# LEAST-COST PLAN

A Resource Option Study by
The Washington Water Power Company
April 1989

WWP100

# CONTENTS

**Introduction** v

**Summary** vii

**Chapter 1**
The Company 1

**Chapter 2**
Resource Planning 3

**Chapter 3**
Consumer Information 7

**Chapter 4**
Future Demand For Electricity 11

**Chapter 5**
Least-Cost Planning Process 13

**Chapter 6**
Long-Term Strategy 17

**Chapter 7**
Action Plan 19

**Glossary** 21

**Appendix A**
Demand-Side and Supply-Side Resources A-1

**Appendix B**
Public Involvement B-1

**Appendix C**
Model Output Summary C-1

**Appendix D**
Requirements and Resources D-1

# INTRODUCTION

This report results from the first formal effort by The Washington Water Power Company (WWP) to develop a least-cost electrical supply strategy using procedures and computer modeling developed by state regulators. As defined in this report, least cost planning involves studying both supply-side (e.g., generation) and demand-side (e.g., conservation) resources to meet the company's future electrical energy needs. Because of the uncertainty which is necessarily encountered in any planning process with a 20-year planning horizon, the plan examines numerous resource scenarios against a variety of assumptions which are designed to eliminate the uncertainty of future events by covering a broad range of potential futures. This effort provides an opportunity for the company, state regulators, and the public to join together in developing a reliable low-cost electric plan.

On April 8, 1987, the Washington Utilities and Transportation Commission (WUTC) adopted a rule requiring the company to develop least-cost plans for meeting current and future energy needs. The rule requires WWP to:

- produce a range of demand forecasts using state-of-the-art methods;
- assess in a consistent manner the availability and costs of both demand-side and supply-side resource alternatives; and
- integrate the demand forecasts and resource assessments into a long-range plan.

The company is also working with the Idaho Public Utilities Commission in utilizing this data in their "Resource Management Report."

Since circumstances can change abruptly, the rule notes that the plans will be reviewed and revised every two years. Planning is a dynamic process in itself, taking into account changes in technical, economic and regulatory conditions. In developing a long-term resource strategy, non-economic factors also need to be taken into consideration.

This report is an accumulation of efforts by many individuals both within and outside the company. The result is a 20-year resource plan for WWP based on various future events and factors resulting in a series of power cost scenarios. Future revisions and plans will continue to include input from the WUTC staff and the public.

# SUMMARY

Least-cost planning (LCP) is viewed by the company as a tool to develop and maintain viable least-cost electrical resource and supply planning strategies. The LCP computer model developed by the WUTC allows evaluation of both supply-side (e.g., generation) and demand-side (e.g., conservation) electrical resources under a multitude of possible future scenarios — a process which allows planners to assess and compare a variety of energy resource alternatives. The model is not a cost optimization model, however the resulting computer model outputs can be used to examine the financial impacts on the company from various electrical energy resource additions. This allows for the selection of resources designed to result in the lowest cost to the company's customers under a variety of future conditions.

The planning process needs to be flexible to take into account a wide range of uncertainties. In addition to economics, other factors need to be reviewed and evaluated (e.g., environmental factors, reliability, dispatchability, contributions to peak, seasonal output, uncertainty, fuel mix, impact on local economy, capital requirements, rate stability, and daily-load matching capability). All of these factors, which are defined in the glossary or other areas of this report, will be assessed in the development of an electrical resource plan for WWP.

Under WWP's current (medium) base electric load growth forecast, the company will need energy resources starting in 1994 and peak resources starting in 1997, given existing resource and contract termination dates. By the year 2007, the energy deficit is 192 average megawatts (aMW) and the peak deficit is 251 megawatts (MW). These anticipated deficits will need to be met by demand-side and supply-side resources.

At present time, the company's long-term strategy is to rely on five resource types to meet future loads. These resource types are conservation, cogeneration or small hydro generation acquired under the federal Public Utility Regulatory Policy Act (PURPA), energy purchased from other utilities, generation from a combined-cycle combustion turbine, and generation from a coal plant. During the next two years, the company intends to make no resource acquisition commitments, except those involving lost opportunity resources (such as improvements to existing hydro plants), which could be lost to WWP if no commitment is made within that time frame. Instead, the next two years will be used to develop programs and studies, to gain additional information, and to evaluate resource opportunities. This will provide a more solid basis to make the difficult decisions related to the acquisition of future electrical resources.

# THE COMPANY

## Company Profile

The Washington Water Power Company (WWP) is an investor-owned electric and natural gas utility serving a 26,000-square-mile area in eastern Washington and northern Idaho. The company is based in Spokane, Washington, the largest community served in the area. Electric service is supplied to approximately 243,000 customers, and natural gas is supplied to approximately 85,000 customers.

In addition, the company owns two subsidiaries, Washington Irrigation and Development Company, a coal-mining operation, and Pentzer Corporation, a parent company to its other diversified operations. At the end of 1988, WWP had 38,686 shareholders of common stock located in all 50 states, as well as in 24 countries. A total of 34 percent of company shareholders live in the Pacific Northwest, with 25 percent residing in the state of Washington.

## Current Issues

In mid-1987, the company initiated a comprehensive, in-depth examination of all aspects of its business, including organizational structure, capital and operating costs, and work force requirements. This major undertaking, which continued through 1988, is a necessary and positive step toward meeting the challenges of an increasingly competitive business environment.

A key area of concern for the company is the lack of economic growth within its service territory during the past eight years. Area economic growth is an important factor affecting the long-term financial health of the company. Consequently, WWP is continuing to be active in area economic development activities, including Spokane's major planning process for the future, Momentum '89. The company has also restructured its entire marketing approach toward a competitive, growth-oriented environment in which the identification and promotion of new markets and the competitive pricing of energy services will allow WWP to meet current and future market demands. Providing energy services at competitive prices will also maintain the company's economic base in its service area.

The company has also initiated several strategies designed to strengthen its position in the wholesale marketplace. Because of the company's surplus condition for the next several years, WWP is pursuing a number of wholesale marketing arrangements, including seasonal and long-term contracts with utilities in the Pacific Northwest and Southwest. Some of these arrangements depend on access to transmission capability. Because of this, the company is taking an active interest in the Bonneville Power Administration's (BPA) Intertie Access Policy, which addresses access to the federal transmission system. In addition, the company has initiated steps for the licensing of a transmission interconnection with British Columbia Hydro and Power Authority (B. C. Hydro). If constructed, the line could provide access to firm resources to the company at prices competitive with other resource alternatives.

## Generating Capacity

WWP was incorporated in 1889, and was entirely hydroelectric based until 1971, when the Centralia coal-fired plant in western Washington came on-line (WWP has a 15% ownership). The company's largest hydroelectric plants (Noxon Rapids and Cabinet Gorge) are located on the Clark Fork River in northwestern Montana and northern Idaho, respectively. The remainder of WWP's hydroelectric capacity is on the Spokane River in eastern Washington and northern Idaho.

The company owns 946 megawatts (MW) of hydroelectric generating capacity (peak). WWP also purchases a total of 221 MW peak of hydroelectric generation from four projects located on the mid-section of the Columbia River (Priest Rapids, Wanapum, Rocky Reach and Wells) and the Chelan Lake project.

WWP's thermal ownership, consisting of 521 MW (peak), exists at Centralia, the Kettle Falls wood-fired plant in northeastern Washington, the Colstrip coal-fired plant in eastern Montana, and the oil/gas-fired combustion turbine (Northeast) in eastern Washington.

## Transmission and Distribution

The company's transmission system consists of 230 kV and 115 kV circuits extending from Hot Springs, Montana west to the Columbia River in Washington, south to north-central Idaho, and north to the Canadian border. The transmission system circuit mileage is 2,046. WWP also owns 10,757 miles of distribution lines.

## Arrangements with Other Utilities

WWP frequently purchases, sells, or exchanges power with Canadian and United States entities including BPA, municipalities, public utility districts, and other investor-owned utilities. In the past, a significant part of the company's wintertime capacity used to meet customer requirements came from firm power contracts with other utilities.

The company is also a member of various regional entities that provide various coordinating functions on a multi-utility basis and regional planning perspective. Some of these entities include the Western System Coordinating Council (WSCC), Pacific Northwest Utilities Conference Committee (PNUCC), Northwest Power Pool (NWPP), Pacific Northwest Coordinating Group, and the Intercompany Pool (ICP).

## Other Considerations

In past years, WWP has constructed or acquired long-term resources in excess of loads. This has served as a low-cost method of assuring adequate resources to cover future loads during periods of declining unit costs. However, delays in construction of projects during periods of high inflation and financing costs have increased unit costs for long-term resources, and exposed the company's customers and stockholders to unanticipated costs. Therefore, the company is seeking resources which minimize such risks and which protect the interests of the company's customers and investors.

In an effort to maximize revenues during this surplus period, WWP has sold part, and is seeking markets to sell additional amounts of its current surplus, on both a short-term (0 to 1 year) and long-term (5 to 15 year) firm basis to other utilities. These sales may create an obligation on the part of WWP to construct or acquire resources sooner than expected in order to fulfill contract obligations. However, these market strategies are designed to help keep energy costs lower during the period of surplus than they would be were the company to make only non-firm sales of its surplus.

