1. RATE PROCESS MODELING

1.0 Rate Process Modeling

RATE PROCESS MODELING

The components listed below comprise the major analyses and computer models used in Bonneville Power Administration's (BPA) rate development process. Included is a brief description of the purpose of each component and how it fits in with the other components.

1. Load Forecasts

The sales forecasts used in BPA's rate development process are the source of allocation factors (used to apportion costs) and billing determinants (used to calculate rates and revenues). The sales forecast is a compilation of a variety of forecasts, including forecasts for Priority Firm Power (PF) sales, Industrial Firm Power (IP) sales, sales to investor-owned utilities (IOUs), Firm Power Products and Service (FPS) and New Resource Firm Power (NR) loads as well as other contractual obligations. Loads (or sales) contained in these forecasts are used in the Loads and Resources Study, WP-02-FS-BPA-01.
An explanation of the Federal load forecasts are contained in this study.

2. Hydroregulation Studies

BPA's load forecast, a forecast of available regional resources, assumptions about system operating constraints, and hydro project operating data and assumptions are used as inputs to the hydroregulation studies. These studies produce forecasts of the firm hydro generation available under critical water conditions, and forecasts of regional secondary energy available, given the measured streamflows in each of 50 historical years. An explanation of the hydroregulation studies is contained in the Loads and Resources Study, WP-02-FS-BPA-01. Forecasted hydro generation produced by the hydroregulation studies are used in the planning loads and resource balance and in the Federal Secondary Energy Analysis (FSEA).

3. Load and Resource Balances Analysis

This analysis collects forecasts of Federal loads and resources, including augmentation resources, in order to determine if BPA has a firm surplus or deficit. Should the results indicate a deficit in the ratemaking process, sufficient additional resources must be added as balancing purchases to ensure a load and resource balance. The surplus/deficit calculation is performed for each year of the rate test period and is explained in the Loads and Resources Study, WP-02-FS-BPA-01. Loads and resources used in the Load and Resource Balance studies flow into Risk Analysis Model (RiskMod), the Rate Analysis Model (RAM), and Revenue Forecast.

4. Revenue Requirement Study

The Revenue Requirement Study, WP-02-FS-BPA-02 provides BPA's functionalized revenue requirement for the rate test period. This process is explained in the Revenue Requirement Study, WP-02-FS-BPA-02. The functionalized revenue requirements flow into the Cost of Service Analysis of the Wholesale Power Rate Development Study, WP-02-FS-BPA-05.

5. Federal Secondary Energy Analysis (FSEA)

The FSEA is used to forecast the quantity of secondary energy available to sell and purchased power that need to be acquired in the open market. The FSEA analyzes hydro generation available given 50 years of historical streamflow information (1929-1978). It computes the amount of Federal secondary energy available after adjustments for coordinated interchange. This analysis is performed in RiskMod to calculate revenues from surplus energy sales and expenses from balancing power purchases and is described in the Risk Analysis Study, WP-02-FS-BPA-03. RAM and the Revenue Forecast Model both use the surplus energy revenues and power purchase expenses resulting from the FSEA calculated in RiskMod.

6. The Marginal Cost Analysis (MCA)

The MCA is used for two purposes in the rate case. First, it is used to inform, but not to directly set, the price levels at which BPA buys and sells energy in the bulk power market. Marginal cost estimates are an input into RiskMod (*See* section 9), which calculates the prices at which BPA buys and sells energy on the spot market. For a complete description of BPA's bulk revenue forecast, *See* BPA's Revenue Forecast in the Wholesale Power Rate Development Study, WP-02-FS-BPA-05. Second, the MCA provides a basis for sending price signals through BPA's rate design. For example, marginal costs are used as a starting point in deriving the relative levels of the monthly energy rates, and also in deriving the relative levels of heavy load hour energy rates versus light load hour energy rates in a given month. For a complete discussion of how the marginal costs are used in BPA's rate design, s*ee* the section RAM in the Wholesale Power Rate Development Study, WP-02-FS-BPA-05.

The tool used to estimate marginal costs is a model of the Western Systems Coordinating Council power system called AURORA. AURORA is an economic fundamentals based approach that models wholesale energy transactions in a competitive pricing system. AURORA uses a demand forecast and supply cost information to find an hourly market clearing price, or equivalently, the marginal cost. To determine price in a given hour, AURORA models the dispatch of electric generating resources in a least cost order to meet the load (demand) forecast. The price in the given hour is equal to the variable cost of the marginal resource. Over

time, AURORA will add new resources and retire old resources based on the net present value of the resource.

