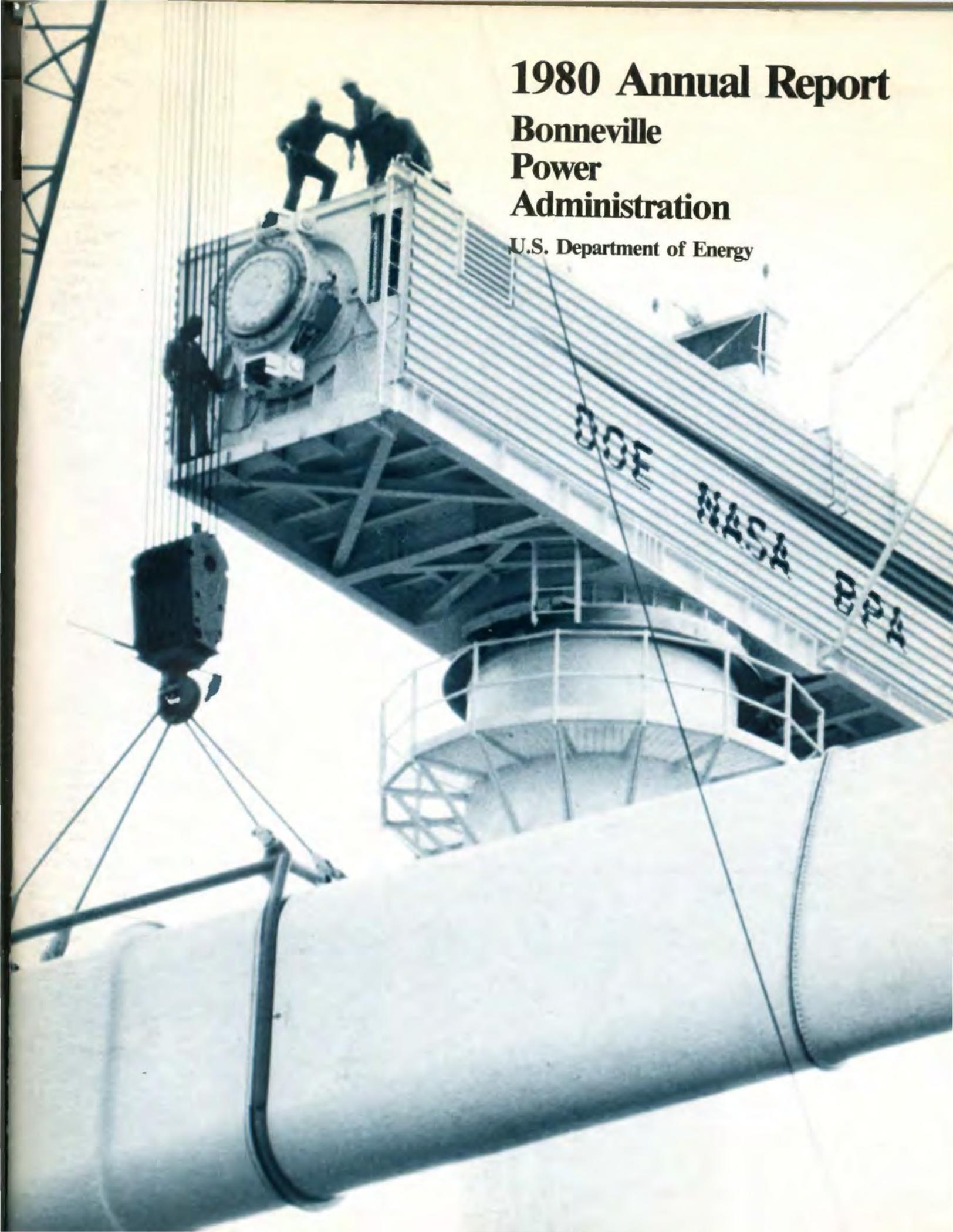


# 1980 Annual Report

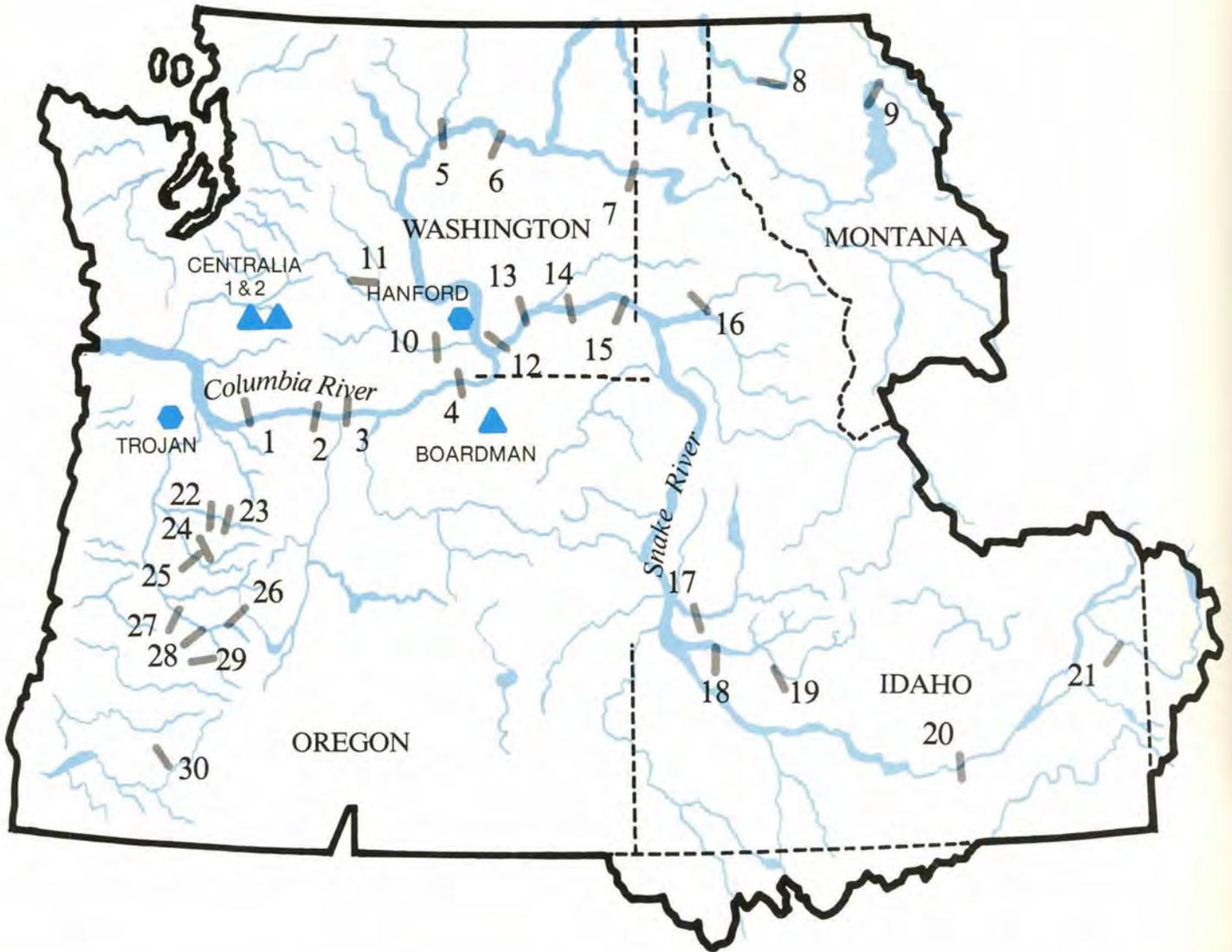
## Bonneville Power Administration

U.S. Department of Energy



**— Federal Dams**

- |                      |                     |
|----------------------|---------------------|
| 1. Bonneville        | 16. Dworshak        |
| 2. The Dalles        | 17. Black Canyon    |
| 3. John Day          | 18. Boise Diversion |
| 4. McNary            | 19. Anderson Ranch  |
| 5. Chief Joseph      | 20. Minidoka        |
| 6. Grand Coulee      | 21. Palisades       |
| 7. Libby             | 22. Big Cliff       |
| 8. Albeni Falls      | 23. Detroit         |
| 9. Hungry Horse      | 24. Foster          |
| 10. Chandler         | 25. Green Peter     |
| 11. Roza             | 26. Cougar          |
| 12. Ice Harbor       | 27. Dexter          |
| 13. Lower Monumental | 28. Lookout Point   |
| 14. Little Goose     | 29. Hills Creek     |
| 15. Lower Granite    | 30. Lost Creek      |



**Thermal Plants**

- Existing Nuclear Plant
- ▲ Existing Coal Plant

# Bonneville Power Administration

U.S. Department of Energy  
Fiscal Year 1980  
Report on the Federal  
Columbia River Power System



**Front cover** and left photo show the 300-foot rotor of the first MOD-2 wind generator being hoisted into place. Two other giant windmills are under construction near the Columbia River Gorge.

**1980 Annual Report**  
**Federal Columbia River Power System**

**U.S. Department of Energy**  
Charles W. Duncan, Jr.  
Secretary

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**Bonneville Power Administration**  
Sterling Munro  
Administrator

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## LETTER TO THE SECRETARY

January 2, 1981

Honorable Charles W. Duncan, Jr.  
Secretary of Energy  
Washington, D.C. 20545

Dear Mr. Secretary:

Bonneville Power Administration has gone to work—along with our customers, the region's Governors and others—to implement the Pacific Northwest Electric Power Planning and Conservation Act, which was signed into law by the President on December 5, 1980. The Act is a turning point in BPA history, placing new responsibilities upon us—in cooperation with others in the region—for the adequacy and the cost and the nature of the region's future power supply.

We have begun the new work without any letup in the duties and responsibilities placed upon us by the Bonneville Project Act which created this agency in 1937, and the Transmission System Act of 1974 which put us on a self-financing basis. Consequently, you will find in this 43rd Annual Report of the Bonneville Power Administration, in addition to much discussion of the new Act and associated workload, information on the more than 2,000 miles of transmission lines in various stages of planning and construction, new money-saving tower designs, improvement in system reliability, and the like.

*To implement the new Act, BPA has:*

- *Identified 32 specific tasks and assigned the work.*
- *Invited suggestions from our customers and others for conservation measures and renewable resources development programs which need to be reflected in our FY 1981 and 1982 budgets.*
- *Met with each of our three customer groups—publicly owned utilities, investor-owned utilities and direct-service industries—as well as with other noncustomer parties including representatives of consumer and environmental groups, fisheries interests, and State and local governments.*
- *Proposed amendments to our FY 1981 budget to commence implementation of the Act, including funding for the Regional Council to be appointed by the States, (emphasizing conservation and renewable resources as provided by the Act), and initial fish and wildlife programs.*

*Even before passage of the new Act, BPA and the region's utilities, working with the limited authority and means available, had made a significant head start on conservation and renewable resources development, the two top priorities established by the Act for meeting the region's future power needs:*

- *BPA and numerous participating utilities have all learned much from four pilot conservation programs now well underway. They cover the areas of home weatherization, solar hot water heating, small wind machines and irrigation pump testing.*
- *BPA has begun testing the first of the three huge Boeing-built MOD-2 wind machines being installed jointly by DOE, NASA and BPA and scheduled for commercial operation in January, May and June, 1981, respectively.*
- *We and the region's utilities have completed a residential energy survey designed to identify conservation opportunities and serve as a benchmark for measuring conservation progress; similar end-use studies are underway in the commercial and industrial sectors.*
- *BPA, itself, has installed solar heating and cooling equipment at several of its substations, and photovoltaic systems for aircraft warning lights atop transmission towers at some remote locations. We are testing a variety of energy conservation measures including several types of solar hot water heaters in the homes of our employees who live at the remote Midway Substation. We have increased the size of our fleet of electric cars to nine, and we pump 1,000 gallons of gasohol each week in a test program.*

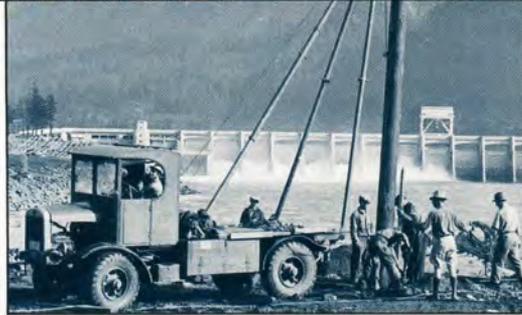
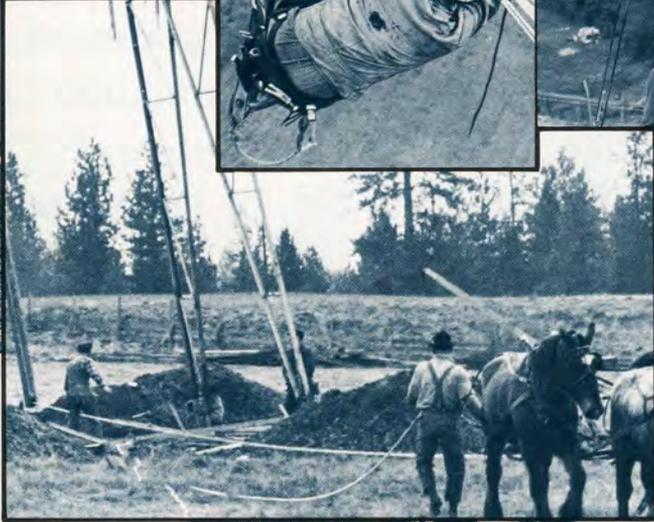
In another important area, BPA in April 1980 signed a new Memorandum of Understanding with the Washington Public Power Supply System (WPPSS). The Memorandum of Understanding gives us more effective oversight of three nuclear projects from which we will be marketing all or most of the power under net-billing contracts with the region's publicly owned utilities and cooperatives for their respective shares of the power.

The Final Role EIS was approved by the Department of Energy in early January 1981 to be filed officially with the Environmental Protection Agency later in January. This is the major environmental impact statement which considers alternative roles BPA could play in the Northwest power supply picture, and will serve as a point of reference for future EIS's that will be necessary in connection with specific programs as we implement the new Act.

We welcome the challenge and expanded opportunities which the new Act gives us to serve the people of our region.

Sincerely,

  
Administrator



## **BPA Milestones - 1937-1980**

What was to become an energy epoch began on August 20, 1937, when President Franklin D. Roosevelt signed the Bonneville Project Act. This historic document heralded the start of a new era in the Pacific Northwest. In creating the Bonneville Power Administration, it was also the seed of what was to become an enduring partnership between a Federal Government agency and the 7-1/2 million people it serves today.

Bonneville Power Administration, or simply "BPA," took its name from the first Federal hydroelectric dam in the region, then under construction on the Columbia River 38 river miles upstream from Portland, Oregon. Although the new agency was formed to market the power from that single U.S. Army Corps of Engineers project, today it transmits the output of 30 Federal dams, numerous utility dams, and four large thermal power plants located in Idaho, Oregon, western Montana, and Washington—the bulk of BPA's 300,000-square mile service area.

The BPA high-voltage transmission grid, some 13,000 circuit-miles of line and 357 substations, is the largest in the Free World. The Federal power which it markets serves more than half of the regional electric load through wholesale arrangements with 124 utilities, 6 Federal agencies, and 17 large industries in the Pacific Northwest. BPA also transmits surplus and exchange power to 14 entities in the Pacific Southwest, the Rocky Mountains and Great Plains, and British Columbia.

Although BPA is headquartered in Portland, Oregon, nearly two-thirds of its 3,000-plus employees are based at 43 locations throughout the four States, including the huge J.D. Ross Complex in Vancouver, Washington. The latter contains one of the first BPA substations, two electrical test laboratories, numerous warehouses and ancillary facilities, and the William A. Dittmer BPA System Control Center. Inaugurated in 1974, this space-age facility is the "nerve center" for balancing the second-by-second generation and load of the Federal Columbia River Power System (FCRPS) through hundreds of interconnections with BPA customers.

Other major components of the BPA network include the Eastern Control Center in Moses Lake, Washington, two ultra-high-voltage test facilities in central and eastern Oregon, and the Celilo Converter Station near The Dalles, Oregon. The latter is the northern terminus of America's first 800-kilovolt direct-current transmission line, which extends 846 miles to the Los Angeles area. Together with two 500-kV alternating-current lines, the d-c line forms the Pacific Northwest-Pacific Southwest Intertie, which entered initial service in 1968. Since then, the Intertie has supplied a net 150 billion kilowatthours of mostly surplus Northwest power to Southwest utilities, or the equivalent of 250 million barrels of oil.

Construction of the Intertie was largely made possible by the ratification of the Columbia River Treaty with Canada in 1964. By providing for the development of three large dams and reservoirs in British Columbia and one in northwestern Montana, the treaty more than doubled the region's hydroelectric storage capacity. The added power benefits were equally divided between the two nations, but Canada ceded its entitlement to a consortium of Northwest utilities for 30 years at an agreed price of \$254 million. Subsequently, during negotiations for the Intertie, a group of California utilities agreed to purchase the Canadian entitlement power on a withdrawable basis.

## BPA MILESTONES, 1937-1980

Besides enabling the displacement of expensive thermal generation in the Southwest, the Intertie operation offers significant benefits to both regions. These include: (1) power exchanges to accommodate the seasonal diversity between the two; (2) emergency exchanges in the case of major generation or transmission outage; and (3) alleviation of the need for both regions to build costly reserves. The sale of surplus Northwest power to the Southwest also benefits ratepayers in both regions of the country.

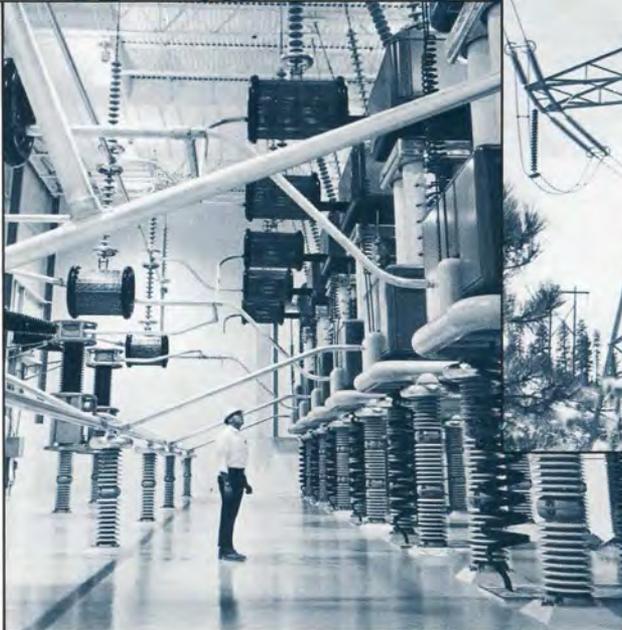
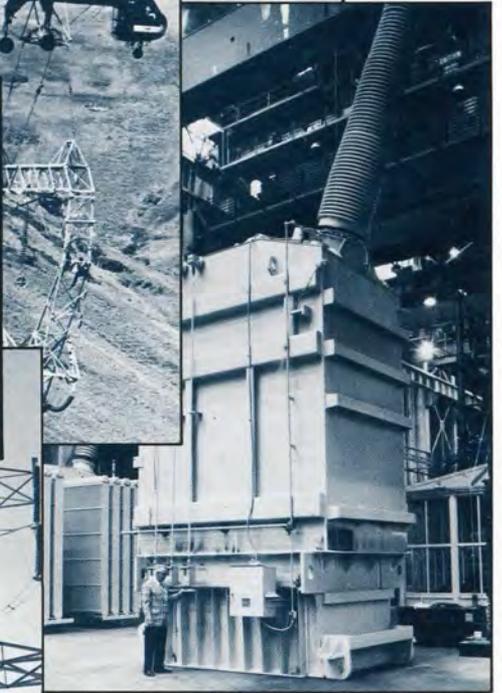
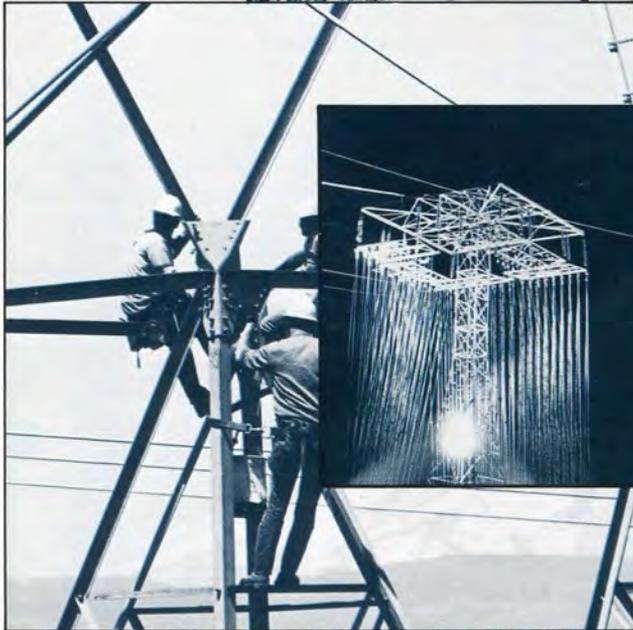
In the mid-1960's it became evident that most of the Northwest's economically feasible and environmentally acceptable hydroelectric potential had been developed, and that future baseload requirements would have to be met largely with thermal generation. BPA and 108 Northwest utilities undertook to formulate a long-range plan for expanding the regional power supply system. The result was the Hydro-Thermal Power Program, which was approved by Congress in 1969. This provided for the development of large thermal power plants by the utilities, with BPA being responsible for integrating their output through its high-voltage grid. The plan also provided for BPA to acquire power from several large planned generating projects under "net-billing" arrangements.

The effectiveness of the Hydro-Thermal Power Program proved to be short-lived as a result of burgeoning load growth, a net-billing limitation, and problems with getting planned thermal facilities licensed and built. This led to an intensive search for a new, comprehensive mechanism that could satisfy the long-range needs of the region. Over a period of several years, the elements of such a planning vehicle were identified and negotiated. They ultimately evolved into the Pacific Northwest Electric Power Planning and Conservation Act of 1980. (See "Turning the Corner," page 9.) This legislation will have a profound impact upon BPA's mission.

Two other hallmark events occurred in recent years. The first of these was the enactment of the Federal Columbia River Transmission System Act of 1974. Among other provisions, this legislation places BPA on a self-financing basis and enables it to borrow from the Federal Treasury to finance its transmission construction program. While these new authorities provide greater planning flexibility and other advantages, they do not alter BPA's statutory obligation to repay, over time, the investment in the Federal Columbia River Power System, plus accrued interest and an irrigation subsidy. BPA also reimburses the Treasury on an annual basis for the power-related operating and maintenance costs of the Federal dams.

In October 1977, after 40 years within the Department of Interior, BPA transferred to the newly-created Department of Energy. Under the terms of the DOE Organization Act, BPA and four other power marketing administrations made the shift with the congressional proviso that they "shall be preserved as separate and distinct organizational entities within the Department . . ."

Today Bonneville Power Administration enters the most challenging chapter of its 43-year history. Under its new congressional mandate, it is embarking upon a whole array of non-traditional programs and functions—energy conservation, alternative and renewable energy resources, fish and wildlife protection and enhancement, and an overriding responsibility to help meet the electric energy needs of a growing population. In doing so, however, this unique agency will adhere to an earlier congressional charge, that of "...encouraging the widest possible diversified use of electric power at the lowest possible rates to consumers consistent with sound business principles."



S. 885

# Ninety-sixth Congress of the United States of America

AT THE SECOND SESSION

*Begun and held at the City of Washington on Thursday, the third day of January,  
one thousand nine hundred and eighty*

## An Act

To assist the electrical consumers of the Pacific Northwest through use of the Federal Columbia River Power System to achieve cost-effective energy conservation, to encourage the development of renewable energy resources, to establish a representative regional power planning process, to assure the region of an efficient and adequate power supply, and for other purposes.

*Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,*

### SHORT TITLE AND TABLE OF CONTENTS

SECTION 1. This Act, together with the following table of contents, may be cited as the "Pacific Northwest Electric Power Planning and Conservation Act".

#### TABLE OF CONTENTS

- Sec. 1. Short title and table of contents.
- Sec. 2. Purposes.
- Sec. 3. Definitions.
- Sec. 4. Regional planning and participation.
- Sec. 5. Sale of power.
- Sec. 6. Conservation and resource acquisition.
- Sec. 7. Rates.
- Sec. 8. Amendments to existing law.
- Sec. 9. Administrative provisions.
- Sec. 10. Savings provisions.
- Sec. 11. Effective date.
- Sec. 12. Severability.

#### PURPOSES

SEC. 2. The purposes of this Act, together with the provisions of other laws applicable to the Federal Columbia River Power System, are all intended to be construed in a consistent manner. Such purposes are also intended to be construed in a manner consistent with applicable environmental laws. Such purposes are:

(1) to encourage, through the unique opportunity provided by the Federal Columbia River Power System—

(A) conservation and efficiency in the use of electric power, and

(B) the development of renewable resources within the Pacific Northwest;

(2) to assure the Pacific Northwest of an adequate, efficient, economical, and reliable power supply;

(3) to provide for the participation and consultation of the Pacific Northwest States, local governments, consumers, customers, users of the Columbia River System (including Federal and State fish and wildlife agencies and appropriate Indian tribes), and the public at large within the region in—

(A) the development of regional plans and programs related to energy conservation, renewable resources, other resources, and protecting, mitigating, and enhancing fish and wildlife resources,

# Turning The Corner

## Landmark Legislation

On December 5, 1980, President Carter signed into law the Pacific Northwest Electric Power Planning and Conservation Act of 1980, now Public Law 96-501. In doing so, he signaled the end of a decade of uncertainty, conflicting concerns, and fragmented planning with respect to the electric energy future of the Pacific Northwest.

Cited by Senator Mark Hatfield as "the single most important piece of legislation ever to affect the Pacific Northwest," Public Law 96-501 provides a sweeping new direction for the planning, development, conservation, and distribution of electricity throughout the region. It will have a profound and far-ranging effect upon millions of Northwest residents.

The legislation evolved from grassroots deliberations on how best to meet the region's energy needs. It was recognized by Congress as being a "regional initiative" which was needed to resolve serious and urgent power supply problems in the Pacific Northwest.

The Act will not result in any subsidy from the Nation's taxpayers. It will not "federalize" the operation of the region's pluralistic utility industry. And it will not, of itself, provide a cure-all for the problems which have beset the Northwest electric energy network over the past decade or more.

Then what does the Act do? First, it places the responsibility for long-range power planning in the hands of an 8-member body comprising representation from the States of Idaho, Montana, Oregon, and Washington. Second, it directs BPA to seek acquisition of sufficient

power resources, starting with conservation, to meet its contractual obligations. Third, it provides a mechanism for building conventional generation with cheaper financing than would otherwise be obtained, with resultant savings to consumers. And fourth, it will, over time, minimize the differences in the cost of electricity to residential and small farm consumers while preserving the traditional rights of BPA preference customers.

Following are some of the salient provisions of this landmark legislation.

Governors of the four Northwest States will each appoint two members to the Pacific Northwest Electric Power and Conservation Planning Council, which is responsible for developing a long-range plan to meet the power requirements of the region. The key elements in the plan are a long-term regional load forecast, energy conservation standards and requirements, and a recommended matrix of alternative and renewable resources. The Planning Council has the authority to create its own technical staff, to be funded out of BPA power revenues. All major determinations of the Planning Council, as well as those of BPA, will require a broad range of public review and comment.

The Act gives BPA broadened authority (with Planning Council direction) to acquire the capacity of new and existing non-Federal generating facilities, but with a stern proviso. It must first explore—and invest in—energy conservation measures, even those costing 10 percent more than the most inexpensive alternative. Renewable resources have second priority, with the

development of conventional generation (coal-fired and nuclear) as a last resort.

In computing its rates, BPA will integrate the costs of all available, cost-effective resources to reflect a "melded" rate structure. The latter will include incentives for utility-sponsored conservation programs, with penalties assessed on those utilities which do not undertake such programs. Prior to contracting for a major energy resource, BPA must justify its proposal in the public arena.

The Act reconfirms the preference rights of Northwest public bodies and cooperatives, with an assurance that their costs of power as a result of the legislation will not exceed those absent the legislation. Should the latter situation come into question, it would trigger a "rate ceiling" formula, whereby non-preference customers could be subject to a surcharge.

Through an exchange of power with investor-owned utilities, BPA will provide a block of low-cost electricity to their residential and small farm users. This exchange will be phased in over a 5-year period, with 50 percent of the rate benefits taking effect during the first year.

