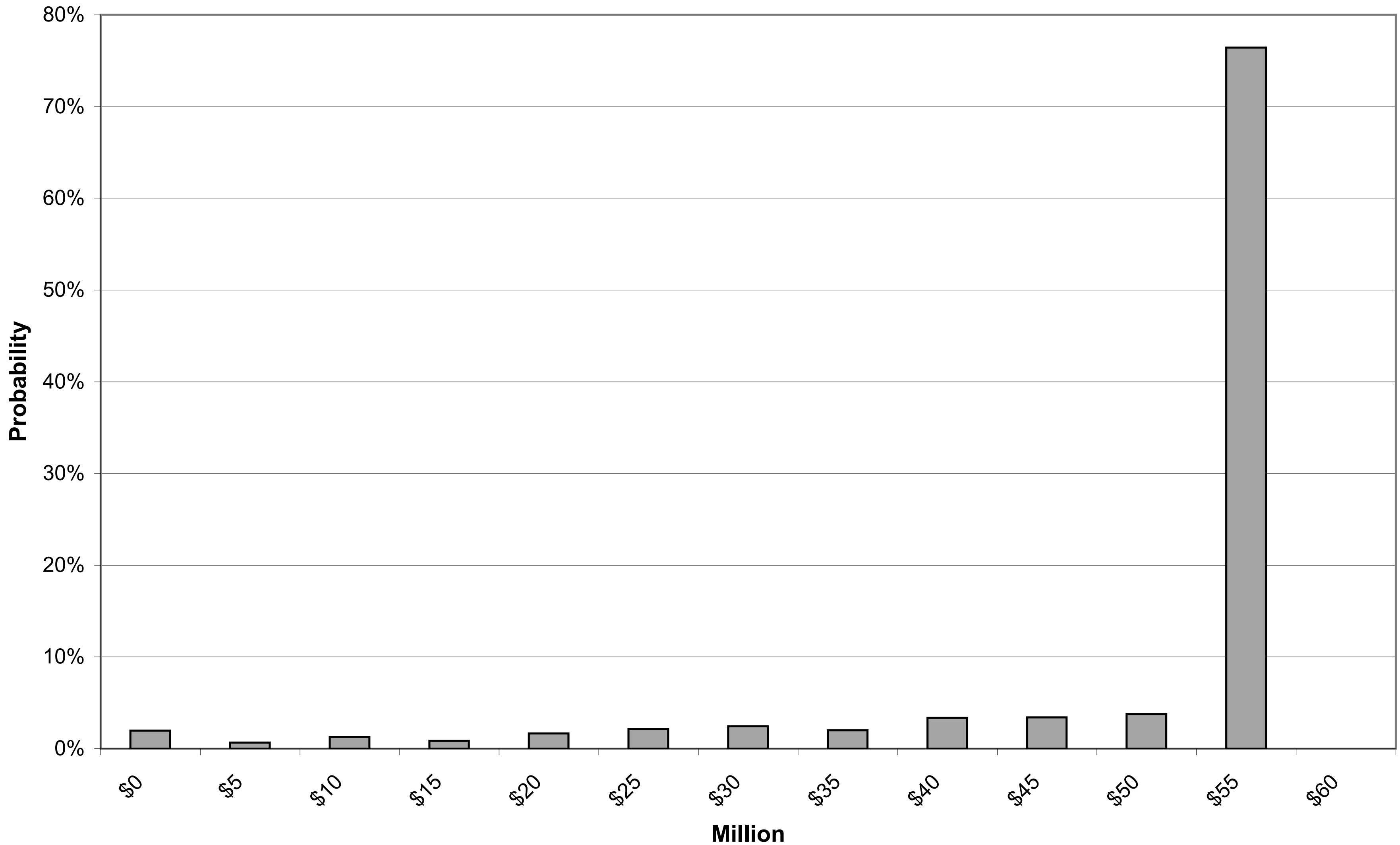
| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Firm | Initial Alloc | | | | | | | | | | | | | | |
| Alcoa | 320 | | | | | | | | | | | | | | |
| CFAC | 140 | | | | | | | | | | | | | | |
| GNA | 100 | | | | | | | | | | | | | | |
| Total (aMW) | 560 | | | | | | | | | | | | | | |
| Total (Max Payment) | $ 58,867 | | | | | | | | | | | | | | |
| Max Electricity Price Benefit | **$ 12.00** | | | | | | | | | | | | | | |
| Shutdown Electricity Price | **$ 70.00** | | | | | | | | | | | | | | |
| Min Output (aMW) | **280** | | | | | | | | | | | | | | |
| **3-Year Average** | | | **$ 52,954** | | | | **369** | | | | **$ 49.72** | | | | **$ 29.25** |
| Average (3000 iterations) | **$ 58,867** | **$ 47,152** | **$ 52,843** | Average | **313** | **389** | **405** | Average | **$ 52.07** | **$ 50.42** | **$ 46.67** | Average | **$ 30.29** | **$ 29.80** | **$ 27.65** |
| Max (3000 iterations) | **$ 58,867** | **$ 58,867** | **$ 58,867** | Stdev | **40** | **155** | **120** | | | | | | | | |
| Min (3000 iterations) | **$ 58,867** | **$ -** | **$ -** | | | | | | | | | | | | |

| | Smelter Payments | | | | Smelter Energy Usage | | | | Annual Flat Forward Mkt Prices ($/MWh) | | | | Effective Flat PF Rate ($/MWh) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Iteration** | **2007** | **2008** | **2009** | | **2007** | **2008** | **2009** | | **2007** | **2008** | **2009** | | **2007** | **2008** | **2009** |
| 1 | $ 58,867 | $ 39,363 | $ 58,867 | | 293 | 560 | 388 | | $ 52.07 | $ 39.37 | $ 44.28 | | $ 29.10 | $ 31.35 | $ 26.96 |
| 2 | $ 58,867 | $ 51,626 | $ 58,867 | | 412 | 560 | 396 | | $ 52.07 | $ 44.75 | $ 52.60 | | $ 35.75 | $ 34.23 | $ 35.64 |
| 3 | $ 58,867 | $ - | $ 58,867 | | 293 | 0 | 288 | | $ 52.07 | $ 77.17 | $ 58.95 | | $ 29.10 | $ 35.69 | $ 35.64 |
| 4 | $ 58,867 | $ 58,867 | $ 58,867 | | 312 | 280 | 280 | | $ 52.07 | $ 57.24 | $ 48.15 | | $ 30.56 | $ 29.10 | $ 21.20 |
| 5 | $ 58,867 | $ 58,867 | $ 58,867 | | 412 | 496 | 530 | | $ 52.07 | $ 49.24 | $ 47.90 | | $ 35.75 | $ 35.69 | $ 35.23 |
| 6 | $ 58,867 | $ 55,446 | $ 35,887 | | 293 | 560 | 560 | | $ 52.07 | $ 41.61 | $ 36.76 | | $ 29.10 | $ 30.31 | $ 29.44 |
| 7 | $ 58,867 | $ 58,867 | $ 58,867 | | 293 | 280 | 513 | | $ 52.07 | $ 53.55 | $ 43.14 | | $ 29.10 | $ 29.10 | $ 30.04 |
| 8 | $ 58,867 | $ 58,867 | $ 58,867 | | 331 | 280 | 330 | | $ 52.07 | $ 62.57 | $ 49.49 | | $ 31.80 | $ 35.69 | $ 29.10 |
| 9 | $ 58,867 | $ 52,555 | $ 58,867 | | 412 | 560 | 525 | | $ 52.07 | $ 42.01 | $ 46.73 | | $ 35.75 | $ 31.30 | $ 33.92 |
| 10 | $ 58,867 | $ 58,867 | $ 58,867 | | 293 | 280 | 280 | | $ 52.07 | $ 63.35 | $ 52.89 | | $ 29.10 | $ 29.10 | $ 19.79 |
| 11 | $ 58,867 | $ 58,867 | $ 58,867 | | 293 | 419 | 305 | | $ 52.07 | $ 45.14 | $ 44.12 | | $ 29.10 | $ 29.10 | $ 22.12 |
| 12 | $ 58,867 | $ 17,416 | $ 58,867 | | 293 | 560 | 280 | | $ 52.07 | $ 32.65 | $ 55.08 | | $ 29.10 | $ 29.10 | $ 29.10 |
| 13 | $ 58,867 | $ 58,867 | $ 28,171 | | 293 | 432 | 560 | | $ 52.07 | $ 51.25 | $ 36.14 | | $ 29.10 | $ 35.69 | $ 30.39 |
| 14 | $ 58,867 | $ 55,211 | $ 58,867 | | 293 | 560 | 280 | | $ 52.07 | $ 40.36 | $ 45.73 | | $ 29.10 | $ 29.10 | $ 15.93 |
| 15 | $ 58,867 | $ 26,759 | $ 58,867 | | 293 | 560 | 288 | | $ 52.07 | $ 39.61 | $ 46.08 | | $ 29.10 | $ 34.16 | $ 22.73 |
| 16 | $ 58,867 | $ 58,867 | $ 58,867 | | 293 | 280 | 329 | | $ 52.07 | $ 53.45 | $ 53.97 | | $ 29.10 | $ 11.89 | $ 33.55 |
| 17 | $ 58,867 | $ - | $ 58,867 | | 293 | 0 | 280 | | $ 52.07 | $ 75.04 | $ 56.46 | | $ 29.10 | $ 34.49 | $ 31.11 |
| 18 | $ 58,867 | $ 58,867 | $ 58,867 | | 293 | 280 | 280 | | $ 52.07 | $ 56.96 | $ 53.85 | | $ 29.10 | $ 20.03 | $ 28.73 |
| 19 | $ 58,867 | $ 58,867 | $ 58,867 | | 293 | 280 | 402 | | $ 52.07 | $ 56.53 | $ 45.33 | | $ 29.10 | $ 29.10 | $ 28.61 |
| 20 | $ 58,867 | $ - | $ 26,600 | | 343 | 560 | 560 | | $ 52.07 | $ 34.37 | $ 34.52 | | $ 32.49 | $ 35.62 | $ 29.10 |
| 21 | $ 58,867 | $ 58,867 | $ 58,867 | | 293 | 280 | 332 | | $ 52.07 | $ 57.50 | $ 45.56 | | $ 29.10 | $ 29.10 | $ 25.35 |
| 22 | $ 58,867 | $ 58,867 | $ 58,867 | | 293 | 280 | 374 | | $ 52.07 | $ 54.85 | $ 45.63 | | $ 29.10 | $ 28.51 | $ 27.65 |
| 23 | $ 58,867 | $ 32,140 | $ 58,867 | | 323 | 560 | 364 | | $ 52.07 | $ 40.03 | $ 45.60 | | $ 31.27 | $ 33.48 | $ 27.12 |
| 24 | $ 58,867 | $ - | $ 34,134 | | 293 | 560 | 560 | | $ 52.07 | $ 30.35 | $ 37.24 | | $ 29.10 | $ 35.69 | $ 30.28 |
| 25 | $ 58,867 | $ 58,867 | $ 58,867 | | 380 | 323 | 280 | | $ 52.07 | $ 49.93 | $ 54.96 | | $ 34.41 | $ 29.10 | $ 25.99 |
| 26 | $ 58,867 | $ 57,278 | $ 58,867 | | 293 | 560 | 298 | | $ 52.07 | $ 46.47 | $ 52.03 | | $ 29.10 | $ 34.79 | $ 29.49 |
| 27 | $ 58,867 | $ 42,474 | $ 864 | | 293 | 560 | 560 | | $ 52.07 | $ 42.82 | $ 35.24 | | $ 29.10 | $ 34.16 | $ 35.06 |
| 28 | $ 58,867 | $ 58,867 | $ 58,867 | | 293 | 446 | 411 | | $ 52.07 | $ 45.79 | $ 45.44 | | $ 29.10 | $ 30.74 | $ 29.10 |
| 29 | $ 58,867 | $ 58,867 | $ 41,122 | | 293 | 292 | 560 | | $ 52.07 | $ 52.14 | $ 37.48 | | $ 29.10 | $ 29.10 | $ 29.10 |
| 30 | $ 58,867 | $ 31 | $ 58,867 | | 293 | 560 | 372 | | $ 52.07 | $ 35.32 | $ 46.70 | | $ 29.12 | $ 35.31 | $ 28.62 |
| 31 | $ 58,867 | $ 58,867 | $ 58,867 | | 412 | 446 | 419 | | $ 52.07 | $ 49.91 | $ 51.69 | | $ 35.75 | $ 34.84 | $ 35.64 |
| 32 | $ 58,867 | $ 58,867 | $ 58,867 | | 412 | 280 | 280 | | $ 52.07 | $ 54.73 | $ 66.57 | | $ 35.75 | $ 30.72 | $ 35.64 |
| 33 | $ 58,867 | $ 58,867 | $ 49,569 | | 293 | 412 | 560 | | $ 52.07 | $ 45.42 | $ 39.21 | | $ 29.10 | $ 29.10 | $ 29.10 |
| 34 | $ 58,867 | $ 58,867 | $ 58,867 | | 351 | 280 | 280 | | $ 52.07 | $ 53.69 | $ 50.08 | | $ 32.90 | $ 21.91 | $ 23.20 |
| 35 | $ 58,867 | $ 58,867 | $ 58,867 | | 293 | 280 | 280 | | $ 52.07 | $ 69.22 | $ 56.40 | | $ 29.10 | $ 29.10 | $ 14.67 |
| 36 | $ 58,867 | $ - | $ 58,867 | | 325 | 560 | 342 | | $ 52.07 | $ 34.93 | $ 45.83 | | $ 31.40 | $ 35.44 | $ 26.21 |
| 37 | $ 58,867 | $ 8,234 | $ 58,867 | | 308 | 560 | 308 | | $ 52.07 | $ 36.26 | $ 46.14 | | $ 30.22 | $ 34.58 | $ 24.33 |
| 38 | $ 58,867 | $ 58,867 | $ 58,867 | | 317 | 287 | 479 | | $ 52.07 | $ 48.45 | $ 44.18 | | $ 30.90 | $ 25.00 | $ 30.15 |

## Graph 11: Smelter Benefit Distribution for FY 2008



## Graph 12:  Smelter Benefit Distribution for FY 2009



## 1.13 Wind Resource Risk Factor

The wind resource risk factor reflects the uncertainty in the amount and value of the energy generated by BPA's portion of Condon, Klondike, Stateline, and Foote Creek I, II, and IV wind projects. Wind generation risk is modeled in four risk simulation models (Foote Creek I, II, and IV wind projects were combined) such that the average of the simulated monthly generation outcomes for each project is equal to the expected monthly generation included in the Load Resource Study, WP-07-E-BPA-01. These four risk simulation models are collectively referred to as Wind Generation Risk Models.

The risk of the value of the wind generation is based on the difference between the purchase prices specified in each output contract and the spot market electricity prices received/paid for the amount of energy produced, since BPA only pays for whatever amount of energy is produced. This financial risk is computed in RevSim.

**1.13.1 Historical Data.** To model monthly wind generation risk, daily average energy output data from January 2002 thru January 2005 were sorted by month for each wind project, regardless of year. This process yielded three years worth of daily output data for each month of the year from which cumulative probability distributions of daily output for each month were derived in the RiskCumul function in the @RISK computer package. The historical daily wind generation data used for this analysis were the data used to compute the monthly wind generation values included under Non-Utility Generation in the Load Resource Study. *See* Load Resource Study and Documentation, WP-07-E-BPA-01 and WP-07-E-BPA-01A, regarding this data.

**1.13.2 Modeling Methodology for Wind Generation Risk.** Monthly wind generation variability for each of the wind projects (the Foote Creek projects were combined) was derived in risk simulation models in the following manner: (1) Sample the daily wind generation values from the cumulative probability distributions for each day in a given month (i.e., 31 days for January); (2) Sum the daily wind generation values for all days in a given month; (3) Divide the monthly sum by the number of days in that particular month.

The daily wind generation from one day to the next day was modeled independently based on the highly variable daily generation amounts from one day to the next day exhibited in the historical data. The output of all the wind projects were simulated independent of one another, with the exception that the generation from the three Foote Creek projects, which are all on the same ridgeline, contiguously located, and electrically connected at the same substation, were modeled together.

Tables 28-31 contain copies of the cumulative probability distributions of the daily output by month for each of the wind projects (with the Foote Creek projects combined) from which daily output risk was modeled. The values in these tables are specified in terms of daily capacity factors for which energy values can be computed by multiplying the capacity factors times the capacity value for a particular wind project. Tables 32-35 contain copies of the four risk simulation models.

## Table 28: Condon Wind Project Daily Output Variability by Month

**Condon**
**Nameplate Capacity: 49.8 MW**

| | Cumulative Probability Distribution of Daily Capacity Factors (Energy = Capacity * Capacity Factors) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Percentile | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
| Min | 0.000 | 0.001 | 0.000 | 0.008 | 0.000 | 0.000 | 0.027 | 0.004 | 0.001 | 0.000 | 0.000 | 0.000 |
| 0.01 | 0.000 | 0.003 | 0.003 | 0.013 | 0.000 | 0.000 | 0.027 | 0.005 | 0.001 | 0.000 | 0.000 | 0.000 |
| 0.05 | 0.000 | 0.010 | 0.011 | 0.031 | 0.000 | 0.000 | 0.031 | 0.015 | 0.014 | 0.003 | 0.003 | 0.000 |
| 0.10 | 0.000 | 0.025 | 0.037 | 0.038 | 0.014 | 0.026 | 0.037 | 0.025 | 0.025 | 0.014 | 0.008 | 0.001 |
| 0.15 | 0.003 | 0.035 | 0.051 | 0.046 | 0.024 | 0.044 | 0.044 | 0.034 | 0.036 | 0.035 | 0.020 | 0.008 |
| 0.20 | 0.005 | 0.046 | 0.077 | 0.064 | 0.035 | 0.057 | 0.047 | 0.040 | 0.044 | 0.046 | 0.024 | 0.019 |
| 0.25 | 0.009 | 0.055 | 0.088 | 0.072 | 0.049 | 0.068 | 0.058 | 0.053 | 0.058 | 0.058 | 0.035 | 0.044 |
| 0.30 | 0.018 | 0.065 | 0.100 | 0.084 | 0.064 | 0.075 | 0.067 | 0.067 | 0.064 | 0.073 | 0.051 | 0.071 |
| 0.35 | 0.028 | 0.075 | 0.125 | 0.106 | 0.078 | 0.080 | 0.085 | 0.081 | 0.073 | 0.083 | 0.083 | 0.083 |
| 0.40 | 0.044 | 0.092 | 0.168 | 0.113 | 0.095 | 0.101 | 0.100 | 0.088 | 0.082 | 0.097 | 0.107 | 0.100 |
| 0.45 | 0.076 | 0.105 | 0.224 | 0.125 | 0.106 | 0.118 | 0.119 | 0.092 | 0.093 | 0.130 | 0.154 | 0.125 |
| 0.50 | 0.101 | 0.131 | 0.265 | 0.147 | 0.124 | 0.136 | 0.131 | 0.098 | 0.105 | 0.147 | 0.176 | 0.188 |
| 0.55 | 0.158 | 0.139 | 0.300 | 0.170 | 0.137 | 0.155 | 0.138 | 0.111 | 0.124 | 0.182 | 0.197 | 0.233 |
| 0.60 | 0.200 | 0.155 | 0.356 | 0.187 | 0.157 | 0.169 | 0.152 | 0.123 | 0.137 | 0.212 | 0.255 | 0.248 |
| 0.65 | 0.292 | 0.187 | 0.389 | 0.206 | 0.196 | 0.192 | 0.177 | 0.134 | 0.176 | 0.252 | 0.315 | 0.278 |
| 0.70 | 0.335 | 0.200 | 0.422 | 0.242 | 0.230 | 0.204 | 0.205 | 0.161 | 0.205 | 0.272 | 0.358 | 0.327 |
| 0.75 | 0.369 | 0.215 | 0.452 | 0.268 | 0.265 | 0.234 | 0.222 | 0.199 | 0.245 | 0.298 | 0.406 | 0.402 |
| 0.80 | 0.419 | 0.268 | 0.518 | 0.291 | 0.274 | 0.269 | 0.251 | 0.223 | 0.268 | 0.351 | 0.467 | 0.474 |
| 0.85 | 0.488 | 0.311 | 0.574 | 0.325 | 0.308 | 0.318 | 0.267 | 0.258 | 0.327 | 0.426 | 0.527 | 0.541 |
| 0.90 | 0.522 | 0.429 | 0.683 | 0.396 | 0.443 | 0.374 | 0.312 | 0.306 | 0.437 | 0.483 | 0.630 | 0.628 |
| 0.95 | 0.596 | 0.513 | 0.752 | 0.499 | 0.525 | 0.444 | 0.343 | 0.406 | 0.483 | 0.635 | 0.739 | 0.662 |
| 0.99 | 0.825 | 0.823 | 0.831 | 0.651 | 0.681 | 0.554 | 0.586 | 0.593 | 0.594 | 0.794 | 0.876 | 0.776 |
| Max | 0.866 | 0.953 | 0.901 | 0.712 | 0.696 | 0.628 | 0.723 | 0.719 | 0.758 | 0.859 | 0.931 | 0.800 |
| | | | | | | | | | | | | |
| Average | 0.207 | 0.175 | 0.301 | 0.189 | 0.175 | 0.169 | 0.158 | 0.142 | 0.166 | 0.213 | 0.254 | 0.243 |
| Energy (aMW) | 10.3 | 8.7 | 15.0 | 9.4 | 8.7 | 8.4 | 7.9 | 7.1 | 8.3 | 10.6 | 12.6 | 12.1 |

# Table 29: Combined Foote Creek I, II, and IV Wind Project Daily Output Variability by Month

**Foote Creek I, II, and IV**
**Nameplate Capacity: 33.9 MW**

| | Cumulative Probability Distribution of Daily Capacity Factors (Energy = Capacity * Capacity Factors) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Percentile** | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **Jun** | **Jul** | **Aug** | **Sep** | **Oct** | **Nov** | **Dec** |
| Min | 0.270 | 0.331 | 0.168 | 0.189 | 0.151 | 0.135 | 0.118 | 0.075 | 0.092 | 0.144 | 0.189 | 0.162 |
| 0.01 | 0.274 | 0.342 | 0.168 | 0.213 | 0.160 | 0.141 | 0.119 | 0.082 | 0.103 | 0.153 | 0.198 | 0.177 |
| 0.05 | 0.322 | 0.353 | 0.176 | 0.245 | 0.176 | 0.155 | 0.129 | 0.088 | 0.114 | 0.158 | 0.224 | 0.213 |
| 0.10 | 0.382 | 0.364 | 0.202 | 0.269 | 0.186 | 0.177 | 0.134 | 0.097 | 0.122 | 0.167 | 0.254 | 0.278 |
| 0.15 | 0.435 | 0.382 | 0.246 | 0.282 | 0.190 | 0.186 | 0.140 | 0.103 | 0.134 | 0.182 | 0.290 | 0.317 |
| 0.20 | 0.469 | 0.405 | 0.265 | 0.298 | 0.201 | 0.193 | 0.144 | 0.116 | 0.140 | 0.203 | 0.341 | 0.354 |
| 0.25 | 0.490 | 0.439 | 0.272 | 0.310 | 0.206 | 0.225 | 0.149 | 0.127 | 0.151 | 0.216 | 0.349 | 0.374 |
| 0.30 | 0.500 | 0.462 | 0.319 | 0.332 | 0.210 | 0.233 | 0.152 | 0.130 | 0.169 | 0.236 | 0.363 | 0.409 |
| 0.35 | 0.519 | 0.506 | 0.354 | 0.353 | 0.233 | 0.246 | 0.156 | 0.140 | 0.188 | 0.245 | 0.375 | 0.430 |
| 0.40 | 0.539 | 0.524 | 0.361 | 0.373 | 0.246 | 0.253 | 0.165 | 0.151 | 0.200 | 0.264 | 0.392 | 0.465 |
| 0.45 | 0.561 | 0.542 | 0.400 | 0.386 | 0.265 | 0.264 | 0.168 | 0.157 | 0.207 | 0.303 | 0.399 | 0.495 |
| 0.50 | 0.576 | 0.569 | 0.409 | 0.399 | 0.280 | 0.274 | 0.175 | 0.171 | 0.229 | 0.334 | 0.435 | 0.520 |
| 0.55 | 0.582 | 0.587 | 0.428 | 0.418 | 0.292 | 0.283 | 0.190 | 0.181 | 0.235 | 0.355 | 0.459 | 0.540 |
| 0.60 | 0.590 | 0.592 | 0.444 | 0.443 | 0.303 | 0.295 | 0.193 | 0.192 | 0.244 | 0.369 | 0.475 | 0.556 |
| 0.65 | 0.602 | 0.619 | 0.453 | 0.459 | 0.321 | 0.318 | 0.195 | 0.204 | 0.250 | 0.388 | 0.502 | 0.561 |
| 0.70 | 0.612 | 0.630 | 0.475 | 0.479 | 0.329 | 0.336 | 0.204 | 0.225 | 0.273 | 0.413 | 0.524 | 0.571 |
| 0.75 | 0.624 | 0.638 | 0.492 | 0.490 | 0.342 | 0.353 | 0.222 | 0.242 | 0.282 | 0.418 | 0.529 | 0.590 |
| 0.80 | 0.630 | 0.654 | 0.510 | 0.506 | 0.366 | 0.376 | 0.229 | 0.258 | 0.298 | 0.426 | 0.540 | 0.598 |
| 0.85 | 0.643 | 0.676 | 0.559 | 0.519 | 0.390 | 0.398 | 0.240 | 0.270 | 0.315 | 0.446 | 0.566 | 0.610 |
| 0.90 | 0.661 | 0.691 | 0.587 | 0.540 | 0.426 | 0.444 | 0.265 | 0.278 | 0.344 | 0.473 | 0.595 | 0.628 |
| 0.95 | 0.673 | 0.696 | 0.604 | 0.580 | 0.452 | 0.485 | 0.296 | 0.321 | 0.386 | 0.495 | 0.643 | 0.636 |
| 0.99 | 0.706 | 0.721 | 0.639 | 0.627 | 0.484 | 0.566 | 0.334 | 0.350 | 0.485 | 0.526 | 0.680 | 0.648 |
| Max | 0.713 | 0.723 | 0.639 | 0.642 | 0.515 | 0.644 | 0.369 | 0.420 | 0.492 | 0.530 | 0.693 | 0.654 |
| | | | | | | | | | | | | |
| Average | 0.545 | 0.543 | 0.398 | 0.405 | 0.287 | 0.293 | 0.189 | 0.184 | 0.230 | 0.321 | 0.435 | 0.478 |
| Energy (aMW) | 18.5 | 18.4 | 13.5 | 13.7 | 9.7 | 9.9 | 6.4 | 6.3 | 7.8 | 10.9 | 14.7 | 16.2 |

# Table 30: Klondike Wind Project Daily Output Variability by Month

**Klondike**
**Nameplate Capacity: 24.0 MW**

| | Cumulative Probability Distribution of Daily Capacity Factors (Energy = Capacity * Capacity Factors) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Percentile** | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **Jun** | **Jul** | **Aug** | **Sep** | **Oct** | **Nov** | **Dec** |
| Min | 0.000 | 0.000 | 0.003 | 0.001 | 0.007 | 0.010 | 0.002 | 0.008 | 0.002 | 0.000 | 0.000 | 0.000 |
| 0.01 | 0.000 | 0.001 | 0.004 | 0.002 | 0.022 | 0.027 | 0.017 | 0.018 | 0.009 | 0.000 | 0.000 | 0.000 |
| 0.05 | 0.000 | 0.002 | 0.015 | 0.012 | 0.050 | 0.049 | 0.052 | 0.045 | 0.017 | 0.002 | 0.000 | 0.000 |
| 0.10 | 0.000 | 0.007 | 0.027 | 0.037 | 0.080 | 0.068 | 0.106 | 0.068 | 0.032 | 0.007 | 0.003 | 0.000 |
| 0.15 | 0.001 | 0.015 | 0.049 | 0.063 | 0.131 | 0.092 | 0.155 | 0.096 | 0.050 | 0.021 | 0.005 | 0.001 |
| 0.20 | 0.003 | 0.025 | 0.065 | 0.094 | 0.158 | 0.137 | 0.205 | 0.131 | 0.070 | 0.037 | 0.007 | 0.004 |
| 0.25 | 0.007 | 0.033 | 0.109 | 0.134 | 0.182 | 0.191 | 0.256 | 0.173 | 0.084 | 0.058 | 0.022 | 0.007 |
| 0.30 | 0.011 | 0.045 | 0.135 | 0.164 | 0.231 | 0.248 | 0.302 | 0.216 | 0.105 | 0.080 | 0.036 | 0.010 |
| 0.35 | 0.015 | 0.050 | 0.167 | 0.186 | 0.294 | 0.310 | 0.338 | 0.249 | 0.154 | 0.107 | 0.044 | 0.019 |
| 0.40 | 0.021 | 0.068 | 0.201 | 0.214 | 0.326 | 0.346 | 0.363 | 0.283 | 0.191 | 0.137 | 0.050 | 0.036 |
| 0.45 | 0.033 | 0.094 | 0.246 | 0.244 | 0.379 | 0.401 | 0.416 | 0.301 | 0.217 | 0.216 | 0.058 | 0.047 |
| 0.50 | 0.048 | 0.104 | 0.316 | 0.274 | 0.424 | 0.427 | 0.478 | 0.357 | 0.272 | 0.232 | 0.064 | 0.071 |
| 0.55 | 0.073 | 0.135 | 0.360 | 0.297 | 0.456 | 0.470 | 0.553 | 0.378 | 0.302 | 0.277 | 0.083 | 0.102 |
| 0.60 | 0.113 | 0.189 | 0.416 | 0.353 | 0.491 | 0.489 | 0.577 | 0.411 | 0.368 | 0.323 | 0.144 | 0.114 |
| 0.65 | 0.132 | 0.229 | 0.482 | 0.391 | 0.546 | 0.595 | 0.622 | 0.448 | 0.436 | 0.348 | 0.196 | 0.177 |
| 0.70 | 0.185 | 0.258 | 0.533 | 0.426 | 0.567 | 0.616 | 0.639 | 0.510 | 0.497 | 0.400 | 0.233 | 0.196 |
| 0.75 | 0.255 | 0.287 | 0.565 | 0.488 | 0.609 | 0.732 | 0.678 | 0.584 | 0.527 | 0.449 | 0.268 | 0.260 |
| 0.80 | 0.287 | 0.361 | 0.595 | 0.531 | 0.704 | 0.768 | 0.727 | 0.642 | 0.605 | 0.530 | 0.387 | 0.289 |
| 0.85 | 0.304 | 0.487 | 0.687 | 0.598 | 0.735 | 0.811 | 0.785 | 0.699 | 0.651 | 0.569 | 0.508 | 0.330 |
| 0.90 | 0.404 | 0.593 | 0.757 | 0.664 | 0.824 | 0.853 | 0.824 | 0.750 | 0.705 | 0.645 | 0.549 | 0.381 |
| 0.95 | 0.562 | 0.713 | 0.822 | 0.808 | 0.903 | 0.894 | 0.854 | 0.799 | 0.769 | 0.714 | 0.633 | 0.500 |
| 0.99 | 0.673 | 0.808 | 0.887 | 0.904 | 0.970 | 0.961 | 0.900 | 0.843 | 0.821 | 0.895 | 0.802 | 0.685 |
| Max | 0.817 | 0.835 | 0.915 | 0.918 | 0.978 | 0.976 | 0.915 | 0.852 | 0.873 | 0.896 | 0.827 | 0.847 |
| | | | | | | | | | | | | |
| Average | 0.142 | 0.207 | 0.350 | 0.323 | 0.428 | 0.450 | 0.469 | 0.378 | 0.326 | 0.283 | 0.188 | 0.148 |
| Energy (aMW) | 3.4 | 5.0 | 8.4 | 7.8 | 10.3 | 10.8 | 11.3 | 9.1 | 7.8 | 6.8 | 4.5 | 3.6 |

## Table 31: Stateline Wind Project Daily Output Variability by Month

**Stateline**
**Nameplate Capacity: 90.4 MW**

| | Cumulative Probability Distribution of Daily Capacity Factors (Energy = Capacity * Capacity Factors) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Percentile** | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **Jun** | **Jul** | **Aug** | **Sep** | **Oct** | **Nov** | **Dec** |
| Min | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 0.01 | 0.000 | 0.000 | 0.000 | 0.000 | 0.003 | 0.001 | 0.002 | 0.001 | 0.000 | 0.000 | 0.000 | 0.000 |
| 0.05 | 0.000 | 0.000 | 0.003 | 0.007 | 0.005 | 0.003 | 0.005 | 0.003 | 0.000 | 0.000 | 0.000 | 0.000 |
| 0.10 | 0.000 | 0.000 | 0.018 | 0.017 | 0.013 | 0.006 | 0.020 | 0.010 | 0.000 | 0.000 | 0.000 | 0.000 |
| 0.15 | 0.000 | 0.000 | 0.036 | 0.028 | 0.019 | 0.009 | 0.025 | 0.015 | 0.008 | 0.001 | 0.001 | 0.000 |
| 0.20 | 0.000 | 0.001 | 0.063 | 0.049 | 0.041 | 0.021 | 0.044 | 0.033 | 0.014 | 0.007 | 0.002 | 0.000 |
| 0.25 | 0.000 | 0.002 | 0.086 | 0.078 | 0.068 | 0.029 | 0.070 | 0.049 | 0.022 | 0.020 | 0.005 | 0.001 |
| 0.30 | 0.001 | 0.005 | 0.125 | 0.105 | 0.091 | 0.037 | 0.094 | 0.080 | 0.039 | 0.027 | 0.011 | 0.003 |
| 0.35 | 0.002 | 0.009 | 0.240 | 0.132 | 0.114 | 0.071 | 0.130 | 0.114 | 0.061 | 0.063 | 0.027 | 0.014 |
| 0.40 | 0.005 | 0.012 | 0.299 | 0.170 | 0.140 | 0.101 | 0.167 | 0.152 | 0.074 | 0.095 | 0.034 | 0.024 |
| 0.45 | 0.009 | 0.017 | 0.343 | 0.194 | 0.168 | 0.143 | 0.201 | 0.180 | 0.090 | 0.126 | 0.047 | 0.031 |
| 0.50 | 0.015 | 0.025 | 0.387 | 0.212 | 0.195 | 0.179 | 0.221 | 0.196 | 0.125 | 0.143 | 0.067 | 0.053 |
| 0.55 | 0.045 | 0.043 | 0.425 | 0.244 | 0.208 | 0.213 | 0.259 | 0.223 | 0.179 | 0.215 | 0.113 | 0.133 |
| 0.60 | 0.089 | 0.087 | 0.508 | 0.285 | 0.232 | 0.260 | 0.310 | 0.251 | 0.200 | 0.241 | 0.176 | 0.158 |
| 0.65 | 0.176 | 0.108 | 0.546 | 0.305 | 0.307 | 0.337 | 0.329 | 0.280 | 0.277 | 0.290 | 0.241 | 0.254 |
| 0.70 | 0.222 | 0.141 | 0.585 | 0.357 | 0.409 | 0.412 | 0.391 | 0.314 | 0.316 | 0.329 | 0.346 | 0.316 |
| 0.75 | 0.269 | 0.191 | 0.623 | 0.399 | 0.482 | 0.505 | 0.415 | 0.342 | 0.372 | 0.392 | 0.446 | 0.356 |
| 0.80 | 0.325 | 0.234 | 0.647 | 0.503 | 0.507 | 0.563 | 0.453 | 0.384 | 0.482 | 0.457 | 0.528 | 0.471 |
| 0.85 | 0.376 | 0.306 | 0.699 | 0.537 | 0.578 | 0.628 | 0.491 | 0.480 | 0.526 | 0.483 | 0.585 | 0.505 |
| 0.90 | 0.671 | 0.393 | 0.750 | 0.658 | 0.645 | 0.691 | 0.554 | 0.551 | 0.614 | 0.545 | 0.760 | 0.587 |
| 0.95 | 0.787 | 0.569 | 0.847 | 0.719 | 0.728 | 0.769 | 0.604 | 0.686 | 0.721 | 0.622 | 0.822 | 0.692 |
| 0.99 | 0.878 | 0.951 | 0.875 | 0.821 | 0.858 | 0.880 | 0.815 | 0.760 | 0.804 | 0.788 | 0.857 | 0.779 |
| Max | 0.899 | 0.956 | 0.893 | 0.849 | 0.948 | 0.922 | 0.829 | 0.780 | 0.827 | 0.800 | 0.889 | 0.825 |
| | | | | | | | | | | | | |
| Average | 0.174 | 0.134 | 0.385 | 0.271 | 0.272 | 0.274 | 0.261 | 0.238 | 0.228 | 0.227 | 0.233 | 0.203 |
| Energy (aMW) | 15.8 | 12.1 | 34.8 | 24.5 | 24.6 | 24.7 | 23.6 | 21.5 | 20.6 | 20.5 | 21.1 | 18.3 |

# Table 32: Condon Wind Project Risk Model

| | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Condon** | | | | | | | | | | | | | | | | | | | | | | | |
| **Capacity (MW)** | **49.8** | | | | | | | | | | | | | | | | | | | | | | |
| | Month aMW | Day 1 | Day 2 | Day 3 | Day 4 | Day 5 | Day 6 | Day 7 | Day 8 | Day 9 | Day 10 | Day 11 | Day 12 | Day 13 | Day 14 | Day 15 | Day 16 | Day 17 | Day 18 | Day 19 | Day 20 | Day 21 | Day 22 |
| Jan-05 | **10.2** | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 |
| Feb-05 | **8.7** | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 |
| Mar-05 | **15.0** | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 |
| Apr-05 | **9.4** | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 |
| May-05 | **8.7** | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 |
| Jun-05 | **8.4** | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 |
| Jul-05 | **7.8** | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 |
| Aug-05 | **7.1** | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 |
| Sep-05 | **8.3** | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 |
| Oct-05 | **10.5** | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 |
| Nov-05 | **12.5** | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 |
| Dec-05 | **12.0** | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 |
| Jan-06 | **10.2** | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 |
| Feb-06 | **8.7** | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 |
| Mar-06 | **15.0** | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 |
| Apr-06 | **9.4** | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 |
| May-06 | **8.7** | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 |
| Jun-06 | **8.4** | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 |
| Jul-06 | **7.8** | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 |
| Aug-06 | **7.1** | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 |
| Sep-06 | **8.3** | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 |
| Oct-06 | **10.5** | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 |
| Nov-06 | **12.5** | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 |
| Dec-06 | **12.0** | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 |
| Jan-07 | **10.2** | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 |
| Feb-07 | **8.7** | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 |
| Mar-07 | **15.0** | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 |
| Apr-07 | **9.4** | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 |
| May-07 | **8.7** | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 |
| Jun-07 | **8.4** | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 |
| Jul-07 | **7.8** | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 |
| Aug-07 | **7.1** | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 |
| Sep-07 | **8.3** | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 |
| Oct-07 | **10.5** | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 |
| Nov-07 | **12.5** | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 |
| Dec-07 | **12.0** | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 |
| Jan-08 | **10.2** | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 |
| Feb-08 | **8.7** | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 |
| Mar-08 | **15.0** | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 |
| Apr-08 | **9.4** | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 |
| May-08 | **8.7** | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 |
| Jun-08 | **8.4** | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 |
| Jul-08 | **7.8** | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 |
| Aug-08 | **7.1** | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 |
| Sep-08 | **8.3** | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 |
| Oct-08 | **10.5** | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 |
| Nov-08 | **12.5** | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 |
| Dec-08 | **12.0** | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 |
| Jan-09 | **10.2** | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 |
| Feb-09 | **8.7** | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 |
| Mar-09 | **15.0** | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 |
| Apr-09 | **9.4** | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 |
| May-09 | **8.7** | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 |
| Jun-09 | **8.4** | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 |
| Jul-09 | **7.8** | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 |
| Aug-09 | **7.1** | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 |
| Sep-09 | **8.3** | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 |
| Oct-09 | **10.5** | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 |
| Nov-09 | **12.5** | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 |
| Dec-09 | **12.0** | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 |

## Table 32: Condon Wind Project Risk Model (Continued)

**Condon**

**Capacity (MW)**

| | Day 23 | Day 24 | Day 25 | Day 26 | Day 27 | Day 28 | Day 29 | Day 30 | Day 31 |
|---|---|---|---|---|---|---|---|---|---|
| Jan-05 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 |
| Feb-05 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 |
| Mar-05 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 |
| Apr-05 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 |
| May-05 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 |
| Jun-05 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 |
| Jul-05 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 |
| Aug-05 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 |
| Sep-05 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 |
| Oct-05 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 |
| Nov-05 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 |
| Dec-05 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 |
| Jan-06 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 |
| Feb-06 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 |
| Mar-06 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 |
| Apr-06 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 |
| May-06 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 |
| Jun-06 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 |
| Jul-06 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 |
| Aug-06 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 |
| Sep-06 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 |
| Oct-06 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 |
| Nov-06 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 |
| Dec-06 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 |
| Jan-07 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 |
| Feb-07 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 |
| Mar-07 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 |
| Apr-07 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 |
| May-07 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 |
| Jun-07 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 |
| Jul-07 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 |
| Aug-07 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 |
| Sep-07 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 |
| Oct-07 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 |
| Nov-07 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 |
| Dec-07 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 |
| Jan-08 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 |
| Feb-08 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 |
| Mar-08 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 |
| Apr-08 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 |
| May-08 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 |
| Jun-08 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 |
| Jul-08 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 |
| Aug-08 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 |
| Sep-08 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 |
| Oct-08 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 |
| Nov-08 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 |
| Dec-08 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 |
| Jan-09 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 | 10.2 |
| Feb-09 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 |
| Mar-09 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 |
| Apr-09 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 | 9.4 |
| May-09 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 | 8.7 |
| Jun-09 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 |
| Jul-09 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 |
| Aug-09 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 |
| Sep-09 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 | 8.3 |
| Oct-09 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 | 10.5 |
| Nov-09 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 | 12.5 |
| Dec-09 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 |

# Table 33: Foote Creek I, II, and IV Wind Project Risk Model

**Foote Creek I, II, IV**

**Capacity (MW)** **33.9**

| | Month aMW | Day 1 | Day 2 | Day 3 | Day 4 | Day 5 | Day 6 | Day 7 | Day 8 | Day 9 | Day 10 | Day 11 | Day 12 | Day 13 | Day 14 | Day 15 | Day 16 | Day 17 | Day 18 | Day 19 | Day 20 | Day 21 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Jan-05 | **18.5** | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 |
| Feb-05 | **18.4** | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 |
| Mar-05 | **13.5** | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 |
| Apr-05 | **13.7** | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 |
| May-05 | **9.7** | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 |
| Jun-05 | **9.9** | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 |
| Jul-05 | **6.4** | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 |
| Aug-05 | **6.2** | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 |
| Sep-05 | **7.8** | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 |
| Oct-05 | **10.9** | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 |
| Nov-05 | **14.7** | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 |
| Dec-05 | **16.2** | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 |
| Jan-06 | **18.5** | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 |
| Feb-06 | **18.4** | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 |
| Mar-06 | **13.5** | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 |
| Apr-06 | **13.7** | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 |
| May-06 | **9.7** | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 |
| Jun-06 | **9.9** | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 |
| Jul-06 | **6.4** | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 |
| Aug-06 | **6.2** | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 |
| Sep-06 | **7.8** | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 |
| Oct-06 | **10.9** | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 |
| Nov-06 | **14.7** | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 |
| Dec-06 | **16.2** | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 |
| Jan-07 | **18.5** | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 |
| Feb-07 | **18.4** | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 |
| Mar-07 | **13.5** | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 |
| Apr-07 | **13.7** | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 |
| May-07 | **9.7** | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 |
| Jun-07 | **9.9** | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 |
| Jul-07 | **6.4** | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 |
| Aug-07 | **6.2** | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 |
| Sep-07 | **7.8** | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 |
| Oct-07 | **10.9** | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 |
| Nov-07 | **14.7** | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 |
| Dec-07 | **16.2** | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 |
| Jan-08 | **18.5** | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 |
| Feb-08 | **18.4** | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 |
| Mar-08 | **13.5** | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 |
| Apr-08 | **13.7** | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 |
| May-08 | **9.7** | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 |
| Jun-08 | **9.9** | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 |
| Jul-08 | **6.4** | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 |
| Aug-08 | **6.2** | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 |
| Sep-08 | **7.8** | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 |
| Oct-08 | **10.9** | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 |
| Nov-08 | **14.7** | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 |
| Dec-08 | **16.2** | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 |
| Jan-09 | **18.5** | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 |
| Feb-09 | **18.4** | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 |
| Mar-09 | **13.5** | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 |
| Apr-09 | **13.7** | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 |
| May-09 | **9.7** | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 |
| Jun-09 | **9.9** | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 |
| Jul-09 | **6.4** | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 |
| Aug-09 | **6.2** | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 |
| Sep-09 | **7.8** | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 |
| Oct-09 | **10.9** | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 |
| Nov-09 | **14.7** | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 |
| Dec-09 | **16.2** | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 |

