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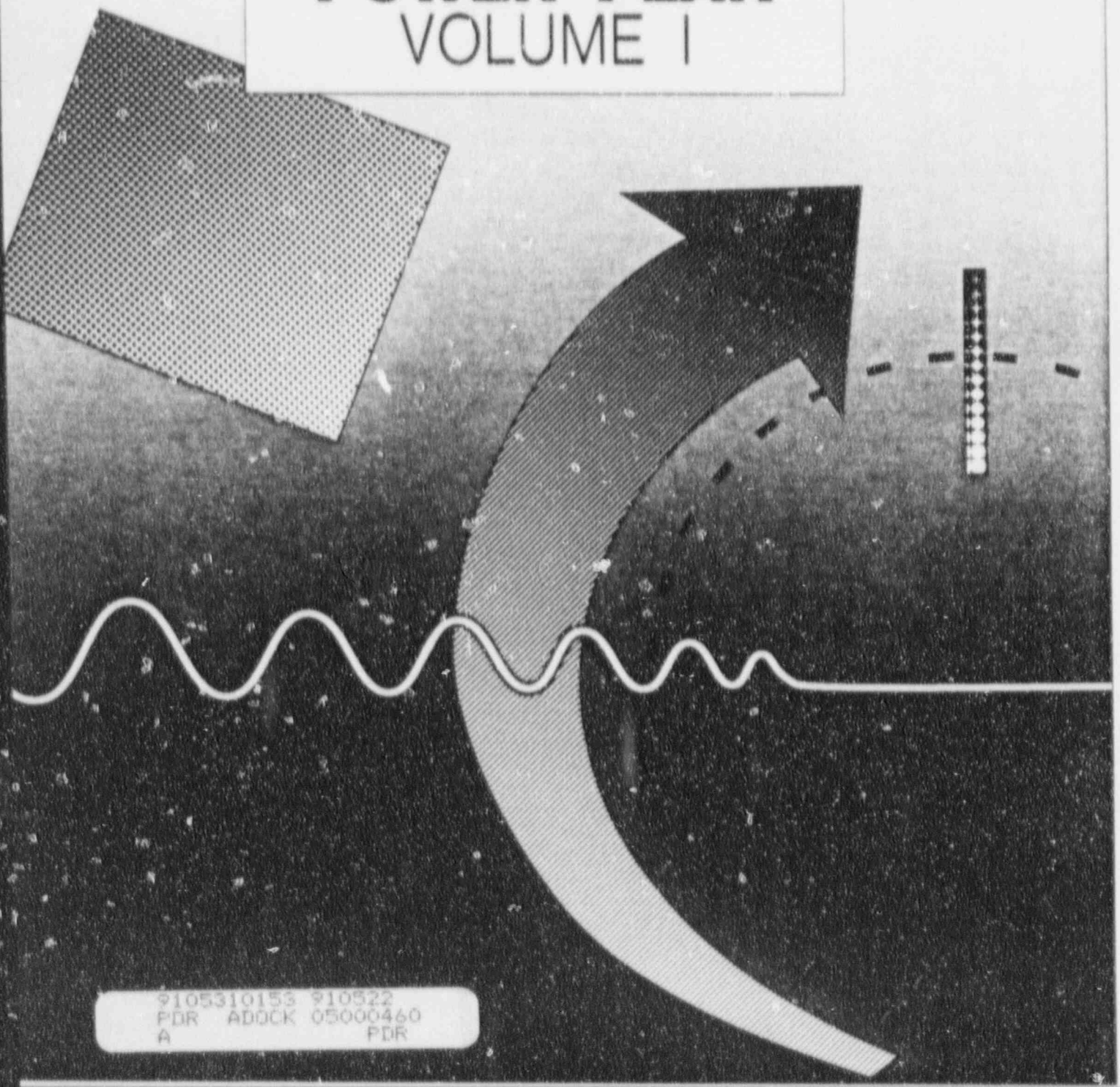
Draft

1991 NORTHWEST CONSERVATION and ELECTRIC POWER PLAN

VOLUME I



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This document is the complete Volume I of the Draft 1991 Northwest Power Plan. The technical analysis, supportive data and planning assumptions are contained in Volume II, which can be ordered from the Council (see page 38).

To the Citizens of the Pacific Northwest:

The draft power plan you hold in your hands is unlike any we have produced in the past. Not only is it shorter and, we hope, easier to read, but it also should communicate to you a new sense of urgency. If there ever were a time for cooperative action in the Pacific Northwest, this is it.

We felt this plan was so important that we are sending it to those of you who regularly receive our magazine, *Northwest Energy News*. It replaces the January/February 1991 issue. We hope you will take the time to read this plan and give us your comments. Guidelines for comment begin on page 36.

Why is this plan so important? The fact is, the surplus of electricity we had through most of the 1980s is gone. In the latter half of the 1980s, the region's demand for electricity grew at a rate that was equivalent to adding a city the size of Portland each year. That rapid economic growth has slowed, but electricity demand is still growing.

The Pacific Northwest needs new resources to maintain its healthy economy, and it needs to begin acquiring them immediately. But we have limited options. It is time for all of us—Council members, electricity providers and consumers—to look very closely at the difficult choices we face.

We have spent the better part of the past two years studying the various resources we can turn to: energy efficiency, hydropower, wind power, geothermal power, solar energy, cogeneration, coal, nuclear and others. We have a good handle on what each will cost and how much of each we can expect. We've spent months analyzing and testing the possible outcomes of various combinations of resources and future scenarios.

All of this work has pointed to the actions called for in this plan. Please read on. Then let us know what you think. Help us move into the next century with a secure electrical power system, a thriving economy and a healthy environment.

Jim Goller

Jim Goller, Chairman

A Decade for Action

The goal of this power plan is straightforward. It is to ensure that the Pacific Northwest will have a reliable electricity supply well into the next century.

This plan focuses on electrical resources that balance sometimes-competing attributes. These resources were chosen with great care to provide a mix that is the least expensive (both in economic and environmental terms), yet most risk free.

There is some history behind this plan. Ten years ago, the Pacific Northwest embarked on a grand experiment. It was a test, initiated by the Northwest Power Act of 1980, to determine whether four states, sharing common needs and resources, could coordinate their efforts to ensure their people reliable and economical electrical services.

This draft 20-year power plan is the most recent product of that regionwide collaboration. In it we face a new challenge, the challenge the Act was designed to manage. For the first time since the Act was passed, the Northwest actually needs new resources. Our challenge is to prudently select among all available sources of electricity those that offer the region the most value for its money. In this and the next decade, the Pacific Northwest almost certainly will be called upon to add thousands of megawatts[1] of resources to its power system. One thousand megawatts is enough to power the city of Seattle. If the region grows rapidly, we could need more than 13 times that amount in 20 years.

Even a few hundred megawatts do not come cheaply, nor are they without complex consequences. In preparing for the region's energy future, it is the job of the Northwest Power Planning Council, working with the Bonneville Power Administration, utilities and electricity consumers, to weigh all resource alternatives and choose carefully among them.

1. Megawatts are used in this plan to refer to average megawatts. An average megawatt is 8,760 megawatt-hours of energy. When megawatt is used to refer to capacity, it is noted. Capacity is the maximum output of an electricity system.

The Act provided guidance on this choice—wise guidance. It called for a regional power plan that turns to conservation as its most cost-effective resource. This plan does just that.

Four Objectives

The plan calls on the Northwest to purchase more than 1,350[2] megawatts of conservation over the next 10 years. This means concerted efforts to stop wasting electricity in new and existing residences, commercial buildings, industrial processes and irrigated farming practices. It also means upgrading power plants and transmission systems to make them more efficient. (See Figure 1.)

Second, the plan calls for efforts to shorten the lead time needed to bring new resources into the power system. If it takes years to develop a resource from idea to reality, then the odds increase that conditions will have changed by the time the power is delivered. The demand for electricity could have been exacerbated, or it could have declined. Short lead times and resources that can be secured in small increments, are important keys to responding flexibly to uncertain future power needs.

The third focus of this plan includes actions to confirm still more resources by pinning down their costs and availability. The Council is reviewing a category of resources that are "promising," but not quite ready for development. Other resources could be bargains, but the region needs more information before major investments can be made. More research is needed, and in some cases, demonstration projects must be initiated to resolve questions.

Finally, to make all of this possible, this draft power plan outlines regulatory changes and other actions to improve power system planning and implementation efforts. Perhaps the most important regulatory change that needs to be considered is a mechanism to link power company profits to energy the utility *saves* as well as energy the company sells.

To sum up, the four basic objectives of this plan are: Acquire more than 1,350 megawatts of conservation and other low-cost resources in the next 10 years; shorten lead times to provide flexibility to respond quickly to energy needs; confirm the costs and availability of additional resources; and encourage regulatory and other changes to help this plan get implemented. These objectives are not meant to be sequential. Action on all of them is needed now. (See the Action Plan, which begins on page 21, and Volume II, Chapter 1, for more detail.)

Action Plan

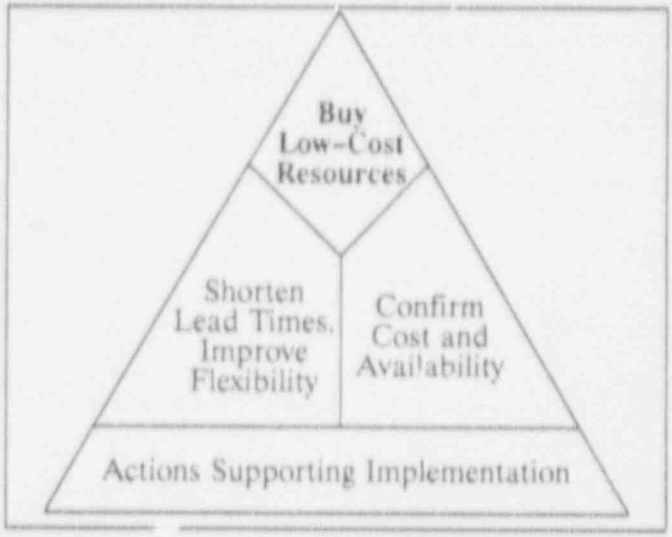


Figure 1
Four Objectives

Responsibility for implementing this plan is shared by a number of regional entities, and cooperation will be critical to the plan's success. (See Figure 2.) Utility regulators will have to play a major role in streamlining resource acquisition processes and ensuring there are no barriers—especially for conservation—that can impede implementation.

Government support at all levels will be necessary to require cost-effective conservation standards and other policies.

The Bonneville Power Administration and the region's utilities will bear the fundamental responsibility of buying, through bidding and other means, or building most new resources. Utilities serving rapidly growing areas will have to be especially aggressive in implementing this plan.

2. Numbers are rounded off in Volume I, which accounts for the slight discrepancy compared to Volume II. Volume II contains precise figures.

Environmental groups, consumer groups and the public at large need to lend their support to make this plan a reality.

For the Council, drafting this plan is only the beginning. We are committed to its implementation. We will actively participate with all interested parties in efforts to make the potential embodied in this plan become reality.

Why Now?

This is not the first Northwest Power Plan; it is the third. But the region changed so dramatically in the last half of the 1980s that, in some ways, the whole focus of power planning has had to change with it. The first two plans reflect a period when the region had surplus electricity. It was an expensive surplus, fueled by thermal power plants that had cost considerably more than the hydropower that supplies most of the region's electricity. Nonetheless, the surplus bought us time.

Regional power planners, power system managers and electricity consumers used that time to lay the foundation to implement this plan. The concept that energy conservation is a resource like any generating power plant was introduced by the Power Act. This region's utility managers had to find ways to bring a conservation "power plant" into their electrical grids.

They developed and offered programs to enable their consumers to save electricity in homes and businesses, on farms and in industries. Even without really pushing to make all the efficiency improvements that are possible, the region managed to acquire more than 350 megawatts of energy savings, at a price roughly half that of power from a new coal plant. Hundreds of thousands of homes were weatherized. Millions of dollars in annual heating, cooling and operating costs were saved. New building codes that met the Council's energy-efficiency standards were introduced in some parts of the Northwest. All in all, the region started building the infrastructure to acquire large amounts of energy by saving it.

The Players

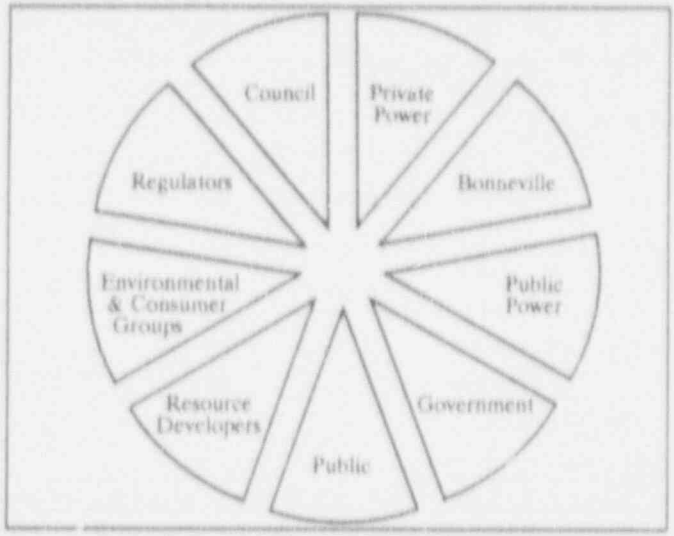


Figure 2
Cooperation is Needed to Make this Plan a Reality

The Surplus Is Gone

Now the region is in what utility planners call "load[3]/resource balance." This means that there is just about enough power supplied by the existing system to meet regional electricity needs at their present level. Some power is still sold to California, and it can be recalled if necessary, but in practical terms, the supply is equal to demand.

Despite the progress of the last 10 years, the region enters the 1990s without the capability to successfully run conservation programs in all sectors of the economy and without an inventory of resources that can be developed quickly. Even with moderate growth, the region will need an additional 2,000 megawatts by the turn of the century.

A System Under Stress

The situation could get worse. Other pressures also are influencing the amount of power we can expect to produce in the future. (See Figure 3.)

To make sense of the stresses compelling this region to acquire electricity from new sources, it is important to understand that, unlike any other part of the nation, the four Northwest states of Idaho, Montana, Oregon and Washington all rely on a single source for two-thirds of their electricity—Columbia River hydropower.

