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REPORT BY THE
Comptroller General
OF THE UNITED STATES

Impacts And Implications Of The Pacific Northwest Power Bill

Congressman John Dingell asked GAO to determine how the bill might impact on (1) consumers paying for construction cost overruns on non-Federal powerplants backed by the Bonneville Power Administration, (2) Bonneville's direct service industrial customers, and (3) the region's anadromous salmon and steelhead fisheries.

GAO doubts that Bonneville is adequately prepared to protect consumers from cost overruns on large powerplants. If Bonneville is authorized to construct or finance construction of major thermal plants, its contracting and oversight practices should be strengthened before financial commitments are made.

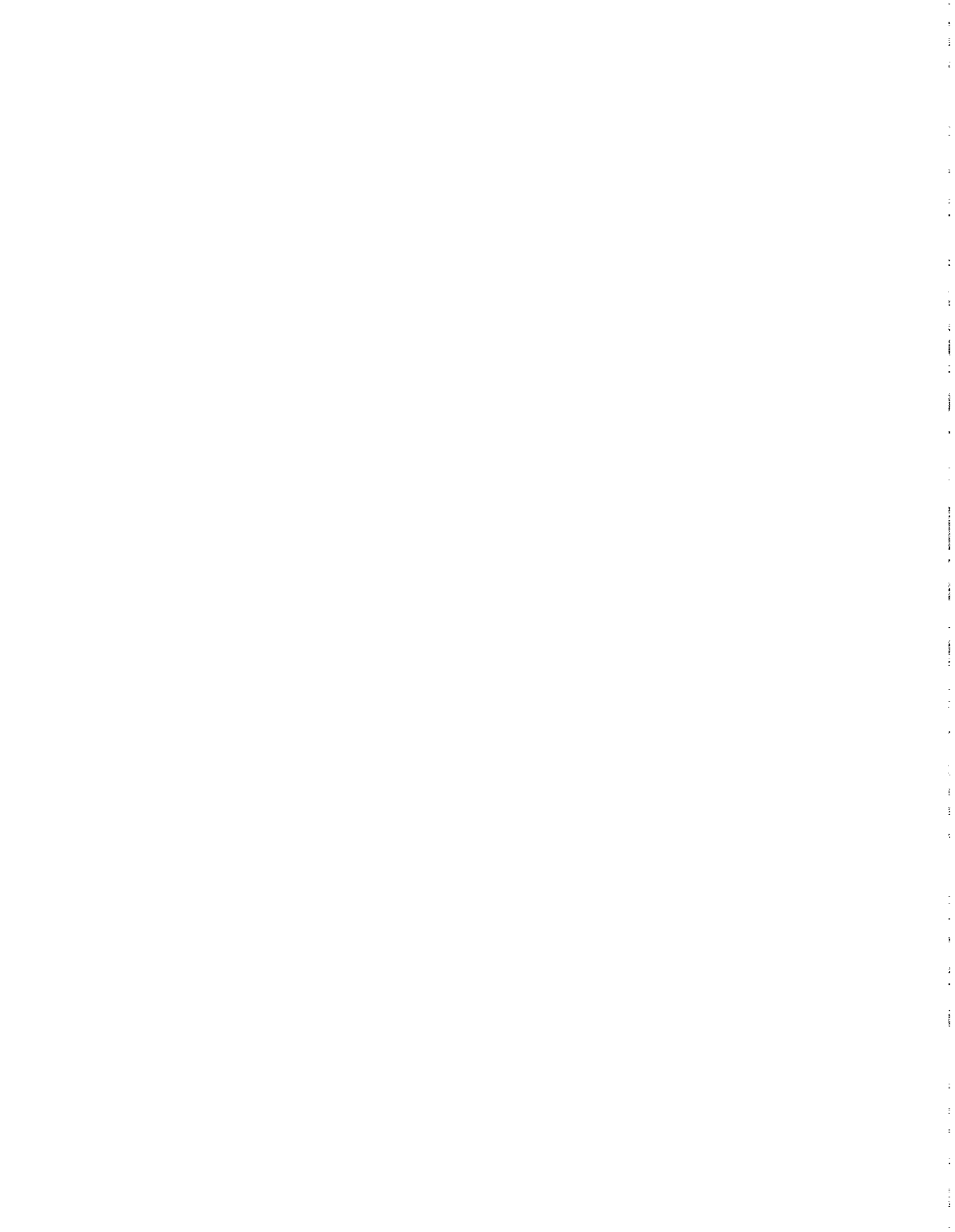
Before long-term contracts are authorized for Bonneville's industrial customers, GAO recommends actions to (1) assure conservation of electricity, (2) provide more appropriate credits for power interruptions, and (3) thoroughly analyze alternative system reserves.

GAO found that legislation could help assure survival of upriver salmon and steelhead runs.



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EMD-79-105
SEPTEMBER 4, 1979





COMPTROLLER GENERAL OF THE UNITED STATES
WASHINGTON, D.C. 20548

B-114858

The Honorable John D. Dingell
Chairman, Subcommittee on Energy and Power
Committee on Interstate and Foreign Commerce
House of Representatives

HSE02303

Dear Mr. Chairman:

Pursuant to your letter of January 22, 1979, and subsequent discussions with your staff, we have examined the impacts and implications of certain aspects of the Pacific Northwest Electric Power Planning and Conservation Act. That act would change the Bonneville Power Administration from a marketer of Federal hydropower to a regional utility with broad responsibilities for assuring adequate power supplies in the Pacific Northwest. In response to your request, our examinations were directed at three issues relating to potential impacts of the proposed legislation:

- Would the legislation expose regional power consumers to more rate increases from construction cost overruns on non-Federal power plants backed by the Bonneville Power Administration?
- How would passage or failure of the legislation impact on Bonneville's direct service industrial customers?
- Could the legislation have a significant effect on runs of anadromous salmon and steelhead trout in the Columbia River system?

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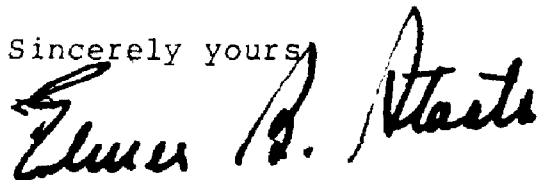
We are making recommendations to remedy the problems we identified.

We have confirmed the factual material in this report through informal discussions with Federal officials in the Pacific Northwest. At your request, we did not discuss our conclusions and recommendations.

B-114858

As arranged with your staff, this report will be made available for unrestricted distribution in 30 days unless you publicly announce its contents earlier.

Sincerely yours,

A handwritten signature in cursive script that reads "Elmer A. Staats". The signature is written in black ink and is positioned below the typed name "Elmer A. Staats".

Comptroller General
of the United States

COMPTROLLER GENERAL'S REPORT
TO THE HONORABLE JOHN DINGELL,
CHAIRMAN, HOUSE SUBCOMMITTEE
ON ENERGY AND POWER

IMPACTS AND IMPLICATIONS
OF THE PACIFIC NORTHWEST
POWER BILL

D I G E S T

On January 22, 1979, Chairman John Dingell of the House Subcommittee on Energy and Power asked GAO to answer a number of questions relating to the Pacific Northwest Electric Power Planning and Conservation Act (H.R. 3508). The proposed legislation would change the Bonneville Power Administration from a marketer of Federal hydro-power to a regional utility with broad responsibilities for assuring adequate power supplies in the Pacific Northwest.

In response to Chairman Dingell's request, this report addresses three primary issues:

- Could the legislation expose regional power consumers to more rate increases from construction cost overruns on non-Federal power plants backed by the Bonneville Power Administration?
- How would passage or failure of the legislation impact on Bonneville's direct service industrial customers?
- How would the legislation impact on runs of anadromous salmon and steelhead trout in the Columbia River system?

CONSUMER EXPOSURE TO COST
OVERRUNS ON NON-FEDERAL
POWER PLANTS

In the late 1960's and early 1970's, Bonneville agreed to participate in the development of a series of non-Federal thermal power plants.

EMD-79-105

Tear Sheet. Upon removal, the report cover date should be noted hereon.

Bonneville acquired the production capabilities of three nuclear power plants now under construction by the Washington Public Power Supply System an agent of publicly owned utilities in the region. Bonneville--and therefore its customers--has the ultimate responsibility for payment of all cost from two plants and 70 percent of the costs from the third plant. Revenues to pay for these cost will have to be provided by Bonneville power sales. To protect its customers from unnecessary rate increases, it is important for Bonneville to assure that the nuclear plants are constructed by the Supply System as efficiently as possible.

All three nuclear plants have experienced very substantial delays and cost overruns. The plants were originally scheduled to be completed by September 1981 at an estimated cost of \$1.55 billion. They are now scheduled for completion by December 1984 at an estimated cost of \$5.76 billion.

GAO reviewed the methods used by Bonneville to (1) contract for the net-billed plants' capability and (2) oversee the schedule and cost of plant construction. GAO's review, and studies conducted by other auditors and consultants, showed that Bonneville's contractual rights and oversight practices did not provide adequate financial protection for regional consumers obligated to pay for the nuclear plants. The project agreements generally give Bonneville budget review authorities and monitoring/evaluation rights, but do not assure Bonneville full participation with the Supply System in decisionmaking.

Bonneville's efforts to oversee the nuclear construction program are also hindered by staffing weaknesses. To oversee the three nuclear construction projects Bonneville

established a Thermal Projects Office, but staffed it too lightly to be effective. At the time of our review, 5 of Bonneville's 800 professionals were overseeing the nuclear construction program, and none of them had previous experience with nuclear construction projects. Until recently, Bonneville management has not tried to play a major decisionmaking role in the Supply Systems' construction projects, even though Bonneville's customers will ultimately pay for most plant costs.

There is room for substantial improvement in the Supply System's management and Bonneville's oversight of the nuclear construction program. To make this improvement, the two organizations will need to work harder and cooperate more closely. GAO found little evidence that the supply system is ready to acknowledge Bonneville's need for increased oversight of the construction process.

Recommendations

GAO believes that, at this time, Bonneville is not adequately prepared to construct or oversee the construction of large generating facilities. Even well-managed construction projects of this magnitude are subject to delays and cost overruns resulting from changes in technology, regulatory requirements, and the economic environment. Consequently, legislation cannot totally protect Bonneville's customers from the financial risks of developing additional energy sources. What can be done, however, is to minimize these risks by taking legislative steps to assure (1) that Bonneville's contracting and oversight practices are strengthened to reduce consumer exposure to costly delays and overruns, (2) additional energy sources are diversified and developed only when they are judged necessary by a representative power planning body, and (3) the most cost effective and least capital intensive energy sources are developed first.

If the Congress grants Bonneville authority to construct or finance construction of large power plants, GAO recommends that Bonneville's contracting and oversight capabilities be strengthened before such authority is exercised. GAO also recommends the Committee consider amending the proposed legislation to limit (1) the extent to which Bonneville can participate in constructing large power plants or (2) the construction costs which Bonneville can pass on to its customers.

Any plans for Bonneville to construct energy projects should be subject to advance approval by the representative regional power planning board, the Secretary of Energy, and appropriate Committees of the Congress.

To assure that new energy sources are developed only when necessary, GAO recommends that a representative regional power planning board be established with adequate analytical and public involvement capabilities to develop (1) a range of regional demand forecasts showing the high, low, and most likely demand levels; (2) thorough analyses of the economic, environmental and social costs of alternative means of balancing supply and demand; and (3) a public involvement program in which competing alternatives can be evaluated in open forums by the region's policymakers and power consumers.

To help assure that the most cost-effective energy sources are developed first, we recommend that life cycle analysis should be applied to compare the economic, social, and environmental costs of competing alternatives at the margin.

POSSIBLE IMPACTS ON BONNEVILLE'S INDUSTRIAL CUSTOMERS

Direct service industrial customers purchase large amounts of power directly from Bonneville. In 1978, industrial customers purchased about

as much Federal power as four large nuclear plants can produce. Ten aluminum reduction plants, owned by 6 companies, accounted for 90 percent of the purchases. In 1978, DSIs paid slightly over 3 mills/kwh for power purchased from Bonneville--about one-tenth the cost of new power supplies in the region.

The ages of large industrial plants vary widely, but most were constructed in the 1940's and 1950's. The potential for electricity conservation in some plants with older production facilities may be significant.

The power sold to industrial customers can be interrupted by Bonneville under certain conditions. This, in effect, provides Bonneville with system reserves, which in other power systems are usually provided by standby generating equipment, contractual arrangements with neighboring utility systems, or other means. Bonneville grants discounts or credits when it interrupts the industrial power.

Because a portion of the industrial load can be interrupted by Bonneville at any time for any reason, it could serve as a valuable operating reserve to meet various short-term power needs. However, because of disproportionate credit provisions, Bonneville power schedulers are extremely reluctant to interrupt the industrial loads. Consequently, Bonneville's contracts with industry are not providing sufficiently flexible energy reserves.

If the regional power bill does not pass, industrial customers will continue to receive Bonneville power until their present contracts expire. They will then have to seek power supplies from other sources and Bonneville will need to provide system reserves in a different manner. Bonneville has conducted no studies to determine whether interruptible power sales are the most effective and economical method of providing system reserves.

The legislation would provide industry with long-term contracts for very large quantities

of power at substantially higher prices. Whether the legislation passes or not, industrial customers will be facing higher power costs. However, even greatly increased power costs are unlikely to cause the industry to relocate.

Recommendations

Before Bonneville is authorized to offer the industrial customers new long-term contracts, GAO believes the bill should be amended to assure industrial conservation of electricity, realistic energy pricing, and development of cost effective system reserves. We recommend that amendments be considered to

- authorize Bonneville to gradually reduce the power supplied to any industrial customer whose voluntary conservation efforts prove insufficient to meet commercial standards for production efficiency;
- direct Bonneville to renegotiate contract provisions for power interruptions; and
- require Bonneville to thoroughly analyze and report to the Secretary of Energy on the economic, environmental, and social costs of alternative means of providing various system reserves.

There are other industrial consumers of Federal power in the Pacific Northwest, some of which secure large quantities of Federal power at low rates, without contributing to Bonneville's system reserves. In the interest of fairness, the legislation should be amended to require Bonneville's Administrator to set uniform and equitable rates for all large industrial customers of Federal power.

POSSIBLE IMPACTS ON ANADROMOUS FISH RUNS

After many years of fragmented management and untimely mitigation efforts, the upper river

salmon and steelhead fisheries are in serious trouble. Studies are underway to determine whether some fish runs should be proposed for listing as threatened and endangered species.

While several factors have contributed to the decline of the Columbia and Snake River fish runs, a major problem is failure to adequately mitigate the adverse effects of dams constructed and operated by Federal agencies and electric utilities. The hazards created by dams are critical because they greatly impact on the all-important migration process. Dams on the main-stem Columbia system constitute an obstacle course for up-river salmon and steelhead which must be successfully run twice for the fish to survive--once as small juveniles trying to reach the sea, and then once again as 5 to 50 pound adults returning from the sea to their spawning grounds.

Although large numbers of young fish are produced in hatcheries and natural spawning grounds, many are killed when they migrate to the sea in the spring of each year. This occurs because the main-stem Columbia system is now so developed that (1) most river flows are passed through hydroelectric turbines, and (2) the main-stem waterways have been changed from free-flowing rivers to a series of slow moving reservoirs which slow the juveniles' passage, increases their exposure to predators, and causes some to cease their migration. Depending on river flows, juvenile losses from all causes average and estimated 15 to 20 percent at each main-stem dam and reservoir.

Efforts to preserve the anadromous fish runs are conducted under various authorities by a variety of Federal, State, and Indian organizations. GAO identified 16 organizations which impact on the salmon and steelhead fisheries. But there is no formally organized body that exercises a comprehensive management function over water resource uses in the Columbia Basin.

Fishery maintenance or enhancement is not an authorized purpose of the Columbia system dams. Consequently, Federal and State fishery interests have no "right" to river flows needed for the downstream migration. Fishery officials must seek the voluntary cooperation of Bonneville and the main-stem dam operators. Voluntary cooperation in low water years has been adequate to prevent extinction of the upper river runs, but has not reversed the decline in some stocks.

Recommendations

This bill can be an effective vehicle for restoring the anadromous fisheries. GAO believes it should be amended to that purpose. GAO recommends the legislation be amended to

- Direct the Corps of Engineers through Federal Energy Regulatory Commission, the region's electric utilities, to install at all main-stem Columbia System dams, with all expeditious speed, any equipment needed to effectively reduce mortality of migrating juvenile salmon and steelhead.
- Consolidate the presently fragmented support of anadromous fisheries into one Federal/State/Indian council with planning, policymaking, and coordination responsibilities for fisheries restoration.
- Direct the anadromous fisheries council, the Corps of Engineers, the Bureau of Reclamation, and the Federal Energy Regulatory Commission--within 12 months after enactment--reach total agreement on minimum stream flows on the main-stem Columbia River system adequate to protect and enhance the anadromous salmon and steelhead fisheries.
- Provide the anadromous fisheries council with sufficient revenues or appropriations, and empower it to annually direct the release of water designated for fishery

restoration--as provided in the second recommendations above--at each Columbia system dam and storage reservoir.

--Direct the Secretary of the Interior, within 6 months from enactment of the legislation, to study and report to the Congress on actions needed to consolidate and make more effective the efforts of the many Federal agencies now having operational responsibilities for various aspects of fish and water management in the Columbia River Basin.



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ABBREVIATIONS

BPA	Bonneville Power Administration
FERC	Federal Energy Regulatory Commission
NMFS	National Marine Fisheries Service
WPPSS	Washington Public Power Supply System
kWh	Kilowatt-hour
MW	Megawatt

CHAPTER 1

INTRODUCTION

The Pacific Northwest Electric Power Planning and Conservation Act (H.R. 3508) would change the Bonneville Power Administration from a marketer of Federal hydropower to a regional utility with broad responsibilities for assuring adequate power supplies in the Pacific Northwest. The act could have important lasting effects on Federal power acquisitions and allocations, electricity pricing, river management practices, and environmental quality in the Pacific Northwest. It will also determine what role the Bonneville Power Administration is to play in implementing the principles of national energy policy within the region.

On January 22, 1979, Chairman John Dingell of the Subcommittee on Energy and Power, House Committee on Interstate and Foreign Commerce, asked GAO to answer a number of questions relating to certain aspects of the proposed legislation. In response to Chairman Dingell's request, this report addresses three primary issues:

- Could the legislation expose regional power consumers to more rate increases from construction cost overruns on non-Federal power plants backed by the Bonneville Power Administration?
- How would passage or failure of the legislation impact on Bonneville's direct service industrial customers?
- How would the legislation impact on runs of anadromous salmon and steelhead trout in the Columbia River system?

Evidence bearing on these issues and Chairman Dingell's questions is presented in the appendixes to this report. A copy of Chairman Dingell's request is included as appendix I.

SCOPE OF REVIEW

To explore these three issues we examined appropriate files and studies in the Pacific Northwest. We also interviewed regional officials of the Bonneville Power Administration, the Washington Public Power Supply System, the U. S.

Army Corps of Engineers, the National Marine Fisheries Administration, and the Department of the Interior. We contacted appropriate officials of State government and met with representatives of regional fishing interests, local electric utilities, and Bonneville's direct service industrial customers. We also used information developed for our September 1978 testimony before the Committee, and our August 1978 report 1/ to the Congress on electrical energy options for the Pacific Northwest.

AGENCY COMMENTS

The factual material in this report has been confirmed through informal discussions with Federal officials in the region. We did not discuss the conclusions and recommendations.

1/"Region at the Crossroads--The Pacific Northwest Searches for New Sources of Electric Energy," EMD-78-76, Aug. 10, 1978.

CHAPTER 2

CONSUMER EXPOSURE TO COST OVERRUNS

ON NON-FEDERAL POWER PLANTS

The Bonneville Power Administration (BPA) was established by the Congress in 1937 to market and transmit electric power--initially from Bonneville Dam, and later from other Federal dams in the Columbia River Basin. BPA has no express authority to construct or finance construction of power generating facilities. However, when BPA has indicated that the acquisition of non-Federal generating capacity would provide more efficient operation of the Federal hydropower system, the Congress has allowed BPA to make such acquisitions, and to finance them through a process known as net-billing.

NET-BILLING FOR NON-FEDERAL POWER

Until recently, almost all of the electric power marketed by BPA was generated at Federal hydroelectric projects built and operated by the Bureau of Reclamation and the Corps of Engineers. The Federal power was plentiful and generated at a very low cost. That cost--incurred through appropriations to other Federal agencies--was not subject to BPA oversight and control.

