1.0

1.1

1.25

1.4

1.6

4.5
5.0
5.6
6.3
7.1
8.0
9.0
10
11.2
12.5
14
16
18
20
22.5
25
28
32
36
40
45
50
56
63
71
80
90
100
112
125
140
160
180
200
225
250
280
320
360
400
450
500
560
630
710
800
900
1000

2.8

3.2

3.6

4.0

2.5

2.2

2.0

1.8

1 of 1

Energy Resources Performance Report

FY 1991 and FY 1992

MASTER

ds
DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

Introduction

Transition, change, a journey — these words describe the last 2 years of Bonneville Power Administration's Energy Resources Program. In our search for the best methods to acquire energy resources, we took new steps, learned by doing, and had many successes. We've found good approaches, and removed hurdles for others. We've been on a fast track exploration of conservation and generating resource acquisition, and it's been anything but routine.

This Energy Resources Performance Report highlights our progress in Fiscal Years 1991 and 1992 to provide the "Best Resource Value for Our Customers," with a reliable, environmentally sound, cost-effective power supply. In this report we describe our accomplishments and major activities and what we've learned in order to improve. The report is designed with two goals in mind: to display to the region — our customers — how we spent their investment in the power system; and to share our experiences acquiring conservation and generating resources.

BPA's Energy Resources Program expenditures for FY 1991 and FY 1992 are reported in Appendix A. Estimated leveled costs of energy resources acquired in the past two fiscal years are reported for each conservation acquisition program in Appendix B, some of which are also incorporated in the "Implementing Strategies" section (see p. 25). Appendix B illustrates changes that are taking place in the way BPA reports resource costs. These changes are occurring for two reasons: (1) to update basic assumptions; and (2) to ensure that cost estimates of diverse resources are more comparable than they have been in the past. Documents published and summaries of research, development, and demonstration projects for FYs 1991 and 1992 are listed in Appendix C and Appendix D, respectively. Current staffing charts for the Office of Energy Resources and Area Offices are provided in Appendix E.

Energy Resources Development and Implementation Process

Our customers, the Northwest Power Planning Council (Council), utility associations and environmental groups, and the public work with us planning for future power needs, designing and managing programs, and carrying out our plans. We begin the Energy Resources Development and Implementation Process by forecasting the energy requirements of our customers and identifying possible resources to supply that energy. Then we analyze alternatives that will make resources available. After seeking advice of others, we choose the best strategy and implement that strategy through acquisition programs. To understand how effective we've been, we evaluate program performance. Our last Energy Resource Performance Report described this process in detail. This time, we use the process to organize our report, and include limited process descriptions. A chart showing the process follows this introduction.

Our Starting Point — Where We've Been

Over the last 12 years, Bonneville completed least-cost resource programs. These programs are guided by Power Plans developed by the Council to meet the needs of our Northwest wholesale power and direct-service industry customers. Least-cost planning is mandated by the Pacific Northwest Electric Power Planning and Conservation Act (called the Northwest Power Act). BPA's Resource Program integrates the work of forecasters and analysts, engineers and environmental specialists, District, Area and Headquarters staff, plus the advice and assistance of many others outside BPA. The result is a strategy to deliver reliable, environmentally sound, least-cost energy resources.

Once the Federal Columbia River Power System provided all the power our customers needed and surplus energy, which we sold to others. However, we planned for the time when the surplus would disappear. With our customers, we developed centralized, region-wide conservation programs to conserve energy and build the knowledge and ability to save more energy when needed. We began to look at conservation as a resource, comparing it with supply-side alternatives. Much was accomplished. In Bonneville's service area in the 1980s, our customers acquired 300 average megawatts (aMW) of conservation savings. How? By weatherizing about 240,000 homes, by making aluminum plants, other industrial plants and commercial buildings more efficient, and also by encouraging states to adopt energy-efficient building codes.

Now, our energy surplus is gone. Our customers need energy, and in a hurry. While we plan how much energy will be needed, when and by which customers, we must concurrently accelerate our efforts to acquire resources. Our 1990 Resource Program launched a strategy to do just that, starting in 1991 and 1992, with continuing activities in 1993-95. The goals and plans of the 1990 Resource Program are still being implemented.

First Steps — The Last 2 Years

Flexibility, testing new approaches and teamwork are key concepts from the 1990 Resource Program that guided our efforts to purchase new resources. Conservation, our first choice resource, required a substantial acceleration. Also, we needed to develop the ability to purchase generating resources, the first time under the 1980 Northwest Power Act. So, we've targeted certain conservation resources for acquisition, are continuing to pursue the proposals selected under the competitive bidding and billing credits pilot programs for conservation and generation resources, and are examining proposals received for resource options. We learned much about which resources are available, how much they cost and how to purchase them most effectively. Acquisition programs will provide almost 350 aMW of additional power by 1996-97 and a solid knowledge base for future cost-effective purchases.

Because future energy needs and resource performance are uncertain, we must prepare for even greater loads. To be ready, we solicited proposals from resource developers for options on resources to use if needed. Our first solicitation for 800 aMW brought in proposals for 7,850 aMW. If the optioning approach is successful, it will save our customers substantial investments because we will have the flexibility to shorten lead times and prepare to meet high loads without buying resources ahead of need.

In each of our efforts to test approaches, our customers joined us, offering advice, critique, and suggestions. And their role will grow as we expand our pursuit of new resources.

Our recent 1992 Resource Program is ambitious and challenging. Acquiring the conservation and generation resources contained in the 1992 Resource Program will require a cooperative effort among BPA's customers, resource suppliers, industry, state and local governments, consumers, other interest groups, just about everyone affected by electricity. With that in mind, we are working with our customers to develop Local Conservation Plans. These plans will help us and our customers to effectively acquire 660 aMW.

The Power System of the Future

The 1992 Resource Program focuses on the actions BPA must take in 1994-95 to meet power demand, but it also looks out 10 years to help plan the power system of the future. Our 1992 Resource Program shows that, more than ever, acquiring conservation is still our highest priority for the 1990s. Combining the needed conservation shown in the 1990 and 1992 Resource Programs means we must purchase about 700 aMW of conservation in the next 10 years. To make this happen, we must work with and through our customers, who in turn are developing Local Conservation Plans. These plans identify the amount and cost of individual utility contributions to our 700 aMW target. Bonneville's Area Offices are working with utilities to provide budget stability and program flexibility for them.

But conservation is not the only resource we need. In the 1992 Resource Program we also plan to acquire 400 aMW of generation, either through power exchanges with other regions or low-cost generation (below 28 mills/kilowatthour [kWh], real leveled 1990 \$). Potential changes in our hydroelectric system to meet Endangered Species Act requirements may affect our ability to exchange power with other regions, but exchanges seem the most cost-effective and best environmental choice now.

And we plan to add another 250 aMW of options to our acquisitions. This 250 aMW, coupled with 800 aMW from our first optioning solicitation and 400 aMW of existing surplus power options, should cover the outer range of resource needs. We will be ready to respond to any load or resource uncertainty.

In the next decade, then, Bonneville plans to buy about 1,500 aMW of conservation, renewables, and generating resources and option about 1,500 aMW more. Pivotal investments will create the power system of the future. Bonneville, with our customers, will invest in resources that preserve the value of our power system and maintain its flexibility.

George E. Reel

Terence M. Esvelt

Lee J. Hickey

Wayne R. Lee

Thomas V. Wagenhoffer

Energy Resources Development and Implementation Process

The Energy Resources Program contains all the steps needed to plan for and manage energy resources. This chart reflects that process, with major tasks for each step. Though we display a linear process, it is a simplification; many interactions among the stages take place. Throughout the process, Bonneville asks customers, the Northwest Power Planning Council, utility and environmental groups, the public and others for their advice and comment.

Defining the Resource Picture

To define the resource picture, Bonneville assesses its customers' power requirements for the next 20 years and the supply of existing resources. Bonneville and the Northwest Power Planning Council publish energy demand forecasts, and analysts forecast how much power from existing resources will be available to meet projected uses. The difference must be met by new resources.

Identifying Alternatives

Analysts track potential resources and predict future supplies of conservation and generation resources, including imports and power exchanges. Analysts study all aspects of a resource: reliability, public opinion, cost, environmental impact, regulatory, transmission and fuel constraints, and development time. Alternatives considered include opportunities for coordinating hydro system operations with Canada and for power purchases and transfers with Canadian and Southwest utilities.

*Customers
Northwest Power Planning Council
Utility and Environmental Groups
The Public*

Selecting Strategies

Using information on loads and resources, Bonneville weighs combinations of resources, their consequences, and public comment to choose the most appropriate and cost-effective resource strategy. The Resource Program documents this strategy.

Implementing Strategies

Fulfilling the plans in the Resource Program is the next step. Working with utilities, resource developers, interest groups, the public, and others, Bonneville sponsors conservation and generation programs and projects. BPA conducts environmental reviews of programs and projects and also provides oversight for generation projects. The result: megawatts of electricity generated or saved for the region.

Evaluating Performance

How well did actions meet BPA's objectives? Answering this question through program evaluation provides information on energy savings, energy production, costs and other measures of program quality. It is BPA's policy to evaluate all energy resource acquisitions.

Table of Contents

Defining the Resource Picture

Forecasting Loads

Historical Data	2
Expectations About Future Growth	2
End-Use Research	2
Monthly Load Comparison Report	2
Mid-Term Load Forecast	4
Pacific Northwest Coordination Agreement Forecast	4
Northwest Regional Forecast	4
Sum-of-Utilities Load Forecast	5
1992 Long-Term Load Forecast	5
Preliminary Rate Filing Forecast	5

Analysis of the Existing Power System

System Operation Review - Technical Analysis	6
Efficiency Improvements in Study Methodology	7

Forecasting Resource Needs

Pacific Northwest Loads and Resources Study	8
---	---

Identifying Alternatives

Environmental Impacts, Costs and Benefits	12
Conservation and Generation Resource Supply Estimates	12

Conservation and Renewables

Council Plan	14
Resource Supply Expansion Program	14

Hydro

Coordination with Canada	15
Columbia River Treaty	16
Background	16
Assured Operating Plan and Determination of Downstream Power Benefits	16
Interim Entitlement Return Agreement	16
Allocation of the Entitlement	16
Capacity Credit Limit (CCL)	16

Transmission Resources

Third AC Intertie	17
-------------------------	----

Nuclear

Washington Nuclear Power Plants -1 and -3	17
---	----

Selecting Strategies

Resource Program

Conservation Implementation Plan	21
Energy Conservation Policies	21
Generation Resource Strategy	22
Resource Programs Environmental Impact Statement	22

Mention or portrayal of commercial firms or their products in this document does not imply Bonneville endorsement of any firm or its products.

Implementing Strategies

All Resources

Billing Credits	26
Competitive Acquisition Program	27
Resource Contingency Program	27
Targeted Acquisition Process	27

Continuing Conservation and Generation Programs and Projects

Residential Conservation

Super Good Cents/Long-Term Super Good Cents Programs	29
SGC Manufactured Homes Consumer Rebate Program ...	29
Washington State Energy Code Program	30
Oregon State Energy Code Program	30
Appliance Efficiency Programs	31

Other Residential Conservation

Weatherwise	32
Manufactured Housing Acquisition Program	32
Residential Construction Demonstration Project	33
Eugene Water and Electric Board Bond Financing	34
Residential Sector - Indoor Air Quality	34

Commercial Conservation

Long-Term Commercial Acquisition Process	35
Energy Smart Design Program	36
Lighting Design Lab	37
Energy Edge Project	37
Commercial Retrofit and End-Use Study	38
Commercial Incentives Pilot Program	38
Multi-Sited Businesses	39
Purchase of Energy Savings Field Test and Pilot Program	39

Industrial Conservation

Aluminum Smelter Conservation/Modernization (Con/Mod) Program	39
Energy Savings Plan	40
Sponsor-Designed Program	41

Agricultural Conservation

Irrigated Agriculture Hardware and WaterWise Programs	42
---	----

Multi-Sector Conservation

Northwest Energy Code Program	43
State Technical Assistance Cooperative Agreement	43
Electric Ideas	43
Electric Ideas Clearinghouse	44

Generation Projects

Federal Hydroelectric Projects	46
Idaho Falls Hydroelectric Project	46
Cowlitz Falls Hydroelectric Project	47
Hanford Generating Project	47
Trojan Nuclear Plant	48
Washington Nuclear Plant-2	48
Biomass	49

Research, Development and Demonstration

Evaluating Performance

Program Evaluation	52
Conservation Environmental Evaluations	52

Other Accomplishments

Education Training Programs

Hands On Science	53
Summer Science Camp	54
Northwest Power System Curriculum	54
Saturday Academy Summer Internships	54
Regional Education and Training Advisory Committee	55
Regional Energy Management Program	55

Appendices

Appendix A	Program Accrued Expenditures, FY 1991 and FY 1992	56
Appendix B	Conservation Program Savings and Costs, FY 1991 and FY 1992	58
Appendix C	Publications, FY 1991 and FY 1992	60
Appendix D	Research, Development and Demonstration Projects, FY 1991 and FY 1992	68
Appendix E	Office of Energy Resources and Area Office Staffing Charts	72

Glossary

Tables

Tables 1 and 2, Accumulation of Conservation Results ...	45
--	----

Defining the Resource Picture

Forecasting Loads

Analysis of Existing Power System

Forecasting Resource Needs

Forecasting Loads

Over the last 2 years, BPA analysts, economists, researchers and forecasters worked to develop information and predict a picture of energy requirements, or loads, of BPA's customers. Using historical records, population projections, information about conservation, commercial, industrial and other energy uses, and with help from utilities and the Northwest Power Planning Council, these analysts prepared load forecasts.

Analysts use computer models to help make their predictions. These tools store information and use new knowledge collected by researchers about energy use. Forecasts developed with models are produced at different times over 2 years and have a wide scope of applications. BPA, our customers, and others use these forecasts not only for energy resource planning, but also for transmission planning, contract administration, system operations, revenue estimates, and determining electric rates. Forecasts are also used by state and local agencies such as the Oregon Department of Transportation for specialized planning.

Historical Data

The models that analysts use to make load forecasts contain much historical data. This includes information about population, patterns of fuel prices and how past economic cycles influenced load growth. The models also contain facts about past energy use in the region (see End-Use Research). New data about current conditions are combined with historical information in the computer models.

Expectations About Future Growth

Economic activity drives energy use and different economic conditions influence actual load growth. For the 1991 and 1992 load forecasts, analysts incorporated new data showing growth in population and employment in the region, lower gas prices, and lower electricity use by the aluminum smelters in the Northwest. To complete these forecasts, BPA predicted what may happen to fuel prices, employment, industrial production and international trade, and other factors that affect

End-Use Research

Analyzing historic energy consumption is an important part of Bonneville's forecasting and resource planning process. Bonneville collects end-use energy consumption data primarily through the Regional Energy Metering Project (REMP). The REMP database collects metered data over the long term to analyze trends in energy consumption. REMP monitors energy consumption hourly in residential and commercial buildings. Other ongoing metering efforts include the commercial sector Energy Edge Project and a multifamily residential metering project in collaboration with Tacoma City Light.

Energy use patterns, and what causes them, are critical for energy forecasts, conservation program designs, and other demand-side planning. Historical utility and end-use consumption data Bonneville collects, and resulting analyses, also are used to evaluate programs. The data provide estimates

Monthly Load Comparison Report

BPA's Monthly Load Comparison Report summarizes, by customer class, Federal system and regional loads for each month. It shows load trends for the prior 12, 24, and 36 months and presents information on economic indicators and news about the regional economy that help explain changes in loads. The report tracks the performance of the most recent Pacific Northwest Coordination Agreement (PNCA) Load Forecast.

Oregon Department of Transportation's Ann Eike and John Baker analyze BPA's county level projections to produce Oregon county employment, population, and household information for long-term transportation planning

Information Contact

Pete West - RPCC
(503) 230 - 5624
Bonneville Power Administration
P. O. Box 3621
Portland, OR 97208

the Northwest's economy. For example, BPA expects non-agricultural employment in the Northwest to grow above national levels and manufacturing employment to grow despite an expected national decline.

Information Contact

Chuck Forman - RPCB
(503) 230 - 3658
Bonneville Power Administration
P. O. Box 3621
Portland, OR 97208

of energy savings created by conservation programs. Other planning areas, such as transmission and distribution, use load research data. Analyzing customer demand during peak and off-peak periods is required to accurately calculate the capacity benefit of many conservation measures.

Besides metering, Bonneville uses consumer surveys to collect data about residential and commercial buildings. Surveys include questions about site characteristics, demographics, and occupant attitudes. For example, the Pacific Northwest Non-Residential Energy Survey (PNNonRES) provides information on the region's commercial buildings; the 1992 Pacific Northwest Residential Energy Survey (PNWRES) updates residential sector information obtained from BPA's 1983 residential survey.

In addition, BPA collects and maintains monthly, regional utility data by consuming sector. Data include revenue, sales in kWh, and average number of customers by sector. Using regional historical information about electricity use from consuming sectors, Bonneville produced Annual Historical Sales Reports for 1991 and 1992. These reports are used throughout the Northwest for many analyses.

Information Contact

David Mills - RPEE
(503) 230 - 7606
Bonneville Power Administration
P. O. Box 3621
Portland, OR 97208

The report suggests that the growth rate of temperature-adjusted regional loads is slowing relative to growth experienced in 1988-90. Also, during Operating Year (OY) 1992 (the Operating Year runs from August to July), the PNCA Forecast was close to temperature-adjusted actual regional loads, deviating on average by -0.7 percent.

Information Contact

Carle Lee - RPCD
(503) 230 - 3660
Bonneville Power Administration
P. O. Box 3621
Portland, OR 97208

1991 OCTOBER

Mid-Term Load Forecast

On a quarterly basis, BPA produces a medium case, near-term projection of monthly peak and energy loads. BPA's mid-term forecasts are designed to respond to and reflect near-term factors and events. The time horizon of these forecasts is usually 5 to 8 years. Loads for each of the following customer groups are forecast separately: non- and small generating public utilities (NSGPUs), generating public utilities, direct-service industries (DSIs), Federal agencies, and the U.S. Bureau of Reclamation (Bureau).

In August 1992, BPA produced a mid-term forecast that was merged with the Long-Term Forecast and used for BPA's Pacific Northwest Loads and Resources Study. The August 1992 mid-term forecast was also used as the preliminary 1993 Rate Case Forecast.

BPA's mid-term forecasts are used primarily for operational and financial planning purposes. For operational purposes, the mid-term load forecast is used to prepare BPA's submittal to the Northwest Power Pool (NWPP) for the PNCA and the NWPP Operating Program. For financial purposes, portions of the mid-term load forecast are used to project revenues for quarterly financial reviews and for setting wholesale electric rates.

BPA's most current mid-term load forecast reflects a significant slowdown in near-term regional economic activity, compared to the robust growth of 1988-90. Regional loads are projected to grow at the rate of 1.0 percent per year during 1993 through 1998.

Pacific Northwest Coordination Agreement Forecast

Between November and January of each year, BPA prepares a medium case forecast for the NWPP to use in its operating program and the PNCA. This forecast contains monthly peak and energy load projections for 4 years for NSGPUs, DSIs, Bureau projects, and Federal agencies.

BPA's load forecast produced in early 1992 projected NSGPU loads to grow at an annual average rate of growth of about 0.7 percent during OYs 1992-1996. Total DSI load is projected to decline at an annual average rate of 0.4 percent over this period.

Information Contact
(Mid-Term Load and Pacific NW Coordination Agreement Forecasts)
Carle Lee - RPCD
(503) 230-3660
Bonneville Power Administration
P. O. Box 3621
Portland, OR 97208

Northwest Regional Forecast

The focus of the Northwest Regional Forecast (NRF), published by the Pacific Northwest Utilities Conference Committee (PNUCC) each year in March, is the need for power in the next decade. Northwest electric utilities must determine near-term actions for meeting customers' needs and keep sight of the electric load and resource projections for the entire 20-year period covered in the NRF.

Bonneville is a major contributor to this document, providing load forecasts for the DSIs, for smaller non-generating utilities, and public agencies. BPA then performs hydro-regulation studies which show the amount of electric energy that can be guaranteed under low water conditions. The studies also show extra electric energy that may be available using 50 years of historical streamflow records.

Information Contacts
Jed Folts - RPSE
(503) 230 - 4462 or
Ralph Stein - RPCE
(503) 230 - 3936
Bonneville Power Administration
P. O. Box 3621
Portland, OR 97208

1992 OCTOBER

JANUARY

APRIL

JULY

1993 OCTOBER

Sum-of-Utilities Load Forecast

Each fall BPA updates the Sum-of-Utilities (SOU) Load Forecast with utility forecasts prepared by BPA Area Office or utility staff. The SOU Forecast contains monthly peak and energy load projections over a 20-year period for NSGPUs, DSIs, Bureau projects, and Federal agencies by point-of-delivery. The SOU Forecast also contains the most recent forecasts submitted to the PNUCC for generating public and investor-owned utilities. The forecast of NSGPU loads contained in the 1991 SOU Forecast projects annual average growth of 1.2 percent for OYs 1993-2012.

The SOU Forecast is used by BPA for transmission reliability analyses and transmission needs projections. By using forecasted loads and a model of the transmission system, analysts can determine whether existing substation capacity is adequate to handle projected loads.

Though the SOU Forecast assumes "typical" weather, forecasts under extreme and intermediate weather conditions are also developed. These forecasts are used to analyze the reliability of the transmission system under abnormal weather conditions.

In December, BPA submits to PNUCC load forecasts for the Bureau, Federal agencies, DSIs and the NSGPUs who do not submit their forecast directly to PNUCC. These forecasts are used in the Northwest Regional Forecast.

Information Contact
Carle Lee - RPCD
(503) 230 - 3660
Bonneville Power Administration
P. O. Box 3621
Portland, OR 97208

1992 Long-Term Load Forecast

Since 1988, BPA and the Council alternated the lead responsibility for the joint regional forecast of economic conditions and electric loads. This forecast, which looks out 20 years, is used for long-term resource planning.

Using common tools, BPA and Council staff explored, in detail, issues that affect actual energy use such as conservation standards in different sectors, commercial vacancy rates, natural gas, and changing population and employment patterns. The most important change for the 1991 and 1992 forecasts was a decrease of 300 aMW in energy use by the aluminum smelters in the Northwest.

Staff used metered load data available from REMP, regional commercial and other sector survey data, and other information to forecast future consumption patterns in the Northwest.

Regional firm energy sales during the 1980s and early 1990s mirrored economic activity, growing an average annual rate of about 0.7 percent in the mid-1980s, to 3-4 percent recently. Federal system growth rates were comparable during these periods.

Forecasters predict a slower average rate of load growth for the next 20 years. The 1992 forecast, completed in August 1992, contains a revised medium case forecast of Federal system loads. Since BPA's vision of the future has not changed dramatically, the other four forecast ranges were not revised in 1992. They will be revised as part of the Joint 1993 Forecast. The forecasted regional growth rate for the medium case is 1.1 percent annually. The projected load growth for the medium-high and high cases is 1.6 and 2.2 percent, respectively. The high case reflects a continuation of recent strong growth conditions. Completing the range of forecasts are the medium-low (0.9 percent) and the low (0.08 percent) cases, which assume more pessimistic economic conditions.

Information Contact
Chuck Forman - RPCB
(503) 230 - 3658
Bonneville Power Administration
P. O. Box 3621
Portland, OR 97208

Preliminary Rate Filing Forecast

In August 1992, BPA prepared a preliminary forecast to be used in the 1993 Rate Case. This forecast contains monthly peak and energy load projections for the region by BPA customer group (generating public utilities, NSGPUs, DSIs, Federal agencies, Bureau projects, and investor-owned utilities [IOUs]) for purposes of BPA revenue forecasting and analysis.

Using a Monte Carlo simulation technique, staff developed a distribution of alternate scenarios for the public utility loads for risk assessment analysis. Two sources of uncertainty were explicitly considered: employment and weather.

