

2003 Safety-Net Cost Recovery Adjustment Clause Initial Proposal

Study

Chapter 2 – Loads and Resources

SN-03-E-BPA-01

March 2003



CHAPTER 2: LOADS AND RESOURCES

2.1 Introduction

The Loads and Resources Study represents the compilation of the load, sales, contract, and resource data necessary for developing BPA wholesale power rates. The results of this study are used to: (1) provide base data to determine resource costs for the Revenue Recovery Study, *see* Chapter 3; (2) provide regional sales and hydro data for use in the Secondary Revenue Forecast, *see* Chapter 4; (3) provide base data to derive billing determinants in the Revenue Forecast, *see* Chapter 5; and (4) provide load and resource data for use in calculating risk in the Risk Analysis, *see* Chapter 6.

This study provides a synopsis of BPA's loads and resources analyses. Specific components of the analyses are not addressed in detail in this study. Instead, an overview illustrates how each component is completed, how components relate to each other, and how each component fits into the rate development process. Methods, details, and results supporting this study are contained in the Documentation for SN-03 Study, SN-03-E-BPA-02, Chapter 2.

This study and the supporting Documentation reflect the load and resource assumptions made for BPA's 2003 SN CRAC initial proposal.

2.2 Methods

2.2.1 Overview. This study includes major interrelated Federal system components: (1) a Federal system load and sales forecast that includes BPA's power sales contracts and other BPA contract obligations; (2) Federal system resources that include BPA's Federal system generating resources and other BPA contract purchases; (3) the Federal loads and resources balance that

1 relates Federal loads and sales to the Federal generating resources and contract purchases; and
2 (4) regional hydro resources.

3
4 This study provides projected firm loads and resources of the BPA system for the Fiscal Year¹
5 (FY) 2003-2006 rate period.

6
7 **2.2.1.1 Federal System Load and Sales Forecast.** The Federal system load and sales forecast
8 is the forecast of firm energy load that BPA expects to serve during the FY 2003-2006 period
9 under firm requirements power sale contracts. The Federal system load and sales forecast is
10 composed of customer group sales forecasts for public body and cooperative utilities and Federal
11 agencies (Public Agencies), direct service industrial customers (DSI), investor-owned utilities
12 (IOU), and other BPA power sales contract obligations. These obligations are forecasted
13 monthly over the period for the generation system peak (GSP) in megawatts, energy in average
14 megawatts, heavy load hour energy in megawatt-hours (HLH), and light load hour energy in
15 megawatt-hours (LLH). This forecast is provided to the Risk Analysis, *see* Chapter 6.

16
17 **2.2.1.2 Other BPA Contract Obligations.** BPA's other contract obligations are comprised of
18 contracts not defined under BPA's firm requirements power sale contracts. These obligations
19 include contract sales to utilities, marketers, and power commitments under international treaty.
20 These contract obligations are estimated for monthly energy in average megawatts, HLH, and
21 LLH. The contract data are provided to the Risk Analysis, *see* Chapter 6.

22
23 **2.2.1.3 Federal System Generating Resources.** BPA markets power from generating
24 resources that include Federal and non-Federal hydro projects, other contracted generating
25 projects, and other BPA hydro-related contracts. The combination of these generating resources
26 represents most of the Federal system's available firm output. BPA's current projection of the

¹ Fiscal Year (FY) is a 12-month period October through September. For example, FY 2003 is October 1, 2002, through September 30, 2003.

1 output of these generating resources is incorporated in this study. The Federal hydro generation
2 is estimated in monthly energy in average megawatts only. Other non-hydro Federal generation
3 is projected in monthly energy in average megawatts, HLH, and LLH. These data are provided
4 to the Risk Analysis, *see* Chapter 6.

5
6 **2.2.1.4 Other BPA Contract Purchases.** BPA's other resources are comprised of contract
7 purchases and exchanges, return energy associated with BPA's capacity contracts, and return and
8 exchange energy associated with capacity-for-energy exchanges. These contract purchases are
9 estimated in monthly energy in average megawatts, HLH, and LLH. The data are provided to
10 the Risk Analysis, *see* Chapter 6.

11
12 **2.2.1.5 Federal Loads and Resources Balance.** The Federal loads and resources balance
13 completes BPA's loads and resource picture. It compares monthly the Federal system load and
14 sales forecast under BPA's power sales contracts and contract obligations to the Federal system
15 generating resources and BPA's contract purchases, under 1937 water conditions, for
16 FY 2003-2006. The Federal loads and resources projections are presented by month in fiscal
17 year. The result of the loads and resources balance yields BPA's estimated Federal system
18 monthly firm energy surplus or deficit, in monthly average megawatts. The data are provided to
19 the Risk Analysis, *see* Chapter 6.

20
21 **2.2.1.6 Regional Hydro Generation.** The regional hydro used in the Secondary Revenue
22 Forecast, Chapter 4, includes all regional hydro: regulated hydro, independent hydro, and
23 non-utility generators (NUG) hydro. This larger set of regional hydro generation for the
24 50 water-years of record (August 1928 through July 1978) is compiled for FY 2003-2006. The
25 regional hydro is estimated monthly for energy in average megawatts. The data are provided for
26 use as input to the Secondary Revenue Forecast, *see* Chapter 4.

1 **2.2.2 Federal System Load and Sales Forecast**

2 **2.2.2.1 Overview.** The Federal System Load and Sales Forecast includes BPA’s forecasted
3 sales to regional Public Agencies, IOUs, and DSIs, and contractual obligations outside the
4 Pacific Northwest region (exports) and contractual obligations within the Pacific Northwest
5 region (intra-regional transfers). The Federal system load and sales obligations are provided to
6 the Risk Analysis Study, *see* Chapter 6. The Federal system loads, sales, contracts, and
7 generation estimates used in BPA’s 2003 SN CRAC initial proposal are detailed in the
8 Documentation for SN-03 Study, SN-03-E-BPA-02, Chapter 2. Summaries of Public Agencies,
9 IOU, and DSI projected sales are presented in the Appendix of this chapter.

10
11 Policies and procedures guiding BPA’s firm energy sales in the FY 2002-2006 rate period are
12 presented in BPA’s Power Subscription Strategy Administrator’s Record of Decision
13 (Subscription Strategy) published December 1998. The Subscription Strategy provides the basis
14 for the Public Agencies, IOU, and DSI firm energy sales forecasts presented in the loads and
15 resources study.