Existing direct-service industrial customers of BPA will be offered new 20-year contracts, albeit at substantially higher rates than they now pay. In effect, these higher industrial rates will compensate for the lower rates afforded to the domestic and small farm load of investor-owned utilities.

The Act recognizes the impact of power generation and transmission on the region's fish and wildlife. Accordingly, it provides that the Planning Council must seek the

## TURNING THE CORNER

advice of Federal and State fish and wildlife agencies and Indian tribes in formulating its regional plan. The resultant proposals will be analyzed and, where feasible, incorporated into the plan, with recommendations as to their specific implementation and financing.

While the major responsibility for the planning of electric energy resources falls to the Planning Council, the Act insures that individual utilities will continue to exercise a high degree of local control in their operations. It also provides equal access to BPA power supplies on the part of newly formed public utilities.

The Pacific Northwest Electric Power Planning and Conservation Act is a result of more than 5 years of negotiation among concerned interests in the Pacific Northwest. Its ultimate shape was forged in 2 years of intensive congressional deliberation and debate. Despite the complexity of its far-ranging provisions, the thrust of this legislation is straightforward and positive. This is aptly summed up in the following excerpt from a November 23, 1980, article which appeared in the

*Portland Oregonian*:

*The legislation is not a panacea. It is no more than an opportunity for unified planning, development and financing of plentiful power supplies without the twin specters of economic and environmental disruption. In addition, it opens the door to innovation and extensive use of non-traditional resources.*

Like that writer, BPA views the Pacific Northwest Electric Power Planning and Conservation Act as an opportunity—an opportunity which calls upon 43 years of BPA experience, ingenuity and responsiveness to new demands and new direction. With the enactment of this legislation, the region has turned a corner, and the congressional signpost says “Go.” In partnership with the Northwest community, BPA is committed to pave the way to a secure energy future.

### Implementing the Act

Even prior to the enactment of the regional bill, BPA was intensively preparing to “hit the deck running” as soon as it was signed into law. Starting in August 1980, a steering committee of eight senior staff members, along with some 50 task leaders and task group members, began identifying and working on 32 specific tasks which must be accomplished to implement the Act.

In a November 1980 memorandum to BPA employees, its customers, and other concerned parties, Administrator Munro enumerated some of the most critical tasks which must be addressed in carrying out the legislative mandate.

“... We must amend our FY 1981 budget to get started on conservation and renewable resource programs, and modify our 1982 budget—which will be sent to Congress soon after the New Year—to add programs consistent with the purposes of the new legislation.

... We must turn our conservation pilot programs into regionwide action programs as quickly as pos-

Secretary of Energy Charles W. Duncan, Jr. (right) was a strong proponent of the regional power bill. He is shown inspecting The Dalles Dam with General Richard M. Wells, North Pacific Division Engineer, Army Corps of Engineers, and BPA Administrator Sterling Munro.



## TURNING THE CORNER

sible and ready others for region-wide implementation.

... We must determine how we will establish that conservation programs and resource acquisitions are cost-effective and consistent with the other provisions of the law that will govern BPA acquisitions.

... We must prepare as soon as practicable and, no later than 9 months after the President signs the bill, to offer all our customers our new 20-year full requirements contracts.

... We must complete 'value of reserves' studies before we can write new contracts with the industries we serve directly, and we must complete the 'average system cost' studies which will underlie exchanges of power with the private utilities.

... We must provide for ample opportunity for public participation in our major decisions and actions.

... We must establish effective liaison with the new regional power planning council and comply with the regional plan as soon as they develop it."

With BPA there is a sense of urgency about getting on with the job. And with good reason. Pending the activation of the regional Planning Council, the eyes of the region are on BPA to assume leadership in responding to the congressional directives. "Now that the bill has become law," the mood clearly says, "what is BPA doing to carry it out?"

The answer is manifold. Organizational realignments... the shifting of workloads... funding reallocations... altered priorities... numerous discussions with other involved entities. A plan of action is emerging. By the time this 1980 Summary is published, the critical elements of this plan will be in motion.

### Final Role EIS

On January 2, 1981, after 5-1/2 years of preparation which included broad public review and circulation of a revised draft, BPA's Final Role Environmental Impact Statement was officially approved by the Department of Energy, and the

document will soon be filed with the Environmental Protection Agency (EPA).

Still unresolved is the disposition of a permanent injunction against BPA as a result of 1975 litigation filed in the U.S. District Court for the District of Oregon. (This decision was upheld by the U.S. Court of Appeals, which remanded the case to the lower court.) This injunction essentially prohibits BPA, pending the completion and filing of a court-ordered EIS, from executing new long-term industrial contracts, facilitating increased hydroelectric peaking capacity, and taking actions which facilitate the development and integration of new thermal power plants in the Pacific Northwest.

Imminent filing of the Role EIS, together with the enactment of P.L. 96-501, should help to resolve these legal problems.

BPA Administrator Sterling Munro briefs BPA customer representatives on plans for implementing the new Act.



## TURNING THE CORNER

### 1979 Rate Increase

On December 20, 1979, the third wholesale power rate increase in BPA's history took effect on an interim basis. The first increase in 1965 averaged 3 percent. In 1974 the rate increase averaged 27 percent.

The new rate schedules reflect an 88-percent increase in revenue requirements for power sales and transmission services. This increase is based upon our statutory requirement to repay all costs, including accrued interest, of the Federal Columbia River Power System. The 1979 rate increase is the result of the overall cost escalation which has occurred since 1974, and the additional cost to BPA of the acquisition of capacity from two nuclear projects now under construction. Following interim approval by the DOE Assistant Secretary for Resource Applications, the 1979 rate schedules were transmitted to the Federal Energy Regulatory Commission (FERC) for final confirmation and approval.

Subsequently, 17 BPA customers intervened in the FERC proceedings. In addition, complaints were filed in U.S. District Court to have BPA's firm capacity (F-7) and nonfirm energy (H-6) rates declared invalid on the basis that these rates are not based on cost-of-service. A court decision resulted from such litigation filed by Pacific Power & Light Company, which was subsequently joined by Portland General Electric Company and the Public Utility Commissioner of the State of Oregon.

On September 30, 1980, Judge Owen M. Panner of the U.S. District Court for the District of Oregon affirmed the authority of the Secretary of Energy to approve wholesale power rates of the Federal power marketing administrations and to delegate to the Assistant Secretary for Resource Applications the authority to approve such rates

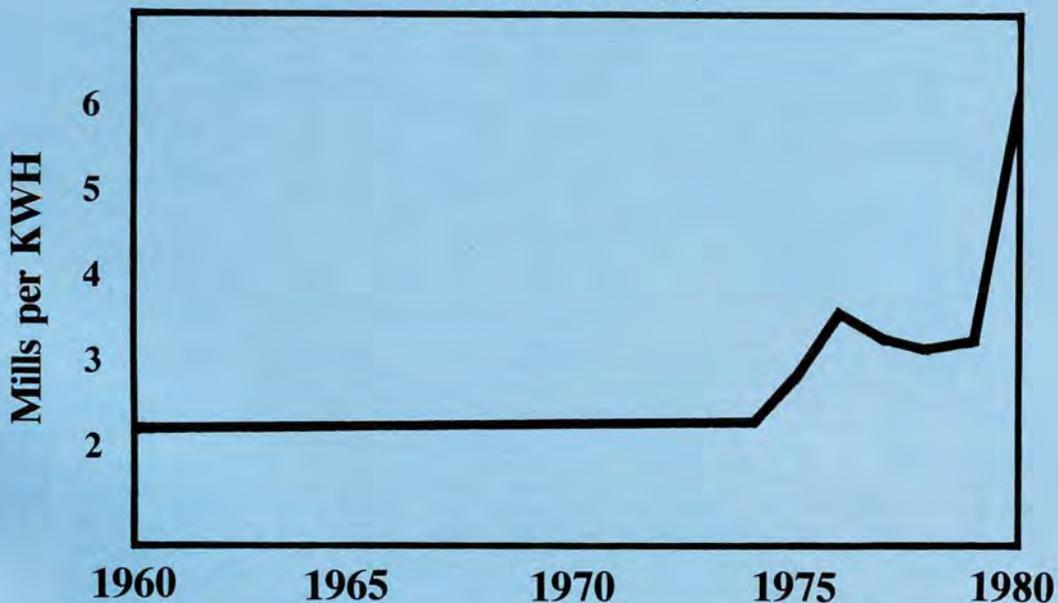
on an interim basis. The court also determined that the procedures of the Assistant Secretary were proper in the ratemaking process initiated by BPA and in her approval of the interim rates.

Similar litigation filed by Idaho Power Company and The Montana Power Company with the U.S. District Court for the District of Montana has, at BPA's request, been transferred to the District of Oregon. No hearing had been scheduled when this 1980 Summary went to press.

On November 21, 1980, FERC issued an order remanding BPA's 1979 wholesale rate filing without prejudice, for the purpose of obtaining additional information. In its order, FERC notes that the extent of its jurisdiction is mainly to insure an adequate level of revenues for repayment of the Federal investment in the Federal Columbia River Power System. The order mentions several rate schedule issues regarded by FERC as being "controversial."

### Average Revenues from Power Sales

FY 1960-FY 1980  
(Mills per Kilowatthour)



## TURNING THE CORNER

### Anticipated 1981 Rate Increase

At a series of preference customer meetings held in May and June 1980, BPA advised its customers that it will require a 50-percent increase in its revenues and would seek a commensurate adjustment in its wholesale power rates effective July 1, 1981. The principal reasons for this revenue increase are:

1. Higher costs of operation, maintenance, and replacements; additions to Federal dams and transmission system; and a high rate of inflation (about 22 percentage points of the 50-percent increase).
2. Increases in the costs of thermal power, mainly the Washington Public Power Supply System (WPPSS) nuclear projects Nos. 1 and 2, but also BPA's 30-percent share of the Trojan nuclear project (all totaling about 21.5 percentage points of the 50-percent increase). Costs associated with the 70 percent of the third WPPSS project whose output BPA will be taking into its system are not included because BPA need not commence debt service on that unit until January 1983.

3. The remaining increase in revenue needs results from a reduction in forecasted revenues, based upon revised assumptions as to the amount of revenue which each rate category will produce. Based on current analyses, earlier projections have been lowered (about 6.5 percentage points of the 50-percent increase).

Numerous cost and rate studies are being prepared for inclusion in an initial rate proposal to be available in early 1981. This will be followed by an extensive public review of the proposal. The studies and rate schedules associated with the initial proposal will be subject to revision in accordance with comments received and updated information. In June 1981, the final wholesale power rate proposal will be submitted to the DOE Assistant Secretary for Resource Applications for interim approval, to become effective on July 1, 1981. The rate package will then be forwarded to FERC for final confirmation.

### New Management at WPPSS

In August 1980, Robert L. Ferguson took up the reins of the Washington Public Power Supply System (WPPSS) as its new managing director. No newcomer to Hanford, he had ramrodded the construction of the Fast Flux Test Facility there, bringing it in on schedule and at budgeted cost. Mr. Ferguson's takeover at WPPSS has been marked by the same no-nonsense commitment to getting the world's biggest construction project rolling on an express track.

Under his direction, a major WPPSS reorganization is taking place. Its emphasis includes strict cost controls, realistic schedules, and a clear delineation of management and contractor responsibilities. Today a new mood of optimism and "can do" pervades not only the Supply System ranks, but a much broader community with a stake in the nuclear program.

BPA and WPPSS signed an April 1980 memorandum of understanding which details the rights and responsibilities of both parties under

# WE WANT YOUR VIEWS...

## ON OUR PROPOSED NEW RATES.

We're Bonneville Power Administration. We wholesale Federal power in Washington, Oregon, Idaho, western Montana, and parts of California, Nevada, Utah and Wyoming. And we operate a high-voltage transmission system for both Federal and non-Federal power.

Both wholesale power rates and transmission rates will have to go up on July 1, 1981. To cover operating costs and scheduled repayment of Federal investments in Northwest generating and transmission facilities, we'll need more revenue than present rates would provide.

We want your views on our new rate proposals.

Please understand. We at Bonneville don't set the rates that you, the consumer, pay for electricity. But what we charge your local utility is a factor in the rates you pay. That's why we urge you to get involved.

### Here's what you can do:

Send for more information (see request form) or call toll free: in Oregon, 1-800-452-6429; in other Northwest states, 1-800-547-6048.

Attend one or more public hearings.

Submit oral or written comments at the hearing, or send us your written comments. All comments received before the close of hearings will be considered.

What you say counts.

**Bonneville Power Administration**



Advertisements in newspapers throughout the Northwest urge the public to attend meetings on BPA's proposed 1981 rate increase.

## TURNING THE CORNER

the project agreements for the three net-billed plants. Negotiation of this document has done much to clarify and improve the BPA/WPPSS relationship.

This new rapport, however, faces a stringent test. During the past year the WPPSS construction program continued to be plagued by schedule slippages, cost escalation, and labor disputes which halted construction for nearly 5 months.

The annual WPPSS budget presented in June 1980 reflected the grave situation. In the period of one year, the estimated completion cost for all five projects had risen from \$11.8 billion to \$15.9 billion. Their projected in-service dates incurred additional delays totaling 76 months.

To make matters worse, an unsettled bond market pushed up the cost of servicing new WPPSS tax-exempt bond issues to unprecedented levels. A December 1980 issuance of 30-year bonds for WPPSS Nuclear Projects (WNP) 4 and 5 bore an interest rate of 12.44 percent. A concurrent but smaller issue of 10 to 20-year "put" bonds went for 11.83 percent.

One of the most serious reversals suffered during the past year was a work stoppage on the Hanford Reservation from June to November 1980. Preliminary estimates place the

cost of this shutdown at more than \$700 million, with added construction delays of approximately 8 months each for WNP 1, 2, and 4. Combined with continued cost escalation and other program adversities, the estimated total completion cost of all five WPPSS projects rose to \$17.3 billion by the end of the calendar year.

Despite these setbacks, the eventual price of electricity from the WPPSS projects should still be cheaper than any large alternative resources coming on line in the same time frame. These projections now range from 4.7 to 5.5 cents per kilowatt-hour for the net-billed projects Nos. 1, 2, and 3. (This includes built-in inflation factors for their respective projected completion dates.)

During the period January-October 1980, WNP 2 progressed

from 79.7 percent complete to 85.3 percent, WNP 1 from 34.1 percent to 41.4 percent, and WNP 3 from 18.7 percent to 23.0 percent complete. The non-net-billed projects Nos. 4 and 5 were 14.5 and 8.8 percent complete at the end of October 1980.

Conscious of our own responsibilities to the WPPSS participants, bondholders, and the ratepayers of the region, BPA has strengthened its oversight activities—with the full concurrence of Bob Ferguson and his staff. The BPA oversight staff is being increased from three professionals to six, including a Hanford resident manager officed with the WPPSS top management team. Our Budget Office and Office of Audit are working closely with their WPPSS counterparts and with outside interest groups, so that a wide area of WPPSS management activities can be sampled and the results shared by the interested parties. In addition, frequent BPA/WPPSS meetings at various staff levels provide a continuous exchange of information, an opportunity for BPA staff to analyze and comment on it, and early notice to WPPSS of any problems we might see. In these and other ways, BPA is contributing to the new direction now taking place at WPPSS.

Robert L. Ferguson, new WPPSS managing director (right) chats with BPA Administrator Munro at a Northwest Public Power Association workshop.



## TURNING THE CORNER

### DOE Pacific Northwest Energy Task Force

Secretary of Energy Duncan's visit to the Pacific Northwest in April 1980 sharpened his perceptions that the region confronts a serious electric energy situation, and that early and concerted action, in addition to enactment of regional power legislation, would be needed to alleviate the threat of crippling power shortages.

In June 1980, Secretary Duncan established a Department of Energy Pacific Northwest Energy Task Force in Washington, D.C., under the direction of Dr. Ruth M. Davis, Assistant Secretary for Resource Applications. The Task Force was directed to assess potential power shortages in the region and to recommend actions which could be taken by DOE under existing authorities to help meet the region's electric energy demand in this

decade. These recommended actions are intended to supplement the effectiveness of the new Act in reducing demand and insuring expeditious handling of the region's power supply problems.

A large number of Pacific Northwest entities, including utilities, BPA's direct-service industrial customers, environmental organizations, and other interested groups, were notified and invited to comment on the program. In addition,



Above: Ironworkers placing reinforcing steel rods in turbine-generator building at WNP 3. (Photo courtesy of Washington Public Power Supply System.)

Left: Welding sparks fly at the WPPSS No. 3 nuclear project being built near Satsop, Washington, with the cooling tower in the background.

## TURNING THE CORNER

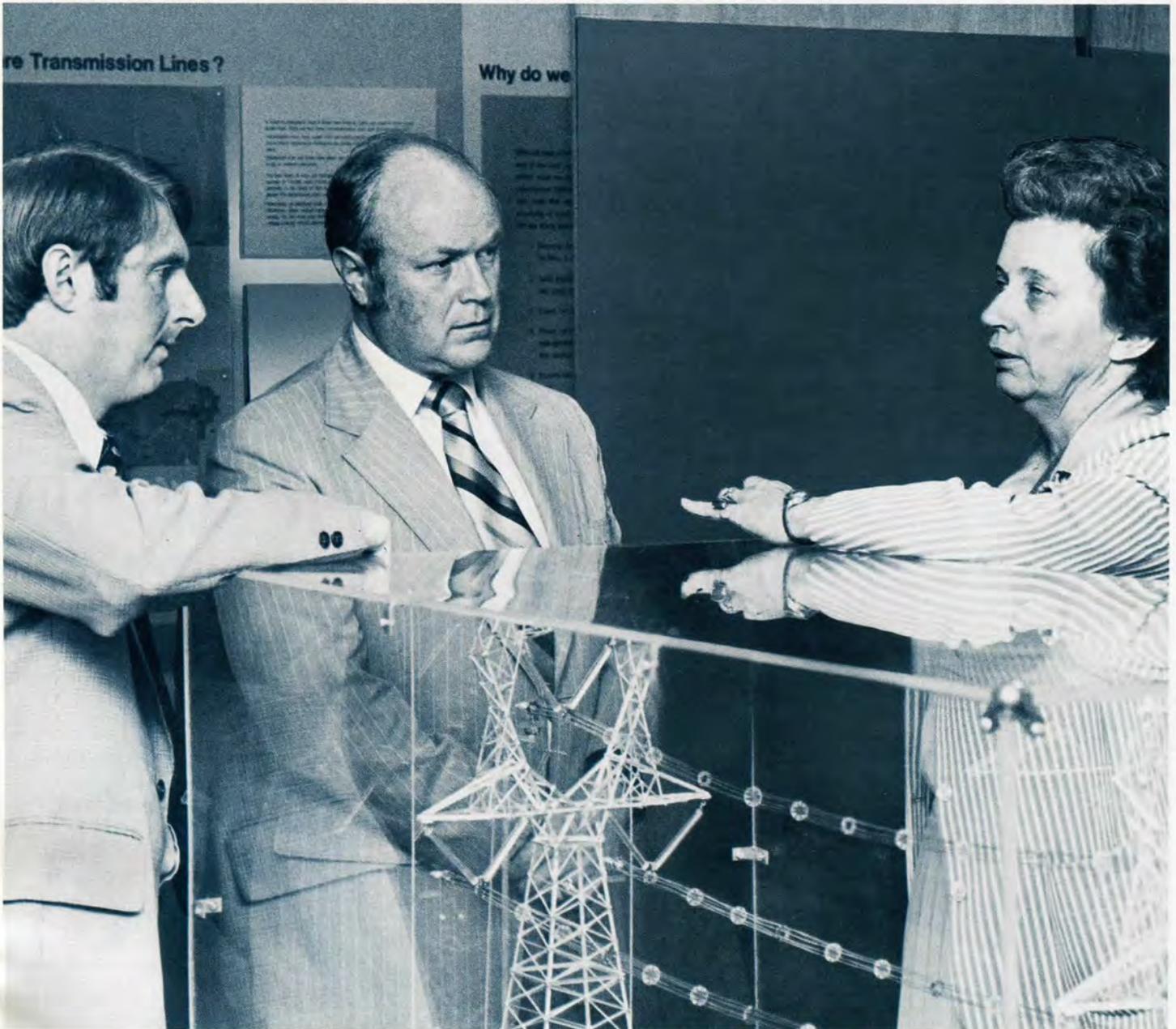
the Governors of the four Northwest States were personally contacted by Dr. Davis for their cooperation. The Pacific Northwest congressional delegation was also briefed on the project.

In November 1980, the Task Force published a draft of its report and circulated it to State officials designated by the Northwest Governors, and to selected repre-

sentatives of public interest groups, utilities, and industries in the region. Where appropriate, comments will be incorporated into the Task Force's final report which is expected to be submitted to the Secretary by mid-January 1981.

Among its highlights, the draft recommends (1) accelerated implementation of energy conservation measures, (2) expedited completion of studies and negotiations to increase intertie capabilities between the Pacific Northwest and other regions, (3) continued operation of the Hanford N-Reactor beyond its earlier scheduled 1983 shutdown to the end of the decade, (4) protection

During her August 1980 visit to the Pacific Northwest, DOE Assistant Secretary Ruth M. Davis discusses Federal/State energy planning with Michael Grainey (left) and Richard Durham of the Oregon Department of Energy.



## TURNING THE CORNER

of completion schedules for thermal power plants under construction, (5) additional studies to develop modified regulated river power operations during energy emergencies, (6) rapid inauguration of studies to gauge the feasibility of specific cogeneration applications, and assistance in arranging funding for

detailed engineering designs and project construction, (7) investigation of the feasibility of "banking" aluminum ingots as a means of storing electric energy, (8) increased support for direct applications of geothermal resources and

small-scale hydro, (9) encouragement of expanded Federal participation in regional solar and wind energy research projects, and (10) development of an energy park on the Hanford Reservation.





The dispatch room of the William A. Dittmer BPA System Control Center in Vancouver, Washington, is the hub of the BPA high-voltage transmission grid.

# Power Operations

## The Operating Year

Despite a shaky first half, the regional power supply system averted any severe pinch during the 1979-80 operating year. This was largely attributable to a relatively mild winter, near-normal snowpack, and a continuing downtrend in electricity consumption vis-a-vis forecasted loads.

On July 31, 1979, at the end of the 1978-79 refill period, Coordinated System reservoirs were 4.4 billion kilowatthours or nearly 10 percent short of full. A drier-than-normal autumn worsened the situation, and by mid-December the reservoirs were some 8 billion kWh

below normal operating levels.

BPA curtailed the upper quartile of its direct-service industrial loads on July 1, 1979, which caused the companies to request advance energy and to make high-cost energy purchases from outside the region. Several firms also cut back on production, resulting in the layoff of nearly 300 workers by February 1980.

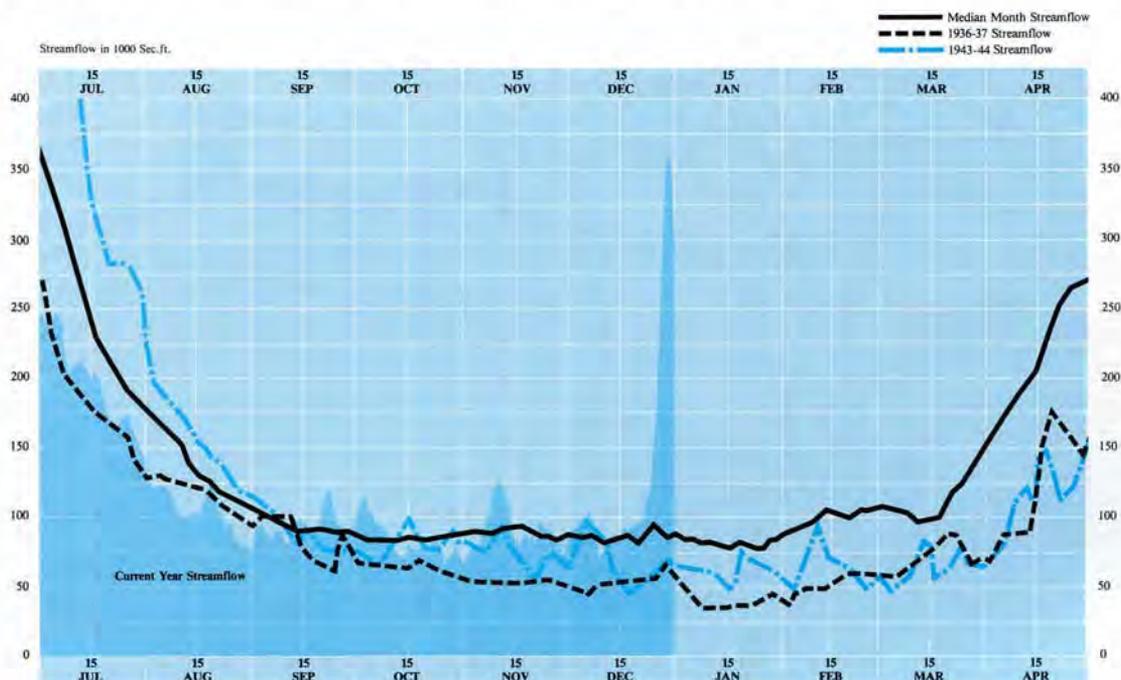
Portland General Electric Company (PGE) experienced a particularly tight squeeze late in 1979 due to technical and regulatory problems which closed down its Trojan nuclear project from mid-October through December. During this period, BPA lost its 30-percent

share of the Trojan output and advanced energy to PGE to help meet its loads.

After a cold, dry winter, warm weather in April contributed to an early snowpack runoff. As a result, on April 22, 1980, for the first time in 9 months, BPA began making nonfirm energy available within the Pacific Northwest. Four days later, surplus Federal energy began flowing to the Southwest utilities. The deliveries of nonfirm energy enabled the Northwest aluminum industry to restart most of its down potlines and return laid-off employees to work.

The 1980 January 1-July 31 volume runoff of the Columbia River as measured at The Dalles,

Hydrograph of the first half of the 1980-81 operating year shows improved streamflows in the fall, with heavy precipitation during the Christmas holiday season.



# POWER OPERATIONS

Oregon, was 95.8 million acre-feet or 87.4 percent of the 1963-77 fifteen-year average. Coordinated System reservoirs were essentially full by August 1.

The end of the annual runoff, however, signals the need for husbanding the stored water for generating electricity during the winter months. Accordingly, BPA terminated its sales of surplus energy to the Southwest utilities on July 9. Secondary energy deliveries to Northwest investor-owned utilities were curtailed on July 21, and to preference customers 10 days later. Nonfirm energy sales to direct-service industries were also curtailed, in mid-July. Most of these industries were able to maintain production levels by acquiring energy from other sources, including advance energy drafted provisionally from Federal reservoirs, and higher-cost

replacement energy from both within and outside the Pacific Northwest.

Low streamflows during the period August through October 1980 resulted in drafting reservoirs to a greater extent than is normal for the period. This need was compounded by the prolonged shutdown of the Hanford N-Reactor because of a 5-month labor dispute on the Hanford Reservation. The dispute was finally settled in November, but the need for completing annual maintenance and facility modifications will delay the N-Reactor from returning to full service until February 1981. Its 860-megawatt output may be sorely missed should a prolonged cold spell take place during the interim.