Information Contact
Carle Lee - RPCD
(503) 230 - 3660
Bonneville Power Administration
P. O. Box 3621
Portland, OR 97208

Analysis of the Existing Power System

System Operation Review - Technical Analysis

Bonneville, the Army Corps of Engineers and the Bureau of Reclamation are preparing a multi-year System Operation Review (SOR) environmental impact statement (EIS) on the Columbia River system's many uses. Uses include navigation, flood control, recreation, hydropower generation, fish, wildlife, cultural resources, and irrigation. With BPA's technical support, the SOR EIS will include extensive analyses of the effects of alternative hydro system operations on these uses. This EIS will allow the agencies to make river system operations decisions about:

- guidelines for operating the system that consider impacts on all river users (System Operation Strategy);
- terms for coordinated river operations for power production (Pacific Northwest Coordination Agreement); and

- new agreements with mid-Columbia utilities for return of energy to Canada (Entitlement Allocation Agreements).

The agencies also will use the EIS to reevaluate and update the system operation strategy in the future.

Major accomplishments during FY 1991 include completing a pilot study comparing three different system operation strategies in four major river areas — recreation, resident fish, anadromous fish, and power. The study's purpose was primarily to develop tools and techniques for future analysis. As part of the study, analysts created a spreadsheet to calculate quickly and easily power system cost changes as system operation variations occur.

Other FY 1991 accomplishments include completing several hydro regulation studies for the screening phase of the SOR EIS analysis. These studies show changes in reservoir elevations and river flows caused by diverse system operation strategies.

A major FY 1992 accomplishment was completing the screening analysis phase of the SOR EIS. Analysts evaluated 90 different system operation strategies for their effects on the power system and other river uses. Results are presented in the report "Screening Analysis: A Summary; Volume 1, Description and Conclusions; and Volume 2, Impact Results." Ten strategies are proposed for further analysis in the full-scale phase of the SOR EIS.

Information Contact
Audrey Perino - RPS
(503) 230 - 4260
Bonneville Power Administration
P. O. Box 3621
Portland, OR 97208

Efficiency Improvements in Study Methodology

Over the past 2 years, BPA has undertaken a concerted effort to improve methods for producing hydropower system studies. Four projects have particularly added to the efficiency and productivity of study capability.

These projects include a new optimization tool that allows analysts to find reservoir operations that conform to the ever-increasing demands on the hydro system. Another improvement is a hydro model that permits analysts to directly interact with the model to produce desired operations. This model, called Hydrosim, has gained regional attention as perhaps the easiest hydro model to use and learn. Two other programs, SAM II and HOSS, extend BPA's ability to estimate effects on the hydro system. SAM II allows BPA to separate impacts to BPA from the rest of the region. HOSS will allow analysts a better look into effects on an hourly and daily basis.

Together these products increased the efficiency of BPA to meet its obligations under the System Operation Review, rates analyses, Columbia River Treaty, and PNUCC membership. British Columbia Hydro (B.C. Hydro), Puget Sound Power and Light, the National Marine Fisheries Service, and the Bureau are among the many utilities and agencies finding these products useful for their work.

Information Contacts
Byrne Lovell - RPSB
(503) 230 - 3930 or
Ken Dragoon - RPSE (Hydrosim)
(503) 230 - 3938
Bonneville Power Administration
P. O. Box 3621
Portland, OR 97208

*June 1992 meeting of the
System Operation Review
Power Work Group.*

Forecasting Resource Needs

After forecasters determine future loads in the Federal power system, resource analysts take the forecast and combine it with their knowledge of resources. Resource specialists study existing resources, how they operate, and information about future operations. Then they compare the capability of existing resources to the forecasted loads and determine if surplus conditions or deficits exist. Each year BPA publishes its findings. Currently, BPA projects deficits and plans to acquire about 1,500 aMW of resources by 2003.

Pacific Northwest Loads and Resources Study

To analyze the need for new resources, analysts first develop a load/resource balance. The load/resource balance shows when and by how much Federal system loads are estimated to exceed existing Federal system resources, without resource additions. Analysts compare the capability of existing resources to the forecasted loads under five load growth scenarios for the next 20 years. The five growth scenarios are high, medium-high, medium, medium-low, and low.

BPA publishes the results of this analysis each year in the Pacific Northwest Loads and Resources Study, called the "White Book." If changes occur during the year due to economic cycles, resource operation, or other events, staff updates the analysis. For example, loads may change if regional aluminum plants cut production, or energy supply decreases if a major generation plant shuts down.

BPA uses the load/resource balance for resource planning, revenue forecasting, ratemaking, marketing, and contract administration. Though the need for detail varies for each function, all use the same assumptions. Load/resource balances cover a range of time, from 1 to 20 years. The load/resource balance sets the stage for the resource program that defines BPA's resource acquisition goals.

The current loads and resources study shows a growing need for resources through the 1990s. Because this study shows a future energy deficit, BPA launched an aggressive resource acquisition program.

Information Contact

Ralph Stein - RPCE

(503) 230 - 3936

Bonneville Power Administration

P. O. Box 3621

Portland, OR 97208

1992 Resource Program Ranges of Resource Need*

*Does not reflect Trojan plant closure or 1992 Medium Load Forecast

Faced with both demand and supply uncertainties, BPA defined ranges of resource need. The graphic above represents BPA's resource need under five different load paths. The most likely range of need falls within the medium-high and medium-low load forecasts. BPA used the high load forecast to define the outer bound of resource need. The 1992 Resource Program planned acquisitions to cover the most likely range of resource need, and option resources to cover the outer bound of need.

If the load/resource balance indicates a need for new resources, BPA looks at the supply of possible alternatives. To determine supply estimates, analysts consider resource costs, timing, quantity of energy produced or saved, conservation measures realized without utility programs, and the effect of energy-saving technologies. BPA weighs alternate resources according to such variables as reliability, availability, environmental impacts, and seasonal, monthly, and hourly operating characteristics. Conservation and generating resources supply forecasts direct energy resource planning and acquisition.

In 1991 and 1992, besides developing supply estimates, BPA focused efforts on resources that now supply huge amounts of the Federal power system's energy, or could supply it in the future — hydro, transmission resources, and existing, but unfinished, nuclear plants.

Identifying Alternatives

Conservation and Renewables

Hydro

Transmission Resources

Nuclear

Environmental Impacts, Costs and Benefits

The National Environmental Policy Act (NEPA) requires Federal agencies to study and fully reveal the possible effects of their proposed actions on the quality of the human environment, and to use all practical means to preserve and enhance environmental quality when carrying out agency mandates. Bonneville identifies environmental issues during energy resource planning, so that environmental, as well as economic and institutional factors, are considered when choosing energy resource alternatives and strategies. From developing resource supply estimates through actual acquisition of energy, Bonneville considers environmental impacts and prepares NEPA documents to ensure NEPA requirements are met. Bonneville also sees that mitigation strategies for avoiding or minimizing adverse effects are in place before a program or project starts. Bonneville tracks ongoing programs and projects to make sure mitigation strategies have been carried out properly and are serving their purpose, i.e., to avoid harmful program effects.

The Northwest Power Act requires BPA to include quantifiable environmental costs and benefits in cost-effectiveness decisions for energy resources. Over the past decade BPA has studied the economic costs and benefits to the environment from operating energy resources. In November 1990, BPA established a work group to help develop environmental externality estimates for the Resource Program Environmental Impact Statement, the 1992 Resource Program, and for evaluating future competitively bid resources. Work group members included representatives from Federal and state regulatory agencies and energy offices, investor-owned and public utilities, environmental advocacy groups, independent power producers, parties interested in offering BPA resources through BPA's competitive bidding process, and the public. The group reviewed and commented on BPA's approach to measuring and applying environmental costs. During FY's 1991 and 1992, BPA incorporated quantifiable environmental costs and benefits into its resource planning and acquisition decision-making activities.

Information Contacts

Charles Alton - RAE (NEPA)

(503) 230 - 5878 or

Elizabeth Bowers - RPPC (Costs and Benefits)

(503) 230 - 3410

Bonneville Power Administration

P. O. Box 3621

Portland, OR 97208

Conservation and Generation Resource Supply Estimates

Bonneville and the Council jointly develop estimates of generation and conservation energy potential. Both explore ways to eliminate duplication, to fully use data sources, and coordinate assumptions.

In 1992, BPA published the 1992 Conservation Resources and 1992 Generation Resources Supply Documents, which report resource supply estimates to the year 2010 and supporting technical documentation.

To make conservation and generating resource estimates, analysts consider the costs, timing, quantity of energy produced or saved, the proportion of conservation measures installed in the Northwest without utility programs, and the market saturation of different energy-saving technologies. These considerations are essential to integrated resource planning when making decisions to meet future loads reliably with the least cost. BPA also weighs alternative resource combinations according to such variables as availability, environmental impacts, and seasonal, monthly, and hourly operating characteristics. BPA uses a public process that involves organizations from the Northwest and elsewhere to develop these estimates.

The 1992 Generation Resource Supply Document relied on data developed in collaboration with the Council. This approach took advantage of the Council's public involvement processes and reduced duplication. The principal changes from the 1990 supply document include: the shift to coal gasification instead of pulverized coal as the coal conversion technology; updated coal fuel forecasts; and the inclusion of renewable resources, e.g., wind and geothermal, as available resources. Also, a transmission adjustment was added to generating resources to reflect the cost of integrating these resources into the existing transmission system.

BPA estimates about 44 percent of the regional conservation technical potential is in the commercial sector. This resource potential will change with increased knowledge of and experience with advanced lighting, heating, ventilation, and air-conditioning technologies. The Council adopted regional Model Conservation Standards (MCS) for commercial buildings in 1987 and 1989.

The residential sector comprises about 38 percent of the estimated regional conservation resource potential. Because Washington and Oregon adopted MCS into their building codes in 1991 and 1992 respectively, and Federal standards for refrigerators and freezers are in place and will be updated in 1993, the resource potential declined significantly in the early 1990s. However, promising new technologies in windows, advanced insulations, heat pumps, and lighting efficiencies may expand the future resource portfolio for this sector.

Sixteen percent of the estimated regional conservation potential is in the non-aluminum industrial sector. Bonneville's Energy Savings Plan will provide data for new measures to be added to this supply potential. Promising cross-industry technical advancements include variable speed drive and air compressor improvements. Further savings potential has been identified through utility customer system efficiency improvements.

Conservation and generating resources supply forecasts provide a foundation for energy resource planning and acquisition. Before developing a program or activity to secure conservation resources, BPA uses supply forecasts and other information to

plan acquisitions. These market assessments give a better understanding of the technologies available within each market segment. From these estimates BPA lists resources, by cost and amounts available, in a resource stack integral to the resource planning process.

Information Contacts
Joe Cade - RPED (Conservation)
 (503) 230 - 5997 or
Mike Berger - RPE (Generation)
 (503) 230 - 5877
 Bonneville Power Administration
 P. O. Box 3621
 Portland, OR 97208

1992 Resource Stack (Real Levelized 1990 \$)

This menu of supply and demand resources available for meeting electrical loads ranks resources in order of cost effectiveness. The most cost-effective resource is on the bottom of the stack—the least on the top.

*Accelerated path conservation through 2003. Other resources shown are through 2010.

Conservation and Renewables

Council Plan

The Northwest Power Act assigns the responsibility for developing and adopting a regional conservation and electric power plan to the Northwest Power Planning Council. BPA works with the Council during its planning process, sharing information and reaching agreement on resource potential.

The Council completed its most recent Power Plan in 1991, which guides BPA's resource planning process. Two objectives of the Power Plan are to acquire all low-cost resources, and determine cost and availability of resources.

The Plan calls for acquiring over 1,500 aMW of conservation and system efficiency improvements in the region by the year 2000. About 40 percent or 660 aMW is achievable in BPA's service area through 2003. The Plan also suggests confirming an added 500 to 1,000 aMW of new cost-effective resources such as conservation, biomass, geothermal, wind, and solar resources, through research and demonstration projects.

Resource Supply Expansion Program

One objective of the Council's Plan is to confirm additional conservation and renewable resources. In 1991, BPA established a target of confirming 1,500 aMW of additional resources by 1997.

In April 1991, BPA, the Council, and PNUCC submitted a proposal to the U. S. Department of Energy (DOE) suggesting that DOE use the Northwest to demonstrate conservation and renewable generation technologies that show promise for being developed as new resources. The Resource Supply Expansion Program (RSEP) is a collaborative process among electric utilities and other interested parties to initiate demonstration projects to prove resources are obtainable. Many technologies are technically available, but untested in the Northwest. Under RSEP, performance, reliability and market acceptance of these technologies will be tested. Demonstration projects show resource providers how various conservation and renewable resources can be developed cost-effectively and reliably. During FY 1992, nine collaborative RD&D projects dealing with residential, commercial, and industrial conservation were initiated under RSEP. Also during 1992, a regional wind energy strategy was developed under RSEP, and a solicitation for wind demonstration project proposals was issued.

RSEP serves to identify added resources for future acquisition, and help utilities reach the "Accelerated Path" called for in CIP.

Information Contact

Jon Blemer - RPED
(503) 230 - 5995

Bonneville Power Administration
P. O. Box 3621
Portland, OR 97208

Hydro

Coordination with Canada

In 1986, BPA and B.C. Hydro conducted studies and determined that up to 600 aMW of firm energy could be gained by more thoroughly coordinating the B.C. Hydro and Pacific Northwest hydropower systems. Coordination means operating the two hydro systems more nearly as one system. Coordination would take advantage of diversities in loads, runoff patterns and storage availability between the two systems. The two parties agreed to pursue partial coordination of the B.C. Hydro system before attempting to achieve the benefits of full coordination.

In November 1990, BPA and B.C. Hydro capped a 2-year long study and negotiation effort by initiating operation under a new 10-year Non-Treaty Storage Agreement (NTSA). Most of the benefits of the NTSA derive from the shared use of 4.5 million acre feet of storage in B.C. Hydro's Mica Dam, which is not covered by the Treaty. This agreement yields approximately 300 aMW of firm energy, about one-half accruing to each country. Also in February 1991, BPA and several Mid-Columbia project owners and power purchasers signed a companion NTSA that helps to assure that full benefits to the agreement can be realized in the United States.

Information Contact

Steve Montfort - RPSC
(503) 230 - 3952

Bonneville Power Administration
P.O. Box 3621
Portland, OR 97208

BPA is currently supporting experiments designed to determine the viability of using alternative energy sources for the region's electric needs. A potential for this is being tested in the Pacific Northwest.

Columbia River Treaty

Background

The Treaty was ratified in 1964. It established the basis for developing three large storage projects in Canada that would provide flood control and downstream power benefits. Canada owns half of the downstream power benefits that were created with the completion of Duncan, Arrow and Mica dams, in 1968, 1969, and 1973, respectively. This half of the power benefits is referred to as the Canadian Entitlement. Canada sold the Canadian Entitlement to parties in the U.S. for a period of 30 years from the completion of the Treaty projects. Thereafter, the Canadian Entitlement that is generated at hydro projects in the U.S. must be returned to Canada as set forth in the Treaty. Unless otherwise agreed, the Treaty requires that beginning April 1, 1998, the portion of the Canadian Entitlement power associated with the completion of Duncan Dam (about 9 percent) must be returned by the U.S. to British Columbia. Also pursuant to the Treaty, the Assured Operating Plan (AOP) and Determination of Downstream Benefits (DDPB) studies that determine, respectively, the operating rules for the three Treaty projects in Canada

and the magnitude of the Canadian Entitlement obligation, must be completed annually and agreed on by the Treaty entities 6 years in advance of the actual year of operation.

Assured Operating Plan and Determination of Downstream Power Benefits

The AOP/DDPB studies are completed according to established procedures that are consistent with the Treaty's intent. They are complex studies involving detailed hydro system simulation studies. They are carried out jointly with Canada and are reviewed in detail by U.S. non-Federal parties. The studies require several months to complete. In FY 1991, BPA completed two AOP/DDPB documents for the 1994-95 and 1995-96 operating years. In FY 1992, BPA finalized and signed the 1996-97 AOP/DDPB and initiated studies on the critical 1997-98 AOP/DDPB.

Interim Entitlement Return Agreement

To assure that the U.S. could meet its obligations under the Treaty to deliver the Canadian Entitlement beginning in 1998, the U.S. and Canada signed an Interim Entitlement Return Agreement in July 1992. The agreement establishes transmission loss

rates and delivery points on the existing transmission system in lieu of on the U.S./Canadian border at or near Oliver, B.C. The agreement terminates midnight March 31, 2003, unless either party elects to do so sooner, except that a 7-year, 3-month window is established from the notice of termination.

Allocation of the Entitlement

The return of the Canadian Entitlement is a U.S. obligation to Canada. It derives from the increase in usable energy and capacity created at plants downstream in the U.S. due to construction of Treaty storage in Canada. There are five Federal and five non-Federal generating plants on the main-stem Columbia in the U.S. that benefit from improved streamflows from Treaty storage. Use of these improved streamflows must be approved by the U.S. entity. This creates the need for an allocation of the U.S. Entitlement return obligation among Federal and non-Federal parties since the existing Entitlement return allocation agreements apply only to the 30-year sale of the entitlement by Canada to the United States. That sale begins to terminate on April 1, 1998, and terminates fully on April 1, 2003.

Negotiations were initiated in April 1990 with non-Federal parties directly involved, three owners of the five Mid-Columbia hydro projects: Grant, Chelan and Douglas County public utility districts (PUD). Several utilities who purchase power from the three Mid-Columbia project owners also participate in negotiations. Negotiations will likely require study of entitlement magnitude now and in the future, its uncertainty and characteristics such as losses and scheduling.

Capacity Credit Limit (CCL)

The Canadian Entitlement has two components, energy and capacity. The Treaty specifies a procedure for confirming whether the standard computation of the capacity credit should be limited. The U.S. and Canada have been attempting to resolve issues on how to conduct this capacity credit limitation procedure for several years. In August 1992, the U.S. and Canada came to agreement on the legal aspects of the end point procedure.

Information Contact
Steve Montfort - RPSC
(503) 230 - 3952
Bonneville Power Administration
P. O. Box 3621
Portland, OR 97208

Transmission Resources

Third AC Intertie

California and the Northwest are connected by one direct current (DC) and two alternating current (AC) interties. In June 1987, several members of Congress asked BPA to give full consideration to non-Federal participation in the financing and use of the Third AC Intertie expansion.

BPA is addressing environmental and economic effects of alternative methods of implementing this proposal in the Non-Federal Participation Draft Environmental Impact Statement. BPA's preferred alternative is to offer Northwest Scheduling Utilities life-of-facilities capacity ownership of 21 percent (or an expected 725 aMW) of BPA's share of the Third AC Intertie.

The Final EIS is planned for September 1993. This schedule allows BPA to develop contracts with potential participants that coincide with the energization of the Third AC Intertie in November 1993. The cumulative level of interest in non-Federal participation by Northwest utilities and customer groups exceeds 1,100 aMW.

Information Contact
John Emery - RPSD
(503) 230 - 4467
Bonneville Power Administration
P. O. Box 3621
Portland, OR 97208

Nuclear

Washington Nuclear Power Plants -1 and -3

BPA has a contract with the Washington Public Power Supply System for the capability of Washington Nuclear Plant-1 (WNP-1), a 1,250 MWe project on the Department of Energy's Hanford Nuclear Reservation. WNP-1 is 63 percent complete.

Washington Nuclear Plant-3 (WNP-3) at Satsop, Washington, is 76 percent complete and has a capacity of 1,240 MWe. The Supply System owns 70 percent of its output and four IOUs own 30 percent. BPA has a contract with the Supply System for its 70 percent share, and with the IOUs for their share, and pays their third-party costs.

Since 1982, WNP-1 and -3 have been preserved pending restart or termination decisions. In April 1993, the Supply System and Bonneville announced their intentions to abandon efforts to complete these projects as nuclear projects. Once legal and technical issues are resolved and alternate uses are examined, decisions will be implemented accordingly during calendar year 1994.

Information Contact
Jim Lewis - RN
(509) 372 - 8760
Bonneville Power Administration
Supply System Office
3000 George Washington Way
P. O. Box 968
Richland, WA 99352

*The power grid at the Cello
Converter Station, The Dalles, Oregon*

As information about loads and resources is updated, so too is BPA's plan for acquiring resources to meet the demand for electricity. BPA updates its Resource Program every 2 years and identifies specific resource actions, or strategies, that BPA could take to meet the power demand. The Resource Program incorporates details about available resource alternatives, considers their consequences, such as cost and environmental impacts, and displays the strategy BPA chooses.

Selecting Strategies

Resource Program

Resource Program

BPA prepared the 1992 Resource Program during the last 2 years. New issues and information surfaced since the 1990 Resource Program and influenced the 1992 strategy:

- *The Council's 1991 Power Plan with its high conservation objectives;*
- *Lower gas prices shifted the generation resource situation;*
- *New and potential listings of anadromous fish as endangered under the Endangered Species Act could affect hydro system operation;*
- *Extra-regional resource development; and*
- *Customers and others want a review of resource policies.*

BPA used information developed about these issues, alternatives, environmental costs and benefits, and public comment to produce significant parts of its Resource Program. The 1992 Resource Program is a 10-year plan that reflects Bonneville's continued focus on acquisition programs that are customized and flexible to meet the needs of utilities and other resource providers.

Information Contact
Scott Coe - RPPD
(503) 230 - 3972
Bonneville Power Administration
P. O. Box 3621
Portland, OR 97208

1992 Resource Program Planned Resources vs. Resource Needs*

*Does not reflect Trojan plant closure or 1992 Medium Load Forecast

Conservation Implementation Plan

Both the Council's Plan and the Resource Program emphasize conservation. Acquiring all available cost-effective conservation resources in the region presents major challenges. In 1991, to identify and resolve issues and challenges to achieving this conservation, BPA issued a draft Conservation Implementation Plan (CIP) and asked for help from the region to develop strategies to meet conservation targets. After receiving comments and revising CIP, it became part of the Resource Program.

In CIP, BPA identifies a need to acquire about 660 aMW between now and 2003. Meeting the challenges laid out in CIP requires working together. Part of meeting these challenges includes developing area and local plans to meet local needs and opportunities with a sense of partnership. Status reports about Area Office activities with their customers on local conservation planning are presented in the 1992 Resource Program.

Another result of the CIP process is a set of conservation guidelines that clearly define BPA's conservation policies for customers.

Information Contacts

Carolyn Whitney - TB
(Puget Sound Area Office)
(206) 553 - 1167

Bonneville Power Administration
201 Queen Anne Avenue North, Suite 400
Seattle, WA 98109

Victoria English - LR
(Lower Columbia Area Office)
(503) 230 - 3079

Bonneville Power Administration
P. O. Box 3621
Portland, OR 97208

Tom Hannon - UB
(Upper Columbia Area Office)
(509) 353 - 2893

Bonneville Power Administration
Room 561 U. S. Court House
920 West Riverside Avenue
Spokane, WA 99201

Gene Ferguson - WB
(Snake River Area Office)
(509) 522 - 6219

Bonneville Power Administration
1520 Kelley Place
Walla Walla, WA 99362

Energy Conservation Policies

In 1992, BPA developed two sets of conservation policies. The first set, Conservation Acquisition Policies, establishes standards for BPA conservation acquisition programs. The second set defines circumstances under which BPA will provide full funding for programs that meet the standards, and when BPA will provide additional compensation to utilities that lose revenue and suffer financially because of their conservation efforts.

Information Contact

Joe Cade - RPED
(503) 230 - 5997

Bonneville Power Administration
P. O. Box 3621,
Portland, OR 97208

Generation Resource Strategy

Many in-region generation resources look promising for meeting resource needs. BPA's 1992 Resource Program plans to acquire 400 aMW and option 250 aMW of generating resources between 1993 and 1995. Two general principles guide the Generation Strategy:

- competition among multiple sources of generation, and
- annual checkpoints to modify or adjust the acquisition process as needed.

At the May 1993 checkpoint, BPA assessed the need and availability of new generating resources. For the 400 aMW of generation recommended for acquisition, BPA plans to pursue about 150 aMW of additional exchanges with California utilities, acquire 30 aMW from the Wauna cogeneration program, and fill the remaining portion of the target from billing credits or option resources. BPA will continue to work with utilities and resource developers to further improve its acquisition approaches and obtain the best resources available.