3. Load is the term for electricity demand on a given power system.

A System Under Stress

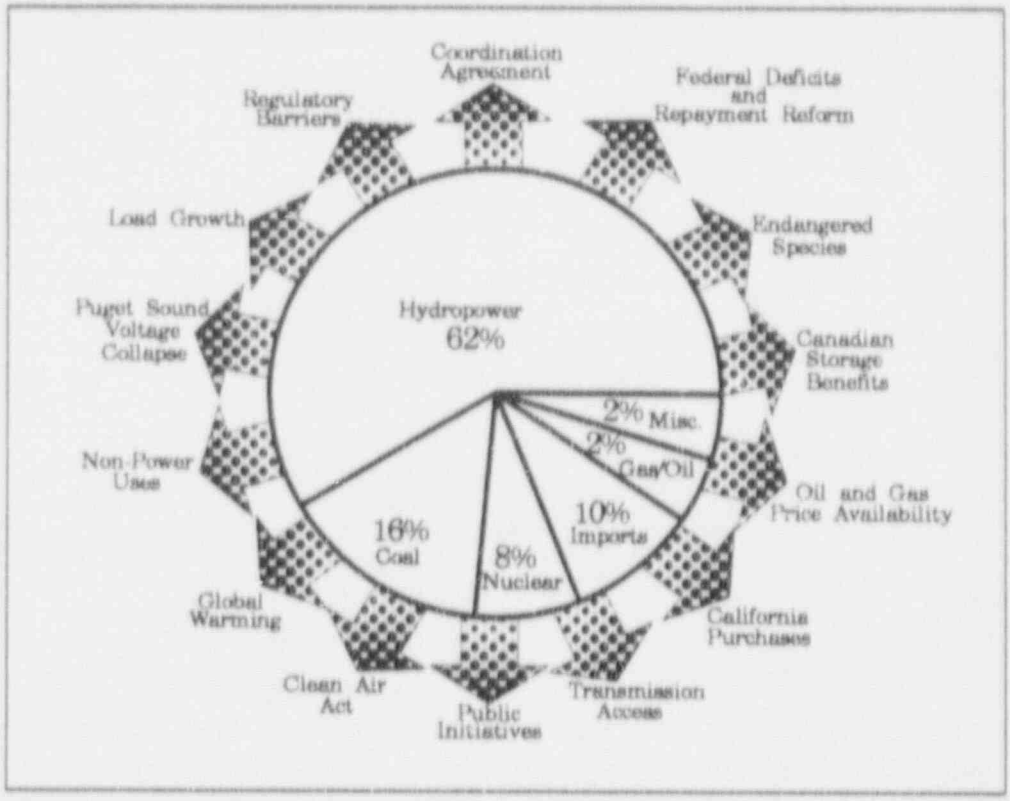


Figure 3
The Pacific Northwest Power System Must Cope with Many Challenges

The number of hydroelectric dams that can transform the Columbia's waters into power is limited. That limit, in large part, has been reached.

Both the United States and Canada constructed dams on the mainstem of the Columbia River and its tributaries, and the two countries negotiated agreements to allocate the cost of those dams and the power they produce. Some of those agreements expire in this decade. Under the terms of one agreement, about 500 megawatts of energy was sold to U.S. utilities for 30 years. When that agreement expires in 1998, that power will begin to return to Canada.

Another agreement governs the way much of the hydropower system is coordinated, so it can be operated as if by one entity, when in fact, many agencies run the individual projects. That agreement expires in 2003, raising the immediate question of how the river will be managed in the future.

New demands on Columbia River water are not so easy to predict. In the spring of 1990, several groups filed petitions to have five species of Columbia and Snake river salmon listed as threatened or endangered under the Endangered Species Act. These salmon use the rivers as spawning and rearing habitat, but the fish mature in the ocean. Each year, during their migration to the sea, millions of them die in the hydroelectric dams and reservoirs. If these fish are declared to be endangered, all other water uses—irrigation, power production, recreation, etc.—could be affected.

Even before the petitions, however, there were concerns about the adequacy of flows for salmon migration. The Council's fish and wildlife program calls for minimum flow levels and a water budget. The latter refers to water stored in reservoirs of the Columbia and Snake rivers that is released to aid the spring migration. But only one-third of the Snake River water budget comes from storage. The remainder comes from runoff, and that has been consistently low for the past few years. The Council is taking a new look at the water budget and flows. If at the end of its review, the Council feels changes are warranted, it could amend its fish and wildlife program. Such changes could require some modifications of the actions in this plan.

In another proposal, there are plans to expand the use of Columbia River water to irrigate farmland in the upper Columbia Basin. Those plans would take both water and power from the system.

Potential new claims on the Columbia are not the only threats to the region's future energy supply. Both the price and availability of natural gas and oil, also used to generate electricity, are influenced by events outside the Northwest. For example, Iraq's invasion of Kuwait in 1990 and the subsequent near-doubling of oil prices jarred the budgets of power producers who depend on that fuel. Historically, the price of natural gas tracks the price of oil. If gas prices climb substantially, this region also would be affected.

In addition, if the Middle Eastern conflict is prolonged, and oil prices stay high, with gas prices following, more people may switch to electricity to heat their homes, adding to the growing demands on the power system.

Other resources also are vulnerable. Concerns about the combustion of carbon-based fuels, particularly coal, oil and gas, and the environmental consequences of emissions from power plants that rely on these fuels, may lead to new regulations that could, in turn, raise costs and lessen the availability of these power sources. Public opinion also may influence reliance on some resources, such as nuclear power plants, and the siting and construction of transmission lines.

Deja Vu?

Is there a familiar ring to this call for new resources, for action now, before the lights dim and go out? This is not 1976, the year the Bonneville Power Administration issued notice that it might not be able to supply additional electricity beginning in 1983.

In the late '60s, utility planners geared their resource decisions to a single-point forecast of future electrical needs. The Northwest was booming—had been for more than a decade. Forecasters looked at the past and figured the future would be about the same. Electrical loads had been growing over 6 percent a year, so planners decided to acquire enough resources to sustain that rate. Convinced of the urgency of their conclusion, and compelled by the need to begin early to construct generating projects that could require 10 to 15 years to complete, they sank fortunes into constructing large power plants.

Most Northwesterners know that this story did not have a happy ending. While our electricity is still among the cheapest in the United States, it is roughly six times more expensive than it was in the early '70s. The Northwest learned a hard lesson.

What is different in this power plan?

- **Range forecast:** This forecast covers a range of possible load growth, extending from a pace that outstrips the rest of the nation to declining use. What's more, the highest growth rate in this forecast is only 2.5 percent.
- **Least costly first:** While there is certainly need for new resources, this plan calls for taking the least costly path. This means making the most efficient use of existing supplies as well as building low-cost new resources.
- **Flexible resources:** This plan seeks to add new resources with short lead times and those that come in small increments.
- **Two-step decisions:** Large power plants (as well as smaller ones) are developed using a two-step decision process: the relatively inexpensive but lengthy process of siting, licensing and designing is carried on first; the decision to build is postponed until it is clear that the power is needed.

Even the federal government, by threatening to require the Bonneville Power Administration to accelerate its repayment of billions of dollars in federal loans, is challenging the stability of this region's supply of affordable electricity.

All of these forces bring tremendous uncertainty to the process of planning for the Northwest's energy future, but one thing is clear: The time to act is now. Of all the options the region faces, inaction would expose the people and the economy of the Northwest to the greatest risk.

Selecting Resources

The past 10 years have not been without conflict in the region's energy community. There were long and heated debates over how to forecast power needs. There was argument over how

The time to act is now. Of all the options the region faces, inaction would expose the Northwest to the greatest risk.

much energy could be saved and at what costs. For the most part, however, those arguments have moved on. The region has reached general agreement on how much of each resource is available. What is needed now is consensus on how to secure the electricity required to meet even moderate economic and energy load growth.

Without new resources, the economic stability of this region will be jeopardized. The region's utilities, its regulatory agencies, its state and local governments, and energy consumers in general must act now to prevent future power shortages. This plan is designed to ensure that judicious actions are taken that will guarantee the region an electricity supply at the least expense to the ratepayers and their environment.

Planning Guidelines

The Council based its planning process on the following criteria:

- Encourage development of the most environmentally responsible and lowest cost resources.
- Give preference to resources that have short lead times and that come in small increments to provide greater flexibility.
- Begin siting, licensing and designing to secure an inventory of resources the region can complete quickly, when the power is needed.
- Confirm the availability and costs of all resources to reduce uncertainties associated with resource selection.
- Expand the diversity of resource choices for the future.
- Promote regional cooperation to remove institutional and other barriers hindering implementation of this plan.

Protecting the Environment

In looking at the three most important considerations this plan must balance—resource cost, risk and the environment—the incorporation of environmental concerns poses the greatest challenges. Different segments of society have divergent environmental values. Environmental impacts can affect future resource costs and increase the risk that the resource may not be available when it is needed.

The Council worked very hard to balance the environmental consequences, costs and risks of resources in designing the least-costly and most risk-free energy strategy. But we could not put a price tag on the loss of a species or on low-probability events that have nearly catastrophic consequences.

On the other hand, some implications of resource development could be controlled by designing actions to prevent the problems. This was the case with the Council's energy-efficient building standards, which require much higher indoor air-quality assurances than any existing building codes. By calling only for the best and cleanest coal technologies, we also hope to reduce the ramifications of turning to that resource.

In addition, we chose to limit our reliance on some technologies, such as even the cleanest coal resources, to keep their environmental impacts to a minimum. We made the same choice with hydropower, by protecting about 44,000 miles of streams from future dam construction, because they contain important fish and wildlife habitat.

Finally, when the resource portfolio was being assembled, we tested the costs and benefits of encouraging the development of more environmentally benign resources. We modeled alternative scenarios in which low-impact resources were moved up in the resource schedule and more questionable ones were dropped to the end of the planning period or eliminated.

From this process, a balance was struck, so that protection of the environment could be aligned with the Northwest's need for cost-effective and reliable sources of electricity. This was accomplished by promoting conservation and renewable resources that could postpone construction of coal and nuclear resources.

Balancing Resources

The term "least-cost" is often misunderstood. It does not refer only to the capital, labor and overhead costs to build a power plant, or the cost to fuel and maintain it over its lifetime.

In least-cost planning, these costs are calculated along with all resource development, operation and decommissioning costs. But these direct costs are balanced against the environmental consequences of using one resource rather than another. These less tangible costs are factored into resource selections along with the value of risk management. For example, certain resources come in smaller increments or take less time to bring online. They may cost more to build or operate than other resources, but their flexibility is a characteristic that makes them particularly well suited to lessening the risk of building too many or too few power plants.

All of this means that the Council must perform an intricate balancing act, weighing the direct costs, the environment and the level of risk. How such balance is achieved is a policy call, and that is an important part of understanding this power plan. (See Figure 4.)

This plan represents far more than numbers fed into and spewed out of a computer. This plan is the product of analysis, judgment and exhaustive public input. Scientific and technical advisers in each resource field participated in lengthy meetings, suggesting the most up-to-date technologies and cost figures to help shape these recommendations.

Delicate Balance

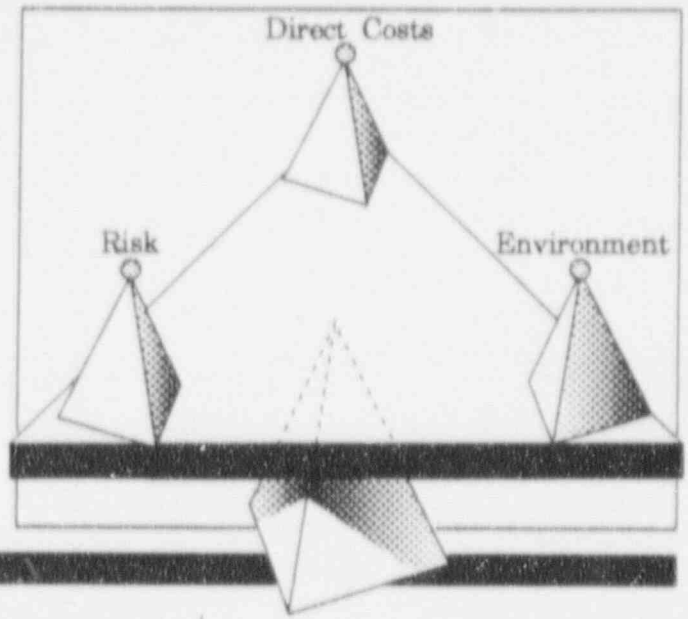


Figure 4
Balancing the Power System

Consumer groups and individuals contributed important perspectives. Over the last two years, the Council has collected an enormous amount of data. It subjected this data, along with assumptions and hypotheses, to the scrutiny of the public in a series of 33 issue papers, released between April 1989 and March 1990.

This plan is the product of analysis, judgment and exhaustive public input.

These papers asked the public for more than confirmation of or additions to the data. These papers asked for opinions on and interpretations of the data, for guidance in direction, for areas that might have been overlooked and, in short, for vision. The Council listened to public testimony and read a three-foot-high stack of comments on these issues. The Council weighed this testimony, along with the technical and economic data, as it made preliminary decisions regarding the best mix of resources and a schedule for bringing them into the system.

This is unquestionably the most diverse set of resources the Council has ever explored. This diversity is deliberate. It is one of the strengths of this plan. The Council looked at every resource that could potentially produce electricity. These included small resources, such as solar collectors used to heat water, and more esoteric technologies, such as power produced by the action of waves in the ocean.

The Council took an especially careful look at renewable resources such as wind, geothermal and solar power. These resources often are proposed as alternatives to more conventional power plants, which ignite public concern because of their environmental consequences. (See Volume II, Chapter 9, for further discussion of the environmental considerations in this plan.)

The list of resources compiled by the Council should not be viewed as a list of resources to buy. These resources (ranked by cost) are expected to be reliable when they are needed. (See Figure 5.) But other technologies may be tested over the coming years, and they may be equally cost-competitive in all the ways the Council judges costs. If better resources are found, they will be brought in to displace some of the current resources.

With these potential resources in mind, the Council turned to the kinds of futures the region can reasonably expect and what can be done to best meet those futures.

A Level Playing Field

The only way to determine if a resource is cost-effective is to compare it to another resource. Is it cheaper or more expensive? This comparison is not as easy as it sounds. For one thing, not all resource costs come in equal increments. Some resources, such as a hydropower dam or conservation, require large capital outlays up front, but low operation costs after that. Other resources that produce electricity, such as gas-fired combustion turbines, are relatively inexpensive to build. But they are expensive to run because of their fuel costs.

To account for these differences, the Council determines the total cost of each resource (including capital, financing, fuel, operation and decommissioning). These costs are spread over the lifetime of the resource and divided into equal annual payments. The result is called the *levelized life-cycle cost*. This allows resources with different cost patterns to be compared on a level playing field.

A dollar by any other name

There are two ways to report costs: in *nominal* and *real* dollars. Nominal dollars are the face value of money at any given time. If you buy something for $100 today and $200 dollars 10 years from now, those costs are in nominal terms.