7. Rate Analysis Model (RAM)

The RAM consists of three linked spreadsheet models (RAM-Prog, RAM-7B2, AND RESEXRAM) that perform the calculations necessary to develop BPA's wholesale power rates. In addition, other rates spreadsheet applications are used to calculate and store data used by the RAM models.

1. **RAM-Prog**: A spreadsheet model of BPA's ratemaking policy and methodology, used to calculate average rate period posted rates. RAM is also used to produce the annual program case PF rates for the Section 7(b)(2) Rate Test.

2. **RAM-7B2**: A spreadsheet model of BPA's ratemaking policy and methodology assuming the five assumptions in section 7(b)(2) of the Northwest Power Act. SEVNBRAM produces annual 7(b)(2) case PF rates for the Section 7(b)(2) Rate Test.

3. **RESEXRAM**: A spreadsheet model of BPA's Residential Exchange Program, used to calculate the gross and net costs of the exchange program.

4. Other spreadsheet applications linked to the RAM models include the Energy Allocation Factor (EAF) spreadsheet, used to determine resource pool allocations to rate pools, as well as an INPUT spreadsheet, used to collect and store data for the RAM models.

8. Revenue Forecast

The Revenue Forecast documents the revenues at both current and proposed rates by applying those rates (IP, PF, and Residential Load) to projected direct service industrial customers, Public and IOU billing determinants. The Revenue Forecast model is used outside the ratesetting process with rates and loads as specified input. The Revenue Forecast Model does not include revenues from Transmission rates applicable to the power customers, unless those revenues are forecast to be collected by the Power Business Line. The Revenue Forecast uses outputs from a number of sources to determine total revenues expected. The forecast uses output from RiskMod to obtain short-term marketing revenues, purchased power expenses, 4(h)(10)(c) credits and Fish Cost Contingency Fund credits.
Revenues from ancillary products and services and long-term contracts are an input to the Revenue Forecast, also.

9. Risk Analysis

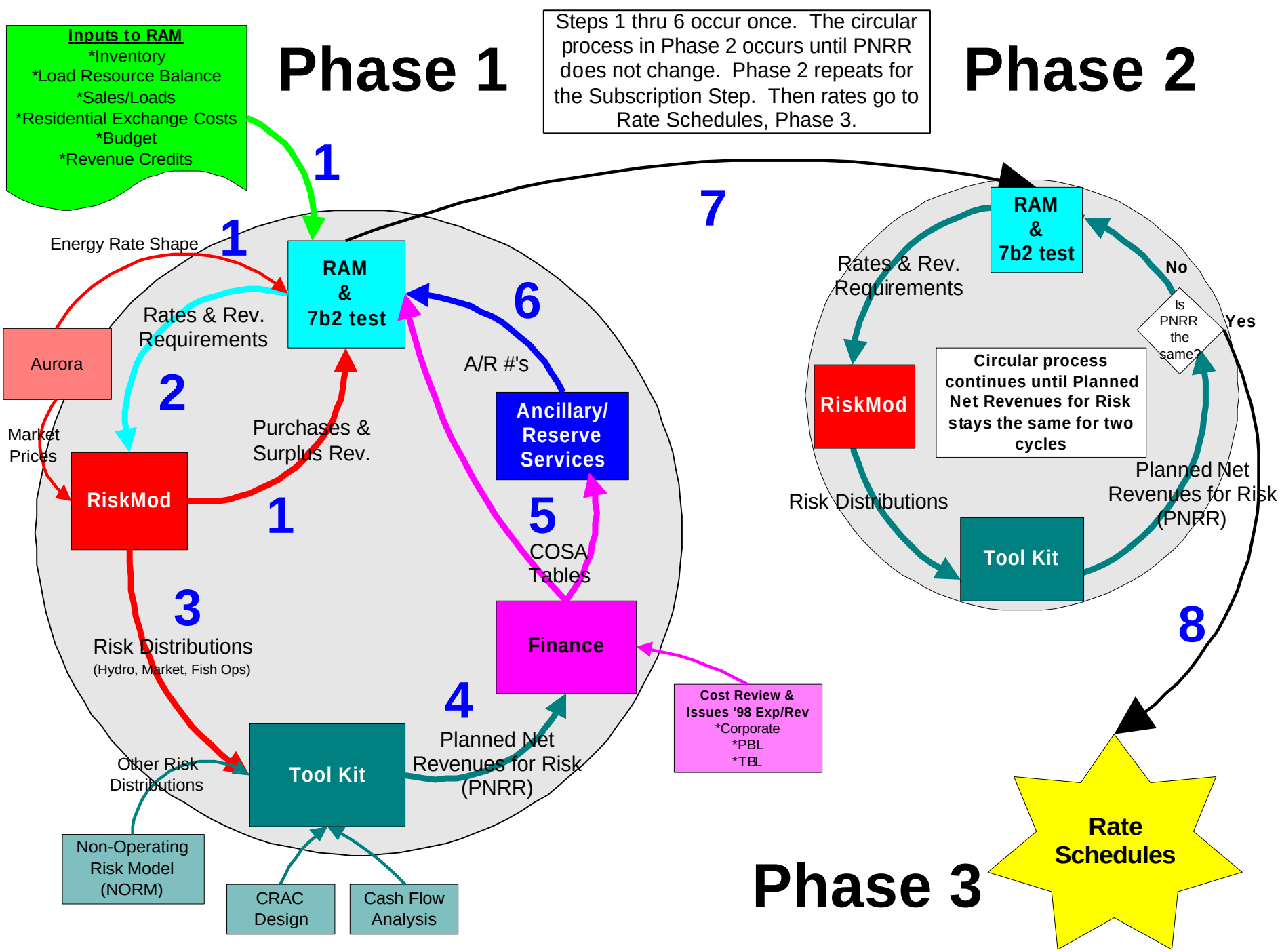
The RiskMod and NORM models are used to quantify BPA's net revenue risk. RiskMod estimates net revenue variability associated with various economic, load, and generation resource capability variations. The Non-Operating Risk Model (NORM) model estimates the non-operational risks, *i.e.*, those associated with uncertainties in the cost projections in the revenue requirement The results from RiskMod and NORM are inputs into the ToolKit, which calculates the probability of making all scheduled Treasury payments on time and in full.
See Risk Analysis Study, WP-02-FS-BPA-03.