## Table 33: Foote Creek I, II, & IV Wind Risk Model (Continued)

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Foote Creek I, II,** | | | | | | | | | | |
| **Capacity (MW)** | | | | | | | | | | |
| | Day 22 | Day 23 | Day 24 | Day 25 | Day 26 | Day 27 | Day 28 | Day 29 | Day 30 | Day 31 |
| Jan-05 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 |
| Feb-05 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 |
| Mar-05 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 |
| Apr-05 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 |
| May-05 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 |
| Jun-05 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 |
| Jul-05 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 |
| Aug-05 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 |
| Sep-05 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 |
| Oct-05 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 |
| Nov-05 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 |
| Dec-05 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 |
| Jan-06 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 |
| Feb-06 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 |
| Mar-06 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 |
| Apr-06 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 |
| May-06 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 |
| Jun-06 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 |
| Jul-06 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 |
| Aug-06 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 |
| Sep-06 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 |
| Oct-06 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 |
| Nov-06 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 |
| Dec-06 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 |
| Jan-07 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 |
| Feb-07 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 |
| Mar-07 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 |
| Apr-07 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 |
| May-07 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 |
| Jun-07 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 |
| Jul-07 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 |
| Aug-07 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 |
| Sep-07 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 |
| Oct-07 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 |
| Nov-07 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 |
| Dec-07 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 |
| Jan-08 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 |
| Feb-08 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 |
| Mar-08 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 |
| Apr-08 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 |
| May-08 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 |
| Jun-08 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 |
| Jul-08 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 |
| Aug-08 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 |
| Sep-08 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 |
| Oct-08 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 |
| Nov-08 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 |
| Dec-08 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 |
| Jan-09 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 |
| Feb-09 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 |
| Mar-09 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 | 13.5 |
| Apr-09 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 |
| May-09 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 | 9.7 |
| Jun-09 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 | 9.9 |
| Jul-09 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 | 6.4 |
| Aug-09 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 | 6.2 |
| Sep-09 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 |
| Oct-09 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 | 10.9 |
| Nov-09 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 | 14.7 |
| Dec-09 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 | 16.2 |

# Table 34: Klondike Wind Project Risk Model

| | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Klondike** | | | | | | | | | | | | | | | | | | | | | | |
| **Capacity (MW)** | **24.0** | | | | | | | | | | | | | | | | | | | | | |
| | Month aMW | Day 1 | Day 2 | Day 3 | Day 4 | Day 5 | Day 6 | Day 7 | Day 8 | Day 9 | Day 10 | Day 11 | Day 12 | Day 13 | Day 14 | Day 15 | Day 16 | Day 17 | Day 18 | Day 19 | Day 20 | Day 21 |
| Jan-05 | **3.4** | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 |
| Feb-05 | **4.9** | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 |
| Mar-05 | **8.4** | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 |
| Apr-05 | **7.7** | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 |
| May-05 | **10.3** | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 |
| Jun-05 | **10.8** | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 |
| Jul-05 | **11.3** | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 |
| Aug-05 | **9.1** | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 |
| Sep-05 | **7.8** | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 |
| Oct-05 | **6.7** | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 |
| Nov-05 | **4.5** | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 |
| Dec-05 | **3.5** | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 |
| Jan-06 | **3.4** | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 |
| Feb-06 | **4.9** | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 |
| Mar-06 | **8.4** | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 |
| Apr-06 | **7.7** | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 |
| May-06 | **10.3** | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 |
| Jun-06 | **10.8** | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 |
| Jul-06 | **11.3** | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 |
| Aug-06 | **9.1** | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 |
| Sep-06 | **7.8** | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 |
| Oct-06 | **6.7** | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 |
| Nov-06 | **4.5** | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 |
| Dec-06 | **3.5** | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 |
| Jan-07 | **3.4** | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 |
| Feb-07 | **4.9** | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 |
| Mar-07 | **8.4** | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 |
| Apr-07 | **7.7** | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 |
| May-07 | **10.3** | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 |
| Jun-07 | **10.8** | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 |
| Jul-07 | **11.3** | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 |
| Aug-07 | **9.1** | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 |
| Sep-07 | **7.8** | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 |
| Oct-07 | **6.7** | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 |
| Nov-07 | **4.5** | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 |
| Dec-07 | **3.5** | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 |
| Jan-08 | **3.4** | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 |
| Feb-08 | **4.9** | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 |
| Mar-08 | **8.4** | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 |
| Apr-08 | **7.7** | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 |
| May-08 | **10.3** | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 |
| Jun-08 | **10.8** | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 |
| Jul-08 | **11.3** | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 |
| Aug-08 | **9.1** | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 |
| Sep-08 | **7.8** | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 |
| Oct-08 | **6.7** | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 |
| Nov-08 | **4.5** | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 |
| Dec-08 | **3.5** | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 |
| Jan-09 | **3.4** | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 |
| Feb-09 | **4.9** | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 |
| Mar-09 | **8.4** | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 |
| Apr-09 | **7.7** | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 |
| May-09 | **10.3** | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 |
| Jun-09 | **10.8** | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 |
| Jul-09 | **11.3** | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 |
| Aug-09 | **9.1** | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 |
| Sep-09 | **7.8** | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 |
| Oct-09 | **6.7** | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 |
| Nov-09 | **4.5** | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 |
| Dec-09 | **3.5** | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 |

## Table 34:  Klondike Wind Project Risk Model (Continued)

**Klondike**
**Capacity (MW)**

| | Day 22 | Day 23 | Day 24 | Day 25 | Day 26 | Day 27 | Day 28 | Day 29 | Day 30 | Day 31 |
|---|---|---|---|---|---|---|---|---|---|---|
| Jan-05 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 |
| Feb-05 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 |
| Mar-05 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 |
| Apr-05 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 |
| May-05 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 |
| Jun-05 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 |
| Jul-05 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 |
| Aug-05 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 |
| Sep-05 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 |
| Oct-05 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 |
| Nov-05 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 |
| Dec-05 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 |
| Jan-06 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 |
| Feb-06 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 |
| Mar-06 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 |
| Apr-06 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 |
| May-06 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 |
| Jun-06 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 |
| Jul-06 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 |
| Aug-06 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 |
| Sep-06 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 |
| Oct-06 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 |
| Nov-06 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 |
| Dec-06 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 |
| Jan-07 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 |
| Feb-07 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 |
| Mar-07 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 |
| Apr-07 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 |
| May-07 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 |
| Jun-07 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 |
| Jul-07 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 |
| Aug-07 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 |
| Sep-07 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 |
| Oct-07 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 |
| Nov-07 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 |
| Dec-07 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 |
| Jan-08 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 |
| Feb-08 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 |
| Mar-08 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 |
| Apr-08 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 |
| May-08 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 |
| Jun-08 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 |
| Jul-08 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 |
| Aug-08 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 |
| Sep-08 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 |
| Oct-08 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 |
| Nov-08 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 |
| Dec-08 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 |
| Jan-09 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 |
| Feb-09 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 |
| Mar-09 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 | 8.4 |
| Apr-09 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 | 7.7 |
| May-09 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 |
| Jun-09 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 |
| Jul-09 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 | 11.3 |
| Aug-09 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 |
| Sep-09 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 |
| Oct-09 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 |
| Nov-09 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 |
| Dec-09 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 |

# Table 35: Stateline Wind Project Risk Model

**Stateline**

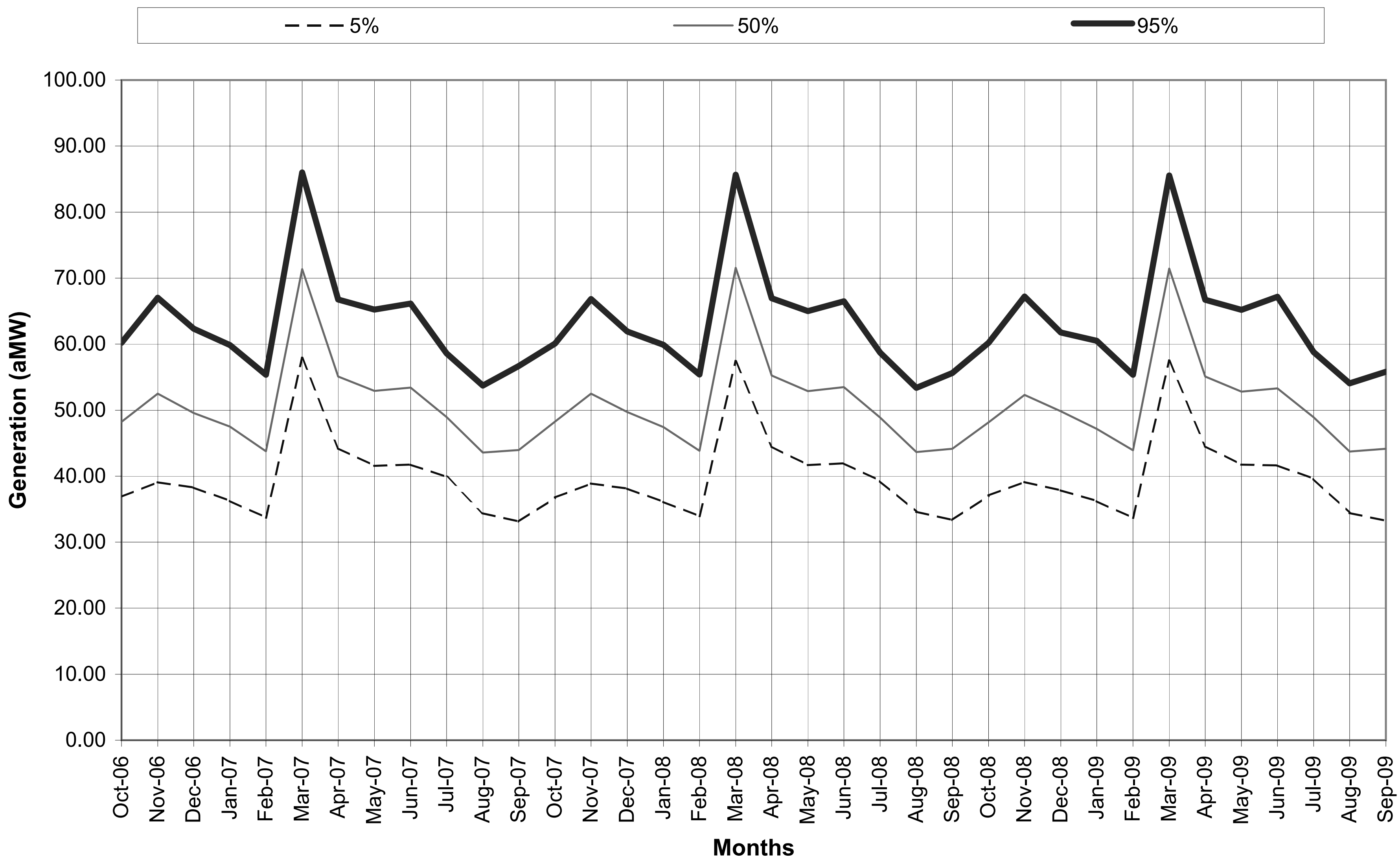
| | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Capacity (MW)** | **90.4** | | | | | | | | | | | | | | | | | | | | | |
| | Month aMW | Day 1 | Day 2 | Day 3 | Day 4 | Day 5 | Day 6 | Day 7 | Day 8 | Day 9 | Day 10 | Day 11 | Day 12 | Day 13 | Day 14 | Day 15 | Day 16 | Day 17 | Day 18 | Day 19 | Day 20 | Day 21 |
| Jan-05 | **15.6** | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 |
| Feb-05 | **12.0** | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 |
| Mar-05 | **34.7** | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 |
| Apr-05 | **24.5** | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 |
| May-05 | **24.4** | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 |
| Jun-05 | **24.5** | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 |
| Jul-05 | **23.6** | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 |
| Aug-05 | **21.4** | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 |
| Sep-05 | **20.5** | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 |
| Oct-05 | **20.2** | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 |
| Nov-05 | **21.0** | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 |
| Dec-05 | **18.1** | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 |
| Jan-06 | **15.6** | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 |
| Feb-06 | **12.0** | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 |
| Mar-06 | **34.7** | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 |
| Apr-06 | **24.5** | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 |
| May-06 | **24.4** | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 |
| Jun-06 | **24.5** | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 |
| Jul-06 | **23.6** | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 |
| Aug-06 | **21.4** | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 |
| Sep-06 | **20.5** | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 |
| Oct-06 | **20.2** | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 |
| Nov-06 | **21.0** | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 |
| Dec-06 | **18.1** | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 |
| Jan-07 | **15.6** | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 |
| Feb-07 | **12.0** | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 |
| Mar-07 | **34.7** | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 |
| Apr-07 | **24.5** | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 |
| May-07 | **24.4** | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 |
| Jun-07 | **24.5** | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 |
| Jul-07 | **23.6** | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 |
| Aug-07 | **21.4** | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 |
| Sep-07 | **20.5** | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 |
| Oct-07 | **20.2** | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 |
| Nov-07 | **21.0** | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 |
| Dec-07 | **18.1** | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 |
| Jan-08 | **15.6** | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 |
| Feb-08 | **12.0** | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 |
| Mar-08 | **34.7** | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 |
| Apr-08 | **24.5** | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 |
| May-08 | **24.4** | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 |
| Jun-08 | **24.5** | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 |
| Jul-08 | **23.6** | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 |
| Aug-08 | **21.4** | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 |
| Sep-08 | **20.5** | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 |
| Oct-08 | **20.2** | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 |
| Nov-08 | **21.0** | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 |
| Dec-08 | **18.1** | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 |
| Jan-09 | **15.6** | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 |
| Feb-09 | **12.0** | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 |
| Mar-09 | **34.7** | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 |
| Apr-09 | **24.5** | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 |
| May-09 | **24.4** | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 |
| Jun-09 | **24.5** | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 |
| Jul-09 | **23.6** | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 |
| Aug-09 | **21.4** | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 |
| Sep-09 | **20.5** | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 |
| Oct-09 | **20.2** | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 |
| Nov-09 | **21.0** | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 |
| Dec-09 | **18.1** | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 |

## Table 35: Stateline Wind Project Risk Model (Continued)

| **Stateline** Capacity (MW) | Day 22 | Day 23 | Day 24 | Day 25 | Day 26 | Day 27 | Day 28 | Day 29 | Day 30 | Day 31 |
|---|---|---|---|---|---|---|---|---|---|---|
| Jan-05 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 |
| Feb-05 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 |
| Mar-05 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 |
| Apr-05 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 |
| May-05 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 |
| Jun-05 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 |
| Jul-05 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 |
| Aug-05 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 |
| Sep-05 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 |
| Oct-05 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 |
| Nov-05 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 |
| Dec-05 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 |
| Jan-06 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 |
| Feb-06 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 |
| Mar-06 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 |
| Apr-06 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 |
| May-06 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 |
| Jun-06 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 |
| Jul-06 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 |
| Aug-06 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 |
| Sep-06 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 |
| Oct-06 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 |
| Nov-06 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 |
| Dec-06 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 |
| Jan-07 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 |
| Feb-07 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 |
| Mar-07 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 |
| Apr-07 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 |
| May-07 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 |
| Jun-07 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 |
| Jul-07 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 |
| Aug-07 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 |
| Sep-07 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 |
| Oct-07 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 |
| Nov-07 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 |
| Dec-07 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 |
| Jan-08 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 |
| Feb-08 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 |
| Mar-08 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 |
| Apr-08 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 |
| May-08 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 |
| Jun-08 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 |
| Jul-08 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 |
| Aug-08 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 |
| Sep-08 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 |
| Oct-08 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 |
| Nov-08 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 |
| Dec-08 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 |
| Jan-09 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 | 15.6 |
| Feb-09 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 |
| Mar-09 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 | 34.7 |
| Apr-09 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 |
| May-09 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 | 24.4 |
| Jun-09 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 | 24.5 |
| Jul-09 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 |
| Aug-09 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 |
| Sep-09 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 |
| Oct-09 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 | 20.2 |
| Nov-09 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 | 21.0 |
| Dec-09 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 |

**1.13.3 Wind Generation Risk Results.** The monthly generation results from the risk simulations models are in terms of flat energy. Graph 13 shows the combined monthly flat energy output for all the wind projects during FY 2007-2009 at the $5^{th}$, $50^{th}$, and $95^{th}$ percentiles. These monthly flat energy values are input into RevSim, where they are converted into monthly heavy and light load hour energy values by applying HLH and LLH shaping factors that are associated with each of these wind projects. The source of these HLH and LLH shaping factors is the data used to compute the monthly HLH and LLH wind generation values included under Non-Utility Generation in the Load Resource Study and Documentation. *See* Load Resource Study, WP-07-E-BPA-01 and WP-07-E-BPA-01A, regarding this data.

## Graph 13: Simulated Total Wind Generation for FY 2007 - FY 2009



**1.13.4 Risk Modeling Methodology for the Value of Wind Generation.** The risk of the value of the wind generation is computed in RevSim in the following manner: (1) Subtract from expenses the expected monthly payments for the expected output of the various wind projects (a weighted contract price was used for the combined Foote Creek wind projects); (2) On a game-by-game basis, compute the monthly payments for the output of the various wind projects; and (3) On a game-by-game basis, compute the revenues associated with the wind generation.

**1.13.5 Value of Wind Generation Risk Results.** Tables 36-38 provide information from which the value of wind generation during FY 2007-2009 can be derived for expected monthly flat energy output levels. Total deterministic wind generation purchase costs and total revenues earned from the sale of all wind generation at average, median, 5$^{th}$ percentile, and 95$^{th}$ percentile spot market electricity prices estimated by AURORA are provided with the value of the wind generation being the difference between the revenues earned and purchase costs paid.

# Table 36: Value of Wind Generation at Expected Wind Generation for FY 2007

## Expected Generation (aMW)

| Wind Project | Oct '06 | Nov '06 | Dec '06 | Jan '07 | Feb '07 | Mar '07 | Apr '07 | May '07 | Jun '07 | Jul '07 | Aug '07 | Sep '07 | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Foote Creek I, II, & IV | 12.8 | 19.0 | 23.2 | 24.2 | 22.1 | 16.5 | 13.2 | 10.5 | 9.4 | 7.5 | 7.5 | 8.7 | |
| Stateline | 20.5 | 21.1 | 18.3 | 15.4 | 12.3 | 34.8 | 24.5 | 24.6 | 24.7 | 23.6 | 21.3 | 20.6 | |
| Condon | 10.6 | 12.6 | 12.1 | 9.8 | 8.8 | 15.0 | 9.4 | 8.7 | 8.4 | 7.8 | 7.0 | 8.3 | |
| Klondike Phase 1 | 6.8 | 4.5 | 3.6 | 3.3 | 5.0 | 8.4 | 7.8 | 10.3 | 10.8 | 11.3 | 9.0 | 7.8 | |
| Total Wind Generation | 50.6 | 57.2 | 57.1 | 52.7 | 48.2 | 74.7 | 54.9 | 54.1 | 53.3 | 50.1 | 44.8 | 45.4 | **53.66** |

## Contract Prices ($/MWh)

| Wind Project | Oct '06 | Nov '06 | Dec '06 | Jan '07 | Feb '07 | Mar '07 | Apr '07 | May '07 | Jun '07 | Jul '07 | Aug '07 | Sep '07 | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Foote Creek I, II, & IV | 49.52 | 49.55 | 49.51 | 49.05 | 49.08 | 49.06 | 49.05 | 49.14 | 49.08 | 49.04 | 49.10 | 49.01 | |
| Stateline | 32.15 | 32.15 | 32.15 | 33.05 | 33.05 | 33.05 | 33.05 | 33.05 | 33.05 | 33.05 | 33.05 | 33.05 | |
| Condon | 60.27 | 60.27 | 60.27 | 60.27 | 60.27 | 60.27 | 60.27 | 60.27 | 61.77 | 61.77 | 61.77 | 61.77 | |
| Klondike Phase 1 | 31.78 | 31.78 | 31.78 | 32.57 | 32.57 | 32.57 | 32.57 | 32.57 | 32.57 | 32.57 | 32.57 | 32.57 | |
| Wtd. Average Price | 42.37 | 44.11 | 45.12 | 45.43 | 45.31 | 41.99 | 41.49 | 40.47 | 40.31 | 39.80 | 40.14 | 41.27 | **42.34** |

## Power Purchase Costs for Expected Wind Generation ($1,000)

| | Oct '06 | Nov '06 | Dec '06 | Jan '07 | Feb '07 | Mar '07 | Apr '07 | May '07 | Jun '07 | Jul '07 | Aug '07 | Sep '07 | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Purchase Cost | 1,596 | 1,817 | 1,918 | 1,782 | 1,466 | 2,334 | 1,641 | 1,629 | 1,548 | 1,484 | 1,339 | 1,349 | **19,903** |

## Average, Median, 5th Percentile, and 95th Percentile Spot Market Electricity Prices Estimated by AURORA ($/MWh)

| | Oct '06 | Nov '06 | Dec '06 | Jan '07 | Feb '07 | Mar '07 | Apr '07 | May '07 | Jun '07 | Jul '07 | Aug '07 | Sep '07 | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5% | 30.91 | 32.28 | 32.77 | 21.42 | 20.11 | 23.65 | 18.38 | 7.94 | 5.77 | 14.64 | 24.53 | 27.59 | **26.27** |
| 50% | 58.35 | 59.72 | 61.56 | 50.44 | 49.37 | 48.52 | 44.13 | 23.61 | 20.76 | 36.65 | 52.40 | 56.81 | **48.48** |
| Average | 62.81 | 64.02 | 66.20 | 54.38 | 53.38 | 52.56 | 48.24 | 29.44 | 25.43 | 41.33 | 56.26 | 60.63 | **51.20** |
| 95% | 109.34 | 109.88 | 116.69 | 98.84 | 101.32 | 94.08 | 92.50 | 68.94 | 59.16 | 82.47 | 100.58 | 106.75 | **86.87** |

## Revenues from Expected Wind Generation at Various AURORA Price Percentiles ($1,000)

| | Oct '06 | Nov '06 | Dec '06 | Jan '07 | Feb '07 | Mar '07 | Apr '07 | May '07 | Jun '07 | Jul '07 | Aug '07 | Sep '07 | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5% | 1,164 | 1,330 | 1,393 | 840 | 651 | 1,314 | 727 | 320 | 222 | 546 | 818 | 902 | **10,227** |
| 50% | 2,198 | 2,460 | 2,617 | 1,978 | 1,597 | 2,697 | 1,745 | 951 | 797 | 1,366 | 1,748 | 1,858 | **22,013** |
| Average | 2,366 | 2,637 | 2,814 | 2,133 | 1,727 | 2,922 | 1,908 | 1,185 | 977 | 1,541 | 1,876 | 1,982 | **24,069** |
| 95% | 4,119 | 4,526 | 4,961 | 3,877 | 3,279 | 5,229 | 3,659 | 2,776 | 2,272 | 3,075 | 3,354 | 3,490 | **44,617** |

# Table 37: Value of Wind Generation at Expected Wind Generation for FY 2008

## Expected Generation (aMW)

| Wind Project | Oct '07 | Nov '07 | Dec '07 | Jan '08 | Feb '08 | Mar '08 | Apr '08 | May '08 | Jun '08 | Jul '08 | Aug '08 | Sep '08 | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Foote Creek I, II, & IV | 12.8 | 19.0 | 23.2 | 24.2 | 22.1 | 16.5 | 13.2 | 10.5 | 9.4 | 7.5 | 7.5 | 8.7 | |
| Stateline | 20.5 | 21.1 | 18.3 | 15.4 | 12.3 | 34.8 | 24.5 | 24.6 | 24.7 | 23.6 | 21.2 | 20.6 | |
| Condon | 10.6 | 12.6 | 12.1 | 9.8 | 8.8 | 15.0 | 9.4 | 8.7 | 8.4 | 7.8 | 7.0 | 8.3 | |
| Klondike Phase 1 | 6.8 | 4.5 | 3.6 | 3.3 | 5.0 | 8.4 | 7.8 | 10.3 | 10.8 | 11.3 | 9.0 | 7.8 | |
| Total Wind Generation | 50.6 | 57.2 | 57.1 | 52.7 | 48.2 | 74.7 | 54.9 | 54.1 | 53.3 | 50.1 | 44.7 | 45.4 | **53.64** |

## Contract Prices ($/MWh)

| Wind Project | Oct '07 | Nov '07 | Dec '07 | Jan '08 | Feb '08 | Mar '08 | Apr '08 | May '08 | Jun '08 | Jul '08 | Aug '08 | Sep '08 | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Foote Creek I, II, & IV | 49.04 | 49.08 | 49.04 | 49.30 | 49.33 | 49.30 | 49.29 | 49.39 | 49.32 | 49.28 | 49.35 | 49.25 | |
| Stateline | 33.05 | 33.05 | 33.05 | 33.97 | 33.97 | 33.97 | 33.97 | 33.97 | 33.97 | 33.97 | 33.97 | 33.97 | |
| Condon | 61.77 | 61.77 | 61.77 | 61.77 | 61.77 | 61.77 | 61.77 | 61.77 | 63.32 | 63.32 | 63.32 | 63.32 | |
| Klondike Phase 1 | 32.57 | 32.57 | 32.57 | 33.38 | 33.38 | 33.38 | 33.38 | 33.38 | 33.38 | 33.38 | 33.38 | 33.38 | |
| Wtd. Average Price | 43.04 | 44.68 | 45.58 | 46.14 | 46.02 | 42.87 | 42.35 | 41.33 | 41.19 | 40.70 | 41.05 | 42.15 | **43.12** |

## Power Purchase Costs for Expected Wind Generation ($1,000)

| | Oct '07 | Nov '07 | Dec '07 | Jan '08 | Feb '08 | Mar '08 | Apr '08 | May '08 | Jun '08 | Jul '08 | Aug '08 | Sep '08 | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Purchase Cost | 1,621 | 1,840 | 1,938 | 1,810 | 1,543 | 2,383 | 1,674 | 1,664 | 1,582 | 1,517 | 1,366 | 1,378 | **20,316** |

## Average, Median, 5th Percentile, and 95th Percentile Spot Market Electricity Prices Estimated by AURORA ($/MWh)

| | Oct '07 | Nov '07 | Dec '07 | Jan '08 | Feb '08 | Mar '08 | Apr '08 | May '08 | Jun '08 | Jul '08 | Aug '08 | Sep '08 | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5% | 26.35 | 29.55 | 31.22 | 17.87 | 21.92 | 21.10 | 16.59 | 6.71 | 5.32 | 13.43 | 25.63 | 29.68 | **24.72** |
| 50% | 53.79 | 56.87 | 59.62 | 45.37 | 48.17 | 44.51 | 36.75 | 23.94 | 22.13 | 35.52 | 46.85 | 49.07 | **44.81** |
| Average | 57.29 | 60.30 | 63.22 | 48.37 | 51.31 | 46.30 | 38.46 | 26.97 | 25.35 | 35.99 | 48.20 | 50.19 | **46.03** |
| 95% | 99.19 | 102.07 | 107.91 | 89.60 | 90.82 | 76.68 | 66.75 | 56.81 | 53.78 | 62.71 | 74.05 | 74.01 | **71.30** |

## Revenues from Expected Wind Generation at Various AURORA Price Percentiles ($1,000)

| | Oct '07 | Nov '07 | Dec '07 | Jan '08 | Feb '08 | Mar '08 | Apr '08 | May '08 | Jun '08 | Jul '08 | Aug '08 | Sep '08 | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5% | 992 | 1,217 | 1,327 | 701 | 735 | 1,173 | 656 | 270 | 204 | 501 | 853 | 970 | **9,599** |
| 50% | 2,026 | 2,342 | 2,534 | 1,780 | 1,615 | 2,474 | 1,453 | 964 | 850 | 1,324 | 1,560 | 1,604 | **20,526** |
| Average | 2,158 | 2,484 | 2,688 | 1,897 | 1,720 | 2,574 | 1,520 | 1,086 | 973 | 1,342 | 1,604 | 1,641 | **21,687** |
| 95% | 3,736 | 4,204 | 4,588 | 3,514 | 3,044 | 4,263 | 2,639 | 2,287 | 2,065 | 2,338 | 2,465 | 2,420 | **37,562** |

# Table 38: Value of Wind Generation at Expected Wind Generation for FY 2009

**Expected Generation (aMW)**

| Wind Project | Oct '08 | Nov '08 | Dec '08 | Jan '09 | Feb '09 | Mar '09 | Apr '09 | May '09 | Jun '09 | Jul '09 | Aug '09 | Sep '09 | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Foote Creek I, II, & IV | 12.8 | 19.0 | 23.2 | 24.2 | 22.1 | 16.5 | 13.2 | 10.5 | 9.4 | 7.5 | 7.5 | 8.7 | |
| Stateline | 20.5 | 21.1 | 18.3 | 15.4 | 12.3 | 34.8 | 24.5 | 24.6 | 24.7 | 23.6 | 21.2 | 20.6 | |
| Condon | 10.6 | 12.6 | 12.1 | 9.8 | 8.8 | 15.0 | 9.4 | 8.7 | 8.4 | 7.8 | 7.0 | 8.3 | |
| Klondike Phase 1 | 6.8 | 4.5 | 3.6 | 3.3 | 5.0 | 8.4 | 7.8 | 10.3 | 10.8 | 11.3 | 9.0 | 7.8 | |
| Total Wind Generation | 50.6 | 57.2 | 57.1 | 52.7 | 48.2 | 74.7 | 54.9 | 54.1 | 53.3 | 50.1 | 44.7 | 45.4 | **53.65** |

**Contract Prices ($/MWh)**

| Wind Project | Oct '08 | Nov '08 | Dec '08 | Jan '09 | Feb '09 | Mar '09 | Apr '09 | May '09 | Jun '09 | Jul '09 | Aug '09 | Sep '09 | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Foote Creek I, II, & IV | 49.29 | 49.33 | 49.29 | 59.11 | 59.11 | 59.12 | 59.17 | 59.24 | 59.14 | 59.18 | 59.13 | 59.08 | |
| Stateline | 33.97 | 33.97 | 33.97 | 34.92 | 34.92 | 34.92 | 34.92 | 34.92 | 34.92 | 34.92 | 34.92 | 34.92 | |
| Condon | 63.32 | 63.32 | 63.32 | 63.32 | 63.32 | 63.32 | 63.32 | 63.32 | 64.90 | 64.90 | 64.90 | 64.90 | |
| Klondike Phase 1 | 33.38 | 33.38 | 33.38 | 34.22 | 34.22 | 34.22 | 34.22 | 34.22 | 34.22 | 34.22 | 34.22 | 34.22 | |
| Wtd. Average Price | 43.91 | 45.50 | 46.36 | 51.26 | 51.12 | 45.88 | 45.53 | 44.09 | 43.78 | 43.06 | 43.56 | 44.90 | **45.73** |

**Power Purchase Costs for Expected Wind Generation ($1,000)**

| | Oct '08 | Nov '08 | Dec '08 | Jan '09 | Feb '09 | Mar '09 | Apr '09 | May '09 | Jun '09 | Jul '09 | Aug '09 | Sep '09 | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Purchase Cost | 1,654 | 1,874 | 1,971 | 2,010 | 1,654 | 2,550 | 1,800 | 1,775 | 1,681 | 1,605 | 1,450 | 1,468 | **21,494** |

**Average, Median, 5th Percentile, and 95th Percentile Spot Market Electricity Prices Estimated by AURORA ($/MWh)**

| | Oct '08 | Nov '08 | Dec '08 | Jan '09 | Feb '09 | Mar '09 | Apr '09 | May '09 | Jun '09 | Jul '09 | Aug '09 | Sep '09 | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5% | 29.65 | 33.31 | 32.49 | 19.38 | 23.99 | 21.95 | 13.34 | 5.51 | 4.30 | 11.00 | 23.77 | 24.95 | **25.01** |
| 50% | 46.91 | 51.21 | 51.78 | 43.81 | 47.17 | 42.89 | 33.94 | 22.85 | 19.63 | 31.67 | 46.53 | 46.21 | **41.24** |
| Average | 47.78 | 51.88 | 52.85 | 48.11 | 53.48 | 45.33 | 35.94 | 26.12 | 22.90 | 34.71 | 51.95 | 49.75 | **43.24** |
| 95% | 68.84 | 73.09 | 75.74 | 87.71 | 103.44 | 77.17 | 67.05 | 56.94 | 53.03 | 67.21 | 98.66 | 83.57 | **69.07** |

**Revenues from Expected Wind Generation at Various AURORA Price Percentiles ($1,000)**

| | Oct '08 | Nov '08 | Dec '08 | Jan '09 | Feb '09 | Mar '09 | Apr '09 | May '09 | Jun '09 | Jul '09 | Aug '09 | Sep '09 | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5% | 1,117 | 1,372 | 1,381 | 760 | 776 | 1,220 | 527 | 222 | 165 | 410 | 791 | 816 | **9,558** |
| 50% | 1,767 | 2,109 | 2,201 | 1,718 | 1,526 | 2,384 | 1,342 | 920 | 754 | 1,181 | 1,549 | 1,511 | **18,962** |
| Average | 1,800 | 2,137 | 2,247 | 1,887 | 1,731 | 2,520 | 1,420 | 1,052 | 880 | 1,294 | 1,729 | 1,627 | **20,322** |
| 95% | 2,593 | 3,010 | 3,220 | 3,440 | 3,347 | 4,290 | 2,650 | 2,293 | 2,037 | 2,506 | 3,284 | 2,732 | **35,402** |

## 1.14 Transmission Expense Risk Factor

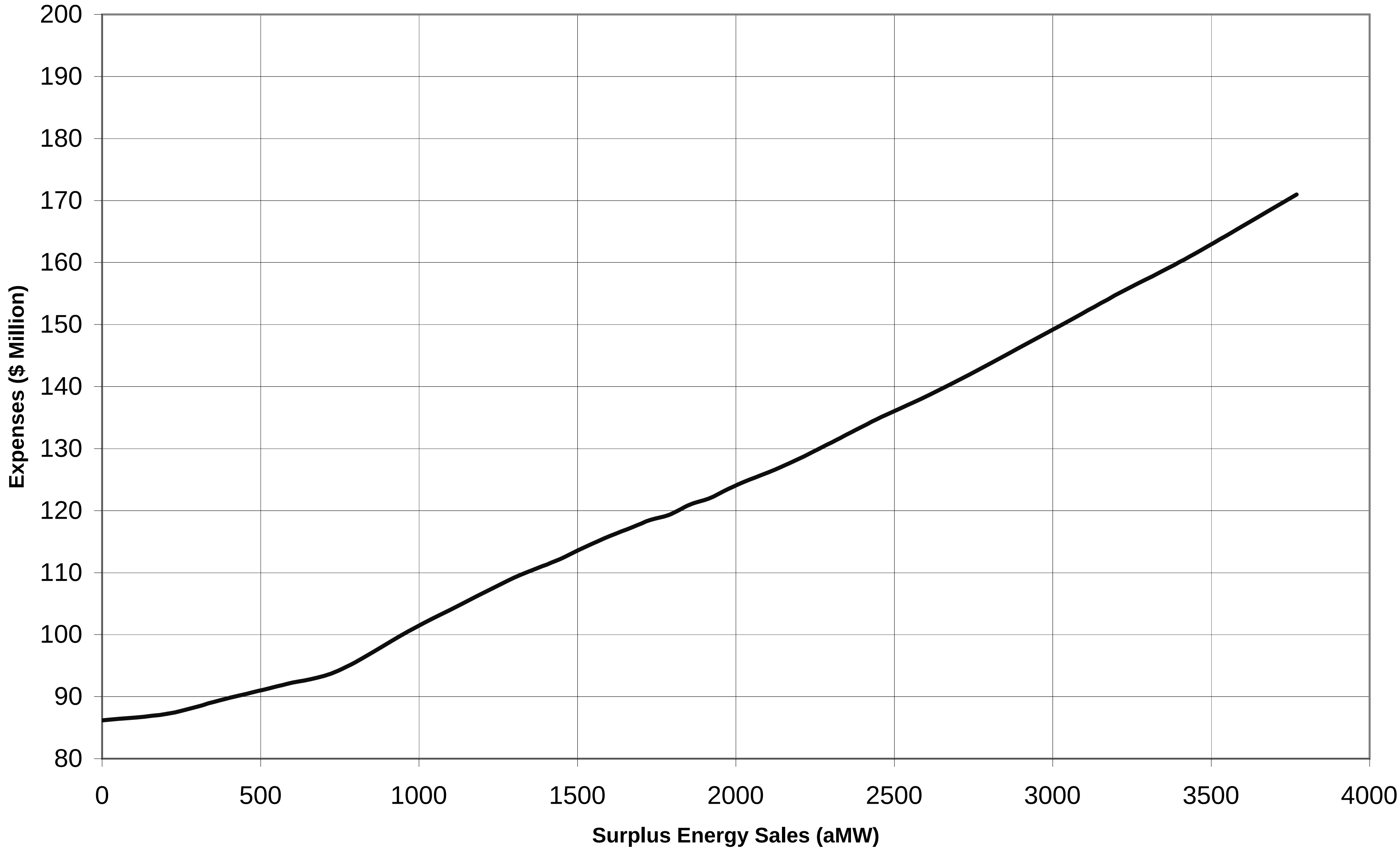
This risk factor reflects the uncertainty in PBL transmission and ancillary services expenses, relative to the expected expenses, which average $126 million during FY 2007-2009, included in the Revenue Requirement when setting rates. *See* Revenue Requirement Study, WP-07-E-BPA-02**.** This risk is modeled in the Transmission Expense Risk Model.

**1.14.1 Data and Modeling Methodology.** The modeling of this risk is based on comparisons between monthly firm transmission capacity that PBL has under contract, the amount of existing firm contract sales, and the variability in surplus energy sales estimated by RevSim. Expense risk computations reflect how transmission and ancillary services expenses vary from the cost of the fixed, take or pay, firm transmission capacity that the PBL has under contract, which must be paid regardless of whether or not it is used. Under conditions where the PBL sells more energy than it has firm transmission rights, transmission and ancillary services expenses will increase. Alternatively, under conditions where the PBL sells less energy than it has firm transmission rights, transmission expenses will remain unchanged but ancillary services expenses will decline. The methodology used in the Transmission Expense Model is consistent with the methodology documented in BPA's Power Function Review February 1, 2005 Technical Workshop on the Transmission Acquisition Program.

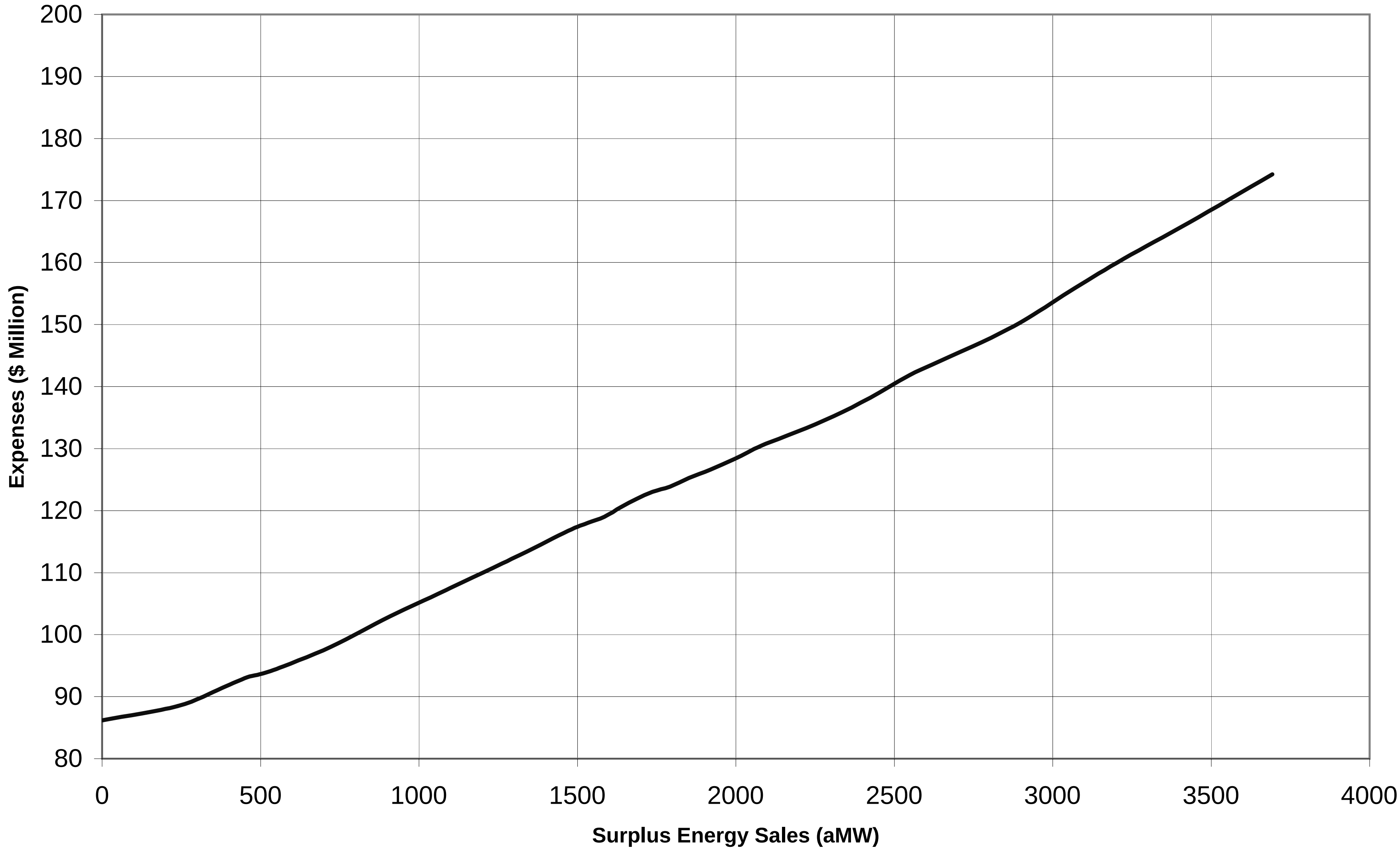
**1.14.2 Results.** Results shown in Graphs 14-16 indicate how transmission and ancillary service expenses vary depending on the amount of surplus energy sales. In these graphs, the PBL transmission and ancillary services expenses do not fall below $85 million/year, regardless of the amount of surplus energy sales, because the PBL must pay for the take or pay firm transmission capacity it has under contract. This $85 million/year figure does not include the cost of ancillary services for any surplus energy sales, since these charges are assessed depending on the amount of transmission usage. PBL's firm transmission capacity can accommodate approximately 1000 MW of surplus energy sales. So, only ancillary service expenses vary on the first increment of secondary energy sales (up to about 1000 MW) while both transmission line capacity and ancillary service expenses vary on surplus energy sales above this amount.

Results shown in Graphs 17-19 reflect the probability distributions for transmission and ancillary service expenses during FY 2007-2009. These graphs indicate how often transmission and ancillary service expenses fall within various expense ranges.