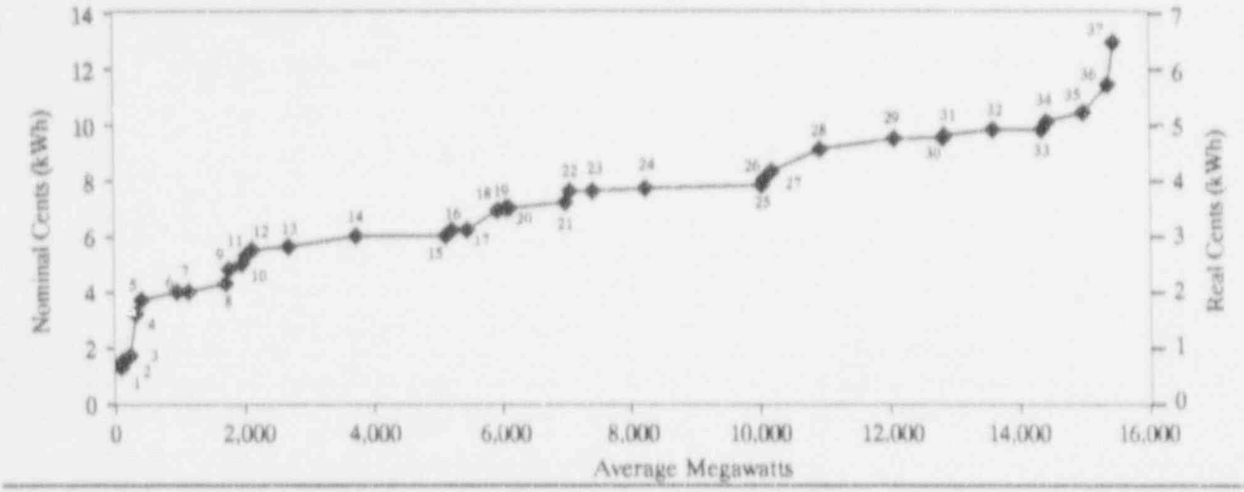
But, if during the intervening 10 years there has been inflation, then the purchasing power of a dollar has changed. It will take more dollars to buy the same things. Real dollars measure purchasing power. To convert nominal dollars to real dollars, you must remove the effects of inflation.

The costs in this plan are reported in nominal levelized life-cycle costs. This approach allows you to compare new resource costs with the current price of electricity. For resources that have primarily capital costs, such as conservation and hydropower, the rule of thumb is that levelized costs in nominal dollars will be approximately twice as much as they would be in real dollars.

For more information, see Volume II, Chapter 13.

Resource Supply

Figure 5
How Much at What Cost?



	Available Resource	High Forecast Megawatts	Levelized Nominal Cost	Resource Category
1.	Conservation Voltage Regulation	100	1.3	Conservation
2.	Freezers	29	1.5	Conservation
3.	Hydro Efficiency Improvements	110	1.7	Conservation
4.	New Manufactured Housing	98	3.2	Conservation
5.	Small Hydro 1	90	3.7	Renewable
6.	Commercial Model Conservation Standards	543	4.0	Conservation
7.	Water Heat	181	4.0	Conservation
8.	Industrial	575	4.3	Conservation
9.	Multifamily Residential Model Conservation Standards	51	4.8	Conservation
10.	Transmission and Distribution Efficiency Improvements	200	5.0	Conservation
11.	Multifamily Residential Weatherization	53	5.3	Conservation
12.	Refrigerators	101	5.5	Conservation
13.	Existing Commercial	558	5.6	Conservation
14.	Hydrofirming (Combined Cycle 1)	1,050	6.0	High Efficiency
15.	Hydrofirming (Combined Cycle 2)	1,400	6.0	High Efficiency
16.	Small Hydro 2	100	6.2	Renewable
17.	Single-Family Residential Model Conservation Standards	226	6.2	Conservation
18.	Cogeneration 1	480	6.9	High Efficiency
19.	Single-Family Residential Weatherization	130	7.0	Conservation
20.	Cogeneration 2	60	7.0	High Efficiency
21.	WNP-3	868	7.2	Thermal
22.	Irrigation	77	7.6	Conservation
23.	Geothermal	350	7.6	Renewable
24.	WNP-1	818	7.7	Thermal
25.	Eastern Montana Coal	1,800	7.8	Thermal
26.	Municipal Solid Waste	30	8.0	Renewable
27.	Small Hydro 3	130	8.3	Renewable
28.	Eastern Washington Coal	750	9.1	Thermal
29.	Cogeneration 3	1,130	9.5	High Efficiency
30.	Eastern Oregon Coal	750	9.5	Thermal
31.	Wind 1	20	9.6	Renewable
32.	Nevada Coal	750	9.8	Thermal
33.	Western Washington/Oregon Coal	750	9.8	Thermal
34.	Small Hydro 4	90	10.1	Renewable
35.	Cogeneration 4	540	10.4	High Efficiency
36.	Wind 2	380	11.4	Renewable
37.	Biomass	90	12.9	Renewable
38.	Solar Thermal	Not Cost-Effective	14.0	Renewable
39.	Ocean Wave Power	Not Cost-Effective	16.0	Renewable
40.	Solar Photovoltaics	Not Cost-Effective	30.0	Renewable

Forecasting the Future

The lesson history teaches is "expect the unexpected," so the Council wastes no time trying to pinpoint future electricity needs. Instead, the Council assumes that the future can play itself out along an infinite number of paths. Some are more likely than others, and these become the "20-year demand forecast."

The actions described in this plan respond to virtually any plausible pace of economic movement. This is essential, because the investments called for over the next 10 years are substantial.

If the region bets wrong and builds too many power plants, as was the case in the 1970s, electricity consumers will be paying a premium for power they can neither use nor sell to recover their investment. If too few resources are acquired or are built too slowly, the region could be forced to buy expensive power from other regions or face curtailments, blackouts and other symptoms of an unreliable power system.

This is why the Council is particularly attracted to resources that can be acquired relatively quickly and in small increments. They are the best hedge against uncertainty.

The Council works with the Bonneville Power Administration to estimate the region's economic growth and the energy it will use in the next two decades. Together, they look at historical trends, study reams of data and use economic computer models to make projections about the future. Because economic growth and the costs of electricity and alternative fuels are the major determinants of energy use, they serve as the basis for the demand forecast.

Forecast Scenarios

The 20-year demand forecast portrays a broad range of growth banded by a low forecast, where the region's need for electricity declines at an average annual rate of -0.6 percent, and by a high annual growth rate of 2.5 percent. The Council looked at hundreds of possible scenarios within this range. Some would have the region grow quickly, then level off. Some portray the opposite pattern. Others indicate several peaks and valleys in growth.

While the Council plans for resources to meet any growth within the overall range, it places more emphasis on loads between the two mid-range levels. These are a medium-high growth rate of 1.6 percent and a medium-low rate of 0.5 percent. (See Figure 6.)

The four load-growth scenarios cover what could happen in the next 20 years, but the most crucial actions are those we take during the first 10 years.

What follows are illustrations of the kinds of events that could happen. It is unlikely that the future will evolve precisely as described in any one of these scenarios, but each is plausible.

1. High Scenario: Economy Booms

The next two decades could be characterized by strong world and national economies. The region has recovered from its recession of the early 1980s and currently is outpacing the rest of the nation's economy. That economic vibrancy could continue.

Consider that the marketing outreach the region has been engaged in pays big dividends, and the Northwest becomes a major Pacific Rim power. Worldwide demand for our lumber supports growth in our wood products industry. The newly democratized, but food-poor, Soviet Union becomes a big purchaser of Northwest wheat.

Our aluminum plants continue operating at full capacity, as world prices for aluminum and efficiency improvements in the region's industry make our plants strong competitors on the world market.

Economic development is booming, and Boeing continues to get big airline and government contracts. The suburban areas of Seattle and Portland emerge as national centers for research and production in the fields of biotechnology, computers and advanced materials.

Loads: Past and Future

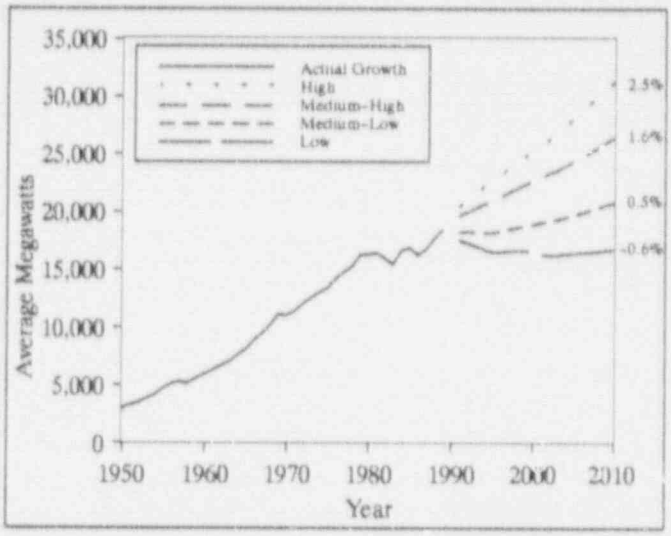


Figure 6
A Wide Range of Energy Futures

International businesses and industries take a new look at the Northwest. The environment is attracting the best-educated and most valuable employees, an asset businesses cannot pass up.

None of this is implausible; the regional economy has grown faster than the current high forecast since 1986. High economic growth would mean that the region's energy needs grow at an annual rate of about 600 megawatts of electricity, the amount Portland now uses. Council and utility response would have to be immediate, with rapid and aggressive deployment of conservation programs. Unless all four states fully implemented model conservation standards for new buildings, the region's ability to keep up with load growth would fall even further behind.

If the region's economy follows the high case, we will need 1,500 megawatts of conservation, 760 megawatts of renewables, 1,760 megawatts of high-efficiency resources,[4] and 2,470 megawatts of thermal resources to meet our need for electricity in the year 2000. (See Figure 7.)

Because of the time it takes to bring all of these resources into production, we will be short about 2,300 megawatts by 1995, and a shortfall would continue until just before the year 2000. This assumes the Columbia River's dams are producing only their most reliable amount of power, called "critical water." In years with better water levels in the Columbia, the deficit would not be as severe.

A poor water year would have serious consequences for power system reliability. The region would have to purchase power from outside the Northwest and likely pay a premium for it. For example, a one-year deficit of

4. High-efficiency resources include electricity cogenerated with steam used in industrial processes and natural gas-fired, combined-cycle combustion turbines that could be used, along with other strategies, to make better use of the hydropower system.

High Scenario

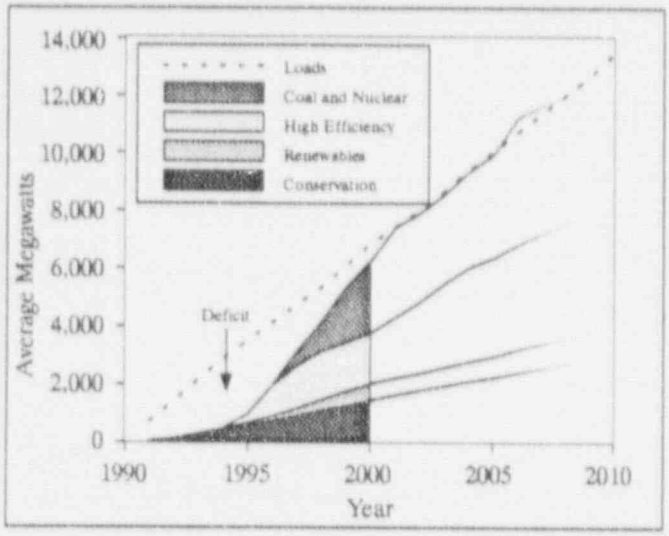


Figure 7
Large Deficits in the 1990s

2,300 megawatts, if made up at 4 cents per kilowatt-hour, would cost the region more than $800 million. If power isn't available from outside the region, because everyone else also is attempting to buy it, power curtailments would be likely. The first to suffer would be the aluminum industry, because part of its power is interruptible. But other consumers also could be cut off.

2. Medium-High Scenario: Growth Moderates

Under this scenario, much of the growth described above takes place, but not at such a frenetic pace. Lumber and plywood production falls from current levels, but by the end of the decade, the industry is again on an upswing.

The economy is still very healthy. Several Northwest cities continue to turn up in the list of most liveable places, drawing people from less attractive regions. The Northwest's physical beauty continues to make the region a mecca for tourists. New convention facilities—with their promise of side trips to mountains, sea and rivers—bring in big-ticket conferences.

Overall, employment is increasing 40 percent faster than the national average, and high-technology and commercial industries also are growing fast. Non-manufacturing employment increases nearly 60 percent.

At this economic pace, electric loads are increasing at a rate of 1.6 percent or about 350 megawatts per year.

This is sufficient growth to mean a power deficit until 1998, with a maximum deficit of more than 800 megawatts in 1995. Efficiency improvements supply 1,350 megawatts in the next decade; renewables contribute 500; high-efficiency resources kick in 1,000 megawatts; and conventional thermal resources provide 1,100 megawatts. (See Figure 8.)

Medium-High Scenario

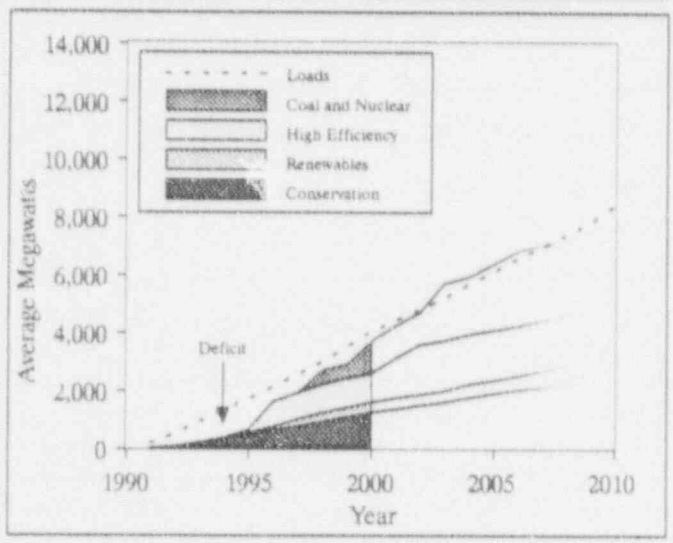


Figure 8
Smaller Deficits in the 1990s

3. Medium-Low Scenario: Economy Slows

In the medium-low growth scenario, the nation and the region experience a recession in the early 1990s. The region recovers slowly, and employment growth falls slightly behind the national rate. Migration into the region drops off. Population growth now is due almost entirely to the resident birth rate, which still exceeds the death rate.

Economies in the nation's "sunbelt" pick up, and industrial investment is drawn away from a lethargic Northwest. Aluminum plants run at two-thirds of their capacity as world prices for the product weaken. Employment in

the lumber and wood products industries drops off by 30 percent.

Even with this slowed economy, the region still needs new resources by the end of the decade. Conservation will take care of the bulk of this need, with 960 megawatts acquired by 2000, and the region develops an additional 300 megawatts of renewables and 60 megawatts of cogeneration during the 1990s. (See Figure 9.)

4. Low Scenario: Recession Deepens

The recession, which has spread across the country, settles deeply in the Northwest, and the region never fully recovers. The Cold War was won, and defense budgets are cut. Boeing's contracts for new planes evaporate. There are massive layoffs in the aerospace industry, with employment dropping by 30 percent. That is still better than the lumber and wood products industry, which sees a 40-percent drop.

The aluminum industry is at a quarter of its operating capacity, and there is serious talk of closing Northwest plants.