As mentioned earlier in this chapter, the company has been pursuing a number of wholesale marketing arrangements. Included in these arrangements is a recent sale agreement that was executed in February 1989 for a sale of power to PacifiCorp.

The sale to PacifiCorp is in keeping with the company's long-term strategy as stated in Chapter 6, "Long-Term Strategy," to be actively engaged in selling any and all surplus capacity and energy to its system on the wholesale market. This sale is the most recent activity under this strategy.

One of the company's planning policies in the past has been to refrain from acquiring firm resources unless the annual energy deficiency is greater than 50 aMW. This deficiency is planned to be met by purchases on the secondary market and/or by better than critical hydro conditions. This policy for planning resource acquisitions remains in effect. Although the Requirements and Resources tabulation now shows energy deficits every year starting in 1989, the need for additional demand- and supply-side resources still occurs in 1994, despite the sale to PacifiCorp.

The company also faces competition in several areas. The competition is in the fuels available to WWP's customers, including wood, and in alternative methods of self-generation, such as cogeneration facilities. WWP needs to continue being a low cost supplier of energy in order to meet this competition.

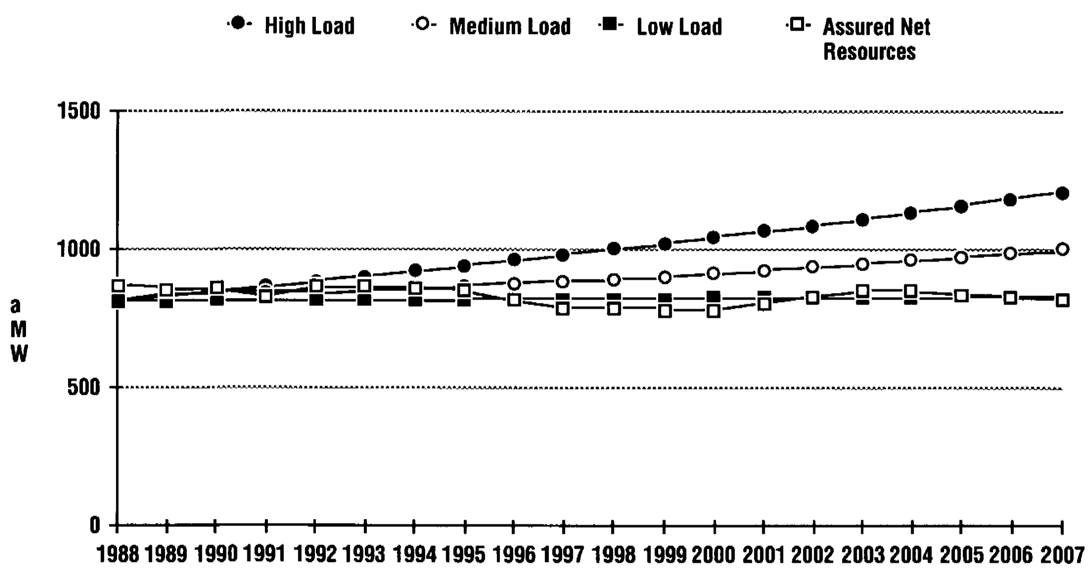
Actual determination of WWP's resource acquisition strategy will come from this least-cost planning process. The goal of the Least-Cost Plan is to identify a mix of resource options which provide reliable electric service and minimize the cost of electrical energy to the customer. WWP is also developing a least-cost plan for gas activities.

# RESOURCE PLANNING

WWP's future resource needs can be met with a combination of demand- and supply-side options. A diverse mix of available resource options protects WWP by mitigating certain types of uncertainties. Similarly, the availability of resource options which can be constructed with a relatively short lead time mitigates other types of uncertainty. These uncertainties can effect the supply of fuels (e.g., the oil embargo) and the price of resources (e.g., the nuclear plant cost escalation). Relying on one type of resource or on one type of fuel would not currently be the most prudent utility planning. Providing the appropriate combination of resource options will allow the company to maintain flexibility, reliability, low rates and profitability.

## Need for Energy

The need for additional energy supply comes from a combination of increased loads and a decrease in available resources. Even under the low load forecast, the company becomes energy deficient during the 20-year period. Under the medium and high load forecasts, the energy deficits in the year 2007 range from 192 to 393 average megawatts (aMW).




### ENERGY LOADS AND RESOURCES

*Figure 2-1. Comparison of WWP's assured net resources and the range of demand forecasts without the PacifiCorp sale.*

The decrease in existing resources is partially due to the expiration of a contract for energy from the Chelan hydro plant (1995) and the gradual termination of various contract purchase rights from the Mid-Columbia hydro facilities (2005). Another significant reduction occurs in 1996, with the termination of a contract with BPA for power deliveries (80 MW) associated with the Hanford NPR/WNP-1 Nuclear Projects. The increase in assured net energy resources starting in the year 2001 is due to the phasing out of the Puget sale, which has a ramped-down delivery rate the last two years of the contract.

## Critical Water

The capability of the company's hydroelectric resources is based on critical (low) water conditions. Better-than-critical water conditions result in higher annual energy production

## AVAILABLE ENERGY RESOURCES TO MEET LOAD

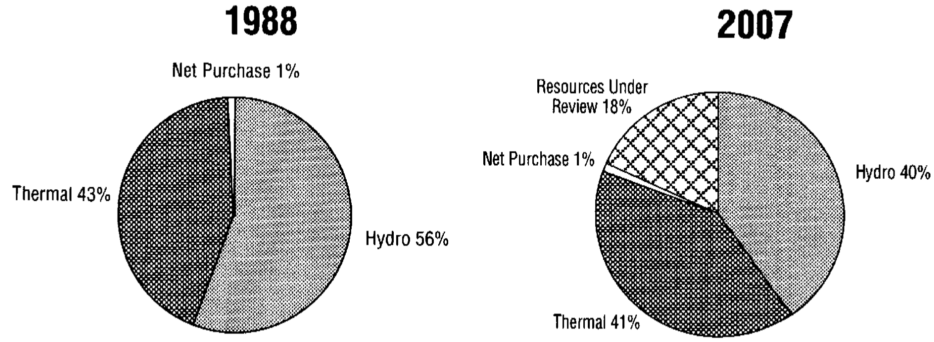



*Figure 2-2. Distribution of existing energy resources (under critical water conditions) used to meet system energy load requirements in the years 1988 and 2007 (medium load growth).*

figures, although the distribution could vary throughout the year. Attempting to plan for conditions better than critical water would necessitate trying to carry more load than the critical capability of the system, which is inherently risky. Also, planning on critical water does not guarantee that demands will always be met. Even worse water conditions could occur. The region and WWP use the 1928-78 historical water sequence for planning, and the critical period currently being used is the worst four-year sequence of flows during that period.

Excess hydro generation, which is seasonally available in most years even under low water conditions, offers the company a resource which can be used in a variety of ways. This non-firm energy (so-called because it is not always available) can be used to back off higher cost thermal plants or can be sold to other utilities in the Northwest and Southwest. The revenues from the non-firm sales can be used to offset company costs and thereby help reduce retail rates.

For the Pacific Northwest region, the difference between the average annual output of the hydro power system and the critical annual output is approximately 4,100 aMW. The difference for the company is approximately 120 aMW.

## Lost Opportunities

There are resources that, if not acquired or developed within a certain time, could be lost to the utility. For example, if cost effective efficiency measures are not included in new construction, it is probably not cost effective to make these improvements later. Hydro upgrades is another example. If the company does not maximize the output of its hydro sites (based on economic and environmental principles) and show good stewardship of the public's river resources, the Federal Energy Regulatory Commission could deny license renewals or impose terms and conditions which affect operating costs and flexibility. These types of lost opportunity resources are treated either as demand-side options and included in the load forecast or supply-side options and included in the resource stack. These resources, if cost effective, could be economical to obtain before they are needed to serve the current requirements of the utility and therefore require special consideration.

## Timing of Delivery

Another resource characteristic important in resource planning is timing of energy delivery. WWP needs much more energy in the winter than in the summer due to its large number of electrically heated homes. Therefore, if a resource can be shaped to provide energy in the winter, it has a higher value to the company. Power purchase contracts can sometimes be obtained to provide this kind of flexibility. Weatherization of electrically heated homes is another good example of a resource that provides most of its benefits during the cold months. Still another example involves small hydro projects without storage capability. Such a project generates most of its annual energy during the high streamflow season when energy is of less value to the company. Timing of delivery can also apply on a daily basis. A utility must have resources that can serve load as it varies on a daily, weekly, monthly and annual basis. Such resources are more valuable to a utility.

## Need for Capacity

The discussion and process of matching resources to requirements in this study deal primarily with the need for meeting energy needs, rather than capacity needs. The main reason is that the least-cost planning computer model used deals with energy resource additions. Northwest regional hydro systems, including the company's, are basically energy constrained, not capacity constrained. However, the forecasted capacity deficit for the company becomes larger than the energy deficit by the year 2006. The need for additional capacity to satisfy the projected peak loads must be considered when making future energy supply decisions.