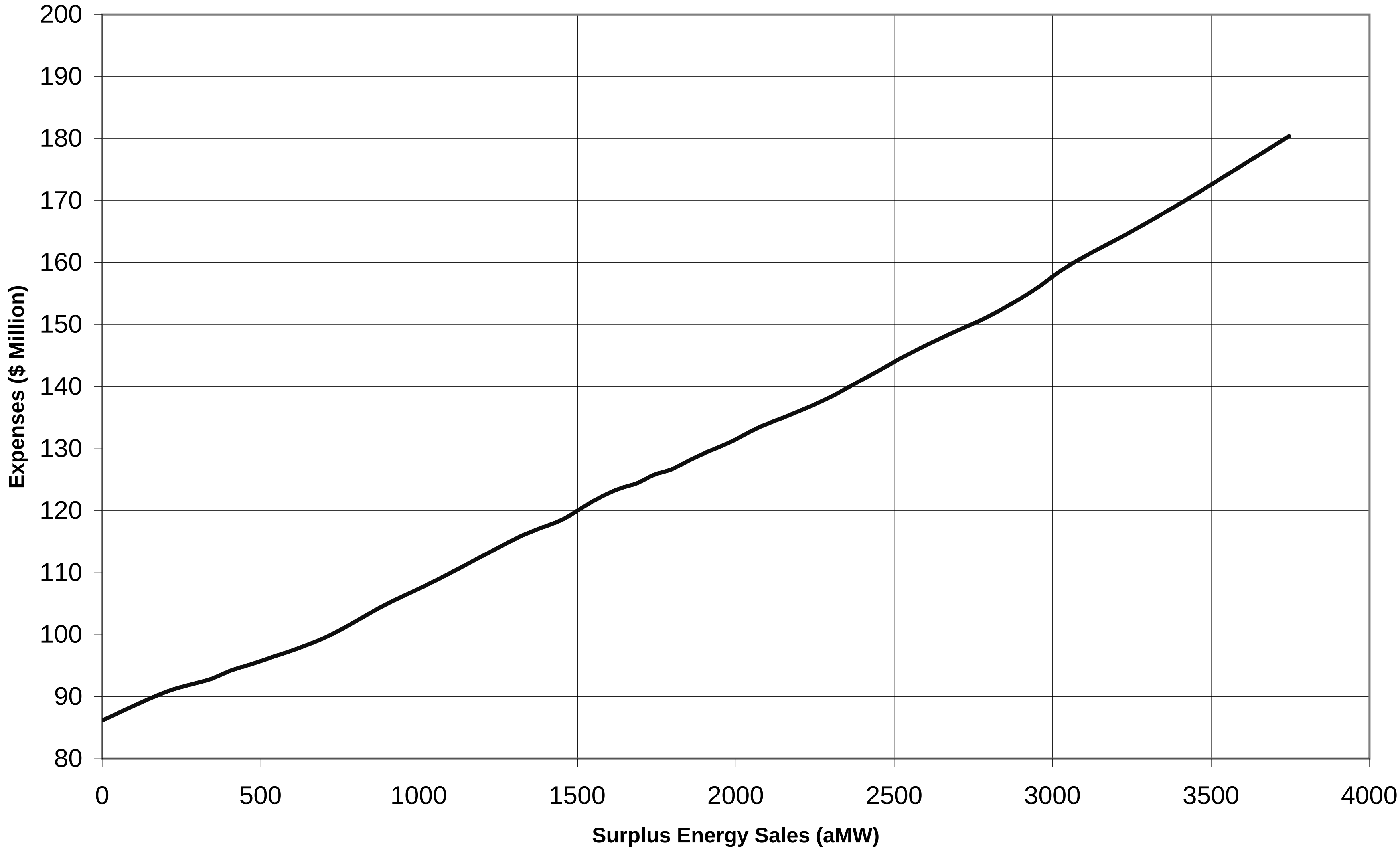
Graph 14:  PBL Transmission & Ancillary Services Expenses vs. Surplus Energy Sales (FY07)



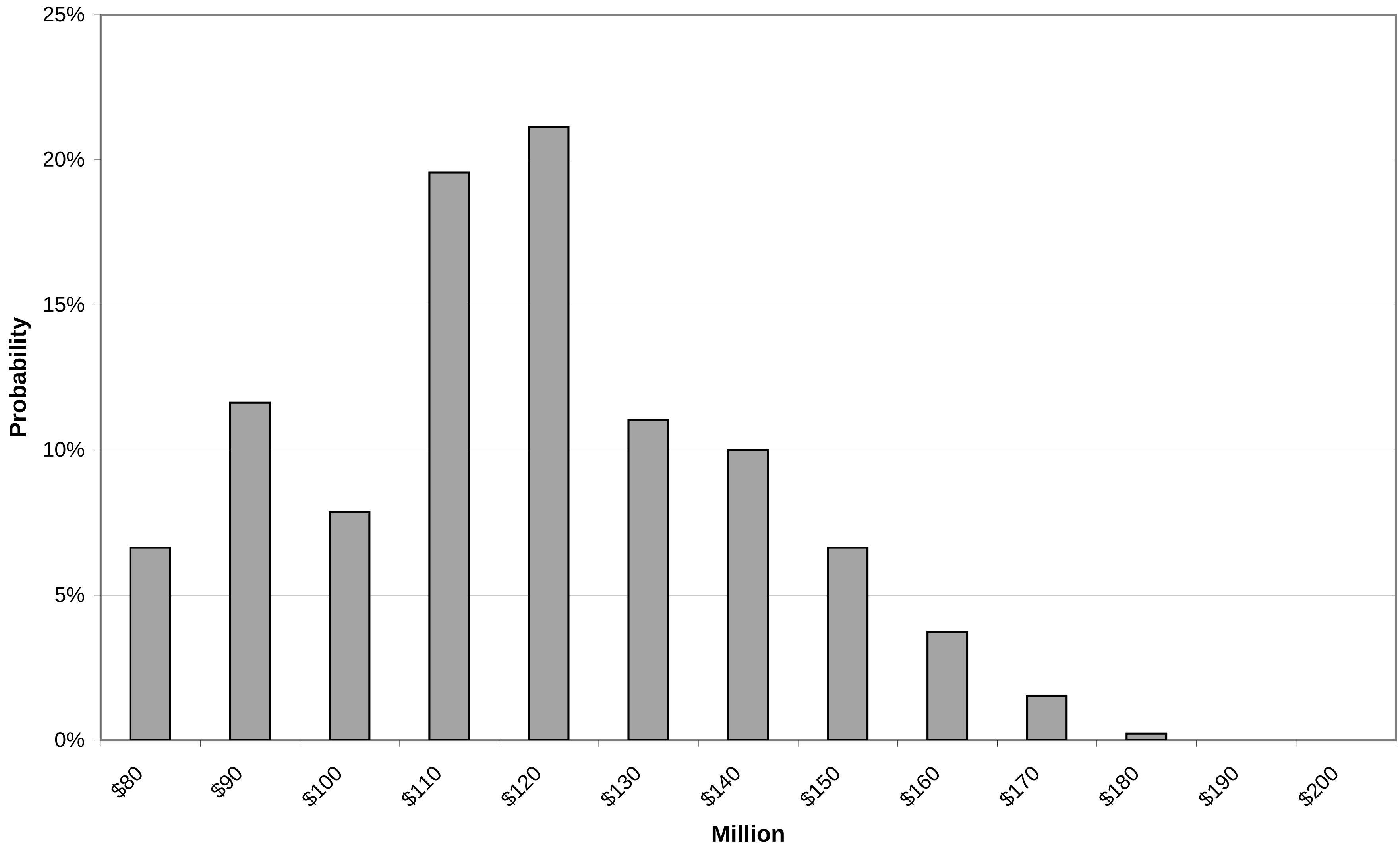
Graph 15: PBL Transmission & Ancillary Services Expenses vs. Surplus Energy Sales (FY08)



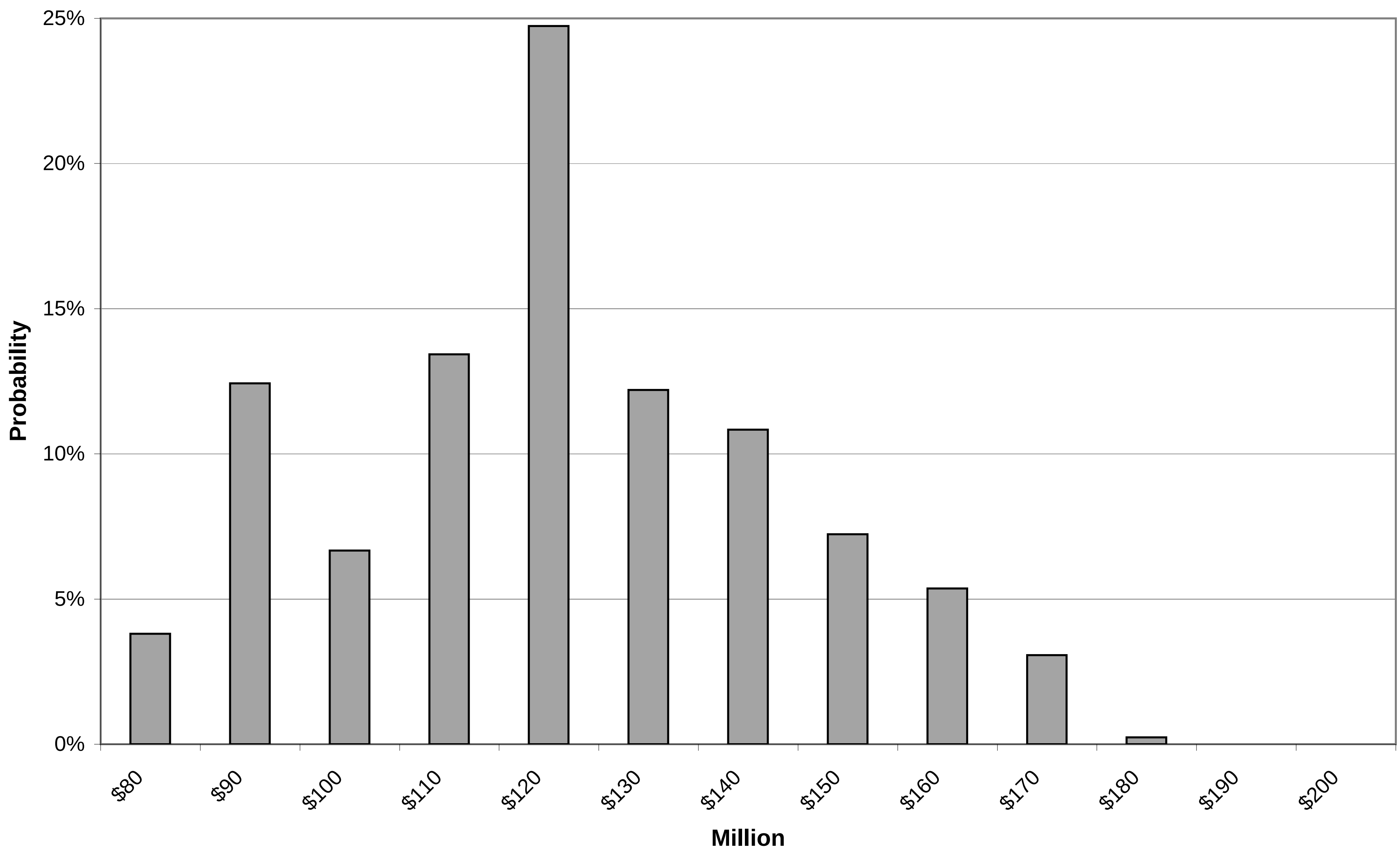
Graph 16: PBL Transmission & Ancillary Services Expenses vs. Surplus Energy Sales (FY09)



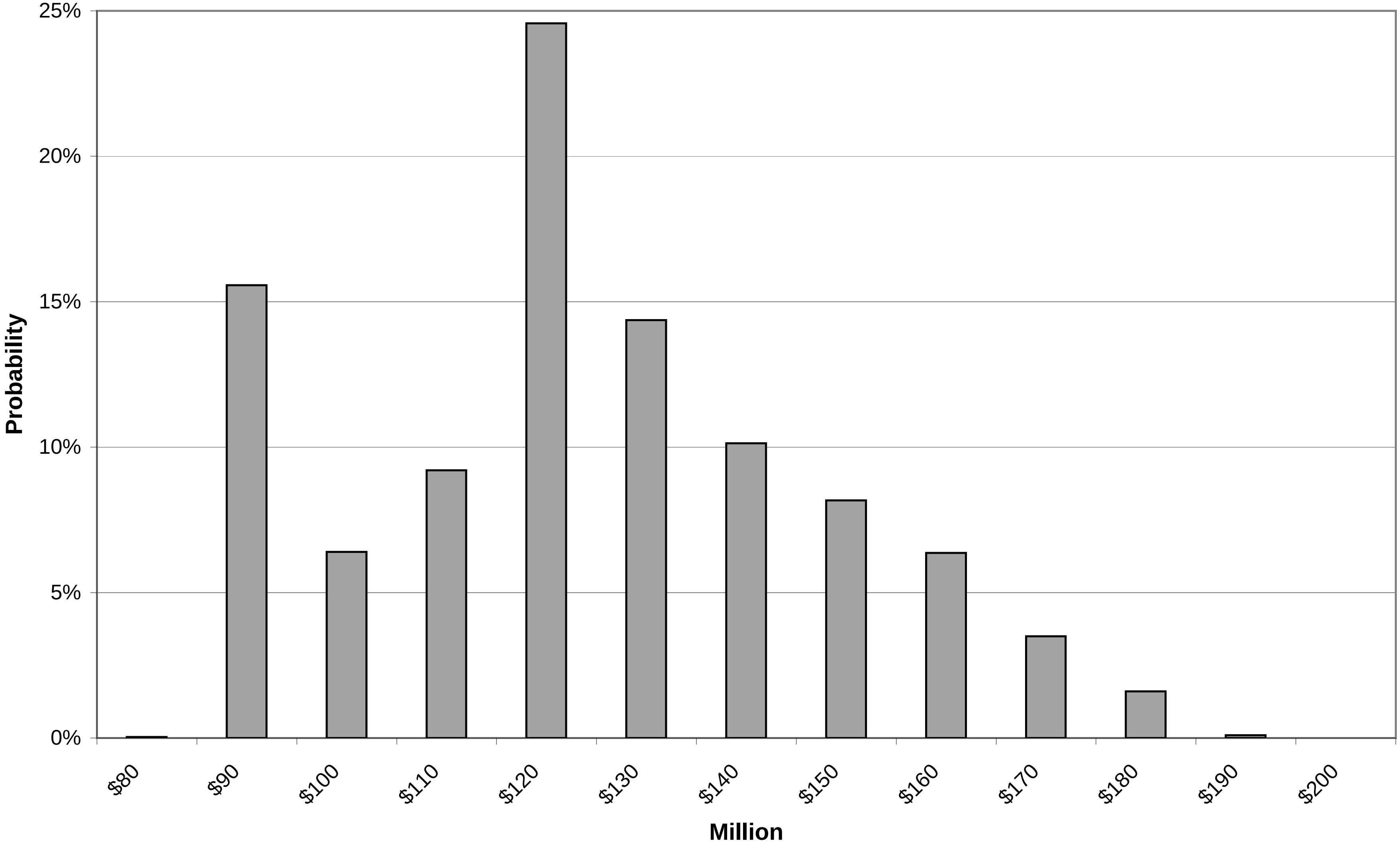
**Graph 17: PBL Transmission and Ancillary Service Expense Distribution for FY 2007**



## Graph 18: PBL Transmission and Ancillary Service Expense Distribution for FY 2008



Graph 19: PBL Transmission and Ancillary Service Expense Distribution for FY 2009



## 1.15 Forward Market Price Risk Model

The Forward Market Price Risk Model was developed for the purpose of quantifying the risk associated with actual annual average forward market prices (i.e., for a 12 month strip of power) differing from the forecasted annual average forward market prices used when setting rates. Forward market price results from this risk model are used in other models to compute IOU and DSI benefit risk relative to the expense values included in the Revenue Requirement. *See* Revenue Requirement Study, WP-07-E-BPA-02 and Sections 1.11 and 1.12 of this Study Documentation, regarding IOU and DSI benefits and risk. The IOU REP Settlement benefits are explicitly tied to forward market electricity prices in the contract terms of the IOU REP Settlement Agreements and, since the contract terms for service to the DSIs have not been negotiated yet, BPA assumed, for rate setting purposes, that the DSI benefits would also be tied to the same forward market electricity prices.

Forward market electricity price curves are estimates at a point in time of what electricity prices will be over a period of time in the future. These estimates will change as we move through time, often in response to whether actual spot market prices are higher or lower than the forward market price at the beginning of the spot month for that month. Based on this interrelationship, BPA designed the Forward Market Price Risk Model to estimate forward market electricity price curve movements through time that are consistent with the spot market electricity price movements estimated by the AURORA model. Thus, this approach accounts for the dependency between the spot market electricity prices used to calculate surplus energy revenues and power purchase expenses and the forward market electricity prices for a 12-month strip of power used to calculate IOU REP Settlement and DSI benefits, while also allowing for different price outlooks between spot and forward electricity markets.

**1.15.1 Estimation of the Historical Relationships Between Forward and Spot Market Price Movements.** Daily forward market electricity price data at Mid C from January, 2004 to August, 2005 were merged with daily spot market electricity price data at Mid C for the same dates. From this data, average price changes for the spot month and 35 subsequent forward months were computed for all 20 months of data (Jan 2004 – Aug 2005). Regression equations for each of the 35 forward months were developed from this data to estimate monthly changes in forward market prices across time based on changes in spot market prices. These regression equations have the following form:

$\Delta Y = \alpha + \beta\Delta X + \varepsilon$

Where,

$\Delta Y$ = Change in the monthly forward market price

$\Delta X$ = Change in the average monthly spot market price

$\alpha$, $\beta$, and $\varepsilon$ = The intercept, slope, and standard error of the regression, which are parameters estimated by regression analysis

Table 39 contains the average price changes for the spot month and 35 subsequent forward months for all 20 months of data, as well as, the regression equations for each of the 35 forward months.  These regression equations were developed for use in the Forward Market Price Risk Model.

## Table 39: Regression Equations that Estimate Changes in Forward Prices Across Time Based on Changes in Spot Market Prices

| | Spot Vs Fwd 1 | Spot Vs Fwd 2 | Spot Vs Fwd 3 | Spot Vs Fwd 4 | Spot Vs Fwd 5 | Spot Vs Fwd 6 | Spot Vs Fwd 7 | Spot Vs Fwd 8 | Spot Vs Fwd 9 | Spot Vs Fwd 10 | Spot Vs Fwd 11 | Spot Vs Fwd 12 | Spot Vs Fwd 13 | Spot Vs Fwd 14 | Spot Vs Fwd 15 | Spot Vs Fwd 16 | Spot Vs Fwd 17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| R^2 | 0.3062 | 0.2242 | 0.1581 | 0.1930 | 0.1695 | 0.1282 | 0.1712 | 0.1550 | 0.1719 | 0.1863 | 0.1713 | 0.1922 | 0.2780 | 0.2720 | 0.1406 | 0.1332 | 0.0896 |
| Intercept | -0.1126 | -0.0069 | 0.0188 | 0.0638 | 0.1018 | 0.0924 | 0.0925 | 0.0746 | 0.0660 | 0.0627 | 0.0491 | 0.0619 | 0.0687 | 0.0722 | 0.0536 | 0.0561 | 0.0612 |
| Slope | 0.3466 | 0.3075 | 0.2466 | 0.2509 | 0.2129 | 0.1601 | 0.1844 | 0.1319 | 0.1318 | 0.1371 | 0.1276 | 0.1365 | 0.1535 | 0.1442 | 0.0944 | 0.0927 | 0.0729 |
| Std Err | 0.2889 | 0.3168 | 0.3151 | 0.2841 | 0.2610 | 0.2311 | 0.2247 | 0.1705 | 0.1602 | 0.1587 | 0.1555 | 0.1550 | 0.1370 | 0.1306 | 0.1292 | 0.1310 | 0.1286 |

### Historical Average Monthly HLH Spot and Forward Market Price Deltas for Mid-C from January 2004 - August 2005; Derived from Daily Data

| Obs | Spot | Fwd 1 | Fwd 2 | Fwd 3 | Fwd 4 | Fwd 5 | Fwd 6 | Fwd 7 | Fwd 8 | Fwd 9 | Fwd 10 | Fwd 11 | Fwd 12 | Fwd 13 | Fwd 14 | Fwd 15 | Fwd 16 | Fwd 17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | -0.342 | -0.188 | -0.090 | -0.021 | -0.021 | -0.021 | -0.042 | -0.042 | -0.042 | -0.042 | -0.042 | -0.042 | 0.014 | 0.014 | 0.014 | -0.005 | -0.005 | -0.005 |
| 2 | -0.334 | -0.042 | 0.049 | 0.167 | 0.167 | 0.319 | 0.319 | 0.319 | 0.208 | 0.208 | 0.208 | 0.111 | 0.111 | 0.111 | 0.120 | 0.120 | 0.120 | 0.120 |
| 3 | -0.195 | -0.159 | 0.199 | 0.091 | 0.040 | 0.040 | 0.040 | 0.074 | 0.074 | 0.074 | 0.080 | 0.080 | 0.080 | 0.064 | 0.064 | 0.064 | 0.064 | 0.064 |
| 4 | 0.588 | 0.625 | 0.675 | 0.363 | 0.363 | 0.363 | 0.238 | 0.238 | 0.238 | 0.288 | 0.288 | 0.288 | 0.175 | 0.175 | 0.175 | 0.044 | 0.044 | 0.044 |
| 5 | -0.551 | -0.368 | -0.118 | -0.053 | -0.053 | 0.026 | 0.026 | 0.026 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 6 | 0.532 | -0.553 | -0.474 | -0.513 | -0.211 | -0.211 | -0.211 | -0.184 | -0.184 | -0.184 | -0.105 | -0.105 | -0.105 | -0.039 | -0.039 | -0.039 | -0.039 | -0.039 |
| 7 | 0.389 | 0.069 | 0.025 | 0.013 | 0.013 | 0.013 | 0.113 | 0.113 | 0.113 | 0.075 | 0.075 | 0.075 | 0.125 | 0.125 | 0.125 | 0.088 | 0.088 | 0.088 |
| 8 | -1.091 | -0.575 | -0.350 | -0.338 | -0.338 | -0.300 | -0.300 | -0.300 | -0.163 | -0.163 | -0.163 | -0.150 | -0.150 | -0.150 | -0.138 | -0.138 | -0.138 | -0.038 |
| 9 | -0.172 | -0.050 | 0.213 | 0.200 | 0.225 | 0.225 | 0.225 | 0.175 | 0.175 | 0.175 | 0.100 | 0.100 | 0.100 | 0.100 | 0.100 | 0.100 | 0.150 | 0.150 |
| 10 | 1.042 | 0.263 | 0.550 | 0.488 | 0.488 | 0.488 | 0.263 | 0.263 | 0.263 | 0.238 | 0.238 | 0.238 | 0.388 | 0.388 | 0.388 | 0.200 | 0.200 | 0.200 |
| 11 | 0.321 | -0.711 | -0.632 | -0.434 | -0.434 | -0.158 | -0.158 | -0.158 | -0.066 | -0.066 | -0.066 | -0.197 | -0.197 | -0.197 | -0.184 | -0.184 | -0.184 | -0.184 |
| 12 | -0.552 | -0.325 | -0.275 | -0.275 | 0.100 | 0.100 | 0.100 | -0.025 | -0.025 | -0.025 | -0.075 | -0.075 | -0.075 | -0.013 | -0.013 | -0.013 | -0.013 | -0.013 |
| 13 | -0.208 | -0.053 | 0.079 | 0.395 | 0.395 | 0.395 | 0.303 | 0.303 | 0.303 | 0.132 | 0.132 | 0.132 | 0.184 | 0.184 | 0.184 | 0.219 | 0.219 | 0.219 |
| 14 | 0.153 | 0.125 | 0.375 | 0.542 | 0.542 | 0.604 | 0.604 | 0.604 | 0.389 | 0.389 | 0.389 | 0.306 | 0.306 | 0.306 | 0.250 | 0.250 | 0.250 | 0.250 |
| 15 | -0.031 | 0.119 | 0.060 | 0.167 | 0.262 | 0.262 | 0.262 | 0.274 | 0.274 | 0.274 | 0.357 | 0.357 | 0.357 | 0.198 | 0.198 | 0.198 | 0.198 | 0.198 |
| 16 | -0.295 | -0.275 | -0.400 | -0.431 | -0.431 | -0.431 | -0.263 | -0.263 | -0.263 | -0.225 | -0.225 | -0.225 | -0.150 | -0.150 | -0.150 | -0.188 | -0.188 | -0.188 |
| 17 | -0.704 | -0.463 | -0.375 | -0.363 | -0.363 | -0.163 | -0.163 | -0.163 | -0.113 | -0.113 | -0.113 | -0.088 | -0.088 | -0.088 | -0.025 | -0.025 | -0.025 | -0.025 |
| 18 | 0.465 | -0.143 | -0.089 | -0.095 | 0.060 | 0.060 | 0.060 | 0.167 | 0.167 | 0.167 | 0.060 | 0.060 | 0.060 | 0.244 | 0.244 | 0.244 | 0.244 | 0.244 |
| 19 | 0.553 | 0.105 | 0.053 | 0.013 | 0.013 | 0.013 | 0.013 | 0.013 | 0.013 | -0.013 | -0.013 | -0.013 | -0.026 | -0.026 | -0.026 | -0.026 | -0.026 | -0.026 |
| 20 | 0.535 | 0.382 | 0.421 | 0.487 | 0.487 | 0.434 | 0.434 | 0.434 | 0.145 | 0.145 | 0.145 | 0.145 | 0.145 | 0.145 | 0.171 | 0.171 | 0.171 | 0.171 |

## Table 39: Regression Equations that Estimate Changes in Forward Prices Across Time Based on Changes in Spot Market Prices (Continued)

| | Spot Vs Fwd 18 | Spot Vs Fwd 19 | Spot Vs Fwd 20 | Spot Vs Fwd 21 | Spot Vs Fwd 22 | Spot Vs Fwd 23 | Spot Vs Fwd 24 | Spot Vs Fwd 25 | Spot Vs Fwd 26 | Spot Vs Fwd 27 | Spot Vs Fwd 28 | Spot Vs Fwd 29 | Spot Vs Fwd 30 | Spot Vs Fwd 31 | Spot Vs Fwd 32 | Spot Vs Fwd 33 | Spot Vs Fwd 34 | Spot Vs Fwd 35 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| R^2 | 0.1265 | 0.1020 | 0.1134 | 0.1045 | 0.1017 | 0.1048 | 0.1224 | 0.1190 | 0.1308 | 0.1243 | 0.1294 | 0.1219 | 0.1196 | 0.1152 | 0.1074 | 0.0995 | 0.1018 | 0.1051 |
| Intercept | 0.0683 | 0.0625 | 0.0598 | 0.0658 | 0.0668 | 0.0632 | 0.0594 | 0.0600 | 0.0613 | 0.0607 | 0.0595 | 0.0601 | 0.0595 | 0.0594 | 0.0596 | 0.0634 | 0.0628 | 0.0566 |
| Slope | 0.0859 | 0.0757 | 0.0810 | 0.0716 | 0.0717 | 0.0700 | 0.0730 | 0.0717 | 0.0732 | 0.0709 | 0.0717 | 0.0692 | 0.0683 | 0.0681 | 0.0664 | 0.0623 | 0.0623 | 0.0608 |
| Std Err | 0.1250 | 0.1244 | 0.1255 | 0.1160 | 0.1180 | 0.1132 | 0.1082 | 0.1080 | 0.1045 | 0.1041 | 0.1029 | 0.1028 | 0.1026 | 0.1044 | 0.1060 | 0.1039 | 0.1024 | 0.0982 |

### Historical Average Monthly HLH Spot and Forward Market Price Deltas for Mid-C from January 2004 - August 2005; Derived from Daily Data

| Obs | Spot | Fwd 18 | Fwd 19 | Fwd 20 | Fwd 21 | Fwd 22 | Fwd 23 | Fwd 24 | Fwd 25 | Fwd 26 | Fwd 27 | Fwd 28 | Fwd 29 | Fwd 30 | Fwd 31 | Fwd 32 | Fwd 33 | Fwd 34 | Fwd 35 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | -0.342 | -0.005 | -0.005 | -0.005 | -0.005 | -0.005 | -0.005 | -0.007 | -0.007 | -0.007 | -0.007 | -0.007 | -0.007 | -0.007 | -0.007 | -0.007 | -0.007 | -0.007 | -0.007 |
| 2 | -0.334 | 0.120 | 0.120 | 0.120 | 0.120 | 0.120 | 0.118 | 0.118 | 0.118 | 0.118 | 0.118 | 0.118 | 0.118 | 0.118 | 0.118 | 0.118 | 0.118 | 0.118 | 0.097 |
| 3 | -0.195 | 0.064 | 0.064 | 0.064 | 0.064 | 0.057 | 0.057 | 0.057 | 0.057 | 0.057 | 0.057 | 0.057 | 0.057 | 0.057 | 0.057 | 0.057 | 0.057 | 0.063 | 0.063 |
| 4 | 0.588 | 0.044 | 0.044 | 0.044 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 |
| 5 | -0.551 | 0.000 | 0.000 | -0.053 | -0.053 | -0.053 | -0.053 | -0.053 | -0.053 | -0.053 | -0.053 | -0.053 | -0.053 | -0.053 | -0.053 | -0.092 | -0.092 | -0.092 | -0.092 |
| 6 | 0.532 | -0.039 | -0.079 | -0.079 | -0.079 | -0.079 | -0.079 | -0.079 | -0.079 | -0.079 | -0.079 | -0.079 | -0.079 | -0.079 | -0.092 | -0.092 | -0.092 | -0.092 | -0.092 |
| 7 | 0.389 | 0.125 | 0.125 | 0.125 | 0.125 | 0.125 | 0.125 | 0.125 | 0.125 | 0.125 | 0.125 | 0.125 | 0.125 | 0.113 | 0.113 | 0.113 | 0.113 | 0.113 | 0.113 |
| 8 | -1.091 | -0.038 | -0.038 | -0.038 | -0.038 | -0.038 | -0.038 | -0.038 | -0.038 | -0.038 | -0.038 | -0.038 | -0.025 | -0.025 | -0.025 | -0.025 | -0.025 | -0.025 | -0.025 |
| 9 | -0.172 | 0.150 | 0.150 | 0.150 | 0.150 | 0.150 | 0.150 | 0.150 | 0.150 | 0.150 | 0.150 | 0.125 | 0.125 | 0.125 | 0.125 | 0.125 | 0.125 | 0.125 | 0.125 |
| 10 | 1.042 | 0.200 | 0.200 | 0.200 | 0.200 | 0.200 | 0.200 | 0.200 | 0.200 | 0.200 | 0.188 | 0.188 | 0.188 | 0.188 | 0.188 | 0.188 | 0.188 | 0.188 | 0.188 |
| 11 | 0.321 | -0.184 | -0.184 | -0.184 | -0.184 | -0.184 | -0.184 | -0.184 | -0.184 | -0.158 | -0.158 | -0.158 | -0.158 | -0.158 | -0.158 | -0.158 | -0.158 | -0.158 | -0.158 |
| 12 | -0.552 | -0.013 | -0.013 | -0.013 | -0.013 | -0.013 | -0.013 | -0.013 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 13 | -0.208 | 0.219 | 0.219 | 0.219 | 0.219 | 0.219 | 0.219 | 0.145 | 0.145 | 0.145 | 0.145 | 0.145 | 0.145 | 0.145 | 0.145 | 0.145 | 0.145 | 0.145 | 0.145 |
| 14 | 0.153 | 0.250 | 0.250 | 0.250 | 0.250 | 0.250 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.076 |
| 15 | -0.031 | 0.198 | 0.198 | 0.198 | 0.198 | 0.226 | 0.226 | 0.226 | 0.226 | 0.226 | 0.226 | 0.226 | 0.226 | 0.226 | 0.226 | 0.226 | 0.226 | 0.208 | 0.208 |
| 16 | -0.295 | -0.188 | -0.188 | -0.188 | -0.050 | -0.050 | -0.050 | -0.050 | -0.050 | -0.050 | -0.050 | -0.050 | -0.050 | -0.050 | -0.050 | -0.050 | 0.025 | 0.025 | 0.025 |
| 17 | -0.704 | -0.025 | -0.025 | -0.025 | -0.025 | -0.025 | -0.025 | -0.025 | -0.025 | -0.025 | -0.025 | -0.025 | -0.025 | -0.025 | -0.025 | 0.019 | 0.019 | 0.019 | 0.019 |
| 18 | 0.465 | 0.244 | 0.167 | 0.167 | 0.167 | 0.167 | 0.167 | 0.167 | 0.167 | 0.167 | 0.167 | 0.167 | 0.167 | 0.167 | 0.179 | 0.179 | 0.179 | 0.179 | 0.179 |
| 19 | 0.553 | 0.079 | 0.079 | 0.079 | 0.079 | 0.079 | 0.079 | 0.079 | 0.079 | 0.079 | 0.079 | 0.079 | 0.079 | 0.079 | 0.079 | 0.079 | 0.079 | 0.079 | 0.079 |
| 20 | 0.535 | 0.171 | 0.171 | 0.171 | 0.171 | 0.171 | 0.171 | 0.171 | 0.171 | 0.171 | 0.171 | 0.171 | 0.171 | 0.171 | 0.171 | 0.171 | 0.171 | 0.171 | 0.171 |

**1.15.2 Future Price Data Sources.** Additional deterministic inputs into the Forward Market Price Risk Model for FY 2007-2009 are forecasted annual forward market prices and expected flat monthly spot market prices estimated by the AURORA model. Monthly forward market prices were derived from these annual prices through the use of monthly price shaping factors calculated from the expected flat monthly spot market prices estimated by the AURORA model.

The forecasted annual forward market price used for FY 2007 is based on the average of the forward market price quotes from the Eligible Data Providers for the first two quarters of FY 2007 that averaged $52.07/MWh, obtained pursuant to Exhibit C, "Determination of Forward Flat-Block Price Forecast for Contract Years 2007 through 2011," of the May 2004 subscription agreements with the region's IOUs. *See* Petty, *et al.*, WP-07-E-BPA-11, regarding the forward market price quotes for FY 2007. Forecasted annual forward market prices for FY 2008-2009 are based on annual average electricity prices estimated by AURORA to compute the demand charge, which are $49.85/MWh and $45.84/MWh. *See* Petty, *et al.*, WP-07-E-BPA-11, regarding the forward market prices for FY 2008-2009. Monthly forward price curve movements through September 2009 are simulated beginning in October 2006 and continuing until October 2008. FY 2008-2009 results from the Forward Market Price Risk Model consist of annual average flat prices for a 12-month strip of power at the end of September 2007 for October 2007 - September 2008 and at the end of September 2008 for October 2008 – September 2009.

Variable inputs consist of 3000 sets of simulated flat monthly spot market prices estimated by AURORA for FY 2007-2009 and monthly standard deviations for each forward month derived by sampling 3000 times from standard normal probability distributions using the @RISK computer software. These variable inputs are read into the risk model from a database via VBA computer code, the forward price curve movements are calculated, and the results are reported in the model output to the database that RevSim uses.

Because the expected flat monthly spot market prices estimated by the AURORA model for the Risk Analysis Study were not identical to the average flat monthly forward market prices, all the monthly flat spot market prices estimated by the AURORA model were adjusted by the monthly differences between the expected flat monthly spot market prices and the average flat monthly forward market prices. These adjustments calibrate the level of the flat monthly spot market prices estimated by the AURORA model for the Risk Analysis Study to the forward market price so that the simulated forward market price movements, which are based on the spot market price movements, are not biased either upward or downward.

**1.15.3 Modeling Methodology.** The modeling methodology used in the Forward Market Price Risk Model assumes that the forward market price at the beginning of the spot month for the spot month is the same as the expected spot market price for the same month, since otherwise arbitrage opportunities exist that will likely be exploited which removes the differences. As spot market prices change each month through the rate period, monthly forward market prices for each of the forward months is computed in following manner:

$FPt = MAX(FPt-1 + ((\alpha + \beta * ((SPt-1,m-1 + (EFPt-1,m-1 – ESPt-1,m-1)) – FPt-1,m-1)) + \varepsilon * N(0,1)), Min Price)$

Where,
FPt = Updated forward market prices for each forward month for a given month (varying values)
FPt-1 = Prior forward market prices for each forward month (varying values)
SPt-1,m-1 = Actual average spot market price for the prior month (varying values)
FPt-1,m-1 = Forward price for the prior spot month at the start of the spot month(varying values)
EFPt-1,m-1 = Forecasted expected forward price for the prior spot month (constant values)
ESPt-1,m-1 = Forecasted expected spot market price for the prior spot month (constant values)
(EFPt-1,m-1 – ESPt-1,m-1) = Calibrates the overall price level of the flat monthly spot market prices estimated by AURORA to the level of the forecasted monthly forward market prices
$\alpha$, $\beta$, and $\varepsilon$ = The intercept, slope, and standard error of the regression, which differ across the forward months
N(0,1) = Sampled standard deviations from a standard normal distribution
Min Price = Minimum price for a monthly forward price, which was set at $5.00/MWh based on professional judgment.
MAX = Maximum function in Excel

Table 40 illustrates how deviations in actual average monthly spot market prices (i.e. AURORA prices) from the forward market price at the beginning of the spot month (recorded in cells with boxed borders) over time impacted the forward market price curve from October 2006 thru September 2008 for simulation iteration number 3000 (the last iteration). For instance, for October, 2006, the actual spot market price was $19.58/MWh less than the September, 2006, forward market price for October, 2006. This difference resulted in the forward market prices for November and December of 2006 falling by $6.46/MWh and $5.62/MWh with price changes generally decreasing by lesser amounts from January, 2007 through September, 2009.

Overall, these results reflect the commonly observed phenomenon that the forward market prices closest in time to the spot month react strongest to changes in monthly spot market prices and tamper off through time. This result reflects the fact that the impact of new information gained in the spot month is often short-lived and often has little, if any, impact on longer-term price expectations.

**Table 40: Changes in Monthly Forward Price Curves Through Time Due to Actual Spot Market Prices Differing From Forward Market Prices at the Beginning of the Spot Months**
**The Amount of $/MWh that Actual Spot Market Prices Differed From Forward Market Prices at the Beginning of the Spot Months Are Indicated In Single Bordered Cells/Boxes**
**Results for Simulation Iteration Number 3000**

| Date | Oct '06 | Nov '06 | Dec '06 | Jan '07 | Feb '07 | Mar '07 | Apr '07 | May '07 | Jun '07 | Jul '07 | Aug '07 | Sep '07 | Oct '07 | Nov '07 | Dec '07 | Jan '08 | Feb '08 | Mar '08 | Apr '08 | May '08 | Jun '08 | Jul '08 | Aug '08 | Sep '08 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Forward Month | | | | | | | | | | | | | | | | | | | | | | | | |
| Oct-06 | -19.58 | | | | | | | | | | | | | | | | | | | | | | | |
| Nov-06 | -6.46 | -7.45 | | | | | | | | | | | | | | | | | | | | | | |
| Dec-06 | -5.62 | -2.48 | -2.07 | | | | | | | | | | | | | | | | | | | | | |
| Jan-07 | -4.47 | -2.14 | -0.37 | 9.30 | | | | | | | | | | | | | | | | | | | | |
| Feb-07 | -4.51 | -1.73 | -0.22 | 3.63 | -3.97 | | | | | | | | | | | | | | | | | | | |
| Mar-07 | -3.78 | -1.69 | -0.13 | 3.35 | -1.48 | -5.98 | | | | | | | | | | | | | | | | | | |
| Apr-07 | -2.81 | -1.40 | -0.10 | 2.76 | -1.28 | -2.04 | 0.54 | | | | | | | | | | | | | | | | | |
| May-07 | -3.27 | -1.06 | -0.03 | 2.82 | -1.07 | -1.75 | 0.85 | 14.70 | | | | | | | | | | | | | | | | |
| Jun-07 | -2.33 | -1.21 | 0.00 | 2.46 | -1.00 | -1.41 | 0.95 | 5.43 | 17.94 | | | | | | | | | | | | | | | |
| Jul-07 | -2.34 | -0.86 | -0.02 | 1.89 | -0.82 | -1.37 | 0.89 | 4.97 | 6.66 | 3.01 | | | | | | | | | | | | | | |
| Aug-07 | -2.44 | -0.86 | 0.00 | 2.13 | -0.64 | -1.13 | 0.89 | 4.07 | 6.09 | 1.47 | -3.57 | | | | | | | | | | | | | |
| Sep-07 | -2.28 | -0.90 | -0.02 | 1.54 | -0.71 | -0.85 | 0.83 | 4.15 | 4.99 | 1.46 | -1.01 | 1.90 | | | | | | | | | | | | |
| Oct-07 | -2.43 | -0.85 | -0.03 | 1.52 | -0.51 | -0.97 | 0.70 | 3.59 | 5.07 | 1.26 | -0.80 | 0.62 | 2.97 | | | | | | | | | | | |
| Nov-07 | -2.74 | -0.89 | -0.03 | 1.57 | -0.51 | -0.69 | 0.72 | 2.75 | 4.38 | 1.28 | -0.61 | 0.58 | 2.27 | -10.43 | | | | | | | | | | |
| Dec-07 | -2.57 | -0.99 | -0.03 | 1.46 | -0.52 | -0.69 | 0.54 | 3.11 | 3.36 | 1.16 | -0.58 | 0.43 | 2.05 | -1.95 | 2.15 | | | | | | | | | |
| Jan-08 | -1.66 | -0.92 | -0.04 | 1.56 | -0.50 | -0.72 | 0.52 | 2.24 | 3.80 | 0.92 | -0.45 | 0.52 | 1.60 | -1.63 | 2.09 | -2.84 | | | | | | | | |
| Feb-08 | -1.63 | -0.62 | -0.03 | 1.73 | -0.52 | -0.69 | 0.52 | 2.23 | 2.74 | 1.01 | -0.32 | 0.47 | 1.71 | -1.28 | 1.87 | 0.31 | -14.45 | | | | | | | |
| Mar-08 | -1.26 | -0.61 | 0.00 | 1.64 | -0.55 | -0.72 | 0.49 | 2.30 | 2.71 | 0.74 | -0.38 | 0.34 | 1.48 | -1.26 | 1.44 | 0.37 | -3.31 | -11.82 | | | | | | |
| Apr-08 | -1.49 | -0.47 | 0.00 | 1.11 | -0.51 | -0.79 | 0.51 | 2.14 | 2.80 | 0.72 | -0.26 | 0.41 | 1.09 | -1.02 | 1.56 | 0.32 | -2.78 | -2.88 | -17.61 | | | | | |
| May-08 | -1.31 | -0.55 | 0.03 | 1.09 | -0.37 | -0.73 | 0.51 | 2.29 | 2.61 | 0.73 | -0.27 | 0.29 | 1.29 | -0.74 | 1.35 | 0.37 | -2.14 | -2.46 | -5.17 | -7.57 | | | | |
| Jun-08 | -1.41 | -0.49 | 0.02 | 0.90 | -0.36 | -0.50 | 0.49 | 2.53 | 2.79 | 0.68 | -0.29 | 0.29 | 0.92 | -0.88 | 0.98 | 0.37 | -2.17 | -1.95 | -4.51 | -1.55 | -7.10 | | | |
| Jul-08 | -1.23 | -0.53 | 0.02 | 1.03 | -0.30 | -0.49 | 0.40 | 2.39 | 3.08 | 0.73 | -0.28 | 0.31 | 0.92 | -0.62 | 1.17 | 0.29 | -1.77 | -1.94 | -3.61 | -1.20 | -2.13 | -4.36 | | |
| Aug-08 | -1.23 | -0.45 | 0.02 | 0.92 | -0.33 | -0.38 | 0.40 | 1.61 | 2.90 | 0.78 | -0.29 | 0.27 | 0.96 | -0.63 | 0.83 | 0.32 | -1.28 | -1.60 | -3.62 | -0.85 | -1.86 | -0.27 | -11.03 | |
| Sep-08 | -1.20 | -0.45 | 0.03 | 0.98 | -0.30 | -0.44 | 0.38 | 1.59 | 1.97 | 0.74 | -0.33 | 0.31 | 0.88 | -0.66 | 0.84 | 0.24 | -1.53 | -1.19 | -3.03 | -0.87 | -1.53 | -0.08 | -2.30 | -8.08 |
| Oct-08 | -1.27 | -0.44 | 0.03 | 0.88 | -0.32 | -0.39 | 0.40 | 1.29 | 1.94 | 0.54 | -0.30 | 0.38 | 0.96 | -0.62 | 0.88 | 0.23 | -1.08 | -1.38 | -2.27 | -0.66 | -1.47 | 0.03 | -1.90 | -1.24 |
| Nov-08 | -1.24 | -0.47 | 0.03 | 0.88 | -0.27 | -0.42 | 0.38 | 1.50 | 1.58 | 0.53 | -0.19 | 0.37 | 1.12 | -0.66 | 0.80 | 0.23 | -1.09 | -0.98 | -2.62 | -0.43 | -1.22 | 0.03 | -1.45 | -0.96 |
| Dec-08 | -1.27 | -0.46 | 0.02 | 0.86 | -0.28 | -0.36 | 0.38 | 1.33 | 1.82 | 0.46 | -0.18 | 0.20 | 1.05 | -0.74 | 0.88 | 0.21 | -1.15 | -0.99 | -1.87 | -0.57 | -0.94 | 0.10 | -1.46 | -0.70 |
| Jan-09 | -1.23 | -0.46 | 0.02 | 0.88 | -0.27 | -0.36 | 0.36 | 1.41 | 1.63 | 0.52 | -0.12 | 0.20 | 0.65 | -0.69 | 1.03 | 0.23 | -1.07 | -1.03 | -1.87 | -0.39 | -1.05 | 0.13 | -1.17 | -0.69 |
| Feb-09 | -1.24 | -0.45 | 0.02 | 0.87 | -0.28 | -0.35 | 0.36 | 1.27 | 1.72 | 0.47 | -0.15 | 0.15 | 0.64 | -0.44 | 0.98 | 0.26 | -1.15 | -0.97 | -1.95 | -0.41 | -0.76 | 0.09 | -0.84 | -0.53 |
| Mar-09 | -1.20 | -0.45 | 0.02 | 0.88 | -0.27 | -0.37 | 0.35 | 1.27 | 1.54 | 0.49 | -0.13 | 0.20 | 0.49 | -0.43 | 0.59 | 0.25 | -1.34 | -1.03 | -1.83 | -0.44 | -0.75 | 0.08 | -1.01 | -0.35 |
| Apr-09 | -1.18 | -0.44 | 0.02 | 0.86 | -0.27 | -0.36 | 0.34 | 1.24 | 1.55 | 0.45 | -0.15 | 0.16 | 0.60 | -0.32 | 0.58 | 0.17 | -1.25 | -1.15 | -1.94 | -0.41 | -0.78 | 0.06 | -0.71 | -0.45 |
| May-09 | -1.17 | -0.43 | 0.02 | 0.86 | -0.26 | -0.37 | 0.34 | 1.27 | 1.51 | 0.45 | -0.12 | 0.17 | 0.52 | -0.38 | 0.44 | 0.17 | -0.76 | -1.08 | -2.17 | -0.45 | -0.74 | 0.05 | -0.72 | -0.31 |
| Jun-09 | -1.14 | -0.43 | 0.02 | 0.84 | -0.27 | -0.36 | 0.34 | 1.25 | 1.55 | 0.44 | -0.12 | 0.16 | 0.56 | -0.33 | 0.54 | 0.15 | -0.74 | -0.70 | -2.04 | -0.55 | -0.78 | 0.05 | -0.77 | -0.32 |
| Jul-09 | -1.07 | -0.42 | 0.02 | 0.83 | -0.26 | -0.36 | 0.33 | 1.28 | 1.53 | 0.44 | -0.12 | 0.16 | 0.50 | -0.36 | 0.46 | 0.18 | -0.54 | -0.69 | -1.34 | -0.51 | -0.83 | 0.05 | -0.72 | -0.35 |
| Aug-09 | -1.06 | -0.39 | 0.03 | 0.83 | -0.26 | -0.35 | 0.33 | 1.24 | 1.55 | 0.44 | -0.13 | 0.16 | 0.50 | -0.31 | 0.50 | 0.16 | -0.67 | -0.52 | -1.31 | -0.27 | -0.78 | 0.01 | -0.77 | -0.33 |
| Sep-09 | -1.04 | -0.39 | 0.03 | 0.81 | -0.26 | -0.34 | 0.33 | 1.25 | 1.51 | 0.44 | -0.12 | 0.17 | 0.49 | -0.31 | 0.45 | 0.16 | -0.57 | -0.62 | -1.02 | -0.25 | -0.55 | 0.02 | -0.89 | -0.35 |

**1.15.4 Model and Results.** Table 41 contains a copy of the Forward Market Price Risk Model. The deterministic input data used by the model and a summary of the results for FY 2008-2009 are reported in the top left quadrant of the first page of this table. The results indicate that the variability, as measured by standard deviation, of annual forward market prices for a 12 month strip of power over FY 2008-2009 is $9.89/MWh, which is 69.8% of the $14.17/MWh standard deviation for annual average spot market prices estimated by the AURORA model. The correlation between the AURORA and forward market prices was found to be moderate, having a correlation coefficient of 0.631. The average simulated FY 2008-2009 annual forward market prices for a 12 month strip of power was $48.54/MWh, which is slightly (1%) higher than the average annual FY 2008-2009 forward market price of $47.85/MWh, which was input into the model. Graphs 20 and 21 show the probability distributions for the simulated average annual forward market prices for a 12 month strip of power during FY 2008-2009.