Even with a solid service industry, the ripple effects of a sinking economy are strong, and regional unemployment increases. With jobs scarce, the Northwest begins to lose population; people look to the South and East for better opportunities.

In this case, conservation more than accommodates the region's needs through the end of the decade. (See Figure 10.)

Medium-Low Scenario

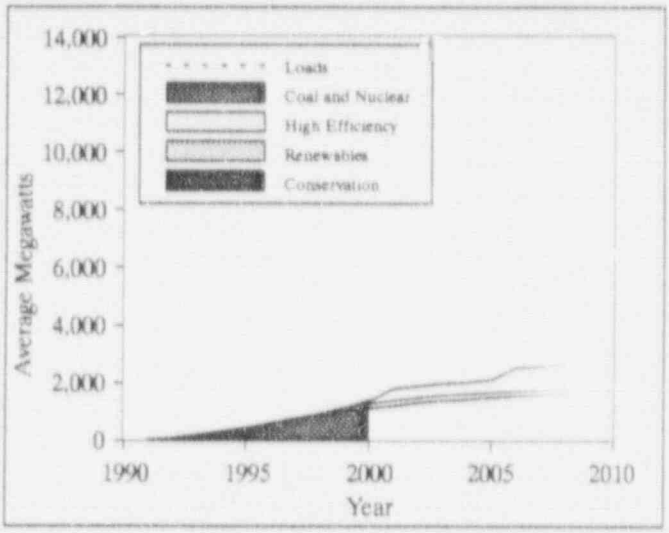


Figure 9 Conservation Meets Most Needs in the 1990s

Resource Scenarios

The challenge for power planners is that they don't get to pick any of these scenarios; any one (or, most likely, some other) could happen. Furthermore, the economic scenarios are only one part of the equation. There are other scenarios as well. In a very real sense, the uncertainties that have the most impact are likely to be the ones we know the least about. By developing and testing a series of alternative *resource* scenarios, the Council was able to identify the most significant resource-related risks the region might face and compile the best resource mix to counteract these risks.

To do this, the Council shifted resources around, testing the power system's sensitivity to changes in any one of them. This was an opportunity to explore more fully the effects on the region of calling on different resources with different lead times, different costs and different envi-

Low Scenario

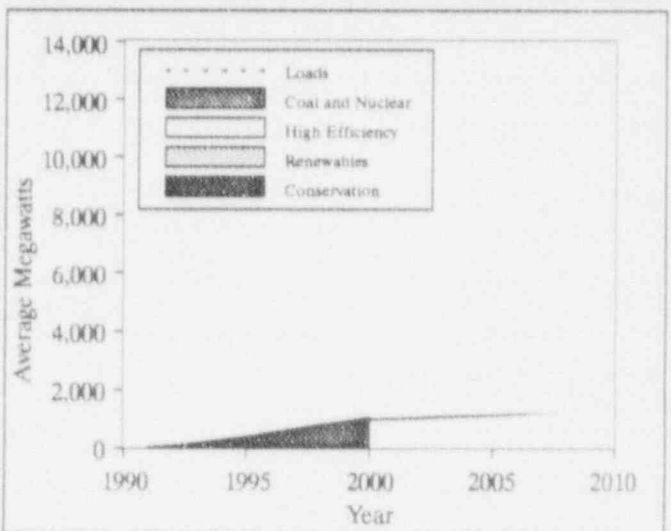


Figure 10 Conservation Meets all Needs

ronmental impacts. It illustrated which parts of the region's resource portfolio are robust or shaky.

Base-Case Portfolio

The amounts and sequences of resources illustrated in Figures 7 through 10 constitute the base-case or least-cost resource portfolio. To develop this resource portfolio, the Council reviewed and evaluated each resource and modified resource planning assumptions to incorporate significant siting or design changes that are likely to affect the resource. For example, the Council frequently incorporated technological improvements that reduce environmental impacts of specific resources.

The resource portfolio also includes judgments of the amount of each resource that is likely to be available. In specific cases, the Council has set its own limits on this amount. This was the case when the Council designated areas of the Northwest to be protected from hydropower development, because they contain important fish and wildlife habitat.

If loads grow above 1 percent per year, the region will experience energy deficits during the mid-1990s. To deal with this, a wide variety of conservation and generating resources will be needed to get the region back in load/resource balance by about the year 2000. For this reason, the region needs to begin the process of identifying sites and obtaining necessary licenses and approvals for resources that could be needed during the 1990s. On the other hand, to avoid overcommitting to these resources and creating another large surplus, the decision to complete them should be delayed until it is clear that they are needed. Only conservation, system efficiency improvements, the lowest cost hydropower and cogeneration facilities should actually be acquired.

We define conservation as the wise and efficient use of energy. It means stretching our kilowatts, making them do more. It does not mean doing with less.

Conservation: It's Our Middle Name

Most of the time we trim our name, but the fact is, we're the Pacific Northwest Electric Power and *Conservation* Planning Council. That's the name Congress selected and for good reason. Energy conservation is the best electrical resource money can buy. We were established to help the Northwest meet its future energy needs at the lowest possible cost to the economy and the environment, and conservation is uniquely suited to that purpose.

We define conservation as the wise and efficient use of energy. It means stretching our kilowatts, making them do more. It does not mean doing with less. It doesn't mean lower thermostats. In fact, in a review of data recorded during the "February freeze" of 1989, we learned that our most efficient homes (ones built to the Council's model conservation standards) saved, on average, 2 kilowatts of capacity per home daily, even though these houses were larger than average, and their indoor temperatures were kept higher than conventional homes that used more energy. At the same time, our efficient homes cut the region's demand for power by nearly 200 megawatts, saving an estimated $7 million in seven weeks.

This region is convinced! Every Northwest utility is promoting efficiency through marketing programs and incentives. They've already saved more than 350 megawatts at a cost less than half that of power from a new coal plant. State energy office programs brought us another 200 megawatts.

New energy-efficient building codes and appliance standards already adopted by federal, state and local governments will save the region up to 800 average megawatts over the next 20 years. This figure is in addition to the 1,350 average megawatts called for over the next 10 years. In addition, if the region experiences high-load growth over the next 20 years, this plan includes 3,200 average megawatts of conservation. Finally, we've identified about 1,400 average megawatts of promising conservation resources, a potential that confirmation activities called for in this plan may help us realize.

Alternative Portfolios

The possible ramifications of alternatives to the base-case portfolio also were analyzed, discussed and debated. Instead of attempting to predict the likelihood of these alternatives, the Council focused primarily on plausible conditions under which our energy future could be altered significantly. Such studies might be called "what if" studies. What if an existing thermal plant is shut down? What if the region achieves only 60 percent of its conservation potential, about a third less than the Council assumed? What if nuclear and coal plants are not available? What if there is a carbon tax on coal? What if confirmation efforts indicate another 1,000 megawatts of geothermal power is readily available? These are just a few of the alternatives the Council looked at.

For example, the Council considered scenarios that would delay construction of coal and nuclear plants. In these scenarios, the region would accelerate cogeneration, gas-fired combustion turbines and renewable resources. These scenarios delayed construction of coal and nuclear plants in the next 10 years, but added $100 million to $500 million to the Council's base-case strategy.

Such heavy reliance on natural gas for electricity generation could deliver 4,200 megawatts, but it leaves the region vulnerable to price increases and fuel shortages. If gas and oil prices increase to the highest forecasted rate, the additional costs incurred would be about $1.6 billion.

This potential price increase for natural gas led the Council to test an alternative scenario in which price or availability put that resource out of reach. Under this scenario, conservation and high-efficiency resources would still receive highest priority, as they do in all scenarios, but they would not be adequate on their own. The region would need to accelerate its assessment of the viability of coal and nuclear resources. The price tag for moving purchases of these resources up would be $460 million.

If the region fails to add resources in the next 10 years, there is enough electricity in only 17 percent of the estimated futures. In 83 percent of the possible futures, the region will be deficit. In 44 percent of the cases, the region's deficit is greater than 2,000 megawatts. (See Figure 11.)

The chart on pages 18 and 19 shows the more important of the alternative future scenarios the Council tested. Each scenario modified certain key attributes of the base-case resource portfolio. The Council then examined the impacts the scenario would have on the regional cost and the risk of that resource package.

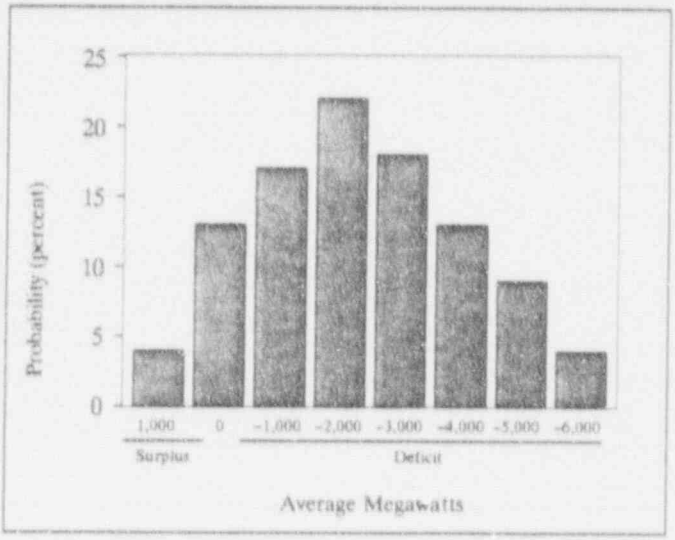
All of these studies were done assuming that Bonneville and the investor-owned utilities pursue independent resource development activities. Each undertakes only those actions that are cost-effective and needed to meet the needs of its customers. To simplify this process, we have combined these independent actions to form a regional composite picture. Similar actions are called for by both Bonneville and all utilities during the next several years. (For a more complete discussion of this process, see Volume II, Chapter 10.)

Conclusions from Forecast and Resource Scenarios

These scenarios reiterated several constant themes. First, it was evident that the best and most effective resource action to deal with uncertainty and risk was the successful acquisition of cost-effective conservation and efficiency improvements. In almost all scenarios, the resource that helps

No-Action Scenario

Figure 11
Without Action, Large Deficits Are Likely in the Year 2000



buy the region time to adapt to uncertainties is conservation.

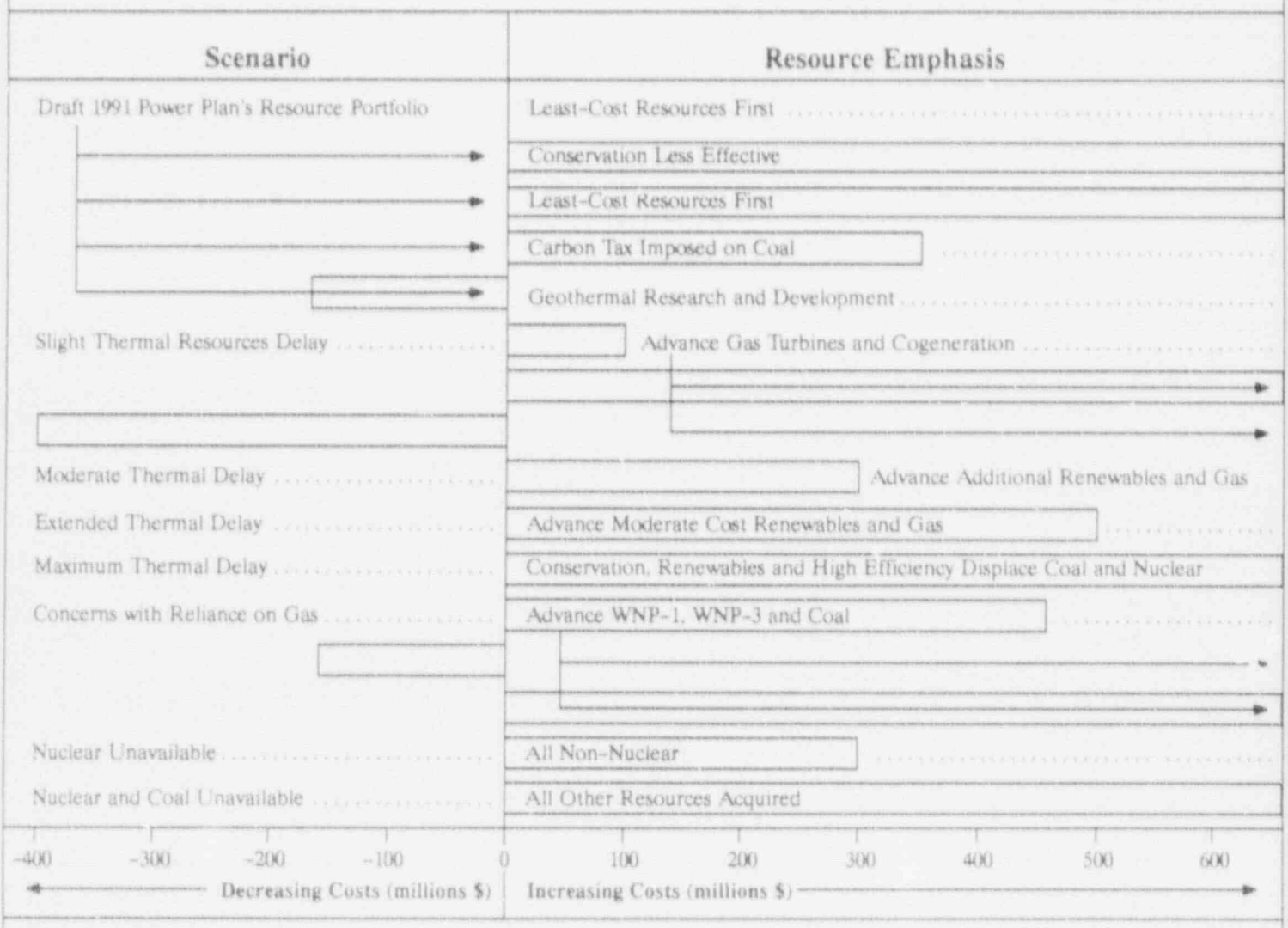
For this reason, conservation plays a central role in the Council's Action Plan. Conservation programs need to be implemented quickly and brought up to a stable level of activity, so that the region can develop an infrastructure for delivering conservation. Labor, technology, materials and expertise must be acquired to secure the region's conservation resources. A major conservation acquisition program will require a stable long-term commitment of both staff and budgets.

With this in mind, the Council looked at the benefits of various conservation targets for the 1990s. The question was, what level of conservation acquisition would balance the greatest benefits and least risk to the region's power system? Should the region acquire enough conservation to meet the highest forecast rate of electrical load growth, the lowest or somewhere in the middle?

Five alternative conservation acquisition targets were tested for the year 2000. These target levels correspond to the amount of conservation acquired in each of the load scenarios, ranging from low to high. Figure 12 shows the cost of acquiring different amounts of conservation, as well as the amount of risk (or variability) the region experiences with each target level.

The Council chose the medium-high conservation target level, because it increased costs only slightly more than a medium target while at the same time substantially reducing future risk.