Information Contact

Jim Sapp - RPPD
(503) 230 - 4000
Bonneville Power Administration
P O Box 3621
Portland, OR 97208

Resource Programs Environmental Impact Statement

The Resource Programs Environmental Impact Statement (RPEIS) is an environmental document that will support several Resource Programs. To ensure coverage of actions for future Resource Programs, the EIS analyzes "maximum" effects by modeling a future where BPA meets high load growth (up to 5,000 aMW of new load). The RPEIS assesses the environmental effects of generic resources at unspecified sites. Exceptions are the two nuclear plants, WNP-1 and -3, since their sites are known. Once BPA proposes to acquire a resource at a specific site, further environmental analysis will be completed to assess its effects.

BPA incorporated environmental costs and benefits into the RPEIS. The RPEIS describes the environmental impacts of generic resource types and displays the tradeoffs among them. It also assesses the impacts of adding different resource mixes to the existing system. Each alternative is a distinct scenario of how BPA will meet its future load growth based on acquiring a large amount of one type of resource. The RPEIS examined the following alternatives:

- **Status Quo** — BPA meets its load growth by acquiring the least expensive resource available;
- **Base Case** — BPA acquires the least expensive resources but includes a factor for external environmental costs;
- **Coal** — Includes one scenario with pulverized coal resources and one with fluidized bed and gasified coal resources available to the region;
- **Conservation** — Includes two scenarios, one with BPA's 1990 estimate of supply, and another with a high estimate of supply;
- **Cogeneration** — BPA acquires all available cogeneration;
- **Renewable Resources** — Includes solar, wind, hydro, and geothermal resources;
- **Nuclear** — Includes WNP-1 and -3;
- **Combustion Turbines** — Acquires all combustion turbines available;
- **Fuel Switching** — Although fuel switching is not a resource, it is examined as a likely alternative;
- **Energy Imports** — Imports from Canada and California from gas-fired combustion turbines are evaluated; and

Photo courtesy of the U.S. Forest Service, Pacific Northwest Forest Experiment Station, showing the rugged topography of the Mt. Rainier National Park.

• No Action • The National Forest Management Act (NFMA) requires that the Forest Service prepare a management plan for each National Forest.

As part of the NFMA, the Forest Service must prepare a management plan for each National Forest. The plan must describe the forest's resources, the values to be managed, and the actions to be taken to manage the forest. The plan must also describe the Forest Service's management objectives and the actions to be taken to achieve those objectives. The plan must be updated every 10 years.

The Forest Service has prepared a management plan for the Mt. Rainier National Forest. The plan describes the forest's resources, the values to be managed, and the actions to be taken to manage the forest. The plan also describes the Forest Service's management objectives and the actions to be taken to achieve those objectives.

The Forest Service has prepared a management plan for the Mt. Rainier National Forest. The plan describes the forest's resources, the values to be managed, and the actions to be taken to manage the forest. The plan also describes the Forest Service's management objectives and the actions to be taken to achieve those objectives.

For more information, contact:
Kathy Pierce, RAI
 (509) 230-3962
 kathy.pierce@fs.fed.us
 For more information, contact:
 (509) 230-3962

The 1992 Resource Program proposes acquiring all cost-effective conservation (about 660 aMW), 400 aMW of generation, and 250 aMW of resource options. BPA's Area Office and Headquarters staff began actions from conservation and generation implementation plans to meet these acquisition targets. As staff work through these plans, they will use experience gained implementing BPA's 1990 Resource Program.

BPA's 1990 Resource Program called for testing new acquisition methods to see if these procedures are workable for customers, developers and Bonneville. Over the last 2 years, BPA staff met the objectives in the 1990 Resource Program through new and established programs.

Implementing Strategies

All Resources

Continuing Conservation and Generation Programs and Projects

Research, Development and Demonstration

All Resources

NOTE

The following pages include BPA and regional costs based on energy savings accrued by the close of each fiscal year from conservation acquisition projects only. These estimated costs are expressed in three ways to reflect different concerns related to costs. Cost units are all mills per kilowatthour. Costs reported are based on direct program costs, including costs of energy conservation measures, administration, and advertising (they do not include indirect costs that are not attributed to the programs)

Real Levelized BPA Cost (1990 dollars) expresses BPA's portion of resource costs on an equal, per-unit basis, in terms of the dollar's purchasing power in 1990. That is, BPA's costs over time are expressed in terms of level payments over the life of the resource using a dollar's purchasing power as of a single reference year—1990—taking into account an appropriate interest rate. The effects of inflation are removed from real levelized costs. A real levelized cost is analogous to an average price that takes into account how the value of money changes over time. BPA reports real levelized costs because it allows the comparison of resources with different sizes, on line dates, and lifetimes on a per kWh basis using a single number. Example: A worker who earns \$30,000 in 1993 and who will receive full future cost of living allowances every year has a real levelized salary of \$30,000 year in 1993 dollars. Real levelized cost can be compared to BPA's management target (average cost of 30 mills/kWh in 1990 dollars over all programs) published in BPA's Energy Conservation Policies.

Real Levelized Regional Cost (1990 dollars) is analogous to a BPA levelized payment. The difference is that, in addition to BPA's costs, the regional cost includes the costs incurred by utilities and consumers. To be cost-effective, a program should have a real levelized regional cost no higher than a limit that varies between 36 and 47 mills/kWh (in 1990 dollars), depending upon the measure life of the resource. Programs above this range are currently being reevaluated.

The BPA Nominal Payment for conservation is the average amount of money that will be paid (or was paid) by BPA during each year of the resource's 20-year financing period. It does not have the effects of inflation removed from it. The BPA nominal payment is used to gauge the relative impact the resource will have on BPA budgets and rates, which real levelized cost measures generally do not do. BPA's average wholesale rate in 1992 was approximately 23 mills/kWh for priority firm power, the average retail rate for the region's public utilities in 1992 was approximately 35 mills/kWh.

Billing Credits

In July 1990, BPA issued its first billing credit solicitation. Under this program, billing credits compensate customers for electric power resources developed or acquired and used to reduce customers' net requirements for electric power or reserves purchased from BPA.

Through the solicitation, BPA received 69 conservation proposals and 17 generation proposals totaling 130 aMW. Eleven contracts have been signed by BPA at the time of publication. Of those contracts, nine are conservation and two are generation contracts. All signed conservation contracts total about 3 aMW; the generation contracts total about 9 aMW. Sponsors of 50 conservation and six generation proposals withdrew their proposals from the pilot program. Seven conservation proposals were rejected and four conservation contracts are pending some form of BPA or customer resolution. Two generation proposals were rejected, five have submitted letters of intent to sign contracts, and one contract is pending customer resolution.

Each conservation and generation project accepted for negotiations received environmental review, and environmental documents were prepared to decide whether the resource is acceptable to Bonneville.

Information Contact
Doug Auburg - RMQ
(803) 230-4523
Bonneville Power Administration
P.O. Box 3621
Portland, OR 97208

Competitive Acquisition Program

The Competitive Acquisition Program is a pilot program designed to acquire up to 300 aMW of firm energy on a long-term basis from generation and conservation projects, and test competitive acquisition for these resources. The new approach proposes to obtain resources from a wide range of sponsors.

BPA issued generation and conservation solicitations in January 1991. Bonneville received over 100 proposals for approximately 5,300 aMW of generating resources and 116 aMW of conservation resources. Through evaluation, Bonneville narrowed the selection and began negotiations in January 1992. BPA has signed a letter of intent with Tenaska Power Partners and is currently conducting a NEPA review and a 6(c) consistency determination on the project, a 240 aMW combined-cycle combustion turbine to be located in the Frederickson Industrial Area near Tacoma, Washington. BPA also is actively negotiating with sponsors of two other generating projects, and developing and negotiating conservation agreements with developers.

BPA signed a conservation contract with Douglas Electric Cooperative (DEC) March 31, 1993. This project will improve transmission efficiency at DEC in Roseburg, Oregon. The project is planned to begin in late 1994 or early 1995, and is expected to save about 1,591 MWh the first year, increasing to 2,936 MWh by 2029.

Each conservation and generation project accepted for negotiations received a site-specific environmental review, and environmental documents were prepared to decide whether the resource is acceptable to Bonneville.

In 1991, BPA established a pool of environmental contractors to provide technical support for the environmental review efforts needed for BPA's resource acquisition activities. The pool facilitates faster turnaround time on NEPA documents and helps to increase BPA's ability to make informed decisions quickly about resource projects.

Information Contacts

Angie Quinata - RMGC (Conservation)

(503) 230 - 5240 or

Helen Goodwin - RMGC (Generation)

(503) 230 - 3126

Bonneville Power Administration

P. O. Box 3621

Portland, OR 97208

Resource Contingency Program

The Resource Contingency Program is designed to reduce lead times for acquiring resources should they be needed in the event that BPA has to meet higher than anticipated firm load obligations. BPA released a solicitation for 800 aMW of option resources in March 1992. Each project must be ready to deliver energy on 3 years' notice. BPA could exercise the option on a resource if demand grows faster than expected or if the agency does not get the megawatts it wants from its preferred source, energy conservation. Option projects also could be used if the Northwest loses a large generating facility, or sees major changes in hydro system operations to accommodate salmon.

Three projects have been selected for negotiation of energy option contracts. All three are gas-fired, combined-cycle combustion turbine projects. One project, sponsored by Ida West Energy, is located in Hermiston, Oregon. The other two projects are located in Washington State—one near Chehalis, sponsored by CRSS Capital, and the other at Satsop, sponsored by the Washington Public Power Supply System.

Information Contact

Dennis Oster - RMGC

(503) 230 - 5571

Bonneville Power Administration

P. O. Box 3621

Portland, OR 97208

Targeted Acquisition Process

Targeted acquisition is another method for meeting load growth. In this program, BPA works with small groups of customers to develop a focused approach to achieve certain types of conservation in each utility's service area.

The first agreement under this program was signed in 1992. Under this agreement, Snohomish County Public Utility District in Washington will design, finance and operate a commercial conservation program. BPA will buy the resource from the utility. The program will save 1 aMW by 1995. Payment will be based on performance, with the utility responsible for verification of the conservation savings.

Targeted Acquisition Process

	1990	1992
Units Accomplished		
Buildings	N/A	44
Savings (aMW)	N/A	0.2
Includes 1.5% transmission and distribution savings		
Avg. Measure Life		16 yrs
Levelized Costs (mill/kWh)		
See NOTE page 26		
BPA Real**	N/A	40
Regional Real**	N/A	35
BPA Non-Paymt.	N/A	41

*Levelized costs include all out-of-pocket payments, but accrued costs shown in Appendix A include only the amount paid in 1992.

** In 1992.

Information Contact

Dick Jamieson - RMGB

(503) 230 - 7502

Bonneville Power Administration

P. O. Box 3621

Portland, OR 97208

Continuing Conservation and Generation Programs and Projects

BPA also continued conservation and generation programs and projects started after earlier Resource Programs. Many programs have changed to reflect current needs and remain on BPA's menu of acquisition approaches. Some conservation programs are no longer offered, but payments for energy savings continue. The programs and projects in this section are arranged by conservation sector, generation, or research.

Residential Conservation

The following programs are offered under the Residential Conservation Agreement (RCA), developed in 1991, as an umbrella contract whereby utilities can operate energy-savings programs under one contract instrument. RCA was designed to allow modifications as regional and utility needs change.

Construction of a Super Good Cents home

Super Good Cents/Long-Term Super Good Cents Programs

Starting in 1984, the Super Good Cents (SGC) Program goal was to encourage energy-efficient building practices. In 1991, over 8,000 homes received SGC certification. As of December 1991, about 40,000 Northwest homes had been constructed to SGC standards over the 7 years of the program. BPA estimates the combined energy savings of these homes is enough to power a city of 9,000 for 1 year.

Design of a Long-Term SGC Program started in 1990 after a survey of utility managers showed an interest in maintaining the program, even after Oregon and Washington adopted codes equivalent to the levels of energy savings identified in the 1986 MCS. The program, effective January 1992, pays builders or home buyers to build homes to 1991 MCS, and is offered through electric utilities for homes and apartment buildings that use electrical space heat. Utilities review building plans, inspect homes during construction and verify homes as meeting program standards. Payments are based on the level of efficiency achieved and the conservation features the building includes. Energy-efficient water heaters and water-conserving shower heads are required; lighting and energy-efficient refrigerators are optional.

BPA conducts a regional advertising campaign for the program. Participating utilities receive promotional, technical materials and funds for advertising, marketing and training.

Recognizing that costs presented below are above BPA's cost-effectiveness level, Bonneville is working throughout the summer of 1993 to redesign this program to make it cost effective and more efficient.

Super Good Cents

FY 1991 FY 1992

Units Accomplished

New Home Construction 7,210 4,024

Savings (uMW) 1.2 0.6

Includes 7.5% transmission and distribution savings

Avg. Measure Life 70 yrs

Est. Levelized Costs (mills/kWh)

See NOTE page 26

BPA Real* 47 41

Regional Real* 47 51

BPA Nom. Paym't 100 113

*In 1990 \$

Information Contact

Suzanne G. Anker - RMRB
(503) 230 - 3306

Bonneville Power Administration
P. O. Box 3621
Portland, OR 97208

Long-Term Super Good Cents

FY 1991 FY 1992

Units Accomplished

New Home Construction N/A 1,140

Savings (uMW) N/A 0.5

Includes 7.5% transmission and distribution savings

Avg. Measure Life 70 yrs

Est. Levelized Costs (mills/kWh)

See NOTE page 26

BPA Real* N/A 93

Regional Real* N/A 113

BPA Nom. Paym't N/A 258

*In 1990 \$

SGC Manufactured Homes Consumer Rebate Program

Consumer rebates were offered for manufactured homes built to the SGC standards. The rebate varied from \$2-3,000 depending on the construction standard of the home. On April 1, 1992, the Manufactured Housing Acquisition Program (MAP) replaced the SGC Consumer Rebate Program (see p. 32). However, manufactured homes constructed under the pre-MAP program and not yet sited are eligible to receive the consumer rebate payments until such homes are sited.

SGC Manufactured Homes Consumer Rebate Program

FY 1991 FY 1992

Units Accomplished

New Home Construction 1,041 2,103

Savings (uMW) 0.5 1.1

Includes 7.5% transmission and distribution savings

Avg. Measure Life 45 yrs

Est. Levelized Costs (mills/kWh)

See NOTE page 26

BPA Real* 43 25

Regional Real* 78 47

BPA Nom. Paym't 99 58

*In 1990 \$

Information Contact

Suzanne G. Anker - RMRB
(503) 230 - 3306

Bonneville Power Administration
P. O. Box 3621
Portland, OR 97208

Washington State Energy Code Program

As a result of Washington adopting new state energy codes, Bonneville developed three support programs: Builder Payments, Builder Assistance, and Heat Pump Buildings.

Builder Payments

According to a section of 1991 Washington State law, electric utilities are required to make a payment to the builder of a newly constructed residential building with electric resistance space heat. Through June 1995, Bonneville will provide the funds to the utilities for these payments. Single-family residences that have 2,000 square feet or less of finished floor area receive a \$900 payment. Each multifamily residential unit receives \$390.

Builder Assistance

Bonneville provides funding to utilities to encourage them to help the shelter industry's transition to the new Washington State Energy Code. Assistance may include (1) design assistance to architects, designers, drafters, builders, subcontractors, consumers, and other persons associated with qualifying buildings to meet the State Energy Code; (2) providing on-site assistance to promote consistency between the utilities and code officials; and (3) coordinating educational activities.

Heat Pump Buildings

Homes built with heat pumps as their source of space heat are excluded from the 1991 Washington State Energy Code yet

represent a substantial potential savings. Therefore, Bonneville is making payments to have these heat pump homes upgraded to the Washington State Energy Code electric resistance path.

Information Contact
Suzanne G. Anker - RMRB
(503) 230 - 3306
Bonneville Power
Administration
P. O. Box 3621
Portland, OR 97208

Craig Sanders of Coos-Curry Electric Cooperative examines a heat pump.

Oregon State Energy Code Program

Bonneville provides funding to utilities to encourage them to help the shelter industry's transition to the new Oregon State Energy Code. Assistance may include (1) design assistance to architects, designers, drafters, builders, subcontractors, consumers, and other persons associated with qualifying buildings to meet the State Energy Code; (2) providing on-site assistance to promote consistency between the utilities and code officials; and (3) coordinating educational activities.

Information Contact
Suzanne G. Anker - RMRB
(503) 230 - 3306
Bonneville Power Administration
P. O. Box 3621
Portland, OR 97208

Appliance Efficiency Programs

The RCA offered in 1991 provides a framework for two of BPA's Appliance Efficiency Programs: Energy Efficient Water Heater and Shower Heads. Under RCA, Bonneville provides shower heads rated at 2.5 or fewer gallons per minute (gpm) at 80 pounds per square inch (psi) to participating utilities for residences, businesses, and institutions that heat water with electricity. The estimated savings in annual kWh for shower heads (2.5 gpm at 80 psi) is 400 per house if all shower heads are replaced. The Water Heater Rebate Option encourages replacing failed electric water heaters with qualifying energy-efficient electric resistance water heaters in new and existing homes and businesses. A savings of 250 kWh a year per home is obtainable.

Formerly known as the Blue Clue Program, the "Energy Efficient Refrigerator and Freezer Directory" helps consumers find the most energy-efficient refrigerator and freezer models available since 1986. Twice a year, Bonneville publishes a list of these models. The list, available from participating utilities and retailers, is a purchasing guide for consumers. Bonneville is updating the list to show models that exceed new higher Federal Appliance Standards. The brochure will continue as an information service to utilities.

BPA also is participating in the adoption of the vanguard "Golden Carrot" Program in the region. This program is a manufacturer rebate program to encourage production of a super-efficient refrigerator that will perform 25-50 percent above the 1993 Federal Standard. The Golden Carrot Program has become institutionalized with the incorporation of the Super Efficient Refrigerator Program (SERP). SERP pools utility resources to request manufacturers bring refrigerators to the marketplace at least 30 percent more efficient (and chlorofluorocarbon free) than the 1993 standards. The "Golden Carrot," a pool of about \$30 million, is being offered through a Request for Proposal (RFP). Two semi-finalists picked from responders to the RFP will produce prototype refrigerators for independent testing, and the winning manufacturer will be announced in late 1993. The winning manufacturer will deliver SERP refrigerators to the marketplace in 1995.

Bonneville is participating with about \$2 million over 3 years, including membership in the Consortium for Energy Efficiency (CEE), a group of nonprofit corporations, mostly utilities, formed to promote energy efficiency.

Additionally, Bonneville participates in the "Appliance Efficiency Committee" which is part of the Residential Efficient Appliance and Lighting Group (REAL). This group's mission is to ensure energy-efficient appliances are available in the Northwest. Made up of more than 25 utilities, associations, state energy offices, and conservation groups, REAL can reach and influence more than 2.5 million electrical customers throughout the region.

Appliance Efficiency Programs

1990-1991 1991-1992

Units Accomplished

Households N/A 158,163

Savings (aMW) N/A 6.5

Includes 7.5% transmission and distribution savings

Avg. Measure Life 12 yrs

Est. Levelized Costs (mill/kWh)

See NOTE page 26

BPA Real* N/A 14

Regional Real* N/A 17

BPA Non-Payment N/A 14

*in 1990X

Information Contact

Debra Byers - RMRC

(503) 230 - 4597

Bonneville Power Administration

P.O. Box 3621

Portland, OR 97208

Other Residential Conservation

Weatherwise

Residential weatherization is a key part of the region's energy resource strategy. Through its utility partners, BPA pays from 60 percent (for non-low income participants) up to 100 percent (for low income participants) of the costs of installing cost-effective weatherization measures in existing homes that use electric heat. Incentive payments are based on installation costs and expected energy savings. Where the BPA incentive is less than 100 percent, utilities, the Washington Department of Community Development and other state programs may offer supplemental funds to cover the consumer portion.

BPA's Weatherwise Program began in October 1990 and replaced the previous Weatherization Program. Utility customers were offered a new weatherization agreement that includes the following options: the Quick Audit, the Buyback, the Percent Savings, and the Contractor-Designed Option.

The Quick Audit Option uses a streamlined audit procedure and does not require that energy savings be calculated. The Buyback Option uses the Standard Heat Loss Methodology to estimate savings. The Percent Savings Option uses a Percent Savings Audit and a streamlined procedure for incentives based on a percent of the actual job cost. The Contractor-Designed Option allows the contractor to design a weatherization program. With these options, utilities can be flexible and decide which weatherization approach meets their local needs.

Weatherwise

FY 1991 FY 1992

Units Accomplished

Homes
Weatherized 9,941 15,228

Savings (aMW) 2.8 4.1

Includes 7.5% transmission
and distribution savings

Avg. Measure Life 40 yrs

Est. Levelized Costs (mills/kWh)

See NOTE page 26

BPA Real* 36 32
Regional Real* 46 47
BPA Nom. Paym't 79 82

*In 1990 \$

Information Contact

Sharon Doggett - RMRC
(503) 230 - 5478
Bonneville Power Administration
P. O. Box 3621
Portland, OR 97208

Manufactured Housing Acquisition Program

MAP, begun in April 1992, is an energy-saving program that reduces up to half the electricity used to heat manufactured homes in the Northwest. Through MAP, all electrically heated homes are now built to region-wide, energy-efficient MAP technical specifications. BPA and local electric utilities are helping offset the initial cost of energy-efficient features by providing \$2,500 per house to home manufacturers. BPA estimates each home will save its owners an average of 6,000 kWh.

Over 11,000 manufactured homes are built each year for Oregon, Washington, Idaho, and Montana. About 90 percent are electrically heated. Manufactured homes represent about 30 percent of the Northwest's electrically heated new homes. All 18 of the region's manufacturers have agreed to build their homes to MAP standards and nearly all of the region's utilities support the MAP through their cooperation and participation.

Utilities verify that individual MAP homes have been sited in their service territory in exchange for a verification payment.

MAP has intergovernmental agreements with Oregon, Washington and Idaho to support the Manufactured Housing Acquisition Program in FY 1993.

Manufactured Housing Acquisition Program

FY 1991 FY 1992

Units Accomplished

New Home
Construction N/A 2,447

Savings (aMW) N/A 1.8

Includes 7.5% transmission
and distribution savings

Avg. Measure Life 45 yrs

Est. Levelized Costs (mills/kWh)

See NOTE page 26

BPA Real* N/A 13
Regional Real* N/A 23
BPA Nom. Paym't N/A 31

*In 1990 \$

Information Contacts

Don Davey - RMR (Program Manager)
(503) 230 - 3124 or
Stephen Onisko - RMRD (Technical Contact)
(503) 230 - 5490
Bonneville Power Administration
P. O. Box 3621
Portland, OR 97208

Residential Construction Demonstration Project

The Residential Construction Demonstration Project (RCDP) demonstrates and promotes advanced technologies and products for residential construction to gain knowledge of effective ways to build new homes to MCS. Builders constructing homes within the service area of a participating SGC or Northwest Energy Code (NWE/C) Program utility are eligible.

The Project has four cycles. In the first two cycles, builders constructed MCS homes using at least one innovative technique or product, then collected cost information for BPA. BPA paid builders and homeowners incentives for their participation. A total of 240 homes, both site-built and manufactured, were studied.

RCDP Cycle III

BPA contracted with the Washington State Energy Office (WSEO) to coordinate and manage four Cycle III projects, with assistance from Oregon, Idaho and Montana state energy offices. The first project, Single-Family Ventilation Case Studies, assessed existing information and evaluated ventilation systems in SGC/NWE/C homes in the field. Field examiners inspected all aspects of ventilation system performance such as inlet vents, bath exhaust fans, automatic controls, habits of occupants, etc. The goal of this project was to transfer to utilities, builders, and

contractors information about what does and doesn't work in existing ventilation systems. This project was completed in June 1992.

The second project, Multifamily Ventilation Systems, recruited developers to build matched home pairs, with one home receiving a conventional SGC ventilation system and the other one of six innovative multifamily ventilation systems. Analysts gathered and compared data on these systems. This project was also completed in June 1992.

The third project, Log Home Demonstration, investigated the thermal performance and infiltration levels in energy-efficient log homes. This work, being performed in conjunction with the following project, is planned for completion in 1993.