Conditions began to change in the late 1960's when BPA and regional electric utilities devised a hydro-thermal power program to meet future load growth by incorporating non-Federal coal-fired and nuclear generating plants into the existing hydroelectric network. The initial phase of this program, which began in 1969, envisioned construction of seven large thermal plants by 1981, expansion of the generating capacity at hydroelectric projects, and further development of the Federal transmission system. BPA agreed to participate in paying for the publicly owned portions of the thermal plants through net-billing arrangements with its preference customers (publicly-owned, municipal, and cooperative utility systems). The purpose of net-billing was to meet the growing power needs of BPA customers through non-Federal development of thermal power.

Under net-billing, preference customers participating in development of new thermal plants assign their share of the plants' production capability to BPA. BPA pays for the plant

capability by crediting its customers' accounts for the amounts the customers are paying for their share of annual power plant costs. As a result of net-billing, more costly thermal power is integrated into the Federal system, increasing the average power rates for all of BPA's customers. Net-billing also shifts the financial risks associated with thermal plants from those preference customers' developing the plants to BPA and all of its customers. This occurs because BPA agrees to pay for its preference customers' share of plant capacity even if the plant never produces electricity. BPA's commitment to pay constitutes the credit supporting revenue bonds which are used by the builders to finance power plant construction. In short, net-billing can be said to have accomplished something for which BPA previously lacked authority--the financing of power generating facilities.

BPA's use of net-billing to acquire power plant capabilities was concurred during appropriation hearings for 1970 and 1971. It constituted an extremely important supplement to BPA's charter--as a marketer of Federal hydropower--one which perhaps deserved more scrutiny than it received. Originally, the Congress regarded net-billing as a convenient way to settle accounts between Federal power marketing agencies and their customers. Net-billing had been used before the 1970's to balance the amounts owed to and by BPA in its various arrangements with customers for electric power sales, transmission, and related services. The new use for net-billing was different, and clearly distinguishable from the previous use. BPA was not offsetting monies owed it for power sales with services it received. Instead, it was paying for the right to receive a share of output from a power plant built by a third party. This transaction did not involve services related to the day-to-day operation of the system, but concerned the acquisition in installments of an ownership interest in generating capacity.

Through net-billing (four plants) and power exchange agreements (one plant), BPA has acquired all or portions of the output of five nuclear power plants. In 1963, BPA used exchange agreements to acquire power from a steam-driven generating plant built and operated by the Washington Public Power Supply System (WPPSS), a construction agent for more than 100 publicly owned utilities in the region. The plant used steam from an Atomic Energy Commission reactor at Richland, Washington--the New Production Reactor (NPR). BPA obtained power from the NPR plant through power exchange agreements with public and private utilities that had purchased the output of the plant from WPPSS.

In 1970 BPA used net-billing to acquire part of the project capability of another nuclear plant, presently in operation. This facility, known as the Trojan nuclear power plant, was constructed and is operated by an investor-owned utility. BPA acquired the 30 percent share of plant output belonging to the City of Eugene, Oregon, directly from the city and some of the city's customers--local public bodies and cooperatives which had purchased a part of Eugene's share.

Subsequently, through net-billing agreements executed in 1971 and 1973, BPA acquired the production capabilities of three nuclear power plants to be constructed and operated by WPPSS. These plants--WNP-1, WNP-2, and WNP-3--are presently under construction. BPA is acquiring 100 percent capability of two plants and 70 percent of the third. On these three projects, WPPSS is constructing both the reactors and the generating plants. On the earlier NPR project, WPPSS constructed the generating facilities but the reactor was constructed by the Atomic Energy Commission.

WPPSS is also constructing and will operate and maintain two other nuclear power plants, WNP-4 and WNP-5. These projects do not involve BPA acquisition of project capability. Shares of project capability have been purchased by a group of BPA's preference customers for their own use.

Because of its unique status as a municipal corporation of the State of Washington, WPPSS can finance its construction projects by selling tax-exempt municipal bonds at very favorable interest rates.

RATE IMPLICATIONS OF THE NET-BILLED NUCLEAR POWER PROGRAM

Under the terms of its net billing agreements, BPA--and therefore its customers--has the ultimate responsibility for payment of all costs associated with WNP-1 and WNP-2, and 70 percent of the costs associated with WNP-3. Revenues to pay for these costs will have to be provided by BPA power sales. To protect its customers from unnecessary rate increases, it is important for BPA to assure that the WPPSS nuclear power plants are constructed as efficiently as possible.

All three net-billed nuclear plants under construction by WPPSS have experienced very substantial delays and overruns. The three plants were originally estimated to cost \$1.55 billion and to be completed by September 1981. They are now scheduled for completion by December 1984 at an

estimated cost of \$5.76 billion. Each project is more than three years behind schedule, and each has experienced cost overruns exceeding \$1 billion. The three plants now fall within the top 10 percent of the cost range for nuclear power projects of the same vintage.

According to WPPSS, numerous factors have contributed to the cost increases, including new or revised regulatory criteria, labor disputes, inflation, and evolution of design. WPPSS has pointed-out that many of these factors are beyond its control. Nevertheless, the magnitude of the cost overruns, their continued growth, and the potential impact on BPA's power rates have raised questions within the region about WPPSS' ability to manage and BPA's ability to oversee the net-billed nuclear construction program.

BPA has accepted the responsibility for payment of principal and interest on WPPSS bonds for WNP-1, -2, and -3, with payments beginning around the planned dates of commercial operation. Because all three plants will start commercial operations much later than originally planned, BPA will be required to service WPPSS' debt on each of the projects from 2 to 4 years before WPPSS can supply BPA with any power to market.

BPA has announced that a 90 percent rate increase will be required effective December 1979 to offset increased costs of power generation and marketing. A significant part of this increase--about 55 of the 90 percent--was needed to meet debt service costs on two of the three net-billed nuclear plants being constructed by WPPSS. BPA plans a series of rate increases from December 1979 through July 1985 to help meet the costs of WPPSS plants and planned additions to the Federal hydropower system.

The net-billed nuclear construction program will continue to drive BPA's rates upward. The three plants being constructed by WPPSS--originally planned to produce power at about 6 mills/kWh--are now estimated to cost over 30 mills/kWh. This is roughly 15 times the cost of producing Federal hydropower. As the increasing costs of nuclear generation are melded into BPA's hydro base, and additional hydroelectric facilities are installed on the Federal system, further rate increases will be needed. The December 1979 increase will raise BPA's preference customer rates from 3.7 mills/kWh to 6.8 mills/kWh.

WEAKNESSES IN BPA'S CONTRACTING
AND OVERSIGHT PROCEDURES

We reviewed the methods used by BPA to (1) contract for net-billed plants' capability, and (2) oversee the schedule and cost of plant construction. We found that weaknesses exist in BPA's agreements with WPPSS and in the way BPA has met its oversight responsibilities. Our findings are, for the most part, a synthesis of reports prepared earlier by other management analysts and auditors who have reviewed the BPA/WPPSS nuclear construction program in recent years.

In contracting with WPPSS, BPA did not establish rights and prerogatives adequate to protect the regional consumers whom BPA has obligated to pay for nuclear plant construction. Our review of BPA's project agreements with WPPSS showed that BPA's rights and responsibilities are passive and impotent. The project agreements generally give BPA budget review authorities and the right to monitor and evaluate WPPSS' actions, but do not assure full BPA participation in the decisionmaking process.

We found, for example, that the agreements:

- Allow BPA to maintain representatives at the project construction sites but provide them no authority regarding the administration or inspection of project construction.
- Authorize WPPSS, not BPA, to control the kinds of information which are disclosed during the planning, engineering, and construction phases, as well as the timing of such disclosures.
- Provide BPA limited opportunities to participate in authorizing and pricing change orders to construction contracts.
- Provide that unresolved conflicts between BPA and WPPSS will be decided by a project consultant using as a criterion the uncertain concept of "prudent utility practice." (What would a reasonable utility do in this situation?)

--Establish no limit or ceiling on the total costs which can be charged to BPA and its customers.

The weakness in BPA's contractual position has come to the attention of its auditors and management consultants. In 1977 the Department of the Interior's Office of Audit and Investigation reported that BPA lacked a viable means of influencing WPPSS management decisions. The auditors concluded that the lack of an effective enforcement mechanism was the major weakness in BPA's oversight. The auditors also observed--and our review confirmed--that BPA earlier had exercised much stronger oversight of WPPSS during construction of the NPR generating plant. BPA representatives explained to us that BPA's close involvement on the NPR generating plant came to be regarded as excessive. Consequently, they said, the project agreements for WPPSS' three nuclear projects were designed for a less active BPA role.

In 1979, Theodore Barry and Associates, a consulting firm employed by BPA to review the WPPSS construction program, reported that, "BPA has very little practical leverage to exercise influence or affect WPPSS decisions."

BPA's efforts to oversee WPPSS' nuclear construction program are also adversely impacted by staffing weaknesses. To oversee the WPPSS construction program, BPA established a Thermal Projects Office, but staffed it too lightly to be effective. Although the Thermal Projects Office oversees a \$5 billion construction program and reports to BPA's Administrator, it is assigned only 6 of BPA's 800 professional positions. At the time of our review, five BPA professionals were overseeing the entire WPPSS program, and none of them had previous experience with nuclear construction projects. BPA's Assistant to the Administrator for Thermal Projects has recognized the futility of continuing this approach. In May 1979, he recommended that BPA's oversight staff be increased to five or six professionals at each nuclear construction project.

Until recently, BPA management has not tried to play a major decisionmaking role on WPPSS' construction projects, even though BPA's customers will ultimately pay for most plant costs. BPA representatives generally have not participated in meetings of WPPSS' Board of Directors, Executive

Committee 1/, or project staffs. The shortcomings in this approach were reported in January 1979 by Theodore Barry and Associates. The consultants observed that BPA's oversight role has been unclear and marginally effective. They recommended that BPA management establish a partnership relationship with the WPPSS Executive Committee to provide meaningful participation by BPA senior management.

THE PROSPECTS FOR IMPROVEMENT

Although management problems have been identified in WPPSS' nuclear construction program, poor management--in the sense of a lack of talent or an insufficient dedication to task--has not been identified as a primary cause. BPA's consultants have acknowledged that WPPSS' management has a strong commitment to completing and operating the plants under construction, and has assembled a vast array of technical skills for that purpose.

Of the various problems attributed to the program, many seem related to an overly ambitious commitment to nuclear plant construction on the part of WPPSS and BPA. Construction of nuclear power plants is an extremely difficult task, characterized by technical and managerial complexities which confound even those who specialize in the field. Despite this complexity and little previous experience, WPPSS has undertaken, with BPA support, one of the largest nuclear construction programs in the Nation.

The ambitiousness of BPA's commitment has its drawbacks. There is virtually no sharing of the considerable financial risks with other utilities--BPA has not taken on sufficient partners in construction. In this respect, we noted that the region's investor-owned utilities have never committed themselves as aggressively as BPA to construction of regional nuclear plants. Of the five nuclear plants constructed or planned for construction by investor-owned utilities, the average participation for each utility is about 30 percent for any one plant. Further, because all three net-billed plants are being constructed concurrently, and by

1/The seven-member WPPSS Executive Committee is elected from 22 members of the Board of Directors. It is authorized to act for the full Board, to authorize WPPSS management actions, and to formulate and approve policies.

the same builder (WPPSS), BPA has limited its opportunities to diversify and to study the lessons learned on one construction project before starting the next project.

The work of BPA's auditors and consultants shows that there is room for substantial improvement in WPPSS' management and BPA's oversight of the net-billed nuclear construction program. To affect this improvement, WPPSS and BPA will need to work harder and cooperate more closely. Both organizations realize the importance of better controlling the cost and schedule of construction. Whether they can work together as a team in a cooperative, closely coordinated mode is yet to be determined. At the conclusion of our review, there was little evidence that WPPSS is ready to acknowledge BPA's need for increased oversight of the construction process. A memorandum of understanding drafted by BPA in February 1979 to more clearly define its oversight role with respect to WPPSS' construction projects remains unsigned, principally because BPA and WPPSS differ in their views of what BPA's oversight role is or should be.

CONCLUSIONS

If the proposed legislation passes in its present form, BPA will be provided with broad authority to purchase the capability of various energy sources constructed by public and private interests throughout the Pacific Northwest. Such energy sources could include conventional coal-fired and nuclear plants, conservation programs, cogeneration projects, and renewable energy developments. If necessary, BPA is authorized to construct energy projects excepting hydroelectric projects.

We think it is appropriate for BPA to help finance and provide technical and administrative support for conservation programs and for non-conventional energy projects. As part of this BPA should take a leadership role in demonstrating

- the technical and economic feasibility of industrial, commercial, and residential conservation programs;
- load management and pricing initiatives, and non-conventional energy supply or displacement projects; and

--the integration of such resources and practices into the planning and operation of the Federal Columbia River Power System.

Actions of this type could set an example for the region, and help make the principles of national energy policy become a reality in the Pacific Northwest. We do not see a comparable need for BPA financial participation in conventional thermal power plants unless it is clearly shown that (1) conventional plants are the region's most cost-effective alternative, (2) the region needs more conventional plants than those already approved for construction, and (3) regional utilities are incapable of meeting this need without BPA backing.

In considering the proposed legislation, it should be recognized that there are other institutions within the region which may be as qualified as BPA to sponsor and finance power plants. WPPSS is already constructing five nuclear plants--three with all or most power output pledged to BPA and two subscribed by various regional utilities. WPPSS officials told us that they support the proposed power bill establishing BPA as a power broker. They said, however, that if the legislation failed to pass, WPPSS could take a lead role in supplying power to small utilities and to the direct service industrial customers of BPA. WPPSS states that it has the legal authority to construct power plants inside or outside the Northwest, and the ability to finance new plants. In addition, the region's investor-owned utilities are planning to develop four nuclear plants to increase regional power supplies.

Our review indicated that, at this time, BPA is not adequately prepared to construct or oversee the construction of large generating facilities. We also realize that even relatively well-managed construction projects of this magnitude are subject to delays and cost overruns resulting from changes in technology, regulatory requirements, and the economic environment. We have therefore concluded that there is no way in legislation to totally protect BPA's customers from the financial risks of developing additional energy sources. What can be done in the legislation, however, is to minimize these risks by providing that (1) BPA's contracting and oversight practices are strengthened to reduce consumer exposure to costly delays and overruns, (2) additional energy sources are diversified and developed only when they are judged necessary by a representative regional

power planning body, and (3) the most cost-effective and least capital intensive energy sources are developed first.

RECOMMENDATIONS

If the Congress grants BPA authority to construct or finance construction of large power plants, it is essential that BPA's contracting and oversight capabilities be strengthened before such authority is exercised. In addition, it may be appropriate to place legislative limits on (1) the extent to which BPA can participate in constructing conventional thermal power plants or (2) the construction costs which BPA can pass on to its customers. We recommend that the Committee consider amending the proposed legislation, to provide safeguards such as those described below, before granting BPA broad power purchase authority:

- BPA's purchase commitment to any conventional thermal power plant will be limited to ___ percent or less of the planned generating capability, and to ___ percent or less of actual construction cost or estimated construction cost at time of BPA's commitment--whichever is less--subject to approval by a representative regional power planning board, the Secretary of Energy, and the appropriate committees of the Congress.
- BPA's contractual rights in purchasing the energy capacity of generating plants or conservation programs will provide that BPA representatives sit on all project planning, management, and evaluation groups and exercise authority commensurate with BPA's purchase of plant capability.
- BPA's contractual rights will also include full BPA participation in: developing, reviewing, and approving project designs, operating plans, and safety procedures; establishing and monitoring construction management and financial management system, authorizing and negotiating settlement of contracts and contract change orders; selecting, inspecting, evaluating and approving payments for the work of

architect-engineers, construction managers, contractors and subcontractors, plant operators, and independent management analysts.

We also believe that recommendations presented in our September 1978 testimony to the Committee are appropriate to assure development of cost-effective power supplies. To assure that additional energy sources are diversified and developed only when necessary, we recommend that a representative regional power planning board with a diverse membership be established with adequate analytical and public involvement capabilities to develop (1) a range of regional demand forecasts showing the high, low, and most likely demand levels, (2) thorough analyses of the economic, environmental, and social costs of alternative means of balancing supply and demand, and (3) a public involvement program in which competing alternatives can be evaluated in open forums by the region's policymakers and power consumers.

To help assure that the most cost-effective energy sources are developed first, we recommend that life cycle analysis should be applied to compare the economic, social, and environmental costs of competing alternatives at the margin. We recommend that the term "cost-effectiveness" be defined in the proposed legislation as follows:

"Cost-effectiveness should be determined by comparing, on a life cycle basis, the unmixed cost of generating, transmitting, and distributing electricity from conventional supply sources with the cost of energy conservation, cogeneration, load management, and/or renewable resource alternatives. Environmental and social effects should be included when they can be identified. To the extent practical, these effects should also be quantified."

CHAPTER 3

POSSIBLE IMPACTS ON

BPA'S INDUSTRIAL CUSTOMERS

Direct service industrial customers (DSIs) purchase large amounts of power directly from BPA. In 1978, 15 DSI customers purchased 26 billion kilowatt-hours of BPA power. This represented 34 percent of BPA's power sales or about as much power as four large nuclear plants can produce. Ten aluminum reduction plants, owned by 6 companies, accounted for 90 percent of this energy and \$57 million in total sales. Those 10 plants provide about 30 percent of U.S. aluminum production. In 1978, DSIs paid slightly over 3 mills/kWh for power purchased from BPA--about one-tenth the cost of new power supplies in the region.

Most DSI plants were constructed in the 1940's and 1950's. The potential for electricity conservation in some plants with older production facilities may be significant. There are large differences, for example, in the relative electrical efficiency of the 10 Northwest aluminum smelters. The most efficient smelter operates at just over 6 kWh per pound of production, while the least efficient smelters consume one-third more electricity--operating at over 8 kWh per pound of production. BPA has not conducted studies, nor is information publicly available, to determine the relative electrical efficiency of the non-aluminum DSI plants.

POWER SUPPLIES

Although DSIs have been customers of BPA for many years, they are accorded no preference to Federal power. In fact, the legislative history of the Bonneville Project Act suggests that anti-monopoly provisions were written into the act because of a concern that energy-intensive industries might monopolize the power from Bonneville Dam. The DSIs obtained long-term contracts with BPA during times when Federal power was inexpensive and plentiful. But times have changed. With the Federal hydroelectric system nearing completion and the region's population and economy growing, BPA does not have sufficient power supplies to meet increasing preference customer requirements and continue serving the DSIs. This condition was made explicit by BPA in June 1976 when it issued notices of insufficiency to its preference customers, advising them that it may not be able to serve their power needs after July 1983. At the same time, the DSIs were notified that BPA could not renew their contracts.

ENERGY RESERVES PROVIDED BY INDUSTRY

The power sold to DSIs it can be interrupted by BPA under certain conditions. This, in effect, provides BPA with system reserves, which in other regions are commonly provided by standby generating equipment, contractual arrangements with neighboring utility systems, or other means.

BPA can interrupt 25 percent of the total DSI load at any time for any reason. An additional 25 percent can be interrupted, with sufficient advance notice, for extended periods because of delays in construction of new generating units or unanticipated shortfalls in generating capacity. BPA grants the DSIs discounts called "availability credits" when it makes such interruptions. In a recent 3-1/2 year period BPA credited the DSIs almost \$38 million--about 14 percent of BPA's gross sales to the DSIs--for power interruptions. BPA has conducted no studies to determine whether this is the most effective and economical method of providing system reserves.

Because the first 25 percent of the DSI load can be interrupted by BPA at any time for any reason, it could serve as a valuable operating reserve to meet various short-term power needs. Unfortunately, BPA's contracts with the DSIs contain financial penalties that tend to preclude this flexibility. The contracts grant availability credits for interruption in a series of steps. The first step, once taken by BPA, results in a credit of almost \$7 million to the DSIs when the power interruption lasts for more than 1 hour but does not exceed 5 percent of the total energy requested during the year. The next step grants an additional \$10 million credit when the energy restricted is between 5 and 10 percent. Because of the size of the credits and the stepped method of application, BPA power system schedulers are extremely reluctant to interrupt the DSI loads. For example, extremely cold weather in late 1978 and early 1979, coupled with unanticipated generating outages, severely stressed BPA's ability to meet its peak energy loads. To avoid interrupting the DSIs, BPA borrowed energy from Canada, made public appeals for voluntary conservation by residential and commercial customers, and purchased some expensive standby power from local utilities. The actions taken by BPA during this peakload period suggest to us that BPA's contracts with the DSIs are not providing sufficiently flexible energy reserves.