When resources are added for energy, some of the requirement for capacity is usually met. The type of resource added to the system will determine what amount of capacity is available from that resource to serve peak loads. In addition, a peak purchase from Canada, BPA, or the Southwest would provide the magnitude of capacity needed under the various load growth scenarios.

Based on WWP's base case projections, the company's peak needs can be met with the capacity component of the energy additions with a peak purchase or seasonal exchange with another utility. This would handle the projected peak deficits for the next 20 years. These peak deficiencies could also be met with combustion turbine installations and/or load management programs, but these considerations should be evaluated as they affect energy. Other variations of energy resource additions will have to be evaluated individually as to their effect on the peak needs of the company.

## Base Case Resource Scenarios

For the base case energy resource additions using the medium load forecast, a plan was developed that utilized five basic resources. The resource options used were conservation, PURPA acquisitions, utility purchases, combustion turbines with a combined cycle addition, and a coal plant. The base case was used as a starting point in evaluating various resource scenarios. The need for additional energy supplies for the company to meet customer needs starts in 1994, under the base case scenario, and amounts to 192 aMW by the year 2007.

Conservation was considered as the number one option due to price and availability. Conservation was estimated to be available up to a maximum of 35 aMW (this is in addition to conservation induced by price elasticity included in the system load forecasts). Additional conservation could be obtained at costs higher than other alternatives. Of the 156 aMW of potential PURPA acquisitions the company estimated for the base case scenario, approximately 60 percent, or 90 aMW, would be available at costs competitive with other resource alternatives.

Purchases from other utilities are assumed to be available from Canada and the United States. These purchases would require the company to obtain the transmission necessary to wheel the power to its system. For the base case resource scenario, purchases from other utilities were limited to ten percent of the company's system load. With the three options of utility purchases, PURPA acquisitions, and conservation, the energy needs of the company by the year 2007 can be met, based on the medium load forecast. Under the low load forecast, only a few years of additional resources are needed. It was assumed that this need would be met with conservation and cogeneration resources.

To cover the energy deficiencies under the high load forecast would require the three options of conservation, PURPA acquisition and utility purchases, plus the other two options of combustion turbines and a coal-fired thermal plant. For planning purposes, the base case scenario under high load forecast, assumed that combustion turbine energy would not exceed approximately 45 percent of the difference between critical and average water generation plus enough turbine energy to cover the company's obligation to BPA under the WNP-3 Exchange Agreement. The last option assumed the construction of a small coal-fired thermal plant. The last option would have to be accompanied with sale arrangements for the few years that the total plant output would be surplus to the company's needs.

See the appendix for a discussion of resource options.

## Least Cost Scenarios

By utilizing the WUTC's least-cost planning model, several variations of the base case can be developed, and assessments can be made of the financial impacts of each variation on the company. The variations deal with changes in future resource additions, as well as changes in real price escalation of fuels, changes in financial parameters, and changes in load growth. Having a multitude of "what if" scenarios gives utility planners a chance to assess the impacts of a number of possible futures by changing the input variables. In the face of future uncertainty, the resulting outputs allow the company to assess the financial impact of each scenario and determine which is most likely to provide the lowest cost to the company and its customers.

See the appendix for a summary of least-cost planning model outputs.

# CONSUMER INFORMATION

The company's net system energy load is composed of three main categories: residential, commercial and industrial. Also included are losses (distribution and transmission), street lighting, and four wholesale for resale customers. The energy load peaked in 1981 and was approximately 105 aMW greater than the energy load experienced in 1987. Since 1970, the energy load has increased at a compounded annual growth rate of 1.92 percent, even though the industrial load has decreased. For 1987, WWP's energy load was 766 aMW, while the peak load of 1,348 MW occurred on January 16, 1987. The record one-hour system peak load (adjusted for borderline loads) of 1,614 MW occurred January 29, 1980, although an unadjusted net system peak load of 1,710 MW occurred on February 2, 1989. In 1978 the company initiated a conservation program for its residential customers.

## ELECTRICITY SALES

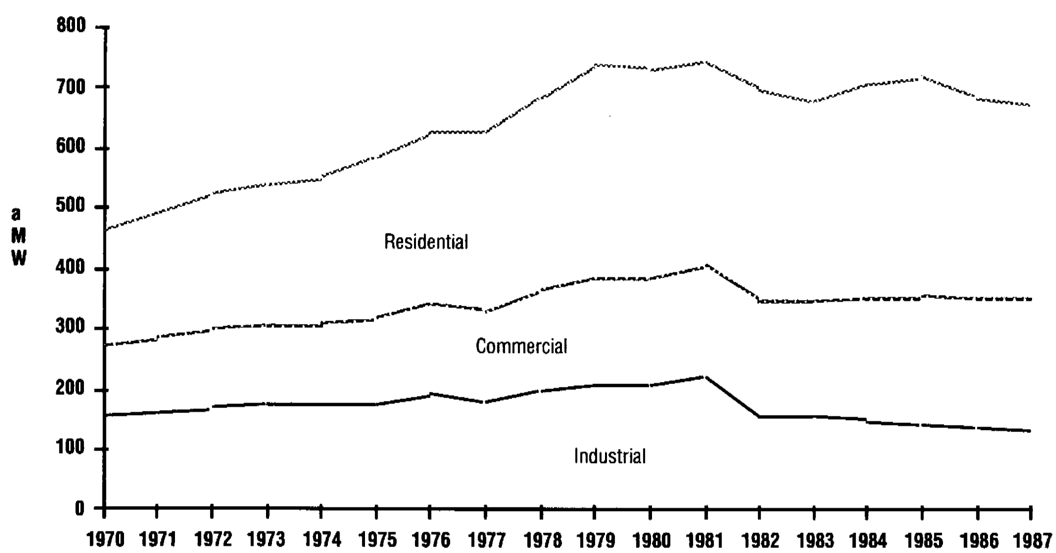



*Figure 3-1. Growth in WWP's electricity sales from 1970 through 1987.*

## PERCENT OF 1987 DOLLAR SALES

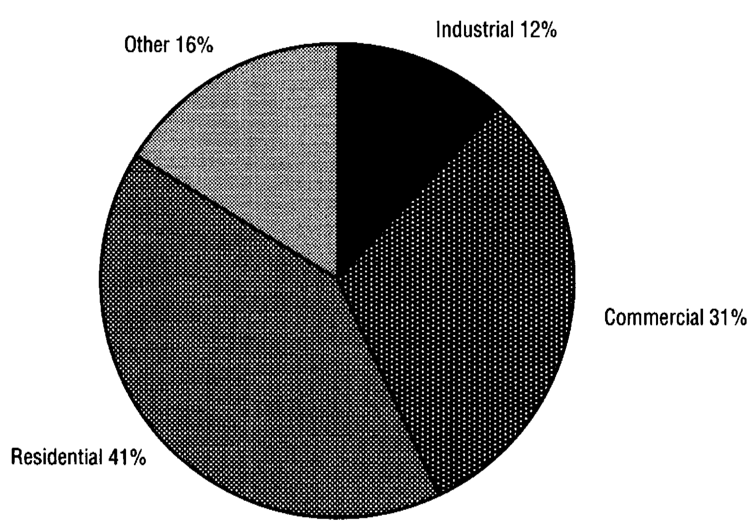
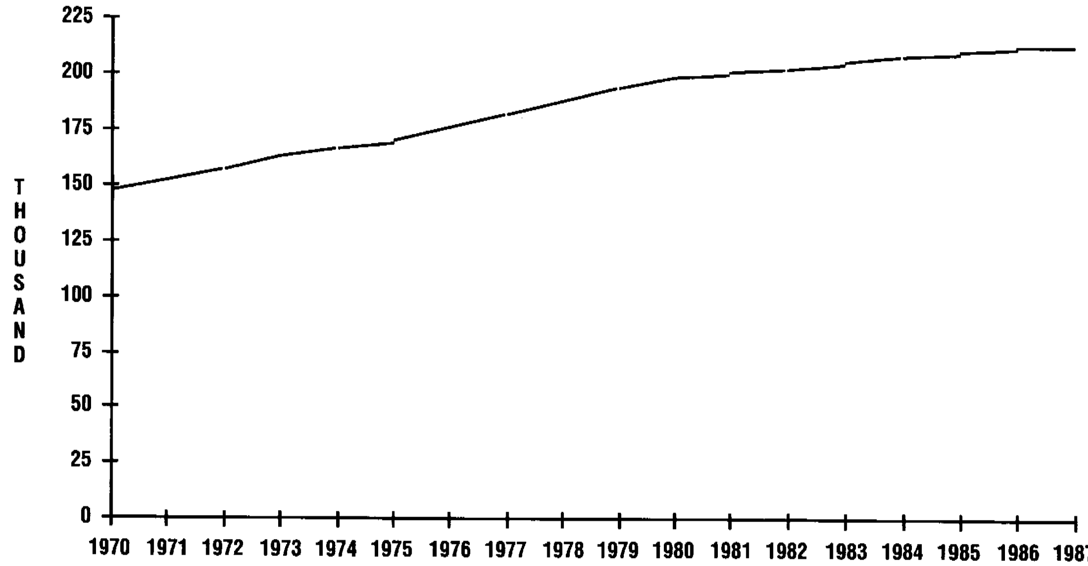