16
17 **2.2.2.2 Public Agencies Sales Forecast.** The Public Agencies monthly energy sales forecast
18 for those utilities that purchased Full or Partial Service products is based on the sum of the
19 utility-specific sales forecasts routinely produced by BPA analysts. The utility-specific forecasts
20 are produced using linear trend models based on historical annual energy totals. The annual
21 projections are spread to monthly figures using historical relationships. These forecasts
22 comprise projections of monthly energy and peak. The energy figures are prorated into HLH and
23 LLH segments. For those utilities purchasing Slice and Block products, the forecast is the
24 contracted amount and is split into appropriate HLH and LLH segments. Slice is a requirements
25 power product that provides a fixed percentage of the energy generated by the FCRPS to a
26 number of public preference customers. The Slice product differs from traditional

1 requirements products in that the power sold through Slice is shaped to BPA's generation output
2 of the FCRPS rather than the purchaser's load. The impact of the Slice product is addressed in
3 the Risk Analysis, *see* Chapter 6.
4

5 The monthly sales forecasts for energy and demand for the Full Service, Partial Service,
6 Slice/Block, and Block customer groups are presented in the Appendix, Tables 2-1 through 2-4.
7 A description of the data, method, and projections of the Public Agencies sales forecast is shown
8 in the Documentation for SN-03 Study, SN-03-E-BPA-02, Chapter 2.
9

10 **2.2.2.3 Investor-Owned Utilities Sales Forecast.** The six IOUs in the region are: Avista
11 Utilities Corporation, Idaho Power Company, NorthWestern Energy (formerly Montana Power
12 Company), PacifiCorp, Portland General Electric Company, and Puget Sound Energy.
13

14 In this study, BPA forecasts power sales to IOUs under the Residential Load (RL) rate and PF
15 Exchange Subscription rate to be 382 aMW per year for FY 2003-2006. This is based on signed
16 contracts with the six regional IOUs. The sales are in equal hourly amounts over the contract
17 period. *See* Appendix, Tables 2-5 through 2-8. Of the 382 aMW in sales, BPA bought back
18 124 aMW each year for FY 2003-2006.
19

20 Some of the IOUs have agreed not to place additional net requirements service, in excess of
21 requirements loads served under section 5(b) Subscription sales, on BPA at the New Resources
22 (NR-02) rate except in accordance with the terms of the Subscription sales agreement. BPA will
23 meet the net requirements service of IOUs without sales contracts at the NR-02 rate. BPA's
24 forecast does not contain any NR sales subject to the SN CRAC at this time.
25
26

1 **2.2.2.4 Direct Service Industry Sales Forecast.** For purposes of this study, DSI sales are
2 forecasted to be 35 aMW in FY 2003 and 350 aMW for FY 2004-2006. In BPA's May 2000
3 Final Loads and Resources Study, WP-02-FS-BPA-01, BPA forecasted 1,440 MW/hour would
4 be sold to the DSIs. The current DSI sales forecast is much lower for several reasons: (1) BPA
5 purchased back some power from the DSIs (all load reductions for the DSIs end on
6 September 30, 2003); (2) the forecasted continued downturn in aluminum prices combined with
7 the level of BPA power prices will likely cause some DSIs to exercise their contractual right to
8 curtail purchases; (3) one DSI has rejected its power sales contract (291 MW) in bankruptcy; and
9 (4) BPA terminated one DSI power sales contract (280 MW).

10
11 The remaining DSIs' Industrial Firm Power (IP) contract total is 864 MW/hour for FY 2004 and
12 2005, and 871 MW/hour during FY 2006. BPA is forecasting that DSIs will curtail the majority
13 of this contract total because aluminum prices are not expected to recover and the IP-02 rate,
14 adjusted for CRACs, is expected to be too high for most DSI aluminum smelters to operate
15 economically during the remainder of the rate period. Non-aluminum DSIs are forecast to
16 purchase their full contract total, while the most efficient aluminum smelters may purchase a
17 portion of their contract total, and the least efficient smelters are likely to curtail all of their
18 contract total.

19
20 The DSI sales forecast for the IP Targeted Adjustment Charge (IPTAC) rate classes is shown in
21 the Appendix, Tables 2-9 through 2-12.

22
23 **2.2.2.5 Other BPA Contract Obligations.** BPA provides Federal power to customers under a
24 variety of contract arrangements not included in the Public Agency, IOU, and DSI power sales
25 contracts forecasts. The contracts are categorized as: (1) power sales; (2) power or energy
26 exchange contracts; (3) capacity sales or capacity-for-energy exchange contracts; (4) power

1 payments for services; and (5) power commitments under international treaty. These
2 arrangements are collectively called “other contract obligations” and can have different rate
3 structures. These obligations are obtained from individual contracts and are estimated monthly
4 for energy in average megawatts, HLH and LLH. These data are provided to the Risk Analysis,
5 *see* Chapter 6.

6
7 All firm contract obligations are assumed served by Federal system firm resources regardless of
8 weather, water, or economic conditions. The Federal system contract obligations are
9 summarized monthly for the Federal system for energy in average megawatts, in the
10 Documentation for SN-03 Study, SN-03-E-BPA-02, Chapter 2, Federal System. Monthly
11 detailed energy in average megawatts, HLH, and LLH are shown in the Documentation for
12 SN-03 Study, SN-03-E-BPA-02, Chapter 2, Table A-2 (Exports) and Table A-16 (Intra-Regional
13 Transfers) for the rate period; and Table A-13 (CSPE Purchase) and Table A-14 (Supplemental
14 and Entitlement Capacity) contractual obligations expire March 31, 2003. These data are
15 provided to the Risk Analysis, *see* Chapter 6.

16 17 **2.2.3 Federal System Resource Forecast**

18 **2.2.3.1 Overview.** Federal system resources consist of both hydro and contracted resources.
19 The Federal system hydro resource estimates are derived from a hydro regulation study that
20 estimates their generation under 50 water conditions using the operating provisions of the Pacific
21 Northwest Coordination Agreement (PNCA) while meeting power and non-power requirements
22 for each hydroelectric project and the system as a whole. The seasonal shape and magnitude of
23 the Federal system hydro generation depends on availability and coordination of regional
24 resources to meet regional loads. This study uses resource generation estimates and contract
25 resource information to determine the composition of Federal system resources.