The last project in this cycle, Single-Family Heating Systems, probed heat pump performance using case studies. Investigators hope to be able to estimate heating system efficiencies in homes with electric furnaces and heat pumps. Through this project, analysts are developing a package of test equipment, procedures, and measurement protocols that can be applied in the future to larger home samples. This project is planned for completion in June 1994.

RCDP Cycle IV

Cycle IV will contain two projects, the Pressure Balanced Heating Systems and the Moisture, Ventilation and Indoor Air Quality (IAQ) Investigation in Retrofitted Manufactured Homes.

The Pressure Balanced Heating Systems Project will determine whether it is warranted to make changes in new residential conservation programs and state code specifications for heating, ventilation, and air conditioning equipment. This project focuses on forced air heating systems and assesses alternative heating distribution systems.

The Moisture, Ventilation and Indoor Air Quality Investigation in Retrofitted Manufactured Homes Project investigates the moisture and ventilation levels and thermal performance before and after weatherization and house tightening performed by utilities on existing manufactured homes. The main objective is to assess the affects of weatherization on moisture, ventilation and thermal performance. Implementation began in July 1993 and will continue through July 1995.

Information Contacts

Kendall Weekes - RMRD
(503) 230 - 4352 or
Shella Bennett - RMRD (Technical Contact)
(503) 230 - 3462 or
Mark Jackson - RMRD (Technical Contact)
(503) 230 - 5475
Bonneville Power Administration
P. O. Box 3621
Portland, OR 97208

1992 display of a manufactured home at Westlake Mall in Seattle, Wash.

Eugene Water and Electric Board Bond Financing

With BPA's support, the Eugene Water and Electric Board (EWEB) financed its Residential Weatherization Program (through FY 1988) with proceeds from a conservation revenue bond sold in 1985. BPA agreed to pay the debt service on the \$17 million tax-exempt bonds offered at an interest rate 2 percentage points below BPA's borrowing rate. These bonds were the first backed by BPA to finance conservation measures.

Proceeds also were used to fund special conservation programs approved by BPA:

- High-rise multifamily housing weatherization;
- Super Good Cents marketing and incentive demonstrations; and
- Low-income Weatherization Marketing Pilot Program.

In 1990, BPA and EWEB refinanced the bonds and shared the \$415,000 saved. EWEB used some savings to finance additional energy savings, access \$1.2 million in a reserve account formerly held by bond trustees, and accelerate and finance a large share of weatherization activities.

Final bond payments end in 2001. Weatherization under the new agreement will be completed by the end of 1996. EWEB is now at over 65 percent penetration, and actively reaching for their 75 percent target.

Information Contact
Ray Classen - LRB
(503) 230 - 4209
Bonneville Power Administration
P. O. Box 3621
Portland, OR 97208

Residential Sector - Indoor Air Quality

The indoor air quality mitigation strategy of informed choice for Bonneville's residential conservation programs has operated for over 5 years. As of the end of 1991, Bonneville has received radon readings from nearly 43,000 homes. Bonneville continues to monitor the activities of experts in the field of indoor air quality mitigation. When new techniques are considered proven technologies, a decision is made whether to use them in programs. Three new mitigation techniques have been accepted since 1988: continuous and intermittent ventilation systems (1990); multifamily non-heat recovery systems for ventilation (1989); and modified exhaust central supply ventilation systems (1988).

The State of Washington, as part of its adoption of MCS, developed a Ventilation and Indoor Air Quality Code. With its code process, the State Building Code Council requested an equivalency determination to BPA's New Energy-Efficient Homes Programs Record of Decision. On May 3, 1991, BPA determined the Ventilation and Indoor Air Quality Code to be equivalent. Follow-on work between BPA and Washington is being done to better assess the effectiveness of radon mitigation made part of the code.

Information Contact
Charles Alton - RAE
(503) 230 - 5878
Bonneville Power Administration
P. O. Box 3621
Portland, OR 97208

Commercial Conservation

Long-Term Commercial Acquisition Process

In FY 1990 through FY 1992, Bonneville conducted a process to revisit its commercial sector program offerings, primarily the Energy Smart Design (ESD) Program (see p. 36). Bonneville was faced with a growing demand for electric energy. The commercial sector showed promise as a significant source of energy savings. Bonneville wanted to form a comprehensive commercial sector conservation acquisition strategy for capturing significantly more resources over an 8-10 year period.

Bonneville thought it could build on, refine, and expand the ESD Program to satisfy a broader range of market needs, perhaps by adding more services. Utilities had been asking for more flexibility in program design, more streamlined program operations, and increased incentives to be able to get more energy efficiency built into buildings.

In 1990, an external steering committee helped develop a general program design, which was endorsed by the public. In 1991, proposed program features were tested through enhancements to the ESD Program. Utilities tested optional services such as different incentive levels and target markets. These tests were used to develop program designs.

Bonneville, using considerable input from utilities, then designed the individual components and specific language for the new long-term ESD Program. Program designs and draft contract language underwent public review in spring 1992. Once issues were resolved, contracts were written, and were offered to utilities in September 1992.

In November 1990, commercial sector environmental requirements for both new and existing commercial buildings were revised. The primary change from previous environmental requirements was that commercial building ventilation system design and operation must now comply with ASHRAE Standard 62-1989 ventilation requirements as incorporated by BPA.

In September 1991, the Department of Energy approved an Environmental Assessment and Finding of No Significant Impact for a document entitled, "Approaches for Acquiring Energy Savings in Commercial Sector Buildings." This environmental assessment covered several commercial sector mechanisms to encourage utilities and others to design and offer regional

conservation programs. These program approaches included the commercial portions of performance-based contracting or custom contracts (Targeted Acquisition Program), Billing Credits, and Competitive Acquisitions.

A comprehensive review of commercial and all other sector conservation activities is being conducted as part of the Resource Programs Environmental Impact Statement (see p. 22). Subsequent to that environmental process, commercial sector environmental strategies likely will be revisited.

Information Contact

Gary Insley - RMC
(503) 230 - 3467

Bonneville Power Administration
P. O. Box 3621
Portland, OR 97208

Energy Smart Design Program

This is BPA's utility-operated program for achieving efficiency levels in the commercial building sector which meet or exceed the MCS. This program, developed in FY 1987, provides design advice and incentives for cost-effective measures and provides other efficiency services which, when coupled with local building and energy codes, contribute to acquiring all cost-effective savings in commercial buildings. ESD targets both new and renovated commercial buildings.

Participant utilities provide design assistance to commercial building owners and designers. Utility staffs use computer models that simulate a building's energy use, hand calculations, walk-through audits, or the Prescriptive Path Manual, a simplified method for recommending measures in small buildings. Designers and owners of energy-efficient buildings receive recognition awards. Utilities and consumers also can contact the Electric Ideas Clearinghouse (see p. 44) for information on equipment and strategies with building applications, and the Lighting Design Lab (see p. 37), which provides information and demonstrations of energy-efficient lighting technologies.

Generally, large utilities in the program offer all services themselves, and small utilities refer projects to their BPA Area or District Office. Investor-owned utilities may offer the program to their customers without reimbursement from Bonneville, taking advantage of promotional material developed for this program. They benefit from the program's regional name recognition and sharing program experiences and information among participants.

In 1991, the program added incentive payments for installation of measures, building commissioning, operations and maintenance, account executives, design, payment, and other services to the design assistance already provided. This additional assistance was provided to building owners and designers to get more energy conservation measures installed and operated as designed, so savings are realized. These payments and services

were initially added in 1991 only to the 14 larger utility programs. In May 1992, incentives were added to the majority of smaller utility programs. The full menu of payments and services are offered region-wide as part of the Long-Term Energy Smart Design, the follow-on version of ESD which is planned to operate through 2001. The number of efficient measures actually installed and energy savings estimated to be captured has increased dramatically since the addition of these payments and services.

Energy Smart Design Program

	FY 1991	FY 1992
Units Accomplished		
Projects	112	561
Savings (aMW)	1.3	6.2
Includes 7.5% transmission and distribution savings		
Avg. Measure Life	15 yrs	
Est. Levelized Costs (mills/kWh)		
<i>See NOTE page 26</i>		
BPA Real*	7	21
Regional Real*	10	24
BPA Nom Payment	8	27

*In 1990/8

Information Contact

Jim Dowty - RMCC

(503) 230 - 5873

Bonneville Power Administration

P. O. Box 3621

Portland, OR 97208

Lighting Design Lab

Designed to lead the region in technology transfer of efficient lighting, this facility meets the needs of commercial lighting designers, specifiers, architects, engineers, contractors, facilities managers, and utility staff. Opened in 1989, the Lab is a resource center offering full scale mockups of different lighting strategies.

Clients use services free of charge. Consultations with lighting specialists, scale model analysis of daylighting options, classes, and demonstrations of state of the art technology are available. An extensive library, computer lab, case studies, videotapes, and a quarterly newsletter are added features of this resource center.

Open from 8 a.m. to 5 p.m. Monday through Friday, the Lab is operated for the Northwest by Seattle City Light. Seattle City Light operates the Lab in conjunction with the Energy Smart Design Program and services such as the Electric Ideas Clearinghouse. The Lab may be reached by calling 1-800-354-3864 or (206) 325-9711.

Located at 400 East Pine Street near downtown Seattle, Washington, the Lab has many sponsors: BPA, Seattle City Light, the Natural Resources Defense Council, the Northwest Conservation Act Coalition, the Northwest Power Planning Council, the California Energy Commission, Tacoma Public Utilities, Snohomish County PUD, the Washington State Energy Office, the University of Washington, Puget Power, Pacific Power and Light, and B.C. Hydro.

Information Contact

Dulce Setterfield - TBA
(206) 553 - 1366

Bonneville Power Administration
201 Queen Anne Avenue North, Suite 400
Seattle, WA 98109

Energy Edge Project

Begun in FY 1986 and ended in 1992, Energy Edge was a demonstration project that promoted and evaluated high standards of energy efficiency in new commercial buildings in the Northwest. Building owners who made their buildings at least 30 percent more efficient than the MCS received payments for the added design and construction costs they incurred.

Four sponsors managed this project for BPA: Washington State Energy Office, Pacific Power and Light, Portland Energy Conservation, Inc., and the Oregon Department of Energy. These sponsors selected 28 buildings for this project. Using computer simulations, developers and designers incorporated conservation measures into new buildings. BPA is monitoring the energy systems and conservation measures in most of these buildings.

This project provides information about the true costs and savings of energy conservation measures in new commercial buildings. Results may encourage local governments to upgrade energy codes and promote more efficient buildings. The final evaluation will be completed in 1994.

Information Contact

Grant Vincent - RMCB
(503) 230 - 5499

Bonneville Power Administration
P.O. Box 3621
Portland, OR 97208

Commercial Retrofit and End-Use Study

Completed in FY 1991, the Commercial Retrofit and End-Use Study (CREUS) measured actual energy savings achieved by installing conservation measures in existing commercial buildings and varying building structure, operation and maintenance. Seventeen commercial buildings were equipped with energy conservation measures and monitored under this program.

In addition, a separate CREUS project, the Westin Monitoring Project, studied the effects of equipment and operation changes in the Westin Seattle Building. The final report for this project was released in September 1992. The last payment under this project was made in FY 1992.

Information Contacts

Dick Jamieson - RMCB (CREUS)
(503) 230 - 7502 or
Corinn Boyko - RMCB (Westin Monitoring Project)
(503) 230 - 5570
Bonneville Power Administration
P. O. Box 3621
Portland, OR 97208

The Westin Seattle Building in Seattle, Washington

Commercial Incentives Pilot Program

Operated by Seattle City Light, Lower Valley Power and Light, Central Lincoln PUD, the City of Tacoma, Snohomish County PUD, and the City of Richland, the Commercial Incentives Pilot Program (CIPP) offered building owners the opportunity to retrofit commercial buildings with energy efficient conservation measures.

The utilities offered building owners assistance through one of two program components, depending on building size and complexity of energy systems. Owners of small buildings with simple energy systems received an audit under the rebate component. Measures were then recommended from a predetermined list of cost-effective measures. Owners of buildings containing more complex energy systems received a site-based analysis under the investment incentive component. Incentives equal to 65-75 percent of the installed cost of the measure were paid under both components.

Although CIPP ended in the fall of 1990, work continued through fall 1992 to complete the retrofit of projects in progress. The final payment for this program was made in FY 1992.

Information Contact

May Hing - RMCC
(503) 230 - 5576
Bonneville Power Administration
P. O. Box 3621
Portland, OR 97208

Industrial Conservation

Multi-Sited Businesses

Multi-sited businesses provide a unique opportunity for the region to acquire significant amounts of energy savings. In 1991, BPA, the Council, the Public Power Council, and PNCCC co-sponsored three regional meetings.

The purpose was to begin discussing issues pertinent to acquiring energy savings from businesses with more than one location. This process created an agreement called Regional Resource Coordination.

Under this agreement, utilities continue to implement their own commercial conservation programs. Multi-sited businesses can contact toll-free, 1-800-872-3568 to learn what commercial conservation opportunities are available. A Regional Coordinator at BPA can then coordinate program participation between the business and involved utilities.

The goal of Regional Resource Coordination is to secure all regionally cost-effective conservation from the multi-sited business sector. It concentrates efforts to encourage multi-sited business to participate in conservation programs now available.

Information Contact

Carole Perigo - RMCC
(503) 230 - 3695
Bonneville Power Administration
P. O. Box 3621
Portland, OR 97208

Purchase of Energy Savings Field Test and Pilot Program

This pilot program, now closed, encouraged installing energy conservation measures in existing commercial buildings using private sector financing rather than initial capital from BPA. Six program sponsors found building owners to participate, and coordinated financing and measure installation.

Twenty-eight retrofits were completed after field testing five buildings in 1984. BPA continues to pay sponsors for the energy savings from the program. The final payment under this program is in FY 1997.

Information Contact

Claire Hobson - LAC
(503) 230 - 5354
Bonneville Power Administration
P. O. Box 3621
Portland, OR 97208

Aluminum Smelter Conservation/Modernization (Con/Mod) Program

The intent of the Con/Mod Program was to encourage the region's 10 primary aluminum smelters to make investments to modernize their plants. Con/Mod provided a 5 mill/kWh (real levelized in 1985 \$) incentive to the smelters for energy saved through efficiency improvements. This \$7.1 million, 10-year program was offered as a package with a variable rate in 1987 to help stabilize the region's energy-intensive primary aluminum industry, maintain BPA's revenues, and stabilize load. The plants became more economic in the worldwide aluminum marketplace and low-cost conservation was acquired by June 1991. By the end of FY 1991, the smelters had achieved over 96 MW in savings of non-interruptible energy. As a result of the Program, the region's smelters gave up 174.6 MW of contract demand. Some improvements also increased the smelter's production. Because the incentive was small, the program provided one of the lowest cost, most reliable conservation resources in the region.

BPA is committed to payments not to exceed \$10 million in 1985 \$ annually for 10 years. Conservation measures were completed by FY 1991, but payments will continue through FY 2000.

Information Contact

Mark Johnson - RMIC
(503) 230 - 7669
Bonneville Power Administration
P. O. Box 3621
Portland, OR 97208

Energy Savings Plan

The Energy Savings Plan (ESP) began as a pilot program in 1987. It has since evolved into a set of broad principles, used by BPA's Area Offices, for acquiring industrial conservation resources. ESP is modified annually to keep its guidelines responsive to Bonneville's acquisition targets and customer needs. Modifications are made through a public process, so all suggested changes receive public comment, review and recommendations.

Through the ESP, energy conservation measures are installed and the energy savings verified. Equipment installed to date through the program includes: high efficiency motors, adjustable speed drives, heat recovery equipment, lighting, energy management systems, induction furnaces, refrigeration, compressors, and other high efficiency machinery/processes in the Northwest's industries. Customer system efficiency improvements recently became eligible under ESP. In addition, rebates for transformers have been added to ESP. Energy savings acquired by ESP are treated as a resource by BPA.

Puget Sound Area Office

In 1991 and 1992, BPA's Puget Sound Area Office (PSAO) began focusing on using its utility customers to deliver industrial conservation resources to Bonneville. PSAO to date has signed 10 ESP implementation contracts with utilities including its largest utility customers, Seattle City Light, Tacoma City Light, and Snohomish County PUD.

In 1992, one of PSAO's focuses was to use vendors to help deliver conservation resources to Bonneville. Vendors of electrical energy efficient equipment and technologies were trained in the specifics of the Energy Savings Plan. Utility customers and Bonneville are working together to promote an "Annual Consultant/Vendor's Fair" to deliver the conservation message on how Bonneville's acquisition efforts can help businesses sell their energy savings services or products. Two such events have been held to date. There is tremendous interest in ESP because of this effort, and the resulting increased "sales force" has already increased BPA's ability to acquire conservation resources.

Information Contacts

Dana Hilde or
Shannon Greene - TBA
(206) 863-1122 or 863-0676
Bonneville Power Administration
201 Queen Anne Avenue North, Suite 400
Seattle, WA 98109

Lower Columbia Area Office

The Lower Columbia Area Office (LCAO) continued a positive track record with ESP. Working directly with plant engineers and utility conservation managers, LCAO completed nine projects for a total of 6,435,476 kWh/year of energy savings. Over the last 18 months, four large plants, five utilities and small industries signed contracts to do ESP programs or projects. Four other LCAO utilities are considering ESP contracts for implementation in the near future, and at least five industries are analyzing the results of energy reviews performed by Oregon State University or private consultants. Completed projects range from installation of computerized management systems for refrigeration, to replacing inefficient air compressors, cooling fans, lighting, and replacement of single drive motors with energy efficient motors and equipment.

Requests for energy reviews increased significantly as plant managers took a holistic approach to long term potential energy savings projects and reducing bottom line costs. Flaverland Foods of Forest Grove hosted two energy audit training courses at their refrigeration facility for over 30 people during the winter of 1992. Area ESP engineers are providing their expertise to utility managers by performing cursory energy reviews to help industries identify potential energy savings projects.

In the summer of 1992, LCAO launched an aggressive marketing strategy to generate more interest in ESP's features and options. This campaign educates vendors, plant managers, engineers, and consultants about the flexibility of the acquisition options, motor rebates, and energy reviews. Case studies of successful ESP projects examined immediate tangible benefits and encourage managers to continue with other projects, large and small.

Information Contact

Barbara Thime - LAC
(503) 230-4046
Bonneville Power Administration
P. O. Box 3621
Portland, OR 97208

Upper Columbia Area Office

HPA's Upper Columbia Area Office (UCAO) championed conservation acquisition in the food storage industry, a pioneering effort that acquired previously unidentified conservation resources in the industrial sector.

UCAO is developing their utility customers as conservation resource providers. Several utilities have signed ESP contracts with UCAO.

Information Contact

Nancy Schimmels - USB
(800) 353-2000
Bonneville Power Administration
Room 561, U. S. Court House
920 West Riverside Avenue
Spokane, WA 99201

Snake River Area Office

HPA's Snake River Area (SRA) has seen a significant increase in participation in ESP in FYs 1991 and 1992, acquiring over 7,000,000 kWh of savings at a cost of \$770,000 for nine projects—accomplished by working through industry plant personnel and utility conservation managers. In addition, during 1992 SRA developed a unique, first of a kind, long term contract with the Department of Energy to acquire energy conservation on the Hanford Nuclear Reservation.

Most projects in the SRA stem from informal energy surveys performed by HPA engineers and the Energy Analysis Diagnostic Center from Oregon State University. Twelve audits were completed, the majority of which are developing into projects. Incentives are up to 80 percent of the project costs or \$10 per kWh saved annually. In some cases, the type of industry is taken into account and the acquisition rate may be lower. Program focus has been on lost opportunity projects where the project cost is the "incremental cost" between what industry was going to do and that recommended as the more efficient option. Two new multi-million dollar processing plants participated in an energy review during the design stage and implemented many energy saving measures.

Completed projects have ranged from simple premium efficient motor rebates to complete alterations of mining processes. Staff has marketed this program at trade shows, conventions and at on-site discussions. All these activities have developed an interest in the program that should commit most of the program's funds in future years.

Information Contacts

**Jennifer Eskil or
Tom Osborn - WBA**
(800) 822-8218 or
(509) 822-8262
Bonneville Power Administration
1520 Kelley Place
Walla Walla, WA 99362

Bonneville is confident that ESP will become even more successful addressing the needs of industries and utilities and will significantly add to the Agency's ability to meet megawatt targets.

Since the program began in FY 1989, 160 proposals have been accepted, with 50 completed.

Energy Savings Plan

	FY 1991	FY 1992
Units Accomplished		
Projects	18	50

Savings (aMW)	3.1	5.6
Includes 15% transmission and distribution savings		

Avg. Measure Life	15 yrs
-------------------	--------

Est. Levelized Costs (mil/kWh)

See NCTE page 26

HPA Real*	3	4
Regional Real*	4	5
HPA Non-Payment	1	0

*1986-1988

Sponsor-Designed Program

The Sponsor-Designed program purchased energy savings from energy conservation measures installed at site-specific projects at industrial facilities, or in programs that completed similar projects at multiple sites.

A total of eight contracts were signed, seven with sponsors of site-specific projects and one with a sponsor of a program. Estimated energy savings from the contracts (1986 through 1987) are about 10 aMW. Payments for energy savings end in FY 1995.

The Sponsor-Designed Program has been folded into ESP, and no longer exists as a separate program.

Information Contact

Mark Johnson - RMIC
(803) 230-7669
Bonneville Power Administration
P. O. Box 3621
Portland, OR 97208

Agricultural Conservation

Irrigated Agriculture Hardware and WaterWise Programs

HPA has operated conservation programs in the irrigated agriculture sector since 1979. Initial efforts consisted of a pilot program that evolved in 1982 into a regional pump testing and system evaluation program, administered and operated by participating utilities. The program has been expanded to include contracts with certified analysts to test and evaluate irrigation systems. Irrigated agriculture programs provide incentives and rebates to encourage irrigators to adopt cost-effective energy conservation measures.

The WaterWise Program includes System Testing and Design Work (Stage I), Hardware Retrofit (Stage II), and irrigation management features. Pump testing and analyses are provided to locate system components that could, through retrofit, produce energy conservation. Irrigation management facilitates the efficient use of energy and water resources by optimizing the operation of the irrigation system.

The WaterWise Program reflects a decade of utility and HPA experience in irrigation-related conservation programs. Since it began, over \$7 million has been spent on efficiency improvements. Almost 9 aMW have been acquired with a goal to acquire an added 7.8 aMW by 2000. The program matured because of the contributions of many utilities, analysts, state and Federal agencies, and other interested parties.

The Irrigated Agriculture Hardware Program expired and was rewritten in 1991. The resulting WaterWise Program is an acquisition agreement currently operated by 39 utilities, all east of the Cascades.

Historically, system testing and retrofit activities were limited to small and medium systems. FY 1992 saw the addition of procedures to analyze large irrigation systems (over 480 acres). Some large irrigation systems' project costs exceed \$1 million. The program budget was nearly doubled for FY 1992 to cover these new systems.

HPA has incorporated irrigation management techniques into the WaterWise Program. These techniques, when practiced correctly, have the potential to save energy and water, and improve crop yield. Previous HPA pilot programs, conducted during the last 3 years, have shown good potential for water and energy savings through irrigation management.

Information Contact:
Robert Holman - WBA
(800) 622-6626
 Bonneville Power Administration
 1520 Kelley Place
 Walla Walla, WA 99362

HPA's Irrigated Agriculture Program encourages irrigation to adopt cost-effective energy conservation measures.

Irrigated Agriculture Program

FY 1991 - FY 1992

Units Accomplished

Measures Installed	708	708
--------------------	-----	-----

Savings (aMW)

	1.2	0.67
--	-----	------

Includes 1.5% transmission and distribution savings.

Avg. Measure Life

15 yrs.

Est. Levelized Costs (mills/kWh)

See NOTE, page 26

HPA Real*	17	33
Regional Real*	28	41
HPA Non-Payment	19	43

*In 1990's

*Recent information indicates 1992 savings to be approximately 0.9 aMW, which would reduce levelized costs correspondingly.