*Figure 3-2. Distribution of WWP's electricity sales in dollars for 1987. Total sales that year amounted to $324,405,612.*

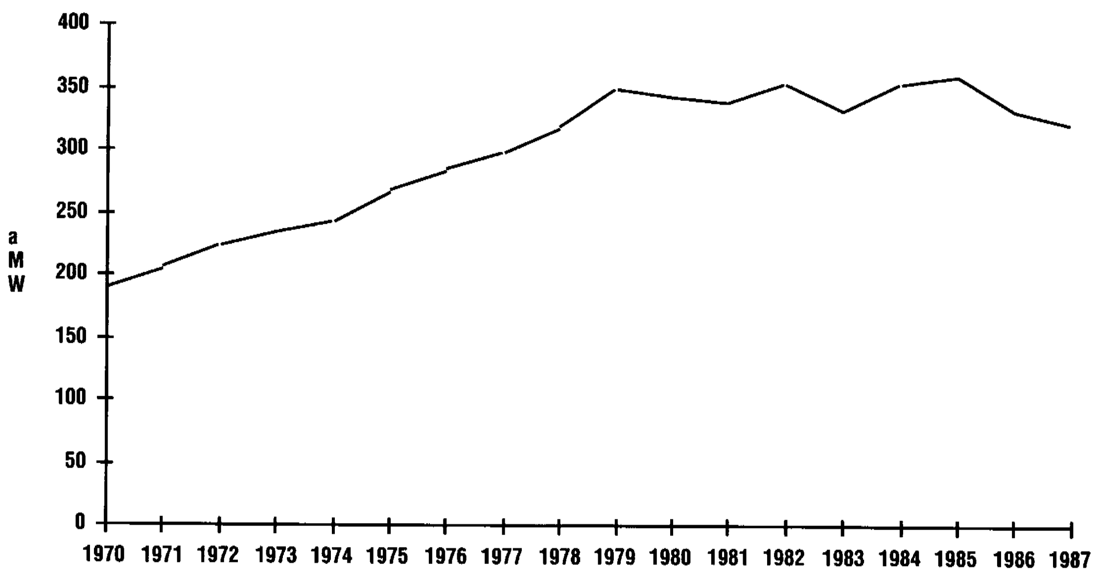
## NUMBER OF RESIDENTIAL CUSTOMERS

*Figure 3-3. The number of residential electricity customers served by WWP from 1970 through 1987.*




## RESIDENTIAL ELECTRICITY SALES

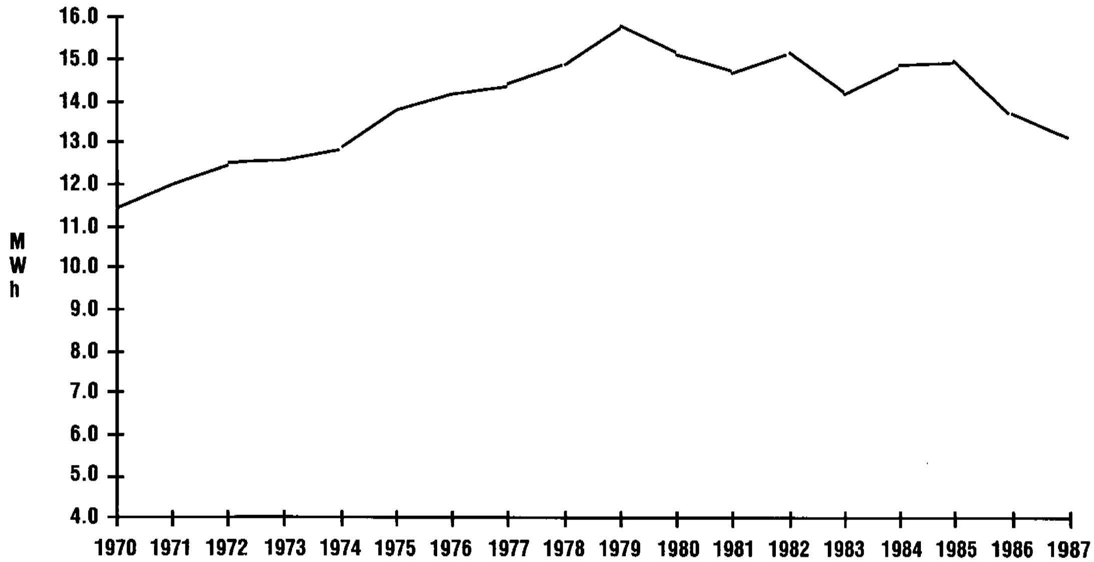
*Figure 3-4. Growth in WWP's residential electricity sales from 1970 through 1987.*




## Residential Sales

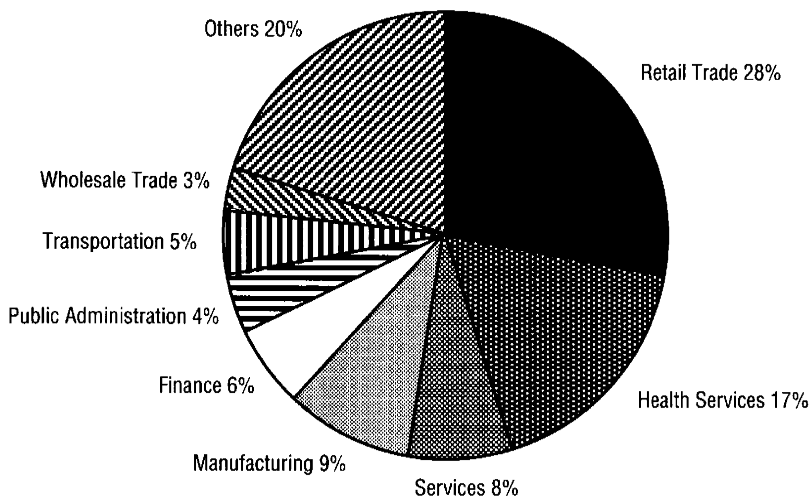
The company's residential electricity sales increased each year from 1970 through 1979, and peaked during 1985 at 361 aMW. Although the number of residential customers has steadily increased since 1970, residential sales since 1979 have fluctuated downward due to temperature variations, conservation activities, and availability (price) of alternate fuels (wood and natural gas). The residential kilowatt-hour (kWh) use per customer is significantly higher than the national average due to the concentration of electric heat. In 1987 the company had 214,479 residential customers who used an average of 13,062 kWh per customer. Of that number, 36 percent were classified as electric heat customers.

From a residential household energy survey conducted in 1986, it was determined that 83 percent use electricity for water heating but only 36 percent use electricity as their main




## ELECTRICITY USE PER RESIDENTIAL CUSTOMER

*Figure 3-5. Changes in average electricity usage per residential customer from 1970 through 1987.*




## PERCENT OF COMMERCIAL ELECTRICITY SALES

*Figure 3-6. Distribution of commercial sector electricity use by type in 1987.*

source for space heating. Other main fuels for space heating were natural gas (32 percent), wood (18 percent), and oil (13 percent). In addition, 25 percent use wood as a supplement to their main heating source.

## Commercial Sales

The number of commercial customers has grown from 19,078 in 1970 to 25,346 in 1987. This equates to a growth rate of 1.68 percent while the total usage in MWh has grown at a rate of 4.03 percent. In 1987 the commercial sector accounted for 31 percent of the retail sales of the company expressed in dollars of revenue.

The commercial sector in 1987 used approximately 223 aMW of electrical energy. The main areas of commercial activity were retail trade, services, manufacturing and finance.

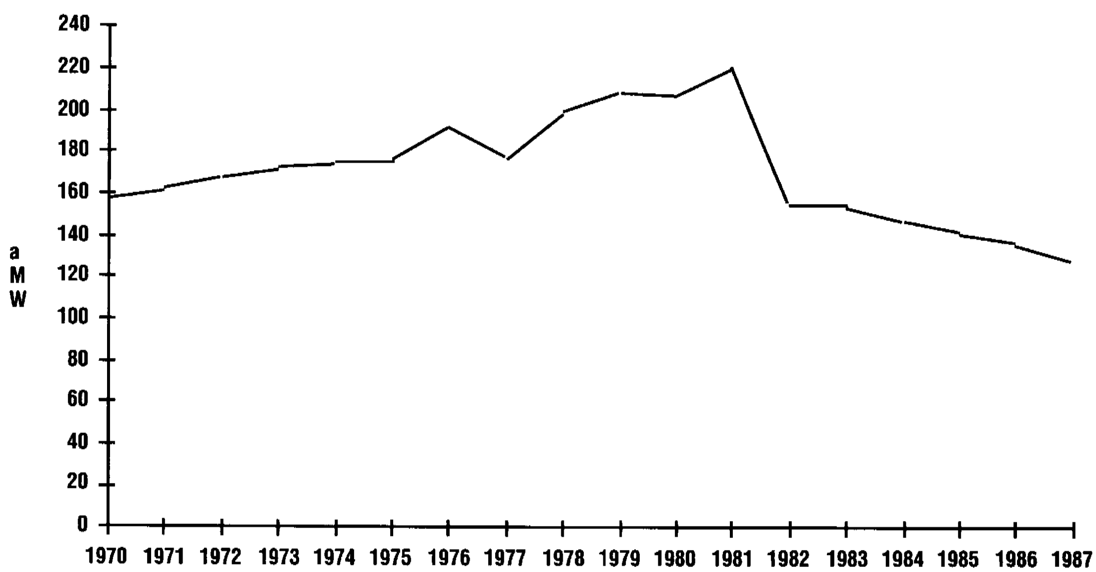
In an effort to learn more about WWP's large commercial/small industrial customers, a survey was conducted in January 1987. A questionnaire was mailed to approximately 5,000 of WWP's largest electric customers. The company received 1,762 responses to the survey. Responses were categorized by Standard Industrial Classification code. The survey analysis pointed clearly to the Services class as the market with the greatest potential for energy efficient load growth opportunities, as well as the market with the greatest risk for loss of electric and gas loads.