1 A major feature of these hydro regulation studies are the operations described by the National
2 Marine Fisheries Service (National Oceanographic & Atmospheric Administration (NOAA
3 Fisheries)) and the U.S. Fish and Wildlife Service (USFWS) in their Biological Opinion (BiOp)
4 published December 21, 2000, and operations described in the Northwest Power Planning
5 Council's Fish and Wildlife Program. Each specifies hydroelectric project operations to provide
6 for such elements as seasonal flow augmentation, minimum flow levels for fish, spill for juvenile
7 fish passage, reservoir drawdown limitations, and turbine operation efficiency requirements.

8
9 **2.2.3.2 Federal System Generation and Contract Resources.** Federal resources from which
10 BPA markets power currently consist of federally owned hydro, non-federally owned resources
11 (hydro, thermal, and wind projects), exchange energy associated with BPA's existing
12 capacity-for-energy exchanges, power purchases, and other BPA hydro-related contracts.

13
14 **2.2.3.2.1 Hydro Regulation Study.** Hydro plant operating characteristics are necessary to
15 determine the expected energy production from a specific project, given specific operating
16 conditions. These are physical characteristics that establish the limits within which each project
17 must be operated. These project-specific data were taken from PNCA data submittals made by
18 the regional utilities and government agencies involved in operating hydro projects.

19
20 Hydro plant operating requirements are inputs to the hydro regulation simulator (HydroSim)
21 used to simulate the coordinated operation of the hydro system. As taken from PNCA data
22 submittals, these operating requirements include, but are not limited to, storage content limits
23 determined by rule curves, maximum project draft rates determined by each project, and flow
24 and spill objectives determined by the 2000 BiOp. Deviations from the PNCA data submittals
25 occur in the FY 2003 analysis when specific operating decisions have been made in order to
26

1 implement the 2000 BiOp. Data submittals made in 2003 have not yet been completed and are
2 not reflected in this study.

3
4 For the purpose of this SN CRAC initial proposal, BPA made a hydro regulation study for each
5 year, FY 2003-2006. Sets of variables are used to characterize hydro regulation studies. These
6 variables include streamflows, firm loads, firm resources, markets for secondary energy, and
7 project-by-project operating requirements, which all affect the amount and timing of energy
8 available from the hydro system. In each year of the hydro regulation study, these variables were
9 changed as necessary to reflect current knowledge of each operating parameter.

10
11 Modified streamflows are used to estimate power generation under historical streamflow
12 conditions. The Actual Energy Regulation (AER) and Operational Hydro regulation studies
13 were developed with the use of the 1990 level modified streamflows. Modified streamflows are
14 the historic streamflow adjusted to a common level of development by correcting for the effects
15 of irrigation and consumptive diversion demand, return flow, and changes in contents of
16 upstream reservoirs and lakes. These modified streamflows were developed by the A.G. Crook
17 Company, under contract with BPA, for the Columbia River Water Management Group's
18 Depletions Task Force.¹ Irrigation depletions are included for the 1990 level of development.

19
20 These modified streamflows are adjusted to include estimates of irrigation pumping at
21 Grand Coulee, as projected, for the rate period. This irrigation pumping provides water to the
22 Columbia Basin Project. The Bureau of Reclamation (Reclamation) provided the pumping
23 schedule in its 2000 PNCA preliminary data submittal. Adjustments are also made to include the
24 return flows downstream of Grand Coulee resulting from this updated pumping schedule. Due to
25 projected below-normal runoff for the FY 2003 water year, the 50-year modified flow set was

¹ The process by which the modified streamflows were created by the A. G. Crook Company is beyond the scope of this document. For further information on this process, please refer to documents published by the Columbia River Water Management Group.

1 weighted to reflect the latest projections for the 2003 January through July runoff. The latest
2 Northwest River Forecast Center volume forecast, the February “early bird” of 74.8 million
3 acre-feet (maf), was used to base the weightings at the time of this analysis. The result was a
4 weighted 50-year set of years with a weighted mean of 75 maf. In addition to having a weighted
5 mean of 75 maf, the set was also truncated above 108.5 maf (all years above 108 maf were
6 weighted zero) to reflect the less than 1 percent probability of occurring cutoff. The resulting set
7 of years with weights greater than zero contained a subset of 30 years out of the original 50-year
8 set. For years FY 2004-2006, all 50 water years, equally weighted, were used.

9
10 There are two modes for hydro regulation studies: refill and continuous. Both are used to
11 estimate the energy production of the hydro system. However, each mode is different in how it
12 treats initial reservoir conditions. Continuous hydro studies operate from one water year to
13 another, using the previous water year’s final reservoir elevations as the initial reservoir
14 elevations for the next water year. Refill studies operate each water year independent of all other
15 water years, using the same initial reservoir elevations for each water year. Continuous studies
16 are typically used when there is little or no information on initial reservoir elevations such as
17 when considering operations for a future year.

18
19 Since this year’s initial conditions are known, a refill study was used for the FY 2003 analysis.
20 For the FY 2004-2006 studies, each was run in the continuous mode. A significant difference
21 was noted in the Columbia River Treaty reservoirs’ storage levels when comparing the end of the
22 FY 2003 study with the storage levels those reservoirs started at in the FY 2004 study. In order
23 to transition smoothly from the FY 2003 study to the FY 2004 study, an energy adjustment was
24 made to the Federal system energy production in the FY 2004 study results. A table of these
25 energy adjustments may be found in the Documentation for SN-03 Study, SN-03-E-BPA-02,
26 Chapter 2.

1 There are other differences between the study done for FY 2003 and those done for
2 FY 2004-2006. Since BPA is already operating within the FY 2003 year, more is known about
3 the range of possible streamflows that need to be considered and their effects on such things as
4 flood control draft requirements and fish operations requirements that vary with the amount of
5 spring runoff expected. Also, ongoing winter operations, such as Chum and Vernita Bar, are
6 modeled consistent with current operations. Non-Treaty storage operation was modeled in the
7 hydro regulation studies in a manner that makes the most economic use in January through
8 March and September. The 2000 BiOp calls for Non-Treaty Storage to be operated to provide
9 flow augmentation water by storing in May and June and releasing in July through August is
10 modeled to the extent allowable by the current flow shaping agreement with Canada.