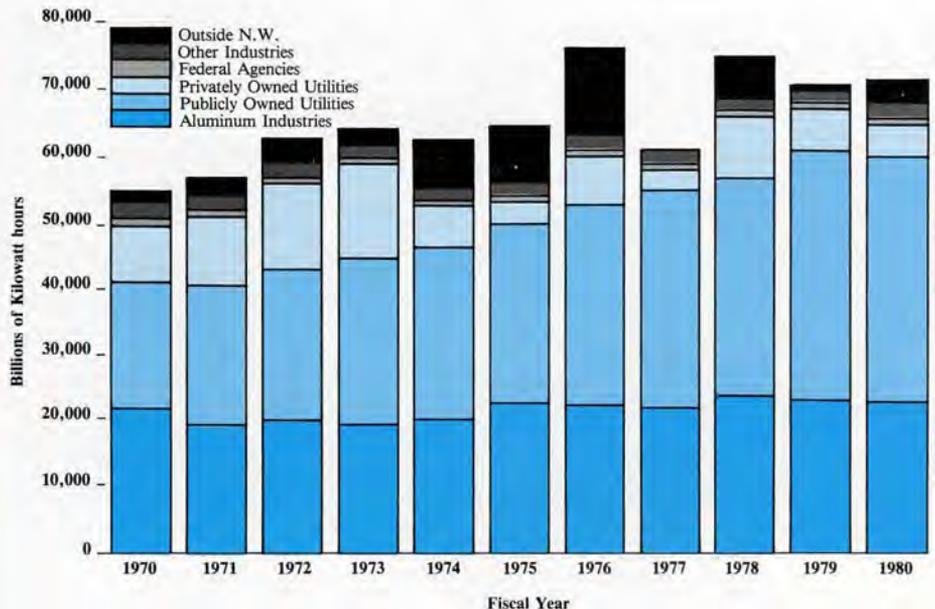
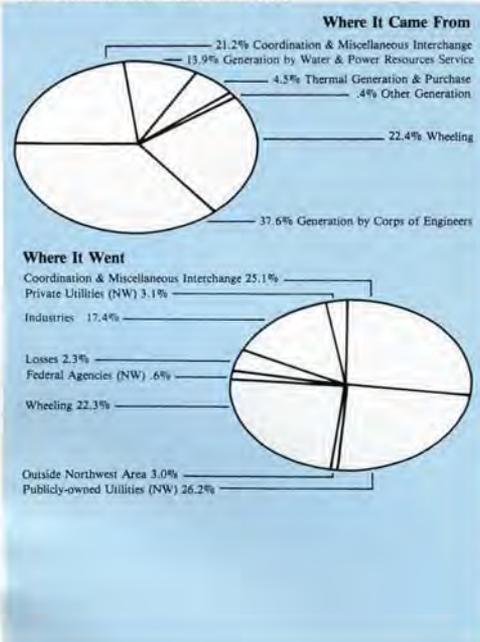
Despite the temporary unavailability of this resource, the power situation improved in November 1980. A combination of increased

precipitation and mild temperatures allowed reservoirs to maintain their normal seasonal levels. With an outlook of cautious optimism for the peak winter months, BPA began advancing Hanford energy to its direct-service industrial customers in mid-November. This relieves them of the need for continuing purchases of expensive replacement energy.

On December 10, 1980, BPA resumed selling secondary energy to its utility and direct-service industrial customers within the Pacific Northwest. These sales were made possible by normal late fall precipitation, adequate reservoir storage levels, and continued load underruns. The secondary sales are anticipated to continue for at least 2 to 3 months.

## BPA Sales of Electric Energy

Source and Disposition of Total Energy Handled by BPA  
Fiscal Year 1980 Total 144.1 Billion KWH



## POWER OPERATIONS

### Power Sales

While the first half of the fiscal year was marked by below-average water conditions, there was a significant improvement during the spring and early summer of 1980. This spurred the sale of surplus energy outside the region during that period. For the year as a whole, this was the only category of energy sales which experienced an upturn from FY 1979. All classes of Northwest customers purchased somewhat less than in the previous year, which is attributable in part to continued energy conservation and the severe economic recession gripping the Pacific Northwest.

Total BPA energy sales in FY 1980 were 72,548,755,000 kilowatthours, a slight increase over the 72.0 billion kWh sold in the previous year. As a result of the interim rate increase which took effect on December 20, 1979, however, the average revenue from all sales was 5.74 mills per kWh as compared to 3.39 mills in FY 1979.

The availability of nonfirm energy allowed utilities outside the region, most of them in California, to purchase 4.3 billion kWh of BPA power during the fiscal year. Representing about 6 percent of all sales, this was a sharp increase from the 392.5 million kWh made available for purchase outside the Northwest in the previous year, when the Pacific Northwest experienced low water for a number of months.

BPA sold 4.5 billion kWh to investor-owned utilities in the Pacific Northwest during FY 1980, or 6 percent of total BPA sales. This was 2.0 billion kWh less than was purchased by this class of customer in FY 1979.

BPA preference customers, comprising municipalities, cooperatives, and public and people's utility districts, were the largest purchasers of BPA energy, accounting for 52 percent of total sales. The 37.8 billion kWh which they purchased from BPA in FY 1980 was slightly less than in the previous year.

Sales to Federal agencies in the Pacific Northwest were 825.5 million kWh, or about 1 percent of total BPA sales. This was a small downturn from the Federal purchases in FY 1979.

Sales to the aluminum industry in FY 1980 totaled 22.9 billion kWh, representing 32 percent of all sales. Here again the aluminum company purchases were slightly less than in the previous year.

BPA's other direct-service industrial customers accounted for 2.2 billion kWh, or 3 percent of total BPA sales in FY 1980. This was almost the same as in FY 1979.

### Fish Migration Assistance

As in previous years, BPA participated in the 1980 spring "fish flush" to assist the downstream passage of migrating juvenile salmon and steelhead on the Columbia and Lower Snake Rivers. This annual effort, involving the Corps of Engineers, Water and Power Resources Service, generating utilities, and fish and wildlife agencies, is directed at providing adequate streamflows and spill to carry the fish to the sea with minimal mortality.

Cooperation between the region's fish and wildlife agencies and the river operating agencies continued to improve during 1980 as indicated by several events prior to and during special fish operations. Early in 1980, the fishery agencies agreed to extend the wintertime minimum flows beyond the end of February through mid-April. This provided BPA with more flexibility in scheduling project operations and assisted in conserving water and energy during light load hours. As a result, energy deficits below the energy content curve were smaller by about 65,000 megawatthours. If reservoirs had not refilled and low water conditions had occurred requiring the purchase of energy to meet firm loads, the energy saved by this concession could have had a minimum replacement value of \$2.6 million.

Water is released over the spillways at Ice Harbor Dam in May 1980 to aid the downstream migration of juvenile salmon and steelhead. (Photo courtesy of Army Corps of Engineers.)



## POWER OPERATIONS

At an April 4, 1980, meeting of the Committee on Fishery Operations, BPA, along with the Corps and WPRS, agreed to meet the minimum streamflows recommended by fishery experts. The fish flush plan subsequently went into effect in late April and terminated in the second week of June.

From BPA's perspective, providing extra water for fish passage creates a problem of "over-generation" since prudence dictates that this water also be used for power generation. As in previous years, BPA made special arrangements with British Columbia Hydro & Power Authority of Canada for storage of as much overgeneration as possible. These negotiations resulted in an agreement to store the "fish energy" in B.C. Hydro's Williston project on the Peace River. Ultimately, all of this overgeneration was returned to the Pacific Northwest; however, storage costs of \$3.8 million resulted from the operation.

BPA's efforts to provide minimum streamflows were further enhanced when the fishery agencies agreed to weekly average flow requirements rather than the previously requested daily average flows. The benefit of the weekly average flow requirement to BPA results from reduced or eliminated uncontrolled weekend spill and better shaping of discharge to fit Northwest load requirements. Approximately \$1.2 million in benefits was realized as a result of this change during the 1980 fish flush operations.

Spill was once again provided during 1980 to aid the migration of juveniles over dams rather than through the turbines. Water equivalent to 196,046 megawatthours of generation foregone was provided for this purpose. The loss in power revenues due to spilling amounted to \$1.5 million.

What were the benefits to the fishery resource as a result of these special river operations? In 1980, 7.8 million spring and summer migrating juvenile salmon and steelhead were transported around Columbia and Snake River hydroelectric projects. When combined with an estimated 8.5 million non-transported smolts, the total of over 16 million juveniles reflects above-average outmigration.

Fishery agencies estimate that without augmented river flows, spill at dams, and transportation, fewer than 1.5 million of the estimated 12 million spring-migrating smolts protected by the special river operations would have survived to the lower river. (Not all of the nontransported juveniles reaching the lower river successfully in 1980 were afforded protection, which was available only during April, May and early June.) While continuing evaluation of adult returns over the next few years is needed to fully realize the benefit of special river operations in 1980 and other water years, the fishery agencies expect a decided improvement in the upriver run of adults returning from this year's outmigration.

### Long-Term Power Outlook

Fiscal Year 1980 saw a further deterioration in the projected capability of the regional electric energy system to meet its firm loads over the coming decade. Under critical water conditions, energy deficits would exceed 2,000 average megawatts in every year through 1990-91. During the mid-1980's, these deficits would range above 3,000 average megawatts, which is about three times the present electrical load of the City of Seattle.

This gloomy outlook is based upon the 1980 long-range forecast of power loads and resources in the West Group Area of the Northwest Power Pool, which is compiled annually by the Pacific Northwest Utilities Conference Committee (PNUCC). The input to this forecast essentially comprises: (1) the best estimates of regional utilities with respect to their future loads, and (2) the most recent information as to scheduled in-service dates of generating facilities under construction or planned.

For the sixth consecutive year the PNUCC forecast reflects a reduced rate of load growth in the forthcoming decade. This year the average annual energy load growth rate for the 10-year period is projected to be 3.4 percent, compared to 3.9 percent last year. The projected peak-load growth rate is 3.7 percent, compared to 4.1 percent last year. That is the good news.

The bad news is that the schedules



As a result of the annual "fish flush" operation, a greater number of mature salmon like this one should return from the ocean in future years. (Photo courtesy of U.S. Fish and Wildlife Service.)

Aerial photo shows WPPSS Nuclear Project No. 1 under construction on the Hanford Reservation, with WNP 2 in the background. (Photo courtesy of Washington Public Power Supply System.)



## POWER OPERATIONS

of planned resources have again experienced substantial slippages. Of 12 large thermal generating projects listed in last year's Annual Report, one has entered service, two remain on schedule, three have been indefinitely postponed, and the remaining six have incurred additional delays averaging 6 months. Licensing problems, labor disputes, regulatory requirements, design and construction setbacks—all have combined to push back the in-service dates of these crucial facilities.

As a result, it is now a mathematical near-certainty that the Pacific Northwest will experience firm energy deficits in at least one of the next 10 years. The severity and duration of such power shortages will depend upon water and temperature conditions, additional delays in planned resources, the availability of imported energy, and other factors. Intensified energy conservation efforts can narrow the gap, as can the development of non-traditional energy systems.

This year, for the first time, the PNUCC forecasted resources include scheduled alternative and renewable resource generation. In 1980-81 it is estimated that a number of wind turbine generators will produce about one average megawatt of electric energy, increasing to three average MW in the following year. Preliminary planning has been undertaken for the construction of a 42-MW wood-burning powerplant in the mid-1980's. Other such projects, including cogeneration, show

promise for development over the next few years.

In the meantime, under critical water conditions, the region faces the prospect of energy deficits ranging from 9 percent to 17 percent of its total load. And as of now, there are no large increments of power scheduled to come on line after 1990.

A grim outlook indeed... Just how grim will depend to a large extent upon the ability of BPA and its regional partners to get to work with the new tools provided to them in Public Law 96-501.

### End-Use Energy Consumption Data Base

In July 1979, BPA and the Pacific Northwest Utilities Conference Committee (PNUCC) embarked upon a regionwide residential sector survey to develop an end-use data base with respect to electricity, oil and natural gas consumption. This data will be of use in forecasting energy demand, in designing and determining the effectiveness of home weatherization and other conservation practices, and in identifying the need for new conservation programs. Thirty-seven regional utilities participated in the

survey, which included 4,030 residential interviews conducted by a marketing research firm.

The results of the residential survey were published in July 1980. The findings are highlighted in an Executive Summary supplemented by 11 volumes of detailed reports and data.

For the commercial sector, BPA is co-funding a Department of Energy survey of nearly 1,500 buildings in Portland, Seattle, and the Tri-Cities. The survey, in which seven Northwest electric utilities are participating, will yield the most advanced and comprehensive data base on commercial sector energy consumption available regionally or nationally. A final report, detailing findings and evaluation of the project, will be completed by September 1981.

Industrial sector energy consumption is being identified and analyzed using a different approach. Rather than employing a new survey to acquire data, BPA has retained a consultant to acquire existing data from many diverse sources. From secondary data sources, the consultant will construct a "synthetic" end-use energy data base. The data base will enable analysts to more accurately evaluate industrial electric energy conservation measures and to assess the regional conservation potential for industrial power consumption. This study, together with recommendations for BPA action, will be completed by October 1981.



The Boardman coal-fired power plant in northeastern Oregon came on line in mid-1980. Its 530-megawatt capability will help to reduce impending power deficits in the region. (Photo courtesy of Portland General Electric Company.)

George Gwinnutt, Director, Division of Power Requirements, holds the 12-volume report on BPA's residential end-use survey. He is flanked by Terence Esvelt (left) and Mark Roberts, who supervised the conduct of the survey and its analysis.





Blowing insulation in a Kalispell, Montana home is part of a BPA-sponsored energy conservation pilot project.

# Energy Conservation

In anticipation of the enactment of Public Law 96-501, our Branch of Energy Conservation was directed to formulate procedures for the planning, evaluation and conduct of regionwide energy conservation programs. These procedures have been translated into preliminary proposals for achieving specific kinds of energy savings in the residential, commercial, industrial and farm sectors. In the process, BPA staff have accrued valuable experience in (1) estimating fiscal and staffing requirements, (2) assessing potential energy savings, and (3) working out the mechanics of putting conservation to work through BPA Areas and local utilities.

## Home Weatherization Program

Under this pilot program initiated in 1980, some 2,600 homes in the region are being weatherized through BPA funding in cooperation with 12 publicly owned utilities. Homeowner customers simply apply to these utilities for an energy analysis of their houses, duplexes, or permanently sited mobile homes. Owners of electrically heated homes qualify for deferred, no-interest loans for cost-effective energy-saving measures. The local utility also arranges for bids from contractors, and, after each weatherization job is completed, checks the installation for satisfactory workmanship.

BPA pays the total cost of each weatherization job and carries the investment as an interest-free loan until the home is sold. Only then must the homeowner repay the

original cost of the job, which averages between \$1,500 and \$2,000. Even in these days of "no free lunch," all parties benefit. The homeowner saves between 15 and 50 percent on his use of electricity, year after year. On a cumulative basis, the utilities and BPA can avoid the expense of acquiring new increments of high-cost generation which tend to raise everyone's rates.

By the end of December 1980, weatherization had been installed in 252 homes under this program, for an estimated annual energy savings of nearly 2 million kilowatthours. In addition, the participating utilities report a backlog of 1,712 requests for home weatherization. Yet this may be only scratching the surface.



Measuring duct system for insulation is demonstrated at a home weatherization class held by BPA for its utility customers.

## ENERGY CONSERVATION

Including customers of all utilities in the region, there are an estimated 800,000 electrically heated homes which could benefit from the service. With the added authority of the new Act, BPA can tackle this much larger job—with resultant benefits to every electricity user in the Pacific Northwest.

### Solar Applications

While building weatherization appears to offer the greatest immediate savings in electricity usage, solar energy also has a considerable potential for replacing kilowatts in a variety of residential and commercial functions. BPA is therefore engaged in a number of pilot solar projects which should have regionwide application.

The most ambitious of these is the installation of 600 solar hot water systems in Northwest homes over the next 2-3 years. Working through six participating utilities, BPA is offering each system at \$750 below BPA's cost of about \$2,500, and further offering to finance the balance. We estimate that the \$750 subsidy will save at least that much in not having to acquire the same amount of electricity from a new power plant. The total cost of this pilot project is expected to range up to \$2.4 million. It is, however, being held in abeyance pending an Internal Revenue Service clarification with

respect to tax credits to homeowners.

In addition to this program, BPA will sponsor 50 to 100 workshops to teach people how to construct, install and maintain their own solar domestic hot water systems. These 2-1/2-day workshops should enable those attending to assemble and install their own systems at about half the cost of commercially built and installed systems.

In addition, BPA plans to "buy back" the electricity saved by those workshop participants who actually install their own solar hot water systems. Each participating homeowner will be paid \$500 upon approval of the completed system. The total estimated cost to BPA will be about \$400,000, but will save at least that much in terms of new generating facilities not having to be built.

Other BPA solar activities include a contract with the University of Oregon to compile and analyze solar insolation data in various locales, and BPA funding of a passive-solar home design contest. The latter is a trial program to be conducted jointly with Clark County Public Utility District in southwestern Washington.

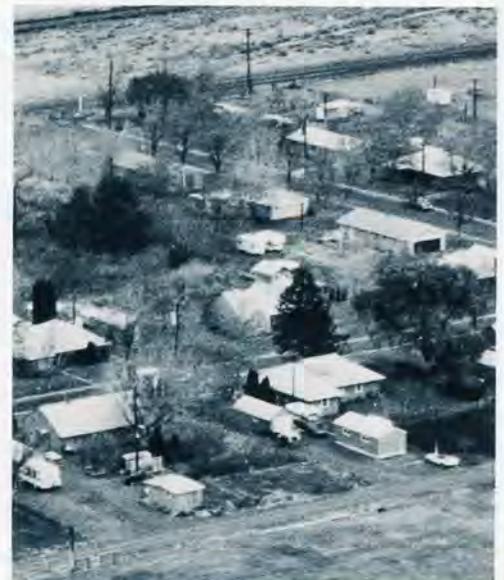
### Keeler Substation Maintenance Building

The BPA Keeler Substation Maintenance Building, located on the outskirts of Portland, Oregon, is a practical application of BPA's ongoing research and development in energy conservation. Designed by our architectural engineers, the building incorporates passive-solar features to reduce energy consumption. Three 28-bank tiers of double-glazed windows admit daylight to the office and workshop, reducing the need for artificial lighting and hence, cooling. Sunlight passing through these south-facing and roof-mounted clerestory windows strikes two interior thermal storage walls which absorb heat during the day and slowly release it at night. Supplemental heat is provided by a heat pump. During the heating season, the building's energy consumption will be monitored to assess the effectiveness of these energy conservation features.



BPA's Keeler Substation Maintenance Building near Portland, Oregon, has a passive-solar design.

BPA employees and their families at Midway, Washington, are active participants in a home energy conservation experiment.



## ENERGY CONSERVATION

### Other BPA Solar Facilities

The Keeler project is only the most recent of several BPA building conversions. Others include the prototype energy retrieval and solar system installed at the BPA Ross Substation in Vancouver, Washington, and a more elaborate system of solar heating and cooling at BPA's Big Eddy Substation near The Dalles, Oregon.

The most extensive experiment, involving a variety of energy-saving applications, is being conducted at Midway, a remote village in south-eastern Washington. Eighteen homes built there to house employees at the BPA Midway Substation are serving as a field laboratory for both weatherization and solar devices. This real-life experiment tests the effectiveness of various "mixes" of insulation, storm doors and windows, and different types of solar, heat pump, and point-of-use water heaters.

### Ongoing Projects

Expanding a program initiated in 1979, BPA joined with 24 publicly owned utilities and cooperatives during the 1980 irrigation season to test the efficiency of irrigation pumps throughout eastern Oregon, eastern Washington, western Montana and Idaho. Approximately 400 pumps were tested and the findings given to their owners. While the final results have not been tabulated, a large percentage of the pumps tested had efficiencies well below the 60 to 68-percent levels obtainable. By overhauling their pumps, farm customers in the region could save a sizeable amount of the \$23 million they paid for electricity in 1978. With the likelihood of future rate increases, there is even more incentive today to improve the efficiency of the pumps and other farm equipment.

For the fourth consecutive year, BPA sponsored a program using aerial infrared photography and ground-level portable infrared

scanners to identify heat losses in buildings. The infrared photographs are used by utilities to encourage their customers to install cost-effective weatherization.

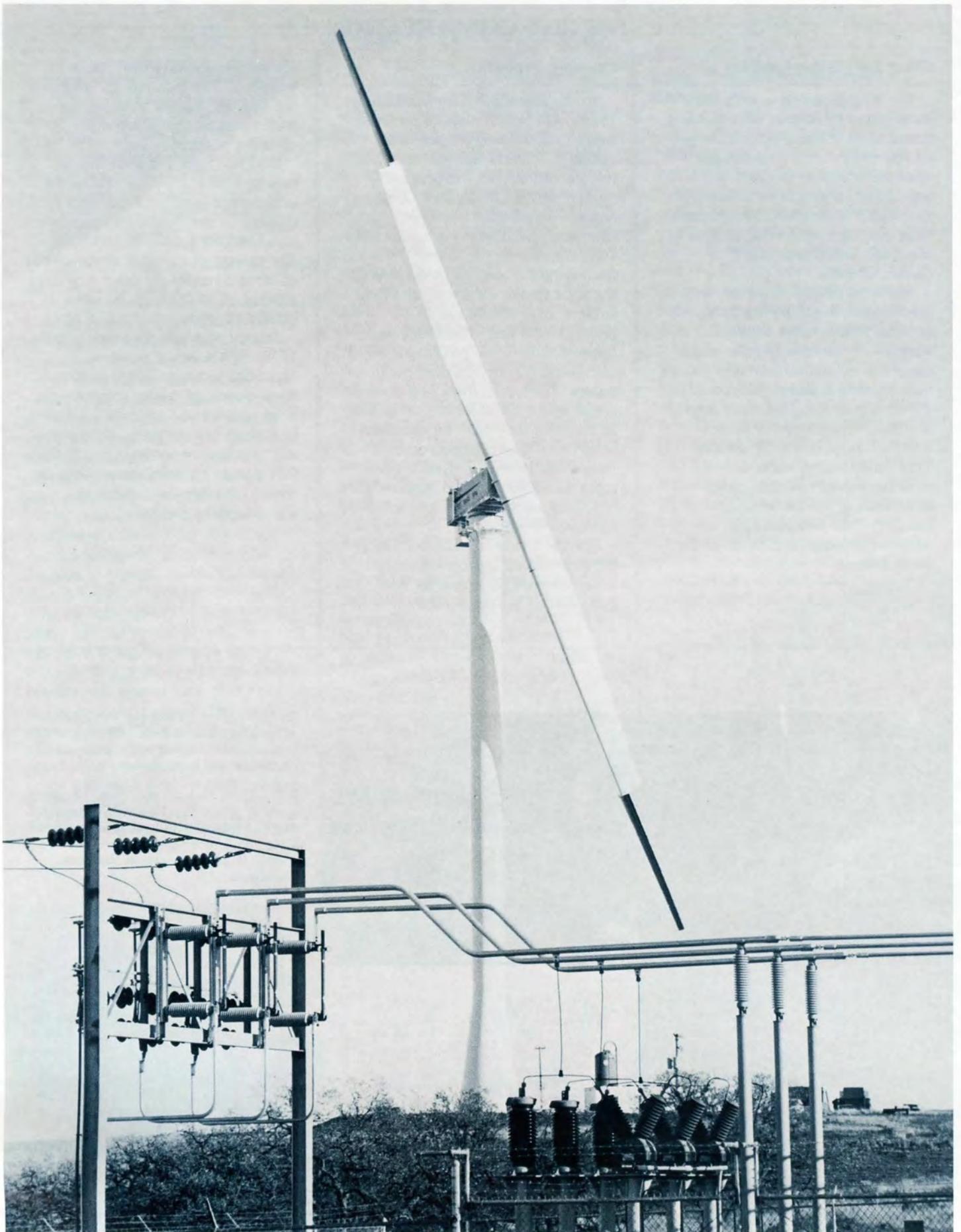
By 1980 BPA's fleet of electric cars had grown to nine. These test vehicles are used for interoffice mail delivery in the Portland/Vancouver area, and for local business trips. The newest models can attain speeds of 50 to 55 miles per hour and have a range of 40-50 miles between battery charges.

Started as a test program in early 1979, BPA's use of gasohol expanded to about 1,000 gallons a week dispensed during the past year. Both ethanol and methanol are used in various test mixtures, with generally satisfactory results. Several BPA fuel storage facilities throughout the region have been converted to accommodate gasohol.



On left, Kathryn Ekberg and Ralph Donat of the BPA Spokane Area staff check out an irrigation pump. Lower left is a drawing of an experimental earth-sheltered house being built in Wawawai County Park near Pullman, Washington. BPA is one of several sponsors of this energy-efficient structure, which includes passive-solar features. Below is one of the BPA fleet of electric cars based at the J.D. Ross Complex in Vancouver, Washington.





The first MOD-2 wind generator undergoes testing in December, 1980, with the BPA switching station in the foreground.

# Alternative & Renewable Resources

## World's Largest Windmills

By the time this 1980 Summary is published, the first of three giant windmills under construction near the Columbia River Gorge will be delivering power through the BPA grid. The MOD-2 wind turbine generators, designed and fabricated by the Boeing Company under the technical management of NASA's Lewis Research Center, will be the largest such machines ever built. The project is also the first test using a cluster of wind turbines to generate electricity for a utility grid.

Construction began at Goodnoe Hills in southern Washington in April 1980. By late October the nacelle containing the gear box and electrical components was installed atop the 200-foot Unit 1 tower, as was the 300-foot rotor blade. Testing and synchronization of the power system took place in November and December. Meanwhile construction progresses on the other two units, with all three windmills scheduled to be in service by mid-1981.

Each machine will have a rated electrical power output of 2-1/2 megawatts, and together they will be able to generate enough electricity to serve at least 2,000 homes. This demonstration project, which is funded by the Department of Energy, will be operated and maintained by BPA for a field-test period of about 2 years.

## Small Windmills

In April 1980, BPA installed two small or "family sized" windmills for residential customers of the Klickitat County Public Utility District in southern Washington. Nine more are scheduled to enter service at similar locations near the Columbia River Gorge in the spring of 1981. The windmills will range from 1-1/2 to 4 kilowatts in capacity, and cost between \$7,000 and \$15,000 to fabricate and erect.

While the two-windmill operation to date has yielded some useful data, a full year's experience will improve upon it. To ascertain how well the family sized units perform when connected with the utility grid, BPA is metering their performance. Power from the small windmills in excess of the individual home or farm needs will be fed into local utility lines.

BPA will retain ownership of the units for 5 years, during which it will underwrite their full costs. After 5 years, the homeowners may buy



A balloon release heralds the start-of-construction ceremony held at Goodnoe Hills wind generator site in April 1980.

## ALTERNATIVE & RENEWABLE RESOURCES

the machines for 10 percent of their original cost, assuring them of attractive prices for the output of these windmills.

In a related program, BPA is purchasing 140 anemometers or wind-measuring devices to assist homeowners throughout the region in determining whether or not their wind conditions might be suitable for small windmills. The anemometers will be loaned out through some 20 utilities and BPA offices, and should provide valuable information with respect to wind characteristics in various locales.

### Restart of Small Hydro Plant

BPA's exploration of the potential for renewable resource development is not limited to new projects or applications. We are also seeking out opportunities for reviving older facilities which may have been retired for economic reasons, but which could be cost-effective in today's energy market.

A relatively small but significant example is the Felt Hydro Plant owned by the Fall River Rural Electric Cooperative in eastern Idaho. Its two units, with a combined nameplate capacity of 1,405 kilowatts, were last operated in 1968. Discussions between the cooperative and our Idaho Falls District led to the rehabilitation of these units and their return to service in June 1980.

Under an agreement being negotiated with Fall River, BPA will purchase the plant output, which feeds into the BPA grid, for a period of at least 5 years. The purchase commitment allowed the cooperative to proceed with the plant's refurbishment and start-up.

Doubtless there are similar opportunities for acquiring small blocks of power at costs which are attractive by 1980 standards. Added together, these "reclaimed" energy increments could make an important contribution to overcoming the region's power deficits.



A technician helps to position the nacelle of the first "family sized" wind generator installed by BPA for a residential customer of Klickitat County PUD.

"Small is beautiful" exemplified by the Felt Hydro Plant in eastern Idaho.



One of the two Felt turbines from which Fall River Rural Electric Co-op supplies power to the BPA grid.



## ALTERNATIVE & RENEWABLE RESOURCES

### Photovoltaic Demonstration Projects

Of all the "exotic" energy systems now in the research and development stage, photovoltaic cells show perhaps the greatest promise for early and widespread use. Those involved in this new technology believe that it will be cost-effective for residential and commercial application within 5 to 10 years, and adaptable to central station power production as early as the mid-1990's.

Both to gain experience in this exciting field, and to test out some utility applications, BPA has been active in photovoltaics since 1968. We first used solar cells in our hydromet system—powering remote stations which measure and transmit streamflow and meteorological information which helps to forecast the hydroelectric power supply. More recently we have been installing solar arrays in our system of warning lights which alert aircraft to the presence of transmission towers at river crossings and near airports. Another internal application now

being tested is that of powering our microwave repeaters—the links which amplify and transmit signals between remote microwave stations, system control centers, and BPA substations. In all three applications, the use of photovoltaic cells appears to be cost-effective as well as energy-efficient.

Having gained valuable experience from these low-voltage applications, our engineers have undertaken several projects utilizing much larger and more sophisticated solar cell arrays.

...A mobile, solar-powered water pump system is being designed for use in irrigation, pumping well water, and other farming and construction operations.