# Table 41: Forward Market Price Risk Model

INPUT DATA:

| | Forward Mkt | Aurora Spot | Differences |
|---|---|---|---|
| FY07 Annual Price | $ 52.07 | $ 51.22 | $ 0.85 |
| FY08 Annual Price | $ 49.85 | $ 46.00 | $ 3.85 |
| FY09 Annual Price | $ 45.84 | $ 43.40 | $ 2.44 |
| Min Monthly Price | 5.00 | | |
| Avg FY08-09 Price | $ 47.85 | $ 44.70 | $ 3.15 |

AVERAGE FY08-09 RESULTS AND COMPARISONS

| | Simulated Forward Price | AURORA Spot Price | Forward Vs Spot Prices |
|---|---|---|---|
| Average (FY08-09) | $ 48.54 | $ 44.67 | $ 3.87 |
| Std Dev (FY08-09) | $ 9.89 | $ 14.17 | 69.8% |
| Correlation (FY08-09) | 0.631 | | |

| | Spot Vs Fwd 1 | Spot Vs Fwd 2 | Spot Vs Fwd 3 | Spot Vs Fwd 4 | Spot Vs Fwd 5 | Spot Vs Fwd 6 | Spot Vs Fwd 7 | Spot Vs Fwd 8 | Spot Vs Fwd 9 | Spot Vs Fwd 10 | Spot Vs Fwd 11 | Spot Vs Fwd 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| R^2 | 0.3062 | 0.2242 | 0.1581 | 0.1930 | 0.1695 | 0.1282 | 0.1712 | 0.1550 | 0.1719 | 0.1863 | 0.1713 | 0.1922 |
| Intercept | -0.1126 | -0.0069 | 0.0188 | 0.0638 | 0.1018 | 0.0924 | 0.0925 | 0.0746 | 0.0660 | 0.0627 | 0.0491 | 0.0619 |
| Slope | 0.3466 | 0.3075 | 0.2466 | 0.2509 | 0.2129 | 0.1601 | 0.1844 | 0.1319 | 0.1318 | 0.1371 | 0.1276 | 0.1365 |
| Std Err | 0.2889 | 0.3168 | 0.3151 | 0.2841 | 0.2610 | 0.2311 | 0.2247 | 0.1705 | 0.1602 | 0.1587 | 0.1555 | 0.1550 |

Forecasted FY07 Forward Price Curve

| | | FY07 | | | | | | | | | | | | FY08 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Fiscal Year | | 2007 | 2007 | 2007 | 2007 | 2007 | 2007 | 2007 | 2007 | 2007 | 2007 | 2007 | 2007 | 2008 |
| Month | | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct |
| Monthly Hours | | 745 | 720 | 744 | 744 | 672 | 744 | 719 | 744 | 720 | 744 | 744 | 720 | 745 |
| Forward Price Curve - Avg Aurora Spot | | 62.81 | 64.02 | 66.20 | 54.38 | 53.38 | 52.56 | 48.24 | 29.44 | 25.43 | 41.33 | 56.26 | 60.63 | 57.29 |
| Forward Price Curve - Used | | 63.85 | 65.08 | 67.29 | 55.28 | 54.26 | 53.43 | 49.04 | 29.93 | 25.85 | 42.01 | 57.19 | 61.63 | 62.09 |
| Aurora Spot Price | 3000 | 44.28 | 51.17 | 57.12 | 57.59 | 47.47 | 43.73 | 44.71 | 41.13 | 46.70 | 54.02 | 63.20 | 70.74 | 72.24 |
| No. of Stdevs | 3000 | 0.26 | -0.54 | 0.29 | 0.71 | -1.03 | -0.53 | 1.71 | 0.98 | 1.41 | 1.04 | 0.06 | -0.96 | -1.06 |
| Selected Annual Avg FY Forward Prices | | | | | | | | | | | | | #REF! | |

Simulated FY07 Forward Price Curve

| | | Oct '06 | Nov '06 | Dec '06 | Jan '07 | Feb '07 | Mar '07 | Apr '07 | May '07 | Jun '07 | Jul '07 | Aug '07 | Sep '07 | Oct '07 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sep-06 | Fwd PC (Oct-06 to Sep-09) | 63.85 | 65.08 | 67.29 | 55.28 | 54.26 | 53.43 | 49.04 | 29.93 | 25.85 | 42.01 | 57.19 | 61.63 | 62.09 |
| Oct-06 | | 44.28 | 58.61 | 61.67 | 50.81 | 49.75 | 49.66 | 46.23 | 26.66 | 23.53 | 39.67 | 54.75 | 59.35 | 59.67 |
| Nov-06 | | | 51.17 | 59.19 | 48.67 | 48.02 | 47.96 | 44.83 | 25.60 | 22.32 | 38.81 | 53.89 | 58.45 | 58.82 |
| Dec-06 | | | | 57.12 | 48.30 | 47.81 | 47.83 | 44.73 | 25.57 | 22.32 | 38.79 | 53.88 | 58.44 | 58.79 |
| Jan-07 | | | | | 57.59 | 51.43 | 51.19 | 47.48 | 28.40 | 24.78 | 40.68 | 56.02 | 59.98 | 60.31 |
| Feb-07 | | | | | | 47.47 | 49.71 | 46.20 | 27.33 | 23.78 | 39.86 | 55.38 | 59.27 | 59.81 |
| Mar-07 | | | | | | | 43.73 | 44.17 | 25.59 | 22.37 | 38.49 | 54.25 | 58.42 | 58.84 |
| Apr-07 | | | | | | | | 44.71 | 26.43 | 23.32 | 39.38 | 55.14 | 59.25 | 59.54 |
| May-07 | | | | | | | | | 41.13 | 28.75 | 44.35 | 59.21 | 63.41 | 63.13 |
| Jun-07 | | | | | | | | | | 46.70 | 51.01 | 65.30 | 68.40 | 68.20 |
| Jul-07 | | | | | | | | | | | 54.02 | 66.77 | 69.86 | 69.46 |
| Aug-07 | | | | | | | | | | | | 63.20 | 68.84 | 68.66 |
| Sep-07 | Fwd PC (Oct-07 to Sep-09) | | | | | | | | | | | | 70.74 | 69.27 |
| Oct-07 | | | | | | | | | | | | | | 72.24 |
| Nov-07 | | | | | | | | | | | | | | |
| Dec-07 | | | | | | | | | | | | | | |
| Jan-08 | | | | | | | | | | | | | | |
| Feb-08 | | | | | | | | | | | | | | |
| Mar-08 | | | | | | | | | | | | | | |
| Apr-08 | | | | | | | | | | | | | | |
| May-08 | | | | | | | | | | | | | | |
| Jun-08 | | | | | | | | | | | | | | |
| Jul-08 | | | | | | | | | | | | | | |
| Aug-08 | | | | | | | | | | | | | | |
| Sep-08 | Fwd PC (Oct-08 to Sep-09) | | | | | | | | | | | | | |

# Table 41: Forward Market Price Risk Model (Continued)

| | Spot Vs Fwd 13 | Spot Vs Fwd 14 | Spot Vs Fwd 15 | Spot Vs Fwd 16 | Spot Vs Fwd 17 | Spot Vs Fwd 18 | Spot Vs Fwd 19 | Spot Vs Fwd 20 | Spot Vs Fwd 21 | Spot Vs Fwd 22 | Spot Vs Fwd 23 | Spot Vs Fwd 24 | Spot Vs Fwd 25 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| R^2 | 0.2780 | 0.2720 | 0.1406 | 0.1332 | 0.0896 | 0.1265 | 0.1020 | 0.1134 | 0.1045 | 0.1017 | 0.1048 | 0.1224 | 0.1190 |
| Intercept | 0.0687 | 0.0722 | 0.0536 | 0.0561 | 0.0612 | 0.0683 | 0.0625 | 0.0598 | 0.0658 | 0.0668 | 0.0632 | 0.0594 | 0.0600 |
| Slope | 0.1535 | 0.1442 | 0.0944 | 0.0927 | 0.0729 | 0.0859 | 0.0757 | 0.0810 | 0.0716 | 0.0717 | 0.0700 | 0.0730 | 0.0717 |
| Std Err | 0.1370 | 0.1306 | 0.1292 | 0.1310 | 0.1286 | 0.1250 | 0.1244 | 0.1255 | 0.1160 | 0.1180 | 0.1132 | 0.1082 | 0.1080 |

**Forecasted FY08 Forward Price Curve**

| | | | | | | | | | | | | FY09 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Fiscal Year* | 2008 | 2008 | 2008 | 2008 | 2008 | 2008 | 2008 | 2008 | 2008 | 2008 | 2008 | 2009 | 2009 |
| *Month* | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov |
| *Monthly Hours* | 720 | 744 | 744 | 696 | 744 | 719 | 744 | 720 | 744 | 744 | 720 | 745 | 720 |
| Forward Price Curve - Avg Aurora Spot | 60.30 | 63.22 | 48.37 | 51.31 | 46.30 | 38.46 | 26.97 | 25.35 | 35.99 | 48.20 | 50.19 | 47.78 | 51.88 |
| Forward Price Curve - Used | 65.36 | 68.52 | 52.42 | 55.61 | 50.18 | 41.68 | 29.23 | 27.47 | 39.00 | 52.24 | 54.39 | 50.47 | 54.80 |
| **Aurora Spot Price** **3000** | 63.02 | 75.46 | 56.92 | 48.67 | 41.79 | 24.55 | 18.48 | 16.24 | 30.91 | 37.46 | 40.35 | 39.98 | 47.45 |
| **No. of Stdevs** **3000** | 0.10 | -1.31 | 0.02 | 1.10 | -0.04 | -0.26 | 1.40 | -1.02 | 1.09 | 0.82 | 0.76 | 2.26 | -0.48 |
| *Selected Annual Avg FY Forward Prices* | | | | | | | | | | | #REF! | | |

**Simulated FY08 Forward Price Curve**

| | | Nov '07 | Dec '07 | Jan '08 | Feb '08 | Mar '08 | Apr '08 | May '08 | Jun '08 | Jul '08 | Aug '08 | Sep '08 | Oct '08 | Nov '08 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sep-06 | Fwd PC (Oct-06 to Sep-09) | **65.36** | **68.52** | **52.42** | **55.61** | **50.18** | **41.68** | **29.23** | **27.47** | **39.00** | **52.24** | **54.39** | **50.47** | **54.80** |
| Oct-06 | | **62.62** | **65.95** | **50.76** | **53.98** | **48.92** | **40.19** | **27.93** | **26.06** | **37.77** | **51.00** | **53.19** | **49.20** | **53.56** |
| Nov-06 | | **61.72** | **64.97** | **49.84** | **53.36** | **48.32** | **39.71** | **27.38** | **25.58** | **37.25** | **50.55** | **52.74** | **48.76** | **53.10** |
| Dec-06 | | **61.69** | **64.94** | **49.80** | **53.33** | **48.32** | **39.72** | **27.40** | **25.60** | **37.27** | **50.57** | **52.76** | **48.79** | **53.12** |
| Jan-07 | | **63.27** | **66.40** | **51.36** | **55.06** | **49.95** | **40.83** | **28.50** | **26.49** | **38.31** | **51.49** | **53.74** | **49.67** | **54.01** |
| Feb-07 | | **62.76** | **65.88** | **50.86** | **54.54** | **49.41** | **40.32** | **28.13** | **26.13** | **38.01** | **51.17** | **53.44** | **49.35** | **53.73** |
| Mar-07 | | **62.07** | **65.18** | **50.14** | **53.85** | **48.69** | **39.53** | **27.40** | **25.63** | **37.52** | **50.79** | **53.00** | **48.96** | **53.31** |
| Apr-07 | | **62.80** | **65.73** | **50.65** | **54.37** | **49.17** | **40.04** | **27.90** | **26.12** | **37.92** | **51.19** | **53.38** | **49.36** | **53.69** |
| May-07 | | **65.55** | **68.84** | **52.90** | **56.60** | **51.47** | **42.18** | **30.19** | **28.65** | **40.31** | **52.80** | **54.98** | **50.65** | **55.18** |
| Jun-07 | | **69.92** | **72.20** | **56.69** | **59.33** | **54.19** | **44.99** | **32.80** | **31.44** | **43.39** | **55.71** | **56.94** | **52.59** | **56.76** |
| Jul-07 | | **71.21** | **73.36** | **57.62** | **60.34** | **54.93** | **45.70** | **33.54** | **32.12** | **44.12** | **56.48** | **57.68** | **53.13** | **57.30** |
| Aug-07 | | **70.60** | **72.77** | **57.17** | **60.02** | **54.54** | **45.44** | **33.26** | **31.83** | **43.84** | **56.20** | **57.36** | **52.83** | **57.11** |
| Sep-07 | Fwd PC (Oct-07 to Sep-09) | 71.18 | 73.21 | 57.69 | 60.49 | 54.88 | 45.85 | 33.56 | 32.13 | 44.15 | 56.47 | 57.67 | **53.21** | **57.48** |
| Oct-07 | | **73.45** | **75.25** | **59.29** | **62.20** | **56.36** | **46.94** | **34.85** | **33.04** | **45.07** | **57.43** | **58.54** | **54.17** | **58.59** |
| Nov-07 | | **63.02** | **73.31** | **57.66** | **60.93** | **55.10** | **45.93** | **34.10** | **32.17** | **44.45** | **56.80** | **57.88** | **53.55** | **57.93** |
| Dec-07 | | | **75.46** | **59.76** | **62.80** | **56.55** | **47.49** | **35.45** | **33.15** | **45.63** | **57.63** | **58.72** | **54.43** | **58.73** |
| Jan-08 | | | | **56.92** | **63.11** | **56.92** | **47.81** | **35.82** | **33.52** | **45.92** | **57.95** | **58.96** | **54.65** | **58.96** |
| Feb-08 | | | | | **48.67** | **53.61** | **45.04** | **33.69** | **31.35** | **44.15** | **56.68** | **57.43** | **53.58** | **57.87** |
| Mar-08 | | | | | | **41.79** | **42.16** | **31.23** | **29.40** | **42.21** | **55.08** | **56.24** | **52.20** | **56.89** |
| Apr-08 | | | | | | | **24.55** | **26.05** | **24.88** | **38.60** | **51.46** | **53.21** | **49.93** | **54.27** |
| May-08 | | | | | | | | **18.48** | **23.34** | **37.40** | **50.61** | **52.34** | **49.27** | **53.84** |
| Jun-08 | | | | | | | | | **16.24** | **35.27** | **48.75** | **50.81** | **47.79** | **52.61** |
| Jul-08 | | | | | | | | | | **30.91** | **48.48** | **50.74** | **47.82** | **52.65** |
| Aug-08 | | | | | | | | | | | **37.46** | **48.44** | **45.92** | **51.20** |
| Sep-08 | Fwd PC (Oct-08 to Sep-09) | | | | | | | | | | | **40.35** | 44.68 | 50.24 |

## Table 41: Forward Market Price Risk Model (Continued)

| | Spot Vs Fwd 26 | Spot Vs Fwd 27 | Spot Vs Fwd 28 | Spot Vs Fwd 29 | Spot Vs Fwd 30 | Spot Vs Fwd 31 | Spot Vs Fwd 32 | Spot Vs Fwd 33 | Spot Vs Fwd 34 | Spot Vs Fwd 35 |
|---|---|---|---|---|---|---|---|---|---|---|
| R^2 | 0.1308 | 0.1243 | 0.1294 | 0.1219 | 0.1196 | 0.1152 | 0.1074 | 0.0995 | 0.1018 | 0.1051 |
| Intercept | 0.0613 | 0.0607 | 0.0595 | 0.0601 | 0.0595 | 0.0594 | 0.0596 | 0.0634 | 0.0628 | 0.0566 |
| Slope | 0.0732 | 0.0709 | 0.0717 | 0.0692 | 0.0683 | 0.0681 | 0.0664 | 0.0623 | 0.0623 | 0.0608 |
| Std Err | 0.1045 | 0.1041 | 0.1029 | 0.1028 | 0.1026 | 0.1044 | 0.1060 | 0.1039 | 0.1024 | 0.0982 |

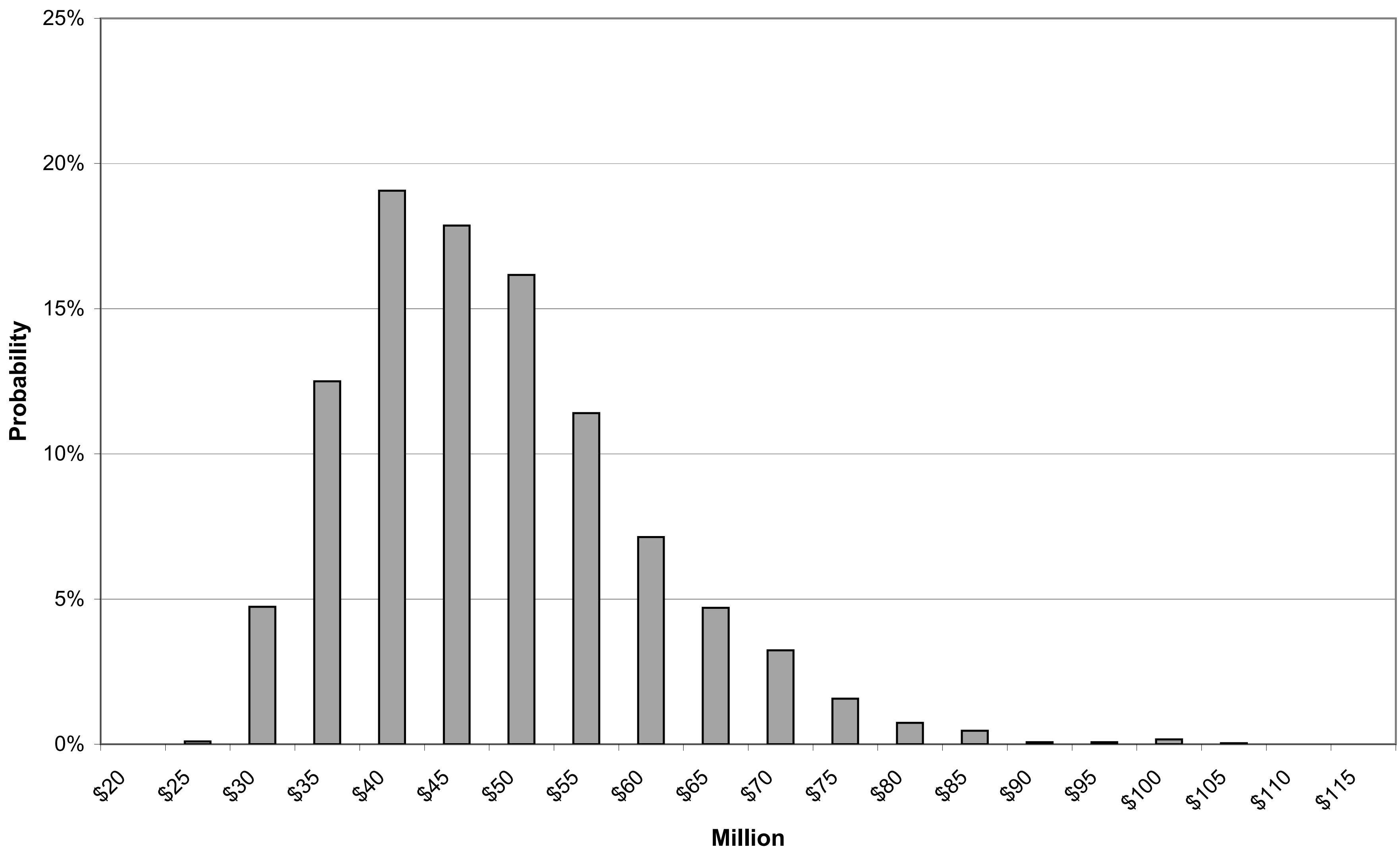
**Forecasted FY09 Forward Price Curve**

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Fiscal Year* | | 2009 | 2009 | 2009 | 2009 | 2009 | 2009 | 2009 | 2009 | 2009 | 2009 |
| *Month* | | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep |
| *Monthly Hours* | | 744 | 744 | 672 | 744 | 719 | 744 | 720 | 744 | 744 | 720 |
| Forward Price Curve - Avg Aurora Spot | | 52.85 | 48.11 | 53.48 | 45.33 | 35.94 | 26.12 | 22.90 | 34.71 | 51.95 | 49.75 |
| Forward Price Curve - Used | | 55.82 | 50.81 | 56.49 | 47.88 | 37.96 | 27.59 | 24.19 | 36.66 | 54.87 | 52.54 |
| **Aurora Spot Price** | **3000** | 54.91 | 41.72 | 41.13 | 43.01 | 36.79 | 28.49 | 9.17 | 12.49 | 32.24 | 31.92 |
| **No. of Stdevs** | **3000** | 0.36 | -0.77 | -1.45 | 0.20 | 1.15 | 1.31 | -1.87 | -0.45 | 0.01 | 0.53 |
| *Selected Annual Avg FY Forward Prices* | | | | | | | | | | | #REF! |

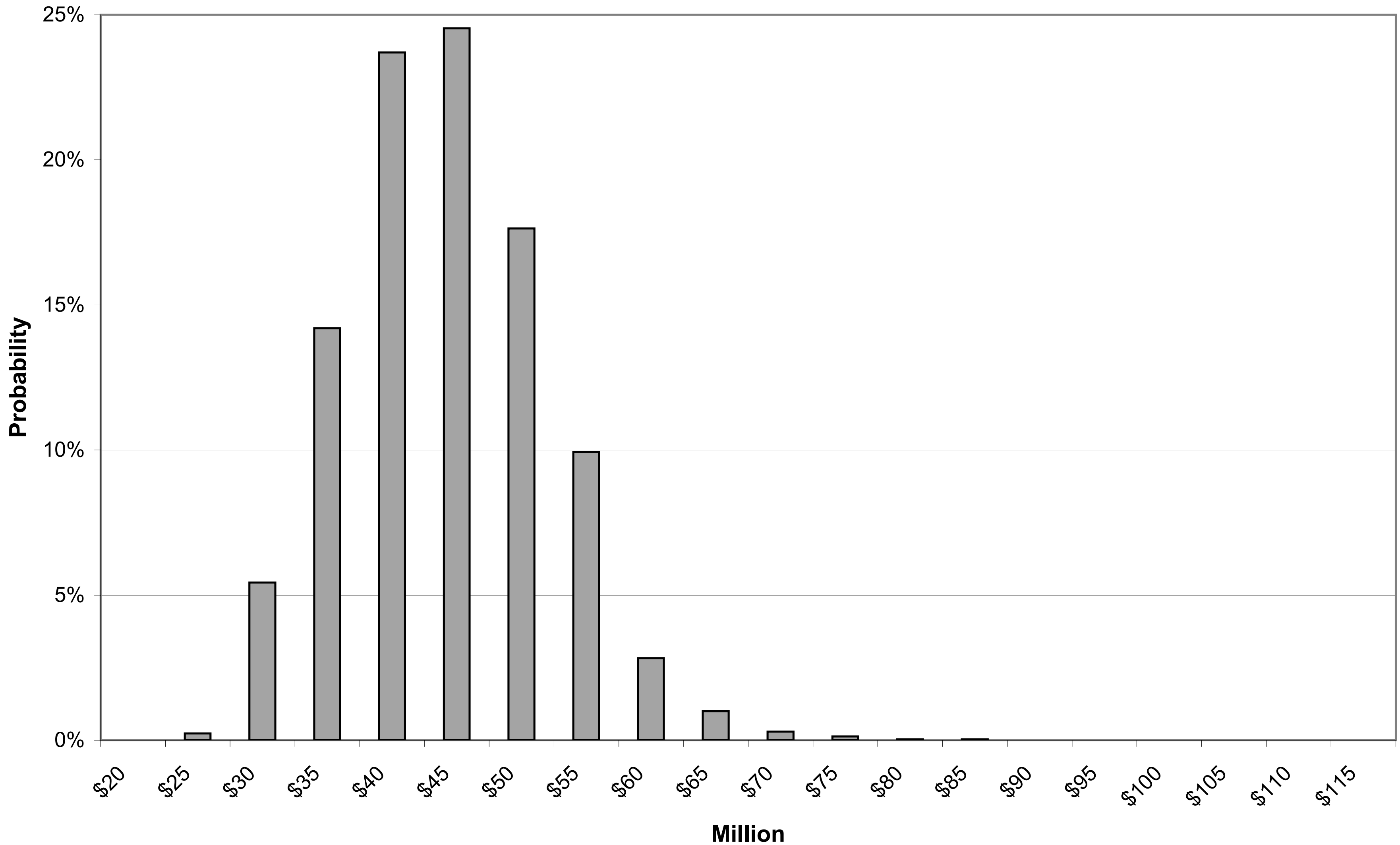
**Simulated FY09 Forward Price Curve**

| | | Dec '08 | Jan '09 | Feb '09 | Mar '09 | Apr '09 | May '09 | Jun '09 | Jul '09 | Aug '09 | Sep '09 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sep-06 | Fwd PC (Oct-06 to Sep-09) | **55.82** | **50.81** | **56.49** | **47.88** | **37.96** | **27.59** | **24.19** | **36.66** | **54.87** | **52.54** |
| Oct-06 | | **54.55** | **49.59** | **55.24** | **46.68** | **36.78** | **26.42** | **23.05** | **35.59** | **53.80** | **51.50** |
| Nov-06 | | **54.10** | **49.12** | **54.80** | **46.23** | **36.34** | **25.99** | **22.62** | **35.17** | **53.41** | **51.11** |
| Dec-06 | | **54.12** | **49.15** | **54.82** | **46.25** | **36.36** | **26.01** | **22.64** | **35.19** | **53.44** | **51.14** |
| Jan-07 | | **54.97** | **50.03** | **55.68** | **47.13** | **37.22** | **26.87** | **23.48** | **36.02** | **54.26** | **51.95** |
| Feb-07 | | **54.70** | **49.76** | **55.41** | **46.86** | **36.94** | **26.61** | **23.21** | **35.76** | **54.01** | **51.70** |
| Mar-07 | | **54.34** | **49.40** | **55.05** | **46.49** | **36.58** | **26.24** | **22.85** | **35.40** | **53.66** | **51.35** |
| Apr-07 | | **54.72** | **49.76** | **55.42** | **46.84** | **36.92** | **26.58** | **23.19** | **35.74** | **53.99** | **51.68** |
| May-07 | | **56.05** | **51.17** | **56.68** | **48.11** | **38.16** | **27.85** | **24.45** | **37.01** | **55.23** | **52.93** |
| Jun-07 | | **57.88** | **52.80** | **58.41** | **49.65** | **39.71** | **29.36** | **26.00** | **38.54** | **56.78** | **54.44** |
| Jul-07 | | **58.34** | **53.31** | **58.88** | **50.14** | **40.16** | **29.82** | **26.44** | **38.98** | **57.22** | **54.88** |
| Aug-07 | | **58.16** | **53.19** | **58.73** | **50.01** | **40.01** | **29.70** | **26.32** | **38.87** | **57.09** | **54.76** |
| Sep-07 | Fwd PC (Oct-07 to Sep-09) | **58.36** | **53.39** | **58.88** | **50.21** | **40.18** | **29.87** | **26.48** | **39.03** | **57.25** | **54.92** |
| Oct-07 | | **59.42** | **54.04** | **59.52** | **50.70** | **40.78** | **30.39** | **27.04** | **39.53** | **57.75** | **55.41** |
| Nov-07 | | **58.67** | **53.35** | **59.07** | **50.27** | **40.46** | **30.01** | **26.71** | **39.16** | **57.44** | **55.10** |
| Dec-07 | | **59.55** | **54.38** | **60.05** | **50.86** | **41.04** | **30.45** | **27.25** | **39.63** | **57.94** | **55.55** |
| Jan-08 | | **59.76** | **54.61** | **60.31** | **51.11** | **41.21** | **30.62** | **27.41** | **39.80** | **58.10** | **55.71** |
| Feb-08 | | **58.60** | **53.54** | **59.16** | **49.77** | **39.96** | **29.86** | **26.67** | **39.27** | **57.43** | **55.14** |
| Mar-08 | | **57.62** | **52.51** | **58.19** | **48.74** | **38.81** | **28.78** | **25.97** | **38.58** | **56.91** | **54.52** |
| Apr-08 | | **55.75** | **50.63** | **56.23** | **46.91** | **36.86** | **26.60** | **23.93** | **37.24** | **55.60** | **53.50** |
| May-08 | | **55.18** | **50.25** | **55.83** | **46.47** | **36.45** | **26.16** | **23.38** | **36.73** | **55.33** | **53.25** |
| Jun-08 | | **54.24** | **49.19** | **55.07** | **45.72** | **35.67** | **25.41** | **22.60** | **35.90** | **54.55** | **52.70** |
| Jul-08 | | **54.34** | **49.32** | **55.16** | **45.80** | **35.73** | **25.47** | **22.65** | **35.95** | **54.56** | **52.72** |
| Aug-08 | | **52.88** | **48.15** | **54.32** | **44.79** | **35.03** | **24.74** | **21.88** | **35.23** | **53.80** | **51.83** |
| Sep-08 | Fwd PC (Oct-08 to Sep-09) | 52.18 | 47.45 | 53.79 | 44.43 | 34.57 | 24.43 | 21.56 | 34.88 | 53.47 | 51.48 |

## Graph 20: FY 2008 Forward Market Price Distribution For 12-Month Strip of Power



**Graph 21: FY 2009 Forward Market Price Distribution For 12-Month Strip of Power**



### 1.16 Revenue Simulation Model (RevSim).

The purpose of the RevSim module within RiskMod is to determine, via simulation, PBL's operational net revenue risk. Inputs to RevSim include risk data simulated by RiskSim and the AURORA model along with deterministic monthly load and resource data, monthly PF rates, and non-varying revenues and expenses from the Load Resource Study, WP-07-E-BPA-01, the Revenue Forecast component of the Wholesale Power Rate Development Study, WP-07-E-BPA-05, and the RAM2007.

RevSim uses these inputs to calculate all revenues and expenses needed to determine PBL operational net revenues. These revenues and expenses include revenues from firm power sales (including the SLICE product), surplus energy sales revenue, 4(h)(10)(C) credits, power purchase expenses, and purchase expenses for wind generation. Additional net revenue adjustments include varying DSI benefits and transmission expenses, which are computed external to RevSim and are then input into the model. These variable revenues and expenses are then combined with deterministic revenues and expenses to calculate PBL operational net revenues.

RevSim calculates firm and surplus energy revenues and balancing power purchase expenses under various load, resource, and market price conditions to estimate PBL's operational net revenue risk. A key attribute of RevSim is that it is a HLH and LLH load and resource model. For each simulation, RevSim calculates PBL's HLH and LLH load and resource condition and determines HLH and LLH surplus energy sales and power purchases.

Transmission losses on BPA's transmission system are incorporated into RevSim by reducing Federal hydro generation and CGS output by 2.82 percent. This factor excludes losses on the Southern Intertie. This loss factor is identical to the loss factor used in the Load Resource Study, WP-07-E-BPA-01.

Electricity prices estimated by AURORA are applied to the surplus sales and power purchase amounts to determine surplus energy revenues and power purchase expenses. These HLH and LLH revenues and expenses are then combined with deterministic revenues and expenses to calculate PBL operational net revenues.

RevSim calculates the 4(h)(10)(C) credit that BPA can collect for each of the 50 water years for FY 2007-2009. The 4(h)(10)(C) credit is a provision in the 1980 Pacific Northwest Power Planning and Conservation Act that allows BPA and its ratepayers to receive a credit for non-power fish and wildlife impacts attributable to Federal projects. The 4(h)(10)(C) credits that BPA can collect for each of the 50 water years for FY 2007-2009 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 0.223 (22.3 percent).

Power purchases (aMWs) that qualify for 4(h)(10)(C) credits vary depending on monthly hydro operations due to fish mitigation measures. The amounts of power purchases (aMWs) 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 the power purchases (aMWs) associated with the 4(h)(10)(C) credits is contained in the Load Resource Study, WP-07-E-BPA-01, and Table 2.8.1 in the Load Resource Study Documentation, WP-07-E-BPA-01A, contains the 4(h)(10)(C) power purchase amounts for FY 2007-2009.

The costs of the operational impacts for Fish & Wildlife measures are calculated for each of the 50 water years in RevSim for FY 2007-2009 by multiplying the amount of monthly power purchases (aMWs) that qualifies for 4(h)(10)(C) credits in a given water year by the flat monthly spot market electricity prices (computed from the AURORA HLH and LLH spot market electricity prices) for the same water year. The expenses and capital costs associated with the 4(h)(10)(C) credit are determined external to RevSim and are input into RevSim, *See* Revenue Requirement Study, WP-07-E-BPA-02, regarding expenses and capital costs.

The calculation of rates requires two different analyses by RevSim, which are referred to as the "50 Water Year Run" and the "Risk Simulation Run". The 50 Water Year Run provides data to the RAM2007 model for calculating base rates. The Risk Simulation Run provides data to the ToolKit model for the purpose of determining if BPA has met its financial objectives for the rate period.

**1.16.1 Fifty (50) Water Year Run.** The purpose of the 50 Water Year Run is to calculate revenues from surplus energy sales, expenses associated with purchases needed to meet firm load, and 4(h)(10)(C) credits. Since the Fish Cost Contingency Fund has been exhausted, there is no longer any year-to-year dependency in the 50 Water Year Run. Therefore, the study is now run by inputting hydro generation for water years 1929-1978 consecutively for iterations 1 to 50 for each FY (2007-2009), i.e., iteration 1 uses hydro generation for historical water year 1929 for FY 2007, 2008, and 2009.

The risk data simulated by RiskSim are not used in the 50 Water Year Run of RevSim. CGS output and PBL loads are provided to RevSim by repeating the respective forecasted values for each of the 50 simulations. HLH and LLH spot market electricity prices from the 50 Water Year Run of AURORA are used to calculate surplus energy revenues and power purchase expenses associated with the monthly HLH and LLH surplus and deficit amounts for each of the 50 water years. Surplus energy sales amounts, surplus energy sales revenues, power purchase amounts, and power purchases expenses are reported in the Revenue Forecast component of the Wholesale Power Rate Development Study Documentation, Volume 1, WP-07-E-BPA-05A.

The 50 Water Year Run of RiskMod calculates the annual 4(h)(10)(C) credits for inclusion into the Revenue Forecast and RAM2007 calculation of rates. The dollar amounts of 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-07-E-BPA-05B.

**1.16.2 Risk Simulation Run.** The Risk Simulation Run of RevSim provides PBL annual net revenues for 3000 iterations per FY considering several risk variables in addition to the variable hydro generation and 4(h)(10)(C) credits used in the 50 Water Year Run. 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* Load Resource Study, WP-07-E-BPA-01). The differences between the simulated and forecasted values are added to the forecasted monthly PF loads reported in the Load Resource Study, WP-07-E-BPA-01, to obtain variable PF loads**.**

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-07-E-BPA-05, to obtain variable PF demand. These variable demand values are multiplied by the PF demand charge to obtain variable PF demand revenues.

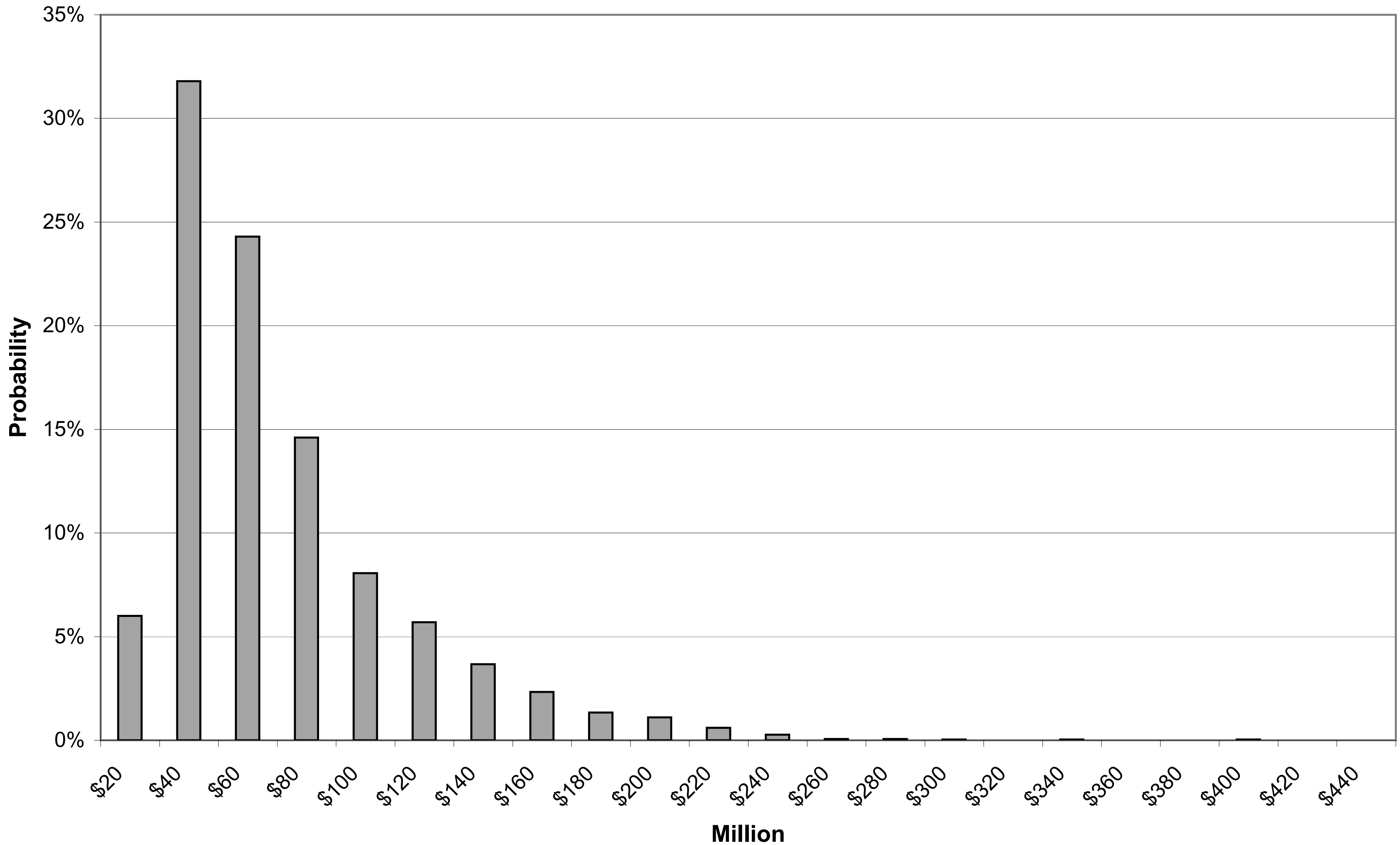
Surplus energy sales revenue and power purchase expenses are based on Federal hydro generation (50 water years), Federal HLH hydro generation ratios (50 water years), BPA load variability, CGS output variability, variable wind generation, transmission expenses, and AURORA prices. RevSim calculates monthly HLH and LLH surplus energy sales and power purchases and applies corresponding HLH and LLH prices estimated by the AURORA Model to determine surplus energy sales revenues and power purchase expenses.

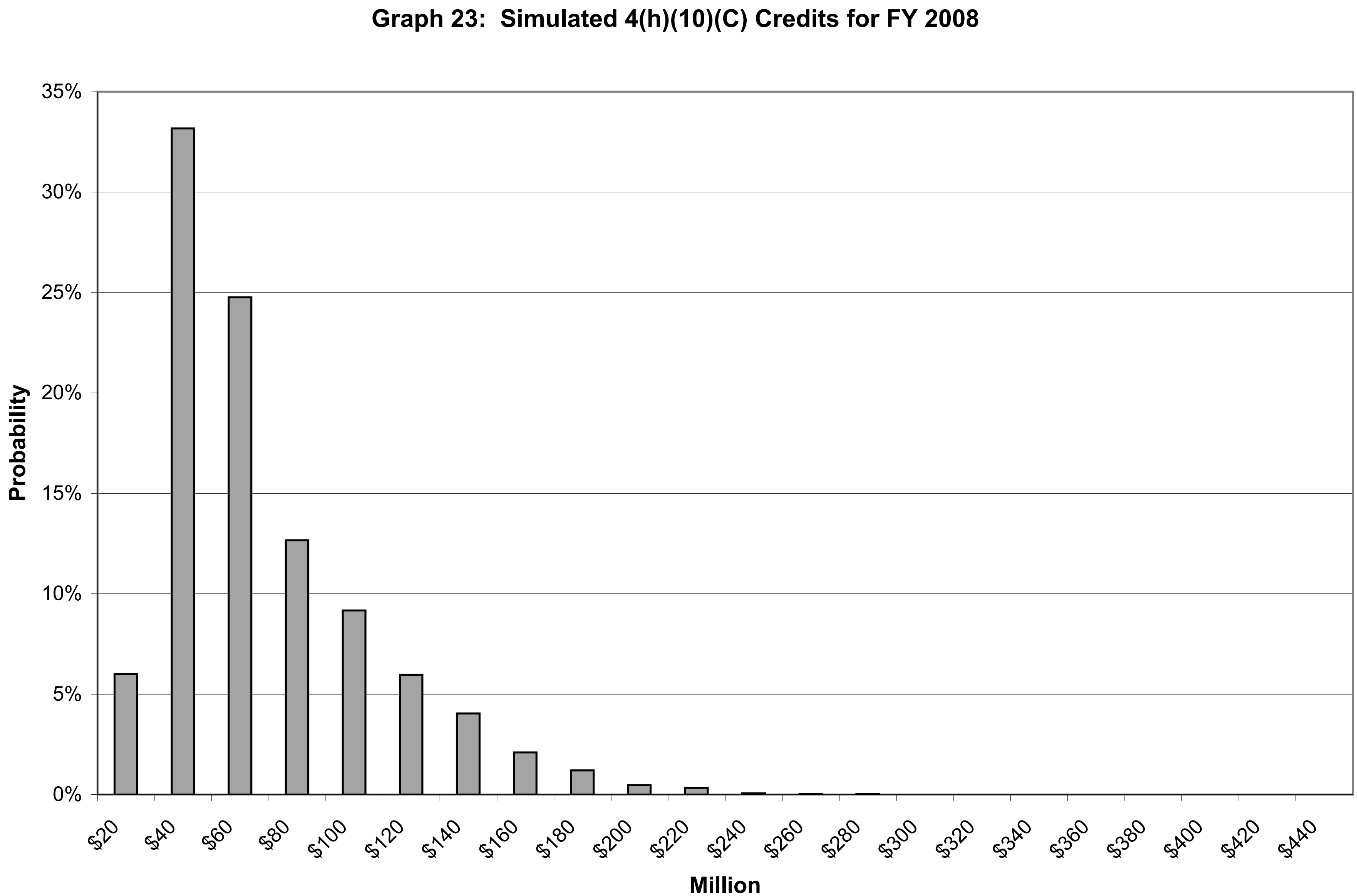
For a given simulation, Federal hydro generation data and HLH hydro generation ratios are determined by the water year sampled for the "hydro index." The hydro index is the water year to use for the first fiscal year, *i.e.,* FY 2007. Successive water years are used for each subsequent FY. For example, 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 2007, hydro generation data for water year 1941 are used for FY 2008, 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 2007, hydro generation for water year 1929 are used for FY 2008, etc. Given the hydro index (water year) for a simulation, Federal hydro generation data are retrieved from the Risk Input Database.