11
12 The 50-year hydro study monthly reservoir operations were run through the Hourly Operating
13 and Scheduling Simulator (HOSS) model to estimate the monthly ratios of HLH hydro
14 generation. The Operational hydro study results and HOSS HLH hydro generation ratios are
15 input into the Risk Analysis, *see* Chapter 6, which determines the Federal system monthly HLH
16 and LLH surpluses and deficits. HLH and LLH energy surpluses and deficits estimated in
17 RiskMod include transmission losses of 2.82 percent, which are applied to all hydro and nuclear
18 generation. The surplus energy is estimated in the Risk Analysis, *see* Chapter 6, to project
19 surplus power sales revenues and power purchase expenses.

20
21 **2.2.3.2.2 Hydro Generation.** The hydro regulation study provides the basis for the hydro
22 system operation and generation for the Federal system on the Federal Columbia River Power
23 System for the 50 water years of record (August 1928 through July 1978). The Federal system
24 hydro resources, though marketed by BPA, are owned and operated by Reclamation and the U.S.
25 Army Corps of Engineers (Corps). BPA also markets power purchased from hydro projects
26 owned by the City of Idaho Falls (Idaho Falls bulb turbine), Lewis County Public Utility District

1 (Cowlitz Falls), and Mission Valley (Big Creek). BPA's contract to purchase from Energy
2 Northwest's (ENW) Packwood hydroelectric project expired September 30, 2002. This study
3 includes hydro improvements anticipated from hydro optimization, turbine runner replacement,
4 and reliability increases through BPA's capital improvements programs at Federal regulated and
5 independent hydro projects. These hydro improvements are estimated by hydro project and
6 included in that project's generation. Generation increases are expected to yield as much as
7 102.9 aMW by FY 2006 under 1937 water conditions. Federal hydro resources are summarized
8 in the Documentation for SN-03 Study, SN-03-E-BPA-02, Chapter 2, Federal System (Regulated
9 Hydro) and (Independent Hydro). Detailed Federal hydro resource data are included in the
10 Documentation for SN-03 Study, SN-03-E-BPA-02, Chapter 2, Tables A-3 (Regulated Hydro
11 Projects) and A-4 (Hydro Independents).

12
13 **2.2.3.2.3 Other Federal Generation.** Additional Federal system resources include ENW's
14 Columbia Generating Station (formerly WNP-2) nuclear plant and other contract resources. The
15 projected output of the Columbia Generating Station includes facility improvements and a
16 change in the refueling cycle to once every two years. *See* Documentation for SN-03 Study,
17 SN-03-E-BPA-02, Chapter 2, Table A-10 (Large Thermal). BPA also has contracted, or is
18 negotiating, for the output of several other generation projects. These projects include small
19 hydro (Elwah and Glines Hydro through July 31, 2005, Clearwater, Dworshak Small
20 Hydropower), wind (shares of Foote Creek 1, 2, and 4 Wind Projects; Stateline Wind project,
21 Condon Wind Project, Nine Canyon Wind Project² and Klondike Phase 1 and 2 Wind Project),
22 geothermal (100 percent of Fourmile Hill Geothermal Project), and a small amount of solar
23 resources. *See* Documentation for SN-03 Study, SN-03-E-BPA-02, Chapter 2, Table A-23
24 (Non-Utility Generation). In addition, BPA has contracted for the output of the gas-fired
25

² In this initial study BPA assumed an output purchase of 1.8 average megawatts from the Nine Canyon Wind Project. BPA no longer assumes this purchase will be made and will delete it in the final study.

1 James River Wauna project. *See* Documentation for SN-03 Study, SN-03-E-BPA-02, Chapter 2,
2 Table A-8 (Renewables).

3
4 **2.2.3.2.4 Other BPA Contract Purchases.** BPA purchases power from sellers under a variety
5 of contractual arrangements to meet Federal load obligations. The contracts are categorized as:
6 (1) power purchases; (2) power or energy exchange purchase; (3) capacity sales or
7 capacity-for-energy exchange contracts; and (4) power purchased under international treaty.
8 These arrangements are collectively called “other contract purchases.” The monthly energy in
9 average megawatts, HLH, and LLH is established in the individual contracts. These data are
10 provided to the Risk Analysis, *see* Chapter 6.

11
12 All firm contract purchases are assumed to be received by the Federal system as firm resources
13 regardless of weather, water, or economic conditions. The Federal system contract purchases are
14 summarized for the Federal system energy in the Documentation for SN-03 Study,
15 SN-03-E-BPA-02, Chapter 2, Federal System, and detailed for monthly energy in average
16 megawatts, HLH, and LLH in the Documentation for SN-03 Study, SN-03-E-BPA-02,
17 Chapter 2, Table A-5 (Imports) and A-16 (Intra-Regional Transfers) for the rate period.

18 19 **2.2.4 Federal Loads and Resources Balance**

20 **2.2.4.1 Overview.** The Federal loads and resources balance compiles BPA’s loads and
21 resources. It compares the monthly energy amounts from Federal system loads, sales, and
22 contract obligations, to the Federal generating resources and contract purchases.

23
24 **2.2.4.2 Federal Energy Loads and Resources Balance.** The result of the Federal firm energy
25 loads and resources balance presents the firm energy surplus or deficit, under 1937 water

1 conditions, for FY 2003-2006 and is shown in the Documentation for SN-03 Study,
2 SN-03-E-BPA-02, Chapter 2, Federal System. The data estimates for the non-regulated and
3 independent hydro varying components are the basis for the Risk Analysis, *see* Chapter 6.
4

5 **2.2.5 Regional Hydro Resources**

6 **2.2.5.1 Overview.** The regional hydro generation for 50 water conditions (1929-1978) is
7 compiled for FY 2003-2006.
8

9 **2.2.5.2 Regional 50 Water Year Hydro Generation.** Using the hydro regulation study
10 developed for this rate case analysis, BPA estimates all the regional hydro generation energy by
11 month for each of the 50 water years of record (1929-1978). The set of regional hydro resources
12 necessary for the Secondary Revenue Forecast includes regional regulated and independent
13 hydro projects, plus NUG hydro projects produced by Independent Power Producers. The
14 summary of the 50 water year regional hydro for FY 2004-2006 is shown in the Documentation
15 for SN-03 Study, SN-03-E-BPA-02, Chapter 2.
16

17 **2.2.6 Estimation of Purchase MWs Eligible for 4(h)(10)(C) Credit.** In order to estimate
18 4(h)(10)(C) credits, it was necessary to estimate the quantity of replacement power necessary due
19 to changes in fish operations for each year of the rate period. These amounts are shown in
20 Table 2-13 (the same amounts were used for 2004-2006). To do this estimation, two
21 hydroregulation studies were necessary. The first study, with fish, modeled how the river would
22 be operated given current requirements for fish mitigation and enhancement. This operation was
23 modeled under 50 possible runoff forecasts (4(h)(10)(C) credits vary dramatically based on
24 Pacific Northwest streamflows). The second study, without fish, modeled what river operations
25 would be like if no changes had been made for the benefit of fish. This study also used
26

1 50 possible streamflow scenarios. BPA receives a 4(h)(10)(C) credit for any power purchases it
2 must make in order to implement the with fish alternative as compared to the without fish
3 alternative.