The DSIs rarely have to reduce production, even when their power supplies are interrupted by BPA. Before restricting deliveries to the DSIs, BPA can supply them an "advance of energy" of up to 2 million kWh. This advance is provided by drawing down Federal reservoirs below the levels required to meet firm power loads. In most years, rainfall refills the reservoirs and restores the advanced energy. Should this not occur, however, the DSIs must return the advance to BPA by purchasing energy from other sources or face supply restrictions. When restricted, the DSIs usually call on BPA to purchase replacement power for them from outside the Federal system. Energy purchased in this manner often costs the DSIs considerably more than they pay for BPA power. In 1977 and 1978, for example, BPA purchased replacement power for the DSIs at average prices of 22.6 and 17.2 mills, respectively.

IMPACTS OF PROPOSED LEGISLATION

Absent passage of the regional power bill, the DSIs will continue to receive BPA power until their contracts expire during the 10-year period starting in 1981 and ending in 1991. If the regional power bill passes in its present form, the DSIs would be provided an opportunity to obtain new 20-year contracts. The proposed legislation does not indicate why it is necessary to reaffirm Bonneville as the DSI's power supplier, rather than gradually shifting all or portions of these large industrial loads to the region's electric utilities. The bill neither specifies the new rates DSIs will pay for BPA power nor establishes the credits to be granted the DSIs for power interruptions. A proposed amendment, known as the DSI rate directive, provides that before July 1, 1985, the rates charged DSIs would be tied to the cost of certain new power purchases and, thereafter, to "a level which the Administrator determines to be equitable in relation to the retail rates charged by the region's public bodies and cooperatives to their industrial customers." BPA's interpretation of these provisions shows that the rates charged DSIs will move from the present level of about 3 mills/kWh to 18 or 19 mills/kWh in 1985, and to 21 to 24 mills/kWh in 1990, before credits. Another very important consideration--the value of credits for power interruptions--is left to administrative determination by BPA. BPA estimates that availability credits to the DSIs will total about \$30 million annually in 1980, and will increase until they reach about \$180 million in 1994.

If BPA is not granted power purchase authority, the DSIs will have to seek power supplies from other sources and BPA will need to provide system reserves in a different manner. Several options are available to the DSIs if their contracts are not renewed. They can seek power from their local utilities, most of whom are or could become preference customers of BPA. This action would further strain preference power supplies and require BPA to develop an allocation program whereby the Federal power available could be equitably shared among competing preference customers. BPA presently has under study a variety of allocation methods, but anticipates extensive litigation if allocation becomes necessary. Other options available to the DSIs include purchasing power from bulk suppliers such as WPPSS, developing their own supplies, or closing operations in the Pacific Northwest and locating elsewhere in the United States or overseas. If the DSIs developed their own power supplies or purchases power from bulk suppliers, the cost of that power would likely exceed the cost of BPA power. However, even greatly increased power costs are unlikely to cause the industry to relocate. By endorsing the proposed regional power bill, industry has, in effect, agreed to rates estimated by BPA at 18 to 19 mills/kWh in 1985 and 21 to 24 mills/kWh in 1990 (before availability credits).

A consultants' study conducted for us in 1977 indicated that the salvage value of Pacific Northwest aluminum plants would have a major bearing on industry reactions to higher energy prices. The study showed that if electrical energy for Pacific Northwest aluminum companies were increased from the present 3 mills/kWh to 25 mills/kWh, the two least efficient plants in the region might cease operations. The other eight plants would likely be modernized, take on more workers, and produce more aluminum without increasing their consumption of energy.

Another study of Northwest aluminum producers, conducted by the Department of Commerce at BPA's request, was completed in April 1979. It concluded that

--there is little likelihood of any Pacific Northwest plants being shut down as a result of increasing power costs under the proposed legislation;

- four of the least efficient plants, making up one-third of the region's smelting capacity would be the most severely impacted by the projected increase in power rates; and
- modernization of these four plants would be profitable, provided it were coupled with plant expansion that added new capacity.

CONCLUSIONS AND RECOMMENDATIONS

Passage of the regional power bill would substantially increase the cost of power to DSIs, although without a clearer view of both rates and credits, its net affect is difficult to assess. The DSIs would be offered 20-year contracts for very large quantities of power. The allocation and pricing of power for the DSI's and the length of their contracts are, therefore, very important parts of this legislation.

The propriety and pricing of availability credits for power interruptions are also very important, especially if--as BPA estimates--such credits will ultimately cost BPA's other customers as much as \$180 million annually. BPA needs to carefully study and compare alternative methods of providing various system reserves. If interruption of DSI loads proves to be the most appropriate method of providing energy reserves, BPA should renegotiate its contract provisions for availability credits. Renegotiations should fully recognize the great amount and favorable price of BPA power supplied to the DSIs, as well as the energy brokerage services which BPA provides them. It may be appropriate for BPA to completely eliminate availability credits for some types of interruptions. Where availability credits are retained, the contract provisions should be modified to assure that disproportionate credits are eliminated.

Before BPA is granted authority to offer the DSIs new 20-year contracts, the legislation should assure industrial conservation of electricity, realistic energy pricing, and development of cost effective system reserves. We recommend the legislation be amended to:

- Authorize BPA, when necessary, to gradually decrease the quantities of power allocated to a DSI customer until the plant receives only as much power as would be needed by a

modernized plant of the same capacity and technology. This action would be taken by BPA only if voluntary conservation efforts by the DSI customer proved insufficient to meet commercial standards for production efficiency.

--Require BPA to renegotiate contract provisions for power interruptions.

--Direct BPA to conduct a thorough analysis of the economic, environmental, and social costs of alternative means of providing system reserves including, but not limited to, interruptible power sales, load management and conservation techniques, power exchange agreements, pricing initiatives, and standby generating facilities. This study, complete with recommendations for action, should be submitted for review and approval by the Secretary of Energy.

Before leaving the DSI question, there is a matter of equity which deserves attention. There are, in addition to the DSIs, other large industrial consumers of Federal power in the Pacific Northwest, some of which consume as much power as BPA's non-aluminum DSI customers. As evidenced in our report of August 10, 1978, these industrial plants, rather than buying directly from BPA, secure their power through BPA preference customers. In this way, they purchase large quantities of Federal power at low rates, but do not contribute to BPA's system reserves. According to BPA, if the proposed legislation passes in its present form, such plants will receive less expensive power than the DSIs. Equity would seem to require that large industrial consumers, whether served directly by BPA or indirectly through BPA's preference customers, should be treated in the same manner. In the interest of fairness, we recommend the legislation require the Administrator to identify all large industrial consumers of Federal power and, as soon as feasible, establish uniform and equitable rates for all similar consumers, regardless of how or by whom their power is supplied.

CHAPTER 4
POSSIBLE IMPACTS ON
ANADROMOUS FISH RUNS

With respect to the salmon and steelhead fisheries the most ominous aspect of the unamended bill is its silence. Like most previous power legislation for the Pacific Northwest, the bill contains no provisions to reverse the cumulative adverse impacts of multi-purpose dams on the salmon and steelhead runs. After many years of fragmented management and untimely mitigation efforts, the upper river fisheries which once contributed so much to regional employment, food production and recreation are in serious trouble. Ironically, at a time when the practicality of raising anadromous fish is drawing multi-million dollar investments from the private sector, some of the region's fish runs have declined to a point nearing extinction. Studies are underway to determine whether some fish runs should be proposed for listing as threatened and endangered species.

While other factors such as over-fishing, logging and industrial development have contributed to the decline of Columbia and Snake River salmon and steelhead runs, a major factor is failure to adequately mitigate the cumulative adverse effects of dams constructed and operated by Federal agencies and electric utilities. The hazards created by dams are critical because they have an impact on the all-important migration process. Anadromous fish are hatched in natural spawning grounds or hatcheries, migrate seaward to mature in the ocean, and return as adults to spawn where they were hatched. Dams on the main-stem Columbia system constitute an obstacle course for up-river salmon and steelhead which must be successfully run twice for the fish runs to survive. Fish hatched in the upper Snake River spawning grounds, for example, must successfully navigate eight dams as small juveniles trying to reach the sea and the same eight dams as 5 to 50 pound adults returning from the sea to their spawning grounds.

About two-thirds of the area where Columbia system salmon and steelhead originally spawned have been rendered inaccessible to the fish by the construction of dams. The construction of Grand Coulee Dam in 1941 eliminated about 500 miles of the upper river, and many hundred miles of spawning grounds. Chief Joseph Dam, constructed and operated by the

Corps of Engineers, and Hells Canyon Dam, owned by the Idaho Power Company, now mark the upstream limits of anadromous fish migration on the Columbia and Snake Rivers, respectively, since neither has fish passage facilities. Today anadromous fish must negotiate nine dams to reach the upstream limit of their migration on the Columbia River. Fish journeying to their natural spawning areas in the Snake River and its major tributary, the Salmon River, must pass over eight dams-- four on the Columbia and four on the Snake. Of the 16 main-stem dams which now impact on the anadromous fish runs, 9 are operated by the Corps of Engineers, 1 by Bureau of Reclamation, and 6 by electric utilities in Washington and Idaho.

STATE AND FEDERAL ACTIONS TO PRESERVE THE FISHERIES

Federal and State efforts to preserve the anadromous fish runs are conducted under various authorities, central of which is the Columbia River Fishery Development Program authorized by the Mitchell Act of 1938 as amended. The Program was initiated to counteract the severe loss of salmon and steelhead resulting from expansion of water-use projects in the Columbia River system. It is a cooperative effort of the States of Oregon, Washington, Idaho and the Federal Government, led by the National Marine Fisheries Service (NMFS). The Program has two major functions: (1) to protect and improve stream environment and (2) to produce fish in hatcheries and rearing ponds on the Columbia River and its tributaries. NMFS also sponsors investigations and research to improve the habitat and survival of salmon and steelhead.

Many efforts to produce more salmon and steelhead impinge on the interests of other water user groups such as irrigators and electric utilities. But there is no formally organized body that exercises a comprehensive management function over water resource uses in the Columbia Basin. Instead, a variety of agencies and councils are at work to provide the necessary coordination between Federal and State agencies and local interest groups. Our review identified 16 organizations which have an impact on the salmon and steelhead fisheries.

The joint State/Federal stewardship for salmon and steelhead has had some success in stabilizing fish runs in the lower Columbia system, although today's runs are much smaller than those of the past. Upriver stocks are severely depressed and declining because the many problems posed by hydro developments exceed the corrective efforts undertaken.

A 1978 NMFS report showed that few hatcheries have been located on the upper river because the impacts of downstream dams would make such hatcheries a poor investment. NMFS and the Fish and Wildlife Service have initiated a review of the upriver stocks of salmon and steelhead to determine whether any should be proposed for listing as threatened or endangered species.

PROBLEMS IN DOWNSTREAM MIGRATION OF JUVENILE FISH

One essential element in preserving the upriver fish runs is safe downstream passage of juvenile salmon and steelhead, especially when river flows are below average. Although large numbers of young fish are produced in hatcheries and natural spawning grounds, many are killed when they migrate to the sea in April, May, and June of each year. This occurs because the main-stem Columbia system is now so developed that (1) most river flows are passed through hydroelectric turbines and (2) the main-stem waterways have been changed from free-flowing rivers to a series of slow moving impoundments or reservoirs. These changes severely impact the downstream migration of juvenile salmon and steelhead. Turbine mortality and disorientation claim many of the juveniles reaching each dam. In addition, the lack of a strong downstream current slows the juveniles' passage, increases their exposure to predators, and causes some to cease their migration and become permanent river residents. It now takes young fish more than twice as long to migrate downstream as it did before the dams were constructed. The slower the downstream migration, the greater the mortality rate. Depending on flows, juvenile losses from all causes average an estimated 15 to 20 percent at each main-stem dam and reservoir complex. Mortalities as high as 30 percent per project have been recorded under particularly adverse conditions.

Fishery experts have identified several actions which partially solve these problems. First is the development of screens and collection devices to prevent migrating juveniles from entering the turbines and to route them via bypass systems safely past the dams. Research and development on such devices is being pursued by the NMFS, but only two of the main-stem dams have been completely equipped to protect and by-pass the young fish. Other practices to lessen the impact of dams on juvenile salmon and steelhead include the use of trucks and barges to carry young fish past the dams and release them safely in the lower river. Another action--

one which is far more controversial--involves carefully coordinated water releases (spills) at the main-stem dams to safely "flush" migrating juveniles past the dams and down the river to the sea. Although this operation occurs in the spring of each year and does not coincide with peak power loads, it reduces power production and has become the center of heated annual debates and legal actions--particularly in recent low-water years.

SALMON AND STEELHEAD
HAVE NO WATER RIGHTS

Fishery maintenance or enhancement is not an authorized purpose of the Columbia and Snake River dams. Consequently, Federal and State fishery interests have no "right" to direct river flows for the betterment of the downstream migration. Fishery officials must seek the voluntary cooperation of BPA and the main-stem dam operators including the Corps of Engineers, the Bureau of Reclamation, and electric utilities with dams on the mid-Columbia. Voluntary cooperation in low-water years has been adequate to prevent extinction of the upper river runs, but it has not reversed the decline in some stocks. BPA, which works with the Corps of Engineers and the Bureau of Reclamation to schedule water releases for power generation, is somewhat sympathetic to the fishery needs. However, BPA's power marketing goals dictate a policy of maximizing power revenues through generation and sale of power, first within the region and then outside the Pacific Northwest. Three utilities with dams on the mid-Columbia also have power production and marketing as primary objectives. In the absence of a legislated right to schedule river flows during the spring migration, regional fishery interests are forced to appeal for help in below-average water years.

--In 1977, the region faced a record low-water year due to the lack of rainfall and snow in the mountains. In order to protect the anadromous fisheries and assure survival of an adequate number of downstream migrants, the fishery agencies requested spills of water at each of the dams so that approximately 50 percent of the juvenile fish would pass through the spillways rather than the turbines. Although the Corps of Engineers and BPA agreed to a minimum "survival" flow, the mid-Columbia utilities were unable to provide such a spill without a voluntary commitment from all of their

power purchasers. To assure the spill, fishery agencies filed an emergency petition with the Federal Energy Regulatory Commission (FERC) which subsequently ordered the mid-Columbia utilities to provide a minimum level of spill.

--In 1978, the fishery agencies again requested a spill at each of the mid-Columbia utility dams. At the last moment they filed a petition with FERC. The mid-Columbia utilities received authorization from their power purchasers to provide spills greater than the 1977 levels prior to receiving an order from FERC.

--In late 1978, the fishery agencies petitioned FERC to order four of the mid-Columbia utility dams to provide spills to aid the spring migration. Before formal hearings took place, a compromise was reached in the spring of 1979 on duration and quantity of spills.

While this approach to river management has worked to some degree, it is a patchwork solution to a continuing and serious problem. Depending on water conditions, fishery officials estimate that up to 95 percent of the juvenile salmon and steelhead migrating from upriver can perish from turbines, predators, and other causes before reaching the sea. Unless minimum river flows are provided for anadromous fish passage, a series of poor water years could be disastrous to the upriver salmon and steelhead runs.

CONCLUSIONS AND RECOMMENDATIONS

We recognize that the purpose of this legislation is power planning and conservation, not river management. We also recognize that there are practical limitations on amending the bill to restore the anadromous fisheries. Nevertheless, some fish runs have declined to the point of near extinction, and others are threatened by increasing electric power developments and irrigation withdrawals. For some upriver fish runs, time is a critical factor. This bill can be an effective vehicle for restoring the anadromous fisheries. We believe it should be amended to restore the salmon and steelhead fisheries, or that other legislation should be drafted for that purpose.

We recommend the legislation be amended to:

- Direct the Corps of Engineers and, through FERC, the region's electric utilities, to install at all main-stem Columbia System dams, with all expeditious speed, turbine screens, bypass systems, and such other equipment as may be needed to effectively reduce mortality of migrating juvenile salmon and steelhead. The costs of such improvements to be included in their respective costs of producing power.

- Consolidate the presently fragmented support of anadromous fisheries into one Federal/State/Indian council with planning and policymaking responsibilities for fisheries restoration and for coordination of all aspects of fishery resource management from hatchery operations and migration assistance through commercial and sport harvesting in fresh and salt water. The fisheries council will report biannually to the Congress and to the people of the Pacific Northwest on its progress and problems in restoring the salmon and steelhead runs. Its membership will include, in addition to representatives of Federal, State and Indian fishing interests, the chairman of the regional power planning board or his designee. To further encourage communication and coordination between power planners and the fishery agencies, the chairman of the anadromous fisheries council will be made a permanent member of the regional power planning board.

- Direct the anadromous fisheries council, the Corps of Engineers, the Bureau of Reclamation, and the Federal Energy Regulatory Commission (FERC)--after holding public hearings in the Pacific Northwest and receiving testimony from representatives of fishery and agriculture interests, dam operators, Federal and State water quality experts, environmentalists, elected officials, and the public generally--to establish, within 12 months after enactment of the legislation and reach total agreement on, minimum stream flows on the main-stem Columbia River system adequate to

protect and enhance the anadromous salmon and steelhead fisheries.

- provide the anadromous fisheries council with appropriations or with a percentage of BPA and utility power revenues sufficient to fund its authorized activities and whatever legal actions are necessary to protect and enhance the fisheries. Also empower the council to annually schedule and direct the release of water designated for fishery restoration--as provided in the third recommendation above--at each Columbia system dam and storage reservoir during the salmon and steelhead juvenile migration periods.
- Direct the Secretary of the Interior, within 6 months from enactment of the legislation, to study and report to the Congress on actions needed to consolidate and make more effective the efforts of the many Federal agencies now having operational responsibilities for various aspects of fish and water management in the Columbia River Basin.

APPENDIX I

APPENDIX I

NINETY-FIFTH CONGRESS

ROOM 3204
HOUSE OFFICE BUILDING ANNEX NO. 2
PHONE (202) 225-1030

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CONGRESS OF THE UNITED STATES
HOUSE OF REPRESENTATIVES

SUBCOMMITTEE ON ENERGY AND POWER
OF THE
COMMITTEE ON INTERSTATE AND FOREIGN COMMERCE
WASHINGTON, D.C. 20515

January 22, 1979

The Honorable Elmer B. Staats
Comptroller General of the United States
U. S. General Accounting Office
441 G Street, N.W.
Washington, D. C. 20548

Dear Mr. Staats:

Last month our Subcommittee held hearings on H.R. 13931 concerning the electric power needs of the Pacific Northwest. Those hearings indicated that the Bonneville Power Administration and many public and private utilities in the region are interested in legislation which enables the BPA to purchase the power capability of powerplants constructed for the region. It is likely that a similar bill will be introduced in the 96th Congress.

The GAO's August 10, 1978 (B-114858) report concerning this subject matter states that pursuant to a net-billing arrangement the BPA agreed to purchase the project capability of three nuclear power plants of the Washington Public Power System. Similar agreements have been executed between BPA and the City of Eugene, Oregon. As the GAO report points out, there have been significant delays in the completion of these plants. Many reasons are given for this delay, but the most frequently identified reason is poor management. In this regard, we have learned that in the case of at least one of these plants some BPA personnel repeatedly wrote memoranda to BPA officials pointing out some of these management problems, but it appears that little was done about them by the BPA until recently.

Enclosed is a copy of a September 22, 1978 response to the Subcommittee concerning BPA's "interpretation of its authority to influence project construction under those agreements." Also enclosed is a copy of the three WPPSS contracts. If the Subcommittee, in marking up legislation in this Congress, should agree to include such purchase authority, we will most likely want to include provisions to prevent the delays that have occurred in connection with these projects and avoid other management problems.

We request that the GAO examine these documents and the BPA actions under them. In particular, we request the following:

- (a) Your views and comments on the adequacy of the contracts, particularly from the standpoint of BPA's authority to oversee such construction, avoid delays, and prevent overruns and resultant increased costs;
- (b) Your views and comments on the BPA's interpretations of the contracts;
- (c) Your findings concerning the adequacy of BPA's efforts to oversee the project, prevent delays and costly overruns, including the identification of any failure on the part of BPA to utilize its authority fully and in a timely fashion;
- (d) Your findings concerning BPA's experience and capability to oversee the construction and operation of the thermal plants;
- (e) Your evaluation of the impact of these delays, etc., on BPA rates and on the actions taken recently by BPA to defer BPA's cost of purchasing power from WPPSS in order to reduce its proposed 1979 electric rate increase; and
- (f) Your recommendations for provisions in the legislation designed to overcome problems that you identify.

As part of this review, please obtain and examine all BPA documents, memoranda, etc., concerning these contracts and the administration thereof, including the three audit reports mentioned in the enclosed September 22, 1978 document and the actions taken by BPA as a result of each. We are also asking for copies of these reports for our files.