Alternative Resource Portfolios



Acquiring enough energy savings to meet medium-high load growth helps reduce risk for two reasons.

First, all available conservation is needed in most future load scenarios, and it takes time to achieve the full cost-effective potential. By starting an aggressive effort now, the region is more likely to be able to acquire all of this low-cost conservation.

Second, in those scenarios where little or no new resources are needed, the conservation acquired is relatively low in cost. This creates a low-cost surplus that can be sold outside the region to recoup some of our investment.

Many of the resource scenarios illustrated the need for an inventory of resources that can be brought into operation without long delays. Among the best resources for responding to quick economic or other turnarounds are gas-fired technologies. Obviously, the acquisition of significant amounts of gas-fired technologies poses a larger and larger risk, due to future uncertainty surrounding gas availability and prices. Nevertheless, the Council recommends that the region begin the process of identifying sites and obtaining the necessary licenses and approvals for gas-fired resources that either operate in a cogeneration mode or as stand-alone plants to back up the region's existing hydropower system.

In a number of the scenarios, significant amounts of new or existing resources were assumed to be unavailable. In these events, the primary resources that the Council and the region can turn to are newer, emerging technologies with which we have less

and Sensitivities

Uncertainty	Results	Costs (millions $)
13,000-Megawatt Load Range in 2010	Acquire Conservation, Hydropower and Cogeneration	Base Case (0)
Achieve 70 Percent of Plan's Conservation	Acquire More Generation	1,560
Lose 700 Megawatts of Existing Resources	Accelerate all Resource Development	1,580
25-Percent Increase in Fuel Cost	Increases Costs when Coal is Acquired	350
1,000 Megawatts More Geothermal	Geothermal Displaces Thermal	-163
Thermal Lead Times Longer	Shorter Lead Time Resources Acquired	100
► Gas Prices Increase Rapidly	Heavy Reliance on Gas Risky	1,660
► Gas Prices Stay Low	Reliance on Gas Low Cost	-400
Medium Gas Prices	Higher Cost Renewables Acquired	300
Medium Gas Prices	Additional Higher Cost Renewables and Gas Acquired	500
Coal and Nuclear Delayed as Long as Possible	Significant Cost Increase	1,800
Medium Gas Prices	Cogeneration and Combustion Turbines Delayed	460
► Gas Prices Increase Rapidly	Region not Reliant on Gas	-160
► Gas Prices Stay Low	Nuclear and Coal Cost More than Gas	900
Significant Barriers to WNP-1 and WNP-3	Coal Resources Replace WNP-1 and WNP-3	300
6,600-Megawatt Resource Loss	Significant Energy Shortages	4,900

700 800 900 1,000 1,100 1,200 1,300 1,400 1,500 1,600 1,700

Increasing Costs (millions $) →

experience. For this reason, the Council has selected resource confirmation activities to improve our understanding of and our ability to predict the cost and availability of geothermal, wind, solar and other resources.

Also, new conservation technologies are being introduced each year. It is important to promote this development, so the region can rapidly assimilate new conservation measures as they become commercially available and cost-effective.

Finally, in looking at all the scenarios, it was apparent that some resource mixes may appear cheaper on the surface, but they also are more risky. The region is presented with a classic trade-off. It can reduce risk substantially, but it also will pay somewhat higher costs for that security. In any event, the scenario with both the highest cost and the highest risk appears to be the no-action alternative.

In any event, the scenario with both the highest cost and the highest risk appears to be the no-action alternative.

Our findings in this planning process led directly to the actions described in the Action Plan. These actions are designed to secure the resources that are needed by the region at the lowest possible cost. Additional actions are identified to help us shorten lead times and better manage the risks and uncertainties that the region faces.

Finally, a number of activities are designed to determine the availability and costs of resources that may be needed in the future. These research, development and demonstration activities will help the region respond to future energy needs with a diverse and environmentally responsible resource portfolio.

Conservation Target Risk Analysis

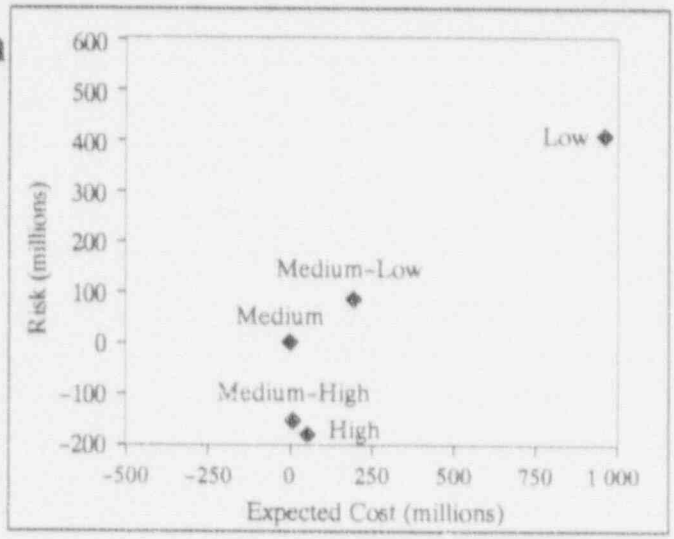


Figure 12
Trade-offs of Building to a Medium-High Load-Growth Level

Action Plan

Action now is imperative, and, as already explained, the Council sees four broad objectives for actions.

The first objective is simple: start now to buy up all the low-cost resources available, because they all take time to develop and it is likely they will be needed within the coming decade.

The second objective is to shorten the time it takes to acquire and fully develop a resource to the point that it is producing electricity. This shortened lead time improves the region's ability to respond quickly to growth or to changing patterns of energy use.

The third objective is to promote diversity in future plans by confirming the cost and availability of additional resources. The resource portfolio described in this plan is not meant to limit the pursuit of new technologies or less expensive alternative resources. We need to get reliable information about these resources so that, if needed, they will be there.

This plan's fourth objective focuses on regulatory, legislative and environmental actions that provide incentives for and remove barriers to the successful implementation of this plan. The Council will work with regulatory, legislative and environmental bodies to improve public policies and laws that can facilitate the actions called for in this plan.

This plan includes a number of actions for Bonneville and the region's utilities. The Council recognizes that each utility faces different problems and opportunities. Utilities serving rapidly growing areas have a major challenge in meeting electricity demand. In this plan, the Council assumes that Bonneville meets the need of its current customers—public power and the direct service industries. At the same time, the Council assumes that investor-owned utilities develop resources independently to meet the needs of their customers. (See Volume II, Chapter 10, for more detail.) Aggressive action is needed by all utilities, but especially investor-owned utilities. Cooperation among utilities is especially important to implement this plan.

Let's look at each of these objectives and the actions they'll require. (A detailed list of recommended activities to implement this power plan is in Volume II, Chapter 1.)

Objective 1: Acquire all Low-Cost Resources

The region's electricity system is currently in load/resource balance. That is, the supply of electricity is equal to the demand for it. Eighty-three percent of the forecast scenarios indicate additional growth in electricity demand by the year 2000. Therefore, the need for additional resources is highly probable during the coming decade, and with strong growth, that need is urgent. Under these conditions, immediate acquisition of particularly low-cost resources makes sense.

The low-cost resources called for in this plan include efficiency improvements in the generation, transmission, distribution and end use of electricity. Energy conservation in all sectors—residential, commercial, industrial and agricultural—falls into this category. It also includes low-cost hydroelectric and cogeneration resources that are cost-effective and needed during the next 10 years under most future scenarios. The *average cost* of these resources is less than the regional avoided cost[5] of about 7 cents per kilowatt-hour.

While the current regional avoided cost is useful as a guide for acquiring generating resources, it is *not* the recommended cost-effectiveness limit for all conservation measures. The Council is recommending that conservation programs should include all energy-saving measures that are expected to cost up to 10 cents per kilowatt-hour. This is partly because conservation as a resource has several advantages: energy savings have fewer environmental impacts than generating resources; they reduce the need for the high-cost generating resources included in this plan; and they closely track growth and decline in energy use.

5. Avoided cost is an investment guideline to use when choosing resources. It is the cost of alternatives that are avoided if you purchase the resource you are reviewing.

The Power System

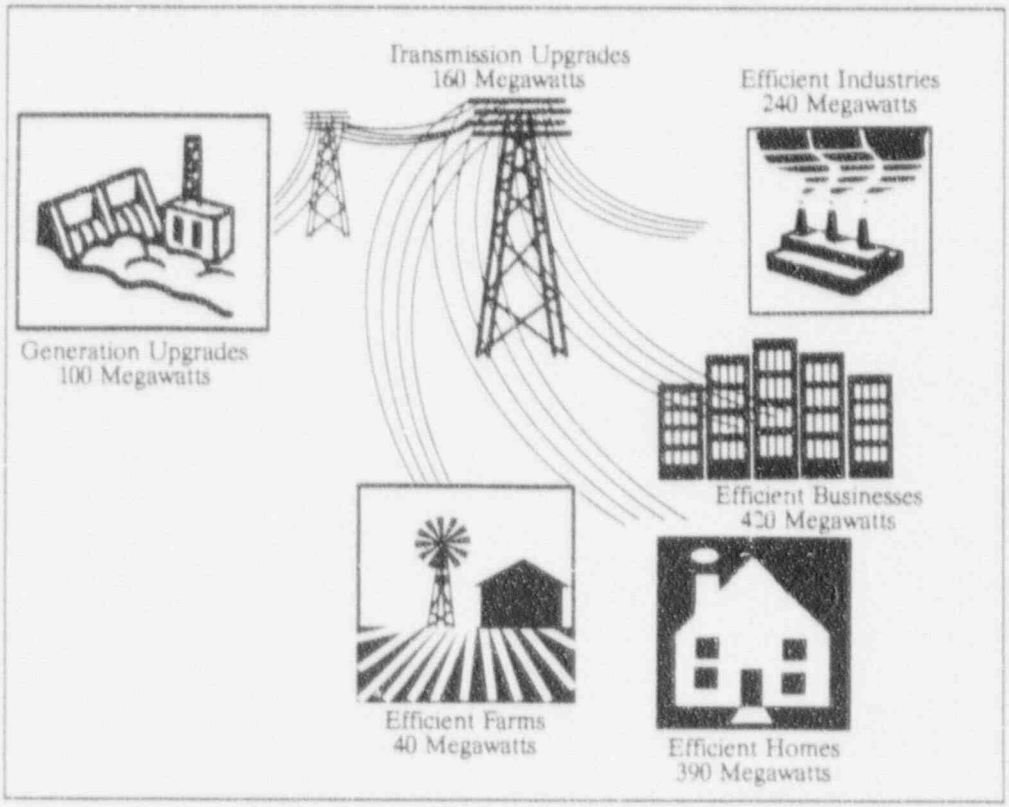


Figure 13
Acquire at Least 1,350 Megawatts of Conservation and Efficiency Improvements by the Year 2000

But energy savings also present a problem that is addressed by including measures up to the 10-cent limit. If the 10-cent measures are postponed, the added expense of returning to the site, coupled with technical and physical barriers to the installation of new measures in existing structures, greatly reduce the cost-effectiveness. Furthermore, the optimum energy-saving package at any given site or in any given conservation program includes lower-cost measures that, when combined with the 10-cent measures, result in average costs that are less than the 7-cent avoided cost.

Efficiency Improvements

The Council calls for *immediate* activities to begin acquisition of all regionally cost-effective efficiency improvements. The Council has identified 1,350 average megawatts of efficiency gains to meet regional load growth over the next decade. This is enough energy to meet the needs of two cities the size of Portland and is consistent with the target of acquiring enough conservation to meet medium-high load growth. (See Figure 13.)

No opportunity for energy conservation should be missed. The successful completion of this action item will mean contacting nearly every residence, commercial enterprise and industrial facility in the Northwest. Acquiring the efficiency improvements identified under this objective will require capital expenditures by utilities and customers of $5 billion to $6 billion in the next 10 years. (See Figure 14.) The annual investment in conservation by investor-owned utilities declines in 1998, because the residential weatherization program is completed. This reduction in investment level may not occur if other conservation programs are brought up to speed faster or additional cost-effective conservation measures are identified.

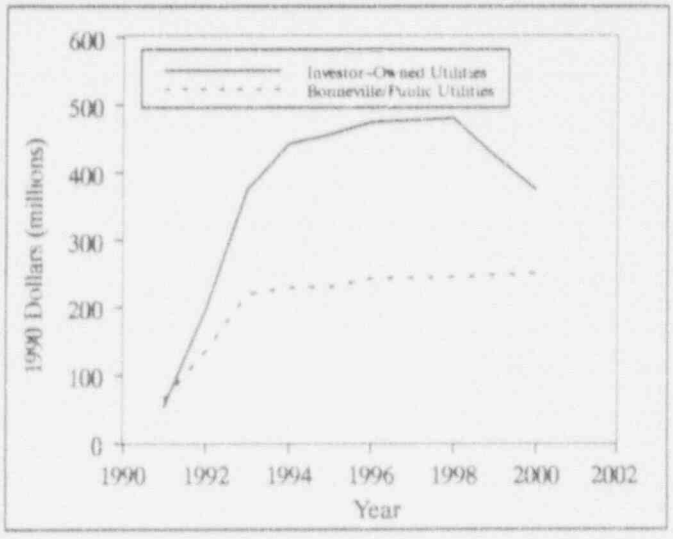
No opportunity for energy conservation should be missed. This will mean contacting nearly every residence, commercial enterprise and industrial facility in the Northwest.

While we are targeting 1,090 megawatts of end-use efficiency improvements (and 260 megawatts of system upgrades), the actual amount of efficiency improvements could be higher, depending on how well acquisition mechanisms work, how quickly the infrastructure is developed to support this level of acquisition and the rate of development of new conservation measures. The 1,350-megawatt figure is not to be interpreted as a cap. It is instead, a planning target. As additional low-cost efficiency improvements present themselves, they should be acquired. Acquisition budgets need to be kept flexible enough to acquire all additional cost-effective conservation resources.

The first objective, like all significant resource decisions, does not come without risk. If electri-

Efficiency Spending

Figure 14
Expenditures by Consumers and Utilities Will Total $5 Billion to $6 Billion



cal loads suddenly drop off, the resource commitments started in this action item could lead to a moderate energy surplus. However, conservation needs a substantial long-term commitment to allow for programs and other acquisition mechanisms to be designed, implemented, evaluated and modified. For this reason, the Council's highest priority is a stable, yet aggressive, conservation effort during the 1990s. There is little risk of "overbuilding" conservation, because significant energy savings are needed in all of the most likely growth scenarios. With slower growth, conservation savings from new buildings and equipment are automatically reduced, because fewer homes and businesses would be built.

Acquiring these end-use efficiency resources will require a variety of approaches, including utility conservation programs and innovative marketing. Bonneville and the utilities should encourage creative market-based approaches for acquiring cost-effective conservation measures, whether these are developed by utility or non-utility providers. At the same time, utilities need to continue their traditional conservation programs.

The 1,350-megawatts of conservation are not to be interpreted as a cap. Instead, they are a planning target.