4
5 To determine power purchases for fish, it was necessary to look at BPA's surplus/deficit situation
6 under each of these hydro studies. One fundamental principal is that 4(h)(10)(C) credits be
7 unaffected by BPA marketing decisions. For example, the decision on the part of BPA to
8 augment the federal system in order to serve more load beginning in FY 2002 has NO effect on
9 the estimation of 4(h)(10)(C) credits. In order that BPA's surplus/deficit situation NOT be a
10 function of BPA marketing decisions, it was assumed that the appropriate BPA load to use in the
11 4(h)(10)(C) calculation was the load that could have been served with certainty under without
12 fish conditions in the worst water year (1936-1937). This is also known as the Firm Energy
13 Load Carrying Capability of the hydro system, or FELCC. FELCC is an estimate of the
14 generation that is guaranteed to be available from the federal hydro system under the worst water
15 conditions prior to changes in operations for fish. Therefore, it is also the amount of firm load
16 that BPA would have been entitled to sell. Changes in this entitlement are the appropriate
17 measurement of operational costs that should be available for 4(h)(10)(C) credit.

18
19 Therefore, BPA's surplus/deficit situation using FELCC as load and 50 different streamflow
20 scenarios given the without fish hydro study was compared to the surplus/deficit situation using
21 FELCC as load and 50 different streamflow scenarios given the with fish hydro study. This is
22 done for each monthly period. There are six possible scenarios in each period:

- 23
24 1. without fish study is deficit, with fish study is more deficit: this leads to more
25 purchases in the with fish case.

- 1 2. without fish study is deficit, with fish study is less deficit: this leads to fewer
- 2 purchases in the with fish case.
- 3 3. without fish study is surplus, with fish study is more surplus: this leads to more
- 4 revenues in the with fish case.
- 5 4. without fish study is surplus, with fish study is less surplus: this leads to fewer
- 6 revenues in the with fish case.
- 7 5. without fish study is surplus, with fish study is deficit: this leads to fewer
- 8 revenues and more purchases in the with fish case.
- 9 6. without fish study is deficit, with fish study is surplus: this leads to fewer
- 10 purchases and more revenues in the with fish case.

11

12 All situations that lead to a change in purchases (1, 2, 5, and 6) are summed across the monthly

13 periods. The resulting change in purchases is the amount eligible for 4(h)(10)(C) credit. These

14 are the results shown in Table 2-13.

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APPENDIX
SALES FORECASTS

		Table 2-1													
		2003 Safety Net CRAC BPA Public Agencies Sales Forecast													
		2002-2003 Fiscal Year													
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	12Mon Avg	
Full - HLH	MWh	587,543	660,923	764,163	785,088	659,019	644,621	594,855	579,672	555,584	587,323	595,732	560,074	7,574,596	
Full - LLH	MWh	346,413	404,466	470,812	480,165	411,169	405,012	369,520	349,918	340,210	344,839	350,174	324,297	4,596,995	
Full - Demand	MW	1,813	1,999	2,169	2,412	2,078	1,958	1,772	1,451	1,307	1,423	1,459	1,486		
Partial - HLH	MWh	366,041	364,033	401,101	423,631	378,013	371,390	369,421	350,826	334,633	346,926	359,249	347,265	4,412,530	
Partial - LLH	MWh	257,809	270,176	292,118	308,927	273,328	277,266	263,821	255,229	239,529	233,223	248,675	237,725	3,157,826	
Partial - Demand	MW	948	999	1,078	1,106	1,060	1,024	965	875	815	810	863	869		
Block - HLH	MWh	265,950	364,557	453,290	445,511	399,980	414,458	484,777	483,785	425,500	331,913	317,181	298,959	4,685,861	
Block - LLH	MWh	155,204	208,092	252,850	263,106	234,602	238,549	300,873	304,288	275,097	195,694	185,341	152,575	2,766,269	
Block - Demand	MW	618	879	1,091	1,034	1,044	999	1,167	1,121	1,065	769	764	719		
Slice Block - HLH	MWh	389,050	413,694	468,141	497,069	429,729	419,526	347,961	285,790	268,488	319,918	337,134	365,416	4,541,916	
Slice Block - LLH	MWh	281,450	301,986	369,603	358,531	322,239	331,270	253,123	205,994	215,352	230,642	261,802	271,336	3,403,328	
Slice Block - Demand	MW	900	994	1,126	1,150	1,119	1,009	836	661	672	740	811	878		
Pre-Subscription - HLH	MWh	372,117	406,769	479,391	483,606	417,730	412,053	378,816	401,223	395,552	433,004	406,989	352,737	4,939,986	
Pre-Subscription - LLH	MWh	234,874	261,313	314,211	312,093	274,079	280,614	242,301	261,009	269,586	280,825	269,013	220,562	3,220,481	
Pre-Subscription - Demand	MW	974	1,065	1,174	1,301	1,162	1,070	971	1,021	939	1,020	956	797		
Total Energy	aMW	4,371	5,078	5,733	5,857	5,655	5,100	5,015	4,674	4,610	4,441	4,478	4,349	4,943	
Total Peak	MW	5,253	5,936	6,639	7,003	6,462	6,059	5,711	5,129	4,797	4,761	4,852	4,749		