The operational portion of the 4(h)(10)(C) credit is computed from 4(h)(10)(C) power purchase amounts and AURORA prices that are read from the Risk Input Database. The variable operational portion of the credit is combined with the deterministic expense and capital portions to calculate the total 4(h)(10)(C) credit. The 4(h)(10)(C) credits for the three-year rate period calculated in the Risk Simulation Run are included in the PBL net revenues passed to the ToolKit Model. Graphs 22-24 show the probability distributions of the 4(h)(10)(C) credits calculated in the Risk Simulation Run.

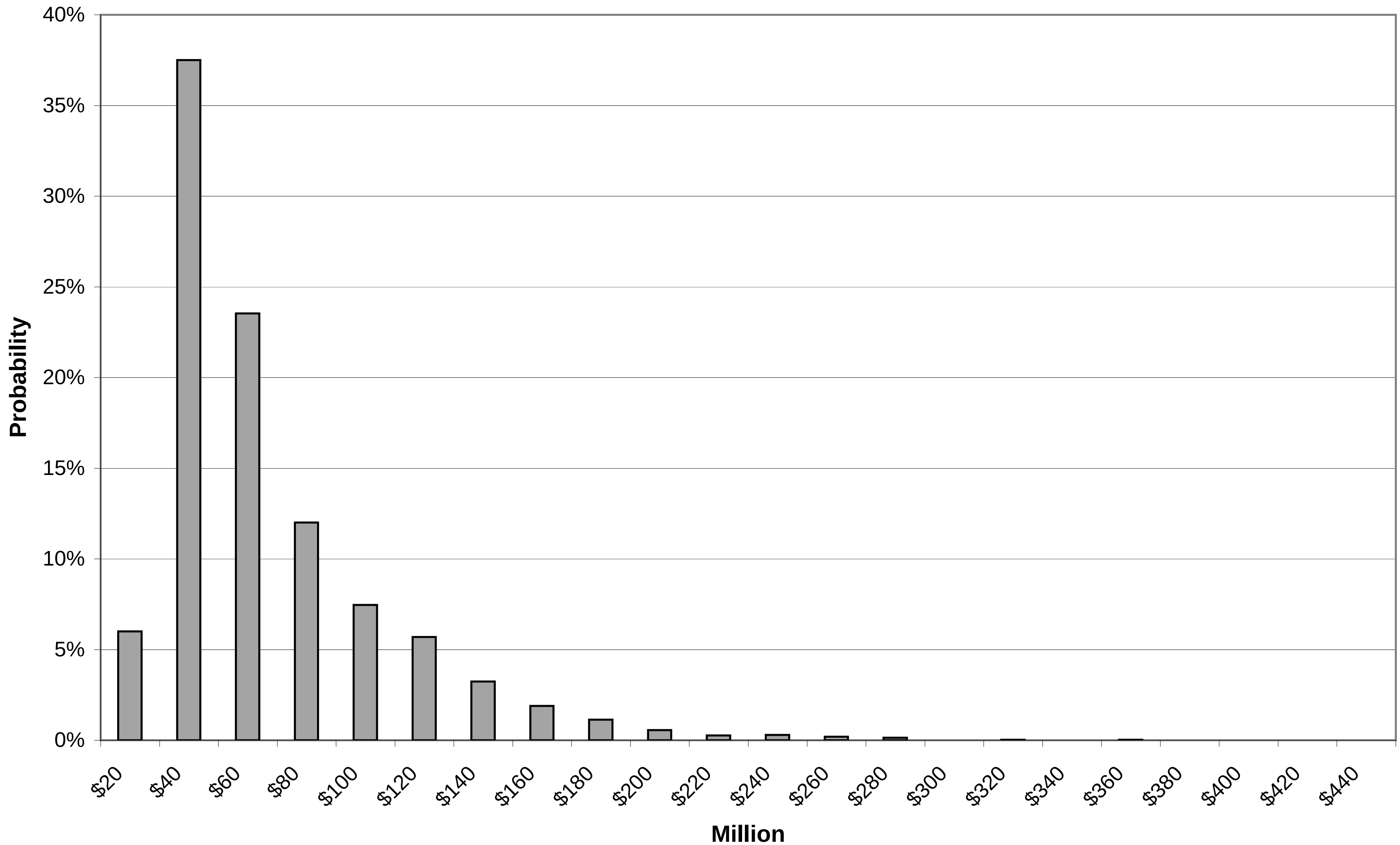
The difference in the 4(h)(10)(C) credits between the 50 Water Year Run and the Risk Simulation Run is derived from in the differences in the spot market electricity prices AURORA estimated between the 50 Water Year Run and the Risk Simulation Run.

## Graph 22: Simulated 4(h)(10)(C) Credits for FY 2007




Graph 23: Simulated 4(h)(10)(C) Credits for FY 2008
Probability
35%
30%
25%
20%
15%
10%
5%
0%
$20
$40
$60
$80
$100
$120
$140
$160
$180
$200
$220
$240
$260
$280
$300
$320
$340
$360
$380
$400
$420
$440
Million

## Graph 24: Simulated 4(h)(10)(C) Credits for FY 2009



## 1.17 Data Management Procedures (DMPs)

RiskMod receives data from a variety of sources and provides data to other computer models used in the rates process including AURORA, RAM2007, and ToolKit. Data are stored in two ACCESS databases, the Risk Input Database and the Risk Output Database. Figure 1 depicts a typical Risk Input Database and Figure 2 depicts a typical Risk Output Database. The computer applications used to move data between modules within RiskMod (i.e., RiskSim, RevSim, and the Risk input and output databases) and also between RiskMod and other computer models are collectively referred to as Data Management Procedures (DMPs).

**Figure 1: Typical Risk Input Database shown in Microsoft Access**

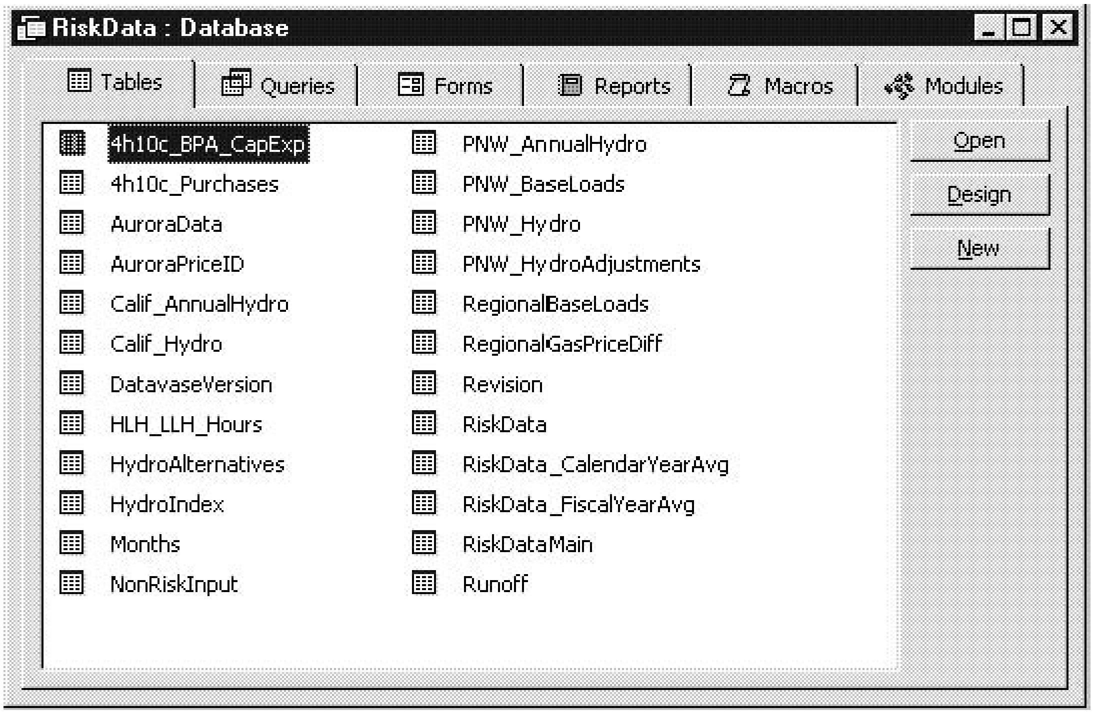
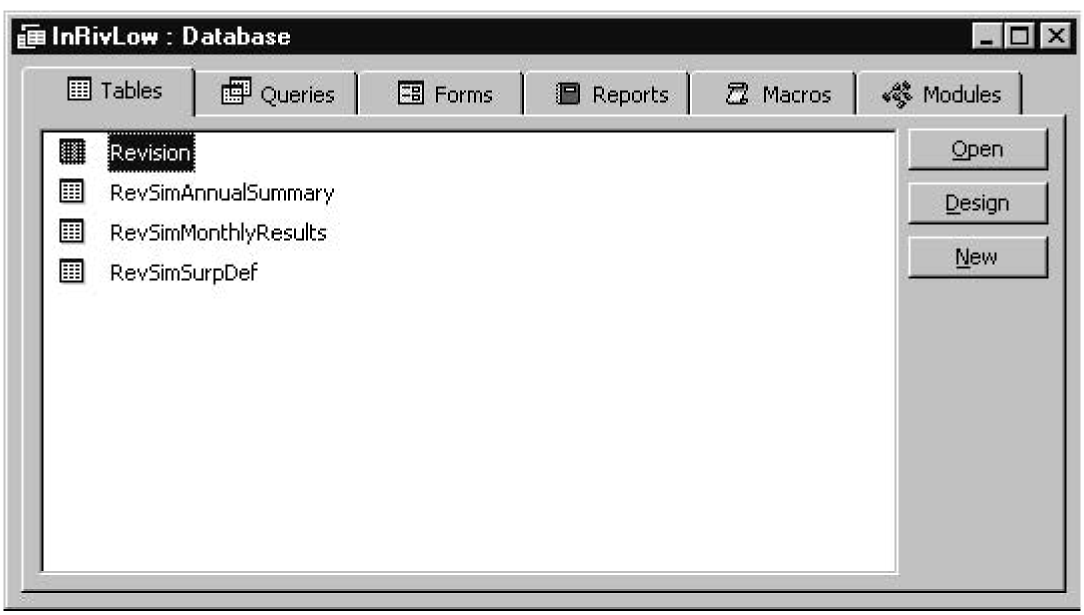



**Figure 2: Typical Risk Output Database shown in Microsoft Access**



**1.17.1 DMPs For Deterministic Data.** Deterministic data from the Load Resource Study, WP-07-E-BPA-01, are stored in the Risk Input Database and then read from the database by automated procedures within RevSim. Non-varying revenues, expenses, monthly rates, and the factor for estimating transmission losses are manually input directly into RevSim.

**1.17.2 DMPs For Hydro Generation Data.** Federal hydro generation data from the Load Resource Study, WP-07-E-BPA-01, are downloaded as flat energy and HLH energy generation for each of the 50 water years. These data are used to calculate Federal HLH hydro generation ratios for each of the 50 water years. The flat generation values and HLH ratios are loaded into the Risk Input Database using the Data Manager computer application, which is one of the Data Management Procedures previously discussed.

The adjustments to Federal hydro generation associated with refilling non-treaty storage in Canada and reconciling differences between the HydroSim study for FY 2006 and the HydroSim study for FY 2007 are not included in the Load Resource Study, WP-07-E-BPA-01, and were received in Excel workbooks. These adjustments are added to Federal generation values as part of the process of loading hydro generation data into the Risk Input Database.

**1.17.3 DMPs For Risk Data.** Risk data simulated by RiskSim are loaded into the Risk Input Database using the Data Manager computer application.

**1.17.4 DMPs For Interaction with AURORA.** AURORA reads data from an input Access database and writes results 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 (CY) data rather than FY data. The rate case period (FY 2007-2009) starts in October of CY 2006 and ends in September of CY 2009. In order to obtain prices that cover the rate case period, it is necessary to provide AURORA with four CY of data, *i.e.,* January 2006 through December 2009.

**1.17.4.1 AURORA Fifty (50) Water Year Run.** The only data varied in the 50 Water Year Run of AURORA is PNW hydro generation (*see* Hydroregulation component of the Load Resource Study, WP-07-E-BPA-01), which is reported in Tables 1-3 of this Study Documentation. Data are supplied to AURORA as twelve monthly energy "ratios" along with a $13^{th}$ value, which is the annual average hydro generation energy to capacity factor. The monthly hydro generation ratios supplied to AURORA are computed in 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 energy to capacity factor is calculated by dividing the PNW annual average hydro generation for each of the 50 water years (*see* Load Resource Study, WP-07-E-BPA-01) by the PNW hydro capacity used in AURORA (*see* Market Price Forecast Study, WP-07-E-BPA-03).

A link between the Excel workbook and the Access input file used by AURORA allows AURORA to read the data that is in the workbook.  A macro is used to alter values in the Excel workbook as each of the simulations (i.e., water years) is processed.  The whole process is combined in a script file that 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 three years, which the Data Manager loads into the Risk Input Database.

**1.17.4.2 AURORA 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.  *See* Market Price Forecast Study, WP-07-E-BPA-03. AURORA is used to estimate HLH and LLH spot market electricity prices for 3000 simulations.  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 Database for each simulation.  This workbook is called “RiskIn.”  The RiskIn 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 RiskIn, 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 3000 simulations.  Upon completion of the 3000 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 Database by the Data Manager.

**1.17.5  DMPs For RevSim.**  The net revenue simulations in RevSim combine variable data from the Risk Input Database with deterministic data that are directly input.  Code within RevSim reads the data from the Risk Input Database, activates the calculation within RevSim, and writes results to the Risk Output Database. The computer code contained in these procedures is comprised of a combination of Microsoft Visual Basic and Structured Query Language.

The procedures in RevSim perform the study one iteration at a time, i.e., 50 iterations for the 50 Water Year Run and 3000 iterations for the Risk Simulation Run.  For each iteration, data are read which reflect the variability in PF loads, the output of CGS, variable wind generation, transmission expenses,  DSI benefits, Federal hydro generation, Federal hydro generation HLH ratios, 4(h)(10)(c) power purchase amounts, and the HLH and LLH spot market electricity prices from the AURORA Model.  Using these data, surplus energy sales and purchase amounts (aMW), surplus energy revenues and power purchase expenses, 4(h)(10)(C) credits, and PBL net revenues are calculated and written to the Risk Output Database.  The Risk Output Database contains both monthly and annual summary data for many of the quantities calculated.

**1.17.6 DMPs Between RiskMod, RAM2007, and ToolKit.** Data transfers between these models are generally accomplished through Excel files or as manual data entry. Surplus energy revenues, power purchase expenses, and 4(h)(10)(C) credits are provided to RAM2007 as an Excel workbook generated from the Risk Output Database. *See* Wholesale Power Rate Development Study, WP-07-E-BPA-05, regarding RAM2007. Rates from RAM2007 are manually entered into RevSim from a RAM2007 summary file. Annual net revenues are provided from RiskMod to ToolKit as an Excel workbook generated from the Risk Output Database. There is no automated procedure for communicating the value of PNRR from ToolKit to RAM2007.

## 1.18 Interaction Between RiskMod, RAM2007, and ToolKit to Calculate Rates.

RiskMod is used in an iterative process with the RAM2007 and ToolKit Model to calculate rates, PNRR, and to design other financial tools as needed (i.e., surcharges or credits) to assure BPA will achieve its financial objectives for the rate period. The initial step in the process is to estimate the annual average surplus energy revenues, power purchase expenses, and 4(h)(10)(C) credits in the 50 Water Year Run of RiskMod and input these data into RAM2007. With this information, RAM2007 calculates an initial set of rates for the rate period which is fed back to RevSim. RevSim is run and produces 3000 net revenues for each FY in the rate period. These results are input into ToolKit to calculate the amount of PNRR and other financial tools needed to achieve BPA's financial objectives.

## 1.19 Results.

A statistical summary of the annual net revenues for FY 2007-2009 estimated by RiskMod using Proposed Rates with $96 million in PNRR is reported in Table 42. Net revenues over the rate period averaged $148.1 million/year. These values only represent the operational net revenues calculated in RiskMod and do not reflect additional net revenue adjustments in the ToolKit Model, such as IOU benefits, the NORM output, interest earned on cash reserves, Cost Recovery Adjustment Clause (CRAC), and Dividend Distribution Clause (DDC).

## Table 42: RiskMod Net Revenue Statistics (With PNRR of $96 million)

| | FY 2007 | FY 2008 | FY 2009 |
|---|---|---|---|
| **Average** | 216,347 | 180,125 | 47,867 |
| **Median** | 185,647 | 161,110 | 26,168 |
| **Standard Deviation** | 371,585 | 298,035 | 301,326 |
| | | | |
| **1% <=** | -441,154 | -376,026 | -507,465 |
| **2.5% <=** | -379,325 | -322,735 | -439,190 |
| **5% <=** | -341,977 | -272,790 | -397,495 |
| **10% <=** | -245,477 | -205,872 | -343,487 |
| **15% <=** | -163,600 | -136,589 | -282,918 |
| **20% <=** | -95,925 | -70,867 | -211,295 |
| **25% <=** | -35,389 | -22,778 | -152,298 |
| **30% <=** | 6,454 | 12,634 | -108,414 |
| **35% <=** | 52,827 | 52,563 | -71,328 |
| **40% <=** | 101,242 | 89,728 | -38,026 |
| **45% <=** | 147,760 | 126,964 | -6,684 |
| **50% <=** | 185,163 | 161,043 | 26,050 |
| **55% <=** | 222,039 | 195,961 | 64,121 |
| **60% <=** | 267,951 | 233,383 | 99,860 |
| **65% <=** | 315,533 | 274,118 | 138,359 |
| **70% <=** | 369,700 | 313,130 | 179,445 |
| **75% <=** | 428,762 | 358,468 | 223,758 |
| **80% <=** | 501,410 | 417,905 | 278,442 |
| **85% <=** | 581,682 | 480,809 | 343,608 |
| **90% <=** | 701,519 | 566,267 | 439,173 |
| **95% <=** | 881,296 | 706,323 | 566,205 |
| **97.5% <=** | 1,078,437 | 836,602 | 716,056 |
| **99% <=** | 1,252,221 | 1,028,338 | 898,243 |

## 2. NON-OPERATING RISK MODEL (NORM)

### 2.1 Methodology

NORM is written in Excel 2003 with the @RISK add-in package. Each of the risks is modeled using probability functions available in @RISK. Some of these functions are *discrete* while others are *continuous*. Discrete functions take 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.

Since NORM is used to represent the possibilities that actual values for various factors will be different from the deterministic value used as starting points in the rate case calculations, this example will illustrate NORM better with one change. Assume that the expected value of the roll of the die, 3.5, has been used in the revenue requirement. Then the actual NORM distribution would comprise the six possible values shown above, while the output from NORM used in the ToolKit would comprise the six deviations from the expected value, or 2.5, 1.5, .5, -.5, -1.5, and -2.5.

Each risk modeled in NORM is described by a *model* and enough data to *specify* the model. A model could be as simple as the discrete risk example above of a single die, or it could be a complicated formula with many random factors in it, each of which uses a different probability distribution. A simple model's specification might require only a few numbers; a complex model might require specifying several distributions (identifying the distributions and giving the parameters) as well as the functional relationships among the various distributions.

Some distributions in NORM are continuous probability distributions, such as the Normal probability distribution. For these, the *parameters* of the distribution of possible deviations are entered (*e.g.*, mean and standard deviation for the Normal distribution). For example, the Consumer Price Index (CPI) is a factor in the calculation of payments under the

Colville/Spokane Settlement. The future values of the CPI cannot be known now, but are modeled in NORM. The annual change in the CPI is modeled as a Normal distribution with a mean of 3.0% and a standard deviation of 0.1%. In each game, @Risk produces a number for the annual change in CPI in such a way that the set of results from all of the games approximates a Normal distribution, that is, @Risk "draws" a number from a Normal distribution with mean of 3.0% and standard deviation of 0.1%. This set of results will approximate a Normal distribution more and more closely as the number of games increases.

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 that a line item will deviate from the costs included in the revenue requirement could be distributed as follows:

- 40 percent probability that costs will deviate $0 (in other words, a 40 percent probability that they will 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 output)
- 20 percent probability that costs will be $10 M lower (shown as $10 M in NORM output)
- 10 percent probability that costs will be $25 M higher
- 10 percent probability that costs will be $25 M lower

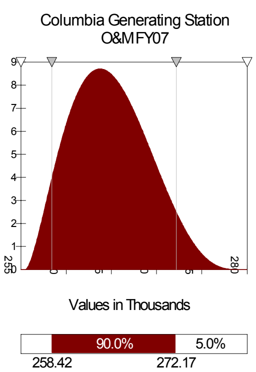
NORM models the risks of the generation function, as well as the risks of the Corporate costs which are the responsibility of the generation function. Transmission function risks are not included in the analysis. In general, NORM includes the generation function expense uncertainty due to the rates yet to be developed for transmission services. The impacts of transmission function revenue uncertainty on BPA's financial picture are excluded. NORM does model some changes in revenue, and some changes in cash. Many of the expense risks are included in the Slice true-up, so NORM models the change in the Slice true-up that would be implied by a change in these expense items, which could result in an increase in revenue if the Slice true-up is positive for BPA. A NORM deviation of -$10M subject to the Slice true-up is handled in this way. In year N, the increase of $10M in expense is noted. $2.26M of this will be covered by the Slice true-up booked in that same year, so NORM notes an increase in net revenue of $2.26M, partially offsetting that expense increase. In that same year N, cash is decreased by the full $10M, but the payment by the Slice customers (or a reduction in payment by BPA to the Slice customers) of $2.26M in the year following year N is also noted. 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 associated deviations and probabilities assumed are shown in Section 2.2.

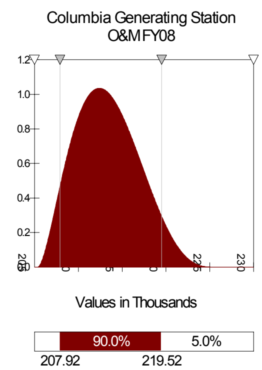
## 2.2 NORM Distributions

### 2.2.1 CGS O&M Distributions

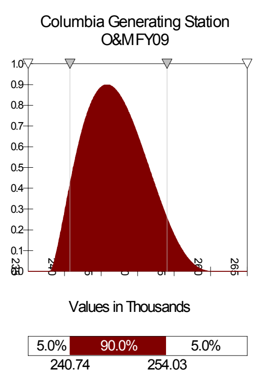
**Table 1: CGS O&M Distributions**



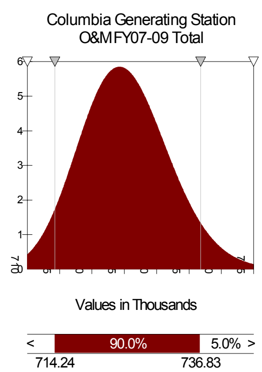

| | | |
|---|---|---|
| Minimum | $ | 255,616 |
| 5th Percentile | $ | 258,460 |
| Median | $ | 264,500 |
| 95th Percentile | $ | 272,214 |
| Maximum | $ | 277,616 |
| Std. Dev | $ | 4,204 |
| Initial Proposal | $ | 256,300 |




| | | |
|---|---|---|
| Minimum | $ | 205,599 |
| 5th Percentile | $ | 207,915 |
| Median | $ | 213,089 |
| 95th Percentile | $ | 219,477 |
| Maximum | $ | 224,376 |
| Std. Dev | $ | 3,540 |
| Initial Proposal | $ | 206,300 |



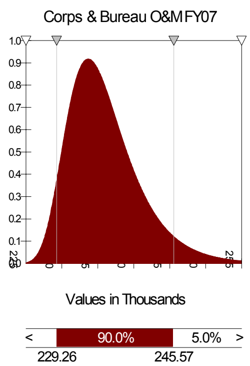

| | | |
|---|---|---|
| Minimum | $ | 238,301 |
| 5th Percentile | $ | 240,773 |
| Median | $ | 246,630 |
| 95th Percentile | $ | 254,055 |
| Maximum | $ | 259,339 |
| Std. Dev | $ | 4,056 |
| Initial Proposal | $ | 238,800 |



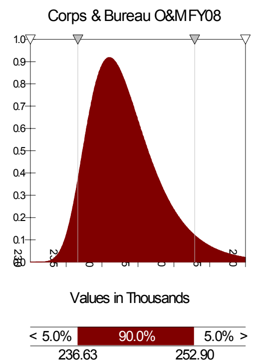

| | | |
|---|---|---|
| Minimum | $ | 707,576 |
| 5th Percentile | $ | 714,154 |
| Median | $ | 724,918 |
| 95th Percentile | $ | 736,896 |
| Maximum | $ | 749,590 |
| Std. Dev | $ | 6,874 |
| Initial Proposal | $ | 701,400 |

## 2.2.2 COE and Bureau O&M Distributions

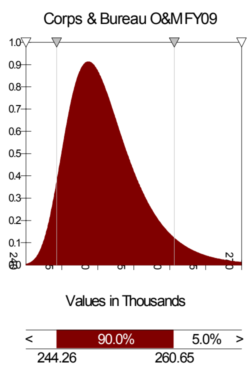
**Table 2: COE and Bureau O&M Distributions**



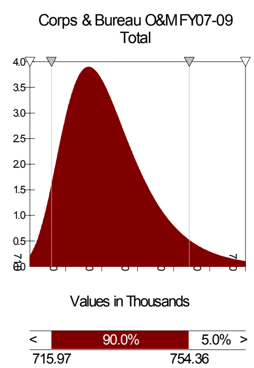

| | | |
|---|---|---|
| Minimum | $ | 231,187 |
| 5th Percentile | $ | 231,575 |
| Median | $ | 232,629 |
| 95th Percentile | $ | 250,477 |
| Maximum | $ | 308,900 |
| Std. Dev | $ | 7,958 |
| Initial Proposal | $ | 233,173 |




| | | |
|---|---|---|
| Minimum | $ | 238,518 |
| 5th Percentile | $ | 238,906 |
| Median | $ | 239,973 |
| 95th Percentile | $ | 257,626 |
| Maximum | $ | 299,487 |
| Std. Dev | $ | 7,645 |
| Initial Proposal | $ | 240,502 |



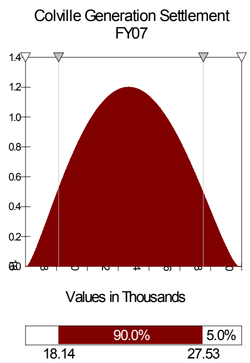

| | | |
|---|---|---|
| Minimum | $ | 246,188 |
| 5th Percentile | $ | 246,599 |
| Median | $ | 247,628 |
| 95th Percentile | $ | 265,564 |
| Maximum | $ | 307,036 |
| Std. Dev | $ | 7,769 |
| Initial Proposal | $ | 248,173 |



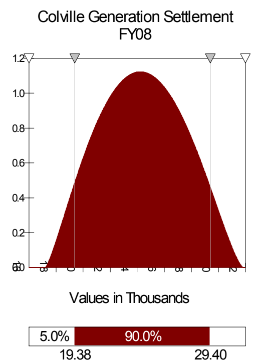

| | | |
|---|---|---|
| Minimum | $ | 716,741 |
| 5th Percentile | $ | 718,355 |
| Median | $ | 731,713 |
| 95th Percentile | $ | 757,181 |
| Maximum | $ | 828,733 |
| Std. Dev | $ | 13,558 |
| Initial Proposal | $ | 721,848 |

## 2.2.3 Colville Settlement Payments Distributions

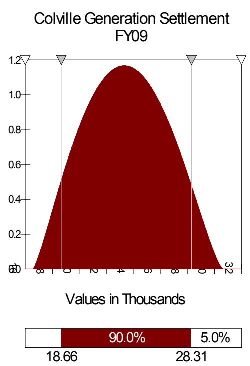
**Table 3: Colville Settlement Payments Distributions**



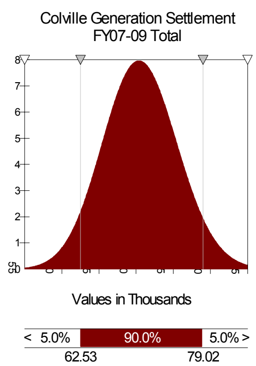

| | | |
|---|---|---|
| Minimum | $ | 16,500 |
| 5th Percentile | $ | 18,068 |
| Median | $ | 22,778 |
| 95th Percentile | $ | 27,569 |
| Maximum | $ | 29,336 |
| Std. Dev | $ | 2,840 |
| Initial Proposal | $ | 16,968 |




| | | |
|---|---|---|
| Minimum | $ | 17,624 |
| 5th Percentile | $ | 19,299 |
| Median | $ | 24,334 |
| 95th Percentile | $ | 29,454 |
| Maximum | $ | 31,331 |
| Std. Dev | $ | 3,034 |
| Initial Proposal | $ | 17,354 |



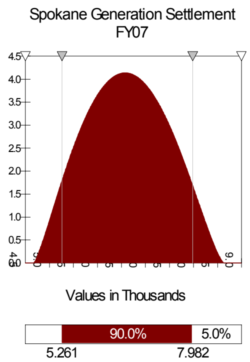

| | | |
|---|---|---|
| Minimum | $ | 16,979 |
| 5th Percentile | $ | 18,581 |
| Median | $ | 23,428 |
| 95th Percentile | $ | 28,359 |
| Maximum | $ | 30,182 |
| Std. Dev | $ | 2,921 |
| Initial Proposal | $ | 17,749 |



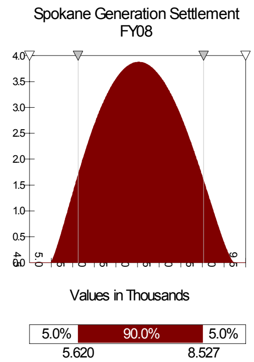

| | | |
|---|---|---|
| Minimum | $ | 53,528 |
| 5th Percentile | $ | 62,493 |
| Median | $ | 70,615 |
| 95th Percentile | $ | 78,942 |
| Maximum | $ | 88,158 |
| Std. Dev | $ | 5,013 |
| Initial Proposal | $ | 52,071 |

## 2.2.4 Spokane Settlement Payment Distributions

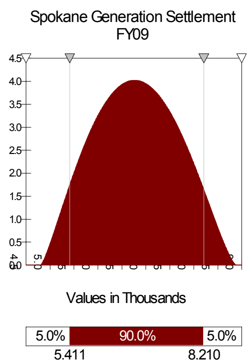
**Table 4: Spokane Settlement Payment Distributions**



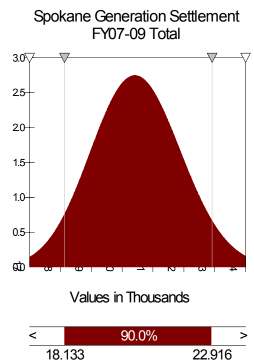

| | | |
|---|---|---|
| Minimum | $ | 4,785 |
| 5th Percentile | $ | 5,240 |
| Median | $ | 6,606 |
| 95th Percentile | $ | 7,995 |
| Maximum | $ | 8,507 |
| Std. Dev | $ | 824 |
| Initial Proposal | $ | - |




| | | |
|---|---|---|
| Minimum | $ | 5,111 |
| 5th Percentile | $ | 5,597 |
| Median | $ | 7,057 |
| 95th Percentile | $ | 8,542 |
| Maximum | $ | 9,086 |
| Std. Dev | $ | 880 |
| Initial Proposal | $ | - |




| | | |
|---|---|---|
| Minimum | $ | 4,924 |
| 5th Percentile | $ | 5,389 |
| Median | $ | 6,794 |
| 95th Percentile | $ | 8,224 |
| Maximum | $ | 8,753 |
| Std. Dev | $ | 847 |
| Initial Proposal | $ | - |




| | | |
|---|---|---|
| Minimum | $ | 15,523 |
| 5th Percentile | $ | 18,123 |
| Median | $ | 20,478 |
| 95th Percentile | $ | 22,893 |
| Maximum | $ | 25,566 |
| Std. Dev | $ | 1,454 |
| Initial Proposal | $ | - |

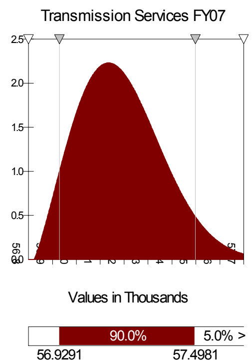
## 2.2.5 Public Residential Exchange Cost Distributions

**Table 5: Public Res. Exch. Cost Distributions**

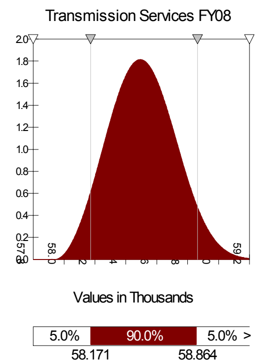
| Probability | 2007 | 2008 | 2009 |
|---|---|---|---|
| | | $000 | |
| 80.0% | $ - | $ - | $ - |
| 10.0% | $ 15,000 | $ 15,000 | $ 15,000 |
| 5.0% | $ 45,000 | $ 45,000 | $ 45,000 |
| 3.0% | $ 60,000 | $ 60,000 | $ 60,000 |
| 2.0% | $ 80,000 | $ 80,000 | $ 80,000 |

## 2.2.6 Transmission Services Expense Distributions

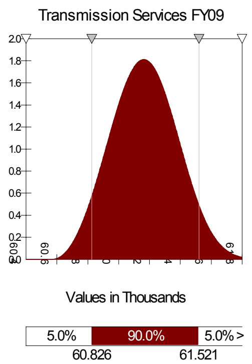
**Table 6: Transmission Services Expense Distributions**



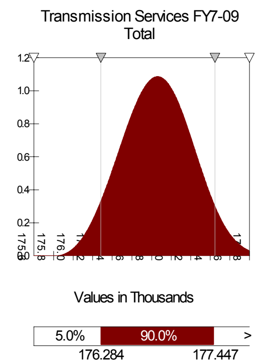

| | | |
|---|---|---|
| Minimum | $ | 56,824 |
| 5th Percentile | $ | 56,941 |
| Median | $ | 57,162 |
| 95th Percentile | $ | 57,509 |
| Maximum | $ | 57,803 |
| Std. Dev | $ | 175 |
| Initial Proposal | $ | 56,962 |




| | | |
|---|---|---|
| Minimum | $ | 57,945 |
| 5th Percentile | $ | 58,190 |
| Median | $ | 58,494 |
| 95th Percentile | $ | 58,876 |
| Maximum | $ | 59,171 |
| Std. Dev | $ | 209 |
| Initial Proposal | $ | 56,962 |



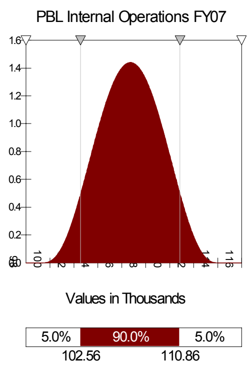

| | | |
|---|---|---|
| Minimum | $ | 60,569 |
| 5th Percentile | $ | 60,853 |
| Median | $ | 61,153 |
| 95th Percentile | $ | 61,530 |
| Maximum | $ | 61,943 |
| Std. Dev | $ | 208 |
| Initial Proposal | $ | 59,662 |



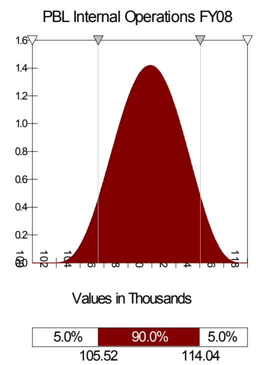

| | | |
|---|---|---|
| Minimum | $ | 175,819 |
| 5th Percentile | $ | 176,294 |
| Median | $ | 176,854 |
| 95th Percentile | $ | 177,458 |
| Maximum | $ | 178,059 |
| Std. Dev | $ | 349 |
| Initial Proposal | $ | 173,586 |

## 2.2.7 Internal Operations Distributions

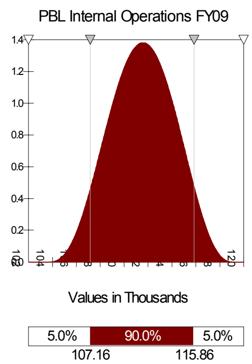
**Table 7: Internal Operations Distributions**



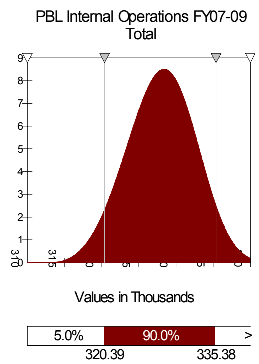

| | | |
|---|---|---|
| Minimum | $ | 99,660 |
| 5th Percentile | $ | 102,575 |
| Median | $ | 106,664 |
| 95th Percentile | $ | 110,925 |
| Maximum | $ | 113,220 |
| Std. Dev | $ | 2,521 |
| Initial Proposal | $ | 106,747 |




| | | |
|---|---|---|
| Minimum | $ | 102,353 |
| 5th Percentile | $ | 105,512 |
| Median | $ | 109,811 |
| 95th Percentile | $ | 114,021 |
| Maximum | $ | 116,811 |
| Std. Dev | $ | 2,586 |
| Initial Proposal | $ | 109,841 |



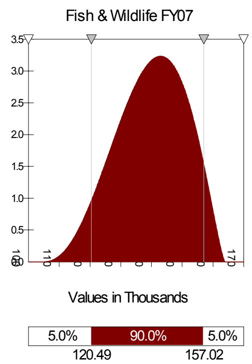

| | | |
|---|---|---|
| Minimum | $ | 104,140 |
| 5th Percentile | $ | 107,152 |
| Median | $ | 111,504 |
| 95th Percentile | $ | 115,912 |
| Maximum | $ | 119,074 |
| Std. Dev | $ | 2,657 |
| Initial Proposal | $ | 111,566 |



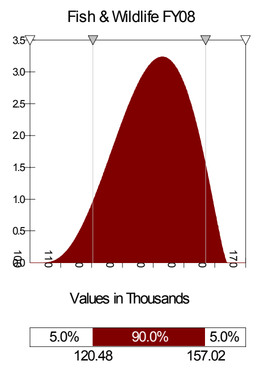

| | | |
|---|---|---|
| Minimum | $ | 312,899 |
| 5th Percentile | $ | 320,889 |
| Median | $ | 328,047 |
| 95th Percentile | $ | 335,234 |
| Maximum | $ | 342,780 |
| Std. Dev | $ | 4,378 |
| Initial Proposal | $ | 328,154 |

## 2.2.8 Fish and Wildlife Direct Program Expense Distributions

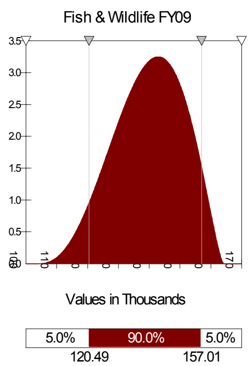
**Table 8: F&W Direct Program Expense Distributions**



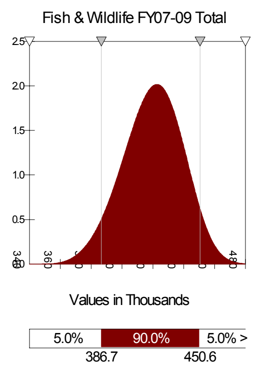

| | | |
|---|---|---|
| Minimum | $ | 107,056 |
| 5th Percentile | $ | 120,458 |
| Median | $ | 140,672 |
| 95th Percentile | $ | 157,007 |
| Maximum | $ | 163,722 |
| Std. Dev | $ | 11,146 |
| Initial Proposal | $ | 143,000 |




| | | |
|---|---|---|
| Minimum | $ | 106,934 |
| 5th Percentile | $ | 120,467 |
| Median | $ | 140,671 |
| 95th Percentile | $ | 156,995 |
| Maximum | $ | 163,505 |
| Std. Dev | $ | 11,146 |
| Initial Proposal | $ | 143,000 |



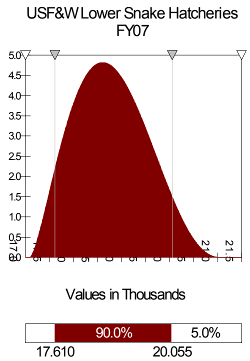

| | | |
|---|---|---|
| Minimum | $ | 107,054 |
| 5th Percentile | $ | 120,467 |
| Median | $ | 140,675 |
| 95th Percentile | $ | 156,992 |
| Maximum | $ | 163,243 |
| Std. Dev | $ | 11,145 |
| Initial Proposal | $ | 143,000 |



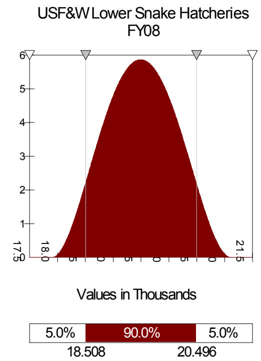

| | | |
|---|---|---|
| Minimum | $ | 358,521 |
| 5th Percentile | $ | 387,545 |
| Median | $ | 420,459 |
| 95th Percentile | $ | 449,595 |
| Maximum | $ | 475,742 |
| Std. Dev | $ | 18,847 |
| Initial Proposal | $ | 429,000 |

## 2.2.9 Lower Snake River Hatcheries Expense Distributions

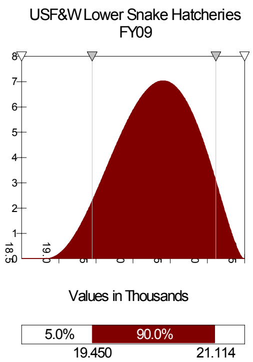
**Table 9: Lower Snake River Hatcheries Expense Distributions**



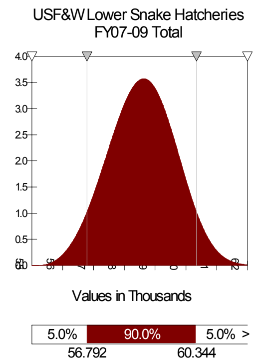

| | | |
|---|---|---|
| Minimum | $ | 17,119 |
| 5th Percentile | $ | 17,610 |
| Median | $ | 18,727 |
| 95th Percentile | $ | 20,057 |
| Maximum | $ | 20,907 |
| Std. Dev | $ | 745 |
| Initial Proposal | $ | 18,600 |




| | | |
|---|---|---|
| Minimum | $ | 17,996 |
| 5th Percentile | $ | 18,505 |
| Median | $ | 19,500 |
| 95th Percentile | $ | 20,494 |
| Maximum | $ | 21,067 |
| Std. Dev | $ | 605 |
| Initial Proposal | $ | 19,500 |




| | | |
|---|---|---|
| Minimum | $ | 18,878 |
| 5th Percentile | $ | 19,451 |
| Median | $ | 20,336 |
| 95th Percentile | $ | 21,114 |
| Maximum | $ | 21,453 |
| Std. Dev | $ | 506 |
| Initial Proposal | $ | 20,400 |




| | | |
|---|---|---|
| Minimum | $ | 55,373 |
| 5th Percentile | $ | 56,840 |
| Median | $ | 58,588 |
| 95th Percentile | $ | 60,355 |
| Maximum | $ | 62,489 |
| Std. Dev | $ | 1,075 |
| Initial Proposal | $ | 58,500 |

## 2.2.10 30-Year Borrowing Rates

**Table 10: 30-Year Borowing Rates**

**30-Year Appropriation Borrowing Rate Dist.**

| Probability | 2007 | 2008 | 2009 |
|---|---|---|---|
| 95.0% | 4.72 | 5.06 | 5.51 |
| 90.0% | 4.96 | 5.31 | 5.76 |
| 85.0% | 5.14 | 5.49 | 5.94 |
| 80.0% | 5.27 | 5.63 | 6.09 |
| 75.0% | 5.39 | 5.76 | 6.22 |
| 70.0% | 5.51 | 5.87 | 6.34 |
| 65.0% | 5.62 | 5.98 | 6.45 |
| 60.0% | 5.73 | 6.09 | 6.55 |
| 55.0% | 5.83 | 6.20 | 6.66 |
| 50.0% | 5.94 | 6.30 | 6.77 |
| 45.0% | 6.04 | 6.41 | 6.87 |
| 40.0% | 6.15 | 6.52 | 6.99 |
| 35.0% | 6.28 | 6.64 | 7.10 |
| 30.0% | 6.40 | 6.77 | 7.23 |
| 25.0% | 6.54 | 6.90 | 7.37 |
| 20.0% | 6.70 | 7.06 | 7.52 |
| 15.0% | 6.88 | 7.26 | 7.71 |
| 10.0% | 7.13 | 7.50 | 7.96 |
| 5.0% | 7.51 | 7.88 | 8.34 |