In addition to improving efficiency in the end use of electricity, this plan calls for acquiring all cost-effective efficiency improvements in existing generating facilities, as well as in the transmission and distribution of electricity. Most generating plants can be modified to get more energy for a given amount of fuel burned or water passed through the turbines. Transmission and distribution systems also can be modified to reduce energy losses. These actions are expected to provide about 260 megawatts during the next decade.

Generating Resources

If loads grow faster than the medium-low forecast rate, efficiency improvements cannot provide all the energy needed in the next decade. To meet this challenge, the plan calls for the development of the least expensive and most environmentally sound hydropower and cogeneration facilities.

Acquisition of hydropower and cogeneration resources should incorporate provisions for beginning the siting, licensing and design phases of development, while deferring construction until it is clear the energy is needed.

Hydropower

The Council recommends that Bonneville and the region's utilities begin the process of acquiring hydropower by siting, licensing and designing facilities at the most cost-effective sites in the Northwest. The Council estimates this would yield about 150 megawatts by 2000. These new

Acquire These Resources

Resources	Megawatts
Conservation Resources:	
New Residential	110
New Commercial	170
Appliances	90
Manufactured Housing	40
Industrial	240
Existing Commercial	250
Existing Residential	150
Irrigation	40
System Efficiency Improvements	260
Total Conservation Megawatts	**1,350**
Generating Resources:	
Low-Cost Hydropower	150
Low-Cost Cogeneration	300
Total Generating Megawatts	**450**
Total Acquisition Megawatts	**1,800**

hydropower projects must comply with the protected area requirements of the Council's Columbia River Basin Fish and Wildlife Program and with the Council's hydropower acquisition criteria (see Volume II, Chapter 11).

Cogeneration

The Council recommends that Bonneville and the region's utilities also begin the process of acquiring the most cost-effective and environmentally sound cogeneration resources in the region. Studies conducted by Bonneville, the utilities and the Council indicate that approximately 300 megawatts of these resources will be needed during the next 10 years. Because of their significant potential and apparent acceptability to the public, cogeneration resources could be a very important component of future electric power generation.

Cogeneration projects that match their electricity output with industrial heat requirements will minimize the additional combustion of natural gas or biomass and thus have minimum impacts on the environment.

This action must address the institutional, environmental and power system integration problems that will undoubtedly occur as significant amounts of cogeneration are acquired.

Resources from Outside the Region

The Council is aware that significant amounts of energy may be available from utility systems surrounding the Pacific Northwest, but it is very difficult to predict the cost and availability of this resource. Nonetheless, the Council recommends that Bonneville and this region's utilities negotiate with utilities outside the region to acquire additional resources that are cost-competitive and compatible with the Council's resource portfolio.

In particular, it appears there are significant opportunities for interregional power exchanges. These exchanges have the potential of providing energy to the Northwest during the times of year when this region needs it most and capacity to the Southwest when it is most valuable to that region. Possible changes in the operation of the Northwest's hydropower system as a result of needs for fish flows or the system operation review will likely create more opportunities for advantageous exchanges.

To the extent these seasonal exchanges can be negotiated, additional firm (guaranteed) energy could be available to the Pacific Northwest without the construction of new generating resources. No specific amounts of this resource have been included in the resource portfolio, but they will be added as contracts are signed. Access to transmission will be key to facilitating these exchanges.

On-Site Renewables

The Council looked at a number of on-site applications of renewable energy that can effectively displace electric loads. These applications, such as solar photovoltaics and solar and geothermal water heating, can be cost-effective in particular locations. The Council recommends that Bonneville and the utilities acquire the cost-effective direct applications of renewable energy that are available in the region. Because of their site-specific nature, the difficulty in predicting the availability of these renewable resources, and the fact that they are not likely to be available in large amounts, the Council has not included specific amounts of this resource in its power plan. Instead, as on-site renewables are acquired, the Council will incorporate their impact in future electric load forecasts.

Acquisition Principles

All of the acquisition efforts called for in this Action Plan should comply with the Council's acquisition principles (see Volume II, Chapter 11). These principles are designed to ensure the cost-effectiveness of resources, and the incorporation of important environmental criteria and risk management strategies in the acquisition process.

This plan recognizes the unique aspects of acquiring any resource. Many factors influence the integration of a resource with each utility's system. Not all of these factors are incorporated in the general regional cost-effectiveness limits calculated in this plan and described in detail in Volume II, Chapter 14. Some of the more important factors that are difficult to integrate include environmental concerns, siting issues, system interconnection and

future uncertainties in costs of fuel, operations, maintenance and repairs. The Council will work with utilities, developers and regulators to ensure that non-cost factors are appropriately incorporated into the resource acquisitions.

Objective 2: Reduce Resource Lead Times

Reducing the time it takes from a decision to build a resource until it begins producing electricity is critical to reducing investment risk. Some resources may take 10 or more years to go from concept to delivered energy. Such resources force planners to make major investments now, hoping the resource will be needed 10 years from now. But economic changes, new regulations and emerging technologies are only a few of the factors that can alter the need for a particular resource. The more we can shorten lead times, the greater chance we have of accurately matching demand with supply. Underbuilding resources has an obvious economic impact, in that an inadequate power supply can curtail economic development. But overbuilding resources also has serious economic repercussions.

A diverse inventory of resources with short lead times gives the Northwest a key advantage: flexibility. It enables us to react quickly to changes in demand for power and thus secure a reliable *and* low-cost system. The Council has found that the siting, licensing and design activities can take half the time needed to develop a resource, but cost a small fraction of the total project cost. (See Figure 15.)

The key to reducing lead times is to introduce multiple decision points in the resource development process, so that energy needs can be periodically reassessed before committing large amounts of money to the next step in development. This concept is what is called the "options process" in Volume II and in previous plans. While this concept has the potential to reduce risk and save ratepayers money, changes in siting and ratemaking regulations will be needed to allow multiple decision points.

This objective calls for actions to reduce lead times for three resources: cogeneration, hydropower and resources such as combustion turbines, which would be used to firm up nonfirm hydropower.[6] In preparation for the possibility of rapid load growth during the 1990s, this plan recommends siting, licensing and design of the most cost-effective of these resources during the next five years. These resources generally should have costs of less than 10 cents per kilowatt-hour. They will represent substantial investments if actually completed, but the preparation needed to confirm these resources in the next five years will be relatively inexpensive. The plan does not call for construction until it is clear that these resources are needed.

Hydropower

The Council recommends that Bonneville and the utilities begin the process of siting, licensing and designing hydropower projects that are somewhat more expensive than those called for in Objective 1. These projects also must comply with protected area

Resource Cost and Timing

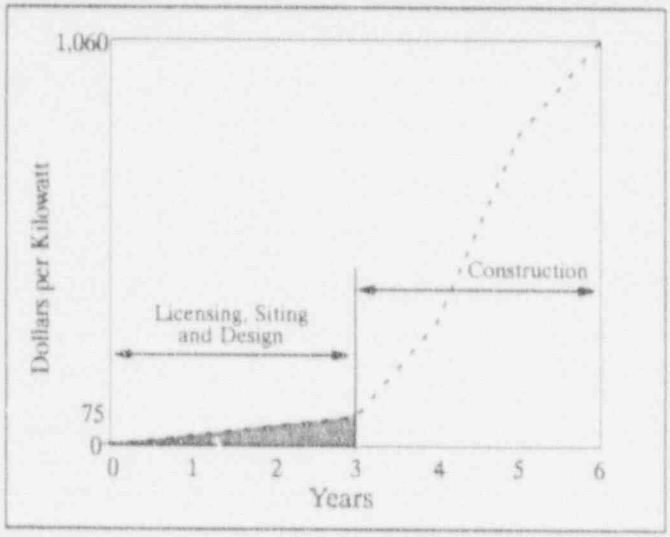


Figure 15
Cost and Timing of Resource Pre-Construction and Construction (Hydropower)

6. Hydroelectric resources are divided into "firm" and "nonfirm" categories. Firm power can be guaranteed and sold at a premium, because it is the amount of electricity the dams can provide under even the worst recorded water conditions. Nonfirm power is what is available in any year that has additional water. If nonfirm power could be backed up by other resources, such as combustion turbines, it could be counted on to serve guaranteed loads.

Shorten Lead Times for These Resources

Hydropower	200 average megawatts
Cogeneration	500 average megawatts
Hydrofirming	1,000 average megawatts
Total	**1,700 average megawatts**

requirements. The energy from these projects may not be needed during the next 10 years; however, if loads do grow rapidly, these projects not only will be cost-effective, but necessary. If load growth does not occur at a rapid pace, these projects can be held for up to four years under current Federal Energy Regulatory Commission regulations.

Cogeneration

Estimates suggest that between 700 and 3,700 megawatts of cost-effective cogeneration opportunities exist in the Northwest.

While cogeneration facilities typically have relatively short lead times, their installation is often tied to industrial plant expansions rather than utility resource acquisition schedules. If, when an industry plans to add or replace a steam boiler, it could negotiate an agreement that would speed development of cogeneration, the lead time for acquisition could be reduced. For this reason, the Council recommends that Bonneville and the utilities secure the necessary approvals and contracts that would enable them to install quickly an additional 500 megawatts of cogeneration equipment in regional industrial facilities, as need and opportunities arise.

Research indicates that cogeneration development is very sensitive to utilities' avoided costs. If loads grow quickly, avoided costs are likely to increase significantly. This will facilitate the rapid development of the cogeneration resource. On the downside, if the economy stagnates, and there is little or no load growth, avoided costs will remain low, and there will be much less cogeneration development. Gaining a better sense of how much cost-effective cogeneration potential is available in this region, and taking steps to reduce the time it takes to construct these facilities, will significantly improve the flexibility of the region's power system.

Hydrofirming

Bonneville and the region's utilities should investigate alternative methods for cost-effectively backing up as much as 1,000 megawatts of the region's nonfirm hydropower. Hydrofirming strategies will become even more important if flows are increased for fish, because such flows would draw on water generally stored until it is needed to generate firm power later in the year.

If back-up strategies can be developed, a portion of the nonfirm hydropower currently produced in this region can be used to meet firm loads. Interregional energy transactions, increased interruptible loads within the region and gas-fired combustion turbine power plants are prime candidates. Other strategies for making better use of the existing hydropower system also should be identified.

For strategies that require specific sites and licenses, the Council recommends that Bonneville and the utilities acquire the necessary sites and licenses and conduct the design process so these facilities can be constructed quickly when needed.

Objective 3: Determine Cost and Availability of Resources

In addition to resources included in the Council's portfolio, there is a category of resources considered "promising," but because of uncertainties not yet ready for development. These promising resources could reduce the cost and environmental impacts of the portfolio. The region should confirm these resources through research, development and demonstration programs. (See Figure 16.)

Promising resources include additional amounts of conservation, biomass, geothermal, wind and solar resources.

Other resources in the portfolio may be technically viable, but have uncertainties that need further resolution. These include conservation voltage regulation, Washington Public Power Supply System nuclear projects 1 and 3 (WNP-1 and WNP-3) and state-of-the-art coal plants.

Confirm New Resources

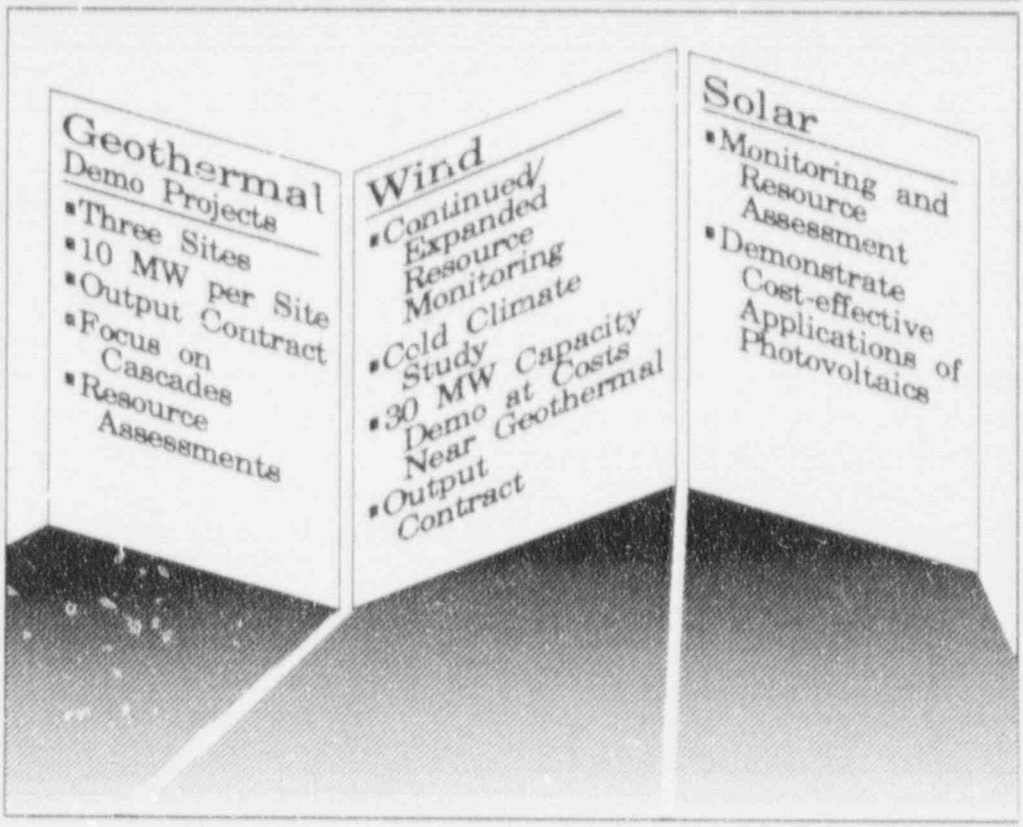


Figure 16
Strategy to Promote Renewables

The Council recommends that Bonneville and the utilities initiate the following actions to determine the cost and availability of resources that could play a significant role in future plans. Research, development and demonstration projects should help expand resource diversity. Since the entire region will benefit from these activities, they should be sponsored jointly by Bonneville and the utilities.

Conservation

New conservation technologies appear constantly. This plan calls for activities to monitor their development and, where appropriate, to undertake research, development and demonstration of the most promising new technologies not currently in the resource portfolio. If successful, these activities could speed up the introduction of 1,100 megawatts of potentially cost-effective conservation. The Council will convene a Conservation Research, Development and Demonstration Advisory Committee to identify and recommend an agenda for confirming these resources. The region should explore joint research with California and the U.S. Department of Energy.

Biomass

There is great uncertainty regarding the amount of power that could be produced using biomass residues and municipal solid waste, but abundant combustible residues are available for power production in the Northwest. This plan calls for the Council's Research, Development and Demonstration Advisory Committee to identify and recommend an agenda for confirming these resources.

Geothermal

The geothermal resources of the Northwest may offer the potential for producing several thousand megawatts of cost-effective energy. While geothermal energy has been proven in other areas of the country, geothermal energy from the type of fields found in the Cascades has not been proven. Moreover, possible environmental and other constraints on the development of this resource are poorly understood.