...BPA's Redmond (Oregon) Maintenance Headquarters will be equipped with 10 kilowatts of solar cells on its roof to augment the building's power supply. Any excess power generated will be fed into the regional power grid.

...A considerably larger photovoltaic system will be installed at BPA's G.H. Bell Maintenance Headquarters near Spokane, Washington. This will provide comparison data under a different voltage range and different climatic conditions than the Redmond experiment.

...We are also exploring the possible use of photovoltaics in anti-corrosion devices to lengthen the life of our transmission towers, submarine cables, and substation equipment. These devices inject small amounts of electric current to replace electrons being dissolved in the oxidation or rusting process.

Testing of these projects will get underway in 1981. They are being funded jointly by the Department of Energy and BPA.



Assembling an aircraft warning light powered by solar photovoltaic cells.

## ALTERNATIVE & RENEWABLE RESOURCES

### Renewable Resource Assessments

In 1978 BPA undertook a comprehensive assessment of the region's potential for developing alternative energy resources. Those which seem to offer the best near-term development potential include biomass and cogeneration, small hydro and wind.

... **Biomass**—Some 34 million tons of forest, mill and farm residue, and municipal solid waste are produced annually in the Pacific Northwest. Of this, more than 7 million tons containing 88 trillion BTU's might be available for power production. The thrust of our ongoing biomass assessment is to identify opportunities and various economic, institutional and technical constraints relating to biomass

conversion. In addition to participating in several feasibility studies of biomass applications, BPA is providing partial funding of two biomass-fired cogeneration projects now in the planning stage, and a biomass energy farm experiment.

... **Cogeneration**—Our 2-year study shows that more than 80 percent of the region's cogeneration potential is in the forest products industry where mill, and to a lesser extent, logging residue would be the primary fuel. The average cost of power for plants starting operation in 1983 at 16 sites which received in-depth analyses would be about 4 cents per kilowatt-hour (based upon public ownership and tax-exempt

financing). With the current steam processing requirements of the region's industries, there is a potential for adding some 1,400 megawatts of industrial cogeneration and condensing cycle generation capacity.

... **Small Hydro**—On this subject, we rely heavily upon Corps of Engineers and Water and Power Resources Service studies of the potential at new and existing hydro sites. Preliminary results published in July 1980 indicate that hydro projects ranging up to 25 megawatts could add 310 MW average energy to the region's resource base from 107 sites at existing dams, and 1,800 MW average energy from 195

One of thousands of YUM piles (yarded unmerchantable material) left from Northwest logging operations. Unless reclaimed for energy production, this forest residue poses a fire hazard. (Photo courtesy of the U.S. Forest Service.)



## ALTERNATIVE & RENEWABLE RESOURCES

undeveloped sites. This theoretical potential will be substantially reduced when the specific sites are subjected to economic and environmental feasibility tests.

... **Wind**—BPA has recently completed its preliminary assessment of large-scale wind power potential based on data collected by Oregon State University. These studies indicate that the southern Oregon coast, Columbia River Gorge, and north-eastern Nevada are the prime areas for this resource. OSU estimates that at six of the best sites identified, there is sufficient wind to support a network of Northwest wind farms with a combined capacity of 3,000 megawatts. Experience with the

MOD-2 demonstration cluster and continuation of the Wind Energy Assessment Program will help to refine these preliminary estimates and assure that an inventory of potential wind sites is available when the wind technology attains commercial status.



The search for undeveloped waterpower sites enjoys a new popularity. Even the Anderson Ranch Dam on the Boise River (left), one of the smaller Federal projects, would dwarf many of the mini-hydro possibilities now under study. (Photo courtesy of the Water & Power Resources Service.)



Mount St. Helens—May 18, 1980—with Mount Hood in the background. (Photo courtesy of U.S. Geological Survey.)

# Operation & Maintenance

## Mount St. Helens Eruptions

The massive eruption of Mount St. Helens on May 18, 1980, removed the top 1,400 feet of the peak and deposited it in the form of volcanic ash over most of eastern Washington, northern Idaho, and western Montana. Some areas were inundated with as much as 6 inches of the powderlike substance. Subsequent lesser eruptions in June and July caused minor inconvenience, but nothing comparable to the May 18 blast.

The effect of this eruption on the Northwest transmission grid was serious but not catastrophic. The ash caused a number of localized utility outages and could pose continuing problems, particularly at substations with low-voltage service. BPA and utility maintenance crews were immediately placed on an emergency footing, and worked round-the-clock dusting, blowing, and washing ash deposits from substation and transmission equipment. Because of these

efforts, the BPA high-voltage system has suffered no outages or equipment damage as a direct result of the Mount St. Helens fallout.

It appears that dry ash is not a serious problem, but when exposed to mist or light drizzle it can become highly conductive, causing short circuits. In addition, ash recirculation caused by the wind could present a long-term maintenance problem, as would any future large eruptions of ash.

To date there have been no incidents of the volcanic ash having adverse effects on power generation facilities. However, the operation of three non-Federal hydroelectric dams in the Mount St. Helens vicinity could be jeopardized by erosion-caused flooding during this winter and spring.

For their tireless efforts in maintaining transmission facilities in volcanic fallout areas, 150 BPA employees received a Unit Award for Excellence of Service, with a certificate going to each recipient.

## System Reliability

Most U.S. utilities are wrestling with the many new problems and responsibilities stemming from the Nation's concern over energy supplies and their cost. A utility manager can no longer focus simply upon day-to-day operations, service complaints, and system planning. Instead he is swept up in the ferment of new challenges and mandates—energy conservation, rate structure reviews, renewable resource pilot projects, and load management techniques, to mention just a few.

But always lurking in the background is the specter of a catastrophic blackout such as those which paralyzed the Northeastern Seaboard in 1965 and New York City in 1977. Many utilities are skating on thin ice, confronted by growing loads while struggling with sky-high costs of adding facilities to serve them. Generation reserves continue to shrink, while trans-



Using a "cherry picker," a BPA maintenance worker blows volcanic ash from electrical equipment at the BPA Lower Monumental Substation in southeastern Washington.

## OPERATION & MAINTENANCE

mission additions are postponed or delayed for financial, legal, or political reasons. The cumulative result is to jeopardize the very bedrock of the utility creed—reliability of service.

At BPA our Engineering and Construction staff has teamed up with that of Operation and Maintenance in devising ways to avert major system disturbances—and to quickly correct them should they occur. The automated techniques which we employ also yield dividends in the normal grid operation by replacing manpower with electronic equipment. For instance, over the past 5 years, we have been able to reduce personnel at most of our substations by the installation of electronic monitoring and control systems which are observed and operated by our two dispatch centers. Today only eight of BPA's 357 substations are manned around-the-clock.

The communications necessary for exercising this control consist of 141 BPA microwave repeater stations beaming 463,494 miles of information channels throughout the

region. This microwave system is nearly as important as the transmission grid itself. It provides an early alert as to trouble spots, and transmits corrective instructions within milliseconds instead of the minutes it might take for manual control measures. To protect against the loss of microwave communication due to equipment failure or acts of nature, we have developed a microwave re-routing plan. This enables the electronic impulses to be "detoured" around trouble spots in the system and still reach the control center or substation to which they are directed.

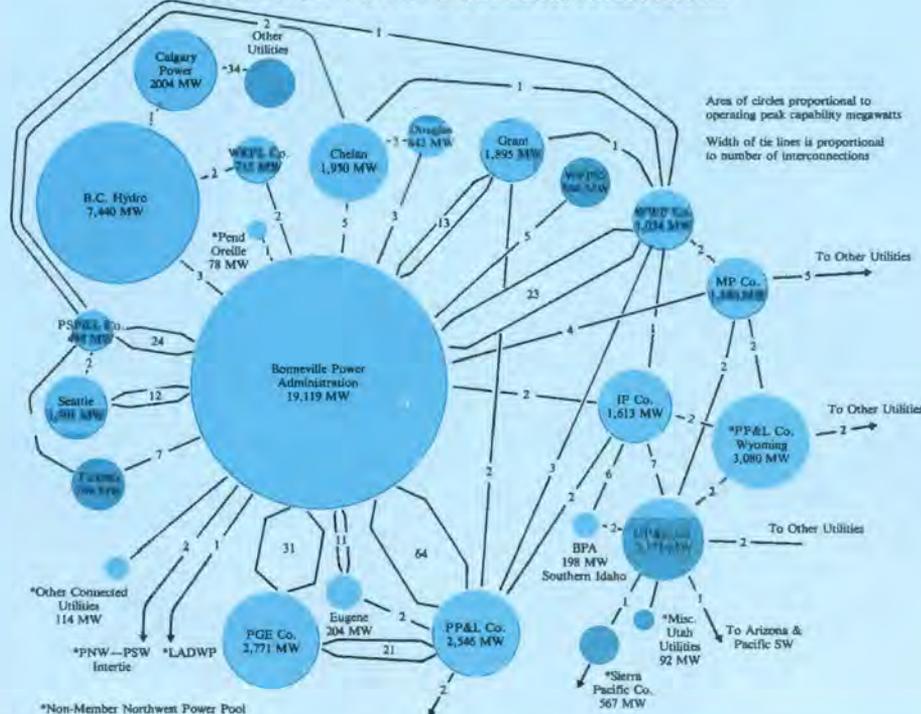
The BPA transmission grid is most vulnerable to system disturbances during periods of light Pacific Northwest generation and heavy power imports from neighboring regions. Under these circumstances, the loss of a large increment of Northwest generation could cause the system to "island," throwing the Northwest grid out of synchronism with neighboring systems. The systems would automatically separate, leaving the Northwest grid with a large generation deficit which would

cause a rapid decline in system frequency or speed. Unless this decline were quickly arrested, other Northwest generating plants would trip off-line in domino fashion, resulting in a widespread blackout.

To guard against such an eventuality, BPA engineers have developed a twofold corrective plan. The first of these is the high-speed Import Contingency Load Tripping scheme. The scheme senses the loss of key generating plants or major inter-regional transmission lines, and immediately drops, or disconnects by remote control, up to 3 million kilowatts of BPA industrial load under prearranged plans with our industrial customers. In most cases, this will stabilize the system without interrupting service to the rest of the region.

In the event this contingency plan fails, and islanding occurs, an Underfrequency Load Shedding plan goes into effect. Under this plan, all Northwest Power Pool members apply high-speed, solid-state underfrequency relays to shed up to 25 percent of the remaining regional load. The underfrequency relays are

### Northwest Power Pool Interconnections



## OPERATION & MAINTENANCE

pre-set to drop this load in seven successive blocks, each at a lower frequency, until the frequency decline is arrested.

But what happens if these contingency plans fail, and the Northwest grid suffers a total blackout? To confront such an unlikely occurrence, BPA has developed and is currently refining a System Restoration Plan. Its main objective is to give system dispatchers and substation operators the means to restore the power system in rapid sequence.

Such quick restoration is critical in minimizing the social and economic impact of a widespread loss of power. It has a special urgency in the case of aluminum smelters. If their potlines cannot be restarted within 45 minutes to an hour, the molten aluminum "freezes," which results in expensive overhaul of the equipment and several weeks' loss of production.

Given this urgency, however, attempting to restore too much of the load too hastily could cause a second or third system collapse, which would prolong the outage.

Our plan is therefore predicated on a two-stage response: first restore transmission to the aluminum loads within 45 minutes; and second, interconnect this transmission and restore the remaining system loads within 4 hours.

The restoration plan calls for initially picking up enough load and power generation to build a base transmission grid with a stabilized frequency. Once this is done, the remaining loads can be gradually picked up and synchronized with the base system grid.

To date, the Northwest power grid has not suffered a blackout of the magnitude described above, so we don't know whether the System Restoration Plan will work in actual practice. We have, however, run a number of system tests which indicate that the plan elements are essentially valid. This testing program is scheduled for completion by June 1981. Its successful implementation in terms of added power system refinements should enable the Pacific Northwest to avoid a prolonged loss of electrical service and the crippling impacts thereof.

As mentioned above, the Northwest power system is especially vulnerable to disruption during periods when electricity is being imported from outside the region. With the prospect of severe power deficits in the Pacific Northwest, we may look to increasing imports, both to meet our loads and to conserve water behind dams for later use.

The stability and system restoration schemes described above are hopefully a temporary expedient—methods of bridging the gap until sufficient generation and reinforcing transmission can be installed to make this region self-sufficient. In the interim, they show considerable promise for meeting a paramount utility criterion: reliable service at minimal cost.



The ability to interrupt service to aluminum potlines such as this one is a crucial factor in maintaining system stability when emergencies occur. (Photo courtesy of Western Aluminum Producers.)



Stringing conductor on the BPA Slatt-Marion line in northeastern Oregon.

# Engineering & Construction

## System Totals

During fiscal year 1980 approximately 2,090 circuit-miles of BPA transmission lines were in various stages of survey, design, and construction. Of this total, 180 circuit-miles of line were energized, bringing the system total to 12,794 circuit-miles at fiscal year-end. In addition, 7 new substations entered operation in FY 1980, for a total of 357 substations on the BPA transmission system.

The BPA transmission grid includes 265 circuit-miles of 800-kV direct-current lines. The totals for the remaining lines are 3,154 circuit-miles of 500-kV, 709 miles of 345-kV, 1,450 miles of 287-kV, 3,435 miles of 230-kV, 46 miles of 138-kV, and 3,736 miles of 115-kV or lower voltage lines. Transformer capacity for the system totaled 53,047,871 kVa at the end of the fiscal year.

Major transmission facilities under construction during FY 1980 included:

1. Construction of a 73-mile double-circuit 500-kV line from Ashe Substation on the Hanford Reser-

vation near Richland, Washington, to Slatt Substation near Arlington, Oregon. Two construction contracts of 51 miles and 22 miles were completed in October 1980. The latter included completion of a temporary wood pole facility crossing a Columbia River slough at Crow Butte Island.

2. Construction of a 152-mile double-circuit 500-kV line from Slatt Substation to Marion Substation near Salem, Oregon. This line was constructed under three construction contracts. The first contract covered 73 miles westward from Slatt Substation and was completed in September 1980. The second section under contract crosses Warm Springs Indian Reservation land and covers 37 miles. The third section is 42 miles long and continues the line into Marion Substation. The latter two segments were scheduled for completion in the spring of 1981.
3. Construction of a 2-mile double-circuit 230-kV line and conducting of 21 miles of the vacant side of existing double-

circuit 230-kV towers. These facilities will integrate power from the second powerhouse at Bonneville Dam into the BPA system during FY 1981.

## Opposition to Colstrip Transmission Corridor

In its early years, BPA drew accolades for introducing electricity to vast areas of the Pacific Northwest. Construction crews were often greeted with cheers and refreshments when they brought the "miracle of light" to farms and remote villages throughout the region.

Forty years later, the construction of a new transmission line is more likely to provoke protests and lawsuits than plaudits. Population growth, the increasing value of land, a growing concern for aesthetics and the environment—all cast a transmission right-of-way in the role of unpopular intruder, not a sign of progress. A forceful example is the controversy aroused by BPA's plan to build a double-circuit 500-kilovolt



Silhouette of substation equipment provides an interesting abstraction.

## ENGINEERING & CONSTRUCTION

line in western Montana.

The line in question will link the BPA grid with a transmission line to be built by The Montana Power Company for integrating the output of the latter's Colstrip Units 3 and 4. Most of the power from the two 700-MW coal-fired units being constructed in southeastern Montana will serve investor-owned utility loads in the Puget Sound area.

In November 1976 BPA was directed to take the lead in the preparation of a Federal environmental impact statement (EIS) on the proposed Colstrip project. A Federal interagency steering committee and study team were formed to analyze alternative corridors and to prepare the environmental studies. In 1977 The Montana Power Company, citing the provisions of the Federal Columbia River Transmission System Act, requested that BPA construct a portion of the transmission facilities on the western end.

After conditionally agreeing to this request, BPA was directed by Congress to proceed with the project in 1979. During 1978 and 1979 numerous public meetings were held in Montana as part of the planning process and preparation of the EIS.

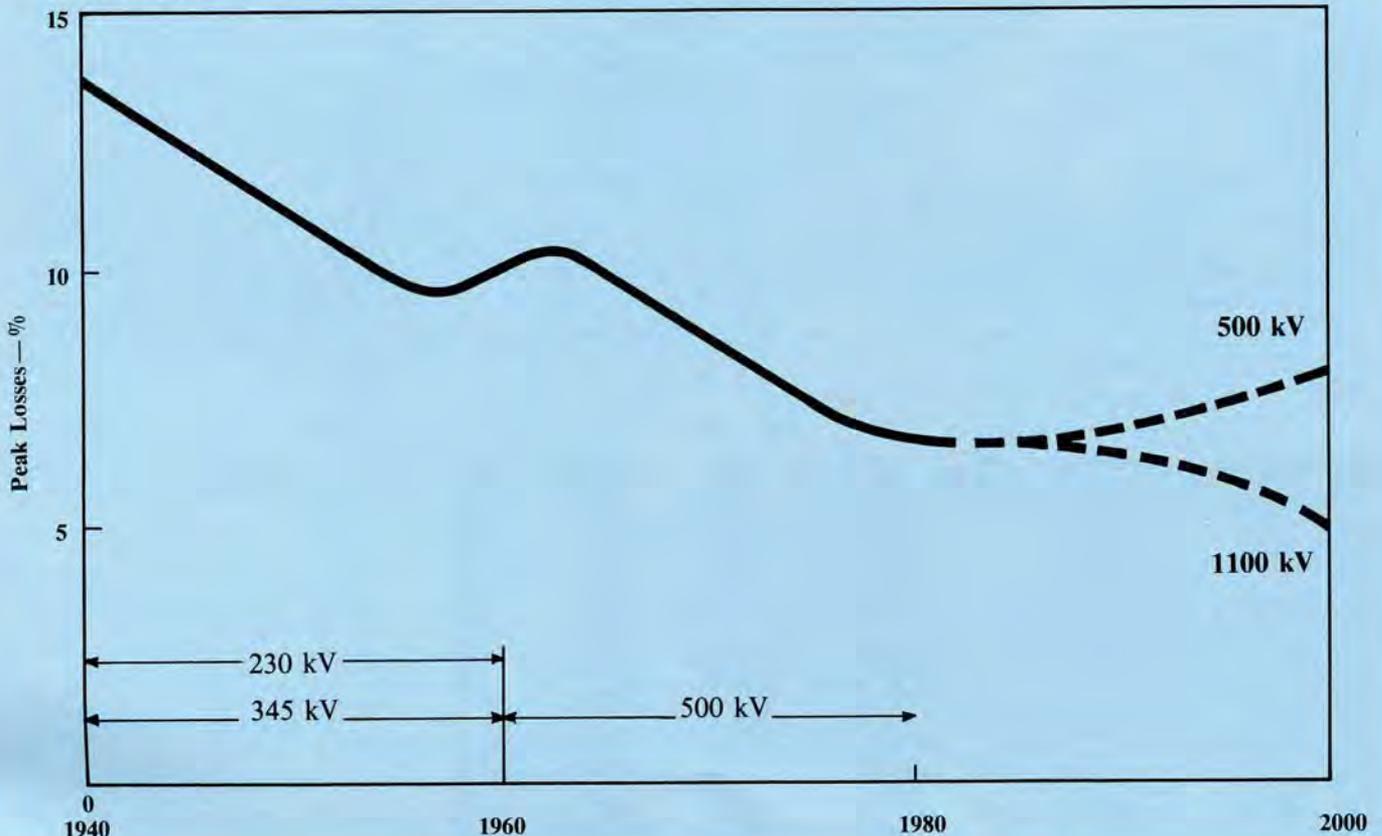
The final environmental impact statement was published in July 1979. Subsequently, the Forest Service (FS) and the Bureau of Land Management (BLM) filed a Record of Decision authorizing a Federal transmission corridor from Townsend, Montana, westward to Garrison, Montana, and continuing on to tie in with the BPA main grid either at Hot Springs, Montana, or at the BPA Bell Substation near Spokane, Washington. Several alternative routings are now being considered for this western segment of the line.

During calendar year 1980, BPA held more than a dozen public meetings in western Montana to describe the project and to elicit public comment on the centerline location. BPA representatives also attended numerous community meetings sponsored by local organizations, several of them chaired by members of the Montana Congressional delegation.

A barrage of opposition to the project and its routing has been voiced at the various meetings. Landowners and communities on the proposed right-of-way have organized resistance based on a number of premises. These include damage to esthetic values and farmlands, the alleged effect of high voltage on human, animal, and crop health, and other environmental grounds.

On May 30, 1980, the State of Montana filed a motion with the Ninth Circuit Court of Appeals in San Francisco seeking status as *amicus curiae* in a 1976 lawsuit filed

**System Losses**



against BPA by a group of landowners in southern Washington. This lawsuit, which the State of Washington subsequently joined, now rests with the Ninth Circuit Court. The requested intervention by the State of Montana is based on the premise that a Federal agency such as BPA should be required to comply with State siting laws and regulations.

Throughout its 4 years of planning and environmental analysis of the proposed transmission route and alternatives, BPA has endeavored to bring all concerned parties into the planning process. Public and agency comments, together with non-environmental issues, were summarized in a Federal corridor option document which was filed in draft and subsequently became part of the EIS. All agency and public comments were considered in making a corridor land use decision. The Record of Decision was dis-

tributed to several hundred interested agencies and organizations, as well as to local news media along the selected transmission route.

A supplement to the Colstrip EIS is now being prepared and will analyze corridor deviations suggested by landowners and other interested parties in the vicinity of Boulder and Deer Lodge, Montana.

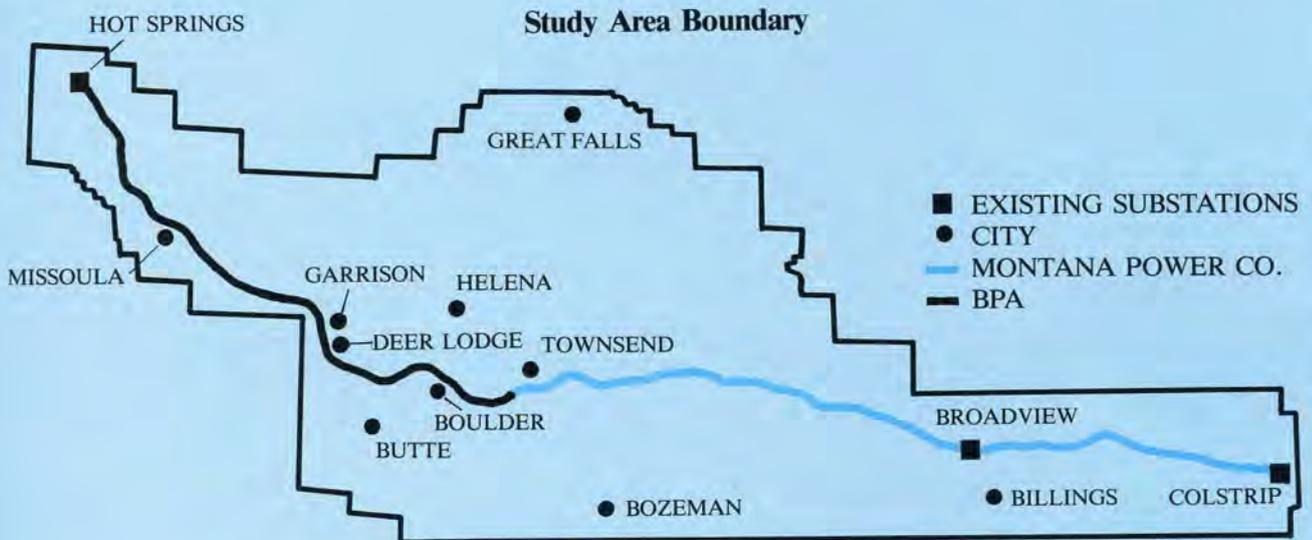
The entire controversy has received extensive news media coverage throughout the region, and opposition to the transmission line continues. This could have an adverse effect upon BPA's ability to complete the project by October 1983, when Colstrip No. 3 is scheduled to enter service.

**Crow Butte Crossing**

Another but more localized dispute concerning the routing of a BPA transmission line came to a head in FY 1980. This involves a double-circuit 500-kV line across the Columbia River at Crow Butte Island near Boardman, Oregon.

Planning and environmental analysis for the Ashe-Willamette Valley transmission line began in 1974. The Crow Butte crossing is a portion of the Ashe-Slatt segment of this line. The line is required to assure system reliability and to deliver power from the Hanford Reservation, the Lower Snake River hydroplants, and an Eastern Oregon coal-fired project to the Willamette Valley.

Prolonged studies of various river crossing routes led to the selection of Crow Butte as being the most economical and least disruptive to irrigated farmlands on both sides of



This map shows the Colstrip transmission corridor approved by the Federal interagency study team in September 1979. Since then numerous deviations and alternative routings to the BPA segment of the corridor have been proposed. These are currently undergoing close analysis.

## ENGINEERING & CONSTRUCTION

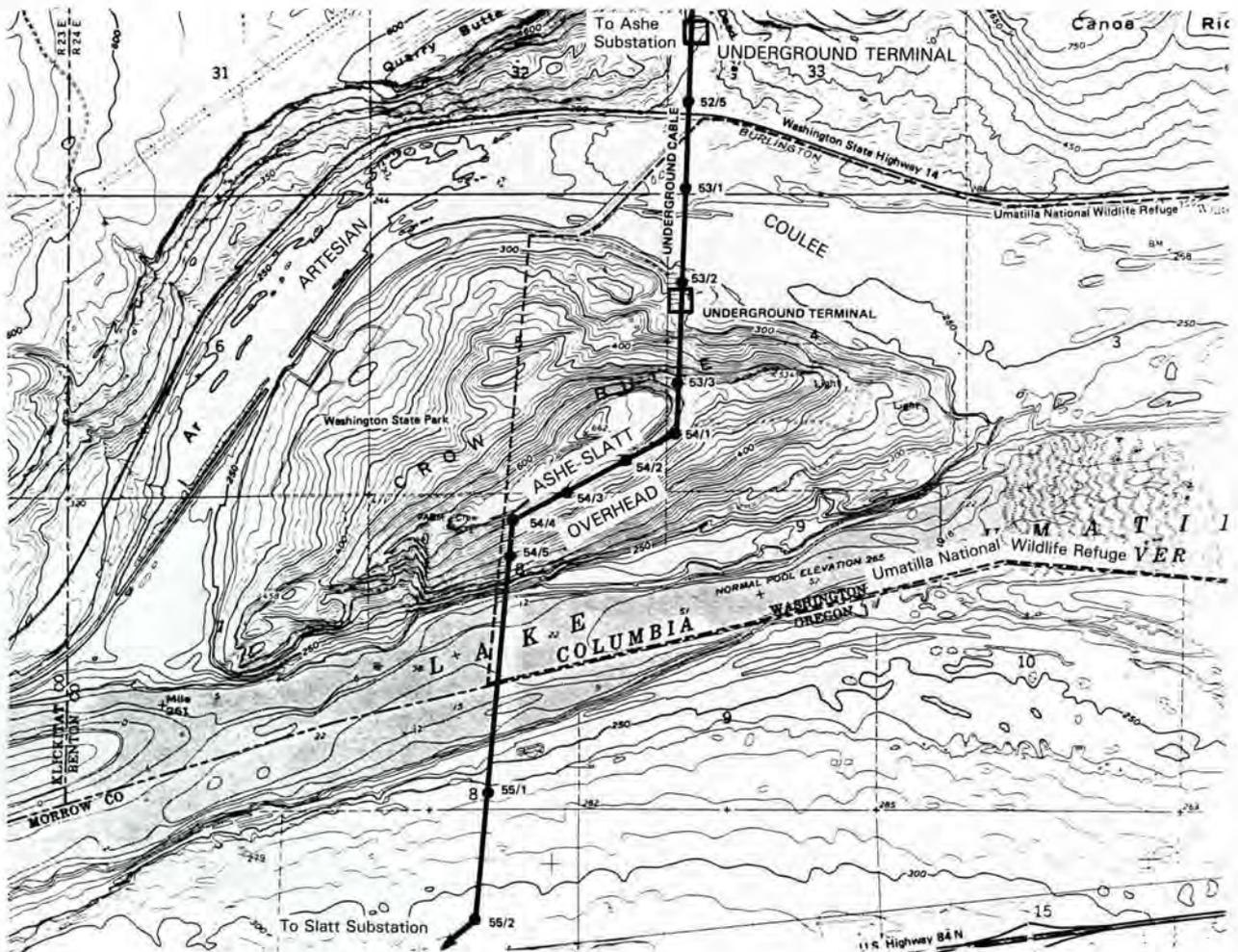
the river. The selected route, however, crosses a portion of the Umatilla National Wildlife Refuge at Crow Butte, a waterfowl habitat. This aroused considerable concern, particularly on the part of the U.S. Fish and Wildlife Service (FWS), which emphatically opposed the issuance of a U.S. Army Corps of Engineers' (COE) Section 10 permit and a right-of-way across the refuge area. Although the routing was approved by the States of Washington and Oregon, FWS continued its resistance to the project even after the COE permit had been issued. To further complicate the matter, an environmental organization and three individuals filed suit against the project in April 1980.