10. ToolKit

The Tool Kit Model is used to determine the amount of Planned Net Revenues for Risk that is to be included in the Revenue Requirement in order to achieve an 88 percent Treasury Payment Probability (the probability of making all of the scheduled Treasury payments during the five-year rate period on time and in full) and to demonstrate BPA's ability to meet the 88 percent standard given the risks identified in RiskMod and NORM, and using risk mitigation tools. . . *See* Revenue Requirements Study, WP-02-FS-BPA-02.

11. Other Analyses

In addition to the above mentioned programs and models, BPA also uses other analyses to calculate inputs used in the rate setting process. The Low Density Discount calculates the revenue impact of granting this discount. The Marginal Cost Analysis estimates the variable cost of marginal resource generation for the Pacific Northwest. These estimates provide the basis for revenues for the sale of capacity and unbundled products and services as well as the seasonal and diurnal differentiation of BPA's energy rates.


Inputs to RAM
*Inventory
*Load Resource Balance
*Sales/Loads
*Residential Exchange Costs
*Budget
*Revenue Credits
Phase 1
Steps 1 thru 6 occur once. The circular process in Phase 2 occurs until PNRR does not change. Phase 2 repeats for the Subscription Step. Then rates go to Rate Schedules, Phase 3.
Phase 2
1
7
Energy Rate Shape
1
RAM & 7b2 test
Rates & Rev. Requirements
2
Aurora
Market Prices
RiskMod
Purchases & Surplus Rev.
1
6
A/R #'s
Ancillary/ Reserve Services
5
COSA Tables
3
Risk Distributions
(Hydro, Market, Fish Ops)
Finance
4
Planned Net Revenues for Risk (PNRR)
Tool Kit
Other Risk Distributions
Non-Operating Risk Model (NORM)
CRAC Design
Cash Flow Analysis
Cost Review & Issues '98 Exp/Rev
*Corporate
*PBL
*TBL
RAM & 7b2 test
Rates & Rev. Requirements
No
Is PNRR the same?
Yes
RiskMod
Circular process continues until Planned Net Revenues for Risk stays the same for two cycles
Planned Net Revenues for Risk (PNRR)
Risk Distributions
Tool Kit
8
Rate Schedules
Phase 3