## Industrial Sales

The Inland Empire's economic base includes three basic commodities: forest products, mining, and agriculture. The industrial load reflects the economic variations which have been experienced in the company's service area. The number of industrial customers has declined since 1970. WWP had 1,278 industrial customers in 1970 and 973 customers in 1987. Since 1981, the industrial load has decreased due to soft markets in the forest and agricultural sectors and the closure of several mines and mining-related activities, such as the Bunker Hill smelter. In addition, some customers have switched to alternate fuels and/or installed cogeneration facilities.

### INDUSTRIAL ELECTRICITY SALES

*Figure 3-7. Growth in WWP's industrial electricity sales from 1970 through 1987.*



# FUTURE DEMAND FOR ELECTRICITY

Each fall, the company develops a long-term load forecast. The forecast provides the basis for much of the resource planning activity, and is the basis for this study effort in least-cost planning. The results of the forecasting effort become the official forecasting information supplied to regional entities such as the Pacific Northwest Utilities Conference Committee (PNUCC), Northwest Power Pool (NWPP), the Bonneville Power Administration (BPA), and the Western System Coordinating Council (WSCC).

## Economic Assumptions

The company has a contract with Data Resources, Inc. to provide economic data and forecasts for the Spokane vicinity using as a basis their national forecasts of economic activity. Personal income is a measure of economic activity. For the 1988-2012 period, the U. S. economy is expected to grow at an 8.1 percent annual rate, and the Spokane regional economy at a 7.3 percent annual rate. Inflation, as measured by the Consumer Price Index, is expected to average 5.5 percent in both areas.

## Price Assumptions

The price of electricity is a significant input to the economic model. Estimates of average price were projected to increase at the rate of inflation through 1996 and then to increase at one percent per year in real terms thereafter. Overall price increases average 6.3 percent annually between 1988 and 2012.

## Other Assumptions

The residential weatherization retrofit conservation program has been operating at the minimum viable level since 1986. Emphasis has been placed on low income and rental structures. No commercial or industrial conservation programs have been included in the forecast. Model Conservation Standards (MCS) for all new structures were assumed (both residential and commercial) as recommended by the Northwest Power Planning Council. Large industrial loads were determined from survey data for the first five years, and then assumed to increase at 1.2 percent per year. Residential electric heat saturation reaches 60 percent by the end of the forecast. This assumption is based upon natural gas availability and anticipated conversions from heating oil and natural gas.

## Techniques

The company's load forecasting methodology is an integrated econometric/end-use method. Some electric consumption behavior lends itself to economic relationships, while special relationships between users of electricity do not.

The econometric part of the model relates electric consumption to income and electric prices. Residential, commercial, and small industrial are examples of economic relationships. Large industrial, small utilities, system losses, and peak demand are special relationships. The weatherization program is a special relationship which is used to modify the economic relationship in the residential sector. Large industrial loads are based upon the previously discussed assumption, as is the weatherization program. Small utility loads are trended with company loads and represent less than four percent of the total. Losses are assumed to continue at the historical level of 8.5 percent. Street light loads are assumed constant. Peak demands are determined by trending monthly load factors.

## Results

The 1988 Long-Term Load Forecast is for a 20-year growth rate of 1.1 percent, which compares with the 1987 forecasted growth rate for the same period of 1.5 percent. In the residential sector, the company expects to add about 38,000 new customers in the next two decades. The overall residential electric growth rate for the 20-year period is 0.9 percent. The number of commercial customers is expected to increase by 4,700 in 20 years. The electric growth rate averages 1.8 percent through the year 2008. Industrial loads are expected to increase an average 0.4 percent per year. Several large industrial customers are assumed either to self-generate or to close down during the forecast period.

## Sensitivity

The load forecast described above is considered the most likely, or base case, medium forecast. In this sense, most likely means the fifty percentile forecast. Thus, there is a 50 percent chance that actual loads will be below the estimate and a 50 percent chance that they will be above the estimate.

Low and high load growth scenarios have been developed to show the effects of varying load growths on the company's resource needs. The 20-year growth rate for the company under the various load scenarios is as follows:

| Scenarios | 20-Year Load Growth |
|---|---|
| Low | 0.1% |
| Medium (base case) | 1.1% |
| High | 2.1% |

These scenarios were developed without the use of sophisticated models, and without relating them directly to regional or national alternatives. The purpose was to indicate a range, not to tie economic projections to them.

The low forecast assumes: (1) one-half the growth rate of personal income and population; (2) zero growth rate for remaining large industrial customers (half of whom close); (3) zero electric price increase (in real terms) after a five percent rate hike to remaining customers to recover fixed costs; and (4) no further improvement of MCS codes beyond those currently in force.

The high forecast assumes: (1) a fifty percent increase in the growth rates of personal income and population; (2) a fifty percent increase in the growth rate of large industrial loads; (3) a thirty percent increase in base rate electric prices by 1991; (4) development of new MCS codes which improve thermal efficiencies of homes; and (5) a 5,000 kWh per year decrease in average electric heating loads resulting from increased use of natural gas for heating.

These forecast ranges can be compared to the November 1988 Draft Supplement of the 1986 Northwest Power Plan (88-21) recently released by the NPPC and BPA. The company's estimates compare most closely to the "sales" forecasts in Table 2-5, page 2-13 of that document, although the programmatic conservation available from existing customers is being considered a resource for these purposes. The following table compares the forecast growth rates:

| | WWP | Region BPA/NPPC | Investor-Owned Utility (IOU) BPA/NPPC |
|---|---|---|---|
| High | 2.1 | 2.4 | 3.1 |
| Medium | 1.1 | 1.0 | 1.6 |
| Low | 0.1 | -0.1 | 0.3 |

These comparisons are complex because of the influence of BPA's Direct Service Industries on regional loads. No attempt is made, nor are any implications intended, to suggest that the company's loads are compatible with the customer mix of the region. The IOU data is the "price effects" only estimate, and shows a slightly different pattern.

# LEAST-COST PLANNING PROCESS

The WUTC least-cost planning model was used by WWP to evaluate alternative resource additions to the company. The model produces total revenue requirements, resulting retail rates and a weighted average incremental resource cost indicator. These results help narrow down the range of possibilities resource planners face in deciding on a future course of action relating to demand-side and supply-side resource options. As the decision point approaches in resource acquisitions, utility planners will use least-cost analysis along with experience and judgment to decide a prudent course of action.

The planning process must take into account a wide range of uncertainties. To do this, flexibility needs to be stressed in order that the planning process becomes the key and not the plan itself. In addition, non-economic factors (e.g., environmental factors, reliability, dispatchability, contributions to peak, seasonal output, uncertainty, fuel mix, impact on local economy, capital requirements, rate stability, and daily load matching capability) need to be reviewed, as well.

## Description of WUTC Model

The WUTC has developed a computerized model for use in least-cost planning and other regulatory forums where accessibility, ease-of-use, and rapid turnaround times are important. The model calculates financial and rate implications of a utility resource acquisition plan. The model also allows the user to generate multiple scenarios in order to examine the sensitivity of a resource plan to variations in parameters such as fuel costs and load growth.

The WUTC's least-cost planning model has several purposes. At the most basic level, the model is simply a "fill-in-the-blanks" spreadsheet that establishes the data requirements and planning assumptions the WUTC will require from each company. At its more sophisticated level, the model is a set of methodologies which takes this basic planning information and produces a number of financial statements.

The spreadsheet is not an "optimization" model, in that it does not attempt to produce a plan that minimizes or maximizes some objective. It does not search for the "best" least-cost plan. Rather, it records the results from an assumed plan and reports the power planning and rate implications of those assumptions. In other words, the model is of the "what if" variety. The model makes it possible to change the planning assumptions and test the results by examining the subsequent changes to the rates and revenue requirements.

The model is developed for determining relative impacts on revenue requirements and rates, and does not determine the expected level of those two outputs. The model also determines the weighted average incremental resource costs for each plan as another method of comparison. Costs of transmission and distribution upgrades, and of power plant upgrades and life extensions, cannot be estimated for 20 years, and can be expected to be largely independent of resource mix.

**The model is intended to help the WUTC do three things:**

1. Organize and present the data. The model relies on the information developed by each company in consultation with WUTC staff and the public participation process. The model helps standardize the presentation of least-cost planning information much in the same way that income statements and balance sheets help to standardize financial information.