Multi-Sector Conservation

Northwest Energy Code Program

The Northwest Energy Code Program is a BPA supported program to encourage adoption and enforcement of residential and commercial MCS as building codes or mandatory utility service requirements.

With statewide residential MCS energy codes taking effect in Washington and Oregon in 1991 and 1992, respectively, BPA's efforts turned to supporting other state implementation, concentrating Northwest Energy Code efforts in remaining areas not covered by state codes. BPA issued a new program solicitation in October 1991. This effort is to pursue statewide code adoption in Idaho and to push for sustained enforcement of energy codes after BPA support agreements with states and local jurisdictions end.

In the commercial sector, BPA funded current practice studies in 1991-92 in Oregon and Washington. BPA will use the results of these studies to shape future commercial code support programs.

Information Contacts

Doug Couch - RMRB (Residential)
(503) 230 - 3312 or
Andy Ekman - RMCB (Commercial)
(503) 230 - 5859
Bonneville Power Administration
P. O. Box 3621
Portland, OR 97208

John Flynn of BHACO checks house plans to verify Northwest Energy Code compliance in Lynnwood, Washington

State Technical Assistance Cooperative Agreement

Northwest state energy offices continued to provide technical assistance in the residential, commercial, industrial, governmental, and agricultural sectors during FY 1992. Because of utility interest in reviewing the Technical Assistance Agreement, a Technical Assistance Advisory Group was formed with representatives from the region's utilities, local governments, the Council, and the states.

This advisory group met to review the guidelines for the program, exchange opinions on where program emphasis should be placed, and comment on the proposed statements of work for next year's program. After these meetings, advisory group members said it was a useful exercise that enhanced communications and provided an opportunity for utilities to better understand technical assistance services.

In the future, the advisory group plans to meet twice each year to discuss proposals and respond to guidelines.

Information Contact
Gabrielle Foulkes - RMR
(503) 230 - 4217
Bonneville Power Administration
P. O. Box 3621
Portland, OR 97208

Electric Ideas

Electric Ideas is a technology transfer program that collects and distributes information about electrically efficient technologies. Information is distributed to utility customers for their use in responding to consumer requests, or for developing technology transfer marketing approaches. Information covering all conservation sectors is delivered through various media such as publications, telephone hotlines, videotapes, and seminars.

Since it began in May 1989, the program has attracted 67 utility customers. Informational notebooks have been distributed to utilities, state energy offices, utility associations, and technology development centers. A second industrial sector notebook was created in fall 1992.

The Electric Ideas Clearinghouse is a real time referral source that responds to technical questions for both the commercial and industrial sectors. Information is provided through a telephone hotline and published information.

Information Contact
Doug Untalan - RMIC
(503) 230 - 5821
Bonneville Power Administration
P. O. Box 3621
Portland, OR 97208

Electric Ideas Clearinghouse

The Electric Ideas Clearinghouse, operated by the Washington State Energy Office, is a source for fast, free energy-efficiency information in the Northwest. Through electronic communications and a toll-free hotline, utilities, architects, engineers and designers can find and share information on energy-efficient products, technologies and programs.

Toll-free lines connect users within the BPA region with a hotline, computer bulletin board service and fax machine. The hotline is staffed by energy experts including licensed engineers and a technical research librarian. A computer bulletin board service allows networking and communication between users to exchange information.

The clearinghouse has vendor and product information, technical assistance, a referral directory, a training calendar, technical library search capability, electronic mail, job listings and networking opportunities and can be reached by calling:

1-800-872-3568 Telephone

1-800-762-3319 Computer Bulletin Board Service

1-800-872-3882 FAX

Clearinghouse use has grown steadily since it opened in March 1990. A total of about 7,100 calls have been received to date. The hotline responds to about 300 calls per month; the computer bulletin board receives about 2,000 per month. Most users are utilities, with architects and engineers the second major group. About 52 percent of the calls are from the State of Washington, 34 percent from Oregon, with 9 percent and 5 percent from Montana and Idaho, respectively.

The clearinghouse supports the Energy Smart Design technical design assistance program for commercial and some industrial buildings, and the Energy Savings Plan for technology assistance for industrial buildings and processes.

Information Contact

Janet Ross Klippstein - RMCC

(503) 230-4984

Bonneville Power Administration

P. O. Box 3621

Portland, OR 97208

Linda Witham, Electric Ideas hotline operator, takes a call

Accumulation of Conservation Results

The effects of BPA's conservation programs since 1982 are significant. Summarized in Tables 1 and 2, BPA direct program investments have created about 370 aMW in efficiency gains.

A less direct, but still significant consequence of BPA's actions is the savings that will result over time from more energy-efficient construction practices. We recognize that BPA has many partners in the strategy for saving energy through these improvements. Table 2 shows current estimates of energy savings the region and BPA will achieve as new, more efficient buildings come into the market.

Table 1

Cumulative Historical Conservation Efficiency Gains in Annual Average Megawatts (aMW) through Direct BPA Programs *

	FYs 1982-91	FYs 1982-92
Sector/Subsector		
Existing Residential	70.4	74.5
New Residential	4.0	5.1
New Manufactured Homes	6	3.5
Appliances	0	0
Water Heaters/Shower Heads	49.5	46.0
Commercial	62.1	68.5
Irrigation	8.3	8.9
Industrial	20.6	26.4
Subtotal	205.5	232.9
Direct Service Industries Con/Mod	95.9**	95.9**
Subtotal with Con/Mod	301.4	328.8
Load Reduction Savings (since 1985)		
Improved Building Codes	12.7***	44.6***
Total Efficiency Gains	334.1	373.4

* Includes transmission and distribution savings

** Represents 75 percent of efficiency improvements submitted for payment. Actual load reduction is somewhat less due to offsetting increases in production. (See Aluminum Smelter Conservation Modernization Program on p. 30.)

***BPA has promoted the adoption of more energy efficient building codes (residential and commercial) in Washington and Oregon. These savings are a result of adopting these codes and residential Model Conservation Standards (MCS).

Table 2

Cumulative Regional and BPA Load Reduction Savings Expected by the Year 2003* from the Promotion of Improved Building Codes Based on Medium Load Forecast

	Regional aMWs	BPA aMWs
Measure		
Improved Building Codes	240	130

*These potential savings are treated in load forecasts as a load reduction. They are based on conservation and resource actions taken during FYs 1981-1992.

Generation Projects

Federal Hydroelectric Projects

The Army Corps of Engineers and the Bureau of Reclamation own and operate the region's 30 Federal hydroelectric dams. Each year, BPA requests budget estimates to operate, maintain, and replace power generation facilities from the Bureau and the Corps, and operation and maintenance costs from the U.S. Fish and Wildlife Service. BPA needs these estimates to help decide the rates charged for power. BPA then makes payments to the U.S. Treasury based on the actual costs incurred.

During FYs 1991 and 1992, BPA continued to strengthen its oversight role with the Corps and Bureau. BPA established mechanisms to obtain and review additional information on fish and wildlife activities, hydro system efficiency improvements, construction and capital additions, and operations and maintenance work. This allows resource planners to understand the activities of the Corps and Bureau and improves the information exchange for planning. The agencies continue to provide information for BPA's Programs in Perspective process, to participate in the System Operation Review, and to assist in customer meetings.

Information Contact

Donn Smithpeter - RMGB
(803) 230 - 3466
Bonneville Power Administration
P.O. Box 3621
Portland, OR 97208

Idaho Falls Hydroelectric Project

In 1982, BPA contracted to purchase the generation from the Idaho Falls Hydroelectric Project, owned and operated by the City of Idaho Falls, Idaho. This Snake River project includes three run-of-the-river hydroelectric developments. The capacity of the plants is 27 MW. The acquisition agreement signed was the first under the 1980 Northwest Power Act.

According to the power purchase agreement, BPA pays all costs of the project, including debt service and operation and maintenance costs. BPA's debt service obligation is equal to the principal and interest on the 1985 revenue bonds issued to refinance the City's original borrowing. In FY 1991, a Memorandum of Understanding (MOU) was signed between BPA and the City to complete an amendment to the power purchase agreement. The amendment allows the City to substitute a schedule of fixed costs for the debt service requirements on the 1985 Revenue Bonds, under which the payments for BPA are currently calculated. In the MOU, BPA and the City agree to approve such an amendment before July 1, 1995.

Information Contact

Rick Poon - WI
(208) 524 - 5463
Bonneville Power Administration
Idaho Falls District Office
1527 Hollipark Drive
Idaho Falls, ID 83401

Cowlitz Falls Hydroelectric Project

The Cowlitz Falls Project is a 70 MW installed capacity, 22 aMW hydroelectric facility on the Cowlitz River in eastern Lewis County, Washington. On June 30, 1986, the Federal Energy Regulatory Commission (FERC) issued a 50-year license to Public Utility District No. 1 of Lewis County, Washington, authorizing the construction, and operation and maintenance of the project until June 1, 2036. The project's output will be sold to BPA through June 30, 2032. Construction began in June 1991, and the project will be completed in March 1994.

The project includes a concrete gravity dam and powerhouse, with four gated spillway bays, one ungated spillway bay, and two low level sement sluices. The indoor powerhouse will contain two adjustable-blade Kaplan turbine generation units each rated at 35 MW.

The project's reservoir will inundate the existing channel and portions of the floodplains of both the Cowlitz and Cispus rivers. The reservoir will extend upstream toward the town of Randle and will cover about 610 acres, with a total volume of about 10,500 acre-feet. The project will be operated as a run-of-the-river hydroelectric facility. The project also includes other features such as access roads, an electrical substation, a transmission line, developed recreation facilities, fish collection facilities, and wildlife mitigation.

In 1990, Bonneville began the environmental review required by NEPA for the project. BPA concluded, based on the analysis, that the FERC EIS was adequate and on January 28, 1991, Bonneville's Administrator signed the NEPA Record of Decision to acquire the output of the project.

Information Contact

Bob Moulton - RMGB
(503) 230 - 4360
Bonneville Power Administration
P. O. Box 3621
Portland, OR 97208

Hanford Generating Project

The Washington Public Power Supply System (Supply System) owns the Hanford Generating Project (HGP) on the Federal Hanford Nuclear Reservation north of Richland, Washington. HGP has two 430 MW steam-turbine generators that used by-product steam from the Department of Energy's N-Reactor to generate electricity. BPA received 72 percent of HGP's energy capability.

In 1987, DOE shut down the N-Reactor and completed a major safety enhancement program. Because the need for defense materials decreased, DOE placed the N-Reactor in cold standby status in 1988.

In August 1991, DOE announced its plan to permanently close the N-Reactor. On July 19, 1992, BPA sent a letter to the Supply System stating that repowering HGP is not economically viable for meeting future BPA loads, and that BPA would support Supply System efforts to terminate the project. The Supply System, Bonneville, and DOE are negotiating post-operation responsibilities and obligations. Project termination should occur in late 1993 or early 1994.

Information Contact

Ed Brost - RNM
(509) 372 - 5752
BPA's Supply System Office
3000 George Washington Way
P. O. Box 968
Richland, WA 99352

Trojan Nuclear Plant

Portland General Electric Company (PGE), Eugene Water and Electric Board (EWEB), and Pacific Power and Light Company own the Trojan 1,095-MWe pressurized water reactor. PGE operates the plant. BPA contracted with EWEB for 30 percent of the project's capability, through net-billing and other agreements. During FY 1991, BPA's share was 128 aMW, and in FY 1992, 122 aMW.

1991 was significant in Trojan's operating history because an outage lasted almost 1 year. This outage reduced the plant's capacity factor for the calendar year to 15 percent. An inspection detected extensive cracking in steam generator tubes. These cracks were repaired by plugging or placing sleeves inside the tubes. The inspection process itself was improved, and the steam generator tubes were reinspected. Some steam generator tubes originally thought acceptable needed repair. This extended the outage.

During 1991, PGE reorganized the plant's management structure, offered early retirement bonuses, and replaced most of the top four management levels. BPA supported the changes made.

In late 1991 and throughout much of 1992, PGE conducted its Least Cost Planning process in a public forum to evaluate alternative resource options. This process evaluated the Trojan plant against other resource alternatives.

In 1991 and 1992, BPA participated in on-site budget workshops. BPA approved Trojan's 10-year fuel management plan and Trojan and EWEB's annual budgets.

On August 10, 1992, PGE's Board of Directors announced that it would phase out Trojan operation in 1996. PGE's Board of Directors decided that continued operation under pessimistic operation and maintenance growth and capacity factor assumptions was marginally non-cost-effective as compared to a combined-cycle combustion turbine plant at the Boardman site. Trojan permanently ceased power operation in January 1993.

Information Contact

Bob Mazurkiewicz - RNN

(509) 372 - 5772

BPA's Supply System Office
3000 George Washington Way
P. O. Box 968
Richland, WA 99352

Washington Nuclear Plant-2

The Supply System owns and operates Washington Nuclear Plant-2 (WNP-2), a 1,112-MWe boiling water reactor. BPA contracts for 100 percent of the project's capacity. The plant generated 512 aMW in FY 1991 and 579 aMW in FY 1992.

In 1991, the Supply System continued the Megawatt Improvement Program, a program to improve the plant's efficiency. The Supply System signed contracts with General Electric for a 5 percent reactor uprate and adjustable speed drives on the reactor recirculating coolant system pump motors. With the help of BPA staff, the Supply System also implemented a project review and priority system that used a cost/benefit analysis as an important element in its process.

General Electric and the Supply System settled a long-standing dispute over containment modification during construction. Details of the out-of-court settlement were sealed by the judge at the request of General Electric. The settlement requires General Electric to provide certain unspecified goods and services to WNP-2 at no charge, and other material and services at discounts to the Supply System and BPA.

In 1991 and 1992, BPA actively participated in the Supply System's budget development process and approved WNP-2's 10-year fuel management plan, annual budget and subsequent amendments.

A Supply System organization efficiency study made by an outside consultant suggested recommendations for improvements in several key areas. The study highlighted the goal of improving efficiency through work process improvements. The Supply System created a task force to review the study's findings and make recommendations to upper management. This provides an opportunity for the Supply System to make significant improvements that will reduce operating costs.

Information Contact

Bill Milbrot - RNN

(509) 372 - 5753

BPA's Supply System Office
3000 George Washington Way
P. O. Box 968
Richland, WA 99352

Biomass

Bonneville continues to be part of the Department of Energy's Pacific Northwest and Alaska Regional Biomass Energy Program. The program's major focus is to encourage specific application of biomass and municipal waste-to-energy technologies to local needs and opportunities. This program undertakes the following kinds of studies:

- identification and assessment of regional biomass types and availability;
- comparative cost analyses of biomass and other energy sources;
- assessment of local bioenergy application options — residential, commercial, institutional, industrial; and
- identification of transportation and infrastructure limitations of biomass energy suppliers, distributors and users.

Program activities include technology transfer, industry support, resource assessment, and matching local resources to local energy needs.

Bonneville funding for this program in the past few years has been about \$740,000 annually, and includes a major state technical assistance grant element for five states under the program.

Information Contact

Pat Fox - RMGB
(503) 230 - 3449
Bonneville Power Administration
P. O. Box 3621
Portland, OR 97208

Research, Development and Demonstration

BPA continued and started research, development and demonstration (RD&D) projects in FYs 1991 and 1992. Projects may carry over from one fiscal year to another. These projects are described in Appendix D.

Many projects had noteworthy accomplishments. The Cross-Flow Turbine Project made a new cost-effective generation technology available for low-head hydro conditions. This technology improves the operating efficiency of low-head turbines and made a new machine available to develop hydro sites. High-R window research is moving a new generation of efficient residential windows into the marketplace. Findings from this research show heat loss can be substantially reduced in wood- and vinyl-framed windows. A guidebook for manufacturers was developed in 1991.

An ongoing series of research and technology transfer activities related to motors is being coordinated with national activities by the Department of Energy and the Electric Power Research Institute. Several new tools including guidebooks and software were developed in 1991 and 1992 to help small companies evaluate their motor needs and efficiencies.

The most pervasive resource RD&D activity is the Resource Supply Expansion Program (RSEP). RSEP provides an umbrella under which BPA can develop and fund cooperative projects to expand Northwest conservation and renewable energy resources and remove barriers to their acquisition. This effort, started in 1991, is gradually becoming a regional program (see p. 14).

Information Contact

Jon Blemer - RPED
(503) 230 - 5995
Bonneville Power Administration
P. O. Box 3621
Portland, OR 97208

To learn more about techniques for energy savings acquisition and to make improvements in current and future programs and projects, Bonneville uses evaluations to test estimates of savings, output, and other program variables. Evaluation is a scientifically defensible method of measuring how well a program achieves its goals and objectives.

Evaluating Performance

Program Evaluation

Bonneville evaluates all conservation programs acquiring significant amounts of energy, from pilot to region wide utility programs. Two kinds of evaluation are performed. Impact evaluations measure the direct energy effects of a program, process evaluations identify what caused a program to be effective or not, and any barriers to implementing the program successfully. Evaluations act as a "meter" of the conservation resource, measuring energy savings, costs and the reliability of savings estimates.

During 1991 and 1992, Bonneville completed 15 impact and 14 process evaluations. The most significant were the following:

- The Model Conservation Standards Impact Evaluation shows that new homes built under Bonneville programs have more energy efficiency components and use less energy than standard practice homes. The study also showed that standard construction practices have improved — that is, the energy efficiency of homes built to those practices has improved significantly because of the MCS programs.
- Impact evaluations of Energy Savings Plan projects demonstrated that industrial retrofits are a low-cost resource.
- The Energy Edge New Commercial Building Program evaluation shows that program buildings are using more energy than predicted, but that they are relatively low energy users when compared to newly constructed standard practice buildings.
- Energy savings for homes weatherized in 1983 were studied for 6 years. The average net energy savings declined by 20 percent during this period. This provided valuable information used in adjusting planning estimates.

Program evaluation now shares the spotlight with "performance verification." Performance verification emerged as the form of measurement appropriate for conservation programs where payments are based on performance (e.g., Billing Credits and Competitive Acquisition.) Similar to evaluation, performance verification involves measurement of energy savings based on accepted methodologies and actual research results. While evaluation yields findings to be used in resource planning and reporting of region wide results, performance verification is directed at findings that show that contract terms are being met. For example, measured conservation savings that are sufficient to justify payment.

BPA has successfully negotiated both Targeted Acquisition and Billing Credits contracts with member utilities, and is in the process of negotiating Competitive Acquisition contracts with Energy Service Companies.

Conservation Environmental Evaluations

Bonneville also conducts conservation environmental field appraisals regularly. Bonneville conducts environmental oversight reviews to ensure the institutional aspects of its conservation programs reflect NEPA requirements. These reviews provide follow up for previous oversight reviews, recommendations and action plans. During 1991, Bonneville found that recommended corrective actions were completed as suggested in earlier environmental oversight reviews.

Information Contact

Elizabeth Evans - RPEB (Program Evaluation)
(503) 230 - 4284

Bonneville Power Administration
P. O. Box 3621
Portland, OR 97208

or

Charles Alton - RAE (Environmental Evaluation)
(503) 230 - 5878

Bonneville Power Administration
P. O. Box 3621
Portland, OR 97208

Other Accomplishments

Education Training Programs

BPA recognizes the need for an informed public on energy related issues. Our dedication to public involvement processes in resource acquisitions is one way of fulfilling that need. The need goes beyond involving the public, however. Children and young adults need a deeper understanding of energy issues. They will be called upon to make choices in the future and in their everyday lives. BPA has a responsibility to ensure the next generation has the information and technical knowledge necessary to make good decisions.

In that spirit, BPA has undertaken a number of education projects in the community that promote science, mathematics, and technology with special emphasis on energy related issues and phenomena.

Hands On Science

In January 1992, BPA began an after-school science program for children from pre-kindergarten through the sixth grade. The program, Hands On Science, involves children in doing science, not just reading or hearing about it. The Department of Energy has been running the program for inner-city children in the Washington, D.C., area for several years.

Sessions are 8 weeks long and meet for one hour each week. The classes are popular among teachers, parents, and children. BPA's program focuses on students in lower-achievement schools. From January through June 1992, BPA's program served more than 300 children. BPA served about 900 students during the 1992-93 school year and expects to expand the program outside the Portland area.

Information Contact:
Ken Dragoon - RPSE
(503) 230-3938
Bonneville Power Administration
PO Box 3621
Portland, OR 97201

Livingston School students Joseph Khayim and Jonathan Cassinell participate in the Hands On Science Program.

Summer Science Camp

BPA extended the Hands-On Science program into the summer. The summer program is an intensive 2-week, 6-hour-a-day summer camp for children entering grades 1, 5, and 6. The summer camp curriculum materials, field trips, and incidentals were supplied through a grant from the U.S. Department of Energy. Teaching staff were paid out of funds from BPA's budget. Lunches, classroom space, and insurance were provided by the Portland Community Schools Program.

The camp served mainly low-income areas in Portland. Students learned about energy, flight, the environment, and plants through hands-on experiments they conducted themselves. Camp highlights were field trips to Bonneville Dam and the construction and launching of model rockets. About 150 students attended the camp.

Information Contact:
Ken Dragoon - RPSE
(503) 230-3938
Bonneville Power Administration
PO Box 3621
Portland, OR 97201

Northwest Power System Curriculum

BPA is developing a curriculum for high school and middle school students to introduce them to technical, social, and environmental issues surrounding the production of electric power in the Northwest. The curriculum focuses on an interdisciplinary approach that involves children in group decision-making and problem-solving activities.

The curriculum was developed with the aid of a middle school teacher, and was field tested by some 600 students at a Portland middle school. Refinements of the curriculum are underway.

Information Contact:
Ken Dragoon - RPSE
(503) 230-3938
Bonneville Power Administration
PO Box 3621
Portland, OR 97201

Saturday Academy Summer Internships

BPA provides for Saturday Academy internship programs for high school freshmen, sophomores, and juniors. These young people have been accepted into the Apprenticeships in Science and Engineering (ASE) Program of Saturday Academy. The apprentices work a full 8 weeks during the summer helping their mentor and learning first-hand about science or engineering as a career. In addition to their work, apprentices are assigned reading to provide the background needed to understand the projects to which they are assigned. The apprentices also participate in workshops designed to teach skills related to science and engineering. At the end of the summer, they describe their own work to each other via oral and poster presentations.

Information Contact:
Ken Dragoon - RPSE
(503) 230-3938
Bonneville Power Administration
PO Box 3621
Portland, OR 97201

Left to Right: Grace Perry, Tanesha Brown, Kelsey Ward, and Lauren McLean of Beaverton Junior High explain a 5th kindergarten science project.

Regional Education and Training Advisory Committee

To better orchestrate commercial/industrial education and training efforts, Bonneville convened the Regional Education and Training Advisory Committee (RETAC). The RETAC, comprised of representatives from utilities, state energy offices, the Northwest Power Planning Council, and commercial and industrial interests, developed an education and training plan for the region. This plan, completed October 1992, prioritizes the education and training opportunities that need to be made available for the commercial and industrial sectors. The RETAC will evaluate the effectiveness of education and training efforts to meet the infrastructure needs of the region's acquisition efforts.

Information Contact

Andy Ekman - RMCB
(903) 230 - 5889

Bonneville Power Administration
P. O. Box 3621
Portland, OR 97208

Regional Energy Management Program

In FY 1992, Bonneville sponsored start-up of a Regional Energy Management Program (REMPRO), intended to expand commercial sector conservation. The program, included in the RETAC education and training plan, provides educational opportunities through 2 year academic programs at community colleges.

The first site selected for REMPRO was the Applied Technology Training Center, a division of Edmonds Community College in Edmonds, Washington. Courses in this industry driven program began in April 1992; degrees in energy management and energy controls will be available for commercial applications. REMPRO also offers certificate programs for residential applications and other customized training. Graduates from this program can pursue a 4 year degree at Evergreen State College in Olympia, Washington.

Bonneville and Northwest utilities are expanding REMPRO to other sites in the region to offer convenient, local commercial sector educational opportunities. Lane Community College in Eugene, Oregon, began its 2 year program in September 1992; efforts are also underway to develop and offer curricula at Portland Community College in Portland, Oregon.