We are particularly interested in your views about the reasonableness and adequacy of provisions in the contracts concerning the handling of disputes with resolution by arbitration, the so-called criteria of "Prudent Utility Practice", and the provision that if BPA fails to act on a WPPSS proposal within 7 days, the proposal is approved. In the case of the latter provision, we are concerned about the short time period and the silence-is-approval approach. We would like to know to what extent this provision has been used and its impact on costs. We are also interested in your views on whether or not it is reasonable and prudent for BPA to enter into purchase agreements for the "project capability" of a plant that is not yet built particularly if it is possible that the plant will never operate. Also, we are concerned that purchase agreements for 100 percent of the project capability

will, in the case of private utilities, tend to result in State public utility commissions being less vigilant about the plant and its costs because the BPA will be picking up the incremental costs. We are interested in your views on how this problem could be avoided. We also want to know the status of the agreements with the City of Eugene and the potential impact on the BPA.

Since it is possible that we will have to consider these matters in the first half of this year, it is necessary that the GAO be ready to testify before our Subcommittee on these matter in April or May. Thus, we request that you act promptly on this request.

Enclosed is a copy of an October 30, 1978 letter from the BPA to the Chairman of the Columbia River Fisheries Council and a copy of testimony before our Subcommittee by a representative of the Fish and Wildlife Service. Also enclosed is a copy of testimony by Mr. Ed Chaney. We are very concerned about fishery management on the Columbia River and the effect of this legislation on fish and wildlife. The BPA letter is not reassuring, particularly the underlined portion. We request that you examine the fishery management activities of the BPA and the Corps of Engineers and those of the private and public utilities that operate facilities on the river to determine whether those activities are resulting in losses of fishery resources in favor of power generation and what actions should be taken administratively or legislatively to avoid such losses and enhance this resource and indicate what impact such actions would have on power generation. This examination should include a review of the problems identified by the Fish and Wildlife Service and the State fishery agencies.

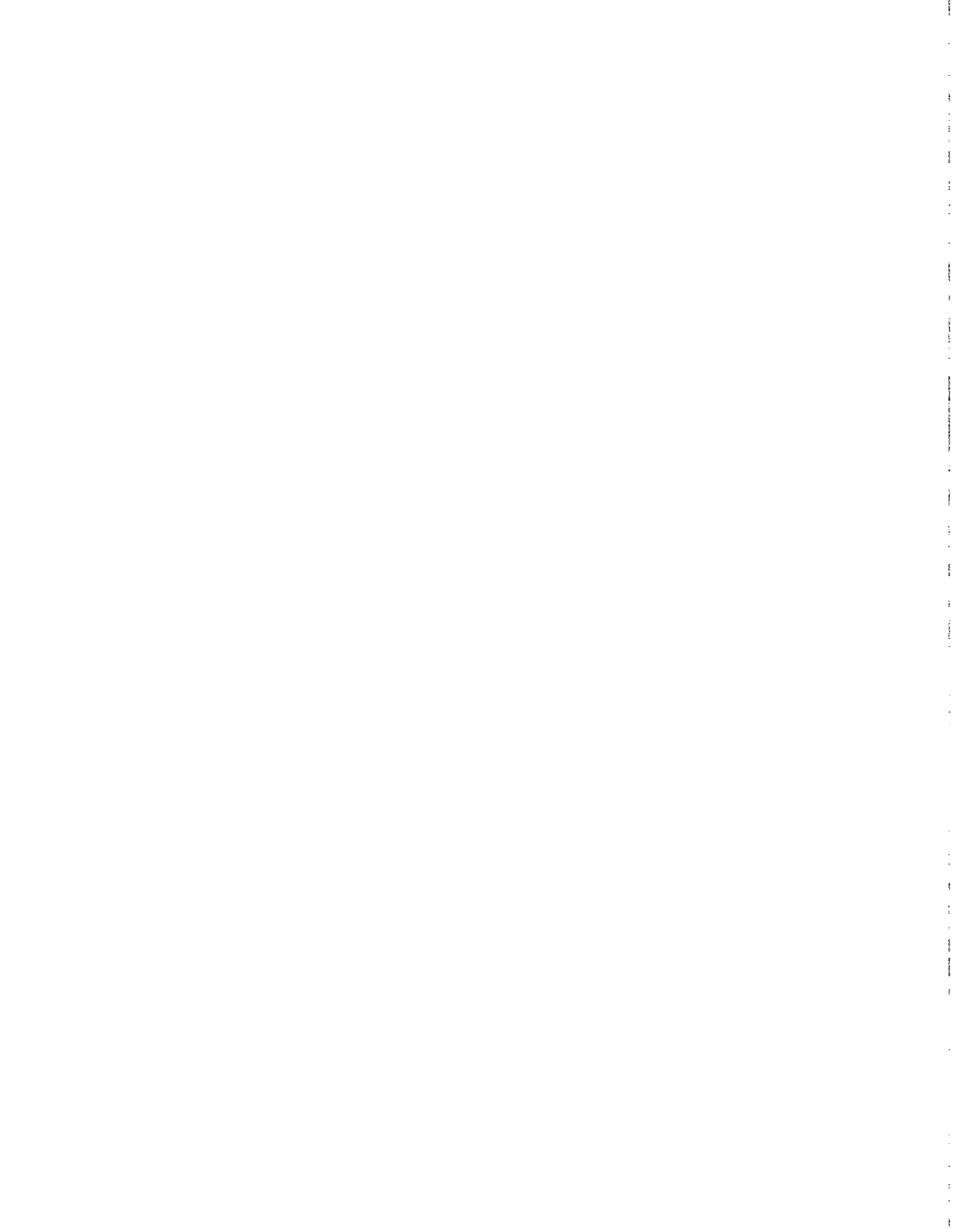
Please keep our Subcommittee staff informed concerning the GAO's progress in this matter. As in all other requests, please do not submit any report to the agency for review and comment prior to submitting the report to us. If necessary, you should meet with agency officials to insure that your factual findings are accurate. We will seek the agency's comments on your conclusions and recommendations.

Sincerely,



John D. Dingell

JDD:Frm
Enclosures



QUESTIONS AND ANSWERS RELATING TO COST
OVERRUNS ON NON-FEDERAL POWER PLANTS

Question 1: What is the nature of contractual relationships between the Bonneville Power Administration (BPA) and the Washington Public Power Supply System which is constructing five nuclear power plants in the Pacific Northwest?

In 1953, the Washington State legislature enacted a law authorizing the formation of joint operating agencies which are political subdivisions and municipal corporations of the State. Subsequently, in 1957, a group of public utility districts petitioned the State to form a joint operating agency to be known as the Washington Public Power Supply System (WPPSS). WPPSS is authorized to generate, transmit, and sell electric energy. Through WPPSS, public utility districts and municipalities operating electrical distribution systems in the State of Washington may belong to and control an agency dedicated to power production.

BPA and WPPSS have had arrangements concerning the acquisition of electric power capability of nuclear plants since 1963. In that year, BPA acquired power from a WPPSS generating project using steam from an Atomic Energy Commission (AEC) reactor at Richland, Washington--the New Production Reactor (NPR). NPR power was obtained by BPA through a power exchange with public and private utilities that had purchased the output of the plant. The exchange of power was to enable BPA to firm-up large quantities of electrical energy and to thereby increase its revenues.

In 1970, BPA acquired part of the capability of another nuclear plant, the Trojan nuclear power plant, constructed and operated by an investor-owned utility. BPA acquired the 30 percent share of plant output belonging to the city of Eugene, Oregon, directly from the city and from some of the City's customers--local public bodies and cooperatives which had purchased part of Eugene's share.

BPA subsequently acquired in 1971 and 1973 all or part of the capability of three WPPSS nuclear power plants now under construction (WNP-1, -2, and -3) from public utilities, municipal bodies, or cooperatives which are statutory

preference customers of BPA. 1/ These preference customers had each purchased a share of plant output from WPPSS. WPPSS is the sole owner of WNP-1 and WNP-2, and will operate and maintain them after the completion. WNP-3 is a combined effort: WPPSS owns 70 percent of the plant and four investor-owned utilities own the remaining 30 percent. WPPSS acts as their agent for the construction of the facility and is responsible for its operation and maintenance.

WPPSS is also constructing and will operate and maintain two other nuclear power plants--WNP-4 and WNP-5. These plants do not involve BPA acquisition of project capability. Plant capability has been purchased by a group of BPA's preference customers for their own use. (See sch. II-1.)

The structure of all of these arrangements is similar. They involve the acquisition, by BPA or other entities, of all or part of the output of facilities constructed, operated, and maintained by another organization which, in all situations except the Trojan plant, is WPPSS. Whenever BPA obtains a part or all of a nuclear plant's output 2/ it does so through purchase of its preference customers' shares. It pays the customers by offsetting the customers' power bills with credits for their share of nuclear plant annual costs--the "net-billing" concept. Both BPA and its net-billed customers agree to pay for the share of plant capability they have acquired whether or not the project ever produces any electric power. BPA and representatives of other purchasers have the right to exercise certain oversight responsibilities with respect to the construction, operation, and maintenance of the projects.

Project agreements between BPA and WPPSS for the construction of WNP-1, -2, -3 showed that BPA's oversight role is directed more to budget reviews and monitoring and evaluation of actions taken by WPPSS than to active BPA participation in management of the construction program. Considering BPA's interest in the output of WPPSS' nuclear plants, it is somewhat surprising that BPA officials did not insist upon a more direct and positive role in the construction program.

1/BPA is required in marketing power to give preference to local public utilities--cities and public utility districts--and cooperatives.

2/NPR does not involve the acquisition of a share of project output, but an exchange of power between BPA and the owners of a share of the project.

Equally surprising is the fact that BPA's first venture into thermal generation--the relatively low-risk NPR generating plant--was characterized by stronger BPA oversight. Although the NPR project did not involve reactor construction and operation (the reactor was constructed and operated by AEC, while WPPSS constructed and operated the generating plant), BPA reviewed and approved designs, plant specifications, contracts, interim financial arrangements, budgets, and expenditures of all funds. BPA also inspected construction work in progress and was kept well informed on construction contract change orders and other construction related activities. BPA's contractual rights and prerogatives for overseeing construction of WPPSS' three net-billed nuclear power plants are much less comprehensive than they were on the NPR steam plant.

BPA representatives explained to us that BPA's close involvement with construction of the NPR generating plant came to be regarded as excessive--an "overkill" in terms of BPA construction oversight. Consequently, they said, the project agreements for WPPSS' three nuclear projects were designed for a less active BPA role.

Schedule II-1
Status of WPPSS Nuclear Construction Projects
(May - June 1979)

	<u>WNP-1</u>	<u>WNP-2</u>	<u>WNP-3</u>	<u>WNP-4</u>	<u>WNP-5</u>
Capacity (MW)	1,250	1,100	1,240	1,250	1,240
Estimated percent complete	25	71	13	9	3
Design work started	7/74	8/71	7/74	7/74	7/74
Estimated date of commercial operation	12/83	9/81	12/84	6/85	6/86
Estimated total cost (millions)	\$2,341	\$1,822	\$2,256	\$2,580	\$2,753
Percent of plant output assigned to:					
BPA	a/100	100	70	-	-
Public-owned utilities	-	-	-	100	90
Investor-owned utilities	-	-	30	-	10

a/BPA has assigned 32 percent of plant capability for the period 1980 to 1996 to five investor-owned utilities in return for partial payment of project construction costs plus certain NPR costs. BPA is pledged to furnish the power whether the plant operates during that period or not. The agreement was made to settle the remaining contractual obligations after the scheduled NPR reactor shutdown.

Question 2: How does BPA contract for electric power via "net billing" agreements with its customers?

Under net-billing, BPA preference customers developing new thermal plants assign their share of the plants' production capability to BPA. BPA pays for the plant capability by offsetting the amounts each of these customers' owes BPA for power or other services by the amounts the customers pay for their share of plant costs. The purpose of net-billing is to meet the growing power needs of BPA customers through non-Federal development of thermal power plants. As a result of net-billing, more costly thermal power is integrated into the Federal system, increasing the average power rates for all BPA's customers. Net-billing also shifts the financial risks associated with new plants from those preference customers developing the plants to all of BPA's customers. This occurs because BPA agrees--and thereby obligates all of its customers--to pay all costs associated with the developers' share of plant capability. This commitment is binding even if the plant never produces electricity.

The use of net-billing to acquire power plant capabilities was concurred in during appropriation hearings for 1970 and 1971. It constituted an extremely important supplement to BPA's charter--one which perhaps deserved more scrutiny than it received. Net-billing can be said to have accomplished what BPA previously lacked legal authority to do--borrow or otherwise finance construction of a generating facility.

Originally, the Congress regarded the net-billing arrangement as a convenient way to settle accounts between Federal power marketing agencies and their customers. Net-billing had been used before 1970 to balance the amounts owed to and by BPA in its various arrangements with customers for electric power sales, transmission, and related services.

The new use for net-billing was different and clearly distinguishable from previous uses. BPA was not off-setting monies owed it for power sales with services it received. Instead, it was paying for the right to receive a share of output from a plant built by a third party. These transactions did not involve services related to the day-to-day operations of the system, but concerned the acquisition in installments of an ownership interest in project capacity developed by another organization.

Question 3: What is the status of BPA's net billing agreements with the city of Eugene, Oregon; and what are the potential impacts on BPA rates and power supplies?

The Eugene Water and Electric Board (EWEB), a municipal utility owned and operated by the city of Eugene, Oregon, and two private utilities, Portland General Electric (PGE) and Pacific Power and Light (PPL) combined to develop the 1,130 MW Trojan nuclear plant near Rainer, Oregon. Their agreement to construct and operate the plant is similar to a limited partnership, and limits their liability to their percentage of ownership--EWEB 30 percent, PGE 67.5 percent, and PPL 2.5 percent.

The parties authorized PGE to construct, operate, and maintain the plant. All three utilities participated in the construction phase through membership on an engineering committee, on which each placed two members. An operating committee with the same number of members from each participant is the vehicle by which the two minor-interest utilities participate in operating the plant.

In 1970 EWEB disposed of the 30 percent interest by assigning that interest to BPA for a period of 14 years. BPA pays for the 30 percent interest by crediting EWEB's account for EWEB's share of the annual charges for power services furnished by the Trojan plant. This net billing arrangement has provided EWEB the security of having available its own source of power (the Trojan plant), while at the same time operating on BPA's less expensive mix of hydro and thermal power. To be more specific, EWEB is trading 18 mill/kWh power from the Trojan plant for 3 mill/kWh power from BPA.

On May 7, 1979, EWEB formally requested BPA to approve a third 1-year extension while EWEB decides what to do with its portion of the Trojan plant's future output. Originally, EWEB was to decide by July 1, 1977, whether it wished to retain or relinquish its portion of the plant's production. EWEB officials explained that they have delayed their decision because BPA is unsure of future power supplies and will not commit any additional firm power to EWEB. In early 1977, EWEB proposed relinquishing about half of its portion of the Trojan plant's production in return for a firm power commitment by BPA, but the ensuing negotiations produced no agreements. Since EWEB is unable to plan on a firm power commit-

ment from BPA, it will not relinquish its share of future output from the Trojan plant.

Because BPA is still uncertain about future power supplies and EWEB has agreed not to take its full share of Trojan in 1984 but sequence it in if needed, BPA approved EWEB's request for a third 1-year extension which will expire July 1, 1980.

BPA officials told us that if EWEB withdrew its share of Trojan power from BPA, the impact on BPA rates and power supplies would be insignificant. EWEB officials, however, believed that exercising this option could have serious impacts on their own operations. Although EWEB's share of Trojan's output could supply more than 95 percent of EWEB's current power needs, EWEB would not have adequate backup power if something happened to the Trojan plant. EWEB officials also estimated that their customers' rates would increase by more than 250 percent if they relied exclusively on Trojan power. EWEB officials prefer to use less expensive BPA power and to rest secure in the knowledge that they will have adequate power supplies in the event of unscheduled outages at the Trojan plant.

Question 4: What is the cost and schedule status of the three net-billed nuclear power plants WPPSS is constructing?

All three net-billed nuclear power plants under construction by WPPSS have encountered very substantial delays and cost overruns. As shown below, each plant is over 3 years behind schedule, and each has experienced cost overruns exceeding \$1 billion.

<u>Construction targets</u>	<u>WPPSS Nuclear Projects</u> (note a)			<u>Total</u>
	<u>WNP-1</u>	<u>WNP-2</u>	<u>WNP-3</u> (note b)	
	----- (billions) -----			
Current cost estimates	\$2.341	\$1.822	\$1.596	\$5.759
Initial cost estimates	<u>.627</u>	<u>.395</u>	<u>.529</u>	<u>1.551</u>
Project overruns	<u>\$1.714</u>	<u>\$1.427</u>	<u>\$1.067</u>	<u>\$4.208</u>
Current date of commercial operation	12/83	9/81	12/84	
Initial date of commercial operation	9/80	9/77	9/81	
Project delay (months)	39	48	39	

a/Based on preliminary WPPSS 1980 budget as of June 1, 1979.

b/WNP-3 figures are 70 percent of total costs because BPA is obligated to net-bill only 70 percent of the project.

According to WPPSS, numerous factors have contributed to the delays and overruns including new or revised regulatory criteria, labor disputes, inflation, and evolution of design. WPPSS has contended that many of these factors are beyond its control. Nevertheless, the magnitude of the cost overruns, their continued growth, and the potential impact on BPA's power rates have raised questions within the region about WPPSS' ability to manage and BPA's ability to oversee the net-billed nuclear construction program.

Question 5: How does the cost and schedule of WPPSS' nuclear plants impact on BPA's power rates?

Under the terms of its net billing agreements, BPA--and, therefore, its customers--has the responsibility for payment of all costs associated with WNP-1 and WNP-2, and 70 percent of the costs associated with WNP-3. Consequently, the costs of overruns and delays on those three power plants will have to be recovered through BPA power sales.

Starting with a 90 percent increase in December 1979 and continuing through July 1985, BPA plans a series of rate increases to cover the costs of its net-billed nuclear program and additions to the Federal hydroelectric system. BPA will become responsible for meeting WPPSS costs when the "date certain" is reached for each project. The date certain approximates the original planned date of commercial operation. BPA has accepted the responsibility for payment of principal and interest on WNP-1, -2, -3 bonds after date certain.

Because of delays in plant completion, the dates certain for all three WPPSS projects are now considerably in advance of the planned dates of commercial operation. This means that BPA will be making payments for bond principal and interest for some time before the plants begin to generate electricity for BPA to market. This condition is illustrated by the table which follows:

Dates Certain and Probable Dates
of Commercial Operation

<u>Projects</u>	<u>Date certain</u>	<u>Probable date of commercial operation</u>	<u>Months BPA services WPPSS debt without receiving power</u>
WNP-1	9/80	12/83	40
WNP-2	9/77	9/81	49
WNP-3	9/82	3/85	31

For WNP-2, the total amount BPA will pay before commercial operation in September 1981 is estimated at about \$400 million. Additional payments in different timeframes will

be necessary for WNP-1 and -3. Commencing in December 1979 BPA will conduct annual rate reviews to determine the revenue collection required to make such payments, cover its operation and maintenance expenses, and finance its construction programs. If necessary, BPA can borrow from the Federal treasury to finance its construction programs. The cost of these borrowings is at the Treasury's interest rates which are higher than those available through WPPSS' tax-exempt financing.

Because WPPSS can borrow at a lower cost than BPA, it was recently proposed that WPPSS sell \$0.9 billion in municipal bonds to finance the payments BPA is obligated to make before the net-billed plants start commercial generation. This would have resulted in a savings in interest rates which would benefit BPA customers. It would also have enabled BPA to reduce its December 1979 rate increase from 90 percent to about 40 percent. This financing proposal collapsed when two of WPPSS' publicly owned utilities refused to approve the bond issue.

Unless that financing plan is revived, BPA will increase its rates about 90 percent effective December 1979. The rate increase is needed to cover (1) a general increase in the costs of the Federal hydro generation and related transmission facilities, (2) higher costs at the Trojan nuclear power plant, and (3) the addition of debt service costs for WNP-2 and WNP-1. The relative impact of these components is scheduled below.

<u>Components of BPA's December 1979 rate increase</u>	<u>Percent of increase</u>
Federal hydro system	24
Trojan nuclear plant	10
WNP-2 debt service	21
WNP-1 debt service	<u>35</u>
Total rate increase	<u>90</u>

The net-billed nuclear construction program will continue to drive BPA's rates upward. The three plants being constructed by WPPSS--originally planned to produce power at about 6 mills/kWh--are now estimated to cost about 30 to 34

mills/kWh, roughly 15 times the cost of producing Federal hydropower. As the increasing costs of nuclear generation are melded into the hydro base, and new hydroelectric facilities are installed for peaking purposes, further rate increases will be needed. The 90 percent increase will move BPA's preference customer rates from 3.7 mills/kWh to 6.8 mills/kWh.