2. Allow "what if" analysis. The model helps in identifying and measuring the uncertainties affecting the future choices facing the utility. Key assumptions can then be changed and power planning, rate, and financial results compared.

3. Improve the WUTC's ability to evaluate certain types of regulatory decisions. Some areas where the results from the model could have future uses are: (1) the setting of avoided costs for PURPA-type resources; (2) the determination of the cost effective level for conservation programs; (3) the setting of rate design policies; and (4) the evaluation of purchased power contracts.

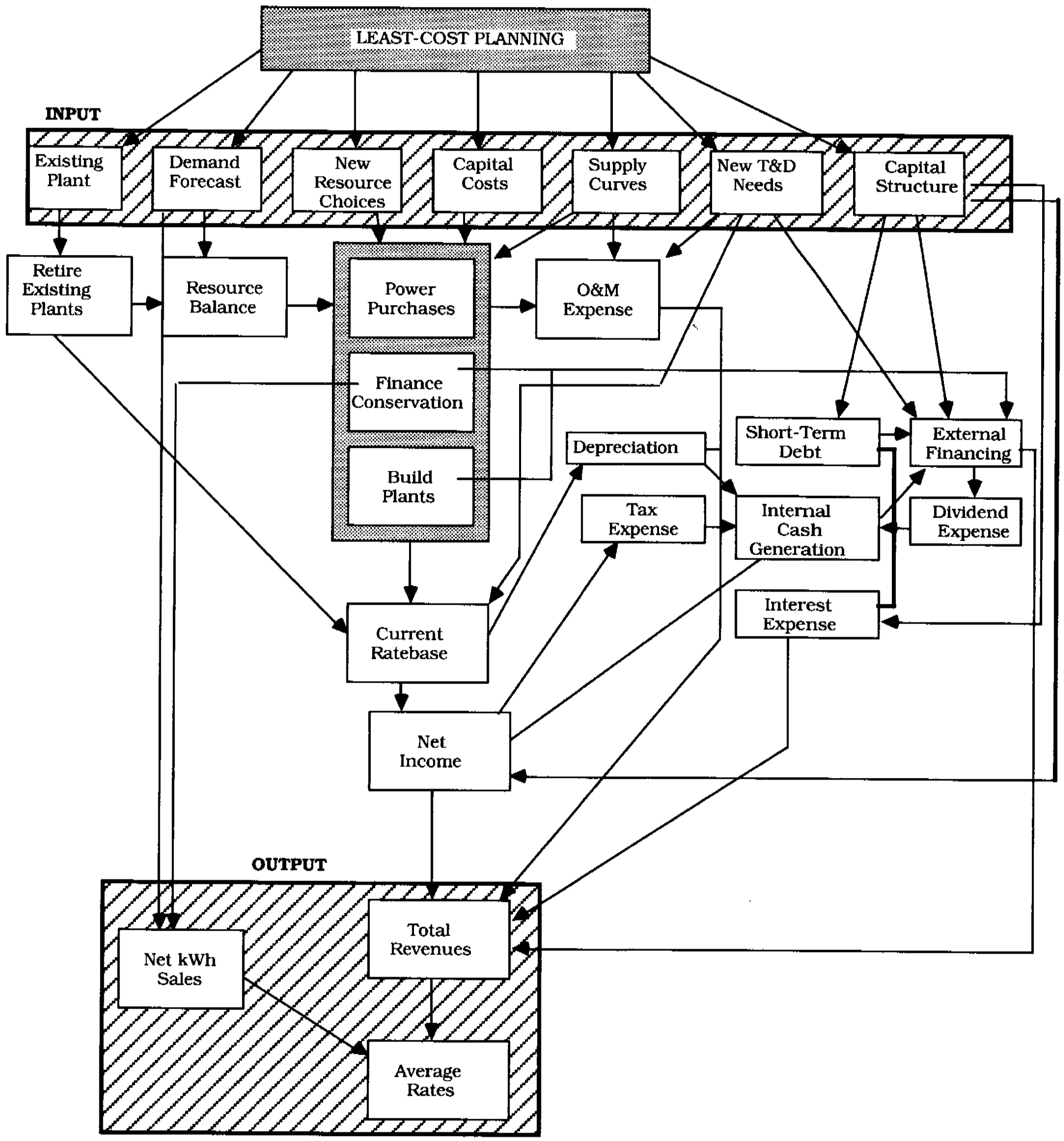
The model is menu-driven, flexible and fairly easy to use. New and existing energy resources can be described as specific projects or generic types. Users can specify as many resources and projection years as they desire. Input options are carefully tailored to the form and level of detail characterizing real world utility data. An output module produces a user-specified combination of balance sheets, key financial and rate indicators, and graphic comparison of indicator performance under different scenarios.

The flow chart shown below gives an overview of the general structure of the WUTC model, including the input data required and the resulting output.

## WUTC LEAST-COST PLANNING MODEL

## Version 2.0

*Figure 5-1.*



## Input Data to WUTC Model

The WUTC model attempts to forecast the relative effect of a variety of assumptions about the future on electric prices, revenue requirements, and weighted resource costs through the manipulation of key variables. The resulting forecasts appear to be most dependent on load growth and the real escalation of fuel prices. These variables, and the ranges of values examined in the analysis, are as follows:

**Key Values Used In The Analysis**
**Range of Real Annual Values**

| Variable | Low | Medium | High |
|---|---|---|---|
| Load Growth | 0.1% | 1.1% | 2.1% |
| Real Price Escalation: | | | |
| Coal | -0.1% | 1.3% | 1.8% |
| Gas | -0.7% | 2.3% | 4.5% |

These variables were studied in different combinations to determine an expected range of future rates, revenue requirements, and weighted resource costs. The medium coal and gas escalation rates were taken from NPPC data.

The WWP dispatch simulation model was used to calculate benefits from surplus sales which were input to the WUTC model under the base load growth scenario. The model then adjusted the benefits as the load growth was varied. The dispatch simulation model is used by the company to determine the level of non-firm energy sales and revenue and thermal production based on various streamflows and secondary market conditions.

Critical water production is used as the basis for the determination of resource additions. An amount of combustion turbine energy was assumed for each resource scenario because of the displacement potential available from hydro conditions better than critical. WWP used an upper limit of 45 percent of the difference in average megawatts between critical water and median water on the company's system. This gives an assurance that approximately 75 percent of the water years will produce sufficient hydro generation to displace the generation from the combustion turbine. Although high fuel costs make the cost of energy from combustion turbines high, the probability of not having to run them is also extremely high. The company is using its combustion turbines to firm up part of the available non-firm energy from its hydro system. This results in no change in the need for energy resources, but allows a different mix between capital and operating cost expenditures. It should be kept in mind that, although the probability of a need for combustion turbine operation is small, low water conditions on the company's system could necessitate turbine use, thereby increasing expenses for the purchase of natural gas or fuel oil. It is likely that these increased costs would need to be recovered through an increase in electric rates.

## WUTC Model Limitations

It should be kept in mind that the WUTC computer model is being used only as a tool to identify the relative impacts of resource plan alternatives on rates and revenue requirements. The model is fairly generic in nature and is not usable for setting rates or evaluating utility performance. Care should be used in employing the model to determine avoided cost. The model has several deficiencies (including not adjusting loads for price elasticity) that should be closely scrutinized before it is used for other purposes.

## WUTC Model Results

The WUTC model was used to test selected resource plans for the report. Detailed results from the model are summarized in Appendix C.

The resource plans tested represent a cross section of possible resource acquisition plans available to the Company. Each plan was subjected to varying coal, natural gas, and load escalation assumptions, although the gas escalation variable had no affect on plans that did not acquire a combined-cycle combustion turbine. Each plan acquired resources, in varying amounts to meet load in the following order:

1. Conservation
2. Cogeneration
3. Utility Purchase
4. Combined-Cycle Combustion Turbine
5. Conventional Coal Plant

These resource options and their costs are discussed in detail in Appendix A. Conservation and cogeneration resources are an integral part of all resource plans tested. Each plan acquires these resources in varying amounts under the assumption that they will be the resources of choice until their supplies are exhausted. Utility purchases, combined-cycle combustion turbines, and conventional coal plants make up the resource options available for the long-term.

The model results indicate that resource plans containing utility purchases and combined-cycle combustion turbines appear to be the most cost effective over the long-term. Conventional coal plants, however, emerge as a competitive resource option under high natural gas escalation scenarios, provided utility purchase opportunities are limited.

The weighted average incremental resource cost indicator varied as might be expected. The indicator increased as resource plans containing more expensive resources were tested. Under high load scenarios, the indicator increased, reflecting an increased need for higher cost resources.

The coal and natural gas escalation variables also had similar predictable effects on the indicator. The frequency distribution of the weighted average incremental resource costs for the resource plans tested can be found in Appendix C, "Model Output Summary."

The conclusion drawn from the WUTC model results is that there is no single resource plan that is ideal for all possible future scenarios. The model does indicate which resources appear to be the most cost-effective, however. Rather than select a single resource plan, the company should position itself to be flexible and to react quickly as future conditions become better understood. There are several actions WWP will take, such as performing detailed studies to reduce the uncertainty of resource costs, availability, and need. The company also plans to continue to acquire options on resources which look promising. These actions are detailed in Chapter 6, "Long-Term Strategy" and Chapter 7, "Action Plan."