Information Contact

Andy Ekman - RMCB
(903) 230 - 5889

Bonneville Power Administration
P. O. Box 3621
Portland, OR 97208

Appendix A

Program Accrued Expenditures FY 1991 and FY 1992

Appendix A is a list of Bonneville's Energy Resources Program/Project expenditures for FYs 1991 and 1992. All costs are shown in actual accrued expenditures. Accrued expenditures are accumulated payments made and liabilities incurred for goods and services received. Expenditures are taken from official BPA financial accounts and are reported to the nearest thousand dollars.

Bonneville budgets for most of its programs and projects on a fiscal year basis. Under certain circumstances, however, BPA may enter into long-term program contracts to acquire energy savings. Long-term contracts require a commitment by Bonneville to make payments "over time" that extend over several fiscal years. Programs and projects of this type are indicated in the table with **.

Program/Project	FY 1991 (\$000)	FY 1992 (\$000)
Conservation		
Residential		
Appliance Efficiency Programs	1,003	8,122
Eugene Water and Electric Board		
Bond Financing	1,904	1,898
Manufactured Housing Acquisition Program	181	2,258
Residential Construction Demonstration Project	2,621	3,187
Residential Northwest Energy Code Program	12,281	14,450
Super Cool Cents Program	12,619	20,328
Weatherwise	19,198	25,706
Commercial		
Commercial Audit Program*	0	156
Commercial Incentives Pilot Program	2,965	1,302
Commercial Northwest Energy Code Program	1,086	2,088
Commercial Retrofit End Use Study	570	86
Energy Edge Project	2,237	877
Energy Smart Design Program	10,442	19,136
Institutional Buildings Program*	31	25
Lighting Design Lab	498	457
Purchase of Energy Savings Field Test and Pilot Program**	1,188	677
Street & Area Lighting Program*	1	0
Miscellaneous	536	530

Program/Project	FY 1991 (\$000)'	FY 1992 (\$000)'
Industrial		
Aluminum Smelter Conservation Modernization Program**	6,254	4,553
Energy Savings Plan	4,656	5,773
Partnership Program*	88	40
Sponsor Designed Program**	63	60
Miscellaneous	1,374	2,524
Agricultural		
Irrigated Agriculture Program	3,257	2,593
Multi-Sector		
Billing Credits	0	185
Competitive Acquisition Program	0	835
Electric Ideas	340	187
Electric Ideas Clearinghouse	211	591
Financial Assistance Program*	68	6
Multi-sector Conservation	0	88
State Technical Assistance		
Cooperative Agreement	2,340	4,444
Targeted Acquisition Process	0	338
Other Program Expenditures		
Community Education Programs	171	727
Environmental	47	43
Other	1	0
Research, Development and Demonstration		
	3,275	3,364

Program/Project	FY 1991 (\$000)'	FY 1992 (\$000)'
Generation		
Hydro		
Canadian Coordination	0	4,168
Cowlitz Falls Hydroelectric Project	32	102
Federal Hydroelectric Projects	92,977	99,710
Idaho Falls Hydroelectric Project	4,868	4,542
Nuclear		
Hanford Generating Project	4,776	5,428
Trojan Nuclear Plant	78,748	80,942
Washington Nuclear Plant-1	149,623	152,148
Washington Nuclear Plant-2	354,838	366,971
Washington Nuclear Plant-3	86,606	148,054
Multi-Sector		
Billing Credits	0	1,722
Competitive Acquisition Program	557	19
Resource Contingency Program	9	72
Other Program Expenditures		
Program Planning and Support	3,328	2,606
Large Thermal Services and Litigation	10,509	4,229
Miscellaneous	3,808	5,368
Research, Demonstration and Development		
	1,773	200

Total Conservation \$91,508 \$132,633

Total Generation \$792,452 \$876,281

Total Energy Resources Program \$883,960 \$1,008,914

Note: Total for 1992 does not include \$5,235,000 in prepayment penalties for bond refinancing

' Numbers may not add due to rounding

* An inactive program/project for which there were closing costs

**An inactive program/project for which BPA has a long-term payment commitment

Appendix B

Conservation Program Savings, Measure Life, and Levelized Costs^a FY 1991 and FY 1992 (Costs in mills/kWh)

Year Program				Regional Costs			BPA Costs			
	1	2	3	4	5	6	7	8	9	10
	Savings (aMW)	Measure Life (years)	Total System Adjustments (mills/kWh)	Real Levelized 1990\$ 5% Inflat ¹	Real Levelized 1991\$ 4% Inflat ²	System Cost Real Lev 1993\$ 4% Inflat ³	Real Levelized 1990\$ 5% Inflat ²	Real Levelized 1991\$ 4% Inflat ²	System Cost Real Lev 1993\$ 4% Inflat ³	BPA Nominal Payment ⁴
1991 Evaluated										
Residential Weatherization ¹	2.8	40	-4.2	46	55	51	36	39	35	79
Agricultural	1.2	15	9.4	25	29	38	17	18	27	19
Energy Savings Plan	5.4	15	7.0	8	9	16	3	4	11	4
Super Good Cents ¹	1.2	70	-5.9	47	50	44	37	39	33	100
Model Conservation Standards	5.2	70	-5.9	13	13	7	9	10	4	26
Unevaluated¹										
Commercial MCS Bldg. Codes	1.1	15	6.5	6	7	14	6	7	13	7
Energy Smart Design	1.3	15	6.5	10	12	19	7	8	14	8
Manufactured Hsng. (SGC) ¹	0.5	45	-5.1	78	83	78	43	46	41	99
Total/Weighted Average	18.7			20	23	24	14	16	16	31
1992 Evaluated										
Residential Weatherization ¹	4.1	40	-4.9	47	56	51	32	39	34	82
Agricultural	0.6	15	8.3	41	49	57	33	39	47	43
Energy Savings Plan	5.8	15	5.9	8	9	15	7	8	14	9
Super Good Cents ¹	0.6	70	-6.5	51	53	47	41	42	35	113
Model Conservation Standards	10.5	70	-6.5	9	9	3	7	9	2	20
Unevaluated¹										
Long-Term Super Good Cents ^{1, 2}	0.5	70	-6.5	113	117	111	93	97	90	258
Commercial MCS Bldg. Codes	1.4	15	5.4	13	14	19	12	13	18	15
Manufactured Hsng. Acquisition (MAP) ^{1, 3}	1.8	45	-5.8	23	24	18	13	14	8	31
Manufactured Hsng. (SGC) ¹	1.1	45	-5.8	37	39	33	25	26	20	58
Energy Smart Design	6.2	15	5.5	24	29	35	21	26	31	27
Targeted Acquisition	0.2	16	5.2	35	35	40	30	30	35	41
Appliance Efficiency ⁴	6.5	12	7.4	17	21	28	14	16	23	14
Total/Weighted Average	39.3			21	24	24	16	19	19	31

¹ Long-lived programs (i.e., greater than 20 years) appear to have disproportionately high BPA nominal payments because program costs are amortized over 20 years while savings persist over a longer period.

² A first year program. Costs for first-year programs may be higher due to initial startup expenditures, which in some cases are one-time only costs—for example, advertising and other administrative costs.

Notes:

- (a) Costs reported are direct program costs—measure costs, installation, BPA administrative, and program evaluation costs. No office or agency overhead costs are included.
- (b) The aMW savings include 7.5% credit for transmission and distribution line losses.
- (c) Unadjusted for system effects.
- (d) Adjusted for system effects.
- (e) Levelized costs reflect the BRL inflation forecast (2003) through 1992 and either a 4% or 5% rate of inflation is assumed for 1993 and beyond as indicated in the column heading. Other assumptions: BPA borrowing rate = 8.35%, 3% discount rate.
- (f) Unevaluated program levelized costs are based on planning estimates of savings.

Documentation (by Column):

- 1. Represents incremental energy savings obtained during the year.
- 2. Represents the estimated average life of all measures in the program.
- 3. BPA is implementing a new system for estimating and reporting costs so that all resources may be evaluated consistently. In the past, BPA reported the average cost of each resource in terms of the purchasing power of dollars in a particular base year. These adjustments have been estimated to account for other non-energy values, such as the time of year when energy savings occur (seasonality), on line date and contract term, location, associated capacity, and whether or not the energy savings coincide with peak loads. Estimates of "system costs" are obtained by applying these adjustments to "real levelized costs."

Regional Cost accounts for payments made by BPA, utilities, and consumers.

- 4. Reflects the average cost of the resource, considering the dollar's purchasing power in 1990. The rate of future inflation is forecasted to be 5%. The numbers in this column can be compared to the resource stack presented in the 1992 Resource Program. This method represents the way BPA has measured its resources from 1990 until the present. To calculate normalized regional nominal levelized costs as calculated by the Council, and used in the Resource Program, multiply 1.97 times the regional real levelized costs in this column.
- 5. Reflects the average cost of the resource, considering the dollar's purchasing power in 1993. The rate of future inflation is forecasted to be 4%, instead of the 5% rate used from 1990 - 1993.
- 6. Column 5 + Column 3 represent the Regional System Cost of each resource. This reflects the cost of the resource itself, plus costs and benefits created elsewhere in the power system as a result of adding the resource to the system.

BPA Cost accounts for costs incurred by BPA only.

- 7. Reflects the cost of the resource to BPA, considering the dollar's purchasing power in 1990. The rate of future inflation is forecasted to be 5%. The numbers in this column can be compared to the management targets for the Office of Energy Resources, indicated in the *Energy Conservation Policies*.
- 8. Reflects the cost of the resources to BPA, considering the dollar's purchasing power in 1993. The rate of future inflation is forecasted to be 4%, instead of the 5% rate used from 1990 - 1993.
- 9. Column 8 + Column 3 represents the BPA System Cost of each program. This cost excludes costs covered by parties other than BPA (and not reimbursed by BPA), such as consumers and utilities, as well as environmental costs and benefits to other parties.
- 10. The numbers in this column reflect the average amount of money that will be paid (or was paid) for each program during each year of a 20-year financing period. The effects of inflation have not been removed. This figure may be used to compare the cost of the program to BPA's rates, which the system cost does not always do. No adjustments have been made to account for the value of the resource's characteristics, such as measure life or seasonality.

Appendix C

Publications FY 1991 and FY 1992

To obtain the following documents, please note the name and number of the document and call 1-800-622-4520. If you are in an area where the phone system cannot handle toll-free numbers, you can call (503) 230-3478, which is not toll-free.

"The Advantages of Efficiency," *Bonneville Power Administration, March 1992. DOE/BP-1388.* This bulletin describes BPA's Energy Smart Design Program.

"Air-Leakage Control Manual," *Jim Maloney, Washington State Energy Office, May 1991. DOE/BP-1687.* This is a manual for builders and developers interested in building energy efficient homes. It describes the "Simple Caulk and Seal" system to control air leakage.

"An Analysis of Predicted vs. Monitored Space Heat Energy Use in 120 Homes, Residential Construction Demonstration Project Cycle II," *John G. Douglas, Marym Young, Washington State Energy Office, October 1991. DOE/BP-1787.* This report analyzes the relationship between space heat consumption predicted by SUNDAY, a thermal simulation program, and monitored use. Results of the analysis show SUNDAY can accurately predict mean space heat consumption of houses in aggregate, but there is variation in individual houses.

"Analysis of Residential Refrigerator/Freezer Performance (ELCAP)," *B. A. Ross, Pacific Northwest Laboratories, September 1991. PNL-7656.* This report quantifies refrigerator/freezer performance in the ELCAP/REMP sample. It compares performance with appliance features and label ratings to determine the potential performance predictions and to investigate the variability within the sample. The author attempted to develop a simple predictive model of standby consumption using physical characteristics of the refrigerators in the sample.

"Appliance Analysis," *Margaret Quaid, Rick Kunkle, Brian Egerberg, Washington State Energy Office, January 1992. DOE/BP-24821-8.* Appliance use in RCDP II homes was analyzed to learn whether significant differences exist in houses with efficient appliances compared to those with inefficient appliances. Researchers studied domestic hot water and refrigerators, whole house and space heat energy use, and interactions between appliance and space heating energy use.

"Approaches for Acquiring Energy Savings in Commercial Sector Buildings," *Bonneville Power Administration, September 1991. DOE/EA-0513.* This document reports the environmental assessment and finding of no significant impact for Bonneville Power Administration's approaches for acquiring energy savings in commercial sector buildings.

"Architect Uses Energy Smart Design," *Bonneville Power Administration, April 1992. DOE/BP-1847.* An architectural firm used Energy Smart Design on a PUD project and saved 33 percent above code levels. This pamphlet describes how the architect feels about the Energy Smart Design Program.

"ASHRAE Standard 62-1989 Energy, Cost and Program Implications," *Tim Steele, Marilyn Brown, Bonneville Power Administration, October 1990. DOE/BP-1657.* This report gives the results of a study of the estimated energy and cost implications of this standard. Using a computer simulation program, researchers studied 10 types of commercial buildings. Prototypical building ventilation rates were varied in five steps to estimate the impacts of outside air on building energy use.

"Assessment of Bonneville Power Administration's 'First Visit's on Us' Promotion, Final Report," *Synergic Resources Corporation, November 1991. SRC-7439-R9.* This report assesses this promotional campaign that provided financial assistance for design professionals to visit the Lighting Design Lab in Seattle, Washington. Results show this promotion was successful and the report provides recommendations to modify the promotion.

"Bonneville Measure Life Study: Effect of Commercial Building Changes on Energy Using Equipment," *L. Skumatz, K. Lorberau, R. Moe, B. Bordner, R. Chandler, Synergic Resources Corporation, December 1991. SRC-7619-R2.* The study examines the extent of impacts of changes in the commercial sector on energy using equipment and potential variations in results by change, business segment, and class of energy equipment.

"Builder's Guide, Your Guide to Super Good Cents Construction and Sales," *Bonneville Power Administration, revised March 1992. DOE/BP-1828.* This Builder's Guide describes the Super Good Cents Program and the benefits available to participating builders. It explains the program standards and typical building techniques used by Super Good Cents builders, and how builders can participate.

"Building Commissioning Guidelines," *Bruce Jones, January 1991. DOE/BP-1574.* This is a guide for utility personnel and other interested parties through the commissioning process.

"Bulletin Board Basics: Job Listings," *Bonneville Power Administration, November 1991. DOE/BP-1882.* This Technology Update describes the Electric Ideas Clearinghouse Bulletin Board's Job Listing feature and explains how to use it.

"Bulletin Board Basics: Navigating," *Bonneville Power Administration, December 1991. DOE/BP-39833-35.* This Technology Update describes the Electric Ideas Clearinghouse Bulletin Board and explains how to use it.

"Bulletin Board Basics: Using the Training Calendar," *Bonneville Power Administration, December 1991. DOE/BP-1773.* This Technology Update describes the Electric Ideas Clearinghouse Bulletin Board's Training Calendar and explains how to use it.

"Chlorofluorocarbons (CFCs)," *Bonneville Power Administration, December 1991. DOE/BP-39833-17.* This is a Technology Update to help facility managers reduce CFCs.

"Collecting Field Data for Lighting Energy Conservation Measures," *Bonneville Power Administration, December 1991. DOE/BP-1881.* This Technology Update contains a checklist for collecting field data for lighting energy conservation measures.

"Comfortable Savings In an Energy-Efficient Motel," *Bonneville Power Administration, March 1992. DOE/BP-175.* This pamphlet describes a small motel that used many energy-efficient features and won an Energy Edge Award. This pamphlet describes the measures installed.

"Commercial Incentives Pilot Program Database for the Impact Evaluation," *Cambridge Systematics, July 1992.* This is a guide to use with the database.

"Commercial Sector Infrastructure Study," *Scott Sparling, Brian Gard, Fred Gordon, July 1991. DOE/BP-1677.* This report examines the commercial infrastructure in the BPA region. Through interviews, the authors discovered the diversity in the region for available and scarce infrastructure. The report describes program design issues and labor pool limitations.

"Comparative Process Evaluation of Five Research and Demonstration Projects," *J. Peters and P. Seratt, Barakat and Chamberlin, February 1992.* This report compares the management structure, contracting process, and project combinations for five projects: the Hood River Conservation Project, the Residential Standards Demonstration Project, the Energy Edge Project, and the Tacoma Multifamily Metering Project.

"Design Assistance For New Commercial Buildings Case Study Evaluation," *Rick Kunkle, February 1991. DOE/BP-1609.* This study addresses whether developers/owners would install energy efficiency improvements only on the recommendations of energy experts. Researchers sampled 10 buildings that participated in the Design Assistance for New Commercial Buildings Program to learn if program participants installed any recommended improvements. Case study results indicate to improve program success, the cost of design services needs to be reduced, particularly for small buildings, and incentives should be considered.

"Determining Electric Motor Load Factor," *Bonneville Power Administration, December 1991. DOE/BP-1768.* This Technology Update shows how to determine the load factor and efficiency of electric motors and identify motors that should be replaced to increase efficiency.

"Dry Kiln Retrofit/Replacement," *Bonneville Power Administration, October 1991. DOE/BP-89833-12.* This Technology Update describes ways to increase energy efficiency of lumber drying while maintaining product quality.

"Economic Impacts of Geothermal Development in Deschutes County, Oregon," *Alex Sifford, Kasi Beale, Oregon Department of Energy, December 1991. DOE/BP-07129-1.* This study provides local economic impact estimates for a 100-megawatt geothermal power project in Oregon. The hypothetical project would be in Deschutes County, chosen because it has identified resources and industry interest. This study quantifies economic impacts as part of regional resource confirmation work recommended by the Northwest Power Planning Council and its advisors.

"Economic Impacts of Geothermal Development in Harney County, Oregon," *Alex Sifford, Kasi Beale, Oregon Department of Energy, December 1991. DOE/BP-07129-02.* This study provides local economic impact estimates for a 100-megawatt geothermal power project in Oregon. The hypothetical project would be in Harney County, chosen because it has identified resources and industry interest. This study quantifies economic impacts as part of regional resource confirmation work recommended by the Northwest Power Planning Council and its advisors.

"Efficiency on Call," *Bonneville Power Administration, November 1991. DOE/BP-39833-2.* This pamphlet describes the Electric Ideas Clearinghouse, services and information available, and how to access services by computer, phone, and fax.

"Efficient Lighting for Elegant Dining," *Bonneville Power Administration, July 1991. DOE/BP-1613.* This pamphlet describes energy measures used in a restaurant in Seattle, Washington.

"Efficient Lighting in a Major Office Building," *Bonneville Power Administration, February 1991. DOE/BP-1533.* This pamphlet describes energy measures used in an office tower in Seattle, Washington.

"Electricity Use in the Pacific Northwest: Utility Historical Sales by Sector, 1990 and Preceding Years" and "Electricity Use in the Pacific Northwest: Utility Historical Sales by Sector, 1991 and Preceding Years," *Bonneville Power Administration, September 1991. DOE/BP-1661.* These reports provide information on electricity use by sector from the perspectives of the region, utility groups and Pacific Northwest states, and explanations and observations about trends.

"End-Use Load and Consumer Assessment Program: Analysis of Residential Refrigerator/Freezer Performance," *B. A. Ross, Pacific Northwest Laboratory, September 1991. PNL-7656.* This report provides an analysis of the amount of energy consumed by both refrigerators and separate freezer units in residential buildings.

"Energy Accounting," *Bonneville Power Administration, November 1991. DOE/BP-39833-16.* This Technology Update describes energy accounting, a system for tracking energy use and using that information to control costs.

"Energy Considerations in Laboratory Water Purification," *Bonneville Power Administration, October 1991. DOE/BP-39833-20.* Innovative water-purification methods that minimize energy and water use are discussed in this Technology Update.

"Energy Edge Impact Evaluation, Early Overview," *Rick Diamond, Jeffrey Harris, Mary Ann Piette, Odon de Buen, and Bruce Nordman, December 1990. DE-A179-88BP39855.* This report provides an initial perspective on program results and building performance, based on the data available midway in the evaluation process.

"Energy Edge Impact Evaluation, Middle Overview," *Rick Diamond, Mary Ann Piette, Bruce Nordman, Odon de Buen, and Jeff Harris, August 1992. DE-A179-88BP39855.* This report provides an initial perspective on program results and building performance, based on the data available. Key findings: the Energy Edge buildings are using more energy than predicted, but are low-energy buildings compared to new construction; occupant surveys show high tenant satisfaction.

"Energy Edge Simulation Tuning Methodologies," *Kaplan Engineering and Portland Energy Conservation, Inc., March 1992. DE-FC79-85BP26683.* This report describes two methodologies for analyzing commercial building energy performance and assessing the cost-effectiveness of individual energy conservation measures. Both methodologies use monitored building data and computer modeling data to calibrate a building model.

"Energy Efficiency in a Metal-Frame Facility," *Bonneville Power Administration, January 1992. DOE/BP-1531.* This pamphlet highlights an energy-efficient metal-frame building providing office space and other areas for Spokane County road crews. The building was designed to reduce energy use and won an Energy Edge Award.

"Energy Simulation Software - A Beginner's Guide," *Bonneville Power Administration, December 1991. DOE/BP-39833-36.* This Technology Update describes three kinds of simulation software and how to obtain more information about these programs.

"Energy Smart Design Ballast Technical Reference," *Bonneville Power Administration, February 1992. DOE/BP-39833-51.* This report presents the findings of a study to investigate the harmonic and power characteristics of electronic ballasts used in fluorescent lighting applications. Results indicate there is a wide variation in performance among the electronic ballasts tested with respect to harmonic current generation and power consumption.

"Energy Smart Design Incentives to Increase Your Savings," *Bonneville Power Administration, April 1992. DOE/BP-1848.* This describes the many incentives for using Energy Smart Design services.

"Energy Smart Design Program Bulletin," *Bonneville Power Administration, April 1992. DOE/BP-1852.* This bulletin describes current program events and information.

"Energy Smart Design Program: Second Process Evaluation," *Synergic Resources Corporation, June 1991. SRC Report No. 7439-R3.* This report covers the second of three process evaluations of BPA's Energy Smart Design Program. The general conclusion of this report is that utilities are happy with the improvements made to the program since the first process evaluation. This report covers feedback from participants about marketing, administration, design assistance, training, and long-term impacts on the design community, and recommendations.

"Energy Smart Design Q&A," *Bonneville Power Administration, March 1992. DOE/BP-1333.* This bulletin answers common questions about BPA's Energy Smart Design Program.

"Energy-Efficient Design in a Small Office Setting," *Bonneville Power Administration, January 1992. DOE/BP-1532.* This highlights a small commercial office building which incorporated many energy-efficient features in its design, and describes the measures installed. The building received an Energy Smart Award.

"Energy-Efficient Electric Motor Selection Handbook," *McCoy, Litman, Douglass, February 1992. DOE/BP-34623-3.* This handbook describes how to assess potential energy savings and cost effectiveness when making a motor purchase decision.

"Envisioning Conservation Data," *Holographics, Inc., March 1992.* This project creates creative alternative graphic formats to display conservation resources data to aid conservation program design and marketing.

"Evaluation of Bonneville's Strategic Planning Models," *J. Litchfield, Litchfield Consulting Group, August 1992. DE-PR79-92BP49334.* This report reviews strategic energy planning models and BPA's analytic capabilities to use these models in support of management's decisions.

"Evaluation of the Development of the 1990 Resource Program," *J. Jennings and D. Barry, ERCE, Inc., April 1991. ERCE/DSM-69.* This study evaluated the procedures and mechanisms which drove the 1990 Resource Program process. It identified the process, identified the strengths and weaknesses of the process, and provides recommendations for improvement.

"Evaluation of Energy Smart Design Optional Services Program, Final Report," *W. Gavelis, R. Moe, L. Skumatz and C. Breckinridge, Synergic Resources Corporation, November 1991. 7439-R10.* This report, third in a series on this program, evaluates the incentive portion of the program. The report includes recommendations about incentives and other aspects of the program.

"Evaluation of Resource Acquisition Approaches," *Maura O'Neill & Company, September 1991. DE-AT9-91BP15474.* Three resource acquisition approaches and a process involving an unsolicited generation project were examined: Competitive Acquisition, Targeted Acquisition, Billing Credits, and the Cowlitz Falls Hydroelectric Project.