**30-Year Treasury Borrowing Rate Dist.**

| Probability | 2007 | 2008 | 2009 |
|---|---|---|---|
| 95.0% | 5.62 | 5.96 | 6.41 |
| 90.0% | 5.86 | 6.21 | 6.66 |
| 85.0% | 6.04 | 6.39 | 6.84 |
| 80.0% | 6.17 | 6.53 | 6.99 |
| 75.0% | 6.29 | 6.66 | 7.12 |
| 70.0% | 6.41 | 6.77 | 7.24 |
| 65.0% | 6.52 | 6.88 | 7.35 |
| 60.0% | 6.63 | 6.99 | 7.45 |
| 55.0% | 6.73 | 7.10 | 7.56 |
| 50.0% | 6.84 | 7.20 | 7.67 |
| 45.0% | 6.94 | 7.31 | 7.77 |
| 40.0% | 7.05 | 7.42 | 7.89 |
| 35.0% | 7.18 | 7.54 | 8.00 |
| 30.0% | 7.30 | 7.67 | 8.13 |
| 25.0% | 7.44 | 7.80 | 8.27 |
| 20.0% | 7.60 | 7.96 | 8.42 |
| 15.0% | 7.78 | 8.16 | 8.61 |
| 10.0% | 8.03 | 8.40 | 8.86 |
| 5.0% | 8.41 | 8.78 | 9.24 |

**Table11: 5-Year & 10-Year Borowing Rates**

**5-Year Treasury Borrowing Rate Dist.**

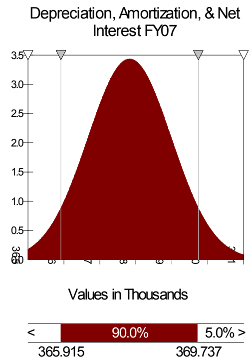
| Probability | 2007 | 2008 | 2009 |
|---|---|---|---|
| 95.0% | 3.53 | 4.03 | 4.70 |
| 90.0% | 3.82 | 4.33 | 5.02 |
| 85.0% | 4.03 | 4.54 | 5.23 |
| 80.0% | 4.20 | 4.71 | 5.42 |
| 75.0% | 4.35 | 4.88 | 5.59 |
| 70.0% | 4.49 | 5.03 | 5.74 |
| 65.0% | 4.63 | 5.17 | 5.88 |
| 60.0% | 4.77 | 5.31 | 6.03 |
| 55.0% | 4.91 | 5.45 | 6.17 |
| 50.0% | 5.05 | 5.59 | 6.32 |
| 45.0% | 5.20 | 5.75 | 6.47 |
| 40.0% | 5.34 | 5.90 | 6.62 |
| 35.0% | 5.50 | 6.06 | 6.78 |
| 30.0% | 5.68 | 6.24 | 6.96 |
| 25.0% | 5.88 | 6.44 | 7.15 |
| 20.0% | 6.12 | 6.66 | 7.38 |
| 15.0% | 6.40 | 6.93 | 7.65 |
| 10.0% | 6.78 | 7.31 | 8.02 |
| 5.0% | 7.38 | 7.91 | 8.60 |

**10-Year Muni Tax-Exempt Borrowing Rate Dist.**

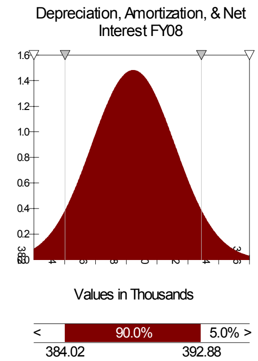
| Probability | 2007 | 2008 | 2009 |
|---|---|---|---|
| 95.0% | 3.61 | 3.99 | 4.49 |
| 90.0% | 3.81 | 4.19 | 4.70 |
| 85.0% | 3.95 | 4.34 | 4.85 |
| 80.0% | 4.06 | 4.46 | 4.97 |
| 75.0% | 4.16 | 4.56 | 5.08 |
| 70.0% | 4.26 | 4.66 | 5.18 |
| 65.0% | 4.35 | 4.75 | 5.27 |
| 60.0% | 4.44 | 4.84 | 5.36 |
| 55.0% | 4.53 | 4.92 | 5.45 |
| 50.0% | 4.62 | 5.01 | 5.53 |
| 45.0% | 4.70 | 5.11 | 5.62 |
| 40.0% | 4.80 | 5.20 | 5.72 |
| 35.0% | 4.90 | 5.30 | 5.81 |
| 30.0% | 5.00 | 5.41 | 5.92 |
| 25.0% | 5.12 | 5.52 | 6.03 |
| 20.0% | 5.26 | 5.65 | 6.16 |
| 15.0% | 5.42 | 5.81 | 6.32 |
| 10.0% | 5.63 | 6.02 | 6.53 |
| 5.0% | 5.96 | 6.35 | 6.86 |

### 2.2.11 Federal Depreciation, Amortization and Net Interest Distributions

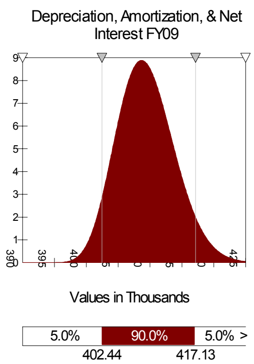
**Table 12: Federal Depreciation, Amortization and Net Interest Distributions**



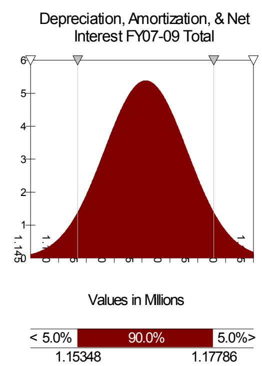

| | | |
|---|---|---|
| Minimum | $ | 363,351 |
| 5th Percentile | $ | 365,928 |
| Median | $ | 367,818 |
| 95th Percentile | $ | 369,757 |
| Maximum | $ | 371,549 |
| Std. Dev | $ | 1,162 |
| Initial Proposal | $ | 368,479 |




| | | |
|---|---|---|
| Minimum | $ | 380,611 |
| 5th Percentile | $ | 384,152 |
| Median | $ | 388,406 |
| 95th Percentile | $ | 392,984 |
| Maximum | $ | 397,543 |
| Std. Dev | $ | 2,693 |
| Initial Proposal | $ | 388,155 |




| | | |
|---|---|---|
| Minimum | $ | 396,895 |
| 5th Percentile | $ | 402,390 |
| Median | $ | 409,174 |
| 95th Percentile | $ | 417,107 |
| Maximum | $ | 426,948 |
| Std. Dev | $ | 4,474 |
| Initial Proposal | $ | 407,945 |




| | | |
|---|---|---|
| Minimum | $ | 1,143,080 |
| 5th Percentile | $ | 1,153,684 |
| Median | $ | 1,165,516 |
| 95th Percentile | $ | 1,178,059 |
| Maximum | $ | 1,193,697 |
| Std. Dev | $ | 7,411 |
| Initial Proposal | $ | 1,164,579 |

## 2.2.12 Annual Grand Coulee Generation

**Table 13: Annual Grand Coulee Generation**

| Avg. MW | GWh |
|---|---|
| 1,931 | 16,916 |
| 1,947 | 17,053 |
| 2,025 | 17,743 |
| 2,380 | 20,845 |
| 2,766 | 24,228 |
| 3,267 | 28,615 |
| 2,453 | 21,486 |
| 2,312 | 20,256 |
| 1,944 | 17,028 |
| 2,456 | 21,515 |
| 2,189 | 19,174 |
| 2,317 | 20,300 |
| 1,998 | 17,498 |
| 2,317 | 20,296 |
| 2,512 | 22,007 |
| 1,836 | 16,084 |
| 1,975 | 17,297 |
| 2,441 | 21,387 |
| 2,646 | 23,177 |
| 2,864 | 25,087 |
| 2,436 | 21,337 |
| 2,594 | 22,726 |
| 2,892 | 25,335 |
| 2,697 | 23,623 |
| 2,417 | 21,174 |
| 2,755 | 24,132 |
| 2,803 | 24,553 |
| 3,096 | 27,119 |
| 2,600 | 22,775 |
| 2,432 | 21,306 |
| 2,797 | 24,501 |
| 2,991 | 26,205 |
| 2,787 | 24,413 |
| 2,416 | 21,165 |
| 2,496 | 21,867 |
| 2,556 | 22,392 |
| 2,812 | 24,637 |
| 2,578 | 22,579 |
| 2,715 | 23,781 |
| 2,551 | 22,349 |
| 3,029 | 26,534 |
| 2,346 | 20,553 |
| 2,676 | 23,443 |
| 3,091 | 27,078 |
| 2,245 | 19,663 |
| 3,097 | 27,129 |
| 2,655 | 23,257 |
| 2,855 | 25,012 |
| 2,359 | 20,661 |
| 2,266 | 19,851 |

| | GWh |
|---|---|
| **Mean** | 22,183 |
| **Std. Dev.** | 3,003 |
| **Min** | 16,084 |
| **Max** | 28,615 |

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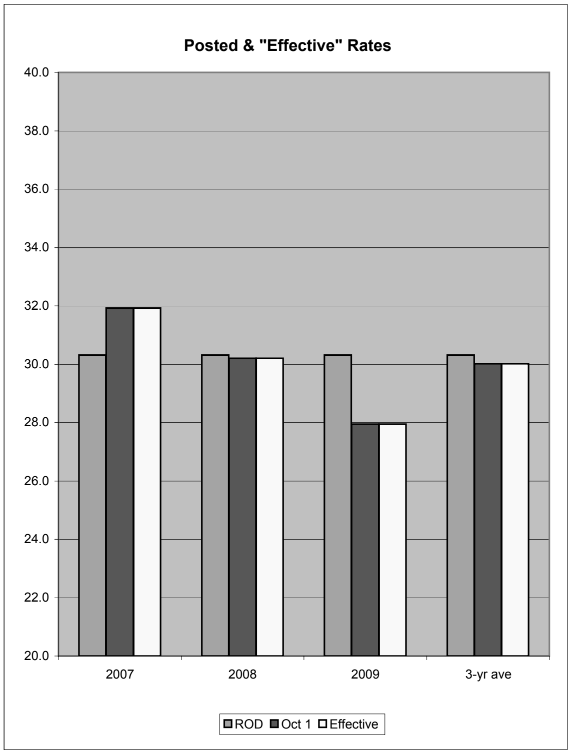
## 3. TOOLKIT OUTPUT

### 3.1 BPA's Proposal: Reserves, Fixed PNRR, CRAC, and DDC

Table 1: ToolKit Main
Table 2: Graphs
Table 3: Statistical Summary

| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | **ToolKit v. 2.30, (11-13-2005)** | | | | | Study title: | I.P.: 100% credit of Net Sec Rev, $300M CRAC, 06 Cap=706, Flat PNRR, $50M LiqRes \| PBL reserves | | | | | | | | | | | |
| 2 | **Time of run: 23:52:07 on 11-13-05** | | | | 3 | -yr TPP = | 92.63% | Run Type | PBL-only run | | | | | | | | | |
| 3 | **Inputs** | PBL data: | RM_PNRR96_3YrRate31-10_19-Oct-05.xls | | | | | | | | | | | | | | | |
| 4 | | NORM dat | NORM 10-18-05_Output.xls | | | | | | | | | | | | | | | |
| 5 | Files => | TBL data: | | | | | | | | | | | | | | | | |
| 6 | Start in | Stop in | Run Type | CRAC | PBL | TBL | PBL Strt. | Add'l | Deferral | ☐ | Sec. Rev. Rebate Description | | | | | | | |
| 7 | TK Year | TK Year | PBL | Lim/Total | LiqRes | LiqRes | ANR | LiqRes 7-9 | Logic | n / a | | | | | | | | |
| 8 | 2 | 6 | BPA | 20,000 | 50 | 20 | -519.62 | 0 | Hybrid | | | | | | | | | |
| 9 | Start TPP | "Small" | No. of | PBL Strt | TBL Strt | Debug | Reserves | AutoPrint | AutoPrint | Flat PNRR | Enable | CRAC | CRAC | | | | | |
| 10 | in TK Yr | Def. Size | Iterations | Rsrv Bal | Rsrv Bal | Level | Graph | Res Grph | This Page | Rate Imp.? | PNRR? | Fixed? | Stats On? | | | | | |
| 11 | 4 | $200 | 3,000 | 402.0 | 0 | 0 | ☑ | ☐ | ☐ | ☑ | ☑ | ☐ | ☐ | | | | | |
| 12 | ToolKit | Fiscal | Probabi- | Treasury | Amort | Interest | PBL Int. | TBL Int. | Other | TBL Rsrvs | Cash Lag | PBL Cash | TBL Cash | | | | | |
| 13 | Year | Year | listic? | Int. Rate | Sched | Sched | Cr. Sched | Cr. Sched | Cash Adj | Available | for PNRR | Tmg Adj | Tmg Adj | | | | | |
| 15 | 2 | 2005 | TRUE | 4.75% | 271.3 | 247.4 | 29.96 | 11.08 | | 0.0 | | 11.5 | 4.6 | | | | | |
| 16 | 3 | 2006 | TRUE | 4.75% | 296.5 | 250.4 | 0.00 | 11.14 | -4.1 | 0.0 | | 12.2 | 5.8 | | | | | |
| 17 | 4 | 2007 | TRUE | 4.75% | 170.3 | 270.1 | 10.03 | | 23.1 | 55.0 | -10.6 | 7.2 | | | | | | |
| 18 | 5 | 2008 | TRUE | 4.75% | 185.2 | 291.6 | 10.47 | | 12.2 | -57.6 | 0.0 | 7.5 | | | | | | |
| 19 | 6 | 2009 | TRUE | 4.75% | 176.4 | 306.1 | 10.33 | | 23.1 | 0.0 | 0.0 | 7.4 | | | | | | |
| 20 | ToolKit | Fiscal | Div. Dist. | | CRAC | | | PNRR | | | | TBL Fed. | PBL Fed. | Other NR | Delta | | | |
| 21 | Year | Year | Threshold | Lim/Year | Threshold | Lim/Year | Rev Basis | Shape | Risk Mod | Calc'd in TK | Sum | Int. Red. | Int. Red. | & Csh Adj | Int. Cred. | | | |
| 23 | 2 | 2005 | 401 | 5,000 | 1 | 0 | 1,017.3 | 0.0 | | | | | | 6.6 | | | | |
| 24 | 3 | 2006 | 401 | 5,000 | 1 | 0 | 1,028.1 | 0.0 | | | | | | | | | | |
| 25 | 4 | 2007 | 133 | 1,282 | -197 | 300 | 1,332.6 | 1.00 | 96 | 5 | 101 | | | -2.3 | | | | |
| 26 | 5 | 2008 | 259 | 1,300 | -41 | 300 | 1,351.6 | 1.00 | 96 | 5 | 101 | | | -6.8 | | | | |
| 27 | 6 | 2009 | 246 | 1,311 | -54 | 300 | 1,362.7 | 1.00 | 96 | 5 | 101 | | | -11.4 | | | | |
| 28 | **Outputs** | | | | | | | | | | | | | | | | | |
| 29 | ToolKit | Fiscal | No. of | "Small" | 1-year | Cumul. | Cumul. | Ave. Def. | Ave. Def. | Ave 1st | Ave. End. | Ave. End. | PNRR | PBL | | Approx PF rates | | |
| 30 | Year | Year | Deferrals | Deferrals | Probab. | Deferrals | Probab. | per Year | per Def. | Def./Def. | Reserves | PBL ANR | Added | Strt Bal | | (average rates, not block) | | |
| 31 | | | | | | | | | | | | | | 402.0 | | Base | After | After |
| 32 | 2 | 2005 | 0 | - | 100% | n / a | n / a | 0.0 | n / a | n / a | 347 | -395 | - | | | | PNRR | Var.Rates |
| 33 | 3 | 2006 | 331 | 295 | 89.0% | n / a | n / a | 12.3 | 111.6 | 111.6 | 381 | -236 | - | FCCF | | | | |
| 34 | 4 | 2007 | 64 | 62 | 97.9% | 64 | 97.9% | 1.4 | 65.6 | 65.6 | 717 | 50 | 5 | Strt Bal | | 30.21 | 30.31 | 31.92 |
| 35 | 5 | 2008 | 83 | 77 | 97.2% | 128 | 95.7% | 2.4 | 87.2 | 61.5 | 793 | 252 | 5 | n / a | | 30.21 | 30.31 | 30.20 |
| 36 | 6 | 2009 | 128 | 102 | 95.7% | 221 | 92.6% | 4.9 | 115.2 | 80.8 | 763 | 209 | 5 | | | 30.21 | 30.31 | 27.94 |
| 37 | 3 | -yr Total | 275 | 241 | n / a | n / a | n / a | 8.7 | n / a | n / a | n / a | n / a | 15 | 5-yr sum> | | n / a | n / a | n / a |
| 38 | 3 | -yr Ave. | 92 | 80 | n / a | n / a | n / a | 2.9 | 95.2 | 95.3 | n / a | n / a | 3 | 3-yr sum> | | 30.2 | 30.3 | 30.02 |
| 39 | ToolKit | Fiscal | Ave. DDC | Ave DDC | PF share | IOU Share | No. of | Ave DDC | Ave. CRAC | Ave CRAC | PF share | IOU Share | No. of | Ave CRAC | Ann.Lim. | Total Lim. | CRAC | |
| 40 | Year | Year | per each | per Year | of DDC | of DDC | DDCs | Rate | per each | per Year | of CRAC | of CRAC | CRACs | Rate | Reached | Reached | Freqncy | |
| 42 | 2 | 2005 | | 0 | | | 0 | 0% | | 0 | | | 0 | 0% | 0 | 0 | 0% | |
| 43 | 3 | 2006 | | 0 | | | 0 | 0% | | 0 | | | 0 | 0% | 0 | 0 | 0% | |
| 44 | 4 | 2007 | | 0 | 0 | 0 | 0 | 0.0% | 189 | 73 | 73 | 0 | 1154 | 5.4% | 427 | 0 | 38% | |
| 45 | 5 | 2008 | 304 | 83 | 83 | 0 | 822 | 6.1% | 197 | 87 | 78 | 9 | 1316 | 5.7% | 513 | 0 | 44% | |
| 46 | 6 | 2009 | 297 | 151 | 146 | 5 | 1530 | 10.7% | 190 | 42 | 37 | 4 | 658 | 2.7% | 214 | 0 | 22% | |
| 47 | 3 | -yr Total | n / a | 234.5 | 228.8 | 6 | 2352 | n / a | n / a | 201 | 188 | 13 | 3128 | n / a | 1154 | 0 | n / a | |
| 48 | 3 | -yr Ave. | 299 | 78 | 76 | 2 | 784 | 5.6% | 193 | 67 | 63 | 4 | 1043 | 4.6% | 385 | n / a | 35% | |
| 49 | ToolKit | Fiscal | NORM | PBL | TBL | A-T-C | Ave. Reb. | Ave Reb. | PF share | IOU Share | No. of | Ave. Re- | PBL Int | TBL Int | IOU Benefits After each calculation | | | |
| 50 | Year | Year | Inputs | Inputs | Inputs | Totals | per each | per Year | of Rebate | of Rebate | Rebates | bate Rate | Credit | Credit | Base | PNRR | Mkt Upd | Var.Rates |
| 52 | 2 | 2005 | 0 | 119 | 0 | -180 | | | | | | 0% | 22 | 0.0 | 0 | | | |
| 53 | 3 | 2006 | 0 | 136 | 0 | -133 | | | | | | 0% | 22 | 0.0 | 0 | | | |
| 54 | 4 | 2007 | -22 | 216 | 0 | -1 | | | 0 | 0 | | 0.0% | 25 | 0.0 | 323 | 323 | 323 | 323 |
| 55 | 5 | 2008 | -24 | 180 | 0 | -90 | | | 0 | 0 | | 0.0% | 33 | 0.0 | 323 | 323 | 287 | 276 |
| 56 | 6 | 2009 | -24 | 48 | 0 | -34 | | | 0 | 0 | | 0.0% | 34 | 0.0 | 323 | 323 | 281 | 282 |
| 57 | 3 | -yr Total | -70 | 444 | 0 | -125 | | | | | | n / a | 91 | 0.0 | 969 | 969 | 891 | 881 |
| 58 | 3 | -yr Ave. | -23 | 148 | 0 | -42 | | | | | | | 30 | 0.0 | 323 | 323 | 297 | 294 |

## I.P.: 100% credit of Net Sec Rev, $300M CRAC, 06 Cap=706, Flat PNRR, $50M LiqRes | PBL reserves




**Notes** **3-year TPP:** **92.6%**

**Not yet real Init. Prop. data, but closer**
2007-9 data is Init. Prop. with a few issues outstanding
2005-6 data from 3rd Q Review with two $8M tweaks

**Rates** are approximations of an ave. PF rate (PF revs/PF load).
**"ROD"** rate is what is published in the Rod.
**"Oct 1"** rate is the rate going into effect on Oct 1 - this will take into account any CRAC or DDC on top of Rod rate.
**"Effective"** rate is a calculation that takes into account the rate calculated in the ROD, plus any CRAC or DDC amounts that into effect on Oct 1, plus any after-the-fact adjustments from a Rebate.

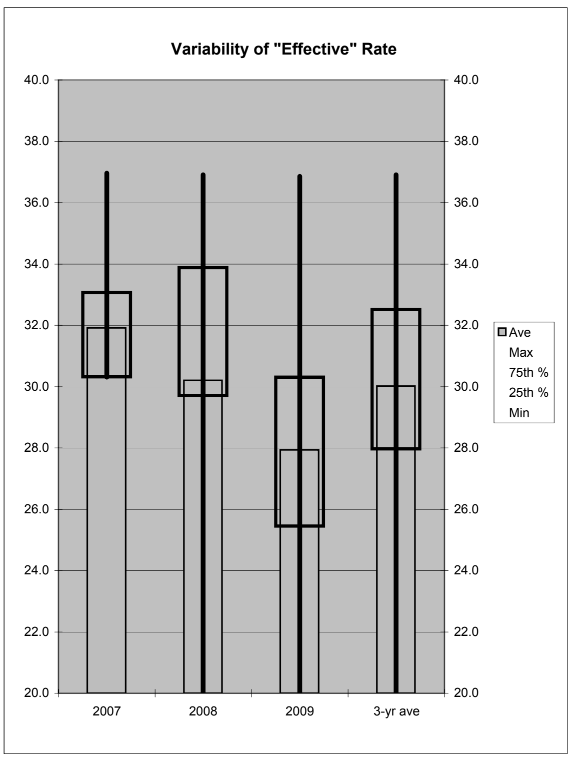
The hollow box on the variability charts below shows the 75th and 25th percentile values - 50% of the outcomes fall between these two values. The vertical line shows the maximum and minimum values over all 3000 games.

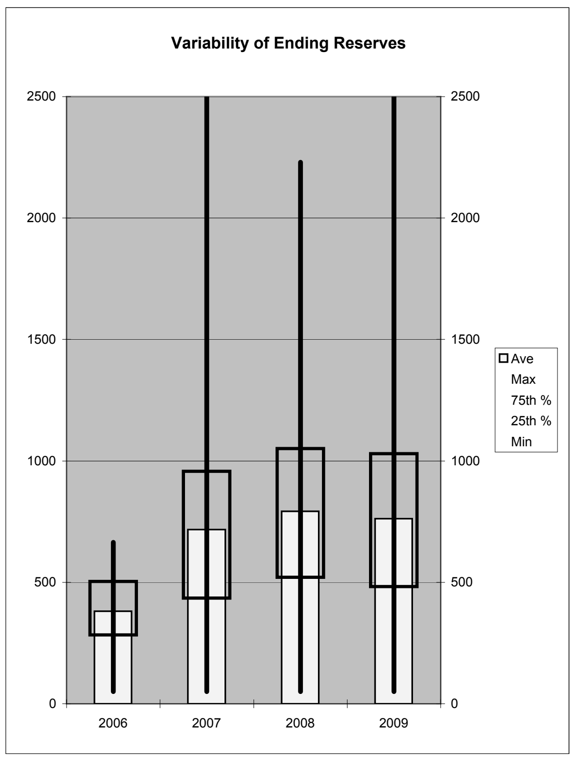
The DDC is calculated near the end of a year but isn't distributed till the next year, so it doesn't cap ending reserves immediately.

| | 2007 | 2008 | 2009 |
|---|---|---|---|
| DDC threshold | 800 | 800 | 800 |
| DDC caps | 1,282 | 1,300 | 1,311 |
| CRAC threshold | 470 | 500 | 500 |
| CRAC caps | 300 | 300 | 300 |
| CRAC trigger freq. | 38% | 44% | 22% |
| CRAC at max freq. | 14% | 17% | 7% |

Rebate
Calcns n / a

| PNRR | 2007 | 2008 | 2009 | 3-yr ave. |
|---|---|---|---|---|
| | 101 | 101 | 101 | 101 |



## I.P.: 100% credit of Net Sec Rev, $300M CRAC, 06 Cap=706, Flat PNRR, $50M LiqRes | PBL reserves

| | PF Rates - 3-year averages | | | |
|---|---|---|---|---|
| | Original Rate from RAM | After Change in PNRR | After adj. for CRAC or DDC | After Sec Rev Rebate |
| Max | 30.21 | 30.31 | 36.90 | 36.90 |
| 75th pcntl | 30.21 | 30.31 | 32.51 | 32.51 |
| Average | 30.21 | 30.31 | 30.02 | 30.02 |
| median | 30.21 | 30.31 | 30.31 | 30.31 |
| 25th pcntl | 30.21 | 30.31 | 27.95 | 27.95 |
| min | 30.21 | 30.31 | 15.02 | 15.02 |
| Range | 0.00 | 0.00 | 21.88 | 21.88 |
| Std dev | 0.00 | 0.00 | 3.52 | 3.52 |

| ===> 2007 | IOU Broker Price | | IOU Benefits | | | | | | Average PF rates (not block rates) | | | | | CRAC Results | | | | DDC Results | | | | Sec. Revenue Rebate Results | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Price Used in RAM | Updated Price from RiskMod | Original Amount from RAM | After Change in PNRR | After Mrkt Quote Update | After adj. for CRAC or DDC | After Sec Rev Rebate | Net Sum IOU ben. Change | | Original Rate from RAM | After Change in PNRR | After adj. for CRAC or DDC | After Sec Rev Rebate | Amount From Formula | Amount Collected From PF | Amt. BPA IOU Exp. Reduced | Amount IOU Ben. Reduced | Amount From Formula | Amount Distribut'd To PF | Amt. BPA IOU Exp. Increased | Amount IOU Ben. Increased | Amount From Formula | Amount Distribut'd To PF | Amt. BPA IOU Exp. Increased | Amount IOU Ben. Increased |
| Max | 52.07 | 0.00 | 323.0 | 323.0 | 323.0 | 323.0 | 323.0 | 0.0 | Max | 30.31 | 36.96 | 36.96 | 300.0 | 300.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 75th pcntl | 52.07 | 0.00 | 323.0 | 323.0 | 323.0 | 323.0 | 323.0 | 0.0 | 75th pcntl | 30.31 | 33.07 | 33.07 | 124.4 | 124.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Average | 52.07 | 0.00 | 323.0 | 323.0 | 323.0 | 323.0 | 323.0 | 0.0 | Average | 30.31 | 31.92 | 31.92 | 72.5 | 72.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| median | 52.07 | 0.00 | 323.0 | 323.0 | 323.0 | 323.0 | 323.0 | 0.0 | median | 30.31 | 30.31 | 30.31 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 25th pcntl | 52.07 | 0.00 | 323.0 | 323.0 | 323.0 | 323.0 | 323.0 | 0.0 | 25th pcntl | 30.31 | 30.31 | 30.31 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| min | 52.07 | 0.00 | 323.0 | 323.0 | 323.0 | 323.0 | 323.0 | 0.0 | min | 30.31 | 30.31 | 30.31 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Range | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | Range | 0.00 | 6.64 | 6.64 | 300.0 | 300.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Std dev | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | Std dev | 0.00 | 2.52 | 2.52 | 113.7 | 113.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

| ===> 2008 | IOU Broker Price | | IOU Benefits | | | | | | Average PF rates (not block rates) | | | | | CRAC Results | | | | DDC Results | | | | Sec. Revenue Rebate Results | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Price Used in RAM | Updated Price from RiskMod | Original Amount from RAM | After Change in PNRR | After Mrkt Quote Update | After adj. for CRAC or DDC | After Sec Rev Rebate | Net Sum IOU ben. Change | | Original Rate from RAM | After Change in PNRR | After adj. for CRAC or DDC | After Sec Rev Rebate | Amount From Formula | Amount Collected From PF | Amt. BPA IOU Exp. Reduced | Amount IOU Ben. Reduced | Amount From Formula | Amount Distribut'd To PF | Amt. BPA IOU Exp. Increased | Amount IOU Ben. Increased | Amount From Formula | Amount Distribut'd To PF | Amt. BPA IOU Exp. Increased | Amount IOU Ben. Increased |
| Max | 49.85 | 107.90 | 323.0 | 323.0 | 323.0 | 323.0 | 323.0 | 0.0 | Max | 30.31 | 36.90 | 36.90 | 300.0 | 300.0 | 74.1 | 95.7 | 1300.0 | 1300.0 | 63.6 | 82.2 | 0.0 | 0.0 | 0.0 | 0.0 |
| 75th pcntl | 49.85 | 56.64 | 323.0 | 323.0 | 323.0 | 323.0 | 323.0 | 0.0 | 75th pcntl | 30.31 | 33.88 | 33.88 | 183.4 | 162.6 | 1.5 | 1.9 | 32.4 | 28.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Average | 49.85 | 50.42 | 323.0 | 323.0 | 286.6 | 275.6 | 275.6 | -47.4 | Average | 30.31 | 30.20 | 30.20 | 86.6 | 77.6 | 9.0 | 11.6 | 83.2 | 82.7 | 0.5 | 0.6 | 0.0 | 0.0 | 0.0 | 0.0 |
| median | 49.85 | 48.71 | 323.0 | 323.0 | 323.0 | 323.0 | 323.0 | 0.0 | median | 30.31 | 30.31 | 30.31 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 25th pcntl | 49.85 | 42.02 | 323.0 | 323.0 | 265.5 | 239.3 | 239.3 | -83.7 | 25th pcntl | 30.31 | 29.70 | 29.70 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| min | 49.85 | 28.55 | 323.0 | 323.0 | 123.0 | 123.0 | 123.0 | -200.0 | min | 30.31 | 1.75 | 1.75 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Range | 0.00 | 79.34 | 0.0 | 0.0 | 200.0 | 200.0 | 200.0 | 200.0 | Range | 0.00 | 35.16 | 35.16 | 300.0 | 300.0 | 74.1 | 95.7 | 1300.0 | 1300.0 | 63.6 | 82.2 | 0.0 | 0.0 | 0.0 | 0.0 |
| Std dev | 0.00 | 11.34 | 0.0 | 0.0 | 61.3 | 70.8 | 70.8 | 70.8 | Std dev | 0.00 | 5.50 | 5.50 | 120.2 | 109.8 | 19.4 | 25.1 | 194.4 | 194.2 | 3.6 | 4.6 | 0.0 | 0.0 | 0.0 | 0.0 |

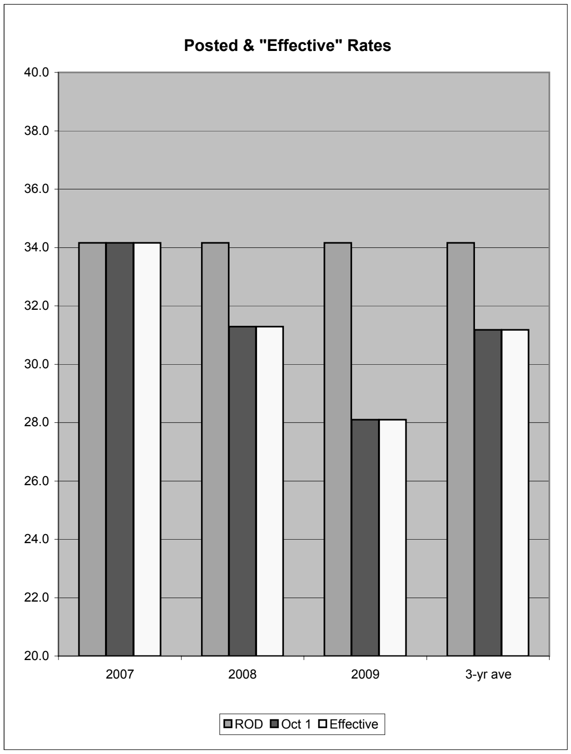
| ===> 2009 | IOU Broker Price | | IOU Benefits | | | | | | Average PF rates (not block rates) | | | | | CRAC Results | | | | DDC Results | | | | Sec. Revenue Rebate Results | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Price Used in RAM | Updated Price from RiskMod | Original Amount from RAM | After Change in PNRR | After Mrkt Quote Update | After adj. for CRAC or DDC | After Sec Rev Rebate | Net Sum IOU ben. Change | | Original Rate from RAM | After Change in PNRR | After adj. for CRAC or DDC | After Sec Rev Rebate | Amount From Formula | Amount Collected From PF | Amt. BPA IOU Exp. Reduced | Amount IOU Ben. Reduced | Amount From Formula | Amount Distribut'd To PF | Amt. BPA IOU Exp. Increased | Amount IOU Ben. Increased | Amount From Formula | Amount Distribut'd To PF | Amt. BPA IOU Exp. Increased | Amount IOU Ben. Increased |
| Max | 45.84 | 87.75 | 323.0 | 323.0 | 323.0 | 323.0 | 323.0 | 0.0 | Max | 30.31 | 36.85 | 36.85 | 300.0 | 300.0 | 73.6 | 95.1 | 1310.6 | 1310.6 | 111.2 | 143.7 | 0.0 | 0.0 | 0.0 | 0.0 |
| 75th pcntl | 45.84 | 51.65 | 323.0 | 323.0 | 323.0 | 323.0 | 323.0 | 0.0 | 75th pcntl | 30.31 | 30.31 | 30.31 | 0.0 | 0.0 | 0.0 | 0.0 | 238.5 | 224.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Average | 45.84 | 46.67 | 323.0 | 323.0 | 281.0 | 282.2 | 282.2 | -40.8 | Average | 30.31 | 27.94 | 27.94 | 41.6 | 37.4 | 4.2 | 5.5 | 151.3 | 146.1 | 5.2 | 6.7 | 0.0 | 0.0 | 0.0 | 0.0 |
| median | 45.84 | 46.09 | 323.0 | 323.0 | 323.0 | 323.0 | 323.0 | 0.0 | median | 30.31 | 30.17 | 30.17 | 0.0 | 0.0 | 0.0 | 0.0 | 7.8 | 6.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 25th pcntl | 45.84 | 41.27 | 323.0 | 323.0 | 251.0 | 255.0 | 255.0 | -68.0 | 25th pcntl | 30.31 | 25.44 | 25.44 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| min | 45.84 | 28.01 | 323.0 | 323.0 | 123.0 | 123.0 | 123.0 | -200.0 | min | 30.31 | 1.73 | 1.73 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Range | 0.00 | 59.73 | 0.0 | 0.0 | 200.0 | 200.0 | 200.0 | 200.0 | Range | 0.00 | 35.13 | 35.13 | 300.0 | 300.0 | 73.6 | 95.1 | 1310.6 | 1310.6 | 111.2 | 143.7 | 0.0 | 0.0 | 0.0 | 0.0 |
| Std dev | 0.00 | 7.75 | 0.0 | 0.0 | 63.4 | 64.6 | 64.6 | 64.6 | Std dev | 0.00 | 5.71 | 5.71 | 92.2 | 83.2 | 14.4 | 18.6 | 227.4 | 225.3 | 14.3 | 18.5 | 0.0 | 0.0 | 0.0 | 0.0 |

## 3.2 Reserves, Fixed PNRR and DDC

Table 1: ToolKit Main
Table 2: Graphs
Table 3: Statistical Summary

| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | **ToolKit v. 2.30, (11-13-2005)** | | | | | Study title: | 100% credit of Sec Rev, No CRAC, 06 Cap=706, Flat PNRR, $50M LiqRes \| PBL reserves | | | | | | | | | | | |
| 2 | **Time of run: 23:25:35 on 11-13-05** | | | | 3 | -yr TPP = | 92.67% | Run Type | PBL-only run | | | | | | | | | |
| 3 | **Inputs** | PBL data: | RM_PNRR0_3YrRate=29-09_9-Nov-05.xls | | | | | | | | | | | | | | | |
| 4 | | NORM dat | NORM 10-18-05_Output.xls | | | | | | | | | | | | | | | |
| 5 | Files => | TBL data: | | | | | | | | | | | | | | | | |
| 6 | Start in | Stop in | Run Type | CRAC | PBL | TBL | PBL Strt. | Add'l | Deferral | ☐ | Sec. Rev. Rebate Description | | | | | | | |
| 7 | TK Year | TK Year | PBL | Lim/Total | LiqRes | LiqRes | ANR | LiqRes 7-9 | Logic | | n / a | | | | | | | |
| 8 | 2 | 6 | BPA | 20,000 | 50 | 20 | -519.62 | 0 | Hybrid | | | | | | | | | |
| 9 | Start TPP | "Small" | No. of | PBL Strt | TBL Strt | Debug | Reserves | AutoPrint | AutoPrint | Flat PNRR | Enable | CRAC | CRAC | | | | | |
| 10 | in TK Yr | Def. Size | Iterations | Rsrv Bal | Rsrv Bal | Level | Graph | Res Grph | This Page | Rate Imp.? | PNRR? | Fixed? | Stats On? | | | | | |
| 11 | 4 | $200 | 3,000 | 402.0 | 0 | 0 | ☑ | ☐ | ☐ | ☑ | ☑ | ☐ | ☐ | | | | | |
| 12 | ToolKit | Fiscal | Probabi- | Treasury | Amort | Interest | PBL Int. | TBL Int. | Other | TBL Rsrvs | Cash Lag | PBL Cash | TBL Cash | | | | | |
| 13 | Year | Year | listic? | Int. Rate | Sched | Sched | Cr. Sched | Cr. Sched | Cash Adj | Available | for PNRR | Tmg Adj | Tmg Adj | | | | | |
| 15 | 2 | 2005 | TRUE | 4.75% | 271.3 | 247.4 | 29.96 | 11.08 | | 0.0 | | 11.5 | 4.6 | | | | | |
| 16 | 3 | 2006 | TRUE | 4.75% | 296.5 | 250.4 | 0.00 | 11.14 | -4.1 | 0.0 | | 12.2 | 5.8 | | | | | |
| 17 | 4 | 2007 | TRUE | 4.75% | 170.3 | 270.1 | 10.03 | | 23.1 | 55.0 | 0.0 | 7.2 | | | | | | |
| 18 | 5 | 2008 | TRUE | 4.75% | 185.2 | 291.6 | 10.47 | | 12.2 | -57.6 | 0.0 | 7.5 | | | | | | |
| 19 | 6 | 2009 | TRUE | 4.75% | 176.4 | 306.1 | 10.33 | | 23.1 | 0.0 | 0.0 | 7.4 | | | | | | |
| 20 | ToolKit | Fiscal | Div. Dist. | | CRAC | | | PNRR | | | | TBL Fed. | PBL Fed. | Other NR | Delta | | | |
| 21 | Year | Year | Threshold | Lim/Year | Threshold | Lim/Year | Rev Basis | Shape | Risk Mod | Calc'd in TK | Sum | Int. Red. | Int. Red. | & Csh Adj | Int. Cred. | | | |
| 23 | 2 | 2005 | 401 | 5,000 | 1 | 0 | 1,017.3 | 0.0 | | | | | | 6.6 | | | | |
| 24 | 3 | 2006 | 401 | 5,000 | 1 | 0 | 1,028.1 | 0.0 | | | | | | | | | | |
| 25 | 4 | 2007 | 139 | 1,282 | -191 | 0 | 1,332.6 | 1.00 | 0 | 301 | 301 | | | 0.0 | | | | |
| 26 | 5 | 2008 | 259 | 1,300 | -41 | 0 | 1,351.6 | 1.00 | 0 | 301 | 301 | | | 0.0 | | | | |
| 27 | 6 | 2009 | 238 | 1,311 | -62 | 0 | 1,362.7 | 1.00 | 0 | 301 | 301 | | | 0.0 | | | | |
| 28 | **Outputs** | | | | | | | | | | | | | | | | | |
| 29 | ToolKit | Fiscal | No. of | "Small" | 1-year | Cumul. | Cumul. | Ave. Def. | Ave. Def. | Ave 1st | Ave. End. | Ave. End. | PNRR | PBL | | Approx PF rates | | |
| 30 | Year | Year | Deferrals | Deferrals | Probab. | Deferrals | Probab. | per Year | per Def. | Def./Def. | Reserves | PBL ANR | Added | Strt Bal | | (average rates, not block) | | |
| 31 | | | | | | | | | | | | | | 402.0 | | Base | After | After |
| 32 | 2 | 2005 | 0 | - | 100% | n / a | n / a | 0.0 | n / a | n / a | 347 | -395 | - | | | | PNRR | Var.Rates |
| 33 | 3 | 2006 | 331 | 295 | 89.0% | n / a | n / a | 12.3 | 111.6 | 111.6 | 381 | -236 | - | FCCF | | | | |
| 34 | 4 | 2007 | 122 | 113 | 95.9% | 122 | 95.9% | 3.9 | 94.8 | 94.8 | 815 | 154 | 301 | Strt Bal | | 28.20 | 34.16 | 34.16 |
| 35 | 5 | 2008 | 104 | 82 | 96.5% | 163 | 94.6% | 4.6 | 132.2 | 107.7 | 973 | 432 | 301 | n / a | | 28.20 | 34.16 | 31.28 |
| 36 | 6 | 2009 | 110 | 86 | 96.3% | 220 | 92.7% | 5.8 | 157.5 | 120.2 | 988 | 425 | 301 | | | 28.20 | 34.16 | 28.09 |
| 37 | 3 | -yr Total | 336 | 281 | n / a | n / a | n / a | 14.2 | n / a | n / a | n / a | n / a | 903 | 5-yr sum> | | n / a | n / a | n / a |
| 38 | 3 | -yr Ave. | 112 | 94 | n / a | n / a | n / a | 4.7 | 126.9 | 108.5 | n / a | n / a | 181 | 3-yr sum> | | 28.2 | 34.2 | 31.18 |
| 39 | ToolKit | Fiscal | Ave. DDC | Ave DDC | PF share | IOU Share | No. of | Ave DDC | Ave. CRAC | Ave CRAC | PF share | IOU Share | No. of | Ave CRAC | Ann.Lim. | Total Lim. | CRAC | |
| 40 | Year | Year | per each | per Year | of DDC | of DDC | DDCs | Rate | per each | per Year | of CRAC | of CRAC | CRACs | Rate | Reached | Reached | Freqncy | |
| 42 | 2 | 2005 | | 0 | | | 0 | 0% | | 0 | | | 0 | 0% | 0 | 0 | 0% | |
| 43 | 3 | 2006 | | 0 | | | 0 | 0% | | 0 | | | 0 | 0% | 0 | 0 | 0% | |
| 44 | 4 | 2007 | | 0 | 0 | 0 | 0 | 0.0% | | 0 | 0 | 0 | 0 | 0.0% | 0 | 0 | 0% | |
| 45 | 5 | 2008 | 343 | 134 | 131 | 3 | 1172 | 9.7% | | 0 | 0 | 0 | 0 | 0.0% | 0 | 0 | 0% | |
| 46 | 6 | 2009 | 434 | 302 | 278 | 24 | 2086 | 20.4% | | 0 | 0 | 0 | 0 | 0.0% | 0 | 0 | 0% | |
| 47 | 3 | -yr Total | n / a | 436.0 | 408.7 | 27 | 3258 | n / a | n / a | 0 | 0 | 0 | 0 | n / a | 0 | 0 | n / a | |
| 48 | 3 | -yr Ave. | 401 | 145 | 136 | 9 | 1086 | 10.0% | | 0 | 0 | 0 | 0 | 0.0% | 0 | n / a | 0% | |
| 49 | ToolKit | Fiscal | NORM | PBL | TBL | A-T-C | Ave. Reb. | Ave Reb. | PF share | IOU Share | No. of | Ave. Re- | PBL Int | TBL Int | IOU Benefits After each calculation | | | |
| 50 | Year | Year | Inputs | Inputs | Inputs | Totals | per each | per Year | of Rebate | of Rebate | Rebates | bate Rate | Credit | Credit | Base | PNRR | Mkt Upd | Var.Rates |
| 52 | 2 | 2005 | 0 | 119 | 0 | -180 | | | | | | 0% | 22 | 0.0 | 0 | | | |
| 53 | 3 | 2006 | 0 | 136 | 0 | -133 | | | | | | 0% | 22 | 0.0 | 0 | | | |
| 54 | 4 | 2007 | -22 | 125 | 0 | -1 | | | 0 | 0 | | 0.0% | 26 | 0.0 | 323 | 323 | 323 | 323 |
| 55 | 5 | 2008 | -24 | 83 | 0 | -90 | | | 0 | 0 | | 0.0% | 38 | 0.0 | 323 | 323 | 260 | 265 |
| 56 | 6 | 2009 | -24 | -54 | 0 | -34 | | | 0 | 0 | | 0.0% | 41 | 0.0 | 323 | 264 | 248 | 279 |
| 57 | 3 | -yr Total | -70 | 154 | 0 | -125 | | | | | | n / a | 105 | 0.0 | 969 | 910 | 831 | 866 |
| 58 | 3 | -yr Ave. | -23 | 51 | 0 | -42 | | | | | | | 35 | 0.0 | 323 | 303 | 277 | 289 |

**100% credit of Sec Rev, No CRAC, 06 Cap=706, Flat PNRR, $50M LiqRes | PBL reserves**




**Notes** **3-year TPP: 92.7%**

**Not yet real Init. Prop. data, but closer**
2007-9 data is Init. Prop. with a few issues outstanding
2005-6 data from 3rd Q Review with two $8M tweaks

**Rates** are approximations of an ave. PF rate (PF revs/PF load).
**"ROD"** rate is what is published in the Rod.
**"Oct 1"** rate is the rate going into effect on Oct 1 - this will take into account any CRAC or DDC on top of Rod rate.
**"Effective"** rate is a calculation that takes into account the rate calculated in the ROD, plus any CRAC or DDC amounts that into effect on Oct 1, plus any after-the-fact adjustments from a Rebate.