This plan recommends implementation of a geothermal research, development and demonstration agenda including 1) monitoring of geothermal technology and development activities

occurring outside the Northwest; 2) collecting environmental baseline data at promising geothermal resource areas; 3) identifying and preparing plans for resolving constraints to geothermal development at promising resource areas; and 4) confirming the feasibility of generating electricity from Northwest geothermal resources through development of a series of pilot projects.

The key uncertainty is whether the geothermal resources of the Cascades can support electric power generation. For this reason, the Council recommends that Bonneville and the utilities acquire at least 10 megawatts of geothermal energy from each of three separate fields ultimately capable of producing at least 100 average megawatts each. These acquisitions should be secured through output contracts, where the developer bears the risk of development in return for guaranteed sales at a price higher than current avoided costs. The objective of these efforts is to confirm a larger resource. If successful, these demonstration projects also would result in shortening the lead time of 300 megawatts of geothermal power currently in the plan and potentially confirm a much larger resource.

Wind

The wind resources of the Northwest also may offer the potential for producing several thousand megawatts of cost-effective energy. However, the size and quality of promising resource areas are not fully understood, and there is great uncertainty regarding system integration requirements and other constraints to the development of this resource. The Northwest needs to test the reliability of wind turbine generators in the colder areas and gain operating experience with commercial-scale pr cts.

This plan recommends implementation of a wind research, development and demonstration agenda including 1) monitoring of wind technology and development activities occurring outside the Northwest; 2) collecting additional information regarding quantity and quality o. wind resources at the better wind resource areas; 3) identifying and preparing plans for resolving constraints to wind development at promising resource areas; 4) developing cold-climate wind turbine studies in the field; and 5) developing a commercial-scale wind demonstration project.

Bonneville and the utilities should secure a commercial scale wind demonstration project. A price premium should be offered for projects that provide additional information about areas with significant resource potential and challenging operating conditions. This action, if successful, will confirm that wind power can be incorporated into the region's power system as a reliable and cost-effective source of power.

Promising Resources

Several thousand megawatts of promising conservation and renewable resources have been identified by the Council. These resources are not included in the resource portfolio of this plan because of uncertainties regarding their cost or availability. However, the Council has included actions in this plan to confirm their cost and availability. If these resources are confirmed and are cost-effective, they will be included in future power plans.

Conservation Resources:

Residential Space-Heating Measures	260 average megawatts
Residential Water-Heating Measures	100 to 130 average megawatts
Residential Lighting	115 average megawatts
Residential Appliances	290 average megawatts
Commercial Conservation Measures	150 average megawatts
Industrial Conservation Measures	450 average megawatts
Transmission and Distribution Loss Reduction[a]	

Renewable Resources:

Hydropower Efficiency Improvements	150 average megawatts
Geothermal	1,000+ average megawatts
Wind	1,000+ average megawatts

Other Resources:

Thermal Plant Efficiency Improvements	about 100 average megawatts

[a] Additional savings, presently unquantified, from distribution feeder voltage upgrade and improved substation transformer efficiency.

Solar

The costs of solar electric generation technology continue to decline, and solar eventually may provide a significant contribution to the Northwest's electrical supply. This plan recommends implementation of a solar research, development and demonstration agenda including 1) monitoring of solar technology and development activities occurring outside the Northwest; 2) expanded collection of regional solar insolation data; and 3) identification and acquisition of cost-effective applications of solar photovoltaics.

Conservation Voltage Regulation

The effectiveness of improved control of distribution system voltage in reducing end-use loads is not fully understood for the types of distribution feeders and loads found in the Northwest. An effort should be made to document feeder performance and load savings through planned conservation voltage regulation programs at several regional utilities.

WNP-1 and WNP-3

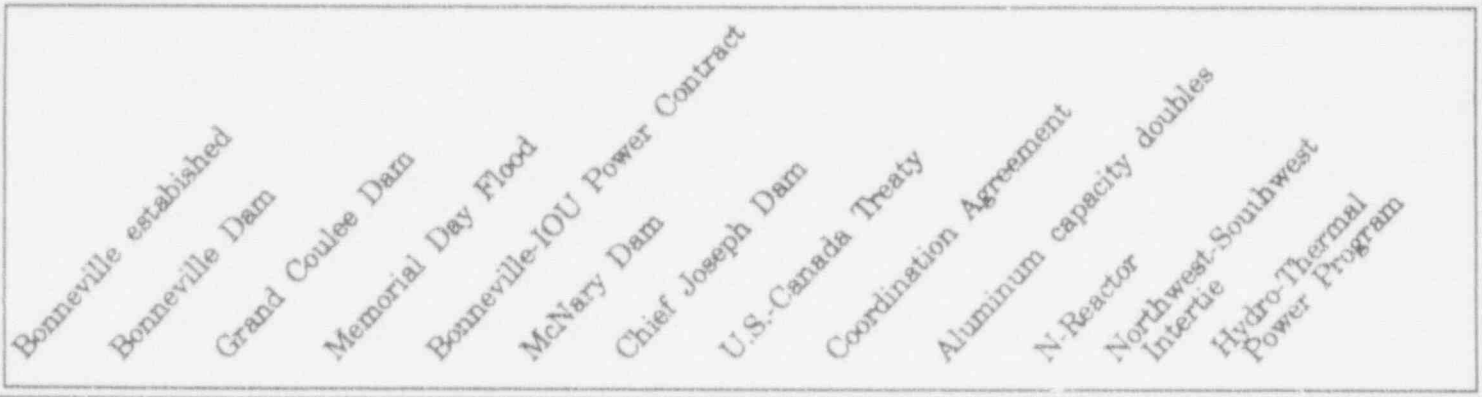
The Washington Public Power Supply System's nuclear project 1 (WNP-1) is located at Hanford, Washington, and is 65-percent complete. WNP-3 is at Satsop, Washington, and is 76-percent complete. Bonneville and its customers are spending approximately $11 million[7] per year to preserve these two nuclear plants. If both plants were needed and could be completed, they would supply approximately 1,600 megawatts of power. However, there are uncertainties regarding the region's ability to complete and operate these plants. For example, there is controversy about the agreements that control the financing, budg ng and management of these projects. Other issues include compliance with the National Environmental Policy Act; the Washington state law requiring cost-effectiveness studies prior to resuming construction and licensing by the U.S. Nuclear Regulatory Commission; as well as public acceptance. (These issues are discussed in Volume II, Chapter 8.)

The Council has heard testimony that these issues can be resolved and that the plants can be successfully completed. Other testimony suggested that the problems are insurmountable, and Bonneville should stop spending money to preserve the plants. It is time to determine whether preservation of these plants is a prudent insurance policy. That is, in the event that the plants are needed, will anyone be able to complete their construction and cost-effectively operate them? If not, they should be terminated.

Bonneville and the Supply System should identify all the issues that need to be addressed to determine whether these two plants could be made operational or whether they should be terminated. Bonneville and the Supply System should work to resolve these issues in a deliberate way, pursuing the most cost-effective issues first. In most instances, resolving these issues also will shorten the lead time for the plants.

7. This figure does not include property taxes on the portion of WNP-3 owned by investor-owned utilities, because the assessed value on that portion is under dispute.

Actions of the Past



This is not a recommendation to resume construction or to change the preservation status of the plants. Rather, the Council is seeking a determination of whether the plants could be completed and successfully operated in the event they are needed.

Coal

Because of the financial, environmental and public acceptance risks presented by coal-fired resource development, the Council is not recommending construction of large-scale, new, coal-fired power plants. However, rapid load growth, the loss of an existing resource, or the failure to demonstrate that alternative energy sources are cost-effective may dictate the need to develop proven energy resources such as coal by 1998. But first, actions are needed to address regulatory and licensing issues and impediments to the development of the resource. The region needs to determine whether anyone will sponsor pre-construction activities for coal plants.

The Council recommends that within the next five years, Bonneville and the utilities should identify, secure and license three sites for possible future construction of new, coal-fired power plants. Each site should be capable of supporting multiple units, totalling at least 500 megawatts of generating capacity.

For the same reasons, transmission corridors for connections to the regional power grid also should be identified, secured and licensed. Possible fuel supplies should be identified and plans prepared for the development, as required, of the necessary fuel transportation facilities. Power plant feasibility studies should be completed for these sites, focussing on technologies featuring high efficiency, low emissions, short lead time and modular development. Consideration should be given to phased development of coal-gasification, combined-cycle power plants.

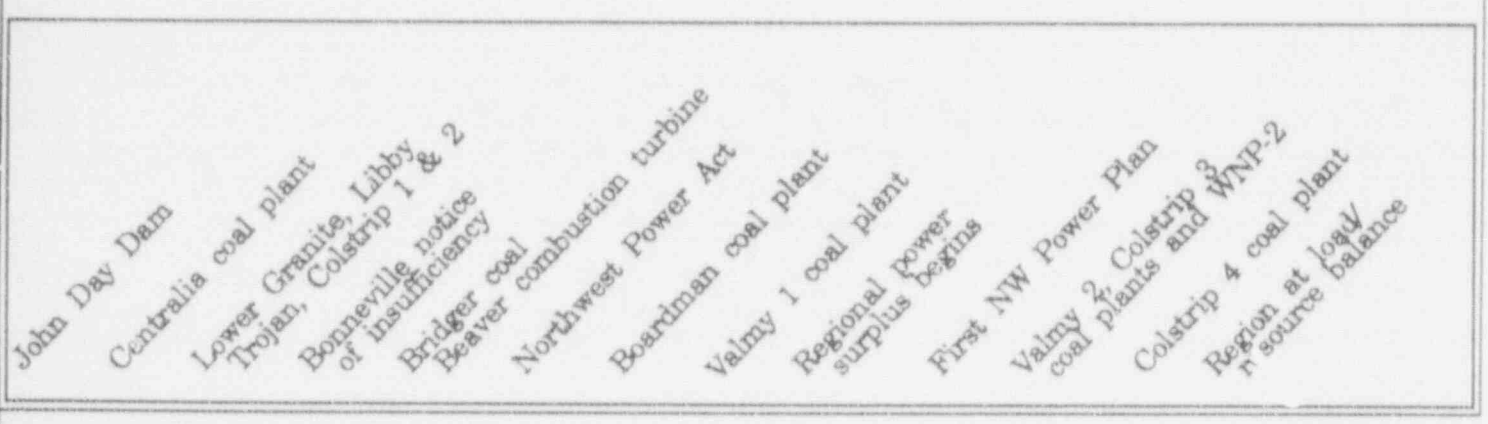
The proposed Creston site in Washington could fulfill part of this objective.

Objective 4: Actions Supporting Implementation

Regulatory Policy

Since the passage of the Northwest Power Act (1980) and the development of the first regional power plan (1983), several regulatory conditions have been identified that tend to either frustrate or diminish the incentive for utilities to acquire conservation resources. The Council recommends that the region's public utility commissions, legislatures and other regulatory bodies review current policies and revise those policies so that equitable regulatory treatment is provided for conservation and generating resources. Policies should be developed that link a utility's profits to energy the utility saves as well as the energy it sells. The Council supports regulatory actions that provide positive incentives for aggressive conservation actions.

The Council also recommends that public utility commissions, siting agencies, state legislatures and federal regulatory agencies



review their regulatory practices to facilitate the acquisition of generating resources included in this plan. Regulatory policies should encourage utilities to invest in activities that reduce resource lead time and increase flexibility. The Council recommends that utilities receive appropriate rate treatment for such activities.

Finally, regulatory policies also affect utility incentives to participate in research, development and demonstration activities. These activities are essential to identifying resources that may prove to be cheaper and more environmentally sound than those already included in the resource portfolio. The Council asks the regulatory commissions to provide appropriate rate treatment for utility participation in research activities.

Conservation

An integral part of the acquisition of more than 1,000 megawatts of conservation over the next 10 years will be the measurement of actual energy savings. Conservation poses unique challenges in reliable measurement of savings and the predictability of savings over time. All conservation acquisition efforts should be monitored and evaluated thoroughly to determine the effectiveness of the region's efforts and to continually improve on those efforts. Just as power plants are watched carefully to ensure their best operation, conservation needs to be verified and fine-tuned, if we are to learn from our experience.

A second activity promoting successful conservation acquisition is the open exchange of information on the effectiveness of conservation efforts. The Council will meet periodically with utilities to facilitate an exchange of the utilities' conservation acquisition plans, including their budgets, timelines, staffing level and expected penetration rates, and to review current estimates of the amount and cost of acquired conservation.

The Council also will explore the coordination of some West Coast conservation activities. Appliance and other equipment manufacturers would be far more likely to cooperate with requests for energy-efficient products, if a larger market could be guaranteed. In addition, research and development agendas and findings could be shared.

Least-Cost Planning

Many of the region's utilities are actively engaged in the production of least-cost resource plans. Utilities should review their plans to ensure they are taking actions that are consistent with the regional plan. These reviews should identify specific actions the utility will take, such as participating in Bonneville conservation programs or initiating its own programs. The Council and Bonneville will provide assis-

A New Utility World

Until about a dozen years ago, the only way utilities acquired new power supplies was to build generating plants. The process was cumbersome, with siting, licensing, design and construction dilemmas to work through with both the public and regulatory agencies.

Then in 1978, with the signing of the Public Utility Regulatory Policies Act (PURPA), things got more complicated. PURPA required utilities to purchase power from qualified non-utility producers at the price the utility would have had to pay to construct its own new generating plant (the avoided cost). This strategy was designed to encourage competitive small-scale resources, such as industrial cogeneration and small hydroelectric projects.

Although there is disagreement about all of its benefits, PURPA succeeded in opening the door to outside power producers with resources supplying everything from kilowatts to hundreds of megawatts. Today, utilities increasingly turn to outside sources for energy-efficiency improvements (the suppliers are known as "energy service companies" ESCos) as well as large thermal resources (supplied by independent power producers or IPPs). Many utilities have even formed their own subsidiaries devoted to resource development for themselves and other utilities.

These new players have brought with them new ways for utilities to acquire resources. Utilities now are calling for bids from resource providers and choosing the resources that best fit utility needs.

This has added complexity to the difficult process of planning and acquiring resources. The specific resources called for in this plan may be developed by non-utility providers. Further, utilities may be offered options that break with the sequence of acquisitions identified in the resource portfolio.

Nonetheless, the Council will evaluate all resources proposed for acquisition and support those that conform to the goals and objectives of this plan. The most important message in this plan is that the Council is serious about this region's need to acquire cost-effective energy now. This commitment is shared by everyone involved with the implementation of this plan.

tance to utilities in their planning efforts. The Council also intends to conduct periodic workshops to help the region take stock of planning and conservation efforts.

Environmental Impacts

The Council accounted for environmental impacts in all its resource decisions. We will continue to develop a more complete reflection of environmental uncertainties in resource planning. The Council will work with Northwest public utility commissions, Bonneville, utilities and other interested parties to identify alternative methods to evaluate and incorporate estimates of unmitigated environmental impacts into resource decisions.