Question 6: Is BPA responsible for overseeing WPPSS' construction practices to protect regional rate payers from cost overruns and schedule slippages?

BPA's legislated responsibilities are directed at providing least cost power to its customers. To meet this mandate, it must ensure that its power costs are reasonable. It is therefore necessary for BPA to play an oversight role to protect its customers from costly overruns and delays on WPPSS' nuclear projects. Controlling the costs of nuclear power plants, however, is a new role for BPA--and a very difficult one.

BPA is not authorized to own or build power plants, or to purchase power from others except as needed to meet temporary energy deficits. Until recently, almost all of the electricity marketed by BPA was generated at Federal hydroelectric projects built and operated by the Bureau of Reclamation and the Corps of Engineers. The Federal power was plentiful and generated at a very low cost. That cost--incurred through appropriations to other Federal agencies--was not subject to BPA oversight.

Conditions changed substantially when BPA entered its net-billed nuclear construction program. Under the net-billing agreements, BPA and its customers have the ultimate responsibility for payment of all costs associated with WNP-1 and WNP-2, and 70 percent of the costs associated with WNP-3. Consequently, it is very important for BPA to play an effective oversight role and to assure that the power plants are constructed as efficiently as possible.

Nuclear plant construction is an extremely difficult task characterized by technological complexity, state-of-the-art management techniques, public advocacy, and increasing regulation. Most nuclear construction projects, including WPPSS' projects, face some or all of these difficulties. With little background in power plant construction, BPA has been hard pressed to effectively monitor the progress and improve the efficiency of WPPSS' construction program.

Question 7: What is BPA's experience and capability to oversee construction and operation of power plants?

BPA's expertise lies in power marketing and in the design and construction of power transmission facilities. It has principally served as the distributor and marketer of power generated at hydropower plants built and operated by other Federal agencies. Most BPA management officials have had little experience in the design and construction of large power plants.

Furthermore, although involved in a multi-billion dollar nuclear construction program, BPA has not closely monitored nuclear plant construction. Only six professional positions have been allotted to BPA's Thermal Projects Office which oversees WPPSS' nuclear construction projects. None of BPA's Thermal Projects staff has previously worked on projects as immense, costly, and complex as the WPPSS nuclear power plants.

A consulting report recently completed for BPA recommended a clearer definition of BPA's oversight role and information requirements on WPPSS' projects. The consultants concluded that (1) BPA's present oversight staff was adequate in size, (2) its analytical skills needed to be strengthened, and (3) less on-site monitoring was required. BPA's Assistant to the Administrator for Thermal Projects strongly disagreed that the staff size was adequate and that less on-site monitoring was required. He said that the consultants' recommendations were based on the assumptions that WPPSS would agree to a more active BPA role, and provide BPA with improved management information. Based on WPPSS' most recent actions, the Assistant to the Administrator now believes that BPA is going to get even less information from WPPSS than it got in the past. He believes that BPA must do more on-site monitoring and has recommended that BPA's on-site staff at each WPPSS project be increased to five or six professionals plus a secretary. He has also recommended that BPA's on-site professionals have skills in cost analysis and scheduling, contract administration, budget and finance, construction management, and auditing. In his opinion, having people with these skills on-site will give BPA new "windows" into the key elements of project management.

Question 8: Have BPA's efforts to oversee WPPSS' construction program been adequate?

Our review, and the work of other analysts, showed that BPA's contracting and monitoring practices do not provide BPA management with adequate opportunities to improve the cost and schedule of WPPSS' construction projects. BPA's oversight role, as defined in BPA/WPPSS project agreements, is largely a passive one oriented to budget reviews and reviews of actions taken by WPPSS. To oversee thermal plant construction, BPA established a special office which reports to the Administrator--but staffed that office too lightly for it to be effective. Until recently, BPA has not aggressively tried to participate with WPPSS in managing the construction projects, although BPA rate payers will have to pay for the overruns and delays. Recent BPA efforts to increase its oversight role are being resisted by WPPSS, and the prospects for improvement are uncertain.

BPA's contractual rights under the project agreements generally give BPA review authorities and veto rights over WPPSS' general plans and budgets, but do not assure active BPA involvement in the management and administration of the projects. We found that the agreements:

- Allow BPA to maintain representatives at the project construction sites, but provide them no authority regarding the administration or inspection of project construction.
- Authorize WPPSS, not BPA, to control the kinds of information reported to BPA during the planning, engineering, and construction phases, as well as the timing of such reports.
- Provide BPA limited opportunities to participate in authorizing and pricing change orders to construction contracts.
- Provide that unresolved conflicts between BPA and WPPSS will be decided by a project consultant using as a standard the uncertain concept of "prudent utility practice." (What would a reasonable utility do in this situation?)

--Establish no limit or ceiling on the total costs which can be charged to BPA's customers.

Auditors and management consultants have previously reported on the weakness in BPA's contractual position. In September 1977, the Department of the Interior's Office of Audit and Investigation reported that letters between WPPSS and BPA management showed a wide variance between these two agencies' perception of BPA's oversight role. The audit report indicated that WPPSS did not acknowledge some of the basic rights BPA officials felt were inherent in their oversight role; and that WPPSS neither felt compelled nor obligated to respond to BPA's comments on many issues. Interior's auditors pointed out that BPA lacked a viable means of influencing WPPSS management decisions, and concluded that the lack of an effective enforcement mechanism was the major weakness in BPA's oversight.

Similarly, in January 1979, Theodore Barry and Associates, a consulting firm employed by BPA, reported that BPA has very little practical leverage to exercise influence or affect WPPSS decisions.

To oversee construction of WPPSS' net-billed nuclear plants, BPA established a Thermal Projects Office. Although the Thermal Projects Office reports to BPA's Administrator, and is responsible for overseeing more than \$5 billion worth of construction work, it contains only six professional positions out of BPA's 800 person professional complement.

Within the Thermal Projects Office, three of the six professional positions are designated project engineers responsible for monitoring of WPPSS' three projects. At the time of our review, one project engineer was attempting to oversee two WPPSS projects because of a vacancy. Another project engineer was stationed at BPA's headquarters and commuting to his WPPSS project site. The Assistant to the Administrator for Thermal Projects has recognized the futility of continuing this approach. In May 1979, he recommended that BPA's oversight staff be increased to five or six on-site professionals for each nuclear construction project.

Until recently, BPA management has not tried to play a major decisionmaking role on WPPSS' construction projects, even though BPA's customers will ultimately pay for most plant costs. BPA representatives generally have not participated in meetings of WPPSS' Board of Directors, Executive

Committee, or project staffs. The shortcomings in this approach were reported in January 1979 by Theodore Barry and Associates. The consultants reported that BPA's oversight role has been unclear and marginally effective. They also said that the focal point for oversight should be high enough in the BPA and WPPSS organizations to be effective. Among the consultants' recommendations were several which focused on the need for a more aggressive role by BPA management. The consultants recommended that:

- The WPPSS Executive Committee 1/ should be established as the official point for BPA contact with WPPSS.
- Relationships between BPA senior management and the Executive Committee should be strengthened.
- BPA's Thermal Projects staff should establish an active interface with the WPPSS Executive Committee and its staff.

The consultants urged BPA management to establish a partnership relationship with the WPPSS Executive Committee to provide:

- An active and more effective oversight role for BPA.
- BPA participation in reviews of key issues concerning management practices, performance, and project status.
- Establishment of the Executive Committee as the focal point for BPA to play its oversight role, and meaningful participation by BPA senior management.

Although the consultants' recommendations should benefit BPA and its customers, the prospects for their implementation are uncertain. WPPSS has prepared a rebuttal to the consultants' report which concludes that the scope of BPA's oversight responsibilities is clearly spelled out in the project

1/The seven member WPPSS Executive Committee is elected from 22 positions on the Board of Directors. It is authorized to act for the full board, to authorize WPPSS management actions, and to formulate and approve policies.

agreements and is not broadened by the Bonneville Project Act or subsequent legislation. A memorandum of understanding drafted by BPA in February 1979 to more clearly define its oversight role with respect to WPPSS' construction projects remains unsigned, principally because the two organizations differ in their views of what BPA's oversight role is or should be.

BPA is obviously striving to improve its oversight of the net-billed nuclear construction program. Recent events indicate, however, that little can be achieved without the cooperation of WPPSS. BPA's project engineers for WNP-1, WNP-2 and WNP-3 recently asked WPPSS if they could attend WPPSS' weekly staff meetings. WPPSS' answer was that they could not. The BPA project engineer for WNP-3 then asked if he could attend a bid evaluation meeting concerning one of the contracts. Again the answer was no. Subsequently, attendance at contract negotiations on the WNP-3 project was discussed by the BPA project engineer and the WPPSS Project Manager. The outcome was that BPA would not be represented at those sessions either.

Question 9: Several audit reports issued in recent years included recommendations for improving BPA oversight and WPPSS management of power plant construction. Were appropriate actions taken by BPA as a result of the audit reports?

Since August 1976, seven audit or consulting reports have been issued which cover some aspect of WPPSS' nuclear construction program or BPA's oversight of that program. Although numerous management weaknesses have been identified in these reports, BPA has not, until recently, taken aggressive actions to increase its oversight role and assure that lasting improvements are made in WPPSS' management systems.

The first report in this series, Washington Public Power Supply System--Study of Management Organization and Related Issues, was issued by Cresap, McCormick and Paget, Inc., (CMP) to WPPSS in August 1976. The CMP report was requested by WPPSS' Executive Committee and the Board of Directors. It showed that improvements were needed in project management, organization and staffing, and planning and budgeting systems. In commenting on these recommendations, BPA's staff advised WPPSS that:

"The absence of a clear, integrated corporate procurement policy is a common thread linking all of the specific comments above. This deficiency is manifested primarily in an ineffective contract management/contract administration function which comprises the entire project management process."

WPPSS subsequently advised BPA that its comments on the CMP report were inappropriate. In a letter dated November 2, 1976, WPPSS' Managing Director stated that:

"We maintain that the majority of these * * * concern the recruitment, training, staffing and organization of general multi-purpose units of WPPSS and, therefore, should not be of concern to Bonneville under the project agreement. BPA's stated accountability for WPPSS expenditures should be through the budget, with measurement through the budget updates and trends."

In a September 1977 report entitled Review of Washington Public Power Supply System Contract Administration and Bonneville Power Administration's Oversight, the Department of the Interior's Office of Audit and Investigation confirmed the existence of numerous problems, showed that WPPSS was taking action on the problems, and reported that each problem was in some stage of resolution. The auditors recommended that BPA should perform follow-up work to assure that WPPSS' actions were effective. More importantly, the report made three recommendations to BPA which were aimed at the very center of BPA's problems with the nuclear construction program:

- Concerted efforts should be made by the Administrator to achieve a mutually agreeable BPA oversight relationship with WPPSS that will establish an effective means of participating in critical decisionmaking activities.
- Oversight program objectives should be defined in functional and organizational terms describing the duties and responsibilities for accomplishing oversight objectives and the organizational channels through which problem areas are to be resolved.
- Any similar future agreements entered into by BPA should provide adequate language to enable BPA to effectively influence the management decision-making process.

Although BPA made some internal changes to comply with these recommendations, it did not directly confront the problem of defining a BPA oversight role and oversight practices agreeable to both WPPSS and BPA.

Four audit or consulting reports were issued in 1978. On April 10, BPA's Thermal Projects staff released a report on WPPSS' change order processing and on the WNP-2 architect-engineer's contract administration and estimating procedures. This was followed, on May 17, by a Coopers and Lybrand report to WPPSS on WPPSS' contract administration and project accounting. In August, United Engineers and Contractors, Inc., (UE&C) reported to WPPSS on opportunities to improve performance on WNP-1 and WNP-4. The fourth report was issued in September by Arthur Andersen and Company. It was entitled Project Planning and Measurements Review, and resulted from

a study requested by WPPSS. Although many opportunities to improve the WPPSS construction program were identified in these four reports, BPA generally did not take aggressive follow-up action because WPPSS agreed with the findings and planned to implement the recommendations. Also, in the case of the UE&C report, BPA officials considered the findings to be internal matters for WPPSS management to resolve without external pressures.

In January 1979, Theodore Barry and Associates, a consulting firm under contract to BPA, issued a comprehensive report on WPPSS management and BPA oversight of the net-billed nuclear construction program. The consultants started work in July 1978 and assessed overall project management as well as the BPA and WPPSS roles and relationships in the net-billed projects. Their report contains numerous recommendations to (1) institute more effective checks and balances upon WPPSS operations, (2) better define and strengthen BPA's oversight role, and (3) improve WPPSS' management, organization, and practices.

BPA's management is taking a more forceful position with respect to the Theodore Barry report. BPA and WPPSS officials have met three times to discuss implementation of the technical recommendations on project management. On February 8, 1979, implementation of eight high priority recommendations was discussed, and WPPSS officials reported that work was underway to implement all eight. The second meeting, on March 30, 1979, covered 13 other priority recommendations. According to WPPSS' representatives, work is also being done on all 13 of these items. The third meeting which was held on May 15, 1979, concerned 25 other recommendations which have not been prioritized. Of the 25, WPPSS reported that 5 had been implemented, 15 were being worked on or considered, and 5 were not agreed with by WPPSS.

Despite WPPSS' apparent acceptance of most technical recommendations in the Theodore Barry report, and several meetings between BPA and WPPSS officials, BPA remains unable to reach agreement with WPPSS on a redefined oversight role for BPA.

Question 10: Has poor management been identified as a prime cause of delays and cost overruns experienced on WPPSS' nuclear construction projects?

Although management problems have been identified in the WPPSS construction program, poor management--in the sense of a lack of talent or an insufficient dedication to task--has not been identified as a primary cause. A consulting study commissioned by BPA acknowledged that WPPSS' management has a strong commitment to completion and satisfactory operation of the plants under construction, and has assembled a vast array of technical skills for that purpose.

Of the various problems attributed to the construction program, many seem related to an overly ambitious commitment to nuclear plant construction on the part of WPPSS and BPA. Construction of nuclear power plants is an extremely difficult task, characterized by technical and managerial complexities which confound even those who specialize in the field. Despite this complexity and little previous experience, WPPSS has undertaken, with BPA support, one of the largest nuclear construction programs in the Nation. As recently observed in a national business periodical, "WPPSS is the proverbial case of an organization that grew too fast and took on too much."

Prior to 1968, WPPSS was relatively small. It was formed in 1957 and undertook only two projects in its first decade: a small hydroelectric project, and a large generating plant which used steam from a reactor (NPR) constructed and operated by the Atomic Energy Commission. In late 1968, when BPA launched its net-billed nuclear program, WPPSS had fewer than 100 staff members and assets totaling about \$100 million. By mid-1976, there were about 525 employees on the WPPSS staff. Employment jumped to 1,471 as of March 31, 1979, and is now projected to be 2,400 in 1985 when WNP-3 is scheduled to be complete. By the time WNP-5 is completed in 1986, WPPSS' assets may exceed \$10 billion.

WPPSS' fast growth has been difficult to manage and will be expensive for BPA customers. As Theodore Barry and Associates pointed out in their January 1979 report to BPA, "Typically, such growth rate is plagued with organizational development problems. When attempted within the nuclear power plant construction arena, both the scope and severity of these and other problems seem to expand."

The Barry Report summarizes the results of a comprehensive management study of the roles and relationships of BPA and WPPSS. It provides a thorough discussion of the problems in policy formulation and project management which need to be solved by the two organizations. The report states in part that:

"Perhaps the most serious weakness is the lack of effective checks and balances upon WPPSS' operations, both from external and internal sources. Typically, the policy-making of major organizations, particularly those within the utility industry, is influenced by groups external to the day-to-day management - e.g., Board of Directors, stockholders, and regulatory agencies. Further, the functional responsibilities within the organization are usually arranged so that there is appropriate participation in or review of key management processes by an authoritative independent group - e.g., finance and accounting usually has a meaningful role in the budgeting process and often analyzes major deviations, and internal audit often serves as an effective reviewer of important procedures. These checks and balances are not functioning satisfactorily for WPPSS.

"Additionally, the information which flows from the management systems does not provide clear visibility over project performance and status. There is an unsatisfactory focus toward some important issues. An improved window inside WPPSS is needed.

"Similarly, the study results suggest that the role of Bonneville Power Administration should be strengthened. * * * This oversight role has been unclear and marginally effective in the past. Further, the organizational focal point for the oversight role should be high enough in both BPA and WPPSS to be effective."

The Theodore Barry report included a series of recommendations, some directed at the policymaking levels of WPPSS and BPA, and others focused more on improvements needed in WPPSS' management processes. At the top management policymaking levels the report recommended:

- "A more active and strengthened role for the WPPSS Executive Committee.
- An independent staff to assist the Executive Committee in their review of important issues and evaluation of project status and performance.
- An active and more effective oversight role for BPA.
- Establishment of the Executive Committee as the focal point for BPA to play its oversight role, and meaningful participation by BPA senior management.
- More meaningful and useful information for WPPSS management, the Executive Committee and BPA."

To improve WPPSS' management processes, the Barry Report recommended:

- "More rigorous review of WPPSS staffing levels.
- Better insight into the causes and impact of change orders.
- A project management system which can more effectively correlate costs and schedules.
- Establishment of work force and effective materials management systems.
- A more comprehensive financial forecasting and planning system.
- Broader participation in the construction budget process.
- More effective use of internal auditing."

Question 11: Do BPA purchase agreements for 100 percent of project capability cause State public utility commissions to be less vigilant about project cost controls?

We found that the extent of BPA participation has little impact on State public utility commissions' (PUCs) scrutiny of cost controls on WPPSS' net-billed nuclear plants. There is little connection between these two factors because State PUCs have no rate setting authority over the publicly owned utilities participating in plant construction. WPPSS is a construction agent for over 100 publicly-owned utilities, municipal bodies, and cooperatives--all of which are exempt from PUC rate regulation.

On WNP-1 and WNP-2, BPA has purchased 100 percent of project capability. On WNP-3, BPA has purchased 70 percent of the project capability, and 4 investor-owned utilities own the remaining 30 percent. Public utility commission officials from Idaho, Oregon, and Washington told us that the extent of BPA participation (e.g., 100 percent versus 70 percent) had no significant impact on their minimal involvement with the WPPSS nuclear projects. In addition regional PUC officials explained that they have no authority over publicly owned utilities' rates.

The lack of PUC oversight of WPPSS' nuclear construction program may have contributed to a consensus among legislators in Washington State's 1979 biennium session that something was needed to make WPPSS operate better. In May 1979, the Washington legislature passed and sent to the Governor a bill which included requirements that:

- The WPPSS Board of Directors shall retain an independent qualified firm or firms to conduct performance audits.
- Continuing audits will be conducted of the methods, procedures, and organization used by WPPSS to control costs, schedules, productivity, contract amendments, project design, and any other topics deemed desirable by the Board. The Board may also require a firm to analyze particular technical aspects of the operating agency's projects and contract amendments.

- At least once each year, the firm or firms conducting such audits shall prepare and furnish a report of actions and recommendations to the Board of Directors.
- The Washington State legislative budget committee shall evaluate such management audits as to adequacy and effectiveness of procedure and shall consult with and make reports and recommendations to the WPPSS Board of Directors.
- WPPSS shall file a copy of each firm's audit reports, and the legislative budget committee shall file a copy of each of its reports or recommendations with the respective chairmen of the State senate and house energy and utilities committees. Upon the concurrent request of the chairmen of the senate or house energy and utilities committees, WPPSS shall report to the committees on a quarterly basis.

The primary objective of this bill was to provide the WPPSS' Board of Directors additional perspective so they will be better equipped to manage WPPSS' activities. The bill, which was signed into law on June 4, 1979, will also enable the cognizant Washington State legislative committees to keep posted on WPPSS' performance.

Question 12: Under terms of the BPA/WPPSS agreements, BPA purchases "project capability" and must consequently share in project costs regardless of how much power is ultimately produced. Is this a common practice in the utility industry? Is it reasonable for BPA to purchase the capability of power plants not yet built?

Our review indicated that it is common practice for electric utilities purchasing the output of major thermal plants to agree to repay construction bonds whether the plant operates or not. Generally, plant output is not guaranteed by any one entity because the risks of cost overruns and operating problems--particularly on nuclear power plants--are too great to be safely assumed by a single owner or builder. It is therefore natural for several utilities to share the risk of a "dry hole." ^{1/} By doing so, they can limit their respective risks and collectively provide a large enough revenue base to withstand a major loss.