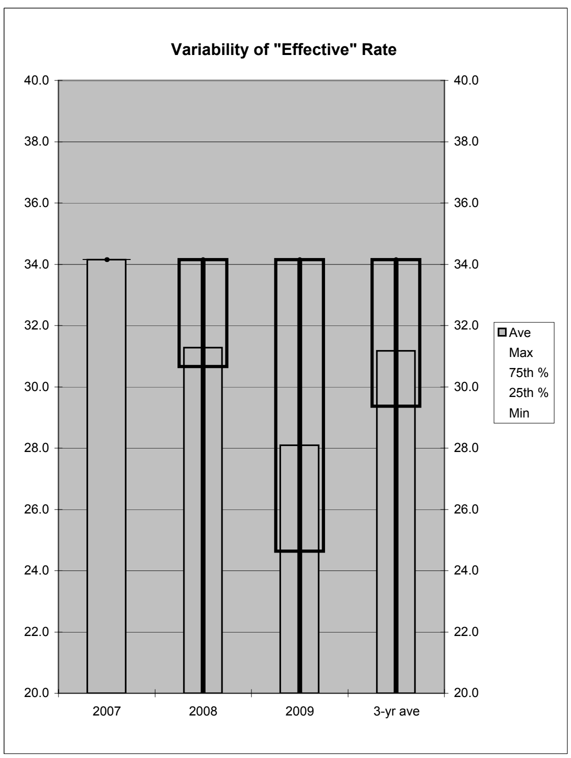
The hollow box on the variability charts below shows the 75th and 25th percentile values - 50% of the outcomes fall between these two values. The vertical line shows the maximum and minimum values over all 3000 games.

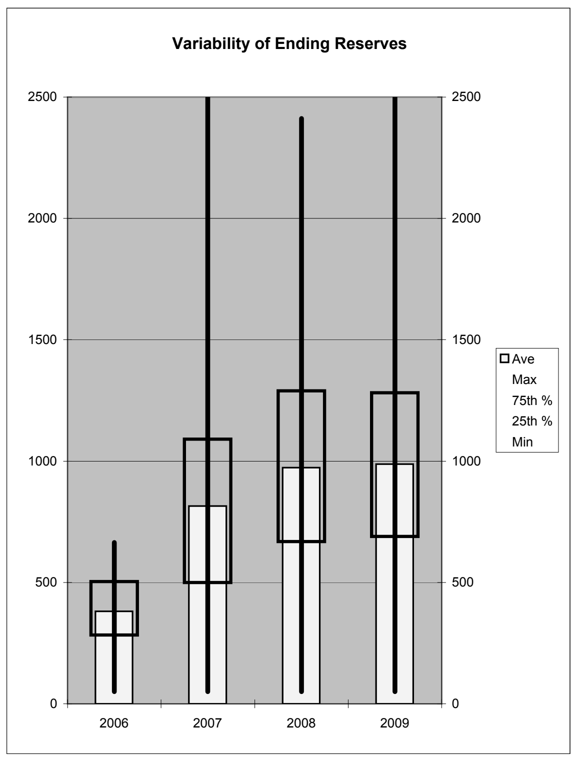
The DDC is calculated near the end of a year but isn't distributed till the next year, so it doesn't cap ending reserves immediately.

| | 2007 | 2008 | 2009 |
|---|---|---|---|
| DDC threshold | 800 | 800 | 800 |
| DDC caps | 1,282 | 1,300 | 1,311 |
| CRAC threshold | 470 | 500 | 500 |
| CRAC caps | 0 | 0 | 0 |
| CRAC trigger freq. | 0% | 0% | 0% |
| CRAC at max freq. | 0% | 0% | 0% |

Rebate
Calcns n / a

| PNRR | 2007 | 2008 | 2009 | 3-yr ave. |
|---|---|---|---|---|
| | 301 | 301 | 301 | 301 |



**100% credit of Sec Rev, No CRAC, 06 Cap=706, Flat PNRR, $50M LiqRes | PBL reserves**

| | PF Rates - 3-year averages | | | |
|---|---|---|---|---|
| | Original Rate from RAM | After Change in PNRR | After adj. for CRAC or DDC | After Sec Rev Rebate |
| Max | 28.20 | 34.16 | 34.16 | 34.16 |
| 75th pcntl | 28.20 | 34.16 | 34.16 | 34.16 |
| Average | 28.20 | 34.16 | 31.18 | 31.18 |
| median | 28.20 | 34.16 | 31.97 | 31.97 |
| 25th pcntl | 28.20 | 34.16 | 29.36 | 29.36 |
| min | 28.20 | 34.16 | 16.35 | 16.35 |
| Range | 0.00 | 0.00 | 17.81 | 17.81 |
| Std dev | 0.00 | 0.00 | 3.14 | 3.14 |

| ===> | IOU Broker Price | | IOU Benefits | | | | | | Average PF rates (not block rates) | | | | CRAC Results | | | | DDC Results | | | | Sec. Revenue Rebate Results | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2007 | Price Used in RAM | Updated Price from RiskMod | Original Amount from RAM | After Change in PNRR | After Mrkt Quote Update | After adj. for CRAC or DDC | After Sec Rev Rebate | Net Sum IOU ben. Change | Original Rate from RAM | After Change in PNRR | After adj. for CRAC or DDC | After Sec Rev Rebate | Amount From Formula | Amount Collected From PF | Amt. BPA IOU Exp. Reduced | Amount IOU Ben. Reduced | Amount From Formula | Amount Distribut'd To PF | Amt. BPA IOU Exp. Increased | Amount IOU Ben. Increased | Amount From Formula | Amount Distribut'd To PF | Amt. BPA IOU Exp. Increased | Amount IOU Ben. Increased |
| Max | 52.07 | 0.00 | 323.0 | 323.0 | 323.0 | 323.0 | 323.0 | 0.0 | Max | 34.16 | 34.16 | 34.16 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 75th pcntl | 52.07 | 0.00 | 323.0 | 323.0 | 323.0 | 323.0 | 323.0 | 0.0 | 75th pcntl | 34.16 | 34.16 | 34.16 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Average | 52.07 | 0.00 | 323.0 | 323.0 | 323.0 | 323.0 | 323.0 | 0.0 | Average | 34.16 | 34.16 | 34.16 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| median | 52.07 | 0.00 | 323.0 | 323.0 | 323.0 | 323.0 | 323.0 | 0.0 | median | 34.16 | 34.16 | 34.16 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 25th pcntl | 52.07 | 0.00 | 323.0 | 323.0 | 323.0 | 323.0 | 323.0 | 0.0 | 25th pcntl | 34.16 | 34.16 | 34.16 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| min | 52.07 | 0.00 | 323.0 | 323.0 | 323.0 | 323.0 | 323.0 | 0.0 | min | 34.16 | 34.16 | 34.16 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Range | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | Range | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Std dev | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | Std dev | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

| ===> | IOU Broker Price | | IOU Benefits | | | | | | Average PF rates (not block rates) | | | | CRAC Results | | | | DDC Results | | | | Sec. Revenue Rebate Results | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2008 | Price Used in RAM | Updated Price from RiskMod | Original Amount from RAM | After Change in PNRR | After Mrkt Quote Update | After adj. for CRAC or DDC | After Sec Rev Rebate | Net Sum IOU ben. Change | Original Rate from RAM | After Change in PNRR | After adj. for CRAC or DDC | After Sec Rev Rebate | Amount From Formula | Amount Collected From PF | Amt. BPA IOU Exp. Reduced | Amount IOU Ben. Reduced | Amount From Formula | Amount Distribut'd To PF | Amt. BPA IOU Exp. Increased | Amount IOU Ben. Increased | Amount From Formula | Amount Distribut'd To PF | Amt. BPA IOU Exp. Increased | Amount IOU Ben. Increased |
| Max | 49.85 | 107.90 | 323.0 | 323.0 | 323.0 | 323.0 | 323.0 | 0.0 | Max | 34.16 | 34.16 | 34.16 | 0.0 | 0.0 | 0.0 | 0.0 | 1300.0 | 1300.0 | 107.1 | 138.3 | 0.0 | 0.0 | 0.0 | 0.0 |
| 75th pcntl | 49.85 | 56.64 | 323.0 | 323.0 | 323.0 | 323.0 | 323.0 | 0.0 | 75th pcntl | 34.16 | 34.16 | 34.16 | 0.0 | 0.0 | 0.0 | 0.0 | 175.3 | 160.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Average | 49.85 | 50.42 | 323.0 | 323.0 | 260.4 | 264.6 | 264.6 | -58.4 | Average | 34.16 | 31.28 | 31.28 | 0.0 | 0.0 | 0.0 | 0.0 | 134.0 | 130.7 | 3.3 | 4.2 | 0.0 | 0.0 | 0.0 | 0.0 |
| median | 49.85 | 48.71 | 323.0 | 323.0 | 319.7 | 323.0 | 323.0 | 0.0 | median | 34.16 | 34.16 | 34.16 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 25th pcntl | 49.85 | 42.02 | 323.0 | 323.0 | 190.8 | 202.0 | 202.0 | -121.0 | 25th pcntl | 34.16 | 30.65 | 30.65 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| min | 49.85 | 28.55 | 323.0 | 323.0 | 123.0 | 123.0 | 123.0 | -200.0 | min | 34.16 | 5.59 | 5.59 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Range | 0.00 | 79.34 | 0.0 | 0.0 | 200.0 | 200.0 | 200.0 | 200.0 | Range | 0.00 | 28.56 | 28.56 | 0.0 | 0.0 | 0.0 | 0.0 | 1300.0 | 1300.0 | 107.1 | 138.3 | 0.0 | 0.0 | 0.0 | 0.0 |
| Std dev | 0.00 | 11.34 | 0.0 | 0.0 | 77.7 | 76.9 | 76.9 | 76.9 | Std dev | 0.00 | 5.36 | 5.36 | 0.0 | 0.0 | 0.0 | 0.0 | 245.0 | 243.7 | 12.0 | 15.5 | 0.0 | 0.0 | 0.0 | 0.0 |

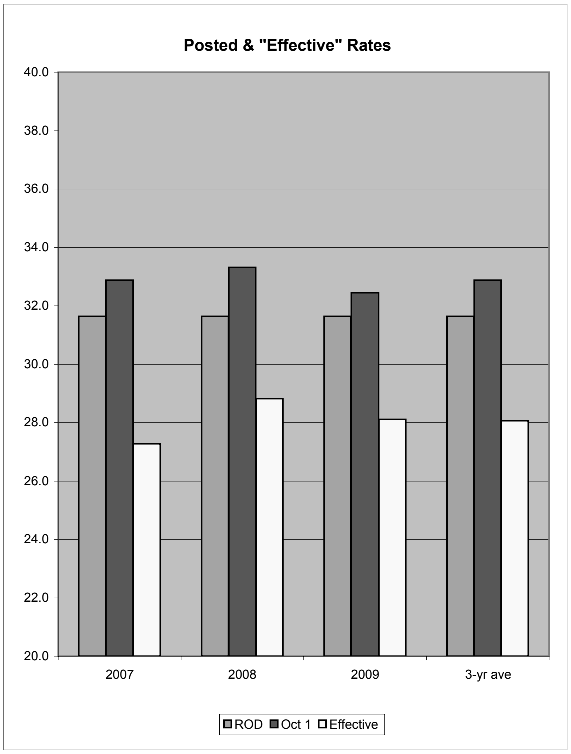
| ===> | IOU Broker Price | | IOU Benefits | | | | | | Average PF rates (not block rates) | | | | CRAC Results | | | | DDC Results | | | | Sec. Revenue Rebate Results | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2009 | Price Used in RAM | Updated Price from RiskMod | Original Amount from RAM | After Change in PNRR | After Mrkt Quote Update | After adj. for CRAC or DDC | After Sec Rev Rebate | Net Sum IOU ben. Change | Original Rate from RAM | After Change in PNRR | After adj. for CRAC or DDC | After Sec Rev Rebate | Amount From Formula | Amount Collected From PF | Amt. BPA IOU Exp. Reduced | Amount IOU Ben. Reduced | Amount From Formula | Amount Distribut'd To PF | Amt. BPA IOU Exp. Increased | Amount IOU Ben. Increased | Amount From Formula | Amount Distribut'd To PF | Amt. BPA IOU Exp. Increased | Amount IOU Ben. Increased |
| Max | 45.84 | 87.75 | 323.0 | 264.3 | 323.0 | 323.0 | 323.0 | 0.0 | Max | 34.16 | 34.16 | 34.16 | 0.0 | 0.0 | 0.0 | 0.0 | 1310.6 | 1310.6 | 154.8 | 200.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 75th pcntl | 45.84 | 51.65 | 323.0 | 264.3 | 323.0 | 323.0 | 323.0 | 0.0 | 75th pcntl | 34.16 | 34.16 | 34.16 | 0.0 | 0.0 | 0.0 | 0.0 | 489.7 | 436.9 | 45.0 | 58.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| Average | 45.84 | 46.67 | 323.0 | 264.3 | 247.6 | 278.6 | 278.6 | -44.4 | Average | 34.16 | 28.09 | 28.09 | 0.0 | 0.0 | 0.0 | 0.0 | 302.0 | 277.9 | 24.0 | 31.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| median | 45.84 | 46.09 | 323.0 | 264.3 | 269.1 | 323.0 | 323.0 | 0.0 | median | 34.16 | 29.42 | 29.42 | 0.0 | 0.0 | 0.0 | 0.0 | 251.7 | 217.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 25th pcntl | 45.84 | 41.27 | 323.0 | 264.3 | 176.3 | 244.4 | 244.4 | -78.6 | 25th pcntl | 34.16 | 24.63 | 24.63 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| min | 45.84 | 28.01 | 323.0 | 264.3 | 123.0 | 123.0 | 123.0 | -200.0 | min | 34.16 | 5.57 | 5.57 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Range | 0.00 | 59.73 | 0.0 | 0.0 | 200.0 | 200.0 | 200.0 | 200.0 | Range | 0.00 | 28.58 | 28.58 | 0.0 | 0.0 | 0.0 | 0.0 | 1310.6 | 1310.6 | 154.8 | 200.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Std dev | 0.00 | 7.75 | 0.0 | 0.0 | 77.4 | 68.1 | 68.1 | 68.1 | Std dev | 0.00 | 6.35 | 6.35 | 0.0 | 0.0 | 0.0 | 0.0 | 301.6 | 291.1 | 35.9 | 46.4 | 0.0 | 0.0 | 0.0 | 0.0 |

### 3.3 Secondary Revenue Rebate, Fixed PNRR, CRAC, and DDC

Table 1: ToolKit Main
Table 2: Graphs
Table 3: Statistical Summary

| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | **ToolKit v. 2.30, (11-13-2005)** | | | | | Study title: | Rebate of SecRev > 75% E.V., $200M CRAC, 06 Cap=706, Flat PNRR, $50M LiqRes \| PBL reserves | | | | | | | | | | | |
| 2 | **Time of run: 23:43:59 on 11-13-05** | | | | 3 | -yr TPP = | 92.60% | Run Type | PBL-only run | | | | | | | | | |
| 3 | **Inputs** | PBL data: | RM_PNRR0_3YrRate=29-09_9-Nov-05.xls | | | | | | | | | | | | | | | |
| 4 | | NORM dat | NORM 10-18-05_Output.xls | | | | | | | | | | | | | | | |
| 5 | Files => | TBL data: | | | | | | | | | | | | | | | | |
| 6 | Start in | Stop in | Run Type | CRAC | PBL | TBL | PBL Strt. | Add'l | Deferral | ☑ | Sec. Rev. Rebate Description | | | | | | | |
| 7 | TK Year | TK Year | PBL ◉ | Lim/Total | LiqRes | LiqRes | ANR | LiqRes 7-9 | Logic | Total sales - purchases - (E.V. PF Sales + .75*E.V. | | | | | | | | |
| 8 | 2 | 6 | BPA ○ | 20,000 | 50 | 20 | -519.62 | 0 | Hybrid | Sec Sales - E.V. Pur), floor at zero | | | | | | | | |
| 9 | Start TPP | "Small" | No. of | PBL Strt | TBL Strt | Debug | Reserves | AutoPrint | AutoPrint | Flat PNRR | Enable | CRAC | CRAC | | | | | |
| 10 | in TK Yr | Def. Size | Iterations | Rsrv Bal | Rsrv Bal | Level | Graph | Res Grph | This Page | Rate Imp.? | PNRR? | Fixed? | Stats On? | | | | | |
| 11 | 4 | $200 | 3,000 | 402.0 | 0 | 0 | ☑ | ☐ | ☐ | ☑ | ☑ | ☐ | ☐ | | | | | |
| 12 | ToolKit | Fiscal | Probabi- | Treasury | Amort | Interest | PBL Int. | TBL Int. | Other | TBL Rsrvs | Cash Lag | PBL Cash | TBL Cash | | | | | |
| 13 | Year | Year | listic? | Int. Rate | Sched | Sched | Cr. Sched | Cr. Sched | Cash Adj | Available | for PNRR | Tmg Adj | Tmg Adj | | | | | |
| 15 | 2 | 2005 | TRUE | 4.75% | 271.3 | 247.4 | 29.96 | 11.08 | | 0.0 | | 11.5 | 4.6 | | | | | |
| 16 | 3 | 2006 | TRUE | 4.75% | 296.5 | 250.4 | 0.00 | 11.14 | -4.1 | 0.0 | | 12.2 | 5.8 | | | | | |
| 17 | 4 | 2007 | TRUE | 4.75% | 170.3 | 270.1 | 10.03 | | 23.1 | 55.0 | 0.0 | 7.2 | | | | | | |
| 18 | 5 | 2008 | TRUE | 4.75% | 185.2 | 291.6 | 10.47 | | 12.2 | -57.6 | 0.0 | 7.5 | | | | | | |
| 19 | 6 | 2009 | TRUE | 4.75% | 176.4 | 306.1 | 10.33 | | 23.1 | 0.0 | 0.0 | 7.4 | | | | | | |
| 20 | ToolKit | Fiscal | Div. Dist. | | CRAC | | | PNRR | | | | TBL Fed. | PBL Fed. | Other NR | Delta | | | |
| 21 | Year | Year | Threshold | Lim/Year | Threshold | Lim/Year | Rev Basis | Shape | Risk Mod | Calc'd in TK | Sum | Int. Red. | Int. Red. | & Csh Adj | Int. Cred. | | | |
| 23 | 2 | 2005 | 401 | 5,000 | 1 | 0 | 1,017.3 | 0.0 | | | | | | 6.6 | | | | |
| 24 | 3 | 2006 | 401 | 5,000 | 1 | 0 | 1,028.1 | 0.0 | | | | | | | | | | |
| 25 | 4 | 2007 | 136 | 1,282 | -194 | 200 | 1,332.6 | 1.00 | 0 | 168 | 168 | | | 0.0 | | | | |
| 26 | 5 | 2008 | 262 | 1,300 | -38 | 200 | 1,351.6 | 1.00 | 0 | 168 | 168 | | | 0.0 | | | | |
| 27 | 6 | 2009 | 252 | 1,311 | -48 | 200 | 1,362.7 | 1.00 | 0 | 168 | 168 | | | 0.0 | | | | |
| 28 | **Outputs** | | | | | | | | | | | | | | | | | |
| 29 | ToolKit | Fiscal | No. of | "Small" | 1-year | Cumul. | Cumul. | Ave. Def. | Ave. Def. | Ave 1st | Ave. End. | Ave. End. | PNRR | PBL | | Approx PF rates | | |
| 30 | Year | Year | Deferrals | Deferrals | Probab. | Deferrals | Probab. | per Year | per Def. | Def./Def. | Reserves | PBL ANR | Added | Strt Bal | | (average rates, not block) | | |
| 31 | | | | | | | | | | | | | | 402.0 | | Base | After | After |
| 32 | 2 | 2005 | 0 | - | 100% | n / a | n / a | 0.0 | n / a | n / a | 347 | -395 | - | | | | PNRR | Var.Rates |
| 33 | 3 | 2006 | 331 | 295 | 89.0% | n / a | n / a | 12.3 | 111.6 | 111.6 | 381 | -236 | - | FCCF | | | | |
| 34 | 4 | 2007 | 74 | 71 | 97.5% | 74 | 97.5% | 1.6 | 66.1 | 66.1 | 506 | -158 | 168 | Strt Bal | | 28.20 | 31.63 | 27.27 |
| 35 | 5 | 2008 | 91 | 82 | 97.0% | 140 | 95.3% | 3.0 | 98.8 | 75.1 | 511 | -26 | 168 | n / a | | 28.20 | 31.63 | 28.82 |
| 36 | 6 | 2009 | 128 | 100 | 95.7% | 222 | 92.6% | 5.7 | 134.6 | 94.7 | 485 | -62 | 168 | | | 28.20 | 31.63 | 28.11 |
| 37 | 3 | -yr Total | 293 | 253 | n / a | n / a | n / a | 10.4 | n / a | n / a | n / a | n / a | 504 | 5-yr sum> | | n / a | n / a | n / a |
| 38 | 3 | -yr Ave. | 98 | 84 | n / a | n / a | n / a | 3.5 | 106.2 | 98.7 | n / a | n / a | 101 | 3-yr sum> | | 28.2 | 31.6 | 28.07 |
| 39 | ToolKit | Fiscal | Ave. DDC | Ave DDC | PF share | IOU Share | No. of | Ave DDC | Ave. CRAC | Ave CRAC | PF share | IOU Share | No. of | Ave CRAC | Ann.Lim. | Total Lim. | CRAC | |
| 40 | Year | Year | per each | per Year | of DDC | of DDC | DDCs | Rate | per each | per Year | of CRAC | of CRAC | CRACs | Rate | Reached | Reached | Freqncy | |
| 42 | 2 | 2005 | | 0 | | | 0 | 0% | | 0 | | | 0 | 0% | 0 | 0 | 0% | |
| 43 | 3 | 2006 | | 0 | | | 0 | 0% | | 0 | | | 0 | 0% | 0 | 0 | 0% | |
| 44 | 4 | 2007 | | 0 | 0 | 0 | 0 | 0.0% | 144 | 56 | 56 | 0 | 1174 | 4.2% | 589 | 0 | 39% | |
| 45 | 5 | 2008 | | 0 | 0 | 0 | 0 | 0.0% | 121 | 85 | 77 | 9 | 2107 | 5.7% | 778 | 0 | 70% | |
| 46 | 6 | 2009 | 56 | 0 | 0 | 0 | 16 | 0.0% | 146 | 42 | 38 | 4 | 865 | 2.8% | 428 | 0 | 29% | |
| 47 | 3 | -yr Total | n / a | 0.3 | 0.3 | 0 | 16 | n / a | n / a | 184 | 171 | 13 | 4146 | n / a | 1795 | 0 | n / a | |
| 48 | 3 | -yr Ave. | 56 | 0 | 0 | 0 | 5 | 0.0% | 133 | 61 | 57 | 4 | 1382 | 4.2% | 598 | n / a | 46% | |
| 49 | ToolKit | Fiscal | NORM | PBL | TBL | A-T-C | Ave. Reb. | Ave Reb. | PF share | IOU Share | No. of | Ave. Re- | PBL Int | TBL Int | IOU Benefits After each calculation | | | |
| 50 | Year | Year | Inputs | Inputs | Inputs | Totals | per each | per Year | of Rebate | of Rebate | Rebates | bate Rate | Credit | Credit | Base | PNRR | Mkt Upd | Var.Rates |
| 52 | 2 | 2005 | 0 | 119 | 0 | -180 | | 0 | | | 0 | 0% | 22 | 0.0 | 0 | | | |
| 53 | 3 | 2006 | 0 | 136 | 0 | -133 | | 0 | | | 0 | 0% | 22 | 0.0 | 0 | | | |
| 54 | 4 | 2007 | -22 | 125 | 0 | -1 | 385 | 253 | 253 | 0 | 1971 | 19.0% | 25 | 0.0 | 323 | 323 | 323 | 323 |
| 55 | 5 | 2008 | -24 | 83 | 0 | -90 | 325 | 215 | 204 | 11 | 1988 | 15.1% | 27 | 0.0 | 323 | 323 | 278 | 281 |
| 56 | 6 | 2009 | -24 | -54 | 0 | -34 | 316 | 212 | 199 | 13 | 2011 | 14.6% | 27 | 0.0 | 323 | 313 | 270 | 282 |
| 57 | 3 | -yr Total | -70 | 154 | 0 | -125 | n / a | 681 | 657 | 24 | 5970 | n / a | 80 | 0.0 | 969 | 959 | 871 | 886 |
| 58 | 3 | -yr Ave. | -23 | 51 | 0 | -42 | 342 | 227 | 219 | 8 | 1990 | 16.2% | 27 | 0.0 | 323 | 320 | 290 | 295 |

**Rebate of SecRev > 75% E.V., $200M CRAC, 06 Cap=706, Flat PNRR, $50M LiqRes | PBL reserves**




**Notes** **3-year TPP:** **92.6%**

**Not yet real Init. Prop. data, but closer**
2007-9 data is Init. Prop. with a few issues outstanding
2005-6 data from 3rd Q Review with two $8M tweaks

**Rates** are approximations of an ave. PF rate (PF revs/PF load).
**"ROD"** rate is what is published in the Rod.
**"Oct 1"** rate is the rate going into effect on Oct 1 - this will take into account any CRAC or DDC on top of Rod rate.
**"Effective"** rate is a calculation that takes into account the rate calculated in the ROD, plus any CRAC or DDC amounts that into effect on Oct 1, plus any after-the-fact adjustments from a Rebate.

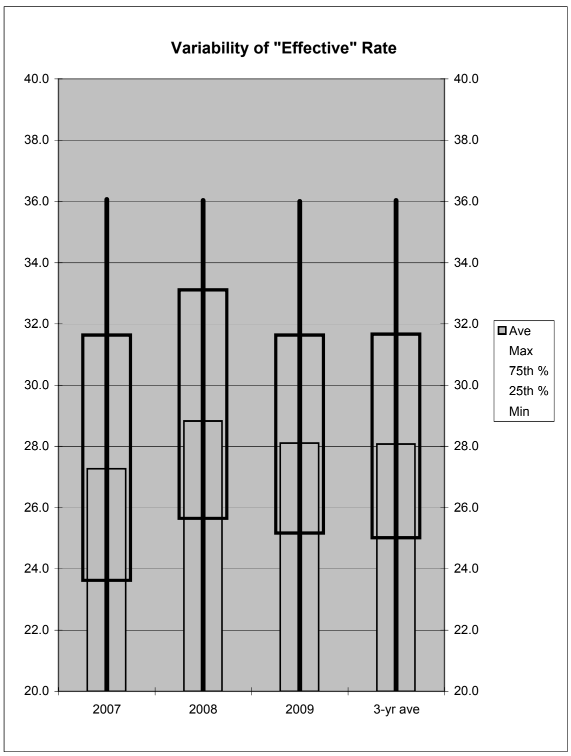
The hollow box on the variability charts below shows the 75th and 25th percentile values - 50% of the outcomes fall between these two values. The vertical line shows the maximum and minimum values over all 3000 games.

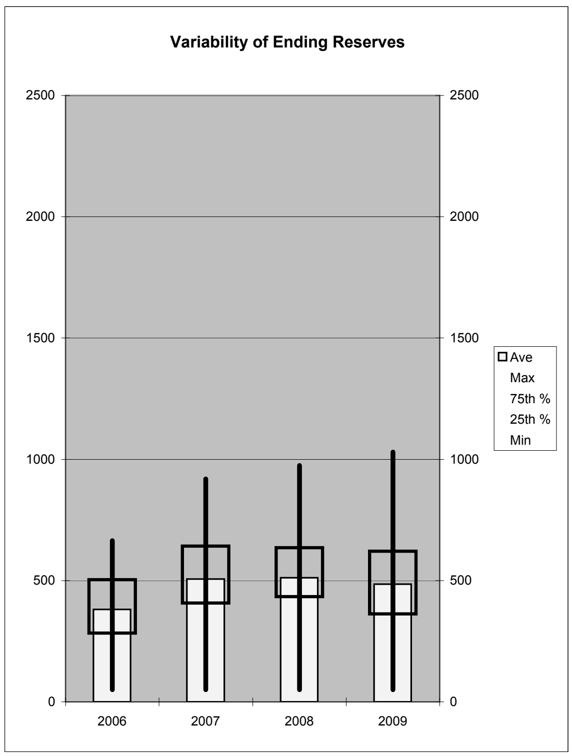
The DDC is calculated near the end of a year but isn't distributed till the next year, so it doesn't cap ending reserves immediately.

| | 2007 | 2008 | 2009 |
|---|---|---|---|
| DDC threshold | 800 | 800 | 800 |
| DDC caps | 1,282 | 1,300 | 1,311 |
| CRAC threshold | 470 | 500 | 500 |
| CRAC caps | 200 | 200 | 200 |
| CRAC trigger freq. | 39% | 70% | 29% |
| CRAC at max freq. | 20% | 26% | 14% |

Rebate Calcns   Total sales - purchases - (E.V. PF Sales + .75*E.V. Sec Sales - E.V. Pur), floor at zero

| PNRR | 2007 | 2008 | 2009 | 3-yr ave. |
|---|---|---|---|---|
| | 168 | 168 | 168 | 168 |



## Rebate of SecRev > 75% E.V., $200M CRAC, 06 Cap=706, Flat PNRR, $50M LiqRes | PBL reserves

| | PF Rates - 3-year averages | | | |
|---|---|---|---|---|
| | Original Rate from RAM | After Change in PNRR | After adj. for CRAC or DDC | After Sec Rev Rebate |
| Max | 28.20 | 31.63 | 36.03 | 36.03 |
| 75th pcntl | 28.20 | 31.63 | 33.88 | 31.67 |
| Average | 28.20 | 31.63 | 32.88 | 28.07 |
| median | 28.20 | 31.63 | 32.33 | 28.51 |
| 25th pcntl | 28.20 | 31.63 | 31.63 | 25.00 |
| min | 28.20 | 31.63 | 30.20 | 5.12 |
| Range | 0.00 | 0.00 | 5.83 | 30.91 |
| Std dev | 0.00 | 0.00 | 1.36 | 4.66 |

| ===> 2007 | IOU Broker Price | | IOU Benefits | | | | | | Average PF rates (not block rates) | | | | | CRAC Results | | | | DDC Results | | | | Sec. Revenue Rebate Results | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Price Used in RAM | Updated Price from RiskMod | Original Amount from RAM | After Change in PNRR | After Mrkt Quote Update | After adj. for CRAC or DDC | After Sec Rev Rebate | Net Sum IOU ben. Change | | Original Rate from RAM | After Change in PNRR | After adj. for CRAC or DDC | After Sec Rev Rebate | Amount From Formula | Amount Collected From PF | Amt. BPA IOU Exp. Reduced | Amount IOU Ben. Reduced | Amount From Formula | Amount Distribut'd To PF | Amt. BPA IOU Exp. Increased | Amount IOU Ben. Increased | Amount From Formula | Amount Distribut'd To PF | Amt. BPA IOU Exp. Increased | Amount IOU Ben. Increased |
| Max | 52.07 | 0.00 | 323.0 | 323.0 | 323.0 | 323.0 | 323.0 | 0.0 | Max | 31.63 | 36.06 | 36.06 | 200.0 | 200.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2337.5 | 2337.5 | 0.0 | 0.0 |
| 75th pcntl | 52.07 | 0.00 | 323.0 | 323.0 | 323.0 | 323.0 | 323.0 | 0.0 | 75th pcntl | 31.63 | 34.46 | 31.63 | 127.6 | 127.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 404.2 | 404.2 | 0.0 | 0.0 |
| Average | 52.07 | 0.00 | 323.0 | 323.0 | 323.0 | 323.0 | 323.0 | 0.0 | Average | 31.63 | 32.88 | 27.27 | 56.4 | 56.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 253.3 | 253.3 | 0.0 | 0.0 |
| median | 52.07 | 0.00 | 323.0 | 323.0 | 323.0 | 323.0 | 323.0 | 0.0 | median | 31.63 | 31.63 | 29.44 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 148.3 | 148.3 | 0.0 | 0.0 |
| 25th pcntl | 52.07 | 0.00 | 323.0 | 323.0 | 323.0 | 323.0 | 323.0 | 0.0 | 25th pcntl | 31.63 | 31.63 | 23.61 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| min | 52.07 | 0.00 | 323.0 | 323.0 | 323.0 | 323.0 | 323.0 | 0.0 | min | 31.63 | 31.63 | -20.14 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Range | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | Range | 0.00 | 4.43 | 56.20 | 200.0 | 200.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2337.5 | 2337.5 | 0.0 | 0.0 |
| Std dev | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | Std dev | 0.00 | 1.83 | 7.36 | 82.7 | 82.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 308.5 | 308.5 | 0.0 | 0.0 |

| ===> 2008 | IOU Broker Price | | IOU Benefits | | | | | | Average PF rates (not block rates) | | | | | CRAC Results | | | | DDC Results | | | | Sec. Revenue Rebate Results | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Price Used in RAM | Updated Price from RiskMod | Original Amount from RAM | After Change in PNRR | After Mrkt Quote Update | After adj. for CRAC or DDC | After Sec Rev Rebate | Net Sum IOU ben. Change | | Original Rate from RAM | After Change in PNRR | After adj. for CRAC or DDC | After Sec Rev Rebate | Amount From Formula | Amount Collected From PF | Amt. BPA IOU Exp. Reduced | Amount IOU Ben. Reduced | Amount From Formula | Amount Distribut'd To PF | Amt. BPA IOU Exp. Increased | Amount IOU Ben. Increased | Amount From Formula | Amount Distribut'd To PF | Amt. BPA IOU Exp. Increased | Amount IOU Ben. Increased |
| Max | 49.85 | 107.90 | 323.0 | 323.0 | 323.0 | 323.0 | 323.0 | 0.0 | Max | 31.63 | 36.03 | 36.03 | 200.0 | 200.0 | 49.4 | 63.8 | 0.0 | 0.0 | 0.0 | 0.0 | 1347.0 | 1347.0 | 154.8 | 200.0 |
| 75th pcntl | 49.85 | 56.64 | 323.0 | 323.0 | 323.0 | 323.0 | 323.0 | 0.0 | 75th pcntl | 31.63 | 34.94 | 33.11 | 200.0 | 150.6 | 12.6 | 16.2 | 0.0 | 0.0 | 0.0 | 0.0 | 347.0 | 322.6 | 3.6 | 4.7 |
| Average | 49.85 | 50.42 | 323.0 | 323.0 | 277.9 | 266.8 | 281.0 | -42.0 | Average | 31.63 | 33.31 | 28.82 | 85.1 | 76.5 | 8.6 | 11.1 | 0.0 | 0.0 | 0.0 | 0.0 | 215.4 | 204.4 | 11.0 | 14.2 |
| median | 49.85 | 48.71 | 323.0 | 323.0 | 323.0 | 323.0 | 323.0 | 0.0 | median | 31.63 | 32.83 | 30.58 | 63.6 | 54.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 135.8 | 119.8 | 0.0 | 0.0 |
| 25th pcntl | 49.85 | 42.02 | 323.0 | 323.0 | 239.4 | 209.9 | 256.0 | -67.0 | 25th pcntl | 31.63 | 31.63 | 25.64 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| min | 49.85 | 28.55 | 323.0 | 323.0 | 123.0 | 123.0 | 123.0 | -200.0 | min | 31.63 | 31.63 | 2.04 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Range | 0.00 | 79.34 | 0.0 | 0.0 | 200.0 | 200.0 | 200.0 | 200.0 | Range | 0.00 | 4.39 | 33.99 | 200.0 | 200.0 | 49.4 | 63.8 | 0.0 | 0.0 | 0.0 | 0.0 | 1347.0 | 1347.0 | 154.8 | 200.0 |
| Std dev | 0.00 | 11.34 | 0.0 | 0.0 | 67.9 | 74.9 | 69.0 | 69.0 | Std dev | 0.00 | 1.66 | 6.08 | 82.0 | 75.5 | 15.2 | 19.6 | 0.0 | 0.0 | 0.0 | 0.0 | 250.9 | 246.0 | 24.2 | 31.3 |

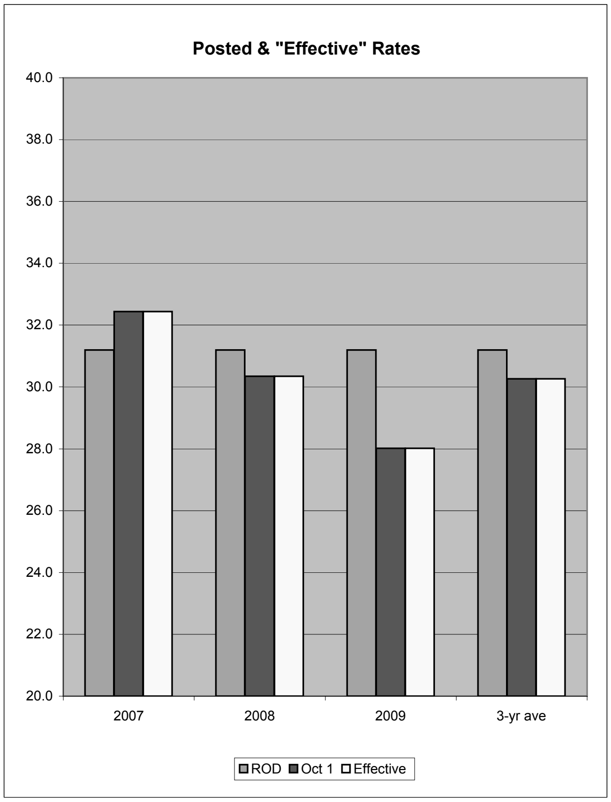
| ===> 2009 | IOU Broker Price | | IOU Benefits | | | | | | Average PF rates (not block rates) | | | | | CRAC Results | | | | DDC Results | | | | Sec. Revenue Rebate Results | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Price Used in RAM | Updated Price from RiskMod | Original Amount from RAM | After Change in PNRR | After Mrkt Quote Update | After adj. for CRAC or DDC | After Sec Rev Rebate | Net Sum IOU ben. Change | | Original Rate from RAM | After Change in PNRR | After adj. for CRAC or DDC | After Sec Rev Rebate | Amount From Formula | Amount Collected From PF | Amt. BPA IOU Exp. Reduced | Amount IOU Ben. Reduced | Amount From Formula | Amount Distribut'd To PF | Amt. BPA IOU Exp. Increased | Amount IOU Ben. Increased | Amount From Formula | Amount Distribut'd To PF | Amt. BPA IOU Exp. Increased | Amount IOU Ben. Increased |
| Max | 45.84 | 87.75 | 323.0 | 312.9 | 323.0 | 323.0 | 323.0 | 0.0 | Max | 31.63 | 35.99 | 35.99 | 200.0 | 200.0 | 49.1 | 63.4 | 197.5 | 197.5 | 11.8 | 15.2 | 1860.5 | 1860.5 | 154.7 | 199.9 |
| 75th pcntl | 45.84 | 51.65 | 323.0 | 312.9 | 323.0 | 323.0 | 323.0 | 0.0 | 75th pcntl | 31.63 | 32.47 | 31.63 | 40.8 | 38.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 340.2 | 312.9 | 14.4 | 18.6 |
| Average | 45.84 | 46.67 | 323.0 | 312.9 | 270.3 | 264.7 | 281.6 | -41.4 | Average | 31.63 | 32.45 | 28.11 | 42.1 | 37.7 | 4.3 | 5.6 | 0.3 | 0.3 | 0.0 | 0.0 | 212.1 | 199.0 | 13.1 | 16.9 |
| median | 45.84 | 46.09 | 323.0 | 312.9 | 317.7 | 305.3 | 323.0 | 0.0 | median | 31.63 | 31.63 | 29.81 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 127.0 | 111.6 | 0.0 | 0.0 |
| 25th pcntl | 45.84 | 41.27 | 323.0 | 312.9 | 224.9 | 213.5 | 254.6 | -68.4 | 25th pcntl | 31.63 | 31.63 | 25.16 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| min | 45.84 | 28.01 | 323.0 | 312.9 | 123.0 | 123.0 | 123.0 | -200.0 | min | 31.63 | 27.33 | -8.94 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Range | 0.00 | 59.73 | 0.0 | 0.0 | 200.0 | 200.0 | 200.0 | 200.0 | Range | 0.00 | 8.67 | 44.94 | 200.0 | 200.0 | 49.1 | 63.4 | 197.5 | 197.5 | 11.8 | 15.2 | 1860.5 | 1860.5 | 154.7 | 199.9 |
| Std dev | 0.00 | 7.75 | 0.0 | 0.0 | 69.2 | 71.1 | 65.2 | 65.2 | Std dev | 0.00 | 1.50 | 5.87 | 75.6 | 68.4 | 12.4 | 16.0 | 5.9 | 5.9 | 0.3 | 0.4 | 252.8 | 246.7 | 25.4 | 32.8 |