Bonneville Policy

Just as the region's regulatory commissions can have a significant impact on the incentives provided to utilities for acquisition of resources, Bonneville has a significant role in the successful implementation of the actions called for in this plan. Bonneville's utility customers see the priority firm rate[8] as their avoided cost, when making decisions about conservation and other resource development. This rate is significantly lower than long-term regional avoided cost estimates and provides little incentive for utility resource development.

By paying utilities up to the difference between avoided cost and the priority firm rate, Bonneville's billing credits program removes the disincentive for utilities that wish to develop conservation or other resources for themselves. However, it does not provide any direct incentive for utilities that may not be interested in developing resources.

We will continue to develop a more complete reflection of environmental uncertainties in resource planning.

If billing credits and other acquisition methods, including programs for conservation, are not successful at attaining the plan's conservation goals, we still need conservation from every end-use sector and utility in the region. For this reason, if the plan's conservation goals are not being achieved, the Council recommends that Bonneville and its customers investigate developing a multilevel priority firm rate.

Such a rate, with the highest level set at the avoided cost, would eliminate the difference that would otherwise have been paid as a billing credit. Thus, the two approaches are mutually exclusive alternatives.

Bonneville also needs to reconsider some of the provisions of its average system cost methodology used in the residential exchange program.[9] The region's investor-owned utilities will be responsible for acquiring more than 700 megawatts of conservation over the next 10 years. Bonneville's average system cost methodology contains provisions that hinder the implementation of conservation actions. For example, audits, advertising and support costs for the Council's model conservation standards are excluded from an investor-owned utility's exchangeable costs, although they may be necessary components of conservation programs developed to be consistent with the plan.

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8. The priority firm rate is the rate that applies to Bonneville's public utility loads and exchanging investor-owned utility residential and small farm loads.

9. The residential exchange was created in the Northwest Power Act to allow the region's investor-owned utilities' residential and small farm customers to share in the benefits of the low-cost federal hydropower system. Some high-cost public utilities also participate in the exchange. Bonneville reduces the utility's cost of serving these loads by purchasing energy from the utility at the utility's average system cost and selling the utility energy to meet these loads at Bonneville's priority firm rate. Bonneville calculates the price it will pay the utility using the average system cost methodology.

Such disincentives can lead to investment in higher-cost generation. Because these costs would be exchangeable, they would lead to higher Bonneville and regional costs. Bonneville should reopen the average system cost methodology for the limited purpose of eliminating any disincentives to utilities to act consistently with the Council's plan.

Council Actions

The Council intends to play an active role in promoting the implementation of this power plan. The Council will continue to identify and seek removal of barriers to implementation of this Action Plan. The Council will actively promote incentives for risk-management actions and facilitate the decision-making processes surrounding the region's efforts to achieve the goals of the plan.

We will need a regionwide collaboration to preserve both the Northwest's economy *and* its environment.

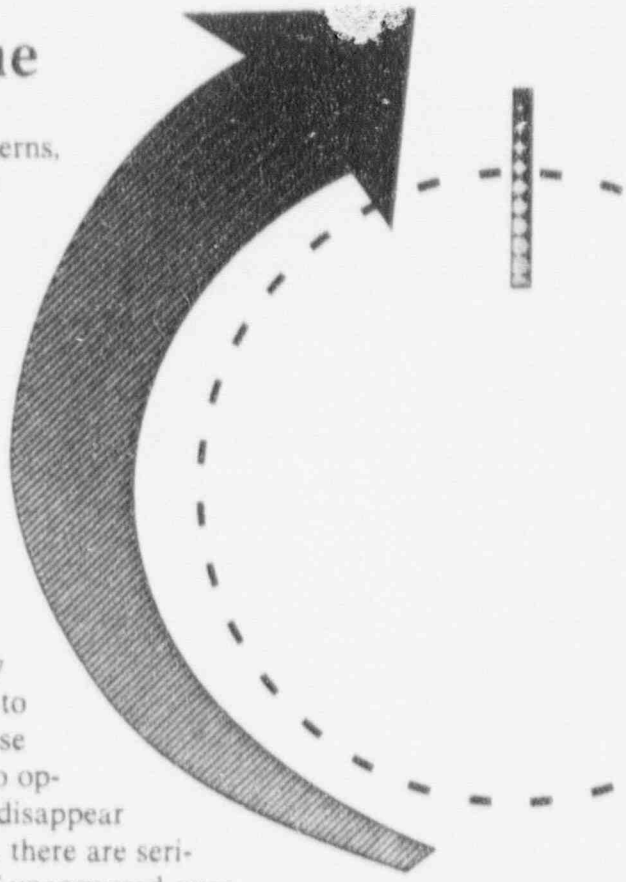
The Council recognizes that federal law requires the Federal Energy Regulatory Commission to consider an applicant's conservation efforts in its relicensing and initial licensing decisions. The Council will work with interested utilities in the relicensing and licensing processes, to show that these requirements have been satisfied fully through the utilities' conservation efforts in accordance with this power plan.

The Council will participate in the siting initiatives of utilities and resource developers to encourage the development of least-cost resources and transmission; improve the ability to shorten resource lead times and site-bank potential resources; and support need-for-power findings. This may involve the Council in land use planning and zoning issues to resolve the conflicts inherent in resource development. The Council will help develop and support proposed initiatives when new legislation or policies are needed.

If this Action Plan is to become a reality, legislative and rulemaking initiatives need to secure energy conservation through improved building codes and standards for new residential and commercial buildings, appliances and lighting. The Council will support such initiatives and also work to see that related health and environmental issues are resolved by the appropriate agencies.

The Council also will participate actively in the implementation of the plan by providing a forum for exchanging information on the effectiveness of implementation actions. Implementors are asked to report on progress toward implementing the plan, and the Council will revise the plan as better information becomes available.

It's Time



The actions in this power plan address a lot of concerns, but the bottom line is—they are the cheapest and most constructive way to buy time. The region is growing—fast! If this economic expansion continues, we'll be prospering, but we'll also face some *very* hard choices about how to fuel that prosperity. Frankly, we don't expect the regional growth patterns of the late 1980s to persist. But it's our job to look at both the best- and worst-case scenarios, because either could come about.

After testing literally hundreds of different resource combinations, against as many forecasts of energy use, we've put together a four-part strategy we believe is the best possible balance of resource cost, environmental protection and risk management to carry this region into the 21st century. One important goal is to delay the need to build large thermal power plants. These plants are expensive. They take a long time to bring into operation, and it is possible that the need for them could disappear at just about the time they are completed. Furthermore, there are serious environmental and societal concerns, and dozens of unanswered questions, about even the cleanest, most advanced technologies.

So we want answers, and it may take some time to get them. Because we don't think we have time to just think about these problems, our four objectives are designed for simultaneous implementation.

We start the way we usually start, with energy conservation in our homes, businesses, industries and on our farms. Efficiency is simply the best deal around. We can save energy for about half the cost of most other options. At the same time, we want to make sure our existing power plants, and the transmission and distribution system we rely on, operate as efficiently as possible, too. To this block of low-cost resources we've added some relatively inexpensive hydropower and industrial cogeneration.

While we're busy buying up energy savings—and we will be busy if we get the full 1,350 megawatts of savings we're after in the next 10 years—we also want to be working on ways to bring other resources online more quickly. The point here is to begin the relatively inexpensive siting, licensing and design processes for certain resources, but stop there and wait for a second decision, closer to the time the electricity is needed. This shortens the resource's lead time, so it can be completed quickly. It also provides a measure of insurance that large amounts of capital will not be wasted on power plant construction that proves to be unnecessary.

Then there are all of the questions about resources we call "promising," which are not quite ready for development, and the problems with coal and nuclear. This plan calls for research and demonstrations of the promising resources and more focus on resolving issues surrounding thermal ones.

Finally, this plan looks at the kinds of regulatory, policy and environmental actions that will be necessary to reach those other three objectives. This will take cooperation. We'll need a regionwide collaboration to preserve both the Northwest's economy *and* its environment.

Power Plan Schedule

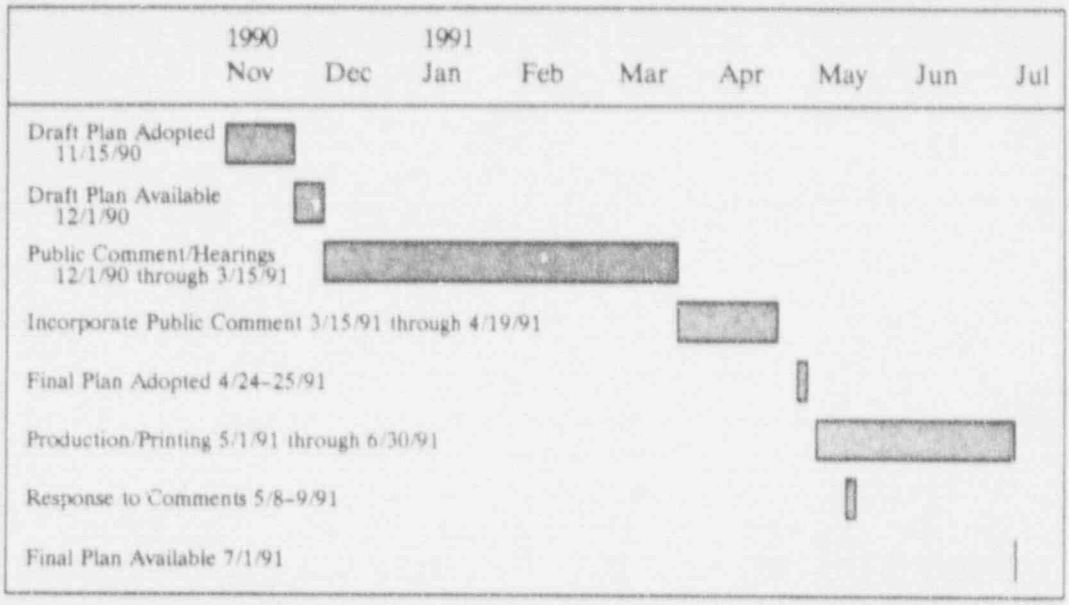


Figure 17
Process for Completing the Power Plan

The comments, written and oral, that the Northwest Power Planning Council receives on this draft power plan are among the most important aspects in the development of the 1991 Power Plan. To ensure that the comments are used most effectively, the Council asks that you follow these guidelines in their preparation.

Instructions for Written Comment

1. All written comments must be received in the Council's central office, 851 S.W. Sixth Avenue, Suite 1100, Portland, Oregon 97204 no later than 5 p.m., on March 15, 1991. Comments received after that time will not be considered.
2. Comments should be clearly marked. If you are commenting on Volume I, refer to document number 90–18. If you are commenting on Volume II, refer to document number 90–18A.
3. Your written comments should be specific and concise and refer to chapters or page numbers in the plan. Please avoid grouping comments on one page that concern different sections of the plan.
4. If appropriate, submit a "marked up" copy of the draft (or appropriate sections) indicating suggestions and/or revisions. Suggested deletions should be lined out and placed in parentheses, like this: (~~Line out portions of the draft to be deleted.~~). Suggested new language should be underlined, like this: Underline all new language.
5. If possible, please type your comments (double-spaced).
6. Provide 10 copies of all comments and supporting materials. If necessary, the Council will provide copying services at no cost for 10 copies of testimony.

Instructions for Oral Comment at Hearings

Public hearings to solicit your opinions are being held in all four Northwest states.

1. Requests for time slots to comment at these hearings should be made at least two workdays prior to the hearing. To sign up for hearings in Idaho, Montana and Washington, please contact those state offices (addresses and phone numbers are listed on page 38). To sign up for hearings in Oregon, please contact Judi Hertz in the Council's central office, 851 S.W. Sixth Avenue, Suite 1100, Portland, Oregon 97204, 503-222-5161 or toll-free 800-222-3355 in Idaho, Montana and Washington or 800-452-2324 in Oregon.
2. Those who do not sign up for time slots will be allowed to testify as time permits.
3. Use the hearing to summarize your written comments. The comments themselves should not be read.
4. If possible, 10 copies of your testimony should be submitted to the Council recorder at the hearings. This person will be sitting at a table near the Council members and will be identified by the chairman at the start of the hearing. When preparing these copies, refer to the instructions on page 36 for written comments.
5. A 10-minute guideline is suggested for comments given at hearings. On certain occasions, the number of people signed up to talk may be so large that it will be necessary to impose shorter time limits to enable all commentors to speak.
6. Your appearance at more than one hearing is unnecessary. Scheduling preference will be given to individuals and groups that have not testified at other hearings.

Hearings Schedule

The tentative dates and locations of public hearings on this plan are:

- Boise, Idaho ..... January 9-10, 1991, at the Owyhee Plaza Hotel, during the regularly scheduled Council meeting.
- Idaho Falls, Idaho ..... To be announced.
- Lewiston, Idaho ..... To be announced.
- Seattle, Washington ..... January 17, 1991
- Tri Cities, Washington ..... January 29, 1991
- Spokane, Washington ..... February 12, 1991, at the Sheraton Spokane Hotel, 10 a.m. to 4 p.m.
- Portland, Oregon ..... February 28, 1991, in conjunction with the regularly scheduled Council working session.
- Missoula, Montana ..... March 13, 1991, at the Village Red Lion, during the regularly scheduled Council meeting and from 7 p.m. to 9 p.m.

These were the hearings scheduled when we went to press. Please contact your state's Council office (addresses and phone numbers are listed on page 38) to confirm times and exact locations. The Council's newsletter, *Update*, also will carry more current information.

Order Form

Volume I is the basic power plan. It contains all of the plan's major policies, directions and actions. Volume II is the technical, supporting documentation. Volume II lays the foundation for Volume I and discusses in greater detail the conclusions and recommendations of Volume I. To reduce environmental and economic waste by mailing out unnecessary paper, Volume II chapters have been divided into six groups. We request that you order only the groups you will need. Chapter titles and number of pages have been included, for your information.

- ☐ Complete set of Volume II.
- ☐ **Group 1:** (60 pages)
  Chapter 1: Recommended Activities for Implementation of the Power Plan; Chapter 11: Resource Acquisition Process.
- ☐ **Group 2:** (80 pages)
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- ☐ **Group 3:** (210 pages)
  Chapter 5: Economic Forecasts for the Pacific Northwest; Chapter 6: Forecast of Electricity Use in the Pacific Northwest.
- ☐ **Group 4:** (190 pages)
  Chapter 7: Conservation Resources; Chapter 12: Model Conservation Standards and Surcharge Methodology.
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- ☐ **Group 6:** (120 pages)
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- ☐ Additional copies of Volume I (specify number). _____

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The Northwest Power Planning Council is required by an Act of Congress to develop a program to protect, mitigate and enhance the Columbia Basin's fisheries and a regional electric energy plan that provides a reliable electricity supply at the lowest cost. For further information, see Pacific Northwest Electric Power Planning and Conservation Act—Public Law 96-501.

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