With respect to the reasonableness of BPA's purchasing the capability of WPPSS nuclear plants, two other questions emerge. The first question is whether BPA should limit its customers' exposure to financial risks by committing them to large thermal power plants more cautiously or with more diversity. BPA's present commitments include 100 percent of the output of two WPPSS plants, WNP-1 and WNP-2, and 70 percent of a third plant, WNP-3. The aggressiveness of BPA's commitment has its drawbacks. There is virtually no sharing of the considerable financial risks with other utilities--BPA has not taken on sufficient partners in construction. In this respect, we noted that the region's investor-owned utilities have never committed themselves to as much as 70 percent of a regional nuclear plant. Of the five nuclear plants constructed or planned for construction by investor-owned utilities, the average participation for each utility is about 30 percent of any one plant.

A second and broader question is whether BPA, traditionally a marketer of hydropower produced at dams constructed

^{1/}A "dry hole" refers to a project that operates either not at all or far below expectations.

and operated by other Federal agencies, is the appropriate regional entity to underwrite the costs of new thermal power plants. Certainly BPA has the size, if not the experience. It annually sells over \$300 million worth of power from the Federal Columbia River Power System--a system with assets exceeding \$6 billion. BPA officials believe that BPA is the most logical source of future power supplies for the region's small utilities. Under the proposed legislation, BPA would purchase power from non-Federal power plants, meld it with low cost Federal hydropower, and market it at average cost prices. According to BPA representatives, establishment of BPA as a central power broker will allow a more efficiently operated and managed regional power grid.

WPPSS officials told us that they support the proposed power bill establishing BPA as a power broker. They said, however, that if the legislation failed to pass, WPPSS could take a lead role in supplying power to small utilities and to the direct service industrial customers of BPA. WPPSS states that it has the legal authority to construct power plants inside or outside the Northwest, and the ability to finance new plants.

In addition, the region's investor-owned utilities are planning to develop four nuclear plants to increase regional power supplies. The projects planned and the participating utilities are scheduled below.

<u>Planned nuclear plants</u>	<u>Participating investor-owned utilities</u>	<u>Percent ownership</u>
Pebble Springs 1 and 2 in Oregon	Portland General Electric	a/40
	Pacific Power and Light	25
	Puget Sound Power and Light	20
Skagit 1 and 2, in Washington	Puget Sound Power and Light	40
	Pacific Power and Light	20
	Portland General Electric	30
	Washington Water Power	10

a/Of the remaining 15 percent, 10 percent is owned by the Pacific Northwest Generating Company, a group of 17 small publicly owned utilities. Another 5 percent is unsold and may be divided between the three major participants.

Total capacity of these four power plants is planned to exceed 5,000 MWs, and total costs are estimated at more than \$6.4 billion.

Question 13: BPA/WPPSS project agreements call for disputes to be arbitrated by a mutually acceptable project consultant using "prudent utility practice" as criterion. How reasonable and adequate are these arbitration provisions? Is "prudent utility practice" a useful and adequate criteria for satisfactorily resolving disputes?

We found that the BPA/WPPSS arbitration provisions using a project consultant are similar to those found in other joint ownership projects throughout the country. For example, in project agreements used by the Massachusetts Municipal Wholesale Electric and the Iowa Public Service Company, an arbitrator (project consultant) or arbitrators are chosen and similarly charged with resolving project disputes. BPA's General Counsel told us that such arbitration provisions are common utility practice in the Pacific Northwest where multiple owners are involved.

According to BPA officials, the arbitration criterion "prudent utility practice" is used throughout the utility industry. Simply defined, the concept means: taking into account the particular circumstances, what would the practices and actions of a reasonable utility be in the situation presented for resolution?

BPA has never sent to arbitration any of the numerous problems it has encountered on the net-billed nuclear program. BPA representatives told us that the criterion of prudent utility practice contains language that doesn't start the parties on equal grounds--WPPSS is assumed to be right, BPA must prove otherwise--and that the requirements are worded too generally to allow BPA to prove a case against WPPSS when trying to resolve contract disputes.

Arbitration based on prudent utility practice has come under fire from BPA's auditors and management consultants. In 1977, a Department of the Interior audit found that, as a criterion, prudent utility practice is so broad and covers such a wide range of possibilities that it would be an extremely difficult task to prove that a particular WPPSS activity is not in accordance with it. In 1979, management consultants hired by BPA pointed-out that having a project consultant arbitrate differences based on prudent utility practices is not always practical because:

- The arbitration process is lengthy, and many decisions may be made after the fact.
- Going to arbitration undoubtedly affects the working relationships between both the organizations. This is bound to reduce the partnership spirit.
- Arbitration may affect the public image of both organizations.
- Arbitration may affect the project schedule directly or indirectly, thus also affecting costs.

The consultants concluded that for these reasons, BPA is more likely to accept WPPSS decisions even if a valid difference of opinion exists.

WPPSS officials expressed their approval of prudent utility practice as a criteria. A member of the WPPSS legal staff told us that prudent utility practice, as defined for the net-billed project agreements, is necessary as a base criteria for establishing standards.

According to BPA's interpretation of its project agreements with WPPSS, a project consultant arbitrating differences based on prudent utility practice must start by assuming that WPPSS is correct and the burden of proving otherwise rests with BPA. In the memorandum of understanding which BPA recently drafted to define more clearly its oversight role with respect to the construction and operation of the WPPSS plants, BPA included language which would reverse the burden of proof:

". . . the Supply System shall have the burden of establishing that its actions or conduct are consistent with Prudent Utility Practice."

This statement would place the burden of proof on WPPSS, not BPA. WPPSS has balked at signing the memorandum of understanding. The point of contention may be which party bears the burden of proof, not the concept of prudent utility practice.

Question 14: The BPA/WPPSS agreements provide that if BPA does not act on contract changes within 7 days, the changes are considered approved. How reasonable is the 7-day silence provision? How often was it used and with what impact on costs?

Under the BPA/WPPSS project agreements, BPA's Administrator has approval authority over contracts and contract changes in excess of \$500,000. According to the terms of the agreements, WPPSS is responsible for providing BPA itemized cost estimates and other details sufficient to support a comprehensive review. These details include, but are not limited to, copies of supporting reports, analyses, recommendations, or other documents pertaining to contracts or to change orders. If the Administrator fails to disapprove the proposal or ask for and secure an extension of time to review additional information, the proposal is considered approved after 7 days. According to BPA officials, approval by default--no BPA response within the 7 days allowed--has never occurred on WPPSS' three net-billed projects.

Since January 1975, 90 out of 8,946 change orders on the WPPSS' projects have been in the "over \$500,000" category requiring BPA's review under the 7-day silence provision. The cumulative dollar value of these change orders was approximately \$.385 billion, which represents 72 percent of the value of all change orders processed during that time period.

Members of BPA's Thermal Projects Office told us that the 7-day silence provision is adequate and reasonable for routine procurements and contract awards. They told us, however, that the provision does not always provide adequate time to review complex change orders to construction contracts. To remedy this shortcoming, BPA has asked for and received from WPPSS both time extensions and additional information on complex changes. Also, on several occasions, WPPSS has approved change orders and contract awards subject to BPA approval. BPA officials said that if they were allowed more participation in WPPSS decisionmaking meetings, the 7-day silence provision would be adequate, even when dealing with complex change orders.

To attain increased participation and more clearly define its oversight role, BPA included in its proposed memorandum of understanding a stipulation that the BPA Administrator and/or his representative may attend all

WPPSS meetings where matters of cost, schedule, or operations will be discussed. This would include, but not be limited to: staff meetings, significant contract and change order negotiations, meetings with principals of the Architect/Engineers, and any other meeting or conference with WPPSS staff or between WPPSS and the contractors that relates to the net-billed projects.

Question 15: Would the proposed Northwest power bill increase BPA's exposure to cost overruns and delays in power plant construction? If so, what would be needed in the legislation to prevent costly delays and overruns?

The proposed legislation, by authorizing BPA to become a regional power broker, would of necessity expose the agency to many new financial risks. In its expanded role, BPA would be required to deal with a much broader variety of energy institutions and energy sources than it has in the past. The management capabilities of the institutions as well as the technical, economic, and environmental feasibility of the energy sources would be matters of great importance to BPA and its customers.

Under the proposed legislation, both publicly owned and investor-owned utilities could sell power to BPA, as could bulk power suppliers such as WPPSS. The range of energy sources eligible for BPA consideration would be very broad and would include many nonconventional options. Based on the results of its cost-effectiveness analyses, BPA might purchase power from conservation programs, cogeneration facilities, geothermal stations, solar energy projects, or conventional coal and nuclear power plants. If necessary, BPA could even construct its own energy projects, excepting hydroelectric projects. Each of these energy sources is susceptible to cost overruns and delays.

Even relatively well-managed construction programs of this magnitude are subject to delays and cost overruns resulting from changes in technology, regulatory requirements, and the economic environment. We noted, for example, that the consulting firm of Theodore Barry and Associates which recently reviewed the BPA/WPPSS nuclear construction program has also reviewed Tennessee Valley Authority's (TVA's) major project design and construction program which includes construction of nuclear power plants. TVA's construction program differs greatly from BPA's because about 90 percent of Tennessee Valley Authority's (TVA) construction work is performed by TVA employees. Theodore Barry and Associates reported that TVA had been highly successful in controlling the cost and schedule of hydro and fossil fueled plants, had badly under-estimated the cost of constructing nuclear plants. A recent GAO review of TVA projects including eight nuclear generating units disclosed a collective cost overrun of \$2.8 billion with completion delays averaging over 3 years.



QUESTIONS AND ANSWERS RELATING TO
BPA'S DIRECT SERVICE INDUSTRIAL CUSTOMERS

Question 1: Who are the direct service industrial customers of BPA and when do their contracts expire? How much power do they purchase and at what rates?

Direct service industrial customers (DSIs) purchase power directly from BPA. In 1978, BPA made direct sales of power to 15 DSIs located in Oregon, Washington, and Montana. Six of the companies operate 10 aluminum reduction plants, providing about 30 percent of domestic aluminum production, while the other 9 are electroprocessing, pulp, paper, or chemical companies. These plants consumed more than one-third of the power sold by BPA in 1978--an amount approximating the production of four 1,200 megawatt nuclear power plants.

Following is a list of DSIs receiving power from BPA, with their contract expiration dates and contract demand amounts.

<u>Customer</u>	<u>Contract expiration</u>	<u>Demand (MW) (as of 3/1/79)</u>
<u>Aluminum Companies (6)</u>		
Alcoa	6/15/87	520
Anaconda Co.	9/08/87	379
Intalco	10/22/84	438
Kaiser Aluminum & Chemical Corp.	10/10/86	674
Martin-Marietta Aluminum Corp.	2/13/88	380
Reynolds Metals Co.	12/28/86	690
Subtotal		<u>3,081</u>
<u>Other Companies (9)</u>		
The Carborundum Co.	12/31/85	30
Crown Zellerbach Corp.	8/30/83	14
Georgia Pacific Corp.	7/06/84	27
Hanna Nickel Smelting Co.	6/26/90	115
Oregon Metallurgical Corp.	5/07/88	9
Pacific Carbide & Alloys Co.	9/09/91	8
Pennwalt Corp.	12/31/85	45
Stauffer Chemical Works	4/22/88	80
Union Carbide Corp.	5/11/81	12
Subtotal		<u>340</u>
Total (15)		<u>3,421</u>

In 1978 DSIs paid slightly over 3 mills/kWh for power purchased from BPA. This price is about one-tenth the cost of new power supplies in the region. BPA sales of power to these companies in 1978 were:

	<u>Kilowatt-hours</u> (billion)	<u>Dollars</u> (millions)
Six aluminum companies	23.9	57.1
Nine other companies	<u>2.1</u>	<u>5.5</u>
Sales to DSIs	<u>a/26.0</u>	<u>62.6</u>
Total BPA sales	76.5	267.5
DSI sales as percent of total BPA sales	34	23

a/All industrial firm power, except for a small quantity of non-firm power.

Question 2: What is BPA's authority to contract for sale of power to DSI's? What are the principal terms of these contracts?

BPA sells power under the authority of the Bonneville Project Act (16 U.S.C. 832 et seq.). The act permits sales for direct consumption to "private agencies and persons," but grants them no legislative preference to Federal power. The act directs BPA to give preference to public bodies in the sale of power by requiring that:

"In order to insure that the facilities for generation of electric energy at the Bonneville project shall be operated for the benefit of the general public, and particularly of domestic and rural consumers, the administrator shall at all times, in disposing of electric energy generated at said project, give preference and priority to public bodies and cooperatives."

Under the act BPA is directed to encourage "the widest possible use" of electric energy. The act also contains an antimonopoly provision, which was included because of a concern that industry may attempt to monopolize the power from Bonneville Dam. Until the early 1970's the region's hydropower resources provided abundant low cost power sufficient to meet regional needs. Power excess to the needs of preference customers was sold by BPA to investor-owned utilities and industrial customers. Energy-intensive industries such as the DSIs were a natural development in a region blessed with an abundance of low cost electricity. The DSI's obtained long-term contracts from BPA during times when Federal power was inexpensive and plentiful.

By the early 1970's, with full development of the Federal hydro system approaching and with increased regional growth, it became clear that BPA would soon be unable to meet the growing needs of its preference customers, let alone those of the DSIs. Consequently, in June 1976, BPA notified its preference customers that after July 1, 1983, it might not be able to serve their power needs. The DSIs were told that their contracts with BPA, which expire over the 10-year period between 1981 and 1991, could not be renewed.

Contract provisions relating to reserves

Most power sold to DSIs is classified by BPA as industrial firm power and is sold at the same rate as that charged BPA's preference customers. Under certain conditions, as described below, BPA can interrupt the power sold to DSIs. Such interruptions provide BPA with capacity reserves and energy reserves, which in other utility systems are provided by standby generating equipment, energy exchanges between utilities, and other means.

Capacity reserves are provided to meet capacity shortages, which are short-term (or instantaneous) inability of the system to carry the load being placed upon it at a particular time. Such reserves are secured by automatic load shedding equipment or by the actions of officials at BPA's control center. BPA has the contractual right to interrupt 100 percent of the DSI load (about 3,400 MW) for up to 5 minutes. It can also interrupt up to 50 percent of the DSI load (about 1,700 MW) for up to 2 hours in any one day, subject to an annual limitation.

Energy reserves provide protection from energy shortages which are inability to meet the foreseeable regional load during some relatively long-term period. BPA's contracts with DSIs provide energy reserves by granting BPA the right to withhold up to 50 percent of the DSI's energy for extended periods under certain circumstances. Because most of the power sold by BPA is hydroelectrically generated, its availability is largely dependent on the amount of annual precipitation. BPA gears its power sales to a "critical water" year and sells only as much firm power as can be generated under the most severe water conditions. Yet in most years there is enough water to produce significantly more power. Because 25 percent of the energy sold to DSIs can be withheld by BPA at any time for any period or reason, it acts as an energy reserve to cope with annual stream-flow fluctuations. A major assumption made in planning sales to DSIs is that only 88 percent of the DSI load will be met in an average water year. It thus requires better than average water conditions for DSIs to receive 100 percent of their energy.

An additional 25 percent of the DSI's energy, known as a planning reserve, can also be restricted if

- there are system stability problems or forced outages, or
- BPA is unable to meet its firm power loads because of delays in bringing new generating units on-line or unanticipated shortfalls in generating capacity.

The DSIs seldom have to reduce production, even when their power supplies are interrupted by BPA. Prior to restricting power deliveries, BPA can supply them an "advance of energy" of up to 2 million kWhs. This is, in effect, a loan of energy which is provided by drawing down Federal reservoirs below normal levels required to maintain firm power loads. In most years rainfall refills the reservoirs which pays back the loaned energy. However, should this not occur, the DSIs must return the energy advanced by purchasing energy from other sources or face load restrictions. When restricted, DSIs usually call upon BPA to purchase replacement energy for them from outside the Federal system. The DSIs often pay considerably higher rates for replacement energy than they pay for Federal hydropower. For example, BPA bought replacement energy for the DSIs in 1977 and 1978 at average prices of 22.6 and 17.2 mills/kWh, respectively.

Credits for power interruptions

When BPA exercises the right to interrupt the DSI loads for more than one hour, it grants the DSIs discounts known as availability credits. During a 3-1/2 year period (January 1975 through June 1978) BPA withheld almost 9 billion kilowatt hours of energy, which is equal to about 9 percent of the total planned DSI load for that period. For these interruptions, the DSIs were granted a total of almost \$38 million in credits--about 14 percent of BPA's gross sales to them.

When they are interrupted, DSIs are granted availability credits in a series of steps. The first step grants a credit of almost \$7 million to be shared by all the DSIs when the power interruption lasts for more than 1 hour but does not exceed 5 percent of the total energy requested during the year. The next step grants an additional \$10 million credit when the energy restricted exceeds 5 percent

but is not over 10 percent. These financial penalties for interruption make BPA power system schedulers very reluctant to interrupt the DSI loads. During the period December 28, 1978, through January 10, 1979, for example, extremely cold weather, coupled with unanticipated generating outages, severely stressed BPA's ability to meet its peak and energy loads. In order to avoid interrupting the DSIs during this period, BPA borrowed energy from Canada, made public appeals for voluntary conservation by residential and commercial customers, and purchased expensive standby power from local utilities--sometimes paying nearly 40 mills/kWh for it. Despite these efforts, BPA finally did interrupt the DSI loads on January 10, 1979.

BPA officials informed us they have decided to discard the stepped method of granting availability credits. They told us that, as part of an overall BPA rate increase to go into effect in December 1979, they would adopt a different method of granting discounts--one which would be applied as a continuous function. Under the new rate schedule BPA estimates that future availability credits to DSIs could total about \$26 million a year. According to BPA officials, no studies have been made to analyze alternative means of providing system reserves.

Question 3: Under the proposed Northwest power bill, how would the DSIs be treated with respect to power supplies and price?

As mentioned earlier, DSIs are accorded no preference to Federal power under the Bonneville Project Act. In the proposed legislation, BPA would be granted purchase authority to acquire non-Federal power; and for a period of one year, to offer existing DSIs an opportunity to secure new long-term supply contracts. While the proposed legislation does not define "long-term", BPA officials told us that the DSIs would be offered 20-year contracts. If the DSIs did not accept the offered contracts, they would continue to receive power until their existing contracts expire; they would then need to seek power from local utilities, develop their own supplies, or acquire it from bulk power suppliers such as WPPSS.

It is not entirely clear, under the proposed legislation, what net rate the DSIs would be paying for BPA power. However, it is apparent that the rate will be significantly higher than the current rate (over 3 mills), and more than a rate planned for implementation in December 1979 (less than 7 mills). Under a proposed amendment known as the DSI rate directive, DSI rates would be set under two criteria:

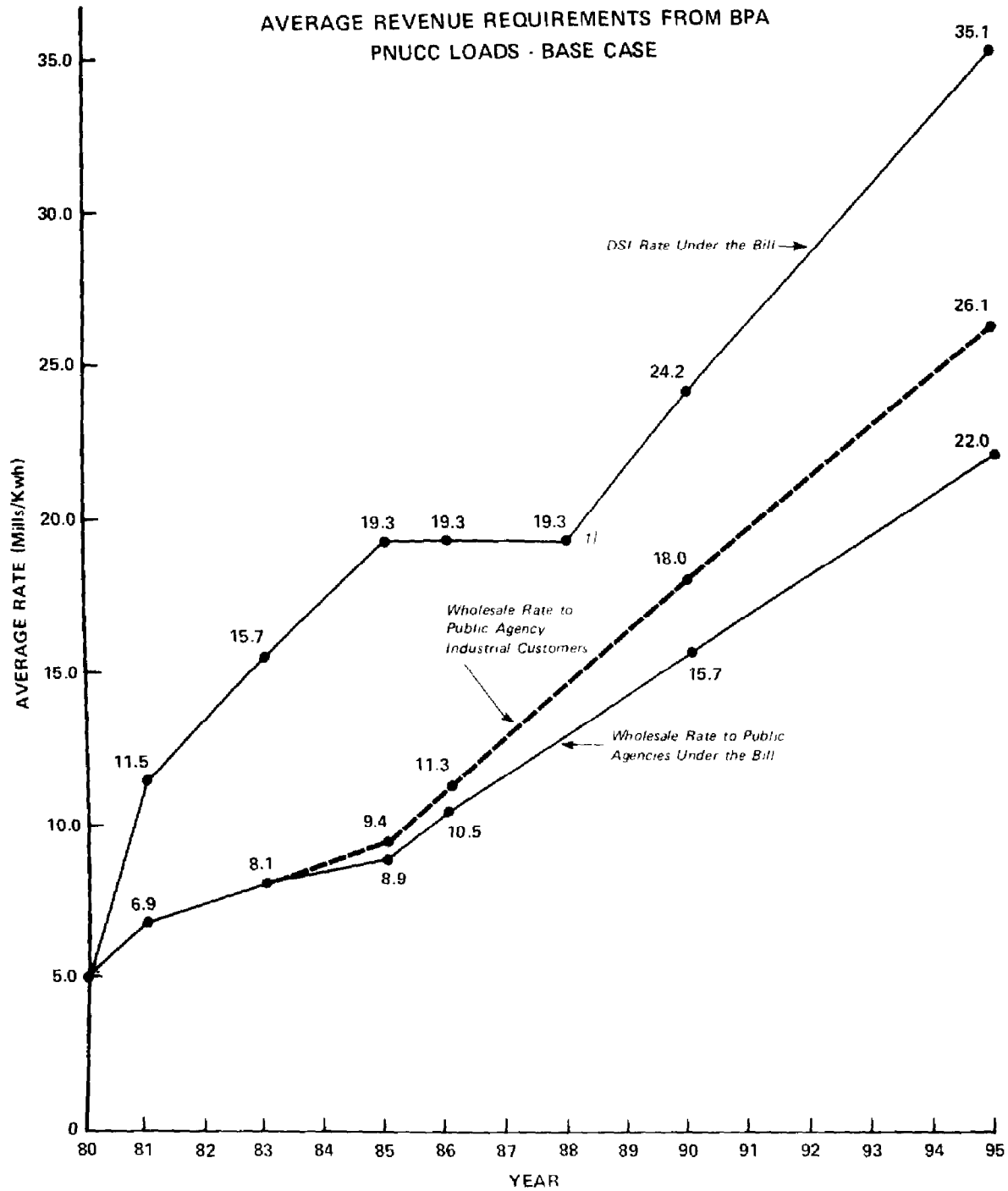
- Prior to July 1, 1985, DSI rates would be set at a level necessary to recover the net costs to BPA which result from purchase of investor-owned utilities exchange power.
- After July 1, 1985, DSI rates would be set at a level, no less than before that date, equitable in relation to the retail rates charged industrial customers of public agencies.