## 3.4 Smaller CRAC Package

Table 1: ToolKit Main
Table 2: Graphs
Table 3: Statistical Summary

| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | **ToolKit v. 2.30, (11-13-2005)** | | | | | Study title: | 100% credit of Sec Rev, $200M CRAC, 06 Cap=706, Flat PNRR, $50M LiqRes \| PBL reserves | | | | | | | | | | | |
| 2 | **Time of run: 23:19:29 on 11-13-05** | | | | 3 | -yr TPP = | 92.63% | Run Type | PBL-only run | | | | | | | | | |
| 3 | **Inputs** | PBL data: | RM_PNRR0_3YrRate=29-09_9-Nov-05.xls | | | | | | | | | | | | | | | |
| 4 | | NORM dat | NORM 10-18-05_Output.xls | | | | | | | | | | | | | | | |
| 5 | Files => | TBL data: | | | | | | | | | | | | | | | | |
| 6 | Start in | Stop in | Run Type | CRAC | PBL | TBL | PBL Strt. | Add'l | Deferral | ☐ | Sec. Rev. Rebate Description | | | | | | | |
| 7 | TK Year | TK Year | PBL | Lim/Total | LiqRes | LiqRes | ANR | LiqRes 7-9 | Logic | | n / a | | | | | | | |
| 8 | 2 | 6 | BPA | 20,000 | 50 | 20 | -519.62 | 0 | Hybrid | | | | | | | | | |
| 9 | Start TPP | "Small" | No. of | PBL Strt | TBL Strt | Debug | Reserves | AutoPrint | AutoPrint | Flat PNRR | Enable | CRAC | CRAC | | | | | |
| 10 | in TK Yr | Def. Size | Iterations | Rsrv Bal | Rsrv Bal | Level | Graph | Res Grph | This Page | Rate Imp.? | PNRR? | Fixed? | Stats On? | | | | | |
| 11 | 4 | $200 | 3,000 | 402.0 | 0 | 0 | ☑ | ☐ | ☐ | ☑ | ☑ | ☐ | ☐ | | | | | |
| 12 | ToolKit | Fiscal | Probabi- | Treasury | Amort | Interest | PBL Int. | TBL Int. | Other | TBL Rsrvs | Cash Lag | PBL Cash | TBL Cash | | | | | |
| 13 | Year | Year | listic? | Int. Rate | Sched | Sched | Cr. Sched | Cr. Sched | Cash Adj | Available | for PNRR | Tmg Adj | Tmg Adj | | | | | |
| 15 | 2 | 2005 | TRUE | 4.75% | 271.3 | 247.4 | 29.96 | 11.08 | | 0.0 | | 11.5 | 4.6 | | | | | |
| 16 | 3 | 2006 | TRUE | 4.75% | 296.5 | 250.4 | 0.00 | 11.14 | -4.1 | 0.0 | | 12.2 | 5.8 | | | | | |
| 17 | 4 | 2007 | TRUE | 4.75% | 170.3 | 270.1 | 10.03 | | 23.1 | 55.0 | 0.0 | 7.2 | | | | | | |
| 18 | 5 | 2008 | TRUE | 4.75% | 185.2 | 291.6 | 10.47 | | 12.2 | -57.6 | 0.0 | 7.5 | | | | | | |
| 19 | 6 | 2009 | TRUE | 4.75% | 176.4 | 306.1 | 10.33 | | 23.1 | 0.0 | 0.0 | 7.4 | | | | | | |
| 20 | ToolKit | Fiscal | Div. Dist. | | CRAC | | | PNRR | | | | TBL Fed. | PBL Fed. | Other NR | Delta | | | |
| 21 | Year | Year | Threshold | Lim/Year | Threshold | Lim/Year | Rev Basis | Shape | Risk Mod | Calc'd in TK | Sum | Int. Red. | Int. Red. | & Csh Adj | Int. Cred. | | | |
| 23 | 2 | 2005 | 401 | 5,000 | 1 | 0 | 1,017.3 | 0.0 | | | | | | 6.6 | | | | |
| 24 | 3 | 2006 | 401 | 5,000 | 1 | 0 | 1,028.1 | 0.0 | | | | | | | | | | |
| 25 | 4 | 2007 | 133 | 1,282 | -197 | 200 | 1,332.6 | 1.00 | 0 | 145 | 145 | | | 0.0 | | | | |
| 26 | 5 | 2008 | 257 | 1,300 | -43 | 200 | 1,351.6 | 1.00 | 0 | 145 | 145 | | | 0.0 | | | | |
| 27 | 6 | 2009 | 244 | 1,311 | -56 | 200 | 1,362.7 | 1.00 | 0 | 145 | 145 | | | 0.0 | | | | |
| 28 | **Outputs** | | | | | | | | | | | | | | | | | |
| 29 | ToolKit | Fiscal | No. of | "Small" | 1-year | Cumul. | Cumul. | Ave. Def. | Ave. Def. | Ave 1st | Ave. End. | Ave. End. | PNRR | PBL | | Approx PF rates | | |
| 30 | Year | Year | Deferrals | Deferrals | Probab. | Deferrals | Probab. | per Year | per Def. | Def./Def. | Reserves | PBL ANR | Added | Strt Bal | | (average rates, not block) | | |
| 31 | | | | | | | | | | | | | | 402.0 | | Base | After | After |
| 32 | 2 | 2005 | 0 | - | 100% | n / a | n / a | 0.0 | n / a | n / a | 347 | -395 | - | | | | PNRR | Var.Rates |
| 33 | 3 | 2006 | 331 | 295 | 89.0% | n / a | n / a | 12.3 | 111.6 | 111.6 | 381 | -236 | - | FCCF | | | | |
| 34 | 4 | 2007 | 87 | 84 | 97.1% | 87 | 97.1% | 2.1 | 72.5 | 72.5 | 742 | 75 | 145 | Strt Bal | | 28.20 | 31.20 | 32.44 |
| 35 | 5 | 2008 | 100 | 87 | 96.7% | 153 | 94.9% | 3.6 | 108.1 | 83.6 | 835 | 291 | 145 | n / a | | 28.20 | 31.20 | 30.35 |
| 36 | 6 | 2009 | 117 | 84 | 96.1% | 221 | 92.6% | 5.6 | 143.6 | 99.5 | 817 | 259 | 145 | | | 28.20 | 31.20 | 28.01 |
| 37 | 3 | -yr Total | 304 | 255 | n / a | n / a | n / a | 11.3 | n / a | n / a | n / a | n / a | 435 | 5-yr sum> | | n / a | n / a | n / a |
| 38 | 3 | -yr Ave. | 101 | 85 | n / a | n / a | n / a | 3.8 | 111.6 | 100.6 | n / a | n / a | 87 | 3-yr sum> | | 28.2 | 31.2 | 30.26 |
| 39 | ToolKit | Fiscal | Ave. DDC | Ave DDC | PF share | IOU Share | No. of | Ave DDC | Ave. CRAC | Ave CRAC | PF share | IOU Share | No. of | Ave CRAC | Ann.Lim. | Total Lim. | CRAC | |
| 40 | Year | Year | per each | per Year | of DDC | of DDC | DDCs | Rate | per each | per Year | of CRAC | of CRAC | CRACs | Rate | Reached | Reached | Freqncy | |
| 42 | 2 | 2005 | | 0 | | | 0 | 0% | | 0 | | | 0 | 0% | 0 | 0 | 0% | |
| 43 | 3 | 2006 | | 0 | | | 0 | 0% | | 0 | | | 0 | 0% | 0 | 0 | 0% | |
| 44 | 4 | 2007 | | 0 | 0 | 0 | 0 | 0.0% | 145 | 56 | 56 | 0 | 1158 | 4.2% | 584 | 0 | 39% | |
| 45 | 5 | 2008 | 308 | 95 | 94 | 1 | 922 | 6.9% | 150 | 61 | 55 | 6 | 1223 | 4.1% | 671 | 0 | 41% | |
| 46 | 6 | 2009 | 321 | 183 | 174 | 9 | 1708 | 12.8% | 158 | 31 | 28 | 3 | 598 | 2.1% | 342 | 0 | 20% | |
| 47 | 3 | -yr Total | n / a | 277.5 | 268.1 | 9 | 2630 | n / a | n / a | 149 | 139 | 9 | 2979 | n / a | 1597 | 0 | n / a | |
| 48 | 3 | -yr Ave. | 317 | 92 | 89 | 3 | 877 | 6.6% | 150 | 50 | 46 | 3 | 993 | 3.4% | 532 | n / a | 33% | |
| 49 | ToolKit | Fiscal | NORM | PBL | TBL | A-T-C | Ave. Reb. | Ave Reb. | PF share | IOU Share | No. of | Ave. Re- | PBL Int | TBL Int | IOU Benefits After each calculation | | | |
| 50 | Year | Year | Inputs | Inputs | Inputs | Totals | per each | per Year | of Rebate | of Rebate | Rebates | bate Rate | Credit | Credit | Base | PNRR | Mkt Upd | Var.Rates |
| 52 | 2 | 2005 | 0 | 119 | 0 | -180 | | | | | | 0% | 22 | 0.0 | 0 | | | |
| 53 | 3 | 2006 | 0 | 136 | 0 | -133 | | | | | | 0% | 22 | 0.0 | 0 | | | |
| 54 | 4 | 2007 | -22 | 125 | 0 | -1 | | | 0 | 0 | | 0.0% | 25 | 0.0 | 323 | 323 | 323 | 323 |
| 55 | 5 | 2008 | -24 | 83 | 0 | -90 | | | 0 | 0 | | 0.0% | 34 | 0.0 | 323 | 323 | 281 | 274 |
| 56 | 6 | 2009 | -24 | -54 | 0 | -34 | | | 0 | 0 | | 0.0% | 35 | 0.0 | 323 | 321 | 274 | 281 |
| 57 | 3 -yr Total | | -70 | 154 | 0 | -125 | | | | | | n / a | 94 | 0.0 | 969 | 967 | 878 | 878 |
| 58 | 3 -yr Ave. | | -23 | 51 | 0 | -42 | | | | | | | 31 | 0.0 | 323 | 322 | 293 | 293 |

## 100% credit of Sec Rev, $200M CRAC, 06 Cap=706, Flat PNRR, $50M LiqRes | PBL reserves




**Notes** **3-year TPP: 92.6%**

**Not yet real Init. Prop. data, but closer**
2007-9 data is Init. Prop. with a few issues outstanding
2005-6 data from 3rd Q Review with two $8M tweaks

**Rates** are approximations of an ave. PF rate (PF revs/PF load).
**"ROD"** rate is what is published in the Rod.
**"Oct 1"** rate is the rate going into effect on Oct 1 - this will take into account any CRAC or DDC on top of Rod rate.
**"Effective"** rate is a calculation that takes into account the rate calculated in the ROD, plus any CRAC or DDC amounts that into effect on Oct 1, plus any after-the-fact adjustments from a Rebate.

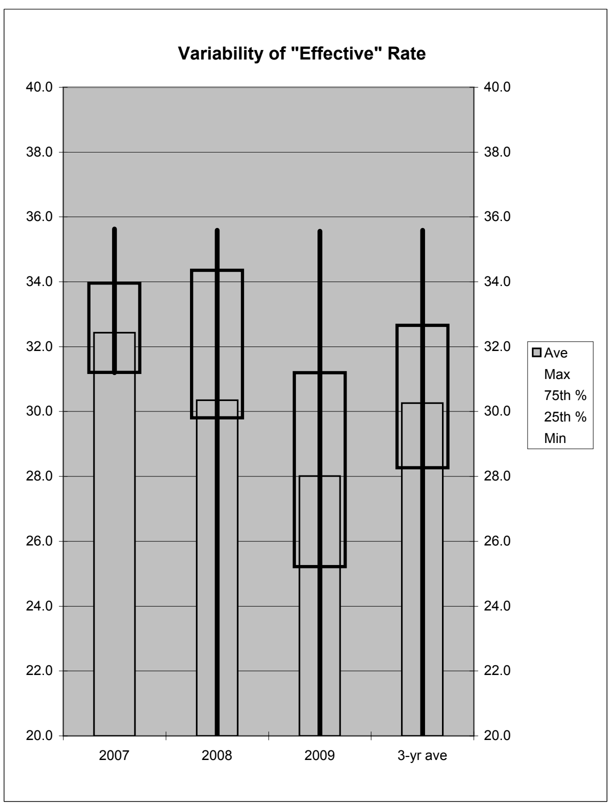
The hollow box on the variability charts below shows the 75th and 25th percentile values - 50% of the outcomes fall between these two values. The vertical line shows the maximum and minimum values over all 3000 games.

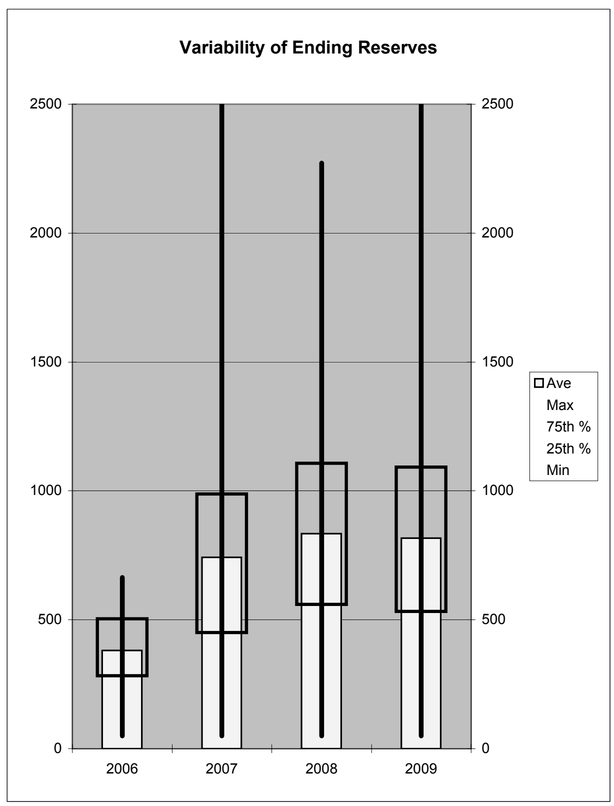
The DDC is calculated near the end of a year but isn't distributed till the next year, so it doesn't cap ending reserves immediately.

| | 2007 | 2008 | 2009 |
|---|---|---|---|
| DDC threshold | 800 | 800 | 800 |
| DDC caps | 1,282 | 1,300 | 1,311 |
| CRAC threshold | 470 | 500 | 500 |
| CRAC caps | 200 | 200 | 200 |
| CRAC trigger freq. | 39% | 41% | 20% |
| CRAC at max freq. | 19% | 22% | 11% |

Rebate
Calcns n / a

| PNRR | 2007 | 2008 | 2009 | 3-yr ave. |
|---|---|---|---|---|
| | 145 | 145 | 145 | 145 |



## 100% credit of Sec Rev, $200M CRAC, 06 Cap=706, Flat PNRR, $50M LiqRes | PBL reserves

| | PF Rates - 3-year averages | | | |
|---|---|---|---|---|
| | Original Rate from RAM | After Change in PNRR | After adj. for CRAC or DDC | After Sec Rev Rebate |
| Max | 28.20 | 31.20 | 35.59 | 35.59 |
| 75th pcntl | 28.20 | 31.20 | 32.66 | 32.66 |
| Average | 28.20 | 31.20 | 30.26 | 30.26 |
| median | 28.20 | 31.20 | 30.88 | 30.88 |
| 25th pcntl | 28.20 | 31.20 | 28.26 | 28.26 |
| min | 28.20 | 31.20 | 15.33 | 15.33 |
| Range | 0.00 | 0.00 | 20.27 | 20.27 |
| Std dev | 0.00 | 0.00 | 3.38 | 3.38 |

| ===> | IOU Broker Price | | IOU Benefits | | | | | | Average PF rates (not block rates) | | | | CRAC Results | | | | DDC Results | | | | Sec. Revenue Rebate Results | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2007 | Price Used in RAM | Updated Price from RiskMod | Original Amount from RAM | After Change in PNRR | After Mrkt Quote Update | After adj. for CRAC or DDC | After Sec Rev Rebate | Net Sum IOU ben. Change | Original Rate from RAM | After Change in PNRR | After adj. for CRAC or DDC | After Sec Rev Rebate | Amount From Formula | Amount Collected From PF | Amt. BPA IOU Exp. Reduced | Amount IOU Ben. Reduced | Amount From Formula | Amount Distribut'd To PF | Amt. BPA IOU Exp. Increased | Amount IOU Ben. Increased | Amount From Formula | Amount Distribut'd To PF | Amt. BPA IOU Exp. Increased | Amount IOU Ben. Increased |
| Max | 52.07 | 0.00 | 323.0 | 323.0 | 323.0 | 323.0 | 323.0 | 0.0 | Max | 31.20 | 35.63 | 35.63 | 200.0 | 200.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 75th pcntl | 52.07 | 0.00 | 323.0 | 323.0 | 323.0 | 323.0 | 323.0 | 0.0 | 75th pcntl | 31.20 | 33.96 | 33.96 | 124.9 | 124.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Average | 52.07 | 0.00 | 323.0 | 323.0 | 323.0 | 323.0 | 323.0 | 0.0 | Average | 31.20 | 32.44 | 32.44 | 55.9 | 55.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| median | 52.07 | 0.00 | 323.0 | 323.0 | 323.0 | 323.0 | 323.0 | 0.0 | median | 31.20 | 31.20 | 31.20 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 25th pcntl | 52.07 | 0.00 | 323.0 | 323.0 | 323.0 | 323.0 | 323.0 | 0.0 | 25th pcntl | 31.20 | 31.20 | 31.20 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| min | 52.07 | 0.00 | 323.0 | 323.0 | 323.0 | 323.0 | 323.0 | 0.0 | min | 31.20 | 31.20 | 31.20 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Range | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | Range | 0.00 | 4.43 | 4.43 | 200.0 | 200.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Std dev | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | Std dev | 0.00 | 1.83 | 1.83 | 82.5 | 82.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

| ===> | IOU Broker Price | | IOU Benefits | | | | | | Average PF rates (not block rates) | | | | CRAC Results | | | | DDC Results | | | | Sec. Revenue Rebate Results | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2008 | Price Used in RAM | Updated Price from RiskMod | Original Amount from RAM | After Change in PNRR | After Mrkt Quote Update | After adj. for CRAC or DDC | After Sec Rev Rebate | Net Sum IOU ben. Change | Original Rate from RAM | After Change in PNRR | After adj. for CRAC or DDC | After Sec Rev Rebate | Amount From Formula | Amount Collected From PF | Amt. BPA IOU Exp. Reduced | Amount IOU Ben. Reduced | Amount From Formula | Amount Distribut'd To PF | Amt. BPA IOU Exp. Increased | Amount IOU Ben. Increased | Amount From Formula | Amount Distribut'd To PF | Amt. BPA IOU Exp. Increased | Amount IOU Ben. Increased |
| Max | 49.85 | 107.90 | 323.0 | 323.0 | 323.0 | 323.0 | 323.0 | 0.0 | Max | 31.20 | 35.59 | 35.59 | 200.0 | 200.0 | 49.4 | 63.8 | 1300.0 | 1300.0 | 74.1 | 95.8 | 0.0 | 0.0 | 0.0 | 0.0 |
| 75th pcntl | 49.85 | 56.64 | 323.0 | 323.0 | 323.0 | 323.0 | 323.0 | 0.0 | 75th pcntl | 31.20 | 34.36 | 34.36 | 166.3 | 143.9 | 0.0 | 0.0 | 70.4 | 63.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Average | 49.85 | 50.42 | 323.0 | 323.0 | 280.8 | 273.8 | 273.8 | -49.2 | Average | 31.20 | 30.35 | 30.35 | 61.3 | 55.1 | 6.2 | 8.0 | 94.7 | 93.9 | 0.9 | 1.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| median | 49.85 | 48.71 | 323.0 | 323.0 | 323.0 | 323.0 | 323.0 | 0.0 | median | 31.20 | 31.20 | 31.20 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 25th pcntl | 49.85 | 42.02 | 323.0 | 323.0 | 247.8 | 231.8 | 231.8 | -91.2 | 25th pcntl | 31.20 | 29.80 | 29.80 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| min | 49.85 | 28.55 | 323.0 | 323.0 | 123.0 | 123.0 | 123.0 | -200.0 | min | 31.20 | 2.63 | 2.63 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Range | 0.00 | 79.34 | 0.0 | 0.0 | 200.0 | 200.0 | 200.0 | 200.0 | Range | 0.00 | 32.96 | 32.96 | 200.0 | 200.0 | 49.4 | 63.8 | 1300.0 | 1300.0 | 74.1 | 95.8 | 0.0 | 0.0 | 0.0 | 0.0 |
| Std dev | 0.00 | 11.34 | 0.0 | 0.0 | 65.9 | 71.7 | 71.7 | 71.7 | Std dev | 0.00 | 5.34 | 5.34 | 85.4 | 78.0 | 14.2 | 18.3 | 207.0 | 206.7 | 5.2 | 6.7 | 0.0 | 0.0 | 0.0 | 0.0 |

| ===> | IOU Broker Price | | IOU Benefits | | | | | | Average PF rates (not block rates) | | | | CRAC Results | | | | DDC Results | | | | Sec. Revenue Rebate Results | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2009 | Price Used in RAM | Updated Price from RiskMod | Original Amount from RAM | After Change in PNRR | After Mrkt Quote Update | After adj. for CRAC or DDC | After Sec Rev Rebate | Net Sum IOU ben. Change | Original Rate from RAM | After Change in PNRR | After adj. for CRAC or DDC | After Sec Rev Rebate | Amount From Formula | Amount Collected From PF | Amt. BPA IOU Exp. Reduced | Amount IOU Ben. Reduced | Amount From Formula | Amount Distribut'd To PF | Amt. BPA IOU Exp. Increased | Amount IOU Ben. Increased | Amount From Formula | Amount Distribut'd To PF | Amt. BPA IOU Exp. Increased | Amount IOU Ben. Increased |
| Max | 45.84 | 87.75 | 323.0 | 321.4 | 323.0 | 323.0 | 323.0 | 0.0 | Max | 31.20 | 35.56 | 35.56 | 200.0 | 200.0 | 49.1 | 63.4 | 1310.6 | 1310.6 | 125.0 | 161.5 | 0.0 | 0.0 | 0.0 | 0.0 |
| 75th pcntl | 45.84 | 51.65 | 323.0 | 321.4 | 323.0 | 323.0 | 323.0 | 0.0 | 75th pcntl | 31.20 | 31.20 | 31.20 | 0.0 | 0.0 | 0.0 | 0.0 | 299.6 | 274.9 | 1.9 | 2.5 | 0.0 | 0.0 | 0.0 | 0.0 |
| Average | 45.84 | 46.67 | 323.0 | 321.4 | 273.9 | 280.7 | 280.7 | -42.3 | Average | 31.20 | 28.01 | 28.01 | 31.4 | 28.2 | 3.2 | 4.2 | 182.8 | 174.3 | 8.5 | 11.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| median | 45.84 | 46.09 | 323.0 | 321.4 | 323.0 | 323.0 | 323.0 | 0.0 | median | 31.20 | 29.95 | 29.95 | 0.0 | 0.0 | 0.0 | 0.0 | 67.0 | 57.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 25th pcntl | 45.84 | 41.27 | 323.0 | 321.4 | 233.2 | 253.3 | 253.3 | -69.7 | 25th pcntl | 31.20 | 25.21 | 25.21 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| min | 45.84 | 28.01 | 323.0 | 321.4 | 123.0 | 123.0 | 123.0 | -200.0 | min | 31.20 | 2.61 | 2.61 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Range | 0.00 | 59.73 | 0.0 | 0.0 | 200.0 | 200.0 | 200.0 | 200.0 | Range | 0.00 | 32.95 | 32.95 | 200.0 | 200.0 | 49.1 | 63.4 | 1310.6 | 1310.6 | 125.0 | 161.5 | 0.0 | 0.0 | 0.0 | 0.0 |
| Std dev | 0.00 | 7.75 | 0.0 | 0.0 | 67.5 | 66.3 | 66.3 | 66.3 | Std dev | 0.00 | 5.86 | 5.86 | 68.7 | 62.2 | 11.0 | 14.2 | 245.1 | 241.7 | 19.2 | 24.8 | 0.0 | 0.0 | 0.0 | 0.0 |

### 3.5 Larger CRAC Package

Table 1: ToolKit Main
Table 2: Graphs
Table 3: Statistical Summary

| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | **ToolKit v. 2.30, (11-13-2005)** | | | | | Study title: | 100% credit of Sec Rev, $400M CRAC, 06 Cap=706, Flat PNRR, $50M LiqRes \| PBL reserves | | | | | | | | | | | |
| 2 | Time of run: 23:27:17 on 11-13-05 | | | | 3 | -yr TPP = | 92.63% | Run Type | PBL-only run | | | | | | | | | |
| 3 | Inputs | PBL data: | RM_PNRR0_3YrRate=29-09_9-Nov-05.xls | | | | | | | | | | | | | | | |
| 4 | | NORM dat: | NORM 10-18-05_Output.xls | | | | | | | | | | | | | | | |
| 5 | Files => | TBL data: | | | | | | | | | | | | | | | | |
| 6 | Start in | Stop in | Run Type | CRAC | PBL | TBL | PBL Strt. | Add'l | Deferral | ☐ | Sec. Rev. Rebate Description | | | | | | | |
| 7 | TK Year | TK Year | PBL ◉ | Lim/Total | LiqRes | LiqRes | ANR | LiqRes 7-9 | Logic | | n / a | | | | | | | |
| 8 | 2 | 6 | BPA ○ | 20,000 | 50 | 20 | -519.62 | 0 | Hybrid | | | | | | | | | |
| 9 | Start TPP | "Small" | No. of | PBL Strt | TBL Strt | Debug | Reserves | AutoPrint | AutoPrint | Flat PNRR | Enable | CRAC | CRAC | | | | | |
| 10 | in TK Yr | Def. Size | Iterations | Rsrv Bal | Rsrv Bal | Level | Graph | Res Grph | This Page | Rate Imp.? | PNRR? | Fixed? | Stats On? | | | | | |
| 11 | 4 | $200 | 3,000 | 402.0 | 0 | 0 | ☑ | ☐ | ☐ | ☑ | ☑ | ☐ | ☐ | | | | | |

| | ToolKit Year | Fiscal Year | Probabi-listic? | Treasury Int. Rate | Amort Sched | Interest Sched | PBL Int. Cr. Sched | TBL Int. Cr. Sched | Other Cash Adj | TBL Rsrvs Available | Cash Lag for PNRR | PBL Cash Tmg Adj | TBL Cash Tmg Adj |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | 2 | 2005 | TRUE | 4.75% | 271.3 | 247.4 | 29.96 | 11.08 | | 0.0 | | 11.5 | 4.6 |
| 16 | 3 | 2006 | TRUE | 4.75% | 296.5 | 250.4 | 0.00 | 11.14 | -4.1 | 0.0 | | 12.2 | 5.8 |
| 17 | 4 | 2007 | TRUE | 4.75% | 170.3 | 270.1 | 10.03 | | 23.1 | 55.0 | 0.0 | 7.2 | |
| 18 | 5 | 2008 | TRUE | 4.75% | 185.2 | 291.6 | 10.47 | | 12.2 | -57.6 | 0.0 | 7.5 | |
| 19 | 6 | 2009 | TRUE | 4.75% | 176.4 | 306.1 | 10.33 | | 23.1 | 0.0 | 0.0 | 7.4 | |

| | ToolKit Year | Fiscal Year | Div. Dist. Threshold | Div. Dist. Lim/Year | CRAC Threshold | CRAC Lim/Year | CRAC Rev Basis | PNRR Shape | PNRR Risk Mod | PNRR Calc'd in TK | PNRR Sum | TBL Fed. Int. Red. | PBL Fed. Int. Red. | Other NR & Csh Adj | Delta Int. Cred. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 23 | 2 | 2005 | 401 | 5,000 | 1 | 0 | 1,017.3 | 0.0 | | | | | | 6.6 | |
| 24 | 3 | 2006 | 401 | 5,000 | 1 | 0 | 1,028.1 | 0.0 | | | | | | | |
| 25 | 4 | 2007 | 131 | 1,282 | -199 | 400 | 1,332.6 | 1.00 | 0 | 76 | 76 | | | 0.0 | |
| 26 | 5 | 2008 | 261 | 1,300 | -39 | 400 | 1,351.6 | 1.00 | 0 | 76 | 76 | | | 0.0 | |
| 27 | 6 | 2009 | 247 | 1,311 | -53 | 400 | 1,362.7 | 1.00 | 0 | 76 | 76 | | | 0.0 | |

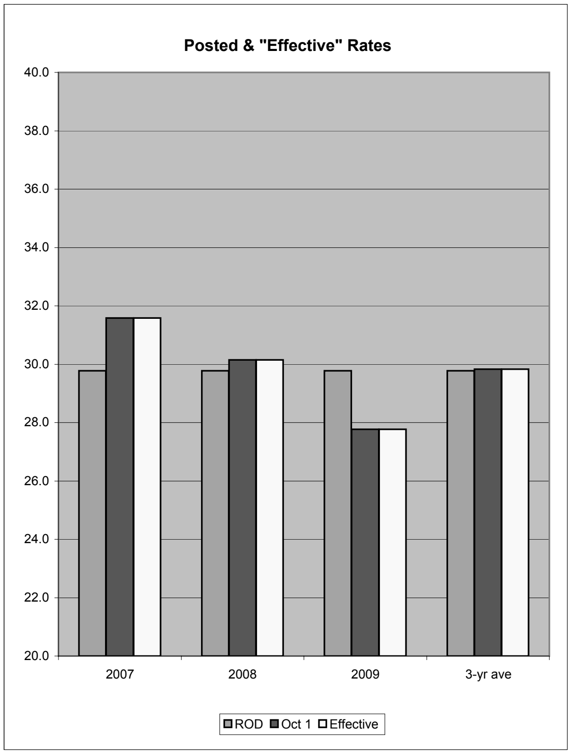
**Outputs**

| | ToolKit Year | Fiscal Year | No. of Deferrals | "Small" Deferrals | 1-year Probab. | Cumul. Deferrals | Cumul. Probab. | Ave. Def. per Year | Ave. Def. per Def. | Ave 1st Def./Def. | Ave. End. Reserves | Ave. End. PBL ANR | PNRR Added | PBL Strt Bal | | Approx PF rates (average rates, not block) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 31 | | | | | | | | | | | | | | 402.0 | | Base | After PNRR | After Var.Rates |
| 32 | 2 | 2005 | 0 | - | 100% | n / a | n / a | 0.0 | n / a | n / a | 347 | -395 | - | | | | | |
| 33 | 3 | 2006 | 331 | 295 | 89.0% | n / a | n / a | 12.3 | 111.6 | 111.6 | 381 | -236 | - | FCCF | | | | |
| 34 | 4 | 2007 | 61 | 58 | 98.0% | 61 | 98.0% | 1.4 | 68.9 | 68.9 | 705 | 36 | 76 | Strt Bal | | 28.20 | 29.77 | 31.59 |
| 35 | 5 | 2008 | 57 | 53 | 98.1% | 104 | 96.5% | 1.5 | 77.1 | 55.2 | 774 | 235 | 76 | n / a | | 28.20 | 29.77 | 30.15 |
| 36 | 6 | 2009 | 141 | 118 | 95.3% | 221 | 92.6% | 4.9 | 104.6 | 89.6 | 735 | 183 | 76 | | | 28.20 | 29.77 | 27.77 |
| 37 | 3 | -yr Total | 259 | 229 | n / a | n / a | n / a | 7.8 | n / a | n / a | n / a | n / a | 228 | 5-yr sum> | | n / a | n / a | n / a |
| 38 | 3 | -yr Ave. | 86 | 76 | n / a | n / a | n / a | 2.6 | 90.1 | 97.8 | n / a | n / a | 46 | 3-yr sum> | | 28.2 | 29.8 | 29.84 |

| | ToolKit Year | Fiscal Year | Ave. DDC per each | Ave DDC per Year | PF share of DDC | IOU Share of DDC | No. of DDCs | Ave DDC Rate | Ave. CRAC per each | Ave CRAC per Year | PF share of CRAC | IOU Share of CRAC | No. of CRACs | Ave CRAC Rate | Ann.Lim. Reached | Total Lim. Reached | CRAC Freqncy |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 42 | 2 | 2005 | | 0 | | | 0 | 0% | | 0 | | | 0 | 0% | 0 | 0 | 0% |
| 43 | 3 | 2006 | | 0 | | | 0 | 0% | | 0 | | | 0 | 0% | 0 | 0 | 0% |
| 44 | 4 | 2007 | | 0 | 0 | 0 | 0 | 0.0% | 219 | 83 | 82 | 2 | 1145 | 6.1% | 274 | 0 | 38% |
| 45 | 5 | 2008 | 298 | 77 | 77 | 0 | 772 | 5.7% | 226 | 105 | 94 | 11 | 1386 | 6.9% | 346 | 0 | 46% |
| 46 | 6 | 2009 | 285 | 136 | 132 | 4 | 1430 | 9.7% | 196 | 44 | 40 | 4 | 681 | 2.9% | 66 | 0 | 23% |
| 47 | 3 | -yr Total | n / a | 212.5 | 208.4 | 4 | 2202 | n / a | n / a | 232 | 216 | 17 | 3212 | n / a | 686 | 0 | n / a |
| 48 | 3 | -yr Ave. | 289 | 71 | 69 | 1 | 734 | 5.1% | 217 | 77 | 72 | 6 | 1071 | 5.3% | 229 | n / a | 36% |

| | ToolKit Year | Fiscal Year | NORM Inputs | PBL Inputs | TBL Inputs | A-T-C Totals | Ave. Reb. per each | Ave Reb. per Year | PF share of Rebate | IOU Share of Rebate | No. of Rebates | Ave. Re-bate Rate | PBL Int Credit | TBL Int Credit | IOU Benefits After each calculation Base | PNRR | Mkt Upd | Var.Rates |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 52 | 2 | 2005 | 0 | 119 | 0 | -180 | | | | | | 0% | 22 | 0.0 | 0 | | | |
| 53 | 3 | 2006 | 0 | 136 | 0 | -133 | | | | | | 0% | 22 | 0.0 | 0 | | | |
| 54 | 4 | 2007 | -22 | 125 | 0 | -1 | | | 0 | 0 | | 0.0% | 24 | 0.0 | 323 | 323 | 323 | 321 |
| 55 | 5 | 2008 | -24 | 83 | 0 | -90 | | | 0 | 0 | | 0.0% | 32 | 0.0 | 323 | 323 | 290 | 276 |
| 56 | 6 | 2009 | -24 | -54 | 0 | -34 | | | 0 | 0 | | 0.0% | 33 | 0.0 | 323 | 323 | 285 | 284 |
| 57 | 3 -yr Total | | -70 | 154 | 0 | -125 | | | | | | n / a | 90 | 0.0 | 969 | 969 | 897 | 881 |
| 58 | 3 -yr Ave. | | -23 | 51 | 0 | -42 | | | | | | | 30 | 0.0 | 323 | 323 | 299 | 294 |

## 100% credit of Sec Rev, $400M CRAC, 06 Cap=706, Flat PNRR, $50M LiqRes | PBL reserves




**Notes** **3-year TPP:** **92.6%**

**Not yet real Init. Prop. data, but closer**
2007-9 data is Init. Prop. with a few issues outstanding
2005-6 data from 3rd Q Review with two $8M tweaks

**Rates** are approximations of an ave. PF rate (PF revs/PF load).
**"ROD"** rate is what is published in the Rod.
**"Oct 1"** rate is the rate going into effect on Oct 1 - this will take into account any CRAC or DDC on top of Rod rate.
**"Effective"** rate is a calculation that takes into account the rate calculated in the ROD, plus any CRAC or DDC amounts that into effect on Oct 1, plus any after-the-fact adjustments from a Rebate.

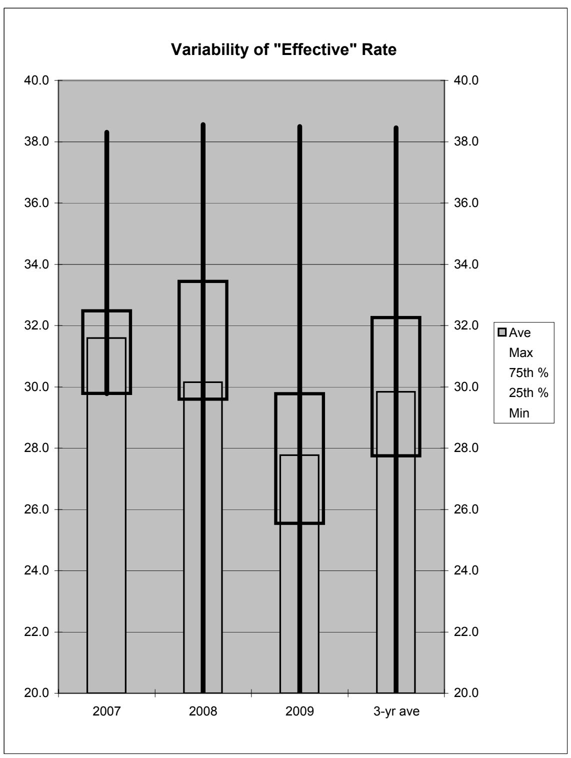
The hollow box on the variability charts below shows the 75th and 25th percentile values - 50% of the outcomes fall between these two values. The vertical line shows the maximum and minimum values over all 3000 games.

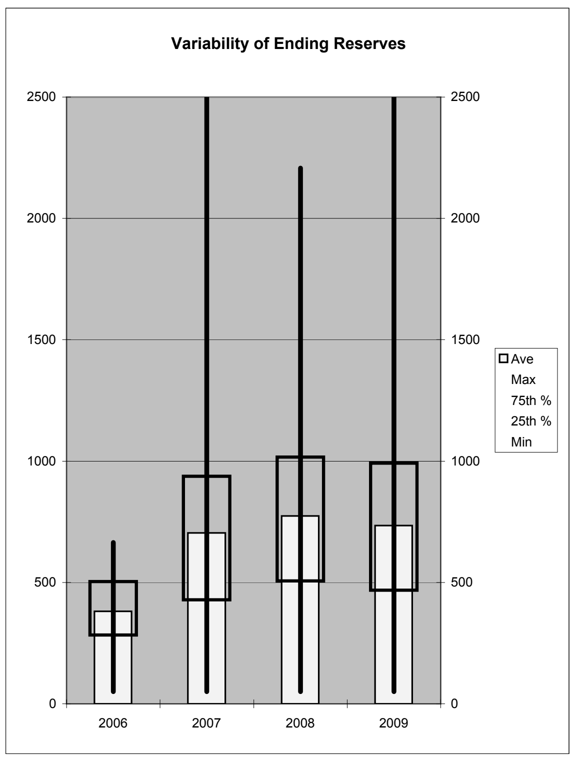
The DDC is calculated near the end of a year but isn't distributed till the next year, so it doesn't cap ending reserves immediately.

| | 2007 | 2008 | 2009 |
|---|---|---|---|
| DDC threshold | 800 | 800 | 800 |
| DDC caps | 1,282 | 1,300 | 1,311 |
| CRAC threshold | 470 | 500 | 500 |
| CRAC caps | 400 | 400 | 400 |
| CRAC trigger freq. | 38% | 46% | 23% |
| CRAC at max freq. | 9% | 12% | 2% |

Rebate
Calcns n / a

| PNRR | 2007 | 2008 | 2009 | 3-yr ave. |
|---|---|---|---|---|
| | 76 | 76 | 76 | 76 |



## 100% credit of Sec Rev, $400M CRAC, 06 Cap=706, Flat PNRR, $50M LiqRes | PBL reserves

| | PF Rates - 3-year averages | | | |
|---|---|---|---|---|
| | Original Rate from RAM | After Change in PNRR | After adj. for CRAC or DDC | After Sec Rev Rebate |
| Max | 28.20 | 29.77 | 38.46 | 38.46 |
| 75th pcntl | 28.20 | 29.77 | 32.26 | 32.26 |
| Average | 28.20 | 29.77 | 29.84 | 29.84 |
| median | 28.20 | 29.77 | 29.82 | 29.82 |
| 25th pcntl | 28.20 | 29.77 | 27.74 | 27.74 |
| min | 28.20 | 29.77 | 14.84 | 14.84 |
| Range | 0.00 | 0.00 | 23.62 | 23.62 |
| Std dev | 0.00 | 0.00 | 3.62 | 3.62 |

| ===> | IOU Broker Price | | IOU Benefits | | | | | | Average PF rates (not block rates) | | | | | CRAC Results | | | | DDC Results | | | | Sec. Revenue Rebate Results | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2007 | Price Used in RAM | Updated Price from RiskMod | Original Amount from RAM | After Change in PNRR | After Mrkt Quote Update | After adj. for CRAC or DDC | After Sec Rev Rebate | Net Sum IOU ben. Change | | Original Rate from RAM | After Change in PNRR | After adj. for CRAC or DDC | After Sec Rev Rebate | Amount From Formula | Amount Collected From PF | Amt. BPA IOU Exp. Reduced | Amount IOU Ben. Reduced | Amount From Formula | Amount Distribut'd To PF | Amt. BPA IOU Exp. Increased | Amount IOU Ben. Increased | Amount From Formula | Amount Distribut'd To PF | Amt. BPA IOU Exp. Increased | Amount IOU Ben. Increased |
| Max | 52.07 | 0.00 | 323.0 | 323.0 | 323.0 | 323.0 | 323.0 | 0.0 | Max | 29.77 | 38.31 | 38.31 | | 400.0 | 385.5 | 14.5 | 18.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 75th pcntl | 52.07 | 0.00 | 323.0 | 323.0 | 323.0 | 323.0 | 323.0 | 0.0 | 75th pcntl | 29.77 | 32.48 | 32.48 | | 122.4 | 122.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Average | 52.07 | 0.00 | 323.0 | 323.0 | 323.0 | 321.1 | 321.1 | -1.9 | Average | 29.77 | 31.59 | 31.59 | | 83.4 | 81.9 | 1.5 | 1.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| median | 52.07 | 0.00 | 323.0 | 323.0 | 323.0 | 323.0 | 323.0 | 0.0 | median | 29.77 | 29.77 | 29.77 | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 25th pcntl | 52.07 | 0.00 | 323.0 | 323.0 | 323.0 | 323.0 | 323.0 | 0.0 | 25th pcntl | 29.77 | 29.77 | 29.77 | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| min | 52.07 | 0.00 | 323.0 | 323.0 | 323.0 | 304.3 | 304.3 | -18.7 | min | 29.77 | 29.77 | 29.77 | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Range | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 18.7 | 18.7 | 18.7 | Range | 0.00 | 8.54 | 8.54 | | 400.0 | 385.5 | 14.5 | 18.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Std dev | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 5.6 | 5.6 | 5.6 | Std dev | 0.00 | 2.98 | 2.98 | | 137.9 | 134.5 | 4.3 | 5.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

| ===> | IOU Broker Price | | IOU Benefits | | | | | | Average PF rates (not block rates) | | | | CRAC Results | | | | DDC Results | | | | Sec. Revenue Rebate Results | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2008 | Price Used in RAM | Updated Price from RiskMod | Original Amount from RAM | After Change in PNRR | After Mrkt Quote Update | After adj. for CRAC or DDC | After Sec Rev Rebate | Net Sum IOU ben. Change | Original Rate from RAM | After Change in PNRR | After adj. for CRAC or DDC | After Sec Rev Rebate | Amount From Formula | Amount Collected From PF | Amt. BPA IOU Exp. Reduced | Amount IOU Ben. Reduced | Amount From Formula | Amount Distribut'd To PF | Amt. BPA IOU Exp. Increased | Amount IOU Ben. Increased | Amount From Formula | Amount Distribut'd To PF | Amt. BPA IOU Exp. Increased | Amount IOU Ben. Increased |
| Max | 49.85 | 107.90 | 323.0 | 323.0 | 323.0 | 323.0 | 323.0 | 0.0 | Max 29.77 | 38.56 | 38.56 | | 400.0 | 400.0 | 98.7 | 127.6 | 1300.0 | 1300.0 | 57.1 | 73.8 | 0.0 | 0.0 | 0.0 | 0.0 |
| 75th pcntl | 49.85 | 56.64 | 323.0 | 323.0 | 323.0 | 323.0 | 323.0 | 0.0 | 75th pcntl 29.77 | 33.44 | 33.44 | | 191.4 | 167.0 | 6.7 | 8.7 | 10.2 | 8.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Average | 49.85 | 50.42 | 323.0 | 323.0 | 289.7 | 276.0 | 276.0 | -47.0 | Average 29.77 | 30.15 | 30.15 | | 104.6 | 93.7 | 10.9 | 14.1 | 76.8 | 76.5 | 0.3 | 0.4 | 0.0 | 0.0 | 0.0 | 0.0 |
| median | 49.85 | 48.71 | 323.0 | 323.0 | 323.0 | 323.0 | 323.0 | 0.0 | median 29.77 | 29.77 | 29.77 | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 25th pcntl | 49.85 | 42.02 | 323.0 | 323.0 | 275.2 | 241.7 | 241.7 | -81.3 | 25th pcntl 29.77 | 29.59 | 29.59 | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| min | 49.85 | 28.55 | 323.0 | 323.0 | 123.0 | 123.0 | 123.0 | -200.0 | min 29.77 | 1.21 | 1.21 | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Range | 0.00 | 79.34 | 0.0 | 0.0 | 200.0 | 200.0 | 200.0 | 200.0 | Range 0.00 | 37.35 | 37.35 | | 400.0 | 400.0 | 98.7 | 127.6 | 1300.0 | 1300.0 | 57.1 | 73.8 | 0.0 | 0.0 | 0.0 | 0.0 |
| Std dev | 0.00 | 11.34 | 0.0 | 0.0 | 58.7 | 70.9 | 70.9 | 70.9 | Std dev 0.00 | 5.70 | 5.70 | | 147.6 | 134.7 | 23.1 | 29.8 | 186.7 | 186.6 | 2.8 | 3.6 | 0.0 | 0.0 | 0.0 | 0.0 |

| ===> | IOU Broker Price | | IOU Benefits | | | | | | | Average PF rates (not block rates) | | | | CRAC Results | | | | DDC Results | | | | Sec. Revenue Rebate Results | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2009 | Price Used in RAM | Updated Price from RiskMod | Original Amount from RAM | After Change in PNRR | After Mrkt Quote Update | After adj. for CRAC or DDC | After Sec Rev Rebate | Net Sum IOU ben. Change | | Original Rate from RAM | After Change in PNRR | After adj. for CRAC or DDC | After Sec Rev Rebate | Amount From Formula | Amount Collected From PF | Amt. BPA IOU Exp. Reduced | Amount IOU Ben. Reduced | Amount From Formula | Amount Distribut'd To PF | Amt. BPA IOU Exp. Increased | Amount IOU Ben. Increased | Amount From Formula | Amount Distribut'd To PF | Amt. BPA IOU Exp. Increased | Amount IOU Ben. Increased |
| Max | 45.84 | 87.75 | 323.0 | 323.0 | 323.0 | 323.0 | 323.0 | 0.0 | Max | 29.77 | 38.50 | 38.50 | | 400.0 | 400.0 | 98.2 | 126.9 | 1310.6 | 1310.6 | 103.7 | 134.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 75th pcntl | 45.84 | 51.65 | 323.0 | 323.0 | 323.0 | 323.0 | 323.0 | 0.0 | 75th pcntl | 29.77 | 29.77 | 29.77 | | 0.0 | 0.0 | 0.0 | 0.0 | 204.6 | 194.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Average | 45.84 | 46.67 | 323.0 | 323.0 | 284.7 | 283.8 | 283.8 | -39.2 | Average | 29.77 | 27.77 | 27.77 | | 44.4 | 40.0 | 4.5 | 5.8 | 135.7 | 131.9 | 3.8 | 4.9 | 0.0 | 0.0 | 0.0 | 0.0 |
| median | 45.84 | 46.09 | 323.0 | 323.0 | 323.0 | 323.0 | 323.0 | 0.0 | median | 29.77 | 29.77 | 29.77 | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 25th pcntl | 45.84 | 41.27 | 323.0 | 323.0 | 260.7 | 259.3 | 259.3 | -63.7 | 25th pcntl | 29.77 | 25.54 | 25.54 | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| min | 45.84 | 28.01 | 323.0 | 323.0 | 123.0 | 123.0 | 123.0 | -200.0 | min | 29.77 | 1.19 | 1.19 | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Range | 0.00 | 59.73 | 0.0 | 0.0 | 200.0 | 200.0 | 200.0 | 200.0 | Range | 0.00 | 37.31 | 37.31 | | 400.0 | 400.0 | 98.2 | 126.9 | 1310.6 | 1310.6 | 103.7 | 134.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Std dev | 0.00 | 7.75 | 0.0 | 0.0 | 60.9 | 63.1 | 63.1 | 63.1 | Std dev | 0.00 | 5.58 | 5.58 | | 101.5 | 91.7 | 15.4 | 20.0 | 217.0 | 215.4 | 11.9 | 15.4 | 0.0 | 0.0 | 0.0 | 0.0 |