		Table 2-2													
		2003 Safety Net CRAC BPA Public Agencies Sales Forecast													
		2003-2004 Fiscal Year													
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	12Mon Avg	
Full - HLH	MWh	632,085	702,845	817,094	836,365	710,957	690,669	634,467	617,494	597,223	632,745	642,099	605,691	8,119,736	
Full - LLH	MWh	372,875	435,001	497,502	511,335	448,527	428,649	394,134	377,554	362,094	371,527	378,625	351,895	4,929,718	
Full - Demand	MW	1,945	2,140	2,318	2,566	2,221	2,088	1,895	1,568	1,422	1,552	1,592	1,625		
Partial - HLH	MWh	396,335	395,040	427,259	446,963	407,813	392,950	387,541	369,253	350,826	363,745	376,902	365,388	4,680,015	
Partial - LLH	MWh	274,511	286,853	309,843	323,201	293,515	291,285	277,382	268,081	252,344	246,109	261,622	250,955	3,335,701	
Partial - Demand	MW	1,001	1,051	1,128	1,147	1,132	1,065	1,003	910	851	849	905	913		
Block - HLH	MWh	284,846	388,371	489,050	479,095	435,981	444,474	401,993	450,809	354,764	348,329	338,621	313,695	4,730,028	
Block - LLH	MWh	170,228	230,524	276,850	292,746	266,306	256,917	238,152	291,384	201,849	207,862	194,869	162,975	2,790,660	
Block - Demand	MW	662	957	1,153	1,112	1,137	1,046	968	1,069	864	807	806	765		
Slice Block - HLH	MWh	403,488	414,000	504,576	514,512	444,672	452,736	363,168	292,448	297,024	335,664	351,936	379,392	4,753,616	
Slice Block - LLH	MWh	292,342	325,040	371,712	371,592	347,736	333,376	264,519	225,656	221,648	242,424	273,040	281,840	3,550,925	
Slice Block - Demand	MW	934	1,035	1,168	1,191	1,158	1,048	873	703	714	777	846	912		
Pre-Subscription - HLH	MWh	378,020	408,899	492,475	491,534	424,350	423,361	384,846	403,425	406,637	440,232	413,990	358,317	5,026,086	
Pre-Subscription - LLH	MWh	238,516	270,045	314,479	317,160	285,378	280,312	246,069	269,306	269,608	285,368	273,425	223,925	3,273,591	
Pre-Subscription - Demand	MW	988	1,080	1,191	1,320	1,179	1,085	985	1,035	952	1,034	969	808		
Total Energy	aMW	4,622	5,356	6,050	6,162	6,049	5,369	4,996	4,792	4,603	4,669	4,711	4,575	5,159	
Total Peak	MW	5,530	6,264	6,959	7,335	6,826	6,332	5,724	5,285	4,802	5,020	5,118	5,023		

		Table 2-3													
		2003 Safety Net CRAC BPA Public Agencies Sales Forecast													
		2004-2005 Fiscal Year													
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	12Mon Avg	
Full - HLH	MWh	641,744	719,006	831,913	845,304	721,226	701,050	643,993	626,311	605,621	639,212	653,757	614,770	8,243,906	
Full - LLH	MWh	383,400	439,860	506,730	522,679	450,208	434,994	399,970	382,852	367,115	379,145	381,509	357,100	5,005,561	
Full - Demand	MW	1,983	2,180	2,360	2,604	2,255	2,119	1,924	1,591	1,443	1,575	1,616	1,649		
Partial - HLH	MWh	395,294	392,413	426,245	448,003	398,781	391,573	386,017	367,176	348,834	362,392	374,684	363,828	4,655,240	
Partial - LLH	MWh	272,439	285,823	308,488	321,700	287,294	289,799	275,752	266,186	250,375	243,966	260,057	249,303	3,311,183	
Partial - Demand	MW	997	1,049	1,127	1,146	1,108	1,063	999	905	846	844	901	909		
Block - HLH	MWh	285,710	393,571	492,506	481,527	432,909	448,794	405,737	454,553	358,092	348,201	344,429	317,023	4,763,052	
Block - LLH	MWh	173,918	230,284	279,034	298,210	261,386	259,413	240,576	293,680	203,977	213,622	194,757	165,103	2,813,958	
Block - Demand	MW	679	948	1,161	1,142	1,129	1,056	977	1,078	872	829	799	773		
Slice Block - HLH	MWh	388,544	430,560	504,576	495,456	444,672	452,736	363,168	292,448	297,024	323,232	360,288	374,400	4,727,104	
Slice Block - LLH	MWh	301,862	314,640	371,712	383,464	333,504	333,376	264,519	225,656	221,648	250,488	260,208	278,192	3,539,269	
Slice Block - Demand	MW	934	1,035	1,168	1,191	1,158	1,048	873	703	714	777	834	900		
Pre-Subscription - HLH	MWh	379,392	420,110	500,548	494,397	431,319	429,921	390,780	409,786	413,238	442,934	425,175	363,760	5,101,360	
Pre-Subscription - LLH	MWh	246,301	269,697	319,518	327,092	282,811	284,566	249,751	273,299	273,798	294,056	273,461	227,154	3,321,504	
Pre-Subscription - Demand	MW	1,003	1,096	1,210	1,341	1,196	1,100	999	1,050	965	1,048	983	819		
Total Energy	aMW	4,656	5,411	6,104	6,207	6,018	5,412	5,035	4,828	4,639	4,701	4,742	4,598	5,192	
Total Peak	MW	5,596	6,309	7,026	7,423	6,846	6,387	5,773	5,327	4,839	5,074	5,133	5,051		