The BPA Administrator would be granted discretion to make credit adjustments to the DSIs' new rates to take into account the value of system reserves provided by DSIs. BPA estimates these credits could reduce DSIs' power bills annually by the following amounts:

<u>Period</u>	<u>Million</u>
1980-81	\$ 29.9
1982-83	42.5
1984-85	56.1
1985-86	78.9
1989-90	121.0
1994-95	180.0

Using only information available in the bill itself, it is impossible to predict with precision the net rates DSIs would be paying under the bill. BPA performed two analyses to estimate the possible DSI rates under different load growth assumptions, excluding availability credits. Figures III-1 and III-2 depict the the results of these analyses.

FIGURE III - 1
 AVERAGE REVENUE REQUIREMENTS FROM BPA
 PNUCC LOADS - BASE CASE

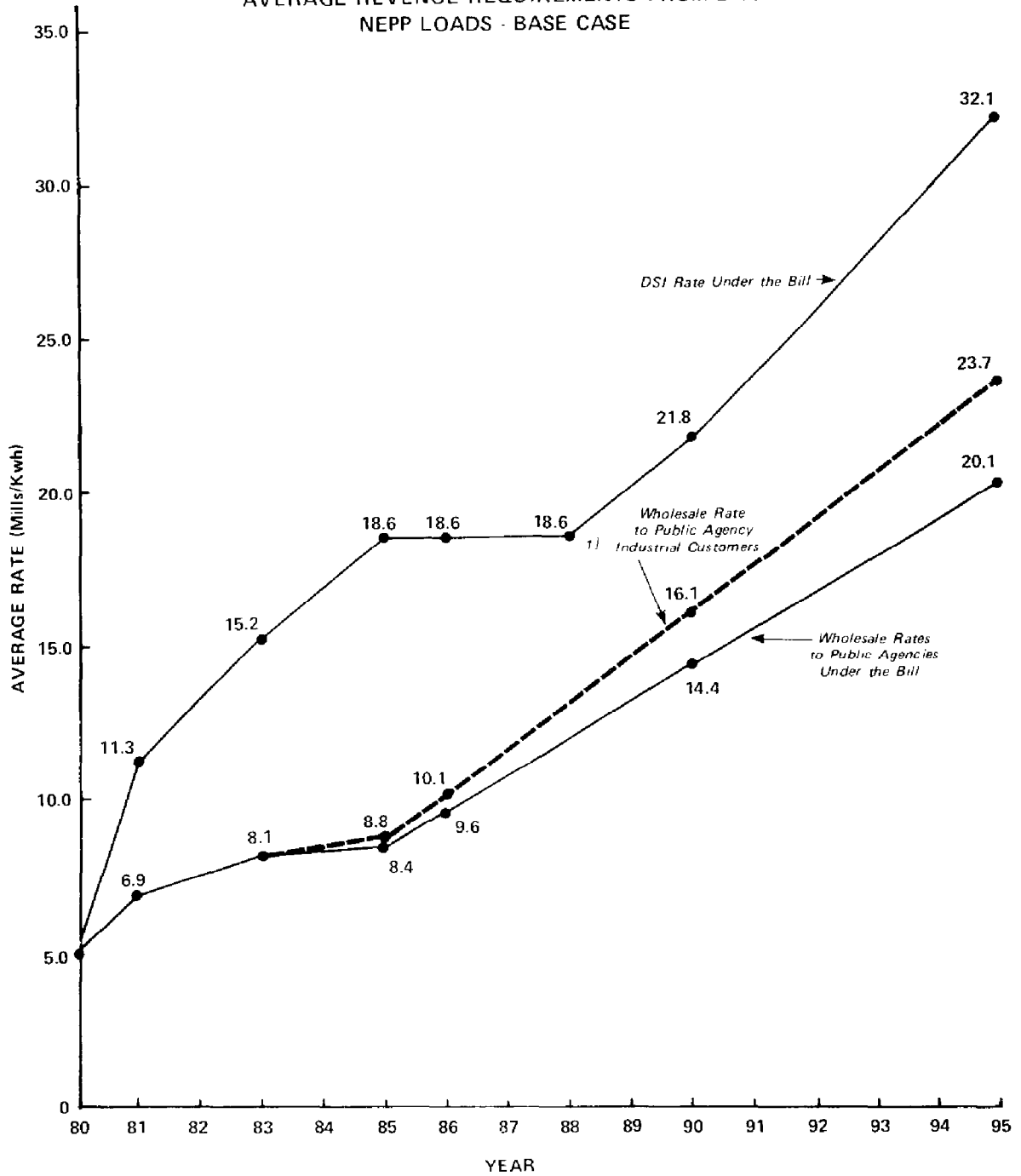


1) After 1984-85, the rate will be set at a level no less than that set for the year 1984-85 and that is equitable in relation to the retail rates charged by the public body and cooperative customers to their individual customers.

Source: Bonneville Power Administration

FIGURE III - 2

AVERAGE REVENUE REQUIREMENTS FROM BPA
NEPP LOADS - BASE CASE



1) After 1984-85, the rate will be set at a level no less than that set for the year 1984-85 and that is equitable in relation to the retail rates charged by the public body and cooperative customers to their industrial customers

Source: Bonneville Power Administration

Another important consideration related to future DSI contracts is the need for equitable treatment of all large industrial consumers of BPA power. Several utilities served by BPA sell preference power to industrial plants consuming as much power as some non-aluminum DSIs. According to BPA's analysis of the proposed bill, these industrial consumers will pay lower rates than the DSIs, even though they provide no system reserves for BPA.

Energy conservation potentials

Most DSI plants were constructed in the 1940's and 1950's. The potential for electricity conservation in some plants with older production facilities appears to be significant. There are large differences, for example, in the relative electrical efficiency of the 10 Northwest aluminum smelters. Although precise data is not available, public information shows that the most efficient smelter operates at just over 6 kWh per pound of production. The least efficient smelters, on the other hand, consume one-third more electricity--operating at over 8 kWh per pound of production.

Substantial improvements in the efficiency of aluminum production may be available in the near term. These improvements involve the use of new materials for making anodes and cathodes used in the smelting process. An improved cathode is about 2 or 3 years from demonstration, while the anode is further off--probably 6 years.

BPA has not conducted studies, nor is information publicly available, to determine the relative electrical efficiency of the non-aluminum DSI plants.

Since the proposed legislation would enable BPA to commit very large blocks of power to DSIs for as long as 20 years, BPA should assure itself that the power will be used efficiently. The legislation does not establish industrial conservation standards; but proposed amendments would provide for the development of model conservation standards as well as rate incentives to encourage their adoption. The bill requires BPA to give first priority to investments in cost effective conservation before purchasing any additional power from generating resources. It would also authorize BPA to provide "financial assistance" to encourage conservation.

Question 4: What can the DSIs expect in terms of power supplies and price if the legislation does not pass?

As shown earlier, the DSI's current contracts with BPA expire over a 10-year period starting in 1981 and ending in 1991. Several options are available to the DSIs if their contracts are not renewed. They can seek power from their local utilities, most of whom are or could become preference customers of BPA. This action would further strain preference power supplies. Ten of the 15 DSIs are located in, or adjacent to, BPA preference customers' service areas. These 10 make-up about 85 percent of the total DSI load. It is expected that these 10 DSIs would seek service through BPA preference customers as their contracts expire. The other five DSIs might seek service from investor-owned utilities. Some DSIs have the option of seeking service from either an investor-owned or publicly owned utility. Whether local utilities would have the capability to serve DSI loads is uncertain. The rates DSIs would be charged would vary from utility to utility. Additionally, the extent to which the DSI would be expected to provide system reserves would affect their rates.

Other options available to the DSIs include purchasing power from bulk power suppliers such as WPPSS, developing their own power supplies, or closing operations in the Pacific Northwest and locating elsewhere in the United States or overseas. If the DSIs developed their own power supplies or purchased power from bulk suppliers, the cost of that power would likely exceed the cost of BPA power. However, increased power costs in the Pacific Northwest are unlikely to cause the industry to relocate. By endorsing the proposed regional power bill the DSIs have, in effect, agreed to rates estimated by BPA at 18 to 19 mills/kWh in 1985 and 21 to 24 mills/kWh in 1990 (before availability credits).

A study by Charles Rivers Associates conducted for GAO in 1977 indicated that the salvage value of Pacific Northwest aluminum plants would have a major bearing on industry reactions to higher energy prices. The study showed that if electrical energy for Pacific Northwest aluminum companies were increased from 3 mills/kWh to 25 mills/kWh, the two least efficient plants in the region might cease operations. Other inefficient plants would likely be modernized, take on more workers, and produce more aluminum without increasing their consumption of energy.

Another study of Northwest aluminum producers, conducted by the Department of Commerce at BPA's request, was completed in April 1979. It concluded that

- there is little likelihood of any Pacific Northwest plants being shut down as a result of increasing power costs under the proposed legislation;
- four of the least efficient plants, making up one-third of the region's smelting capacity, would be the most severely impacted by the projected increase of power rates;
- modernization of these four plants would be profitable, provided it were coupled with plant expansion that added new capacity.

Question 5: If BPA does not renew the DSI's contracts when they expire, how will the power formerly sold to the DSI's be allocated and priced by BPA?

BPA's June 1976 notice of insufficiency was evidence that BPA will be unable to serve the DSIs because the needs of preference customers will soon exceed BPA's power supply. A major question facing BPA is how this limited supply of power is to be allocated among the growing number of preference customers receiving or applying for such power.

To provide a long-term policy in the event that it is not granted power purchase authority, BPA is developing a draft proposal for allocating Federal power among competing preference customers. The draft proposal is scheduled for publication in September 1979, and a final policy is to be adopted by April 1980.

BPA's allocation policy study is considering a number of different variables. Some of the major questions facing the BPA planners developing this policy are:

- Should a preference customer whose current contract expires in 1984 be offered a new 20-year requirements contract if the same offer cannot be made later to a preference customer whose current contract expires in 1990 or 1994?
- Should contracts contain load growth limitations or withdrawal provisions?
- Should public agencies who possess their own generating resources be treated differently from those who do not?
- Should conservation be taken into account, and if so, how?
- Should BPA keep some power in reserve, or subject to withdrawal, in favor of newly formed public bodies and cooperatives at the expense of those already in existence?

With regard to system reserves:

- How should reserves be provided?

- If DSIs do not provide reserves, what is the most cost effective means of providing them?
- If it is desirable to utilize the DSIs as reserves, how would the power be allocated, to whom, and under what price and conditions?
- Should power allocations be based on historical patterns or on the distribution of domestic and rural customers?

Regardless of the allocation policy adopted, BPA officials believe that, without a regional power bill, preference customer allocations are likely to be uncertain for a number of years because extensive litigation is likely over the meaning and intent of the Bonneville Project Act and the scope of the BPA Administrator's authority.

QUESTIONS AND ANSWERS RELATING TO
ANADROMOUS SALMON AND STEELHEAD FISHERIES

Question 1: What is the status of anadromous salmon and steelhead trout runs in the Columbia River System? What factors have contributed to the condition of these fish runs?

The once plentiful anadromous fish runs in the Columbia River Basin are badly depleted. Several of the upper river basin species of salmon and steelhead are being studied by the National Marine Fisheries Service (NMFS) and the Fish and Wildlife Service for listing as threatened and endangered species.

Many factors have contributed to the deteriorating condition of the salmon and steelhead runs. The most noticeable factor has been development of multi-purpose dams on the main-stem Columbia and Snake Rivers. These dams, built by Federal agencies and electric utilities, delay upstream migrating adults and greatly increase mortality rates in juveniles attempting to migrate downstream to the sea.

One of the early problems identified with dam construction and hydrogeneration was a need for improved upstream passage for migrating adults. Later, nitrogen supersaturation--caused by spilling large quantities of excess water over the dams--was found to cause a major portion of mortalities among both salmon and steelhead. These two problems were reduced by installing fish ladders and spillway deflectors on dams operated by Federal agencies.

As additional turbines were installed in the dams and less water was spilled during the spring freshets, turbine mortality was recognized as a severe problem. This term describes the death of "smolts"--young fish, up to 12 inches in length--which pass through the hydroelectric turbines in their attempt to migrate downstream. Turbine mortality has become a serious problem because increased storage capacity and additional turbines enabled dam operators to use most river flows for generation. Many dams have not yet been equipped with effective screening and bypass facilities to protect downstream migrating juveniles from the turbines.

The dams further hindered the downstream passage of young fish by slowing the river's current. A swift spring

runoff is needed to aid the smolts in their downstream migration. However, the hydroelectric dams enable their operators to reduce the spring freshet and to regulate reservoir levels for flood control, navigation, and power generation purposes. As a result, the downstream passage of smolts surviving the turbines is slowed and further losses occur--losses to predators and to a disinclination to migrate seaward.

Other factors which have contributed to the declining status of anadromous fish runs include the following:

- Overfishing, at sea and in freshwater, has been identified as a contributing factor in the decline of the fish runs. Overfishing of adult salmon and steelhead decreases the number of adults returning to the spawning grounds and thereby limits reproduction.
- Irrigation continues to increase in the semi-arid parts of the Basin where more water is needed to grow crops. Greater amounts of water are being removed from the streams in summer, leaving reduced flows for fish migration and propagation.
- Logging has removed ground cover and choked many spawning streams with silt. As a result, some forested parts of the watershed have ceased to support migratory fish.
- Other watershed developments including the dredging of river beds, construction of roads and bridges, and the operation of sawmills, plywood mills, and paper mills have also adversely impacted fish migration and propagation.

Ironically, at a time when the practicality of raising anadromous fish is drawing multi-million dollar investments from the private sector, some of the region's fish runs may be nearing extinction.

Question 2: How has the construction and operation of dams in the Columbia River Basin affected the salmon and steelhead fisheries? Are such activities resulting in losses of fishery resources in favor of power generation?

Salmon and steelhead runs in the Columbia River watershed have suffered great losses in the past century. About two-thirds of the area where these fish originally spawned has been rendered inaccessible by the construction of dams.

Until the completion of Grand Coulee Dam on the Mid-Columbia River in 1941, adult salmon and steelhead enjoyed fairly unimpaired access to most of their historic spawning areas. Chinook salmon once traveled nearly 1,200 miles up the Columbia River to spawn in tributaries of its headwaters in Canada. Because of its great height, Grand Coulee Dam was not provided with fishways, and its completion ended access by anadromous fish to more than 500 miles of the upper river and many hundred miles of productive spawning and rearing tributaries. During the next three decades more dams were constructed along the main-stem of the Columbia and its major tributary, the Snake River. Chief Joseph Dam, constructed and operated by the Corps of Engineers, and Hells Canyon Dam, operated by the Idaho Power Company, mark the upstream limits of anadromous fish migration on the Columbia and Snake Rivers, respectively, since neither was provided with fish ladders.

Adult salmon and steelhead ranging from 5 to 50 pounds must negotiate 9 dams to reach the upstream limit of their migration on the Columbia River. Adult fish journeying to the natural spawning areas in the Snake River and its major tributary, the Salmon River, must pass over eight dams--four on the Columbia and four on the Snake. Of the 16 main-stem dams impacting on the anadromous fish, 9 are operated by the Corps of Engineers, 1 by the Bureau of Reclamation, and 6 by electric utilities in Washington and Idaho. (See fig. IV-1.)

The dams also pose serious problems for young salmon and steelhead migrating downstream to the sea. Prior to the expanded development of the river's main-stem, large quantities of water in excess of power needs were allowed to flow over the spillways. This spillage aided the downstream movement of smolts, but resulted in nitrogen supersaturation which caused a high mortality rate. This problem was reduced by the development of spillway deflectors, increases in up-stream storage capacity, and installation of additional turbines.

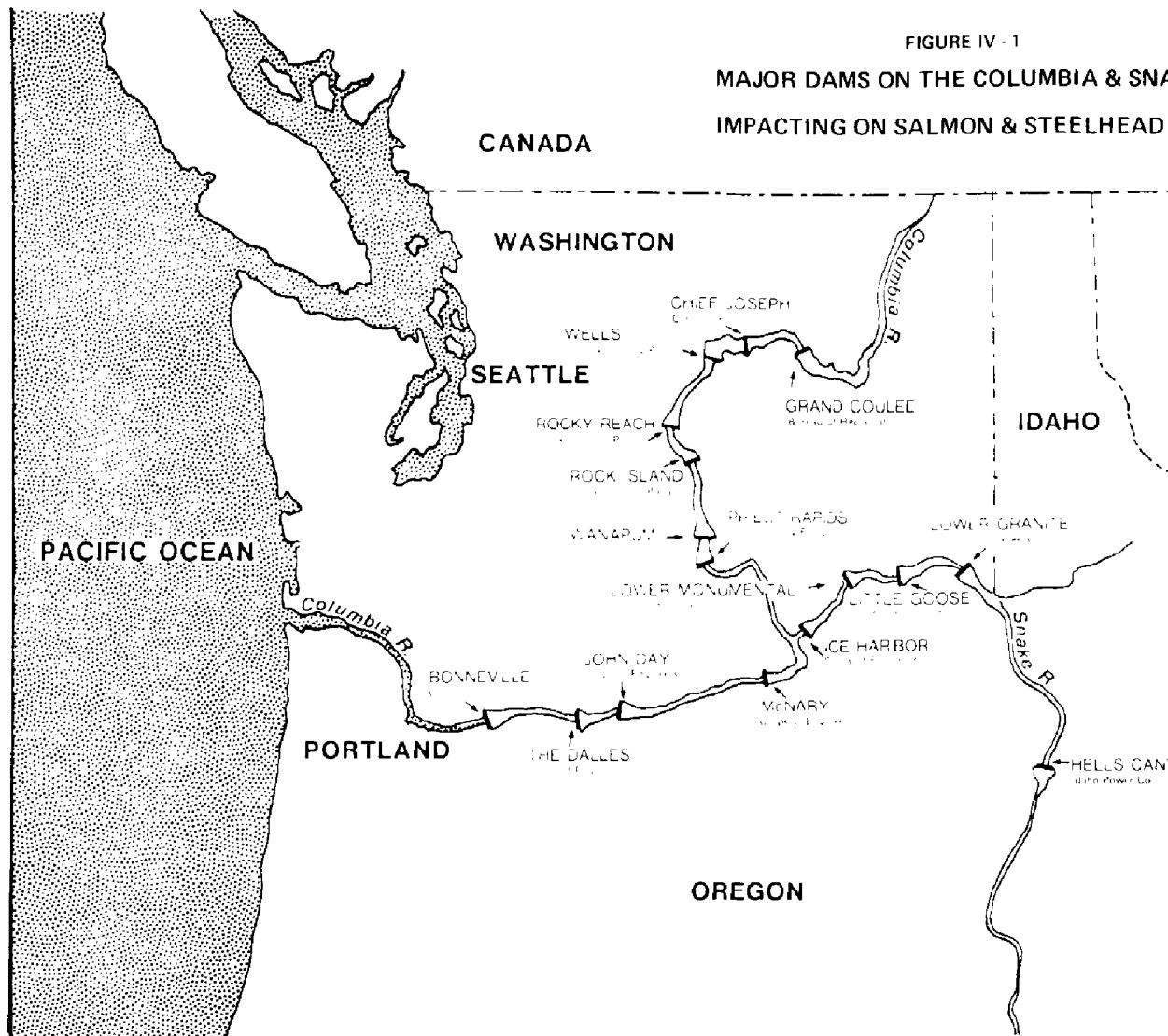


FIGURE IV - 1

MAJOR DAMS ON THE COLUMBIA & SNA
IMPACTING ON SALMON & STEELHEAD

Source: Bonneville Power Administration

In recent years, completion of more main-stem projects and the installation of additional turbines for peaking purposes have enabled power managers to put most of the river flow through their powerhouse turbines. While this reduced spillage and nitrogen supersaturation, it created a serious new problem--turbine mortality among migrating juvenile salmon and steelhead. During the period of April to June when the juveniles are migrating downstream, great numbers of them are killed by or as a result of passage through the hydropower turbines.