Numerous meetings between BPA and FWS resulted in a May 1980 agreement whereby FWS accepted the COE Section 10 permit with several stipulations. This amended permit requires BPA, subject to NEPA compliance, to install an underground and underwater cable across the slough north of Crow Butte Island to the first transmission tower on the island. While this is being done, BPA is permitted to build and operate a temporary wood pole line, to be replaced by the subsurface cable within 3 years. The remainder of the line, both on the island and the crossing into Oregon, is of conventional above-ground construction.

BPA is also required to finance and undertake a joint study with FWS to determine the effect of the transmission line on the waterfowl. Depending upon the study results, BPA will provide mitigation "as reasonable" to compensate for the effect of the overhead line.

As a result of the agreement with FWS, the lawsuit has been proposed for dismissal. However, a number of property owners in the vicinity of Crow Butte are protesting the need for the subsurface transmission. They contend that BPA would spend an inordinate amount of money for the questionable protection of a few ducks, and that the cable location could jeopardize their land development plans. This group is threaten-

Map of Crow Butte Island and surroundings. The temporary wood pole line is parallel to the proposed underground cable and some 40 feet east of it.



## ENGINEERING & CONSTRUCTION

ing to seek an injunction against construction of the subsurface facility.

In the meantime, we have completed construction of the temporary wood pole facility and are preparing the environmental documentation necessary to proceed with constructing the subsurface installation. BPA and FWS are also closely monitoring the effect of the overhead transmission line on the waterfowl.

To date, those monitoring the waterfowl activity have observed no duck collisions with transmission lines at or near the river crossing, nor have they documented more than a few mortalities. This is despite the fact that an FWS aerial survey taken in mid-December 1980

indicated the presence of some 330,000 waterfowl in the vicinity of Crow Butte.

Based upon preliminary engineering studies, the subsurface cable will add some \$8.7 million to the cost of the project. The difficulty of gaining maintenance access to the cable, however, may require a more elaborate system and perhaps a backup facility which could substantially increase the cost. There will also be additional costs for the waterfowl impact study and for possible mitigation should the results of the study so indicate.

BPA management is keenly aware that these added costs will come out of the ratepayer's wallet. The alternatives, on the other hand, are the

prospect of lengthy litigation or devising a new route for the line. The former would conflict with the critical need for placing the Ashe-Slatt line in service. As for alternative routing, a number of river crossing routes were studied early-on and subsequently discarded. Most of them would substantially increase the transmission line's mileage, and hence its cost. Others would have serious environmental consequences or a disruptive effect upon irrigated farmland bordering the river.

In December 1980, the Chairman, Subcommittee on Energy and Water Development of the House Committee on Appropriations, contacted the Secretary of Energy with respect to the proposed Crow Butte crossing

Migrating waterfowl from Canada have any number of customary wintering areas throughout the Pacific Northwest.



plan. The Chairman expressed concern about the cost of the underwater crossing, and requested additional information regarding alternative routings and their cost/benefit ratios. He suggested that BPA not make any firm commitment on the crossing and mitigation plan pending Subcommittee hearings on the BPA program for FY 1982.

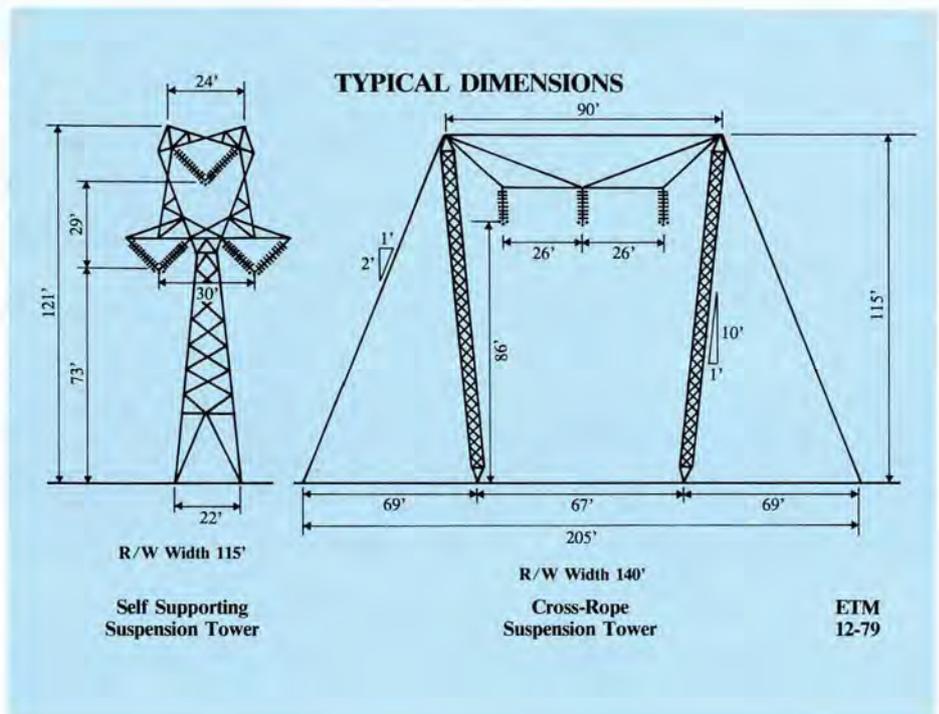
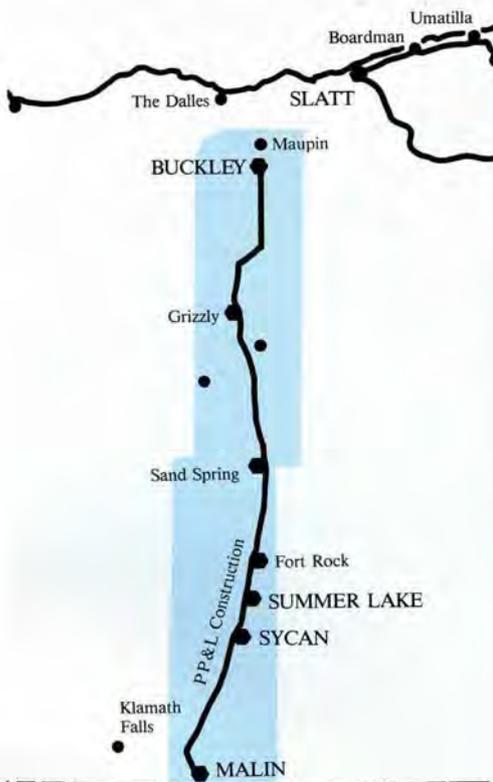
**Buckley-Summer Lake Line**

From a transmission technology viewpoint, one of the most interesting projects now in the design stage is the 500-kV Buckley-Summer Lake line. This 156-mile link, to extend from northcentral to southern Oregon, is scheduled for energization in late 1982. It will serve a number of purposes, including reinforcement of southwestern Oregon service, back-up for the Midpoint-Malin line, and added capacity to serve BPA loads in southern Idaho.

An integral part of this project is the new Buckley Substation to be built near Maupin, Oregon. While most of this area is prime farmland, our surveyors identified a parcel of otherwise unuseable land for the

facility — but one too small for normal substation configuration. With encouragement from the local property owners, our engineering staff designed a prototype installation requiring less than one-half the space of a conventional substation. Its salient feature is the use of compressed gas insulation (CGI) instead of oil or air for substation components. Heretofore CGI has mainly been used by BPA for underground cables.

If this experimental substation system proves to be successful, it should have wide application in built-up areas or others in which land is at a premium.



## New Tower Design

Another interesting feature of the Buckley-Summer Lake line will be the use of cross rope suspension structures on a 26-mile central segment of the line. The cross rope concept is relatively new and provides for the replacement of lattice steel in the upper portions of the structure by a system of wire rope suspension assemblies. The latter's advantages include simpler manufacture, ease of erection, and fewer structures per mile. These benefits are partially offset by wider right-of-way requirements, unsuitability for rugged or intensively used land, and the need for innovative maintenance practices. However, it is anticipated that the prototype system will result in construction savings of 5-10 percent on this stretch of 500-kV line. More importantly, at higher voltages such as 1100-kV, savings of 25 percent or greater may be achieved.

The Buckley-Summer Lake application will be used to gain experience in design and to develop construction and maintenance techniques for other high-voltage and ultra-high-voltage applications. To date there are no cross rope suspension structures in U.S. commercial use, so that BPA is once again pioneering a new transmission technology.

## Occupational Health Study

The increase in transmission voltages to 500 to 700-kV in many parts of the globe over the past dozen or so years has raised serious questions with respect to the effects of electric fields on persons working around high-voltage facilities. Several U.S. electric utilities have experienced litigation and prolonged regulatory delays arising from such occupational health concerns. Early epidemiological studies conducted in the Soviet Union and Sweden several years ago focused increased attention on this subject.

As a leader in the development of power transmission technology, BPA has taken a strong interest in the health effects of high voltage, especially in view of the above preliminary and rather inconclusive studies. Accordingly, in December 1979 we embarked upon a two-phase epidemiological study of BPA's high-voltage workers. Phase 1 of the study deals with developing a study methodology, selecting scientific and medical consultants, and acquainting BPA personnel with the purpose and nature of the project. Phase 1 is scheduled for completion in March 1981. Contingent upon the successful completion of the first phase, the actual health study of selected high-voltage workers will be undertaken in the spring of 1981.

The Soviet and Swedish studies both had two salient shortcomings—the small numbers of subjects involved, and the fact that exposures to electric fields were estimated, not measured. By contrast, the BPA study will involve at least 300 employee volunteers whose exposures will be scientifically monitored. The latter is made possible by an innovative Phase 1 development, the BPA Electric Field Exposure Monitor (EFEM). This portable device permits continuous exposure readings to be taken in the field, from which coded exposure data on individual workers can be compiled and correlated.

Should Phase 2 be undertaken, it will utilize the services of an organization qualified in epidemiology to perform the health examinations, analyze the collected data, and draft the study results. The study is due for completion in October 1982. Regardless of its outcome, we anticipate that the study will establish a notable benchmark in the growing body of knowledge concerning the health effects of exposure to electric fields associated with high-voltage facilities.



The BPA Electric Field Exposure Monitor can easily be worn while working around high-voltage facilities. Photo on right shows the monitor being plugged into a computerized recorder for compiling exposure data.



## Computer-Aided Design

The Division of Substation and Control Engineering has installed a computer-aided design system which does design work and produces drawings for the construction of substations and microwave radio stations. It does this faster and cheaper than people can do the same work.

The computer stores parts of drawings, which are called cells, in its memory bank. When told what is needed for an installation, the computer calls up the required cells and creates a "quick print." This print is checked by a design

engineer. Any corrections needed are made and fed back into the computer. Upon command, the computer then produces a finished drawing on its plotter. We expect the system to reduce the time required to produce drawings by about 50 percent.

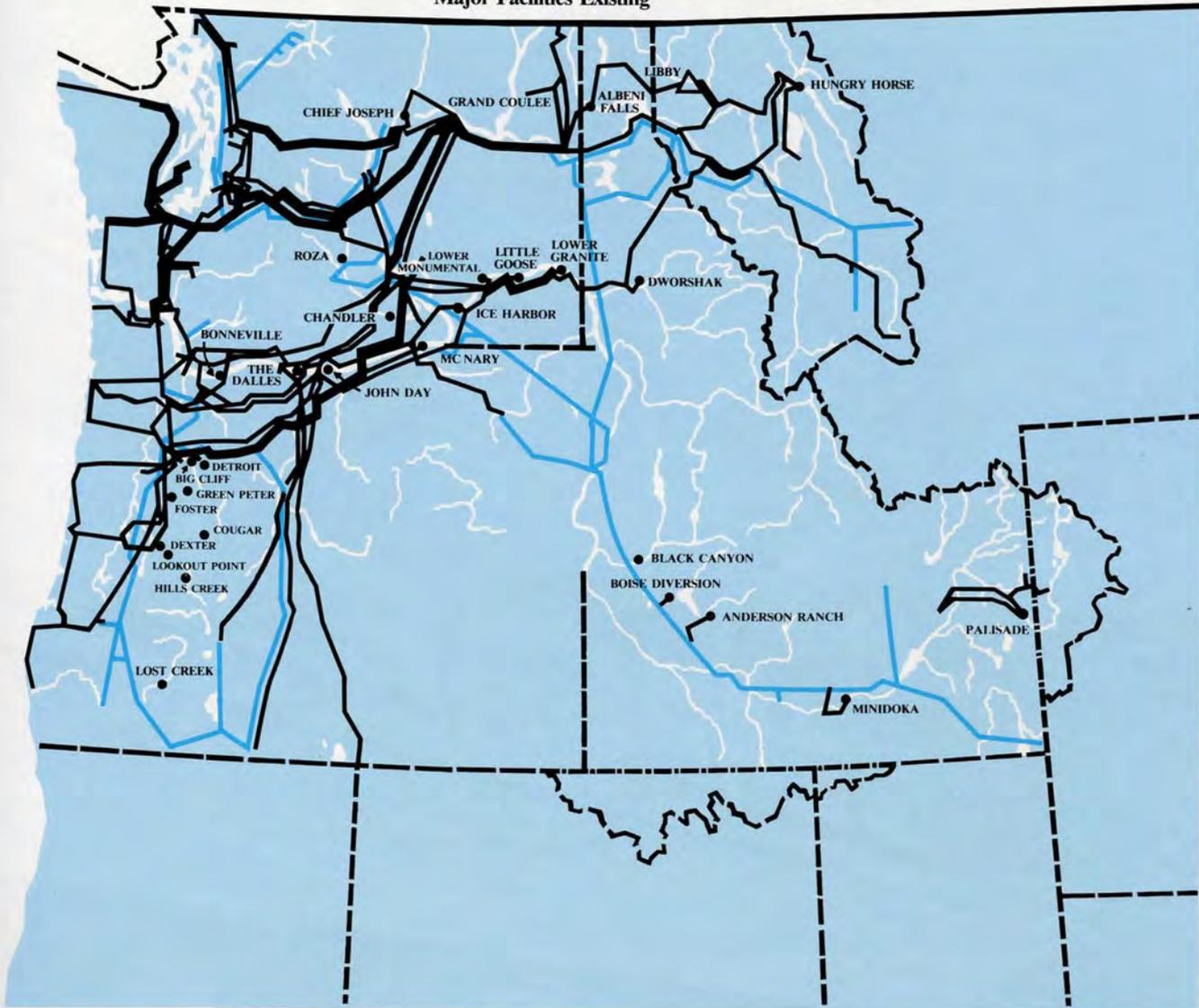
Wiring drawings are created directly from schematic diagrams and the inputs processed with great accuracy. This further reduces the time factor as well as human error.

The automated system is a major step forward in standardizing substation components. Not only does it relieve the design and procurement workload, but it offers a considerable saving in staff resources. With our new responsibilities mandated by Congress, some of the BPA technical staff can be shifted to other, more challenging assignments.

A BPA engineer selects schematic designs from a computer memory bank to help plan new transmission components.



**Pacific Northwest Power System**  
Major Facilities Existing



- MAJOR BPA TRANSMISSION FACILITIES
- MAJOR NON-BPA TRANSMISSION FACILITIES
- FEDERAL HYDROELECTRIC DAM
- ▲ COLUMBIA RIVER TREATY DAMS



BPA headquarters building in Portland, Oregon.

# Administrative & Financial Management

<p><b>Organizational Changes</b></p>	<p>To reflect the need for close liaison and interaction with the Pacific Northwest Electric Power and Conservation Planning Council created by P.L. 96-501, a new position of Assistant to the Administrator has been established as the principal BPA contact with the Council and its staff.</p>	<p>employees and other Federal staff. The existing BPA building would be renovated to house some 925 Federal employees in the Portland area.</p> <p>If the new building is completed in 1989 as called for in the GSA prospectus, it would cost an estimated \$97.8 million. If completed in 1986, as originally proposed, it would cost an estimated \$77.6 million. In either case, GSA is proposing, as strongly recommended by BPA, that the new building incorporate the most advanced energy-efficient design in facilities to demonstrate the practicality of such measures.</p>
<p>In anticipation of the enactment of P.L. 96-501, BPA staff had undertaken a thoroughgoing review of the agency's management structure vis-a-vis the functional responsibilities and priorities inherent in the legislation. This resulted in several major organizational changes in January 1981.</p> <p>The most important of these is the establishment of the Office of Financial Management headed by an Assistant Administrator (Financial Manager) reporting directly to the Administrator. The realignment will strengthen management's ability to integrate financial planning, resource management, and program evaluation and control. It reinforces the provisions of the Act by providing a comprehensive financial oversight of all internal and external BPA functions and responsibilities.</p> <p>The importance of energy conservation activities has been formally recognized by the establishment of the Division of Conservation. The Director of this Division reports directly to the Assistant Administrator for Power Management (Power Manager). Similarly, the establishment of the Division of Power Requirements underlines the need for strengthening BPA's role in load forecasting, energy resource evaluation, and coordinated power planning. This Division Director also reports directly to the Power Manager.</p>	<p><b>Future BPA Office Space</b></p> <p>A proposal to build a new BPA headquarters building in Portland, Oregon, has been reviewed by the General Services Administration (GSA) and is currently under consideration by the Office of Management and Budget. The new facility would be constructed on the south side of the present BPA building and would house some 1,500 BPA employees in about 267,000 square feet of space. An additional 90,000 square feet would accommodate some 500 Department of the Interior</p>	<p>While planning for the new building goes forward, arrangements are being made to provide improved BPA office space on an interim basis. In September 1980, Congress authorized GSA to proceed with a lease consolidation for space now under construction within two blocks of the BPA headquarters building. The space is scheduled to become available in mid-1981.</p> <p>This will free up existing space for neighboring Federal agencies, and permit us to house the BPA headquarters staff in two buildings rather than the present seven. Systems furniture will be provided in this move, with a 10-percent saving in the amount of office space originally contemplated. The relocation will coincide with a changeover in telephone service from the antiquated PBX to the GSA Centrex system for all BPA offices in Portland.</p>



Dotted lines indicate the approximate site of the future BPA headquarters building adjacent to the present one. Arrow points to Lloyd Center Tower where interim leased space will help consolidate BPA operations in Portland.

# Financial Section

## The Financial Year

Federal Columbia River Power System (FCRPS) gross operating revenues totaled \$512.5 million for FY 1980, an increase of \$215.9 million (73 percent) compared to FY 1979. However, expenses for FY 1980 totaled \$572.0 million, an increase of \$205.5 million (56 percent) compared to FY 1979. This resulted in a deficit for FY 1980 of \$59.5 million on a cost accounting basis. The deficit was increased from \$15.3 million by the one-time write-off of \$44.2 million of Trojan Nuclear Project net billing advances that had been accumulated in prior years as prepaid costs.

The substantial increase in revenues was due primarily to the wholesale power rate increase which went into effect on December 20, 1979. Also, more secondary energy was available due to actual firm energy loads being less than estimated and temperatures and precipitation being at or above normal throughout the spring and early summer. Revenues from sales to publicly owned utilities increased by \$111.3 million (76 percent), to privately owned utilities by \$27.4 million (57 percent), to Federal agencies by \$3.2 million (66 percent), to aluminum industries by \$63.5 million (119 percent), and to other industries by \$7.8 million (170 percent) above FY 1979 levels.

In FY 1980 BPA revised its procedure for allocating general and administrative costs to reflect more accurately the relative magnitude of its programs. This change decreased

costs capitalized as utility plant and increased costs expensed as operation and maintenance expense by approximately \$8.7 million. This change, coupled with continued inflation, increased total operation and maintenance expense by \$30.9 million (25 percent) over FY 1979. High interest rates on BPA borrowings and increased investment in existing generating projects combined to increase net interest expense by \$15.8 million (9.4 percent). Purchase and exchange power expense increased the most dramatically, by \$113.3 Million (450 percent). This was due primarily to the effect of expensing, beginning December 20, 1979, \$88.9 million of payments and billing credits for WPPSS Nuclear Projects Nos. 1 and 2. Formerly, these costs were recorded as deferred charges and were to be amortized over the projects' estimated useful lives beginning with their dates of commercial operation. The change was made because the new power rates effective December 20, 1979, provided for current recovery of such thermal project costs.

The remaining major component of the FY 1980 expense increase is a \$44.2 million write-off of Trojan Nuclear Project payments and billing credits recorded in prior years as deferred charges. The terms of the Trojan Nuclear Project net billing agreements, under which the Eugene Water and Electric Board (EWEB) assigned its 30-percent share of the project capability to BPA and other participants, contained a provision allowing EWEB to withdraw the project capability for use in its own system beginning in 1984. Had EWEB exercised its withdrawal rights, a settlement for BPA's prepaid Trojan costs would have been negotiated at the time of the withdrawal. On July 1, 1980, EWEB's right to withdraw expired, and the balance of BPA's prepaid Trojan cost was charged to FY 1980 expense.

Increased expenses and the write-off of the Trojan Nuclear Project net billing advances more than offset the increased revenues provided by the power rate increase, producing for the FCRPS a deficit for the year of \$59.5 million on a cost accounting basis. At the end of FY 1976 cumulative net revenues totaled \$385 million, due to many profitable years. Four consecutive years of deficits have reduced cumulative net revenues to \$183 million at the end of FY 1980. However, effective in 1981, rate changes can be made each July 1 which should begin to correct the recent deficit trend.

## FINANCIAL SECTION

### Basis for Financial Reporting

BPA prepares financial statements for the FCRPS on a cost accounting basis to assess its financial condition from the viewpoint of a commercial enterprise. The financial statements are independently audited by the firm of Coopers & Lybrand, certified public accountants, in accordance with generally accepted auditing standards. The complete financial statements with the auditor's opinion appear on pages 61 through 73. A graphic portrayal of financial results on this basis appears on page 53.

Power rates, however, are not set to recover costs as determined on the cost accounting basis, but are based upon what is called the repayment basis. This report also includes the FCRPS repayment study (Table 5, pages 58 and 59, and graphs on page 53.)

The cost accounting financial statements present financial results

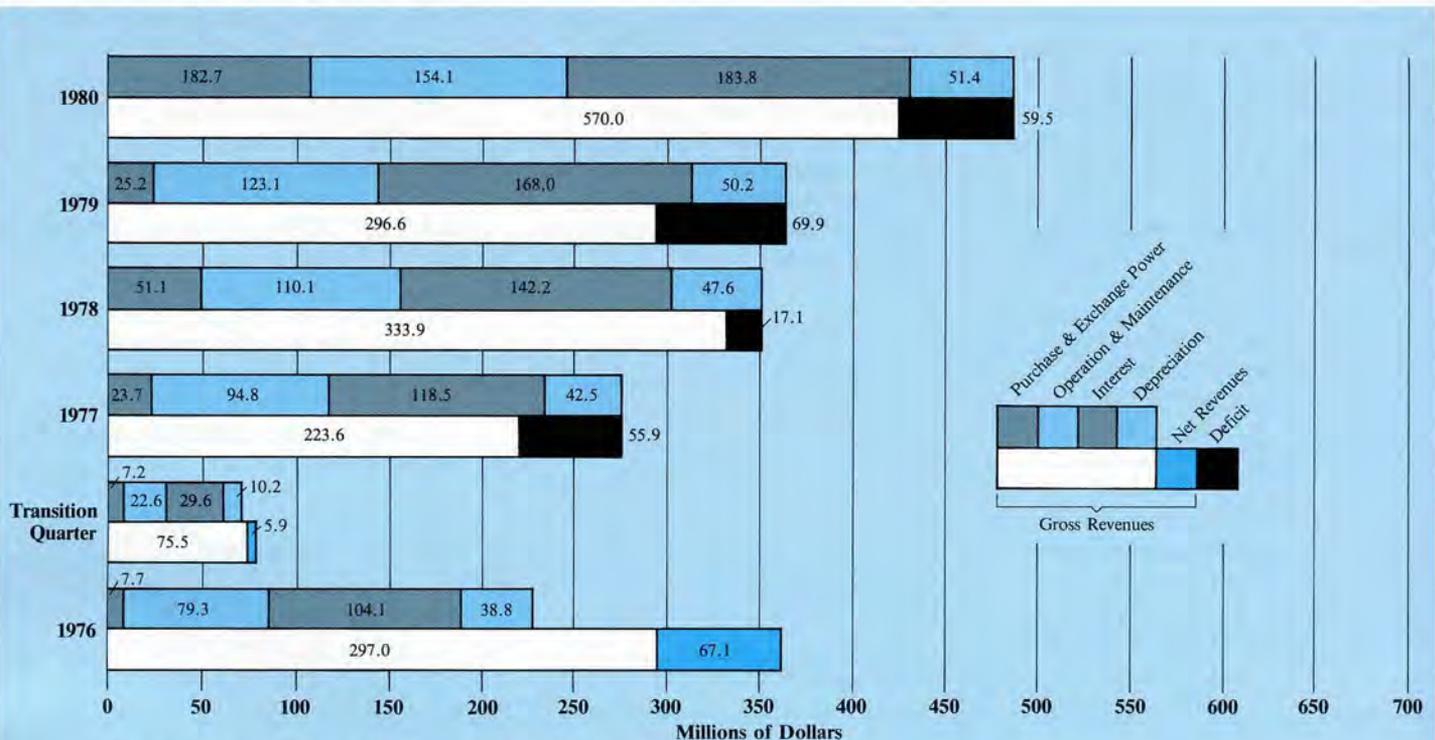
on an annual basis. The repayment study consists of long-range forecasts of future revenues and expenses and the repayment of the investment in power facilities. The two sets of financial reports measure two different things, current financial results in the cost-accounting statements and future financial requirements in the repayment study.

The cost accounting financial statements include depreciation of the power facilities over their expected useful lives, which extend up to 100 years in some cases. The

repayment policy (see page 60), however, requires that the investment in all power facilities be fully repaid within 50 years of each facility being placed in service. The level of revenue required to meet the repayment requirement is higher than needed to cover costs on the cost accounting basis.

Another major difference between the two is that prior to December 20, 1979, estimated net billing advances were included as annual costs in the repayment study while on the cost accounting statements these costs were shown as deferred expenses until the plants start operating. However, beginning December 20, 1979, net billing advances were charged to expense on a current basis for cost-accounting purposes. For a reconciliation of cost accounting results to the repayment study, see schedule B on page 71.

## Revenue and Expense Trend



1) For FY 80 includes \$44.2 million write-off of Trojan Nuclear Project net billing advances.

## FINANCIAL SECTION

### Repayment Study

The repayment study included in this report (Table 5, page 58) demonstrates that current BPA rates are not sufficient to meet all the FCRPS repayment requirements as forecasted for the next one-year rate period (July 1, 1981, to June 30, 1982). As shown in Table 5, under Column 12, **Amortization**, beginning in FY 1981 and throughout the repayment study period, BPA does not have sufficient revenues to pay all current obligations and to amortize any of the FCRPS investment which has been placed in service. This revenue insufficiency is also depicted on the Repayment Study Chart on page 53. This chart shows that repayment requirements are not being met as long as the Unamortized Investment Line is above the Allowable Unamortized Investment Line. The corresponding annual amounts for Unamortized Investment and Allowable Unamortized Investment are included in Table 5, under Columns 13 and 16.

Recognizing the need to increase revenues, BPA in March, 1980, began developing a new preliminary repayment study for its next rate filing. This study was completed in May 1980 and the results, which

indicated the need for an approximate 50-percent revenue increase, were announced at BPA's May, 1980, customer meetings. The 50-percent revenue increase study underwent continuous review and refinement during 1980 and was discussed at many meetings with various customer organizations. It will be included as part of an Initial Rate Proposal for the July 1, 1981, rate increase.