		Table 2-4													
		2003 Safety Net CRAC BPA Public Agencies Sales Forecast													
		2005-2006 Fiscal Year													
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	12Mon Avg	
Full - HLH	MWh	653,207	731,597	846,307	863,304	736,931	716,813	655,732	643,326	619,191	653,483	668,409	629,117	8,417,417	
Full - LLH	MWh	390,455	447,706	515,598	533,817	459,987	444,783	412,117	388,862	375,440	387,836	390,298	365,670	5,112,567	
Full - Demand	MW	2,019	2,218	2,400	2,657	2,302	2,164	1,966	1,627	1,477	1,611	1,653	1,686		
Partial - HLH	MWh	399,796	396,948	431,617	453,686	403,820	396,135	391,862	370,496	352,986	366,725	378,545	367,599	4,710,214	
Partial - LLH	MWh	275,364	288,815	311,982	325,399	290,604	292,857	278,629	269,110	253,120	246,736	262,589	251,739	3,346,944	
Partial - Demand	MW	1,009	1,061	1,141	1,160	1,122	1,075	1,011	915	855	854	910	919		
Block - HLH	MWh	289,454	397,731	497,258	486,519	437,133	453,114	406,457	462,185	361,420	351,529	347,885	320,767	4,811,452	
Block - LLH	MWh	176,550	233,020	282,154	301,162	264,266	262,221	246,300	292,432	206,105	215,918	196,941	166,927	2,843,994	
Block - Demand	MW	688	958	1,172	1,154	1,140	1,066	1,005	1,071	880	837	807	782		
Slice Block - HLH	MWh	385,216	426,400	498,960	489,632	439,680	447,984	345,200	299,376	292,864	319,904	360,288	374,400	4,679,904	
Slice Block - LLH	MWh	299,230	311,600	367,656	378,872	329,760	329,944	269,729	216,216	218,608	247,864	260,208	278,192	3,507,879	
Slice Block - Demand	MW	926	1,025	1,155	1,177	1,145	1,037	863	693	704	769	834	900		
Pre-Subscription - HLH	MWh	385,169	426,784	508,682	502,342	438,144	436,537	372,268	399,706	399,081	430,184	410,609	349,346	5,058,850	
Pre-Subscription - LLH	MWh	249,858	273,869	324,596	332,157	287,183	288,856	241,918	256,702	262,814	281,387	262,240	214,476	3,276,058	
Pre-Subscription - Demand	MW	1,017	1,112	1,228	1,361	1,213	1,116	963	1,014	928	1,013	947	781		
Total Energy	aMW	4,704	5,465	6,162	6,273	6,083	5,469	5,035	4,837	4,641	4,706	4,755	4,609	5,224	
Total Peak	MW	5,658	6,375	7,097	7,508	6,922	6,459	5,808	5,320	4,844	5,084	5,150	5,067		

Table 2-5														
2003 Safety Net CRAC BPA Investor-Owned Utility Sales Forecast														
2002-2003 Fiscal Year														
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	12Mon Avg
HLH	MWh	165,024	158,912	158,912	165,024	146,688	158,912	158,912	165,024	152,800	165,024	158,912	158,912	159,421
LLH	MWh	119,566	116,128	125,296	119,184	110,016	125,296	115,746	119,184	122,240	119,184	125,296	116,128	119,439
Demand	MW	382	382	382	382	382	382	382	382	382	382	382	382	382
Total Energy	aMW	382	382	382	382	382	382	382	382	382	382	382	382	382
Total Peak	MW	382	382	382	382	382	382	382	382	382	382	382	382	382

Table 2-6														
2003 Safety Net CRAC BPA Investor-Owned Utility Sales Forecast														
2003-2004 Fiscal Year														
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	12Mon Avg
HLH	MWh	165,024	152,800	165,024	165,024	146,688	165,024	158,912	158,912	158,912	165,024	158,912	158,912	159,931
LLH	MWh	119,566	122,240	119,184	119,184	119,184	119,184	115,746	125,296	116,128	119,184	125,296	116,128	119,693
Demand	MW	382	382	382	382	382	382	382	382	382	382	382	382	382
Total Energy	aMW	382	382	382	382	382	382	382	382	382	382	382	382	382
Total Peak	MW	382	382	382	382	382	382	382	382	382	382	382	382	382

Table 2-7														
2003 Safety Net CRAC BPA Investor-Owned Utility Sales Forecast														
2004-2005 Fiscal Year														
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	12Mon Avg
HLH	MWh	158,912	158,912	165,024	158,912	146,688	165,024	158,912	158,912	158,912	158,912	165,024	158,912	159,421
LLH	MWh	125,678	116,128	119,184	125,296	110,016	119,184	115,746	125,296	116,128	125,296	119,184	116,128	119,439
Demand	MW	382	382	382	382	382	382	382	382	382	382	382	382	382
Total Energy	aMW	382	382	382	382	382	382	382	382	382	382	382	382	382
Total Peak	MW	382	382	382	382	382	382	382	382	382	382	382	382	382

Table 2-8														
2003 Safety Net CRAC BPA Investor-Owned Utility Sales Forecast														
2005-2006 Fiscal Year														
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	12Mon Avg
HLH	MWh	158,912	158,912	165,024	158,912	146,688	165,024	152,800	165,024	158,912	158,912	165,024	158,912	159,421
LLH	MWh	125,678	116,128	119,184	125,296	110,016	119,184	121,858	119,184	116,128	125,296	119,184	116,128	119,439
Demand	MW	382	382	382	382	382	382	382	382	382	382	382	382	382
Total Energy	aMW	382	382	382	382	382	382	382	382	382	382	382	382	382
Total Peak	MW	382	382	382	382	382	382	382	382	382	382	382	382	382

Table 2-9														
2003 Safety Net CRAC BPA Direct Service Industry Sales Forecast														
2002-2003 Fiscal Year														
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	12Mon Avg
HLH	MWh	15,120	14,560	14,560	15,120	13,440	14,560	14,560	15,120	14,000	15,120	14,560	14,560	14,607
LLH	MWh	10,955	10,640	11,480	10,920	10,080	11,480	10,605	10,920	11,200	10,920	11,480	10,640	10,943
Demand	MW	35	35	35	35	35	35	35	35	35	35	35	35	35
Total Energy	aMW	35	35	35	35	35	35	35	35	35	35	35	35	35
Total Peak	MW	35	35	35	35	35	35	35	35	35	35	35	35	35

Table 2-10														
2003 Safety Net CRAC BPA Direct Service Industry Sales Forecast														
2003-2004 Fiscal Year														
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	12Mon Avg
HLH	MWh	151,200	140,000	151,200	151,200	134,400	151,200	145,600	145,600	145,600	151,200	145,600	145,600	146,533
LLH	MWh	109,550	112,000	109,200	109,200	109,200	109,200	106,050	114,800	106,400	109,200	114,800	106,400	109,667
Demand	MW	350	350	350	350	350	350	350	350	350	350	350	350	350
Total Energy	aMW	350	350	350	350	350	350	350	350	350	350	350	350	350
Total Peak	MW	350	350	350	350	350	350	350	350	350	350	350	350	350