Smolts surviving passage through the turbines of one dam enter the large, slow-moving reservoir of water formed by the next dam. The river no longer has the strong, swift current needed to carry the smolts rapidly downstream and out to sea. It now takes young fish more than twice as long to migrate downstream as it did before the dams were built. The slower the downstream migration, the more smolts are lost to predators. Others lose the desire to migrate and become permanent residents of the river, further reducing the breeding stock that finally reaches the ocean. It is the cumulative effect of hydro facilities which is so destructive. Each facility poses a separate and sometimes different set of problems for migrating smolts, and each contributes to a cumulative deterioration of the downstream migration. Depending on flows, juvenile losses from all causes average an estimated 15 to 20 percent at each main-stem dam and reservoir complex. Mortalities as high as 30 percent per project have been recorded under particularly adverse conditions.

These problems occur in normal or good water years. In low or below normal water years, the problems are compounded and mortality rates for downstream migrants increase. Juvenile losses increase because of competition for available water supplies. River water is released from upstream reservoirs when needed to best serve flood control, power production, and irrigation purposes. This may or may not provide enough water at the right time to aid the downstream migration of young salmon and steelhead.

Most dam operators on the main-stem Columbia system--the electric utilities, the Corps of Engineers, and the Bureau of Reclamation--have been somewhat sympathetic to fishery interests. This has not always been the case, however, especially in low water years.

--In 1977, the region faced a record low water year due to the lack of rainfall and snow in the mountains. In order to protect the anadromous fisheries and assure survival of an adequate number of downstream migrants, the fishery agencies requested spills of water at each of the main-stem dams so that approximately 50 percent of the juvenile fish would pass through the spillways rather than the turbines. Although the Corps of Engineers and BPA agreed to a minimum "survival" flow, the mid-Columbia electric utilities were unable to provide such a spill without a voluntary commitment by their power purchasers. To assure the spill, fishery agencies filed an emergency petition with the Federal Energy Regulatory Commission (FERC) which subsequently ordered the utilities to provide a minimum level of spill. The flows provided were much less than the minimum levels requested to maintain a harvestable run.

--In 1978, the fishery agencies again requested a spill at the mid-Columbia utility dams. At the last moment a petition was filed with FERC. The utilities received authorization from their power purchasers to provide spills greater than the 1977 levels prior to receiving an order from FERC.

--In late 1978, the fishery agencies again petitioned FERC to order the mid-Columbia utilities to provide spills in the spring of 1979 to aid the migrating smolts. Before formal hearings took place, a compromise was reached on the duration and quantity of spills at each dam.

Other methods have been used by the Corps of Engineers and NMFS to aid the smolts' downstream migration. They include trucking and barging the young fish past several dams to avoid the turbines. In 1977 barging and trucking of about 3 million smolts saved a significant number that might have otherwise perished because of insufficient water. According to Corps and BPA estimates, Federal agencies will spend about \$4 million in 1979 for barging and trucking fish downstream, spilling water, and other related activities.

To reduce turbine mortality, the Corps and NWFS have been researching the use of screens and by-pass facilities to prevent migrating juveniles from entering the turbines and to route them safely past the dams. Two of the 10 Federal dams have installed screens on all their turbine units. One other Federal dam has screened 1 of its 14 units, and another is planning to install screens. At the present time none of the five utility dams on the mid-Columbia is scheduled for turbine screens, although negotiations are underway for the installation of screens at one of the dams. Eight Federal dams and two utility dams have in operation, or plan to install, bypass facilities to trap the young fish and route them around the turbines. (see Schedule IV-I).

It seems clear that upriver salmon and steelhead runs have suffered because maintenance of the anadromous fish runs has not been made a basic objective of Federal hydro-projects or Federal licensing of utility-owned projects. The Corps of Engineers operates 9 of the 10 Federal dams on the main-stem Columbia system, none of which have fishery maintenance or enhancement as an authorized project purpose. Although fishery maintenance is not an authorized function of its dams, the Corps believes that it can spill water to aid the downstream migration of juvenile salmon and steelhead. BPA, although supportive of fisheries research, is primarily responsible for marketing hydropower produced by Federal dams; it seeks to "optimize river regulation for power purposes and to maximize power revenues through generation and sale of non-firm power first within and then outside the Pacific Northwest." Similarly, the electric utilities with dams on the mid-Columbia are concerned first with meeting the power needs of their customers.

SCHEDULE IV.1
Fish Migration Facilities
on Main-stem Columbia and Snake River Dams
August 1979

Fish Migration Facilitie
(planned or installed)

<u>Dam</u>	<u>Date in service</u>	<u>Operator</u>	<u>Fish ladders</u>	<u>Bypass juvenile system</u>	<u>Spillway deflectors</u>
Lower Columbia					
Bonneville	1938	Corps of Engineers	3	1981&1982	1975
The Dalles	1957	Corps of Engineers	2	Yes	None
John Day	1968	Corps of Engineers	2	Yes	None
McNary	1953	Corps of Engineers	2	Yes	1976
Middle Columbia					
Priest Rapids	1960	Grant County PUD	2	None	Not scheduled
Wanapum	1963	Grant County PUD	2	None	Not Scheduled
Rock Island	1933	Chelan County PUD	3	1978	Not Scheduled
Rocky Reach	1961	Chelan County PUD	1	Partial	Not Scheduled
Wells	1967	Douglas County PUD	2	None	Not Scheduled
Snake River					
Ice Harbor	1961	Corps of Engineers	2	Yes	None
Lower Monumental	1969	Corps of Engineers	2	Yes	1974
Little Goose	1970	Corps of Engineers	1	Yes	1976
Lower Granite	1975	Corps of Engineers	1	Yes	1975

Note: Chief Joseph, Grand Coulee, and Hells Canyon Dams have no fish pas and none are planned.

Question 3: What procedures are in place to assure that the impacts of power plant construction and operation on anadromous fish runs are identified early and mitigated to the satisfaction of Federal, State and local interests?

Compensation for damages to the salmon and steelhead fisheries, required by Federal legislation, has generally been in the form of hatcheries to replace lost spawning grounds. It has seldom been provided concurrently with project construction. Delays of several years have occurred in some cases. For example, John Day Dam was completed in 1967, but compensation in the form of hatcheries was not fully implemented until almost 10 years later. To date, only limited action has been taken to compensate for salmon and steelhead losses at the Ice Harbor (1961), Lower Monumental (1969), Little Goose (1970), and Lower Granite (1975) Dams on the lower Snake River.

The adverse impacts of most main-stem dams on the Columbia system are mitigated according to various Federal Acts including the 1888 Flood Control Act, the Federal Power Act of 1920, and the Fish and Wildlife Coordination Act of 1934. Mitigation generally has been in the form of hatcheries and spawning channels to replace destroyed spawning grounds. The Mitchell Act of 1938, as amended in 1946, authorized the Columbia River Fishery Development Program, a cooperative effort by the States of Oregon, Washington, Idaho, and the Federal Government, led by the NMFS. The program has two major functions: (1) the protection and improvement of stream environment and (2) the production of fish in hatcheries and rearing ponds on the Columbia River and its tributaries. In addition, NMFS sponsors investigations and research to improve the habitat and survival of salmon and steelhead.

This joint State/Federal stewardship for salmon and steelhead has had some success in stabilizing fish runs in the lower Columbia system, although today's runs are much smaller than those of the past. It is increasingly clear, however, that construction and operation of hatcheries is only a part of the compensation needed for the upper river fish runs. A 1978 NMFS report showed that few hatcheries have been located on the upper river because the adverse impacts of downstream dams would make such hatcheries a poor investment. No purpose is served by constructing and operating hatcheries upstream from hydro projects, unless adequate

numbers of salmon and steelhead smolts survive their migration downstream. Local officials representing fishery and power interests estimate that, depending on water conditions, up to 95 percent of the smolts from the upper river are killed by turbines, nitrogen supersaturation, or larger fish before they complete their migration to the sea. Available data indicates that, in critical water years, 95 out of every 100 young fish may die before they reach the ocean.

Question 4: What agencies are responsible for addressing anadromous fishery problems on the Columbia River System?

No single agency--Federal or otherwise--has been assigned oversight responsibility and authority for maintaining the anadromous fish runs on the Columbia River System. A number of Federal and State agencies and Indian organizations, as well as several interagency coordinating bodies, impact on salmon and steelhead fisheries. The interests represented by these entities are sport and commercial fishing, Indian treaty fishing, agriculture, interstate navigation, flood control, and power production. Responsibility for the protection of salmon and steelhead runs is fragmented, and the resource is subject to "management by committee."

Legislation pertinent to protection of the anadromous fisheries includes:

- The 1920 Federal Power Act (16 U.S.C. 791a-828c) which requires private power producers to build fishways at all of their dam facilities.
- The 1934 Fish and wildlife Coordination Act (16 U.S.C. 661) which gives legal authority for insuring protection and/or compensation for salmon and steelhead could have impacted by Federal water projects. A 1958 amendment to this act provided for the development and improvement of wildlife resources adversely impacted due to the modification of streams and other bodies of water. It also required equal consideration and coordination of wild life conservation with other water resource development programs.
- The Mitchell Act of 1938, (16 U.S.C. 755, et. seq.) under which NMFS operates the Columbia River Fishery Development Program. This is a cooperative effort involving the U.S. Fish and wildlife Service and counterpart agencies in the States of Idaho, Oregon, and Washington. The program involves the construction and operation of hatcheries, construction of fish ladders, and restoration of fishery spawning and rearing habitat.

Operational control of the Columbia Basin water resource is not centered in one organization. It is exercised by the Corps of Engineers, the Bonneville Power Administration, the

Bureau of Reclamation, various State agencies, and public and private utilities. Although dam operations are constrained by operating requirements such as limits on tailwater discharges and pool fluctuations, the final allocation of the water on a systemwide basis remains consistent with the authorized project purposes such as flood control, navigation, irrigation, and power generation. None of the mainstem hydroelectric projects on the Columbia system have fishery protection or enhancement as a project purpose.

The responsibility for management of the Columbia River salmon and steelhead is fragmented among five Federal agencies, five State agencies, and several Federal/State/Indian coordinating bodies. Schedule IV-2 lists the principal agencies involved. Notice, for example, that five different entities are involved in regulating fish catch limits. No single institution has sufficient authority to assure that the salmon and steelhead fisheries have protection adequate for survival.

Fishery maintenance and enhancement is not specified as an authorized purpose of the dams, and the fish runs have no vested water rights. Consequently, fishery management agencies must seek the voluntary cooperation of the operating agencies and utilities or petition the Federal Energy Regulatory Commission (FERC) to provide spills and flows at non-Federal dams that will allow for successful migration of juvenile fish. In March 1979, officials from Federal and State fisheries agencies, Indian tribes, and three electric utilities negotiated until the "eleventh hour"---just before a FERC hearing--before agreeing to the quantity of water to be spilled at utility dams in order to accommodate the spring migration of juvenile salmon.

SCHEDULED IV - 2
Principal Organizations Having Responsibilities
Or Programs For Columbia River Salmon And
Steelhead

	Programs or activities						
	Planning	Coordination	Commercial Catch Regulation	Sport Catch Regulation	Research	Fishery Studies	Hatchery Operation
<u>INDIAN</u>							
Columbia River Inter-tribal Fish Commission		X					
Northwest Indian Fisheries Commission		X					
<u>FEDERAL</u>							
National Marine Fisheries Service (Dept. of Commerce)	X	X	X		X	X	X
Fish and Wildlife Service (Dept. of the Interior)		X			X	X	X
Bonneville Power Administration (Dept. of Energy)					X	X	
Corps of Engineers (Dept. of Defense)	X	X			X	X	X
Bureau of Reclamation (Dept. of the Interior)	X	X			X	X	X
<u>STATE</u>							
Oregon Dept. of Fish and Game	X	X	X	X	X	X	X
Idaho Dept. of Fish and Game	X	X	X	X	X	X	X
Washington Dept. of Fisheries	X	X	X		X	X	X
Washington Dept. of Game	X	X		X	X	X	X
Pacific Marine Fisheries Commission		X					
<u>STATE/FEDERAL</u>							
Pacific Northwest River Basin Commission	X	X				X	
Pacific Fishery Management Council	X	X	X	X			
Columbia River Fishery Council	X	X					
North Pacific Fishery Management Council	X	X	X	X			

Question 5: What funds are expended on behalf of anadromous fish runs and by whom?

The large number of entities involved in protecting and maintaining the Columbia River salmon and steelhead runs (see question 4) makes it difficult to determine the total funds spent for this purpose. However, it appears that significant expenditures have been and are being made for the fisheries. The following paragraphs illustrate the magnitude of regional expenditures.

The Mitchell Act of 1938 authorized appropriation of Federal tax revenues to restore and enhance salmon and steelhead runs of the Columbia River Basin. Since 1949, over \$84 million has been appropriated for a variety of activities under the Columbia River Fishery Development Program administered by the NMFS. These activities are largely conducted through contracts with Oregon, Washington, and Idaho fishery agencies. Mitchell Act funds have been used to build and operate 21 salmon and steelhead hatcheries. Cost of operating these hatcheries and other fish rearing facilities will total about \$4.2 million in fiscal year 1979.

The Corps of Engineers is constructing fish hatcheries to compensate for fish losses resulting from its four dams on the lower Snake River. Through fiscal year 1980 about \$17 million has been appropriated for this purpose. The Corps estimates that the hatcheries and other facilities for the Lower Snake River Compensation Plan will cost about \$73 million. About 80 percent of the cost will be reimbursed from power revenues.

BPA incurs a variety of costs for fisheries enhancement. First is the direct funding of anadromous fisheries research and development projects as part of the "BPA Fishery Restoration Program." Under this program, BPA provided \$500,000 in fiscal year 1978 and has budgeted about \$1.2 million in fiscal year 1979 for projects related to power operations and recommended by a regionally appointed body, the Columbia River Fisheries Council. Most of these projects are for the benefit of the fishery as a whole, rather than for specific rivers or facilities.

BPA also recognizes the costs of revenues lost as a result of special operations, including water spillage 1/,

1/The passing of water over the dam rather than through the turbines.

at Federal dams to facilitate downstream movement of juvenile salmon and steelhead during the spring. These losses vary substantially from year to year depending on the magnitude of annual runoff. During the low-flow year of 1976-77 BPA estimated the loss from these special operations totaled slightly more than \$2 million. In fiscal year 1978 these revenue losses totaled about \$280,000. Special operations in the spring of 1979 are expected to cost BPA about \$2.7 million in lost revenue.

The third category of BPA cost represents power revenues used to repay the cost of fish passage facilities constructed and operated at the Federal generating projects. According to the Corps of Engineers, the Federal investment in these facilities totals about \$195 million. Of this, \$178.5 million is reimbursable from power revenues. Annual repayments for interest and amortization cost BPA about \$6.3 million. Operation and maintenance expenses associated with these facilities add \$9 million, bringing the total for fiscal year 1978 to over \$15.3 million.

The Pacific Northwest Regional Commission--a body composed of the Governors of Washington, Idaho, Oregon and a Federal co-chairman--also spends some monies on research, planning, and coordination of fishery policies. The Commission supports various other activities and provides a forum for the resolution of regional resource management problems. Its proposed budget for fiscal year 1979 is about \$1.3 million.

Fishery costs are also incurred by electric utilities with dams on the main-stem Columbia system. The Fishery Coordinator representing three electric utilities in Washington State estimated that the utilities will spend \$1.2 million in fiscal year 1979 for the operation of fishery facilities at their five mid-Columbia dams. The Idaho Power Company budgeted \$462,000 in 1979 for operation of fish hatchery facilities constructed to mitigate fishery losses from the Hell Canyon Dam.

Question 6: Could the proposed power bill have a significant impact on the anadromous fish runs? If so, how?

The proposed power bill would provide BPA with broad purchase authority to assure the region of an adequate power supply. One likely method of assuring adequate power supplies is further development of the region's hydro-thermal program, and increased use of hydro generation to meet fluctuations (peaks) in demand. The impacts of extensive peaking operations on anadromous fish are not fully known. Potential problems associated with increased use of the hydro facilities to meet peaking needs include:

- increased turbine mortality among juvenile fish,
- more difficult passage for adult fish returning upstream,
- reduced spawning success, and
- stranding or delay of adult and juvenile fish with increased mortality from predators, temperature changes, and oxygen depletion.

Based on studies conducted by BPA, the greatest fluctuations in water level from peaking operations would be expected to occur in April during "average" or "better than average" water years. April is also the beginning of the spring migration for salmon and steelhead, and many smolts could be lost due to the fluctuating river levels caused by peaking operations. Increased peaking operations might also increase the turbine mortality of migrating juveniles if adequate turbine screens and bypass facilities are absent.

The proposed power bill could have numerous other impacts--both positive and negative--on all of the region's anadromous fisheries including those on the main-stem Columbia system. Little is known about these possibilities, but it might be useful to recognize some of them as contingencies. Nonconventional energy sources could have a variety of impacts on the fisheries. Pumped storage projects might disrupt the migration of juveniles and require special protective measures. Low-head hydro developments on tributary streams might hinder fish passage or damage valuable spawning habitat. Conservation, load management and pricing reforms, on the other hand, could slow regional demand growth and perhaps free-up some river water for fish passage and propagation.

The construction of large numbers of nuclear and coal-fired plants could have various effects. If thermal plants assume more of the regional power load, increased river water and better water release schedules might become available for fishery enhancement. On the other hand, site preparation problems together with discharges and pollutants from thermal plants could eradicate spawning habitat, reduce water quality, or increase water temperatures to levels which would disrupt the normal migrating patterns of salmon and steelhead.

Question 7: Is legislative action needed to assure that future construction and operation of power plants on the Columbia River System will be more compatible with the anadromous fish resources? How would such legislation impact on the production of electric power in the region?

It is evident that construction and operation of the Columbia system dams have contributed to the decline of the upriver anadromous fish runs. Dams on the Columbia and Snake Rivers are presently operated to optimize hydroelectric production consistent with other project purposes such as flood control, irrigation, and navigation. Maintenance of the anadromous fisheries, however, is not a purpose of these projects. Consequently, river management sometimes has been inconsistent with preservation of the fish runs.

No accountable entity--State or Federal--has been given the comprehensive authorities and prerogatives needed to manage and maintain the anadromous fisheries. Fishery managers have insufficient leverage to assure that river management decisions adequately protect the resources they are responsible for safeguarding. Increasing demands for water from irrigators and power marketers--especially in low water periods--threaten extinction of some upriver runs unless remedial action is taken. The proposed power bill does not provide such a remedy, but is an opportunity to balance fishery needs with other water management functions.

Existing legislation--such as The 1920 Federal Power Act which requires fishways at all private power projects, The Fish and Wild-life Coordination Act of 1934, which provides the legal authority for protecting and/or compensating for salmon and steelhead impacted by Federal water projects, and The Mitchell Act of 1938, under which the NMFS operates the Columbia River Fishery Development Program--generally authorize Federal and State agencies to provide mitigation for fishery losses inflicted by individual hydro projects. When these laws were enacted, the Columbia River was largely free flowing; water was still a plentiful commodity, and adequate flows were assured. Today the situation is very different--the river is controlled by dams and storage facilities, the demands of irrigators and power consumers have greatly increased and water is becoming scarce. But there is no Federal or State responsibility center with sufficient authority to offset the cumulative impacts of hydroproject development and assure adequate protection and enhancement of the fishery resource.

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