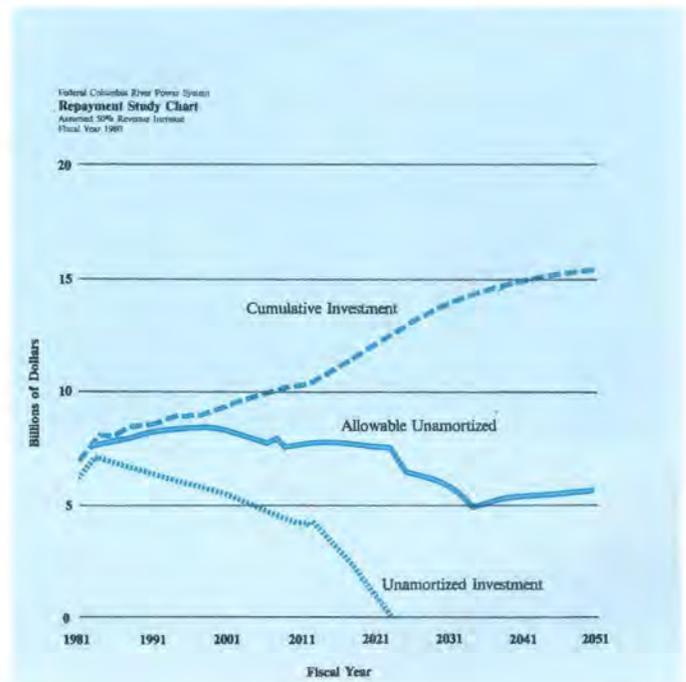
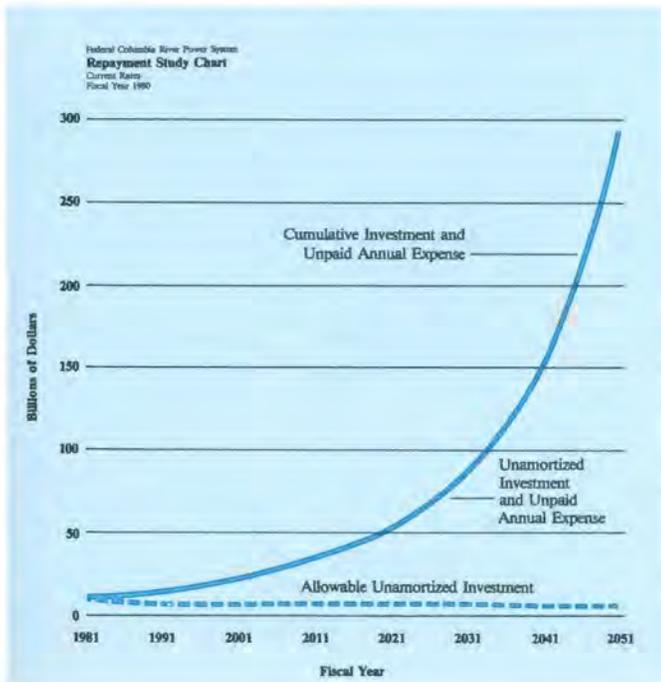
A second graph based on the preliminary 50-percent revenue increase Repayment Study, which shows that BPA's Investment will be amortized within allowable limits, is shown on page 53.

A Final Repayment Study will be prepared in March 1981 for the Final Rate Filing to be submitted to the Federal Energy Regulatory Commission (FERC) by June 1981. The Final Repayment Study will be updated to include new estimated cost and revenue data and actual cumulative historical revenue and costs through September 30, 1980. This study may indicate a need for a revenue increase different from the 50 percent indicated by the preliminary study.

It should also be noted that at the time the preliminary repayment

study was prepared, actual FY 1980 financial results were not yet known and FY 1980 revenues and costs were included in the study on an estimated basis. These estimates were based on the presumption of average water conditions with the knowledge that some years will turn out to be above average and others below average. As it turned out, FY 1980 was an above-average year due to good streamflows, and actual revenues rose to \$24.0 million above the estimate, while O&M expense was less than the estimate by \$.8 million. However, these variations, which are shown on the "adjustments" line on the repayment table, can be expected to be offset at sometime in the future by a below-average revenue year. If this should not occur, the effect will be taken into account in future rate adjustments.

To comply with the requirements of Public Law 89-448 for an annual report to the President and the Congress which includes all authorized Federal power facilities, a note to the repayment study (page 60) lists the authorized projects not specifically included in the repayment study, together with pertinent data thereof.



## FINANCIAL SECTION

Table 1

### Electric Energy Account

Fiscal Year 1980

#### Energy Received (millions of kilowatthours) (Energy Generated for BPA)

Water & Power Resources Service	20,048
Corps of Engineers	54,159
Hanford Steam Plant (NPR)	3,045
Centralia Thermal Project	2,182
Trojan Nuclear Plant	1,219
Other Generation	515
Power Interchanged In	62,929
<b>Total Received</b>	<b>144,097</b>

#### Energy Delivered (millions of kilowatthours)

Sales	72,549
Power Interchanged Out	68,137
Used by Administration	65
<b>Total Delivered</b>	<b>140,751</b>
Energy Losses in Transmission	3,346
<b>Total</b>	<b>144,097</b>
Losses as a Percent of Total Energy Received	2.3
Maximum Demand on Generation (kilowatts) (Date and Time) January 30, 1980, 0900	16,107,000
Load Factor	57.4

#### Source and Disposition of Revenue Dollar Fiscal Year 1980 (In Thousands)

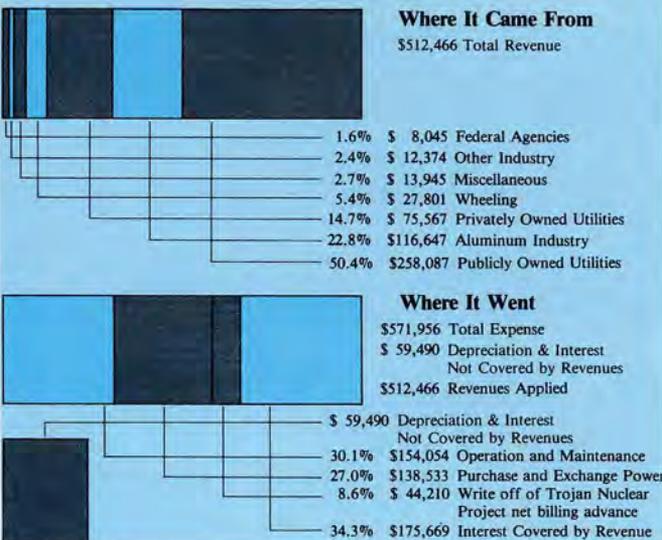


Table 2

### Generation by the Principal Electric Utility Systems of the Pacific Northwest

Fiscal Year 1980<sup>1</sup>

Utility	Kilowatt-hours (Billions)	Of Total Generation (Percent)
<b>Publicly Owned:</b>		
Federal Columbia River Power System <sup>2</sup>	81.2	51.2
Grant County PUD	10.0	6.3
Chelan County PUD	8.3	5.2
Seattle City Light	5.9	3.7
Douglas County PUD	3.4	2.2
Tacoma City Light	2.6	1.6
Eugene Water & Elec. Board	0.8	0.5
Pend Oreille County PUD	0.4	0.3
<b>Total Publicly Owned:</b>	<b>112.6</b>	<b>71.0</b>
<b>Privately Owned:</b>		
Pacific Power & Light Co.	14.0	8.8
Idaho Power Company	11.6	7.3
Montana Power Company	6.7	4.2
Portland General Electric Co.	6.4	4.0
Washington Water Power Co.	4.7	3.0
Puget Sound Power & Light Co.	2.7	1.7
<b>Total Privately Owned:</b>	<b>46.1</b>	<b>29.0</b>
<b>Total Generation:</b>	<b>158.7</b>	<b>100.0</b>

<sup>1</sup> Generation shown is for members of the Northwest Power Pool plus Pend Oreille County PUD and Washington Public Power Supply System, Utah Power & Light Co., British Columbia Hydro and Power Authority, West Kootenay Power and Light and Calgary Power, who are members of the the Power Pool, are not included because their service areas lie outside the Pacific Northwest.

<sup>2</sup> Includes generation from the Washington Public Power Supply System's Hanford steamplant (NPR), Okanogan PUD's share of Wells, the municipalities of Forest Grove, McMinnville, and Milton-Freewater share of Priest Rapids and Wanapum-Kittitas share of Priest Rapids, and the Federal share of the Centralia steamplant and the Trojan Nuclear Plant.

## FINANCIAL SECTION

Table 3  
Federal Columbia River Power System  
**General Specifications of Projects Existing,  
Under Construction, Authorized or Licensed, and Potential**  
Nameplate Rating of Installations as of December 31, 1980

Project	Utility <sup>1</sup>	State	Stream City	Initial Date in Service	Existing		Under Construction		Authorized-Licensed		Potential		Project Totals	
					No. of Units	Nameplate Rating-KW	No. of Units	Nameplate Rating-KW	No. of Units	Nameplate Rating-KW	No. of Units	Nameplate Rating-KW	No. of Units	Nameplate Rating-KW
Minidoka	WPRS <sup>2</sup>	Idaho	Snake	May 7, 1909	7	13,400	—	—	—	—	—	—	7	13,400
Boise River Div.	WPRS	Idaho	Boise	May, 1912	3	1,500	—	—	—	—	—	—	3	1,500
Black Canyon	WPRS	Idaho	Payette	Dec, 1925	2	8,000	—	—	—	—	—	—	2	8,000
Bonneville	CE	Ore-Wash	Columbia	Jun 6, 1938	10	518,400	8-2	558,000 <sup>7</sup>	—	—	—	—	18-2	1,076,400
Grand Coulee	WPRS	Wash	Columbia	Sep 28, 1941	24-3	6,163,000 <sup>4</sup>	—	—	—	—	6	4,200,000	30-3	10,363,000
Anderson Ranch	WPRS	Idaho	S. Fk. Boise	Dec 15, 1950	2	27,000	—	—	—	—	1	13,500	3	40,500
Hungry Horse	WPRS	Montana	S. Fk. Flathead	Oct 29, 1952	4	285,000	—	—	—	—	—	—	4	285,000
Detroit	CE	Oregon	N. Santiam	Jul 1, 1953	2	100,000	—	—	—	—	—	—	2	100,000
McNary	CE	Ore-Wash	Columbia	Nov 6, 1953	14	980,000	—	—	6	740,000	—	—	20	1,720,000
Big Cliff	CE	Oregon	N. Santiam	Jun 12, 1954	1	18,000	—	—	—	—	—	—	1	18,000
Lookout Point	CE	Oregon	M. Fk. Willamette	Dec 16, 1954	3	120,000	—	—	—	—	—	—	3	120,000
Albeni Falls	CE	Idaho	Pend Oreille	Mar 25, 1955	3	42,600	—	—	—	—	—	—	3	42,600
Dexter	CE	Oregon	M. Fk. Willamette	May 19, 1955	1	15,000	—	—	—	—	—	—	1	15,000
Chief Joseph	CE	Wash	Columbia	Aug 20, 1955	27	2,069,000	—	—	—	—	13	1,573,000	40	3,642,000
Chandler	WPRS	Wash	Yakima	Feb 13, 1956	2	12,000	—	—	—	—	—	—	2	12,000
Palisades	WPRS	Idaho	Snake	Feb 25, 1957	4	118,750	—	—	—	—	2	135,000	6	253,750
The Dalles	CE	Ore-Wash	Columbia	May 13, 1957	22-2	1,807,000 <sup>5</sup>	—	—	—	—	—	—	22-2	1,807,000
Roza	WPRS	Wash	Yakima	Aug 31, 1958	1	11,250	—	—	—	—	—	—	1	11,250
Ice Harbor	CE	Wash	Snake	Dec 18, 1961	6	602,880	—	—	—	—	—	—	6	602,880
Hills Creek	CE	Oregon	M. Fk. Willamette	May 2, 1962	2	30,000	—	—	—	—	—	—	2	30,000
Cougar	CE	Oregon	S. Fk. McKenzie	Feb 4, 1964	2	25,000	—	—	1	35,000	—	—	3	60,000
Green Peter	CE	Oregon	Middle Santiam	Jun 9, 1967	2	80,000	—	—	—	—	—	—	2	80,000
John Day	CE	Ore-Wash	Columbia	Jul 17, 1968	16	2,160,000	—	—	4	540,000	—	—	20	2,700,000
Foster	CE	Oregon	South Santiam	Aug 22, 1968	2	20,000	—	—	—	—	—	—	2	20,000
Lower Monumental	CE	Wash	Snake	May 28, 1969	6	810,000	—	—	—	—	—	—	6	810,000
Little Goose	CE	Wash	Snake	May 19, 1970	6	810,000	—	—	—	—	—	—	6	810,000
Dworshak	CE	Idaho	N. Fk. Clearwater	Sep 18, 1974	3	400,000	—	—	3	660,000	—	—	6	1,060,000
Grand Coulee PG <sup>3</sup>	WPRS	Wash	Columbia	Dec 30, 1974	2	100,000	4	200,000	—	—	—	—	6	300,000
Lower Granite	CE	Wash	Snake	Apr 15, 1975	6	810,000	—	—	—	—	—	—	6	810,000
Libby	CE	Mont	Kootenai	Aug 29, 1975	4	420,000	4	420,000	—	—	—	—	8	840,000
Lost Creek	CE	Oregon	Rogue	Dec 1, 1977	2	49,000	—	—	—	—	—	—	2	49,000
Libby Reregulating	CE	Montana	Kootenai	—	—	—	—	—	3	76,400	—	—	3	76,400
Strube	CE	Oregon	S. Fk. McKenzie	—	—	—	—	—	1	4,500	—	—	1	4,500
Teton	WPRS	Idaho	Teton	—	—	—	—	—	3	30,000 <sup>6</sup>	—	—	3	30,000
<b>Total Number of Units and Nameplate Rating</b>					<b>191-5</b>	<b>18,626,780</b>	<b>16-2</b>	<b>1,178,000</b>	<b>21</b>	<b>2,085,900</b>	<b>22</b>	<b>5,921,500</b>	<b>250-7</b>	<b>27,812,180</b>
<b>Total Number of Projects</b>						<b>30</b>		<b>0</b>		<b>3</b>		<b>0</b>		<b>33</b>

<sup>1</sup>CE—Corps of Engineers; WPRS—Water and Power Resources Service

<sup>2</sup>WPRS formerly was known as the Bureau of Reclamation

<sup>3</sup>PG—Pump Generation (Not counted in "Total Number of Projects")

<sup>4</sup>Includes three service units, three 600,000 kW units and three 700,000 kW units at the Third Powerplant.

<sup>5</sup>Includes two fishway units of 13,500 kW each, 14 units of 78,000 kW each, and 8 units of 86,000 kW each at The Dalles Powerplant.

<sup>6</sup>Teton Dam ruptured June 5, 1976. Future status unknown.

<sup>7</sup>Includes two fishway units of 13,000 kW each at the Bonneville Second Powerplant.

## FINANCIAL SECTION

Table 4

### Sales of Electric Energy

Fiscal Year 1980

Customer	KWH (000)	Sales
Northwest Area		
Publicly-Owned Utilities		
Municipalities		
Albion, Idaho	3,287	\$ 23,732
Bandon, OR	56,172	397,935
Blaine, WA	39,506	274,349
Bonnars Ferry, ID	30,678	231,836
Burley, ID	110,840	744,086
Canby, OR	96,048	698,101
Cascade Locks, OR	27,615	186,580
Centralia, WA	107,833	866,761
Cheney, WA	98,835	664,603
Consolidated Irr. Dist., WA	1,846	16,941
Coulee Dam, WA	17,872	115,534
Delco, ID	2,861	21,002
Drain, OR	26,843	189,505
Eatonville, WA	14,710	108,929
Ellensburg, WA	147,872	1,002,465
Eugene, OR	1,507,985	8,728,974
Fircrest, WA	45,003	317,518
Forest Grove, OR	29,909	110,355 <sup>1</sup>
Heyburn, ID	69,193	459,362
Idaho Falls, ID	429,624	2,917,983
McCleary, WA	35,016	256,352
McMinnville, OR	210,161	1,310,432 <sup>1</sup>
Milton, WA	28,919	208,839
Milton-Freewater, OR	2,911	-62,553 <sup>1</sup>
Minidoka, ID	1,060	7,198
Monmouth, OR	53,566	381,389
Port Angeles, WA	723,776	4,542,484
Richland, WA	500,362	3,419,376
Rupert, ID	70,396	487,198
Seattle, WA	2,252,498	12,788,836 <sup>1</sup>
Springfield, OR	696,779	4,684,476
Steilacoom, WA	37,673	270,011
Sumas, WA	7,196	50,851
Tacoma, WA	2,594,694	14,661,036 <sup>1</sup>
Vera Irr. Dist., WA	146,900	1,019,025
Washington Public Power Supply	81,174	517,903
<b>Total (36)</b>	<b>10,307,613</b>	<b>\$62,619,404</b>

Customer	KWH (000)	Sales
Public Utilities Districts		
Benton County PUD #1	1,288,742	\$ 8,568,895
Central Lincoln PUD	1,171,647	7,536,169
Chelan County PUD #1	321,140	2,473,784 <sup>1</sup>
Clallam County PUD #1	435,341	3,119,187
Clark County PUD #1	2,647,388	17,599,833
Clatskanie PUD #1	723,880	4,392,122
Cowlitz PUD #1	3,172,107	18,340,798 <sup>1</sup>
Douglas County PUD #1	249,008	1,607,936 <sup>1</sup>
Ferry County PUD #1	61,748	418,159
Franklin County PUD #1	534,353	3,527,044
Grant County PUD #2	91,639	946,537 <sup>1</sup>
Grays Harbor County PUD #1	1,285,563	8,228,216
Kittitas County PUD #1	28,118	192,092 <sup>1</sup>
Klickitat County PUD #1	228,868	1,528,295
Lewis County PUD #1	660,334	4,167,667
Mason County PUD #1	57,780	399,282
Mason County PUD #3	397,149	2,779,760

Customer	KWH (000)	Sales
Public Utilities Districts (continued)		
Northern Wasco County PUD	217,728	1,513,899
Okanogan County PUD #1	434,462	2,852,291
Pacific County PUD #2	262,319	1,882,747
Pend Orielle County PUD #1	0	0
Skamania County PUD #1	115,692	785,197
Snohomish County PUD #1	5,079,106	33,608,954
Tillamook County PUD	345,153	2,434,129
Wahkiakum County PUD #1	42,355	290,065
Whatcom County PUD #1	131,832	760,432
<b>Total PUD (26)</b>	<b>19,983,452</b>	<b>\$129,953,490</b>

#### Pro Rata Breakdown by Plant Location (Relates to Footnote 3)

Customer	MWH	Revenue
Aluminum Co. of America		
Addy	450,406	\$ 2,055,083
Vancouver	1,576,421	7,192,794
Wenatchee	1,726,557	7,877,822
Kaiser Alum. & Chem. Corp.		
Spokane Reduction	3,572,902	16,475,652
Spokane Rolling	414,250	1,910,220
Tacoma Reduction	1,190,967	5,491,884
Reynolds Metals Co.		
Longview	3,156,643	14,435,970
Troutdale	2,018,182	9,229,554
Martin-Marietta		
Washington	1,578,351	6,691,624
Oregon	1,312,928	\$ 5,557,490

Customer	KWH (000)	Sales
Cooperatives		
Alder Mutual Light Co.	2,211	\$ 16,161
Benton Rural Electric Assn.	286,465	1,918,406
Big Bend Electric Coop.	381,336	2,450,031
Blachly-Lane Co. Coop. Elec. Assn.	108,983	763,170
Central Electric Coop.	287,824	2,003,670
Clearwater Power Co.	149,398	1,045,825
Columbia Basin Elec. Coop.	124,225	786,996
Columbia Power Coop. Assn.	26,966	176,046
Columbia Rural Elec. Assn.	152,456	1,025,496
Consumers Power	312,209	2,164,864
Coos-Curry Elec. Coop.	233,147	1,606,664
Douglas Elec. Coop.	133,884	932,875
Elmhurst Mutual Power & Light Co.	175,116	1,244,213
East End Mutual Elec. Co. Ltd.	13,048	90,456
Fall River Elec. Coop.	111,429	799,762
Farmers Elec. Co.	8,117	58,227
Flathead Elec. Coop.	116,536	789,078
Glacier Elec. Coop.	128,635	795,910
Harney Elec. Coop.	152,072	939,852
Hood River Elec. Coop.	82,695	547,667
Idaho Co. Light & Power Coop. Assn.	36,522	247,168
Inland Power & Light Co.	434,864	3,009,704

## FINANCIAL SECTION

Customer	KWH (000)	Sales
Cooperatives (continued)		
Kootenai Elec. Coop. Inc.	153,897	1,062,785
Lakeview Light & Power Co., Inc.	210,273	1,452,838
Lane Elec. Coop.	240,433	1,688,101
Lincoln Elec. Coop. Montana	56,559	379,730
Lincoln Elec. Coop.—WA.	107,414	699,019
Lost River Elec. Coop.	63,253	408,084
Lower Valley Power & Light Co.	254,751	1,778,106
Midstate Elec. Coop.	188,025	1,265,446
Missoula Elec. Coop.	110,076	748,196
Nespelem Valley Elec. Coop.	35,914	245,753
Northern Lights	138,569	929,893
Ohop Mutual Light Co.	32,137	236,998
Okanogan Co. Elec. Coop.	27,199	184,587
Peninsula Light Co.	286,804	2,053,002
Parkland Light & Water Co.	97,565	682,233
Orcas Power & Light Co.	108,524	771,404
Prairie Power Coop.	9,707	70,341
Raft River Elec. Coop.	191,457	1,242,196
Ravalli Elec. Coop.	73,774	509,178
Riverside Elec. Co.	7,391	52,664
Rural Elec. Co.	71,937	495,871
Salem. Elec.	246,780	1,710,440
Salmon River Elec. Coop.	39,049	248,771
South Side Elec. Lines	30,168	207,701
Surprise Valley Elec. Coop.	102,399	669,665
Tanner Elec. Co.	24,526	179,130
Umatilla Elec. Coop. Assn.	756,383	4,769,859
Unity Light & Power Co.	50,159	354,706
Vigilante Elec. Coop.	98,103	662,196
Wasco Elec. Coop.	89,097	615,102
Wells Rural Elec. Co.	54,486	345,984
West Oregon Elec. Coop.	63,118	436,329
<b>Total Cooperatives (54)</b>	<b>7,478,065</b>	<b>\$ 50,568,549</b>
<b>Total Publicly-Owned Utilities (116)</b>	<b>37,769,130</b>	<b>\$243,141,443</b>

Customer	KWH (000)	Sales
Privately-Owned Utilities		
California-Pacific Utilities Co.	0	\$ 0
Idaho Power Co.	101,646	623,867
Montana Power Co.	651,161	3,885,253 <sup>1</sup>
Pacific Power & Light Co.	1,191,636	18,798,418 <sup>1</sup>
Portland General Elec. Co.	1,284,411	17,309,489 <sup>1</sup>
Puget Sound Power & Light Co.	646,748	5,543,283 <sup>1</sup>
Utah Power Co.	208,414	1,408,124
Washington Water Power	390,545	2,738,112 <sup>1</sup>
<b>Total Privately-Owned Utilities (8)</b>	<b>4,474,561</b>	<b>\$50,306,546</b>

<sup>1</sup>Includes capacity sales

<sup>2</sup>Financial transactions resulting from exchanges of capacity and energy

<sup>3</sup>See table at left

<sup>4</sup>Based on actual billings not including cost accounting accruals

Customer	KWH (000)	Sales
Federal Agencies		
U.S. Department of Energy	382,491	\$2,335,278
U.S. Bureau of Mines	6,183	50,780
Fairchild Air Force Base	25,501	170,774
Water & Power Resources Service— Roza Project	2,554	12,704
U.S. Bureau of Indian Affairs	126,048	970,719
U.S. Navy	282,730	1,836,384
<b>Total Federal Agencies (6)</b>	<b>825,507</b>	<b>\$5,376,639</b>

Customer	KWH (000)	Sales
Aluminum Industries		
Alcoa (combined) <sup>3</sup>	3,753,384	\$ 17,125,699
Anaconda Alum. Co.	2,641,855	11,411,634
Martin Marietta, WA (combined) <sup>3</sup>	2,891,279	12,249,114
Intalco Alum. Co.	3,276,485	15,103,372
Kaiser Aluminum (combined) <sup>3</sup>	5,178,119	23,877,756
Reynolds Metal Co. (combined) <sup>3</sup>	5,174,825	23,665,524
<b>Total Aluminum Industries (6)</b>	<b>22,915,947</b>	<b>\$103,433,099</b>

Customer	KWH (000)	Sales
Other Industries		
Carborundum Co.	222,461	1,052,966
Crown-Zellerbach	102,957	482,235
Georgia-Pacific	162,875	930,988
Hanna Nickel	788,480	3,818,221
Cominco American	0	0
Oregon Metallurgical	49,018	289,554
Pacific Carbide	56,089	268,269
Pennwalt Corp.	345,300	1,601,458
Stewart Elsner	23	968
Union Carbide	93,925	453,699
Stauffer Chemical	403,146	2,039,456
<b>Total Other Industries (11)</b>	<b>2,224,274</b>	<b>\$10,937,814</b>
<b>Total Northwest Region (147)</b>	<b>68,209,419</b>	<b>\$413,195,541</b>

Customer	KWH (000)	Sales
Outside Northwest Region		
Bountiful, Utah	4,026	42,659
BC Hydro	0	0
Burbank, CA	72,251	485,185 <sup>2</sup>
Glendale, CA	80,741	511,401 <sup>2</sup>
Los Angeles, CA	888,134	5,937,084 <sup>2</sup>
Pasadena, CA	56,169	347,343 <sup>2</sup>
Sacramento, CA	0	0
Pacific Gas & Elec. Co.	1,431,356	15,520,081 <sup>1</sup>
San Diego Gas & Elec. Co.	169,257	1,078,813
So. Cal. Edison Co.	1,306,819	8,341,721
State of California	0	0
WAPA—Mid-Pacific Region	330,583	2,667,395 <sup>1</sup>
WAPA—Upper Colorado Region	0	0
WAPA—Upper Missouri Region	0	0
<b>Total Outside Northwest Region (14)</b>	<b>4,339,336</b>	<b>\$34,931,682</b>
<b>Total Sales of Electric Energy (161)</b>	<b>72,548,755</b>	<b>\$448,127,223<sup>4</sup></b>

## FINANCIAL SECTION

**Table 5**  
Federal Columbia River Power System  
**1980 Current Rate Preliminary Repayment Study**  
Projects in Service by July 1, 1982<sup>1</sup>  
(All Amounts in \$1,000)