Table 2-11														
2003 Safety Net CRAC BPA Direct Service Industry Sales Forecast														
2004-2005 Fiscal Year														
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	12Mon Avg
HLH	MWh	145,600	145,600	151,200	145,600	134,400	151,200	145,600	145,600	145,600	145,600	151,200	145,600	146,067
LLH	MWh	115,150	106,400	109,200	114,800	100,800	109,200	106,050	114,800	106,400	114,800	109,200	106,400	109,433
Demand	MW	350	350	350	350	350	350	350	350	350	350	350	350	350
Total Energy	aMW	350	350	350	350	350	350	350	350	350	350	350	350	350
Total Peak	MW	350	350	350	350	350	350	350	350	350	350	350	350	350

Table 2-12														
2003 Safety Net CRAC BPA Direct Service Industry Sales Forecast														
2005-2006 Fiscal Year														
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	12Mon Avg
HLH	MWh	145,600	145,600	151,200	145,600	134,400	151,200	140,000	151,200	145,600	145,600	151,200	145,600	146,067
LLH	MWh	115,150	106,400	109,200	114,800	100,800	109,200	111,650	109,200	106,400	114,800	109,200	106,400	109,433
Demand	MW	350	350	350	350	350	350	350	350	350	350	350	350	350
Total Energy	aMW	350	350	350	350	350	350	350	350	350	350	350	350	350
Total Peak	MW	350	350	350	350	350	350	350	350	350	350	350	350	350

Table 2-13: 4(h)(10)(c) Power Purchase Amounts (aMW)

Wtr Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep
1929	38.0	1063.0	1612.0	1506.0	3398.0	1918.0	1041.0	122.0	0.0	0.0	0.0	826.0
1930	908.0	300.0	1682.0	3379.0	1239.0	1323.0	397.5	1080.0	-54.0	0.0	-41.0	957.0
1931	919.0	480.0	1324.0	3308.0	3152.0	1925.0	650.5	374.0	-8.0	0.0	0.0	909.0
1932	479.0	644.0	2583.0	3249.0	148.0	284.0	0.0	0.0	0.0	-378.0	-101.0	933.0
1933	34.0	935.0	1923.0	0.0	0.0	609.0	0.0	0.0	0.0	0.0	0.0	635.0
1934	0.0	315.0	0.0	0.0	0.0	0.0	0.0	0.0	-232.0	-182.0	0.0	67.0
1935	296.0	1216.0	1988.0	0.0	0.0	227.0	0.0	0.0	0.0	-691.0	-56.0	633.0
1936	436.0	462.0	1554.0	1367.0	2991.0	1333.0	357.0	0.0	0.0	-377.0	0.0	821.0
1937	583.0	336.0	1684.0	2294.0	3247.0	1761.0	960.5	1169.0	-138.0	-834.0	0.0	1028.0
1938	70.0	400.0	1763.0	0.0	829.0	0.0	0.0	0.0	0.0	-442.0	0.0	233.0
1939	22.0	835.0	1719.0	0.0	2171.0	797.0	0.0	0.0	-483.0	-171.0	-129.0	507.0
1940	0.0	601.0	1400.0	674.0	2300.0	0.0	0.0	0.0	-50.0	-66.0	0.0	927.0
1941	-196.0	996.0	1506.0	575.0	3029.0	1942.0	-232.0	0.0	0.0	166.0	-23.0	686.0
1942	475.0	986.0	233.0	0.0	1925.0	2265.0	0.0	0.0	0.0	0.0	0.0	848.0
1943	-236.0	676.0	2273.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	402.0
1944	42.0	1088.0	1745.0	1311.0	3399.0	2291.0	1005.0	0.0	0.0	120.0	0.0	557.0
1945	373.0	874.0	1855.0	3217.0	2951.0	2213.0	925.5	0.0	0.0	-712.0	-158.0	1112.0
1946	-70.0	216.0	1914.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	362.0
1947	0.0	782.0	717.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	254.0
1948	0.0	1214.0	330.0	0.0	679.0	0.0	0.0	0.0	0.0	0.0	0.0	567.0
1949	0.0	753.0	2050.0	0.0	1908.0	0.0	0.0	0.0	0.0	-44.0	0.0	0.0
1950	-1.0	511.0	2023.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-255.0	617.0
1951	0.0	581.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1952	0.0	1082.0	888.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1953	431.0	666.0	1534.0	1994.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	917.0
1954	0.0	759.0	2448.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	299.0
1955	0.0	1124.0	1501.0	0.0	2955.0	2252.0	-218.5	0.0	0.0	0.0	0.0	0.0
1956	0.0	1321.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	376.0
1957	0.0	792.0	2335.0	0.0	1911.0	0.0	0.0	0.0	0.0	0.0	0.0	354.0
1958	65.0	671.0	1972.0	0.0	0.0	0.0	0.0	0.0	0.0	-215.0	-106.0	849.0
1959	0.0	1271.0	530.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-17.5	754.0
1960	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1961	0.0	1189.0	1769.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	549.0
1962	0.0	883.0	1772.0	0.0	465.0	1915.0	0.0	0.0	0.0	0.0	0.0	996.0
1963	0.0	1086.0	584.0	0.0	0.0	1618.0	-36.0	0.0	0.0	0.0	0.0	815.0
1964	36.0	818.0	2071.0	0.0	239.0	1703.0	0.0	0.0	0.0	0.0	0.0	117.0
1965	0.0	678.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1966	0.0	680.0	1517.0	0.0	0.0	1333.0	0.0	0.0	0.0	0.0	0.0	329.0
1967	132.0	620.0	2311.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	885.0
1968	0.0	807.0	1856.0	0.0	0.0	0.0	247.5	0.0	0.0	0.0	0.0	0.0
1969	0.0	1115.0	176.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1970	0.0	730.0	2006.0	167.0	0.0	107.0	-150.0	0.0	0.0	-164.0	0.0	747.0
1971	300.0	982.0	1874.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-17.0	1099.0
1972	0.0	781.0	1923.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	650.0	2096.0	0.0	2616.0	1575.0	137.0	185.0	0.0	0.0	0.0	0.0
1974	593.0	934.0	145.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	907.0
1975	262.0	991.0	2122.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	810.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	209.0
1977	0.0	1026.0	1449.0	1317.0	3017.0	2369.0	1048.5	341.0	73.0	521.0	0.0	0.0
1978	385.0	79.0	1445.0	-624.0	502.0	0.0	0.0	0.0	0.0	0.0	-382.5	1244.0