CHAPTER 6

# LONG-TERM STRATEGY

WWP will continue to do long-term planning on a continuous basis as known conditions or the needs change. Changing conditions, such as fuel prices or supplies, require another view of the future as it relates to resources. Changing the need (as it relates to customer requirements resulting from population growth, inflation, industrial activities, etc.) also requires another look at the future and its impacts on resource strategy and planning. Throughout its planning history, the company has selected resources with the lowest cost, based on conditions known at the time the decision was made.

Much of the company's first experience in resource planning using the least-cost planning process outlined by the WUTC tended to reaffirm the validity of the planning methodology used by WWP in the past. However, the process also introduced new concepts which give a broader view to the company, and which have proven to be beneficial. Public involvement in the resource planning area is one such concept. Forming a Technical Advisory Committee to review the draft report and offer suggestions on the economic assumptions used, the range of load growths, and the resource data, helped broaden the understanding of WWP's planners. The LCP process and computer model have shown to be useful tools in quantifying the financial impacts facing the company as it contemplates the future in demand- and supply-side resource acquisitions.

The next two years will be used to gather additional information and develop programs and studies which can be used in resource planning. This additional data will be used to better position the company in making the hard decisions of acquiring resources for the future. WWP will also continue to acquire cost-effective lost opportunity resources (such as hydro system improvements) and will develop options to minimize the long lead times of resource permitting and construction. See Chapter 7, "Action Plan," for a list of events to be undertaken during the next two years.

In addition, the company is striving to maintain its position as a low-cost supplier of energy to its customers. The goal is to be competitive with other energy suppliers in the production and distribution of energy services. To do that, WWP is working on the premise of making service first, keeping costs down and revenues up. In order to keep the company's generation and transmission costs stable, WWP is seeking to improve the operating efficiencies of its generating plants. While the use of energy to increase one's standard of living is encouraged, the wise and efficient use of energy is also being promoted.

Also during this period, WWP will be actively engaged in selling any and all surplus capacity and energy on its system on the wholesale market. In addition, the company is promoting economic growth in its service area by encouraging the location of new industry, becoming increasingly involved in the brokering of energy supplies, and increasing transmission revenues by providing wheeling services to IPPs and cogeneration projects.

WWP's forecasts indicate a need for additional electric resources in the long term. This need for additional resources comes from a combination of increasing requirements and decreasing available resources. These resource needs can be met with a combination of demand- and supply-side options. Because the price of fuel, cost of resource construction, and rate of load growth in the future are uncertain, the company needs a portfolio of resource options which provide flexibility in meeting these uncertainties. The company does not want to tie itself down in meeting future needs through one type of resource addition. Flexibility in resource planning needs to be maintained in order that planning can be adapted to assure that the company can acquire new resources in the most cost-effective manner possible.

At this point in the planning process, it appears that the best strategy for the long term is to rely on five types of resources to supply the energy needs under a multitude of load forecasts. The resources are conservation, PURPA acquisitions, utility purchases/transmission expansion, combustion turbines with a combined cycle addition, and a coal plant. These resources are in addition to any cost-effective lost opportunity resources that the company will pursue, such as system hydro improvements.

Presently, conservation is considered the number one resource option due to price and availability. Determining the amount and cost of industrial and commercial conservation available is part of the two-year action plan. For the long term, as resources become needed, conservation programs will be evaluated against other resource alternatives and those conservation programs with the lowest cost will have first priority. Additional work needs to be done in the evaluation of conservation programs so that those selected will be best for the company and its customers, as they are integrated into the WWP system.

Purchases from PURPA-type resources and other utilities appear to have merit for the long term. Purchases need to be compatible with existing transmission system, or additional transmission needs to be built. The PURPA-type resources are those resources from which WWP can purchase electrical power, such as cogeneration and small power production facilities. The company is working closely with both state utility commissions in the determination of avoided costs, which is the price paid for PURPA acquisitions. In addition, as stated in the action plan, the company is working with the WUTC to integrate LCP into a proposed competitive bidding process. PURPA acquisitions appear to offer a significant potential to contribute to WWP's resource needs in both the short and long term. Purchases from other utilities can also play a significant part in the company's long-range strategy. WWP has relied on purchases and exchanges in the past to carry its wintertime loads. Power purchase evaluations and negotiations with other utilities will continue, in order that a least-cost determination can be made on additional resources, which will include power purchase and transmission/wheeling costs.

Combined-cycle combustion turbine power plants and conventional coal plants appear to be the supply-side resources offering the greatest potential for meeting resource needs over the long term. These two types of resources are proven technology and, with proper environmental controls, are acceptable forms of power generation. As the company approaches the time when decisions must be made on adding new resources, further evaluation of supply-side resources will be undertaken, and current uncertainties related to such resources, such as future fuel supplies and fuel costs, will be addressed.

Under medium load growth scenario, the least-cost planning computer model outputs indicate power purchases offer the best alternative for supply-side resources over the long-term. Under the high load growth scenario, the least-cost alternative would be to rely on purchases and combined-cycle generation. As mentioned in the report, other factors enter into the decision-making process in developing a long-term resource plan for the company. When resource decisions are required, these factors and up-to-date information will be used in assessing the best resource additions for the company. Using models to develop a multitude of "what if" scenarios gives the company a chance to evaluate the effects in planning for the future. The ultimate goal is to plan for resource additions which will provide the lowest cost to the company and its customers under conditions of uncertainty.

# ACTION PLAN

In its final Least-Cost Planning rule, the WUTC stated the need for "a short-term (i.e., two-year) plan outlining the specific actions to be taken by the utility in implementing the long-range least-cost plan." The company views this two-year action plan as a list of activities that will facilitate the accomplishment of its long-term strategy.

The company is aware of the need to collect, interpret, and analyze additional data, and to improve the analytical tools used in long-range planning. Many of the listed action items are a direct result of the input received from the Technical Advisory Committee.

Presently, the company is positioning itself in energy supply markets by maintaining competitive energy prices through cost containment and revenue enhancement. Because of this, and the absence of a need for energy resources until the mid-1990s, the company is not planning on large expenditures for the acquisition of demand- or supply-side resources during the next two years.

The two-year action plan is a list of items which will provide additional information and planning to better position the company to make difficult resource acquisition decisions in the future. WWP will continue during the next two years to acquire lost opportunity resources, if cost effective, and will also develop options to minimize the long lead times of resource construction. The company's action plan includes developing programs and studies, gaining additional information, and evaluating resource opportunities.

## Developing Programs and Studies

**Industrial and Commercial Conservation** - During the next two years the company's Marketing Department will develop an industrial and commercial conservation analysis which will be applicable to WWP's customers and fit WWP's future energy needs. The cost of various conservation measures for WWP's service area will also be determined. This analysis will be used to support the development and implementation of an industrial and commercial conservation program plan.

**Model Conservation Standards** - The company is actively promoting the adoption of MCS within its service territory. WWP will continue to work with state agencies and the legislature to get building codes passed for both the states of Idaho and Washington. In addition, work will continue with several cities and counties to extend the adoption of building codes, if they already have them, or to adopt codes if none now exist.

**Capacity Planning** - The company will initiate a study and implement a method to incorporate its capacity needs into the LCP process. This first formal effort at LCP addressed only the energy needs of WWP. In order to have a complete resource plan, other factors need to be considered, such as the need for capacity to meet the maximum demand requirements of the system. Various types of resources contribute differently to the relationship of energy and capacity output. Some resources operate more efficiently base loaded than in a cycling mode for meeting capacity demand. These types and combinations of resources need to be evaluated in the overall resource acquisition plans of the company to ensure the least-cost scenario has been determined.

**Transmission and Distribution Savings** - A study will be completed to determine and evaluate the potential for transmission and distribution line loss savings within the company's service area. The magnitude of savings and costs will be the end result of the study to be used in the determination of whether to proceed with implementation.

**Biomass and Cogeneration** - A study will be finalized during the next two years to assess the potential availability of cogeneration and biomass fuel in WWP's service territory. The amounts and costs of each category will be identified.

**Competitive Bidding** - A program will be initiated to integrate LCP into the proposed WUTC Competitive Bidding process. Adjustments will be determined and evaluated in the LCP model so it can be used as one of the tools in determining the size of the block of resources needed, and the maximum or ceiling costs associated with that block. Work will continue in this area in conjunction with the WUTC staff.

## Gaining Additional Information

**Conservation Activities** - The company will continue to monitor conservation activities, methods and programs within the Northwest. Those conservation items that appear to be worthwhile and cost effective will be evaluated within the context of what is best in the company's service area and beneficial to the company's customers. Information will be gathered from many entities, including other utilities, BPA, and the Northwest Power Council.

**Economic Variables** - Additional up-to-date financial and economic variables will be gathered and evaluated to determine their impact on the LCP model. If these economic variables significantly affect the output of the model, they will be incorporated into the next formal submittal of the LCP Report. Some of these economic variables are: inflation rate, construction capital cost, and company's cost of capital.