Fiscal Year Ending Sept. 30	PLANT ALLOCATED TO									
	Revenues	Operation and Maintenance Expense	Purchase and Exchange Power	Interest Expense	Investment Placed in Service			Cumulative Investment in Service		
					Initial Project	Replacements	Total	Initial Project	Replacements	Total
Cumulative To 9-30-80	4,441,940	1,351,139	726,992	1,712,880	6,009,790		6,009,790	6,009,790		6,009,790
Adjustments <sup>2</sup>	(24,066)	752	6,165	23,011	345,120		345,120	345,120		345,120
1981	605,900	179,406	360,900	245,734	583,305	2,503	585,808	6,938,215	2,503	6,940,718
1982	631,100	209,973	391,600	296,918	824,979	36,743	861,722	7,763,194	39,245	7,802,440
1983	616,300	212,231	367,200	306,379		44,964	312,243	7,763,194	84,210	7,847,404
1984	591,800	212,231	348,900	335,783		54,273	284,510	7,763,194	138,483	7,901,677
1985	605,700	212,231	327,200	351,267		57,551	284,510	7,763,194	196,034	7,959,228
1986	643,600	212,231	361,500	366,693		54,428	316,021	7,763,194	250,462	8,013,656
1987	661,200	212,231	370,000	384,081		72,123	291,958	7,763,194	322,585	8,085,779
1988	663,400	212,231	368,900	402,157		61,600	284,185	7,763,194	384,185	8,147,379
1989	661,400	212,231	368,800	423,614		77,521	284,185	7,763,194	461,706	8,224,900
1990	653,900	212,231	359,600	447,259		91,012	284,185	7,763,194	552,718	8,315,912
1991	655,100	212,231	327,900	471,106		82,325	284,185	7,763,194	635,043	8,398,237
1992	655,400	212,231	328,000	502,479		173,012	284,185	7,763,194	808,055	8,571,249
1993	654,700	212,231	324,500	532,593		71,903	284,185	7,763,194	879,958	8,643,152
1994	653,500	212,231	323,900	588,334		112,029	284,185	7,763,194	991,987	8,755,181
1995	651,900	212,231	323,900	627,240		132,604	284,185	7,763,194	1,071,368	8,834,562
1996	655,100	212,231	338,800	667,018		132,604	284,185	7,763,194	1,203,972	8,967,166
1997	669,200	212,231	383,400	715,805		111,782	284,185	7,763,194	1,315,754	9,078,948
1998	666,500	212,231	383,400	748,115		83,871	284,185	7,763,194	1,399,625	9,162,819
1999	665,900	212,231	383,400	788,290		98,292	284,185	7,763,194	1,497,917	9,261,111
2000	668,400	212,231	383,400	829,871		87,045	284,185	7,763,194	1,584,962	9,348,156
2001	668,600	212,231	383,400	875,103		114,695	284,185	7,763,194	1,699,657	9,462,851
2002	668,600	212,231	383,400	926,209		144,345	284,185	7,763,194	1,844,002	9,607,196
2003	668,900	212,231	383,400	975,278		87,505	284,185	7,763,194	1,931,507	9,694,701
2004	669,000	212,231	383,400	1,027,091		99,436	284,185	7,763,194	2,030,943	9,794,137
2005	669,000	212,231	383,400	1,081,510		96,848	284,185	7,763,194	2,127,791	9,890,985
2006	669,000	212,231	383,400	1,140,442		116,231	284,185	7,763,194	2,244,022	10,007,216
2007	668,600	212,231	383,400	1,206,814		139,715	284,185	7,763,194	2,383,737	10,146,931
2008	667,300	212,231	383,400	1,274,969		103,630	284,185	7,763,194	2,487,367	10,250,561
2009	667,300	212,231	383,400	1,349,242		115,394	284,185	7,763,194	2,602,761	10,365,955
2010	665,200	212,231	383,400	1,452,953		157,266	284,185	7,763,194	2,760,027	10,523,221
2011	657,300	212,231	367,000	1,574,740		173,229	284,185	7,763,194	3,033,256	10,796,450
2012	654,500	212,231	350,600	1,697,399		174,797	284,185	7,763,194	3,208,053	10,971,247
2013	654,500	212,231	350,600	1,829,770		153,904	284,185	7,763,194	3,361,957	11,125,151
2014	654,500	212,231	350,600	1,951,073		119,272	284,185	7,763,194	3,481,229	11,244,423
2015	654,500	212,231	350,600	2,077,737		105,662	284,185	7,763,194	3,586,891	11,350,085
2016	654,500	212,231	350,600	2,227,939		282,171	284,185	7,763,194	3,869,062	11,632,256
2017	654,500	212,231	350,600	2,385,884		128,739	284,185	7,763,194	3,997,801	11,760,995
2018	654,500	212,231	304,700	2,569,137		139,085	284,185	7,763,194	4,136,885	11,900,080
2019	654,500	212,231	183,200	2,778,135		105,678	284,185	7,763,194	4,242,564	12,095,758
2020	654,500	212,231	183,200	3,012,281		150,304	284,185	7,763,194	4,392,868	12,156,062
2021	654,500	212,231	32,200	3,185,765		131,566	284,185	7,763,194	4,524,434	12,287,628
2022	654,500	212,231		3,367,841		185,822	284,185	7,763,194	4,710,256	12,473,450
2023	654,500	212,231		3,556,764		105,064	284,185	7,763,194	4,815,320	12,578,514
2024	654,500	212,231		3,756,608		119,445	284,185	7,763,194	4,934,765	12,697,959
2025	654,500	212,231		3,969,192		110,510	284,185	7,763,194	5,045,275	12,808,469
2026	654,500	212,231		4,196,377		150,448	284,185	7,763,194	5,195,723	12,958,917
2027	654,500	212,231		4,438,175		142,000	284,185	7,763,194	5,337,723	13,100,917
2028	654,500	212,231		4,692,286		113,800	284,185	7,763,194	5,451,523	13,214,717
2029	654,500	212,231		4,963,970		135,046	284,185	7,763,194	5,586,569	13,349,763
2030	654,500	212,231		5,250,296		109,406	284,185	7,763,194	5,695,975	13,459,169
2031	654,500	212,231		5,556,311		154,335	284,185	7,763,194	5,850,310	13,613,504
2032	654,500	212,231		5,883,803		186,963	284,185	7,763,194	6,037,273	13,800,467
2033	654,500	212,231		6,226,999		107,072	284,185	7,763,194	6,144,345	13,907,539
2034	654,500	212,231		6,591,385		121,238	284,185	7,763,194	6,265,583	14,028,777
2035	654,500	212,231		6,978,403		112,176	284,185	7,763,194	6,377,759	14,140,953
2036	654,500	212,231		7,391,384		135,564	284,185	7,763,194	6,513,323	14,276,517
2037	654,500	212,231		7,830,717		131,070	284,185	7,763,194	6,644,393	14,407,587
2038	654,500	212,231		8,295,412		111,280	284,185	7,763,194	6,755,673	14,518,867
2039	654,500	212,231		8,787,643		123,996	284,185	7,763,194	6,879,669	14,642,863
2040	654,500	212,231		9,315,599		135,140	284,185	7,763,194	7,014,809	14,778,033
2041	654,500	212,231		9,872,279		148,036	284,185	7,763,194	7,162,845	14,926,039
2042	654,500	212,231		10,467,212		219,961	284,185	7,763,194	7,382,806	15,148,000
2043	654,500	212,231		11,094,164		117,799	284,185	7,763,194	7,500,605	15,265,799
2044	654,500	212,231		11,759,888		131,971	284,185	7,763,194	7,632,576	15,397,771
2045	654,500	212,231		12,470,609		171,363	284,185	7,763,194	7,803,939	15,567,133
2046	654,500	212,231		13,229,604		272,347	284,185	7,763,194	8,076,285	15,839,480
2047	654,500	212,231		14,031,481		162,297	284,185	7,763,194	8,238,583	16,001,777
2048	654,500	212,231		14,882,171		178,369	284,185	7,763,194	8,416,952	16,180,146
2049	654,500	212,231		15,783,061		123,523	284,185	7,763,194	8,540,475	16,303,669
2050	654,500	212,231		16,739,659		128,365	284,185	7,763,194	8,668,840	16,432,034
2051	654,500	212,231		17,756,775		139,218	284,185	7,763,194	8,808,058	16,571,252
2052	654,500	212,231		18,837,865		181,567	284,185	7,763,194	8,989,625	16,752,819
2053	654,500	212,231		19,983,115		121,245	284,185	7,763,194	9,110,870	16,874,064
2054	654,500	212,231		21,200,914		138,486	284,185	7,763,194	9,249,356	17,012,550
2055	654,500	212,231		22,492,303		124,210	284,185	7,763,194	9,373,566	17,136,760
2056	654,500	212,231		23,872,122		300,485	284,185	7,763,194	9,674,051	17,437,245
2057	654,500	212,231		25,329,881		131,834	284,185	7,763,194	9,805,885	17,569,079
2058	654,500	212,231		26,877,000		155,898	284,185	7,763,194	9,951,783	17,724,977
2059	654,500	212,231		28,519,418		147,961	284,185	7,763,194	10,109,744	17,872,938
2060	654,500	212,231		30,263,601		171,029	284,185	7,763,194	10,280,773	18,043,967
2061	654,500	212,231		32,115,426		135,154	284,185	7,763,194	10,415,927	18,179,121
2062	654,500	212,231		34,087,984		261,659	284,185	7,763,194	10,677,586	18,440,780

## FINANCIAL SECTION

### Repayment Policy

The basis on which BPA establishes its revenue requirements, and hence its rate level, is the repayment policy. This policy, which is based upon the Department of Energy's interpretation of statutory requirements, provides that FCRPS revenues from power sales, wheeling service, and other miscellaneous sources must be sufficient to satisfy the following criteria:

1. Pay the cost of obtaining power through purchase and exchange agreements.
2. Pay the cost of operating and maintaining the power system.
3. Pay interest on and amortize outstanding revenue bonds sold to the Treasury to finance transmission system construction.
4. Pay interest on the unamortized investment in power facilities financed with appropriated funds.

(Federal hydroelectric projects are all financed with appropriated funds. BPA transmission facilities constructed prior to BPA authorization to finance its construction program with sales receipts and revenue bonds were financed with appropriated funds.)

5. Repay, with interest, any outstanding unpaid annual expenses.
6. Repay each increment of the power investment in the Federal hydroelectric projects within 50 years after such increment becomes revenue-producing.
7. Repay each annual increment of the investment in the BPA transmission system previously financed with appropriated funds within the average service life of the transmission facilities (currently 35 years).

8. Repay the investment in each replacement of a facility at a Federal hydroelectric project within its service life. (In repaying the investment financed with appropriated funds, the investment bearing the highest interest rate will be amortized first to the extent possible while still completing repayment of each increment of investment within its prescribed repayment period.)
9. Repay the portion of construction costs at Federal reclamation projects which is beyond the ability of the irrigation water users, and which is assigned for repayment from commercial power revenues, within the same overall period available to the water users for making their repayments. These periods range from 40 to 66 years with 60 years being applicable to most of the irrigation repayment assistance.

### Note to Federal Columbia River Power System Repayment Study

(Table 5, Page 58)

Section 2 of Public Law 89-448 (80 STAT 200) requires the submission to the President and the Congress of an annual financial statement which includes all projects authorized by Congress as components of the FCRPS. BPA previously fulfilled that requirement by publishing the FCRPS Repayment Study in its Annual Report and transmitting copies thereof to the President and the Congress. Through FY 1978 the FCRPS repayment study included the estimated costs of all authorized projects even though some were not yet in service or in some cases were not yet under construction. In determining revenue requirements for the purpose of establishing power rates, however, objections were raised by customers to the inclusion of projects in the repayment study which would not be in service during the period in which the power rates would be in effect. During preparation of our last power rate increase, which took effect December 20, 1979, the BPA General Counsel issued an opinion concluding that whereas PL 89-448

does, in fact, require the inclusion of all authorized projects in the annual financial statement to be submitted to the President and the Congress, the repayment study used as a basis for establishing rate levels should properly include only those projects which will be in service during the rate period. The FCRPS repayment study included in this report is the same current rate level Repayment Study that will be used in the upcoming February 1981 submittal for the July 1, 1981, Initial Rate Proposal; i.e., it includes only those Federal power facilities expected to

be in service during the rate period from July 1, 1981 through June 30, 1982.

The authorized projects not included in the repayment study, their estimated capital investments in 1982 dollars, and their estimated completion dates are set forth in the table below.

These projects will be included in future repayment studies for rate purposes as they are completed and placed in service, and will be reported pursuant to the requirement of PL 89-448 by inclusion in the BPA Annual Report.

#### Libby Units

No. 5 through No. 8 .....	Nov. 1985 .....	\$330 million
Libby Reregulation Project .....	May 1986 .....	68 million
Cougar Unit No. 3 .....	Sept. 1986 .....	25 million
Strube Unit No. 1 .....	Sept. 1986 .....	49 million
McNary Second Powerhouse .....	Aug. 1989 <sup>1</sup> .....	616 million
Dworshak additional units .....	July 1994 .....	163 million
John Day additional units .....	July 1997 .....	122 million

<sup>1</sup>Subject to appropriation in FY 1982.

## FINANCIAL SECTION

### Accountants' Report

Administrator  
Bonneville Power Administration  
United States Department of Energy

**Coopers & Lybrand**  
Certified Public Accountants

We have examined the statement of assets and liabilities of the Federal Columbia River Power System (FCRPS) as of September 30, 1980 and 1979, and the related statements of revenues and expenses, changes in federal investment and source and use of funds for the fiscal years then ended. Our examinations were made in accordance with generally accepted auditing standards and, accordingly, included such tests of the accounting records and such other auditing procedures as we considered necessary in the circumstances.

Recorded revenues are based upon rates for service established in accordance with the Bonneville Project Act and related legislation which are intended to provide for the full recovery of all FCRPS costs and repayment to the U.S. Treasury of its investment in power facilities and assigned irrigation costs within repayment periods established pursuant to such statutory requirements. As discussed in Note 1 to the financial statements, revenues needed to recover the costs of generating facilities are based on required repayment periods which are shorter than the periods over which such facilities are depreciated and, prior to September 30, 1979, the periods over which required net billed projects payments were recovered in revenues differed from the periods in which such payments were included in operating expenses. As indicated in Note 1, under the caption Thermal Plant Net Billing Advances and Amortization, the amortization to operations of certain previously deferred net billed project payments and the expensing of similar payments currently incurred was commenced in December 1979 in order to match such costs and their recovery in rates and, as indicated in Note 5, other deferred net billing advances were written off in July 1980 to operations. Under generally accepted accounting principles, revenues based upon cost recovery and the related costs should be included in the determination of net revenues in the same accounting period. Accordingly, the financial statements are not intended to present financial position and results of operations in conformity with generally accepted accounting principles. The financial statements are, however, appropriately presented in accordance with accounting principles required by or appropriate to applicable legislation and executive directives of other government agencies, as described in Note 1.

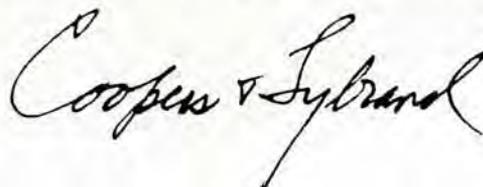
As described in Note 3, the allocation of certain utility plant cost and operation and maintenance expenses relating to multi-purpose projects between power and nonpower purposes is subject to adjustment, and the amount of adjustments, if any, that may be necessary when allocations become firm is not determinable at this time.

As described in Note 1 under the caption, Regulatory Authorities, power rate increases which were placed into effect on an interim basis and wheeling rate increases which have been collected under a temporary rate order are subject to refund with interest in the event of regulatory disapproval.

In our opinion, subject to the effects, if any, on the financial statements of the resolution of the cost allocations and rate proceedings discussed in the two preceding paragraphs, the financial statements referred to above present fairly the assets and liabilities of the Federal Columbia River Power System at September 30, 1980 and 1979, and its revenues and expenses, changes in federal investment and source and use of funds for the fiscal years then ended, in conformity with accounting principles described in Note 1 applied on a consistent basis.

Supplemental Schedule A showing the amount and allocation of plant investment as of September 30, 1980 was subjected to the audit procedures applied in the examination of the basic financial statements and in our opinion, subject to the effects, if any, on Schedule A of the ultimate resolution of the cost allocations referred to above, is fairly stated in all material respects in relation to the basic financial statements taken as a whole.

Portland, Oregon  
December 17, 1980



## FINANCIAL SECTION

Federal Columbia River Power System

### Statement of Revenues and Expenses

for the fiscal years ended September 30, 1980 and 1979

	Fiscal Year	
	1980	1979
	(Thousands of Dollars)	
<b>OPERATING REVENUES (Note 1):</b>		
Sales of electric power:		
Publicly owned utilities .....	\$258,087	\$146,796
Privately owned utilities .....	75,567	48,131
Federal agencies .....	8,045	4,840
Aluminum industry .....	116,647	53,168
Other industry .....	12,374	4,584
	<u>470,720</u>	<u>257,519</u>
Other operating revenues:		
Wheeling .....	27,801	27,843
Other .....	13,945	11,197
	<u>41,746</u>	<u>39,040</u>
<b>Total operating revenues .....</b>	<b><u>512,466</u></b>	<b><u>296,559</u></b>
<b>OPERATING EXPENSES:</b>		
Operation .....	104,444	76,547
Maintenance .....	49,610	46,601
Purchase and exchange power (Notes 1 and 5) .....	138,533	25,195
Write-off of Trojan Nuclear Project net billing advances (Note 5) .....	44,210	
Depreciation .....	51,380	50,164
	<u>388,177</u>	<u>198,507</u>
<b>Total operating expenses .....</b>	<b><u>388,177</u></b>	<b><u>198,507</u></b>
<b>Net operating revenues .....</b>	<b><u>124,289</u></b>	<b><u>98,052</u></b>
<b>INTEREST EXPENSE (Notes 2, 4 and 7):</b>		
Interest on Federal investment:		
On appropriated funds .....	190,464	173,337
On Transmission System Act borrowings .....	35,235	24,635
Allowance for funds used during construction .....	(41,920)	(29,971)
	<u>183,779</u>	<u>168,001</u>
<b>Net interest expense .....</b>	<b><u>183,779</u></b>	<b><u>168,001</u></b>
<b>NET REVENUES (EXPENSE) .....</b>	<b><u>\$(59,490)</u></b>	<b><u>\$(69,949)</u></b>

The accompanying notes are an integral part of the financial statements.

## FINANCIAL SECTION

Federal Columbia River Power System

### Statement of Assets and Liabilities

at September 30, 1980 and 1979

#### Assets

	September 30,	
	1980	1979
	(Thousands of Dollars)	
<b>UTILITY PLANT (Notes 2 and 3):</b>		
Completed plant (Schedule A) .....	\$5,844,826	\$5,599,965
Accumulated depreciation .....	(510,817)	(469,567)
	5,334,009	5,130,398
Construction work in progress (Schedule A) .....	1,000,164	884,655
<b>Net utility plant</b> .....	<b>6,334,173</b>	<b>6,015,053</b>
<b>CURRENT ASSETS:</b>		
Unexpended funds (Note 4) .....	73,951	75,306
Accounts receivable .....	16,277	8,119
Accrued unbilled revenues .....	26,506	20,668
Materials and supplies, at average cost .....	26,168	26,465
<b>Total current assets</b> .....	<b>142,902</b>	<b>130,558</b>
<b>OTHER ASSETS AND DEFERRED CHARGES:</b>		
Trust funds (Note 6) .....	12,957	8,700
Net billing advances, less amortization (Note 5) .....	207,953	246,861
Investment in Teton Dam (Note 9) .....	13,774	13,741
Other .....	38,606	11,968
<b>Total other assets and deferred charges</b> .....	<b>273,290</b>	<b>281,270</b>
	<b>\$6,750,365</b>	<b>\$6,426,881</b>

#### Liabilities and Federal Investment

<b>FEDERAL INVESTMENT:</b>		
Net investment of U.S. Government in power facilities (Note 7) .....	\$6,462,386	\$6,075,734
Accumulated net revenues .....	182,639	242,129
Irrigation assistance (Schedule A and Note 8) \$646 million and \$627 million, respectively .....		
<b>Total federal investment</b> .....	<b>6,645,025</b>	<b>6,317,863</b>
<b>COMMITMENTS AND CONTINGENCIES:</b> (Notes 1, 2, 3, 5, 8, 9 and 10)		
<b>CURRENT LIABILITIES:</b>		
Accounts payable .....	78,984	86,121
Employees accrued leave .....	8,621	8,311
<b>Total current liabilities</b> .....	<b>87,605</b>	<b>94,432</b>
<b>DEFERRED CREDITS:</b>		
Trust fund advances (Note 6) .....	12,957	8,700
Other .....	4,778	5,886
<b>Total deferred credits</b> .....	<b>17,735</b>	<b>14,586</b>
	<b>\$6,750,365</b>	<b>\$6,426,881</b>

The accompanying notes are an integral part of the financial statements.

## FINANCIAL SECTION

Federal Columbia River Power System

### Statement of Changes in Federal Investment

for the fiscal years ended September 30, 1980 and 1979

	Balance October 1, 1978	Additions (Reductions)	Balance September 30, 1979	Additions (Reductions)	Balance September 30, 1980
(Thousands of Dollars)					
Congressional appropriations .....	\$6,461,889	\$260,772	\$6,722,661	\$281,290	\$7,003,951
U.S. Treasury transfers to Continuing Fund .....	7,005		7,005		7,005
Transfers from (to) other federal agencies, net .....	48,885	(4,258)	44,627	(791)	43,836
Federal Columbia River Transmission System Act borrowings (Note 2) .....	300,000	110,000	410,000	115,000	525,000
Interest on federal investment:					
On appropriated funds .....	1,785,341	74,753	1,860,094	176,643	2,036,737
On Transmission System Act borrowings .....	6,210	24,635	30,845	35,235	66,080
Unpaid annual expense (Note 7) .....		98,584	98,584	13,821	112,405
Less:					
Interest payments .....	(1,791,551)	(99,388)	(1,890,939)	(211,878)	(2,102,817)
Funds returned to U.S. Treasury .....	(1,182,537)	(24,606)	(1,207,143)	(22,668)	(1,229,811)
Net investment of U.S. government .....	5,635,242	440,492	6,075,734	386,652	6,462,386
Accumulated net revenues .....	312,078	(69,949)	242,129	(59,490)	182,639
<b>Total federal investment .....</b>	<b>\$5,947,320</b>	<b>\$370,543</b>	<b>\$6,317,863</b>	<b>\$327,162</b>	<b>\$6,645,025</b>

### Statement of Source and Use of Funds

for the fiscal years ended September 30, 1980 and 1979

	Fiscal Year	
	1980	1979
(Thousands of Dollars)		
<b>SOURCE OF FUNDS:</b>		
Operations:		
Net revenues (expense) .....	\$(59,490)	\$(69,949)
Charges not requiring funds:		
Depreciation .....	51,380	50,164
Amortization of net billing advances .....	8,994	3,503
Write-off of Trojan Nuclear Project net billing advances .....	44,210	
Funds provided from (used in) operations .....	45,094	(16,282)
Increase in net investment of U.S. Government .....	386,652	440,492
Decrease (increase) in current assets:		
Unexpended funds .....	1,355	3,675
Receivables .....	(13,996)	4,543
Materials and supplies .....	297	(484)
Increase (decrease) in current liabilities .....	(6,827)	15,552
<b>Total funds provided .....</b>	<b>\$412,575</b>	<b>\$447,496</b>
<b>USE OF FUNDS:</b>		
Investment in utility plant, net .....	\$370,500	\$348,195
Increase in net billing advances (See Note 1 under caption Thermal Plant Net Billing Advances and Amortization.) .....	14,296	96,919
Other, net .....	27,779	2,382
<b>Total funds used .....</b>	<b>\$412,575</b>	<b>\$447,496</b>

The accompanying notes are an integral part of the financial statements.

## FINANCIAL SECTION

### Federal Columbia River Power System Notes to Financial Statements

#### Note 1. Basis of Preparation of Financial Statements and Summary of Significant Accounting Policies:

##### General

The Federal Columbia River Power System (FCRPS) includes the accounts of the Bonneville Power Administration (BPA), which purchases, transmits and markets power, and the accounts representing the Pacific Northwest generating facilities of the Corps of Engineers (Corps) and the Water and Power Resources Service (Service) for which BPA is the power marketing agency. Each entity is separately managed and financed, but the facilities are operated as an integrated power system with the financial results combined under the FCRPS title. Costs of multipurpose Corps and Service projects are assigned to the individual purposes through a cost allocation process. The portion of total project costs allocated to power is included in these statements as Utility Plant. Schedule A lists the projects included in FCRPS and the allocation of plant investment to the various purposes. Properties and income are exempt from taxation.

Accounts are kept in accordance with standards and principles prescribed by the Comptroller General of the United States and the uniform system of accounts prescribed for electric utilities by the Federal Energy Regulatory Commission (FERC). FCRPS accounting policies described herein also reflect requirements of specific legislation and executive directives issued by the involved government departments (BPA is a unit of the Department of Energy; the Service is a part of the Department of Interior and the Corps of the Department of Defense).

##### Revenues

Operating revenues are recorded on the basis of service rendered.

Rates established under requirements of the Bonneville Project Act and related legislation are intended to provide sufficient cash to meet all required payments for system costs (including operating expenses, payment to the U.S. Treasury for debt service on borrowings and for its investment in power facilities and interest thereon, and costs of net billed thermal projects and assigned irrigation costs—see Notes 5, 7 and 8). The rates are also required to be low enough to encourage widespread use of electric energy at the lowest possible cost to consumers consistent with sound business principles.

If revenues in any year are not sufficient to meet all required payments, the priority for use of revenues is: net billing credits; additional payments required for net billed thermal projects and BPA operating expenses; debt service on Federal Columbia River Transmission System Act borrowings from the U.S. Treasury; Corps and Service operating expenses; interest on unpaid annual expense and on the Federal investment in power facilities financed through appropriations; amortization of unpaid

annual expense (see Note 7); amortization of the Federal investment in power facilities financed through appropriations; irrigation repayment assistance. Presently no irrigation repayment assistance is required until 1997. If insufficient cash is available to meet all payment obligations, the priority order for the application of revenues will be used in reverse order to determine what payments will be deferred. There is no fixed annual requirement for payment of the power investment or assigned irrigation costs, the only requirement being that repayments be completed within prescribed periods. Payments to repay an investment bearing a higher rate of interest may be scheduled ahead of other investments bearing a lower rate to the extent that this is possible while still complying with prescribed repayment periods.

The rates are intended to provide for recovery of the capital investment in transmission facilities within their average estimated useful service lives and within 50 years for power generating facilities. As set forth below, these assets are being depreciated in the accounts on a compound interest method over their estimated useful lives, which currently average approximately 35 years for transmission facilities and 85 years for generating facilities. Thus, annual depreciation charges are not matched with the recovery of the related capital costs and will, in the case of generating facilities, continue beyond the period within which such costs will have been recovered through revenues.

##### Regulatory Authorities

Effective January 1, 1979, the Secretary of Energy delegated authority to the Assistant Secretary for Resource Applications to develop, acting by and through the Administrator, and to confirm, approve and place in effect on an interim basis, power and transmission rates. At the same time, the Federal Energy Regulatory Commission (FERC) was given authority to confirm and approve on a final basis, or to disapprove but not to modify, such rates. Refunds are authorized with interest if rates finally approved are lower than rates approved on an interim basis.

On December 20, 1979, increased power rates were placed into effect on an interim basis. Revenues applicable to these rate increases, which were the first power rate increases since December 20, 1974, totaled approximately \$195.8 million at September 30, 1980. Wheeling rates charged for transmission of nonfederal power were increased approximately 22% on July 1, 1977 under a temporary rate order. Revenues applicable to these wheeling rate increases totaled approximately \$21.3 million at September 30, 1980 (including \$6.0 million in 1980 and \$8.8 million in 1979).

In November and December 1980, FERC remanded the increased power and wheeling rates without prejudice for further development of the records in order to establish their conformity with applicable statutory standards.

## FINANCIAL SECTION

### Utility Plant and Depreciation

Utility plant is stated at original cost. Cost includes direct labor and materials, payments to contractors, indirect charges for engineering, supervision and similar overhead items, and an allowance for funds used during construction. The cost of additions, renewals and betterments is capitalized. Repairs and minor replacements are charged to operating expenses. With minor exceptions, the cost of utility plant retired, together with removal costs and less salvage, is charged to accumulated depreciation when it is removed from service.

Depreciation of utility plant is computed based on the estimated service lives of the various classes of property using the compound interest method (rates from 2-1/2% to 3-1/4%). Service lives currently average approximately 35 years for transmission plant and 85 years for generating plant.

Depreciation provisions recorded in the accounts; expressed as a percent of the average cost of plant in service, approximated 1.9% in 1980 and 2.0% in 1979 for transmission plant and 0.4% in each such year for generating plant. The compound interest method adopted pursuant to executive directives of government agencies results in increasing depreciation charges in the later years of service lives.

Effective October 1, 1979, BPA revised its procedures for allocation of general and administrative costs to more accurately reflect the relative magnitude of its programs. This change decreased general and administrative costs capitalized as utility plant by approximately \$8.7 million in 1980.

### Allowance for Funds Used During Construction

The practice of capitalizing an allowance for funds used during construction is followed. Rates used are based upon interest rates stipulated for certain generating projects (2-1/2% to 3-1/4%) and rates approximating the cost of borrowings from the U.S. Treasury for other construction (8% to 10% during the two years ended September 30, 1980).

### Thermal Plant Net Billing Advances and Amortization

Net billing agreements provide that BPA make payments and/or grant billing credits prior to a nuclear project's date of commercial operation. Additionally, certain payments made by BPA with respect to the operating Trojan Nuclear Project (principally related to fuel purchases, working capital and additions to debt service reserves) were deferred (see Note 5). Deferred payments and billing credits, less amortization, are included as deferred charges under the caption "net billing advances" in the accompanying statement of assets and liabilities.

Payments and billing credits totaling \$212.5 million made prior to December 20, 1979 for Washington Public Power Supply System nuclear plants under construction have been deferred and, commencing December 20, 1979, are being amortized ratably over 35 years. The increased power rates effective December 20, 1979

provide for recovery of the deferred amount. Similar payments and billing credits made since December 20, 1979 totaling \$88.9 million have been charged directly to Purchase and Exchange Power expense since their recovery is also provided for in the increased power rates effective on an interim basis at that date.