"Exploratory Investigation of Energy Use Metering and Data Analysis Methods for Multifamily Buildings in the Pacific Northwest," *J.M. MacDonald and D.L. White, Oak Ridge National Laboratory, May 1991. ORNL/CON-304.* This evaluation focused on analyzing energy data for all-electric multifamily buildings to gain guidance for future field energy measurement studies and analyses of conservation potential.

"Glazing Terminology," *Bonneville Power Administration, October 1991. DOE/BP-39833-13.* This Technology Update defines terminology used for glazing.

"Guidelines for Energy Simulation of Commercial Buildings," *Kaplan Engineering, May 1992. DOE/BP-26683-2.* This report summarizes the experience of computer building simulation work done for the Energy Edge Program.

"High-R Window Technical Development, Phase II Final Report," *Bonneville Power Administration, January 1992. DOE/BP-63401-3.* This paper discusses the design and tested performance of three prototype superwindows and identifies areas requiring further research needed to successfully develop the windows for mass market.

"Hot Water Electric Energy Use in Single-Family Residences in the Pacific Northwest," *M. E. Taylor, K. G. Ritland, R. G. Pratt, September 1991. DOE/BP-13795-27.* This report provides a detailed look at electricity consumed by hot water heaters using the residential data maintained in ELCAP/REMP. The data show that water heating comprises a significant portion of total residential electric energy consumption and is an important part of the region's conservation potential. Another key observation: during winter, the daily water heating peak coincides with the Bonneville system peak, but the size of water heating demand on peak days is no higher than on non-peak days. Thus, water heating end-use, though a substantial contributor to Bonneville's system load, does not create increased loads on system peak days.

"How to Obtain DOE 2.1 Energy Simulation Software," *Bonneville Power Administration, December 1991. DOE/BP-39833-19.* This Technology Update tells where to obtain this software, documentation, and additional information.

"The Impact of Bonneville's Model Conservation Standards on the Energy Efficiency of New Home Construction," *Marilyn A. Brown, James O. Kolb, David Baylon, M. Hossein Haeri, and Dennis L. White, Oak Ridge National Laboratory, July 1991. ORNL/CON-310.* This evaluation assesses the impacts of establishing MCS for single-family homes in the Pacific Northwest and how MCS programs have advanced construction practices since 1983.

"Impact Evaluation of an Energy Savings Plan Project at ARCO Petroleum Products Company," D. R. Dixon, G. E. Spanner, and G. P. Sullivan, *Pacific Northwest Laboratory*, August 1992. PNL-8164/UC-310. This impact evaluation assesses how much electrical energy is being saved at ARCO as a result of the E\$P, and determined how much the savings cost BPA and the region.

"Impact Evaluation of an Energy Savings Plan Project at Columbia Harbor Lumber Company," G. E. Spanner and G. P. Sullivan, *Pacific Northwest Laboratory*, February 1992. PNL-7919/UC-310. This report evaluates an energy conservation measure (an adjustable speed drive for controlling the speed of nine fans on a lumber drying kiln) installed at Columbia Harbor Lumber Company. The report studied BPA and regional costs of this measure.

"Impact Evaluation of an Energy Savings Plan Project at ELF Atochem North America," D. R. Brown and G. E. Spanner, *Pacific Northwest Laboratory*, August 1992. PNL-8225/UC-310. This evaluation assess how much electrical energy is being saved at Atochem as a result of the E\$P, and determines how much the savings cost BPA and the region. The energy conservation measure was adding anode area to sodium chlorate cells at the facility.

"Impact Evaluation of an Energy Savings Plan Project at Georgia Pacific," G. Spanner and D. Dixon, *Pacific Northwest Laboratory*, February 1991. PNL-7491/UC-310. This report evaluates an energy conservation measure (replacing rod anodes with blade anodes in Denora Mercury Cells for producing chlorine and sodium hydroxide) installed at Georgia-Pacific Corporation. The report studied BPA and regional costs of this measure.

"Impact Evaluation of an Energy Savings Plan Project at Lenroc Company/Moorman Manufacturing," G. Spanner and K. K. Daellenbach, *Pacific Northwest Laboratory*, February 1992. PNL-7920/UC-310. This evaluation assesses how much electrical energy is being saved at Lamb-Weston as a result of the E\$P, and determines how much the savings cost BPA and the region.

"Impact Evaluation of an Energy Savings Plan Project at the Linde Division of Union Carbide Corporation," G. E. Spanner and G. P. Sullivan, *Pacific Northwest Laboratory*, April 1992. PNL-8017/UC-310. This report evaluates an energy conservation measure (replacing the plant's nitrogen feed compressor with a larger unit) installed at the Linde Division of Union Carbide Corporation. The report studied BPA and regional costs of this measure.

"Improving Industrial Refrigeration Energy Efficiency," *Bonneville Power Administration*, October 1991. DOE/BP-39833-15. This Technology Update describes some simple low-cost operation and maintenance measures for cold storage and freeze tunnels that will improve energy efficiency and save substantial operating dollars without sacrificing product quality.

"In Touch With Efficiency," *Bonneville Power Administration*, January 1991. DOE/BP-1553. This pamphlet describes the Electric Ideas Clearinghouse, services and information available, and how to access services.

"Industrial Conservation Supply Curve Model Enhancement," ADM Associates, Inc., and RCG/Hagler, Bailly, Inc. DE-A+79-90BP11619. This report documents the work done to develop an enhanced modeling system and information database. It includes Volumes 1 and 2, Reference Databases.

"Infiltration and Ventilation in New Electrically-Heated Homes in the Pacific Northwest," Larry Palmiter, Ian Brown, Tami Bond, *Washington State Energy Office*, February 1991. DOE/BP-23821-6. This study compares the infiltration and ventilation aspects of houses built under Cycle II of the Residential Construction Demonstration Project to two statistical samples of baseline houses built under other Bonneville programs. This information is used to refine and improve ventilation program specifications. The study suggests some homes fail to meet minimum ventilation requirements, and further study is needed.

"Innovative Lighting Application in a Retail Mall," *Bonneville Power Administration*, January 1992. DOE/BP-1603. This pamphlet describes energy measures used in a retail mall in Portland, Oregon.

"The Lighting Design Lab: A Success Story from the Commercial Sector," D. Setterfield, May 1991. This paper describes the Lighting Design Lab, how it was created, its goals and services, and the benefits clients derive from it.

"Lighting Options for Homes," *Bonneville Power Administration*, April 1991. DOE/BP-977812-1. This report lists options for lighting different areas of homes.

"A Lighting Strategy that Makes the Grade," *Bonneville Power Administration*, July 1991. DOE/BP-1655. This pamphlet describes energy measures used in an elementary school in Boise, Idaho.

"Live in a Super Good Cents Apartment," *Bonneville Power Administration*, April 1992. DOE/BP-1776. This pamphlet describes the features of apartments built to Super Good Cents Program standards.

"Loads and Resources Study," *Bonneville Power Administration, February 1991. DOE/BP-1560.* This document contains the load and resource data necessary to develop BPA's wholesale power rates. It contains a synopsis of the results of load forecasts and resource analyses. **"Documentation for the Loads and Resources Study: Volume 1,"** *Bonneville Power Administration, February 1991. DOE/BP-1561.* This volume contains the documentation for the economic forecasts, load forecasts, and energy resource program for Bonneville's 1991 Initial Rate Proposal. It reflects all assumptions used. **"Documentation for the Loads and Resources Study: Volume 2,"** *Bonneville Power Administration, February 1991. DOE/BP-1562.* This volume contains the data associated with balancing forecasted resources against forecasted loads. The netting of loads and resources determines the load to be placed on Bonneville and is used in the rate filing process.

"Long-Term Impacts of the Interim Residential Weatherization Program on Household Energy Savings," *M. Horowitz, L. Ecker and P. Degens, ERCE, Inc., June 1991. ERCE/DSM-65.* This study is the fourth in a series of evaluations and examines the long-term impact of this program on household energy use. This report states that despite occasional fluctuations, net annual energy savings due to this program have persisted over time.

"Measured Electric Hot Water Standby and Demand Loads from Pacific Northwest Homes," *R.G. Pratt, B.A. Ross, Pacific Northwest Laboratories, November 1991. PNL-7889.* Residential water heating is a critical part of actual and predicted future regional energy consumption and regional and local peak demands. Forecasts of energy demand assume that electric water heating loads will decline in the future as the existing stock of water heaters is gradually replaced with new, more energy-efficient models that comply with 1990 Federal appliance standards. This report provides, in detail, the standby and demand load components of electric water heating demand.

"MotorMaster Electric Motor Selection Software, User's Reference Guide," *Washington State Energy Office, June 1992. WSEO Pub. 91-385.* This guide provides step-by-step instructions to run the MotorMaster software program.

"Motors," *Washington State Energy Office, June 1992. WSEO Pub. 92-068.* This pamphlet describes four tools to use to make the best motor choice for an application including MotorMaster Electric Motor Selection Hardware, Energy Efficiency Electric Motor Selection Handbook, Adjustable Speed Drive Application Guidebook, and Electric Ideas Clearinghouse Technology Updates.

"1990 Pacific Northwest Loads and Resources Study," *Bonneville Power Administration, December 1990. DOE/BP-1512.* **"1990 Pacific Northwest Loads and Resources Study Technical Appendix,"** *Bonneville Power Administration, January 1991. DOE/BP-1551.* This study establishes the planning basis for supplying electricity to Bonneville customers. It analyzes the Pacific Northwest's projected loads and available generating resources for the Federal system and for the Pacific Northwest region as a whole. The study presents the Federal system and regional analyses for five forecasts, from high to low.

"1991 Pacific Northwest Loads and Resources Study," *Bonneville Power Administration, December 1991. DOE/BP-1738.* **"1991 Pacific Northwest Economic and Electricity Use Forecast Technical Appendix: Volume 1,"** *Bonneville Power Administration, March 1992.* This study establishes the planning basis for supplying electricity to Bonneville customers. It analyzes the Pacific Northwest's projected loads and available generating resources for the Federal system and for the Pacific Northwest region as a whole. The study presents the Federal system and regional analyses for five forecasts, from high to low.

"1991 Pacific Northwest Loads and Resources Study Technical Appendix Volume 2," *Bonneville Power Administration, December 1991. DOE/BP-1739.* This technical appendix provides utility-specific information that Bonneville uses in its long-range planning. It incorporates electrical demand, generating resources, and contracts, both in and outside the region, for each utility.

"1991 Pacific Northwest Loads and Resources Study, Economic and Electricity Use Forecast," *Bonneville Power Administration, March 1992. DOE/BP-1806.* This publication provides detailed documentation of the load forecast scenarios and assumptions used to prepare Bonneville's "1991 Pacific Northwest Loads and Resources Study."

"1991 Survey of Metering Equipment, Part I: Quick Reference, and Part II: Detailed Surveys and Alphabetical Vendor List," *C. Dent, C. Denson, F. Duhn, Pacific Science & Technology, S. Hadden, R. Abbott, Plexus Research, Inc., March 1991. EPRI Project RP2568-21.* End-use metering has become important to utilities in the Pacific Northwest and the nation, but there is a lack of current information about the basic equipment and techniques available for this data collection. This report provides detailed information on metering equipment, including cost, capabilities, hardware, software, and mechanical specifications. The report is divided into two parts: Part I provides quick reference field definitions; Part II lists vendors and how to contact them.

"1992 Conservation Resources Supply Document," *Bonneville Power Administration, March 1992. DOE/BP-1815,* and **"1992 Conservation Resources Supply Document Technical Documentation,"** *Bonneville Power Administration, March 1992. DOE/BP-1822.* The Supply Document supports BPA's Resource Program and estimates conservation potential for residential, commercial, irrigated agriculture, and industrial sectors. The technical documentation volume presents source data in detail, analyses, and other information.

"Non-Utility Generation Summary," *Bonneville Power Administration, July 1992. DOE/BP-1891.* This is a regional non-utility generation database. The resources are given by type and utility.

"Optimizing Cooling Tower Performance," *Bonneville Power Administration, November 1991. DOE/BP-39833-34.* This Technology Update explains how proper maintenance will create optimum heat transfer conditions and help equipment operate efficiently.

"Optimizing Dry Kiln Operation," *Bonneville Power Administration, October 1991. DOE/BP-39833-14.* This Technology Update describes how to optimize the efficiency of existing dry kilns without sacrificing product quality.

"Optimizing Your Motor Drive System," *Bonneville Power Administration, November 1991. DOE/BP-1769.* This is a Technology Update to help facility management staff identify opportunities to improve drive system efficiency.

"Pacific Northwest Non-Residential/Commercial Energy Survey (PNNonRES), Phases I and II Descriptive Data Analysis Report," *B.R. Associates, November 1991. DOE/BP-10392-1.* This report summarizes the PNNonRES two-phase survey of nonresidential buildings in Idaho, Oregon, Washington, and western Montana. In Phase I, about 15,000 nonresidential buildings were surveyed. In Phase II, on-site surveys were conducted on about 600 Phase I buildings. In addition to floor area, business activity, and age of building, Phase II collected information about the predominate fuels and equipment types across end-uses. Key observations: nearly 40 percent of commercial buildings in the Pacific Northwest, representing 34 percent of total floor area, are located in areas served by public utilities; commercial buildings served by private utilities are, on average, 24 percent larger than buildings served by public utilities.

"Peak Load Management," *Bonneville Power Administration, December 1991. DOE/BP-1769.* This Technology Update explains why managing peak electrical demand is beneficial and describes strategies for reducing peak loads.

"Primary Documentation for the Pacific Northwest Non-Residential/Commercial Energy Survey (PNNonRES), Volume 1: Introduction/Concordance," and **"Volume 2: PNNonRES-1 Documentation,"** *BR Associates, Inc., and "Handbook for First Stage Data Collection,"* *Michael Baker and Baker, Reiter & Associates, February 1992. DOE/BP-10392-2.* Volume 1 provides background and an overview of PNNonRES, including the Concordance that serves as an index to all PNNonRES documents. Volume 2 gives detailed discussion of the sample design, survey implementation, and data processing and preparation as they pertain to Phase I. The "Handbook for First Stage Data Collection" was used by surveyors in the field and contains the Phase I survey instrument and data-collection procedures. **"Volume 3: PNNonRES-II Documentation,"** *BR Associates, Inc., and "Procedures Handbook for Phase II,"* *ADM Associates, Inc., February 1992. DOE/BP-10392-3.* Volume 3 gives a detailed discussion of the sample design, survey implementation, and data processing and preparation as they pertain to Phase II. "Procedures Handbook for Phase II" was used by surveyors in the field and contains the Phase II survey instrument and detailed data-collection procedures. **"Volume 4: PNNonRES Weights: Methodology and Issues,"** *BR Associates, Inc., February 1992. DOE/BP-10392-4.* Volume 4 contains a detailed explanation of the issues and the methodology used to develop case weights for both Phase I and Phase II. **"Volume 5: Analyst's Guide to PNNonRES,"** *BR Associates, Inc., February 1992. DOE/BP-10392-5.* Volume 5 serves as a handbook for users of PNNonRES data, whether from Phase I or Phase II, and includes the Concordance to provide an index to all PNNonRES documentation. **"Data Management Plan for Phase II,"** *ADM Associates, February 1992. DOE/BP-23671-2.* This document establishes the relational database system required to store and retrieve the information assembled during Phase II.

"Process Evaluation of the Bonneville Long-Term Residential Weatherization Program: 1987-1989," *Synergic Resources Corporation, April 1991. SRC Report No. 7582-R3.* This evaluation assesses the effects of changing consumer incentives and other cost reduction measures that utilities made to their programs and gives recommendations.

"Process Evaluation of the Commercial Incentives Pilot Program," *Cambridge Systematics, May 1992. DE-AC79-90BP06102.* This evaluation focuses on the positive and negative aspects of the program and recommendations for improvement.

"Process Evaluation of the Energy-Efficient Mortgage Program," John G. Jennings, and Audrey J. Block, *Environmental and Energy Services Company*, June 1991. *ERCE/DSM 71*. This evaluation was part of the Super Good Cents overall process evaluation. It contains recommendations for continuing and improving this program.

"Process Evaluation of the Redesign of the Energy Savings Plan (ESP) Program," J. G. Jennings and D. J. Barry, *ERC International for Pacific Northwest Laboratory*, October 1991. *PNL 7852/UC 000*. The redesign of this program in 1989 and again in 1990 is the subject of this evaluation. Overall, the process was distinguished by its team effort, public process and decentralized format for refining program features.

"Process Evaluation of the Super Good Cents Manufactured Housing Program," D. J. Berry and J. G. Jennings, *Environmental and Energy Services Company*, July 1991. *ERCE/DSM 73*. This evaluation focuses on program development and delivery, and strengths and weaknesses of the program. It contains recommendations for the future direction of the program.

"Process Evaluation of the Super Good Cents Program: 1989-90, Final Report," John G. Jennings, and Audrey J. Block, June 1991. *ERCE DSM 75*. This evaluation focuses on changes in program operations over these 2 years and differentiates between activities in Oregon and Washington, where MCS-level building codes have been adopted versus Idaho and Montana where no statewide codes exist.

"Progress Evaluation of the Washington State Energy Code Program," P. J. Barton and M. L. Carr, *Pacific Northwest Laboratory*, December 1991. *DE AC06 76RLO 1830*. This report evaluates the effectiveness of this program to facilitate full and timely implementation of new energy codes.

"Putting Efficiency in Its Best Light," Bonneville Power Administration, January 1992. *DOE/BP-1306*. This pamphlet describes the Lighting Design Lab and the services and information available.

"Reducing Power Factor Cost," Bonneville Power Administration, April 1991. *DOE/BP-1656*. This Technology Update describes power factor and explains how to improve power factor to reduce electric bills and enhance electrical system capacity.

"A Regulatory Guide to Leasing, Permitting, and Licensing in Idaho, Montana, Oregon, and Washington," R. Gordon Bloomquist, *PH.D.*, Washington State Energy Office, October 1991. *DOE/BP 00425 2*. This report is a guide to help developers interested in geothermal resource sites in Bonneville's service area (Idaho, Montana, Oregon and Washington) to better understand the Federal, state, and local institutional process, the roles and responsibilities of each agency, and how and when to make contact to obtain necessary documents.

"A Remodeled Hardware Store Saves Energy," Bonneville Power Administration, April 1992. *DOE/BP 1840*. A Coast to Coast Hardware store in Prosser, Washington, was remodeled to save energy. This pamphlet describes the measures used in this building, including heat pumps, windows, wall insulation, and lighting.

"A Restaurant Cuts Its Energy Appetite," Bonneville Power Administration, April 1992. *DOE/BP 1841*. Hump's Restaurant in Clatskanie, Oregon, uses energy efficiency strategies to improve lighting and save energy in its building. This pamphlet describes the measures used in this award-winning building.

"Screening Analysis: A Summary," Bonneville Power Administration, Corps of Engineers, and the Bureau of Reclamation, August 1992. *DOE/BP-1951*, **"Screening Analysis Volume 1 Description and Conclusions,"** Bonneville Power Administration, Corps of Engineers, and the Bureau of Reclamation, August 1992. *DOE/BP-1953*, and **"Screening Analysis Volume 2 Impact Results,"** Bonneville Power Administration, Corps of Engineers, and the Bureau of Reclamation, June 1992. *DOE/BP-1945*. This set of reports presents a synopsis of the screening analysis used to develop proposed strategies for the Columbia River System Operation Review being conducted by these agencies. Volume 1 presents an overview of the screening analysis, analytical techniques, insights learned and proposed strategies for full-scale evaluation. Volume 2 describes the 90 operating alternatives evaluated and river use impacts.

"Solid Energy Savings in a Concrete Office Building," Bonneville Power Administration, March 1992. *DOE/BP-1750*. This pamphlet profiles a new concrete office building designed to use as little electricity as possible. It describes the measures used in the building design and the savings. This building won an Energy Smart Award.

"Staying Power Impact Evaluation," *M. Kellogg, ERCI Demand Side Management Services, August 1991. ERCI/DSM 72.* The Staying Power Program, also known as the Business Closures Program, was designed to preserve electrical load in areas where industries faced closure. This evaluation looks at the firms participating in the program, the utilities serving them, the local communities affected, and BPA.

"Super Good Cents Heat Loss Reference, Manufactured Homes: Heat Loss Assumptions and Calculations; Heat Loss Coefficient Tables," *Bonneville Power Administration, May 1992. DOE/BP 35738-5.* This manual will assist manufactured home builders in assessing the thermal performance of structural components.

"Super Good Cents Update 1992," *Bonneville Power Administration, April 1992. DOE/BP 1824.* This pamphlet lists new developments in this program, including new measures for 1992.

"Third Year Analysis of Electricity Use and Savings for the Hood River Conservation Project," *Pacific Power and Light, October 1990. DE AC 79-83BP11287.* This report discusses persistence of savings from the Hood River Conservation Project in the third post-retrofit year. Participants increased their electricity use in this period, with changes affecting space heating and baseload energy use. Other local changes are reported.

"Update of Electricity Energy Use in Commercial Buildings in the Pacific Northwest," *Z. F. Taylor, Pacific Northwest Laboratories, August 1992. DOE/BP 1958.* This report provides detailed summary information of electricity consumed by various end-uses in nearly 100 commercial buildings from 1984 through 1990. The report contains specific information on daily, monthly, and annual energy use and apportioning of energy, or shares, for nine commercial building types.

"With Super Good Cents Saving Money Is Just the Beginning," *Bonneville Power Administration, December 1991. DOE/BP 1714.* This pamphlet explains features in manufactured homes that save money by reducing heating and cooling costs.

Appendix D

Research, Development and Demonstration Projects FY 1991 and FY 1992

Cross-Sector

Resource Supply Expansion Program (RSEP)

RSEP is a large scale effort to develop many collaborative demonstration projects among BPA, Northwest utilities, DOE, and others to confirm new conservation and renewable energy resources in the Pacific Northwest, to reduce acquisition barriers, to develop collaborative approaches to RD&D, and to leverage each participant's funds and staff.

Regional End-Use Metering Project

This project provides metered data on electrical energy consumption and characteristics data for a variety of buildings in the single family residential and commercial building structure types. The objective is to develop and maintain baseline electrical consumption information for specific end-uses in the residential and commercial sectors and to characterize special events affecting end-use loads in the Pacific Northwest.

Information Contact
Jon Blomer - RPED
(503) 230 - 5995
Bonneville Power Administration
P. O. Box 3621
Portland, OR 97208

Commercial Sector

BPA Headquarters Building Lighting Demonstration

This project will demonstrate cost effective lighting technologies at the BPA Headquarters building.

Building Commissioning Study

This project will develop and test building commissioning guidelines for BPA's commercial programs and estimate the potential energy savings that result using an Energy Edge building in Portland, Oregon.

Building Simulation Guidelines

Commercial building energy simulation guidelines were developed based on information from the Energy Edge demonstration project. These guidelines will be incorporated into BPA's commercial building energy conservation incentive projects.

Comparison of Ventilation Measurement Techniques

Investigators will compare different methods of measuring outdoor air ventilation rates and assess the accuracy and costs of these methods.

Development and Testing of a Screw Compressor Refrigeration System - Phase III

This project demonstrated the use of a screw compressor in a Northwest supermarket.

Direct Use of Water for Space Conditioning

This project will demonstrate the feasibility of space conditioning in commercial buildings with water circulated through a heat exchanger placed in the building's HVAC system.

Electronic Ballast Characterization Project

The objective of this study is to obtain a better understanding of the power quality performance of electron ballasts as compared to conventional magnetic ballasts, and improve customer/utility compatibility.

Energy Edge Occupant Satisfaction Study

This project evaluated occupant satisfaction or responses to workstation conditions in Energy Edge buildings using surveys that address thermal, ventilation, and lighting conditions.

Equivalent Thermal Parameters Proof-Of-Concept

The objective of this project is to develop and test the Equivalent Thermal Parameters technique to assess its capabilities as a descriptive analysis tool.

Evaluation of Energy Management Systems (EMSs)

This project assessed the application of energy management systems in a format that is easily transferable. It documents what is known about EMSs, the source of information, and the circumstances under which an EMS would be beneficial.

Lighting Design Tools

This project will develop lighting design tools (computer programs) for more effective and energy-efficient lighting designs.