As discussed in Note 5, effective July 1, 1980 all unamortized net billing advances (and subsequent payments and billing credits) with respect to the operating Trojan Nuclear Project have been charged to expense.

### Research and Development

Research and development costs, including depreciation of the cost of facilities constructed for research and development activities, are charged to expense. Costs charged to expense totaled approximately \$10.8 million in 1980 and \$11.0 million in 1979.

### Retirement Benefits

Substantially all employees engaged in FCRPS activities participate in the Federal government's Civil Service Retirement Fund, a contributory pension plan. Retirement benefit expense is equivalent to 7% of eligible employee compensation.

### Note 2. Financing of FCRPS Construction Program:

The Federal Columbia River Transmission System Act (Act), approved October 18, 1974, authorized BPA to use its operating receipts and proceeds from sales of revenue bonds, which the Act authorized it to issue, to finance further construction of the Federal transmission system in the Pacific Northwest. Prior to the enactment of this legislation, the transmission system construction program was financed through the appropriation process. Construction performed by the Corps and the Service continues to be financed through annual Congressional appropriations. In order to assist in financing the construction, acquisition and replacement of the transmission system, the Act authorized BPA to issue to the U.S. Treasury and have outstanding at any time up to \$1.25 billion of bonds, notes or other evidence of indebtedness bearing interest and having terms and conditions comparable to those prevailing in the market for similar utility debt instruments.

Following is a summary of borrowings and repayments under the Act:

Date	Notes		Bonds		
	Millions	Rate	Millions	Rate	Maturity
9/30/77	\$125	6.73%			
9/30/78	(125)				
9/30/78	250	9.125	\$ 50	8.95%	9/30/2013
6/30/79	(75)		75	9.45	6/30/2014
9/30/79	(175)				
9/30/79	235	10.5	50	9.90	9/30/2014
9/30/80			115	13.00	9/30/2015
Outstanding at 9/30/80	\$235		\$290		

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BPA's borrowing authority within the aforementioned \$1.25 billion maximum is limited at any one time to its cumulative expenditures for transmission plant (including capitalized interest and any unspent approved construction budget amounts) which have not been financed from appropriations. At September 30, 1980, BPA had borrowed substantially all funds available within this limitation other than the approved 1981 construction budget. The \$235 million note outstanding is payable by September 30, 1981.

BPA's construction budget for fiscal year 1981 is \$143 million, for which substantial commitments have been incurred. Fiscal 1981 construction appropriations for power facilities have been authorized by Congress for the Corps and the Service totaling \$126 million and \$18 million, respectively.

### Note 3. Cost Allocations:

Allocations of plant cost and operation and maintenance expenses between power and nonpower purposes for six system projects are presently based on tentative allocations. At September 30, 1980, total costs for these six projects approximated \$2.1 billion of which \$1.6 billion was tentatively allocated to power and subject to adjustment. In prior years, adjustments were made to plant cost and to accumulated net revenues (for adjustments relating to operation and maintenance, interest or depreciation) when final allocations were adopted. The amount of adjustments that may be necessary when the allocations for these six projects become final is not determinable at this time.

Under certain circumstances, final cost allocations can be changed, but Congressional approval may be required for any significant change. As set forth above, retrospective adjustments to the financial records are performed when a final cost allocation differs from the tentative cost allocation. If a change in a final cost allocation were made, any related adjustments would most likely be prospective unless the affected project never functioned as intended.

### Note 4. Unexpended Funds:

Unexpended funds consist of the unexpended balance of funds appropriated by Congress for construction, operation and maintenance purposes for the Corps and Service, and cash balances of BPA.

Amounts shown in the statement of assets and liabilities comprise:

	September 30,	
	1980	1979
	(Thousands of Dollars)	
Corps and Service unexpended		
appropriated funds	\$48,400	\$47,999
BPA cash balances with U.S. Treasury	25,551	27,307
	\$73,951	\$75,306

FCRPS receives credit for interest on unexpended appropriated funds by deducting them from the unamortized federal investment in determining the required interest on the federal investment. The Treasury gives BPA credit for its cash balances in determining interest charges. The interest expense on Treasury borrowings reflects reductions of \$5.9 million in 1980 and \$2.8 million in 1979 arising from credits for cash balances.

### Note 5. Purchase and Exchange Power Expense and Commitments to Exchange Power and Acquire Project Capability:

Existing net billing and exchange agreements provide that BPA will acquire all or part of the generating capability of the nuclear power plants listed in the table below. BPA is obligated to make payments, exchange power, or apply credits (net billings) to participating customers equal to the customers' portions of the annual project cost, including annual debt service requirements, whether or not the projects are completed, operable, or operated. Annual project budgets have not included provisions for any future costs associated with spent fuel reprocessing, off-site storage of spent fuel or plant decommissioning.

The "Present Termination Commitment" represents the outstanding debt issued to finance the projects (without credit for salvage of assets or unspent construction funds) which would be payable over the varied financing repayment periods if the projects were terminated as of September 30, 1980:

Project and % Capability Acquired	Projected in Service Date	Capacity in Megawatts	Estimated BPA Portion	
			Present Termination Commitment	Additional Estimated Financing Requirements for Projects under Construction
(Thousands of Dollars)				
WPPSS*				
Hanford Project (100%)	Operational	860	\$ 46,045	
Net billed projects:				
Trojan Nuclear Project (30%)	Operational	339	147,660	
WPPSS*				
Nuclear Project #1 (100%)	February 1986	1,250	1,255,000	\$ 899,700
WPPSS*				
Nuclear Project #2 (100%)	September 1983	1,100	1,265,500	701,100
WPPSS*				
Nuclear Project #3 (70%)	September 1986	868	680,000	1,141,700

\*Washington Public Power Supply System

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BPA's commitment period under the net billing agreements extends for the life of the projects, except that the terms of the Trojan Nuclear Project net billing agreements under which Eugene Water & Electric Board (Eugene) assigned its 30% share of the project capability to BPA and other participants, contained a provision allowing Eugene to withdraw the project capability for use in its own system beginning in 1984. Had Eugene exercised its withdrawal rights, settlement for BPA's prepaid Trojan costs would have been negotiated at withdrawal dates and, accordingly, BPA included such prepaid costs as net billing advances in its balance sheet. On July 1, 1980, Eugene's right to withdraw expired, Eugene confirmed that it did not intend to request withdrawal, and the balance of prepaid costs existing at that date (\$44,210,186) was charged to expense. No such withdrawal options exist for the WPPSS projects. See Note 1 for further information concerning net billing advances. Amounts shown therefor in the accompanying statement of assets and liabilities comprise:

	September 30,	
	1980	1979
	(Thousands of Dollars)	
Trojan Nuclear Project, net of accumulated amortization of \$14,426 at September 30, 1979		\$45,113
Washington Public Power Supply System Nuclear Project No. 2 (under construction), net of accumulated amortization of \$4,554 at September 30, 1980	207,953	201,748
	\$207,953	\$246,861

BPA has also entered into agreement with a group of utilities to exchange an agreed amount of power for their rights to a portion of the Canadian Entitlement (one-half of the additional power benefits realized by downstream U.S. projects from three Canadian Treaty dams for a 60-year period). The Canadian Entitlement was purchased for a 30-year period from the completion of each dam (the last dam was placed in service in 1973) by 41 Pacific Northwest utilities. BPA furnishes specified amounts of power to the utilities regardless of entitlement power generated. BPA's minimum average energy commitment to the utilities declines annually from approximately 621 megawatts currently to approximately 100 megawatts in the last year of the exchange agreement (2003):

Following is an analysis of amounts included in purchase and exchange power expense:

	September 30,	
	1980	1979
	(Thousands of Dollars)	
Trojan Nuclear Project:		
Share of annual generation costs	\$ 32,382	\$22,502
WPPSS Nuclear Projects:		
Project No. 1	22,901	
Project No. 2	70,571	
Other purchase and exchange power costs	12,679	2,693
	\$138,533	\$25,195

### Note 6: Trust Funds and Trust Fund Advances:

These balance sheet amounts comprise funds received by BPA from customers and others for the purchase of nonfederal power for customers' benefit and for construction to be done for others.

### Note 7. Net Investment of U.S. Government:

The Federal investment in each of the generating projects and for each year's investment in the transmission system is being repaid to the U.S. Treasury within 50 and 35 years, respectively, from the time the facility is placed in service. No such repayments are required during the next five years. However, amounts are normally expected to be paid annually for interest on outstanding Federal investment, net of interest capitalized on projects financed through appropriations, and for operating expenses of the Corps and Service funded by annual appropriations. To the extent that funds are not available for payment, such amounts become payable from subsequent years' revenue prior to any payment for amortization of Federal investment. Fiscal 1980 and 1979 revenues were not sufficient to pay all these annual amounts and payments of \$13.8 and \$98.6 million, respectively, of interest on appropriated funds has been deferred.

Interest rates (other than on Transmission System Act borrowings) range from 2-1/2% to 8% (the weighted average rate was approximately 3.3% in 1980 and 1979). The rates have been set either by law, by administrative order pursuant to law, or by administrative policies, and have not necessarily been established to recover the interest costs to the U.S. Treasury to finance the investment. See Note 1 - Revenues and Note 8 for additional information concerning repayment requirements and policies.

### Note 8. Repayment Responsibility for Irrigation Costs:

Legislation requires that FCRPS net revenues will be used to repay to the U.S. Treasury that portion of the cost allocated to irrigation of any Pacific Northwest project authorized by Congress and determined by the Secretary, Department of Interior, to be beyond the ability of the irrigation water users to repay. The use of power revenues for such repayment represents a payment for irrigation assistance to the benefitting water users and, while paid by power ratepayers, such costs do not represent a regular operations cost of the power program and are not included therein. The \$646 million in irrigation assistance payments shown as returnable from power revenues in Schedule A will be reflected as reductions of accumulated net revenues at the time future payments are made. The first payment is scheduled to be made in 1997. The \$646 million does not include any portion of \$21 million of costs allocated to irrigation at six Corps projects located within Oregon where

## FINANCIAL SECTION

completion of irrigation facilities is not yet authorized. If completion is authorized, a determination of water users' repayment ability will probably be made which might result in additional irrigation assistance being payable from accumulated net power revenues.

### Note 9: Teton Dam:

On June 5, 1976, before the project had been completed and turned over for the use of FCRPS, a breach occurred in the Teton Dam. The project was extensively damaged, and a vast amount of damage occurred downstream from the resulting flood. The total investment in the project at September 30, 1980 (excluding interest totaling approximately \$1,810,000 subsequent to June 1976 which has been charged to expense) was \$78.0 million. The amount of investment allocated to power was \$13.8 million, and the amount of investment allocated to irrigation but repayable from power revenues was \$49.9 million.

Disposition of the project's costs and final decision as to the repayment obligation are dependent upon Department of the Interior administrative action and/or Congressional action. If repayment is not required, the cost associated with the investment in power facilities (and recovery of the related \$1.8 million interest) will be charged off against the investment of the U.S. Government. Should FCRPS be directed to repay, the costs will be recovered through rates. Until a decision is made, the investment allocated to power is included as a deferred charge in the statement of assets and liabilities and the cost of applicable irrigation assistance is included in the total of other irrigation costs described in Note 8.

FCRPS will not be required to repay the costs of claims of nonfederal entities and individuals resulting from failure of Teton Dam. The Congress enacted legislation to pay the costs of these claims and stipulated that all such payments would be nonreimbursable.

### Note 10: Litigation:

The Confederated Tribes of the Colville Indians and the Spokane Indian Tribes (the Tribes) have asserted claims in unspecified amounts arising from construction of the Grand Coulee and Chief Joseph Dam projects. In response to a request from Congress, a task force established by the Departments of Interior and Army has studied the claims. No basis of liability has been found but the Office of Management and Budget has suggested the affected federal agencies work with the Tribes to develop a proposal which will encourage their economic development, including a supply of necessary power. It is not currently expected that resolution of this matter will adversely affect FCRPS power revenues.

On November 14, 1977, the City of Portland (the City) filed two lawsuits in the United States District Court for the District of Oregon against the Administrator of BPA and the Secretary of the Department of

Energy. In the first suit the City alleges BPA has acted illegally in its sales of power to preference customers, private utilities and direct service industrial customers and that, as a result of such actions, the City has been denied an ability to purchase power from BPA. The City then requests that it be declared a preference customer; that BPA power sales agreements be set aside; that BPA adopt revised allocation procedures; and that BPA sell power to the City of Portland until such reallocation and revised rules are complete. The second suit is based upon BPA's alleged failure to comply with the terms of the National Environmental Policy Act. In this suit the City alleges that all BPA power sales contracts, extensions, renewals and the net billing agreements executed since January 1, 1970, were major Federal actions significantly affecting the quality of human environment in BPA's service area. The suit further alleges that BPA's actions have caused a serious impact on the City by reducing the quality of the environment. The City then asks that all power sales contracts, extensions, renewal agreements and net billing agreements entered into by BPA since January 1, 1970 be declared null and void; that BPA be required to prepare an environmental impact statement (EIS) on each of these agreements and that BPA be enjoined from executing any new power sales agreements or net billing agreements until BPA completes an EIS. In July 1978 three private utilities, Pacific Power & Light Company, Portland General Electric Company and Montana Power Company, who had previously been joined by BPA as defendants, filed cross-claims against BPA. They contend that the BPA preference clause entitles them to power for their domestic and rural customers. Montana Power Company also claims a statutory geographic preference for Federal hydro power produced at Hungry Horse and Libby Dams.

In the City of Portland's first suit the District Court orally granted a motion by the defendants to dismiss the plaintiffs' claims on the ground that the City had not taken the steps necessary to render their claims ripe for court review. Subsequently the court required further briefing on specific issues relating to the motion. Final briefs have been submitted and the matter is pending. The investor-owned utilities' cross claims are also pending. On December 20, 1979, the City moved to amend its complaint for the purpose of supporting the cross claims of Pacific Power & Light Company and Portland General Electric Company, and on December 27, 1979, BPA petitioned the court to deny the City's motion for the reason that the matter has already been determined. The court has taken no action on either the City's motion or BPA's petition.

In the opinion of the BPA General Counsel the lawsuits originally filed by the City of Portland and counter-claims filed by the private utilities are without merit and furthermore have been rendered moot by enactment of the Pacific Northwest Electric Power Planning and Conservation Act. No estimate of the financial effects on FCRPS in the event of adverse decisions in these cases can be made.

## FINANCIAL SECTION

On January 22, 1980, Pacific Power & Light Company filed suit in the United States District Court for Oregon against the Department of Energy and BPA to have the Assistant Secretary's interim rate order of December 3, 1979 declared unlawful and for other relief, including injunctive relief against collection of BPA's new wholesale power rates which were effective December 20, 1979. Portland General Electric Company and the Oregon Public Utility Commission have intervened as plaintiffs in the lawsuit and the Public Power Council has intervened as defendant. Plaintiffs do not contest Bonneville's need for an increase in revenues, but contest the design of Bonneville's rates. On September 30, 1980, the Court entered judgment for the Government and on November 26, 1980, the plaintiffs filed a Notice of Appeal to the Ninth Circuit Court of Appeals. It is the opinion of BPA General Counsel that the holding of the District Court will be sustained.

Montana Power Company and the Idaho Power Company filed suit in the United States District Court for the District of Montana (venue has been changed to the District of Oregon) seeking an injunction against collection of the interim rates approved by the order of December 3, 1979 and for other relief. The contentions of plaintiffs in Montana are nearly identical to those raised by plaintiffs before the District Court of Oregon, except that plaintiffs in Montana do not concede that interim rates may be imposed based upon the imperative need for additional revenue and seek to have all rates reduced to the level prevailing before the order. It is the opinion of BPA General Counsel that in the event that this litigation proceeds further, the contentions of the plaintiffs are without merit, particularly in view of the result in the Pacific Power & Light Company case.

Certain other claims, suits and complaints have been filed or are pending against entities of FCRPS, including litigation relating to the installation of additional generating capacity at Bonneville and Libby dams, acquiring land rights needed to raise the Chief Joseph dam reservoir level and construction of certain transmission lines. In the opinion of counsel and management, these actions are either without merit, involve amounts which are not significant to FCRPS' financial position or results of operations or primarily affect the overall cost of construction projects which will be capitalized and recovered through future power rates.

### Note 11. Regional Power Bill:

The Pacific Northwest Electric Power Planning and Conservation Act became effective December 5, 1980. Under the Act:

- BPA assumes a utility function in its region. The BPA Administrator may acquire power resources, but BPA cannot own or construct any generating resources.
- Resource acquisition priorities are: conservation, renewable resources, resources using waste heat or having high fuel conversion efficiency, other resources.
- All obligations assumed by BPA under the Act are to be secured solely by BPA revenues.
- The BPA borrowing limit (see Note 2) is increased from \$1.25 billion to \$2.5 billion effective in fiscal 1982. The entire increase is for a revolving fund for conservation and renewable resource loans and grants.
- BPA ratemaking remains subject to confirmation and approval by FERC and FERC may approve revised rates on an interim basis.

## FINANCIAL SECTION

Schedule B  
Federal Columbia River Power System

### Reconciliation of Cost Accounting Financial Statements to the Repayment Study

For the Fiscal Year Ended 9-30-80  
(unaudited)

	Cumulative Balance 9-30-79	Fiscal Year 1980 Operations	Cumulative Balance 9-30-80	Cumulative Adj. to Repayment Basis	Cumulative Data Thru 9-30-80 on Repayment Study
(Thousands of Dollars)					
OPERATING REVENUES .....	\$3,929,474	\$512,466	\$4,441,940		\$4,441,940
EXPENSES:					
Purchase and Exchange Power .....	336,296	182,743 <sup>1</sup>	519,039	\$207,953	726,992
Operation and Maintenance Expense .....	1,197,085	154,054	1,351,139		1,351,139
Interest Expense .....	1,530,912	183,779	1,714,691	(1,811)	1,712,880
Depreciation .....	623,052	51,380	674,432	(674,432)	—
<b>Total Expense</b> .....	<b>3,687,345</b>	<b>571,956</b>	<b>4,259,301</b>	<b>(468,290)</b>	<b>3,791,011</b>
NET REVENUES .....	<b>\$ 242,129</b>	<b>\$(59,490)</b>	<b>\$ 182,639</b>		
RECONCILIATION TO CUMULATIVE AMORTIZATION .....			<b>\$ 182,639</b>	<b>\$468,290</b>	<b>\$ 650,929(a)</b>
PLANT INVESTMENT:					
Completed Plant .....			\$5,844,826		
Retirement Work in Progress .....			21,625		
Repayment Obligation Retained by Columbia Basic Project (Schedule A) .....			1,352		
Net Retirements .....				\$141,987	
			<b>\$5,867,803</b>	<b>\$141,987</b>	\$6,009,790
Less Amortization .....					650,929(a)
Unamortized Plant Investment .....					<b>\$5,358,861</b>

(a) Changes in Cumulative Amortization:

Cumulative Amortization through September 30, 1979 .....	\$ 619,699
Fiscal Year 1980:	
Depreciation .....	51,380
Net Revenues (Expenses) .....	(59,490)
Purchase and Exchange Power Adjustment to Cash Basis .....	38,908
Interest Adjustment for Teton Project .....	432
Amortization for the year .....	31,230
Cumulative Amortization through September 30, 1980 .....	<b>\$ 650,929</b>

<sup>1</sup>Includes \$44,210,000 write-off of Trojan Nuclear Project net billing advances

**FINANCIAL SECTION**

Schedule A  
Federal Columbia River Power System  
**Schedule of Amount and Allocation of Plant Investment**  
as of September 30, 1980 (Thousands of Dollars)

Project	Total	Commercial Power		Total Commercial Power
		Completed Plant	Construction Work in Progress	
Projects in service:				
Transmission facilities (BPA)	\$2,144,773	\$1,853,400	\$291,373	\$2,144,773
Albeni Falls (CE)	33,757	32,147		32,147
Boise (Service)	73,998	5,387	2,157	7,544
Bonneville (CE)	620,993	89,612	492,217	581,829
Chief Joseph (CE)	443,666	438,718		438,718
Columbia Basin (Service)	1,437,460	664,686	160,640	825,326
Cougar (CE)	60,440	18,415	3	18,418
Detroit-Big Cliff (CE)	66,914	40,604	25	40,629
Dworshak (CE)	341,565	288,953	30	288,983
Green Peter-Foster (CE)	90,247	49,819	45	49,864
Hills Creek (CE)	48,973	17,449		17,449
Hungry Horse (Service)	101,641	76,975	11	76,986
Ice Harbor (CE)	183,419	131,714	3,205	134,919
John Day (CE) (a)	526,899	385,415	380	385,795
Libby (CE) (a)	579,421	418,319	37,941	456,260
Little Goose (CE) (a)	238,295	178,140	3,163	181,303
Lookout Point-Dexter (CE)	97,566	46,433	67	46,500
Lost Creek (CE) (a)	148,544	26,962		26,962
Lower Granite (CE) (a)	388,457	311,310	3,171	314,481
Lower Monumental (CE) (a)	259,840	204,874	3,194	208,068
McNary (CE)	335,800	268,235	2,384	270,619
Minidoka-Palisades (Service)	188,433	14,057	17	14,074
The Dalles (CE)	324,142	278,598	131	278,729
Yakima (Service)	69,467	4,604	10	4,614
Irrigation assistance at 12 projects having no power generation	113,716			
Plant investment	8,918,426	5,844,826	1,000,164	6,844,990
Repayment obligation retained by Columbia Basin Project	2,211	1,352		1,352(b)
Other repayment obligations	9,297			
Investment in Teton Project (d)	78,023		13,774	13,774
	\$9,007,957	\$5,846,178	\$1,013,938	\$6,860,116

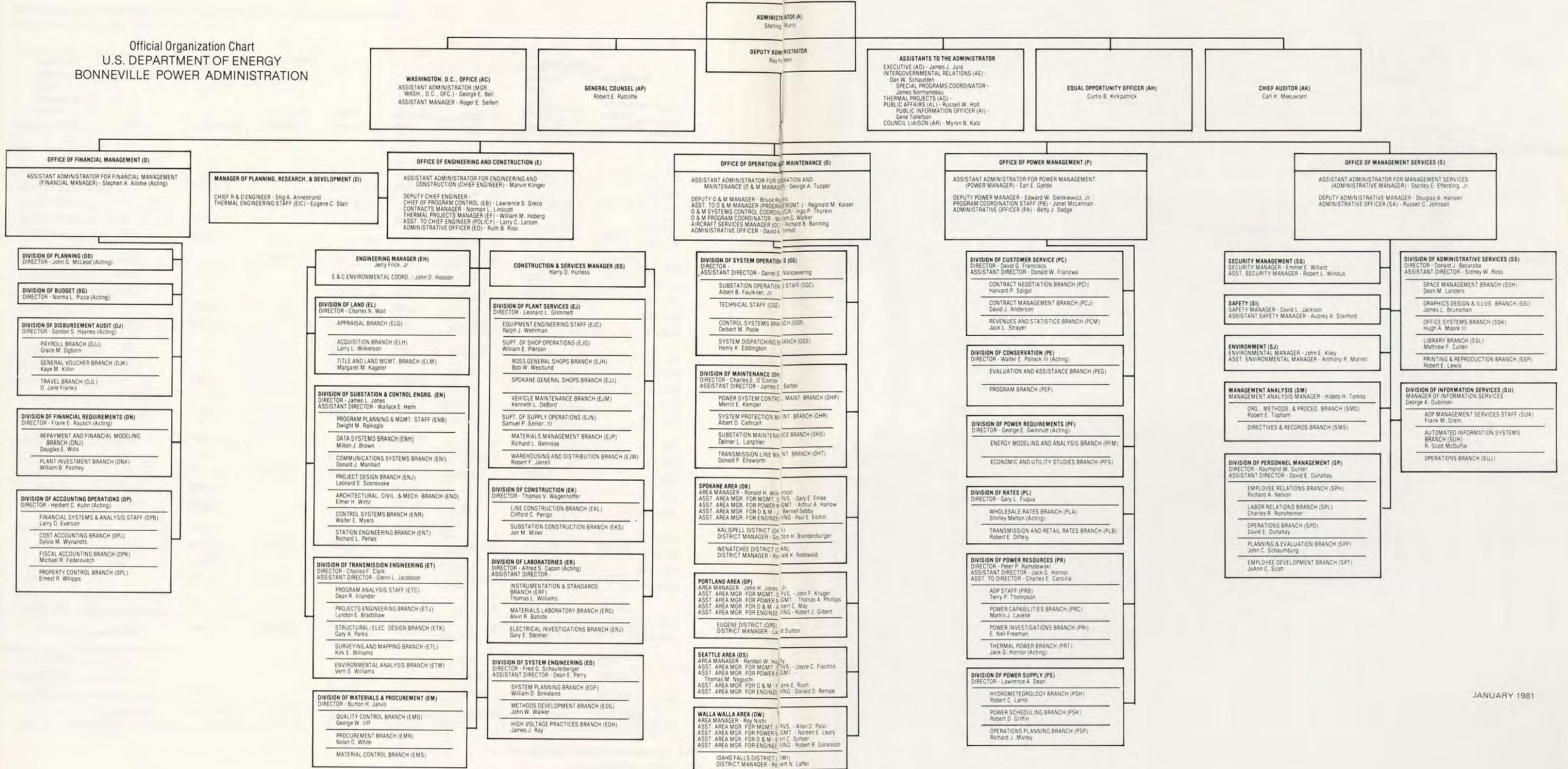
**FINANCIAL SECTION**

Returnable from Commercial Power Revenues	Returnable from Other Sources	Total Irrigation	Nonreimbursable					Percent of Total Returnable from Commercial Power Revenues
			Navigation	Flood Control	Fish and Wildlife	Recreation	Other	
			\$ 135	\$ 174		\$ 1,301		100.0%
\$ 11,754	\$ 38,596	\$ 50,350		16,056			\$ 48	95.2%
			35,509			1,150	2,505	26.1%
732		732				1,014	3,202	99.0%
477,315	83,092	560,407	1,000	47,902	\$ 2,298		527	90.6%
	3,066	3,066	546	38,202			208	30.5%
	4,790	4,790	221	20,984			290	60.7%
			9,149	32,982		10,451		84.6%
	5,813	5,813	365	30,288		1,856	2,061	55.3%
	4,321	4,321	626	26,305			272	35.6%
				24,655				75.7%
			45,991			2,509		73.6%
			88,382	14,880		11,432	26,410	73.2%
				86,343		3,987	32,831	78.7%
			50,341			4,047	2,604	76.1%
	1,372	1,372	733	48,356		511	94	47.7%
	1,985	1,985		52,882	24,285	28,699	13,731	18.2%
			54,189			11,948	7,839	81.0%
			48,533			2,822	417	80.1%
			62,891			2,290		80.6%
10,268	98,360	108,628		60,267	110	5,354		12.9%
			43,309			2,082	22	86.0%
7,714	55,038	62,752		711	1,152	238		17.7%
78,121	35,595	113,716						68.7%
585,904	332,028	917,932	441,920	500,987	27,845	91,691	93,061	83.3%
859		859						100.0%
9,297		9,297						100.0%
49,862	67	49,929		12,033		2,287		81.6%
\$645,922	\$332,095	\$978,017	\$441,920	\$513,020	\$27,845	\$93,978	\$93,061(c)	83.3%

BPA—Bonneville Power Administration  
CE—Corps of Engineers  
Service—Water and Power Resources Service

- (a) Projects in service that have tentative cost allocations at September 30, 1980.
- (b) Joint facilities transferred to Bureau of Sport Fisheries and Wildlife. This portion is included in other assets and deferred charges in the accompanying statement of assets and liabilities.
- (c) Included in this amount are nonreimbursable road costs amounting to \$83.7 million.
- (d) Commercial power portion of Teton is included in other assets and deferred charges in the accompanying statement of assets and liabilities. Amounts exclude interest totaling approximately \$1,810,000 subsequent to June 1976 which has been charged to expense.

Official Organization Chart  
U.S. DEPARTMENT OF ENERGY  
BONNEVILLE POWER ADMINISTRATION



JANUARY 1981



# Customer Service Areas

-  PORTLAND AREA
-  SEATTLE AREA
-  SPOKANE AREA
-  WALLA WALLA AREA





Mar • 1981

U.S. Department of Energy  
Bonneville Power Administration  
Portland, Oregon