Information Contact

Grant Vincent - RMCB

(503) 230 - 5499 or

Norm Clark - RMI

(503) 230 - 5484

Bonneville Power Administration

P. O. Box 3621

Portland, OR 97208

Generation

Adaptive Power Factor Controller

This project will research, develop, and demonstrate a reactive power compensation device that automatically senses the requirements, then switches in capacitors to minimize loading of transmission lines and generating plants.

Adaptive Sequential Controller

This research will develop a control mechanism that will synchronize power circuit breakers and switcher operation, thereby reducing potentially damaging switching surges and saving line losses.

Brushless Doubly-Fed Machine

This project will provide research, development and demonstration of an electric machine that combines the high efficiency of synchronous operation with the low-cost, rugged endurance features of the common squirrel cage induction machine.

Cross-Flow Turbine

The operating efficiency of a cross flow hydraulic turbine for low-head hydro applications will be demonstrated.

Hydro Efficiency Improvement/Variable Speed Generation (VSG)

This project investigates using the Series Resonant Converter (SRC) for improved efficiency through variable speed, constant efficiency operation of hydrogenerators and other, related, applications such as adjustable speed drives (ASD) and pumped hydro.

Key Wind Data Station Monitoring

This continues remote monitoring and data interrogation capability at the remaining five key stations in the BPA wind data network.

U. S. DOE Pacific Northwest and Alaska Regional Biomass Energy Program

This program's major focus is to encourage specific application of biomass and municipal waste-to-energy technologies to local needs and opportunities.

Information Contact

Norm Fuller - RMGB

(503) 230 - 3780

Bonneville Power Administration

P. O. Box 3621

Portland, OR 97208

Industrial and Utility Sectors

Adjustable Speed Drive (ASD) Case Studies

A joint BPA-EPRI project to identify and perform case studies of different cost-effective applications of ASDs, to be followed by engineering, design and installation of ASDs at selected industrial sites.

Analysis and Demonstration of Pinch Technology

Analysis of the thermal process in a Northwest pulp and paper mill using pinch technology.

Compressed Air System Energy Efficiency Study

Promotion of energy efficiency in industrial compressed air systems.

Conservation Voltage Reduction (CVR) Pilot Demonstration Phase II+

Development of a computer model for determining the potential savings from CVR on specific utility systems under a tailored collaboration approach.

Energy-Efficient Motor and Drive System Source Book

A joint project with DOE to develop a compendium of motor and drive research, development and demonstration activities currently underway, and application tools that are available today.

Guidebook of Simplified Test Procedures for Electric Motors

This project will develop a simplified guidebook to assist a plant electrician obtain data from an operating motor to determine operating parameters and other necessary information to make replacement decisions.

Guidebook on Electric Motor Rewind Practices

Development of an Electric Motor Rewind Guidebook that will describe the motor rewinding process, factors affecting the quality of rewinds, and the economics of rewinding vs. purchase of a new energy-efficient motor.

High-Efficiency Electric Motor Guidebook and Case Studies

Development of a guidebook on high-efficiency electric motor application.

High-Efficiency Electric Motor Rewind Study

Test of a method for electric motor rewinding that claims to reduce power consumption from between 5-20 percent.

Industrial Lighting Demonstration and Guidebook

This three-phase study involves assessment/evaluation, whole sale replacement investigation, and analysis of industrial lighting. A guidebook presenting results and recommendations to the industry will be developed.

Industrial Power Factor Demonstration and Guidebook

This project will produce a power factor improvement program at one to three industrial plants, a technical report documenting the results of this program as case studies, a guidebook that explains the procedure for performing a power factor improvement program, and software to automate performing a power factor improvement program.

Motor Controller Case Study and Demonstration Project

This study examines motor controllers currently being tested.

Motor Laboratory Expansion at Oregon State University

This project expands the existing laboratory at OSU to increase motor testing capability.

MotorMaster Software Packages

A joint BPA-DOE project to revise the motors database and analysis software of the Washington State Energy Office, and to convert it to a stand-alone PC software package called MotorMaster.

Naval Petroleum Reserve (NPR) Electric Motor System Efficiency Project

This project identifies electric motor system energy efficiency opportunities that offer a payback on investment of 8 years or less.

Power Factor Improvement Pilot Project

A pilot project to develop software for evaluating power factor improving capacitors inside industrial plants.

Simplified Test Procedures For Electric Motors

Development of a guidebook to help a plant electrician collect data and perform analysis on an operating motor to decide whether it should be replaced with a high-efficiency motor.

Standard Efficiency vs. High-Efficiency Electric Motors

This project consists of a literature search and comparison testing of several high-efficiency motors, beside conventional motors, to quantify various operating parameters. The objective is to ensure that the motor rebate program supplies correct information on proper installation and applications of high-efficiency motors.

Virtual Conservation Project

Development of state-of-the-art multimedia interactive software for informing industrial end-users about BPA's conservation technologies and its Energy Savings Program

Information Contacts

Barry Kennedy - RMID
(503) 230 - 3483 or
Craig Wohlgemuth - RMID
(503) 230 - 3044
Bonneville Power Administration
P. O. Box 3621
Portland, OR 97208

Residential

EPA/Utility Refrigerator/Freezer Research

This project supports working with manufacturers to facilitate the development, design and market introduction of advanced, environmentally acceptable refrigerators and/or freezers with significantly improved energy efficiencies

FENREPP — Fenestration Replacement Project

This project studies the technical and economic feasibility of replacing existing windows with High-R, vinyl-framed replacement products.

Field Testing Exhaust-Air Heat Pumps

This project will determine the installation costs and energy performance of exhaust-air heat pumps in both cold climates and coast climates.

Ground Source Heat Pump Evaluation and Demonstration

This project evaluates the performance of current ground source heat pump technologies and investigates possibilities for improving the cost effectiveness through cost reductions or integration of the capability to supply other heating and cooling loads.

High-R Window Research and Development, Phases IIB and III

These phases compile data from field tests in BPA-sponsored homes, and develop and test improved frame and edge insulating techniques and materials.

Improved Thermal Distribution System — RCDP Cycle IV: Project 1

This project provides information about whether it is warranted to make changes in new residential energy conservation program and state code specifications for heating, ventilation and air conditioning equipment.

Moisture, Ventilation and Thermal Effectiveness Investigation in Retrofitted Manufactured Homes — RCDP Cycle IV: Project 2

This project will investigate the moisture, mold and ventilation levels before and after weatherization of manufactured homes.

Radon Mitigation Expert System

This project is developing a computer expert system to assist radon mitigators in selecting and designing residential radon mitigation systems.

Radon Passive Stack Study

This project evaluates the effectiveness of passive stacks (a PVC pipe that penetrates the slab) in new home construction to reduce radon concentrations.

Residential Lighting Energy Use Baseline Study

This project focuses on obtaining metered residential lighting use information from a representative sample of residences throughout the region.

Residential Ventilation Research Project

This project completes various types of research on ventilation in residential structures.

Space Heat Conservation in Manufactured Homes

This project will determine the cost effectiveness of various measures designed to reduce space heating usage in existing manufactured homes.

Information Contact

Louis Lee - RMRD
(503) 230 - 3062
Bonneville Power Administration
P. O. Box 3621
Portland, OR 97208

Appendix E

Office of Energy Resources and Area Office Staffing Charts

*Acting

Letters at the bottom of each box indicate mail routing codes.

July 1993

Lower Columbia Area Office Staffing Chart

* Interim organization subject to final approval

Upper Columbia Area Staffing Chart

Puget Sound Area Staffing Chart

Snake River Area Staffing Chart

Glossary

Acquisition

The receipt of a power resource, including demand-side and supply-side categories, in energy and/or capacity forms. The term is commonly used by BPA to distinguish this type of acquisition from ownership of project facilities, from which BPA is prohibited by law.

Assured Operating Plan

Studies that determine the operating rules for the three Treaty projects in Canada.

Average Annual Megawatts (aMW)

A unit of energy output over a year. It is equivalent to the energy produced by the continuous operation of one megawatt of capacity over a period of one year (equivalent to 8,760,000 kilowatthours).

B.C. Hydro

The British Columbia Hydro and Power Authority. This Crown corporation was formed in 1962 following the merger of an expropriated private utility and the B.C. Power Commission.

Billing Credits

Under the Northwest Power Act, billing credits give a utility credit on its BPA power bills or equivalent cash payments for resources the utility supplies that reduce its need for power from BPA. Billing credits defer an acquisition by BPA and encourage customers to develop their own resources.

Biomass

Organic matter, derived from a living organism, that can be used as a fuel in combustion, anaerobic digestion, or other energy conversion processes. Biomass sources include wood, grain crops, algae and other aquatic plants, and waste and residues from livestock, agriculture, logging and municipal operations.

Buyback

A conservation program that, in effect, purchases electrical energy in the form of conservation measures installed by a consumer. The consumer is paid a certain amount per kilowatthour of energy saved.

Canadian Entitlement

The Canadian Entitlement is Canada's 50% share of the downstream power benefits of Canada's three large storage dams, Duncan, Arrow and Mica. These dams were built as part of the Columbia River Treaty. Canada offered the rights to this Entitlement for sale in the U.S. for a period of 30 years, beginning with the operational dates of the storage project dams.

Capacity

The amount of power that can be produced by a generator or carried by a transmission facility at any instant. Also, the service whereby one utility delivers firm energy during another utility's period of peak usage with return made during the second utility's off-peak periods; compensation for this service may be with money, energy or other services. Equivalent terms: peak capability, peak generation, firm peak load, carrying capability. In transmission, the maximum load a transmission line is capable of carrying.

Chlorofluorocarbons (CFCs)

Manufactured gas used as a refrigerant, propellant in spray cans and in insulation. Known to reduce ozone in the stratosphere.

Cogeneration

The simultaneous production of electricity and other useful energy from a fuel source, often accomplished by the recovery of excess energy created by various industrial and commercial applications.

Columbia River Treaty

The Treaty between the United States and Canada, which became effective on September 16, 1964, for joint development of the Columbia River.

Combined Cycle

Combination of a combustion turbine and steam turbine in an electrical generation plant. The waste heat from the combustion cycle provides the heat energy for the steam cycle.

Competitive Acquisition

An approach used by BPA to acquire power resources for long-term use, involving soliciting and selecting proposed resources by applying systematic application of quantitative and non-quantitative criteria. The term is commonly used by BPA in reference to resource acquisition from non-federal sources through means other than BPA resource programs.

Competitive Acquisition Program

A program offered by BPA to acquire power resources to meet a forecasted need. (See **Competitive Acquisition**.)

Competitive Bidding

An approach used by some utilities to acquire power that is similar to competitive acquisition. The difference between competitive acquisition and competitive bidding is that BPA does acquisitions and utilities do bidding. Bidding programs are typically regulated by local utility commissions and often characterized by fixed-price bidding. (See **Competitive Acquisition**.)

Conservation

According to the Northwest Power Act, any reduction in electric power consumption as a result of increases in the efficiency of energy use, production, or distribution.

Conservation Measure

An action taken to reduce energy or to use energy more efficiently. Installing insulation, retrofitting energy-efficient lighting, and applying better energy system controls are examples of conservation measures.

Cost-effective

A cost-effective measure or resource must be forecasted to be reliable and available within the time it is needed, and to meet or reduce electrical power demand of consumers at an estimated incremental system cost no greater than that of the least-cost similarly reliable and available alternative or combination of alternatives.

Council

(See **Pacific Northwest Electric Power Planning and Conservation Council**.)

Critical Period

That portion of the historical streamflow record during which the recorded streamflows, combined with all available reservoir storage, produced the least amount of energy.

Determination of Downstream Power Benefits

Studies that determine the magnitude of the Canadian Entitlement obligation.

Direct-Service Industry (DSI)

Industrial customers, primarily aluminum smelters, that buy power directly from BPA at relatively high voltages.

End-use Load

A final, discrete use of electrical energy, such as lighting, space heating and cooling, refrigeration, office equipment, or any other discrete load.

Energy Conservation

Any reduction in electric power consumption as a result of increases in the efficiency of energy use, production, or distribution.

Environmental Assessment (EA)

An EA is a document that evaluates the possible effects of a Federal agency's proposed action to provide sufficient evidence

to determine whether an EIS or a FONSI is warranted. It is one means of compliance with the National Environmental Policy Act (NEPA).

Environmental Impact Statement (EIS)

A document prepared by a Federal agency on the environmental impact of its proposals for legislation and/or other major actions significantly affecting the quality of the human environment.

Exchange Energy

Under a capacity/energy exchange contract, the energy that must be generated or purchased by a utility as compensation for capacity service that was provided by another utility.

Federal Energy Regulatory Commission (FERC)

A Federal agency that regulates interstate aspects of electric power and natural gas industries. It has jurisdiction over the licensing of hydropower projects and the setting of BPA and other rates.

Finding of No Significant Impact (FONSI)

A FONSI follows publication of an environmental assessment. It contains the finding that outlines the reasons why an action may have some impact, but not significant impact, thus making an EIS unnecessary.

Firm Energy

Electric energy which is intended to have assured availability to the customer to meet all or any agreed upon portion of load requirements over a defined period. On BPA's system, firm energy is that produced under critical water conditions.

Firm Surplus

An amount of firm energy that is in excess to firm contractual commitments.

Fiscal Year (FY)

The 12-month period October 1 to September 30. For example, FY 1991 is October 1, 1990, to September 30, 1991.

Generating Public Utilities

Public utility customers of BPA who own or control generating facilities and use this generation to serve a portion of their loads. Also referred to as 'partial requirements,' 'scheduling,' or 'computed requirements customers.' Generators include Eugene Water and Electric Board, Seattle City Light, Tacoma Public Utilities, Chelan County PUD, Cowlitz County PUD, Douglas County PUD, Grant County PUD, Pend Oreille County PUD, and Snohomish County PUD.

Generation

The act or process of producing electric energy from other forms of energy; also the amount of electric energy so produced.

Geothermal Energy

The heat energy available in the rocks, hot water and steam beneath the earth's surface.

Hydroelectric Power (Hydropower)

The generation of electricity using falling water to turn turbo-electric generators.

Impact Evaluation

Impact evaluations measure the direct effects of a program.

Independent Power Producers

Non-utility producers of electricity who operate generation plants under the 1978 Public Utilities Regulatory Policy Act of 1978 (PURPA). Many independent power producers are cogenerators who produce power as well as steam or heat for their own use and sell the extra power to their local utilities.

Interruptible Power

Power that, by contract, can be interrupted in the event of a power deficiency.

Intertie

A transmission line or system of transmission lines permitting a flow of energy between major power systems.

Investor-owned Utility (IOU)

A utility organized under state law as a corporation to provide electric power service and earn a profit for its stockholders.

Kilowatt (kW)

The electrical unit of power which equals 1,000 watts.

Kilowatthour (kWh)

The common unit of electric energy equal to 1 kilowatt of power supplied to or taken from an electric circuit for 1 hour.

Levelized Cost

The present value of a resource's cost (including capital, interest and operating costs) converted into a stream of equal annual payments and divided by annual kilowatthours saved or produced.

Load

The amount of electric power or energy delivered or required at any specified point or points on a system.

Load Shapes

The distribution of the use of electricity, usually over the hours of the day.

Megawatt (MW)

The electrical unit of power which equals 1 million watts or 1,000 kilowatts.

Mid-Columbia

Refers to five privately-owned dams on the mid-Columbia River: Wells, Rocky Reach, Rock Island, Wanapum and Priest Rapids.

Mill

A tenth of one cent. The cost of electricity is often given in mills per kilowatthour.

Mills/kWh

The common expression of the cost of electricity. One mill is a tenth of one cent.

Model Conservation Standards (MCS)

Energy-efficient building standards (developed by the Council) for new electrically heated commercial and residential buildings.

Monte Carlo Simulation

A statistical technique that uses random events, or probability analysis, to simulate the outcome of a process. Monte Carlo simulation can be applied, for example, to determine regional load growth under different economic scenarios that are based on the effects of probabilistic economic events, such as the timing and duration of a recession or the growth and investment of a major regional industry.

National Environmental Policy Act (NEPA)

An act passed by Congress in 1970 requiring that the environmental impact of most large Federal agency projects and programs be considered.

Nominal Dollars

For economic analysis, dollars in the year specified, not adjusted for the effects of inflation or the time value of money.

Non- and Small Generating Public Utilities (NSGPUs)

Public utility customers of BPA who own or control little or no generation capability and who purchase from BPA substantially all of the power required to serve their loads. Also referred to as 'full requirements' or 'metered requirements' customers.

Non-Treaty Storage Agreement (NTSA)

Three storage dams were built under the Canadian Treaty: Mica, Duncan and Arrow. These dams together provide more storage than is required under the Columbia River Treaty. This extra storage space was not covered by the Treaty. In 1983, a short-term, 10-year agreement was worked out on this issue; in November 1990 a new agreement was reached on how to share the extra several million acre-feet.

Northwest Power Planning Council

(See **Pacific Northwest Electric Power Planning and Conservation Council**.)

Northwest Power Pool

The Northwest Power Pool is comprised of public and private utilities serving the Northwest and British Columbia. The Pool has a coordinating group whose primary function is administering the Pacific Northwest Coordination Agreement of 1964, a comprehensive plan for optimizing system wide generation, storage, and transmission resources. Members of the Pool are Bonneville, the Corps of Engineers, the Bureau of Reclamation, and all public and investor-owned utilities with generating resources.

Operating Rule Curve

A composite curve, derived from a family of curves, indicating how a reservoir is to be operated under specific conditions. The operating rule curve accounts for multiple operating objectives, including flood control, hydropower generation, releases for fish migration, and refill.

Operating Year (OY)

The 12-month period from August 1 to July 31. OY 1993 is August 1, 1992, to July 31, 1993. The Operating Year formerly ran from July 1 to June 30. For example, OY 1991 is July 1, 1990, to June 30, 1991.

Option

The purchase of a right to acquire a resource within a particular time on specified terms.

Pacific Northwest

According to the 1980 Northwest Power Act, the Pacific Northwest comprises Oregon, Washington, Idaho, and Montana west of the Continental Divide, as well as portions of Nevada, Utah and Wyoming within the Columbia-Snake River Basin. The Pacific Northwest also includes any contiguous areas, not more than 75 miles from the region defined above, that are part of the service area of rural electric cooperative customers served by BPA on the effective date of the Act whose distribution system serves areas both within and without the region.

Pacific Northwest Coordination Agreement (PNCA)

An agreement between Federal and non-Federal owners of hydropower generation on the Columbia River system. This agreement governs the seasonal release of stored water to obtain the maximum usable energy, subject to other uses.

Pacific Northwest Electric Power Planning and Conservation Act

In December 1980, Congress passed this Act, Public Law 96-501 (referred to as the Northwest Power Act). The Act authorized the four Pacific Northwest states — Idaho, Montana, Oregon and Washington — to enter into an interstate compact for the purpose of long-range planning and protection of shared resources. As a result of the Act, each of the four states passed enabling legislation to create the Pacific Northwest Electric Power Planning and Conservation Council in April 1981.

Pacific Northwest Electric Power Planning and Conservation Council (Council)

A council established by the Northwest Power Act in 1981, made up of two voting representatives from each Northwest state — Washington, Oregon, Idaho and Montana. The Council is charged with planning for power resources and enhancement of fish and wildlife resources in the region.

Pacific Northwest Non-Residential Energy Survey (PNNonRES)

A survey designed to get regional estimates of the energy-using equipment and physical characteristics of buildings in the Pacific Northwest. The 5-year effort gathered information on occupancy patterns, type of heating and cooling systems, and other data that could not be obtained through end-use electrical metering.

Pacific Northwest Utilities Conference Committee (PNUCC)

A voluntary association of consumer and investor-owned utilities and BPA's direct service industries in the Pacific Northwest. Its primary role is to represent its members and their interests in pending legislation and regulating the formation of power planning policy.

Peak Capacity

The maximum capacity of a system to meet loads.

Peak Demand

The highest demand for power during a stated period of time.

Peak Load

The highest demand for power during a stated period of time.

Point of Delivery

The point where power is transferred from one system to another.

Power Exchange

Energy delivered during on-peak hours in a particular season in exchange for an equivalent amount of energy delivery returned during on-peak hours in a different season.

Power Plan

A 20-year power plan developed by the Council. The Plan proposed a comprehensive set of objectives to assure the region adequate power resources, considering conservation and fish and wildlife protection.

Process Evaluation

Process evaluations identify the causes behind the effects of a program and the barriers to its effective implementation.

Programs in Perspective

An annual program conducted by BPA to take the agency's proposed programs and budgets before the public, both to explain the agency's plans and to get constructive feedback.

Public Power Council (PPC)

The PPC, formed in 1966, represents and advocates the common legal and technical interests of the Northwest's consumer-owned utilities. PPC interacts with the Bonneville Power Administration, the Northwest Power Planning Council, and other regional and national groups on subjects including Bonneville rate proceedings and power marketing policies, public preference issues, power supply planning, conservation, legislative concerns and related issues.

Real Dollars

Dollars that have been adjusted to exclude the effects of inflation. By correcting for inflation, a real dollar represents constant purchasing power or *real* value.

Record of Decision (ROD)

The document notifying the public of a decision taken on a Federal action, together with reasons for the choices entering into that decision. The ROD is published in the Federal Register.

Region (see Pacific Northwest)**Regional Energy Metering Project (REMP)**

REMP collects end-use energy data to analyze trends in energy consumption. REMP monitors energy consumption hourly in residential and commercial buildings.

Reliability

The ability of the power system to provide uninterrupted electric service.

Renewable Resource

A resource that uses solar, wind, water (hydro), geothermal, biomass, or similar sources of energy, and is used either for electric power generation or for reducing the electric power requirements of a customer.

Resource Supply Curves

A traditional economic tool used to depict the amount of a product available across a range of prices.

Retrofit

To install an energy conservation measure on an existing piece of equipment or system, regardless of the type of incentive used.

Run-of-the-River Plant

A hydroelectric plant where limited storage capacity confines its operation to daily or weekly shaping.

Sector

A large group of energy users with similar types of conservation or generation opportunities; for example, the residential sector, industrial sector, etc.

Super-Efficient Refrigerator Program (SERP)

SERP pools utility resources to request manufacturers bring refrigerators to the marketplace at least 30% more efficient than 1993 Federal standards.

Surplus Capacity

Amount of electrical capacity above the amount needed to meet the current load requirements of BPA customers.

Surplus Energy

Generally, energy generated that is beyond the immediate needs of the producing system. Specifically for BPA, firm or nonfirm electric energy generated at Federal hydroelectric projects which would otherwise be wasted if there was not a market for the energy.

System Operation Review Process (SOR)

A public process conducted by three Federal agencies: BPA, the Bureau of Reclamation, and the Corps of Engineers. These agencies are concerned with the operation and use of the Federal Columbia River Power System. Key events affecting the outcome of the SOR are the expiration in 2003 of the Coordination Agreement among U.S. parties who operate the U.S. dams in the system, and the end of sale period of the Canadian Entitlement, which is part of the Columbia River Treaty that allocated Canada's firm power benefits from the Treaty to the U.S.

Targeted Acquisition

BPA works with a limited number of customers to develop a focused approach to acquiring conservation in the customer's service area. Customers can identify specific, unique opportunities for programs tailored to their needs. Targeted acquisitions, along with competitive acquisitions, allow innovation and flexibility in acquiring new resources.

Thermal Resources

Generating plants that convert heat energy into electric energy. Coal, oil and gas-fired plants and nuclear power plants are common thermal resources.

Third AC Intertie

A series of upgrades and additions to the two existing alternating-current parts of the Pacific Northwest-Pacific Southwest Intertie that will increase power transfer capabilities between the Northwest and California; scheduled for completion in November 1993.

Transmission

In power system usage, the bulk transport of electricity from large generation centers over significant distances to interchanges with large industries and distribution networks of utilities.

**Washington Public Power Supply System
(Supply System)**

A municipal corporation and joint operating agency in Washington made up of representatives of public utility districts and municipal utilities. Based on power purchase contracts of its members or other utilities, the Supply System has the power to acquire, construct and operate plants and facilities for the generation or transmission of electric power.

**DATE
FILMED**

12 / 27 / 93

END