**Computer Models** - A comparison of various available models being used to facilitate resource planning and optimization will be made. Their benefits to the company's planning process and cost will be evaluated. The company is aware of the need to continue to improve the planning process through different methods, including the use of available tools such as computer models. Enhancing the LCP process for the future is beneficial to the company.

**Power Council's Activities** - The company will continue to utilize information developed for the region by the Northwest Power Planning Council. WWP will monitor the Council's activities in addressing the major issues identified in the draft 1988 Supplement to the 1986 Northwest Power Plan dated November 1988. Some of these major issues include: strategies to make better use of the hydro system, cogeneration, conservation voltage regulation, and transmission/distribution efficiency improvements.

## Evaluating Resource Opportunities

**Hydro System Improvement** - WWP will continue to evaluate its hydro system improvement potential utilizing existing planning evaluation methods, including LCP. After extensive studies on a particular hydro site have been concluded and the hydro improvements have been shown to be cost effective against other supply-side resources, recommendations will be made to proceed. This type of resource activity is considered by the company to be a lost opportunity resource. The results of these planning evaluation studies, including LCP, will be used as input into the final decision of whether to proceed with the improvement of a particular hydro site.

**B. C. Hydro Interconnection** - Utilizing existing planning evaluation methods, including LCP, WWP's B. C. Hydro Interconnection option will be evaluated. The licensing and siting permits are being obtained in order to provide the company an option for additional power. This is an option which may or may not be exercized. When construction costs and power purchase costs have been finalized, the results will be assessed in determining whether this option is a least-cost alternative under presently known conditions.

# GLOSSARY OF TERMS

**aMW**
Average Megawatts (energy).

**Assured net energy resources**
The amount of energy from a resource which can be used to serve load.

**B. C. Hydro**
British Columbia Hydro and Power Authority.

**Base loaded**
A resource which operates more efficiently without being cycled.

**BPA**
Bonneville Power Administration.

**Capacity**
The maximum power that a machine or system can produce or carry under specified conditions.

**Capacity constrained**
A system or resource which has restrictions on peak output resulting from external factors.

**Cogeneration**
A facility that generates electricity and uses the waste steam for other purposes.

**Combined-Cycle**
Combustion turbine with the addition of a heat recovery boiler and a steam turbine.

**Conservation**
Spending dollars on capital improvements to reduce electrical consumption.

**Contributions to peak**
A resource added for energy which also provides capacity.

**Critical Period**
The sequence of low water conditions during which the region's hydropower system's lowest amount of energy can be generated while drafting storage reservoirs from full to empty.

**Cycling mode**
A resource which is operated in a manner which allows variation in output.

**Daily load-matching capability**
Availability of adequate resources to meet load changes during the day.

**Demand-Side Resources**
Resources that can be added to a utility system by reducing usage.

**Dispatchability**
The ability to operate or not operate a resource for economic reasons.

**DSI**
Direct Service Industries of Bonneville Power Administration.

**Energy**
The amount of electrical usage or output averaged over a specified period.

**Energy constrained**
A resource which provides limited output for some period of time as a result of limited fuel or water.

**FERC**
Federal Energy Regulatory Commission.

**Firm load**
Customer load served by a utility without a contractual provision for curtailment.

**Frequency distribution**
An assortment of data based on probabilities.

**Fuel mix**
The make-up of resources used to serve load by fuel type.

**IAP**
Intertie Access Policy.

**ICP**
Intercompany Pool.

**Inland Empire**
The area of eastern Washington and northern Idaho.

**IOU**
Investor-Owned Utility.

**IPPs**
Independent Power Producers.

**kW**
1000 watts

**kWh**
Kilowatt-hour = 1000 watthours.

**LCP**
Least-Cost Plan or least-cost planning.

**Levelized Cost**
The present value of a cost stream converted into a stream of equal annual payments.

**Net system load**
The total load of a system, including both firm and interruptible.

**Lost Opportunities**
Resources, which if not acquired or developed within a certain time, could be lost to WWP.

**MCS**
Model Conservation Standards.

**Mill**
The cost of electricity expressed as a tenth of a cent.

**MW**
Megawatts (peak).

**MWh**
Megawatt-hour = 1000 kilowatt-hours.

**Nominal Dollars**
Dollars that include the effects of inflation.

**Non-firm interruptible load**
Load which can be curtailed in response to a system emergency.

**NPPC**
Northwest Power Planning Council.

**NR**
BPA's New Resource Rate.

**NWPP**
Northwest Power Pool.

**O&M**
Operation and Maintenance Costs.

**Pacific Northwest**
States of Idaho, Washington and Oregon.

**Pacific Southwest**
States of California and Nevada.

**Peak**
The one hour maximum load usage or resource output.

**PNUCC**
Pacific Northwest Utilities Conference Committee.

**Present Value**
The worth of future returns or costs in terms of their value now.

**PURPA**
Public Utility Regulatory Policies Act.

**QFs**
Qualifying Facilities under PURPA (cogeneration and small power production facilities).

**Real Dollars**
Dollars that do not include the effects of inflation.

**Reliability**
A measurement of the percent of time a resource is available to meet load.

**Seasonal output**
Electrical output from a resource which varies in amount according to the season.

**Supply-Side Resources**
Resources that generate an electrical output into the utility system.

**TAC**
Technical Advisory Committee.

**Weatherization**
Home Insulation Program.

**Weighted average resource cost indicator**
The value used in fixing resource costs based on incremental expenditures (i.e., part of the LCP model output).

**WNP**
Washington Public Power Supply System Nuclear Project.

**WSCC**
Western System Coordinating Council.

**WUTC**
Washington Utilities and Transportation Commission.

**WWP**
The Washington Water Power Company.

# Demand-Side and Supply-Side Resources

# Demand-Side and Supply-Side Resources

WWP will select resources from both the demand-side and supply-side options resulting in a least-cost plan compatible with its energy needs. The resources that have been evaluated are discussed in this Appendix A. Each is briefly described in the following paragraphs along with specific assumptions used in this report.

From the demand-side resource options, conservation and cogeneration are utilized up to the estimated amounts that can be obtained in WWP's service territory at costs comparable with supply-side resources. Cogeneration from a customer perspective would be considered demand-side; however, cogeneration sold to a utility could be considered a supply-side option. Purchases from other utilities are also utilized in the resource mix. The supply-side generating resources that could be used by WWP in future resource scenarios, along with costs in mills/kWh, are shown in Table A-1. This data was derived from the Northwest Power Planning Council resource cost information summarized later in Appendix A.

**TABLE A-1**

**Power Cost of New Supply Resources (Mills/Kilowatt-hour in 1988 Dollars)**

| Plant Type | Capital (levelized nominal) | O&M Fixed | O&M Variable | Fuel Fixed | Fuel Variable | Total |
|---|---|---|---|---|---|---|
| Pulverized Coal-Fired | 38.8 | 4.9 | 2.3 | 1.3 | 16.4 | 63.7 |
| Atmospheric Fluidized Bed | 37.1 | 5.2 | 4.8 | 1.2 | 14.7 | 63.0 |
| Simple Cycle Combustion Turbine (capacity factor = 40%) | 23.8 | 0.4 | 0.5 | 0.0 | 36.3 | 61.0 |
| Combined Cycle Combustion Turbine | 13.2 | 1.0 | 0.1 | 0.0 | 24.1 | 33.4 |
| Coal Gasification Combined Cycle | 40.3 | 8.7 | 0.8 | 1.2 | 13.8 | 64.8 |

Note: The power costs in Table A-1 are calculated using the expected total annual cost of an isolated generating unit, including both the operating costs and annual, level fixed charges required to support the new unit investment. The capital costs are levelized over the life of the facility. The following equation demonstrates how the capital cost can be quickly levelized for comparison purposes:

$$COE = \frac{(\text{Capital Cost \$/kW}) \times (FCR) \times (1000 \text{ mills/\$})}{CF \times 8760 \text{ Hours/Year}}$$

Where:
COE = Cost of Energy (mills/kWh)
FCR = Fixed Charge Rate (levelizing factor)
CF = Capacity Factor.

The O&M and Fuel costs are first year costs. The present value of a new resource would have to be calculated over the plant lifetime, taking into effect the cost escalation of the annual operating cost factors for more direct comparison.

## Combustion Turbines

Combustion turbines are versatile forms of power generation. They are capable of burning conventional fuels such as natural gas and various grades of petroleum products. The units can be installed for peaking duty (simple cycle) or for intermediate and base load duty (combined cycle). Typically, the units have been used only to meet peaking loads. However, natural gas-fired units have proven to be attractive for cogeneration applications.

Oil-fired and gas-fired combustion turbines are also attractive for other reasons. The units have short construction lead times, low capital costs, and are economical in small sizes to more closely track load demand. They also have reasonable fuel efficiency and reliability, which results in low maintenance costs. Environmental emissions are minimized when using natural gas, although the possibility that gas-fired turbines may contribute to the "greenhouse effect" has not been ruled out.

The main concern in using combustion turbines as an energy resource is the uncertain future supply and cost of fuel. If natural gas becomes unavailable due to supply or cost problems, a coal gasification process could be added as a fuel supply.

The simple-cycle combustion turbine represents a relatively inexpensive power resource to construct. Its total cost, including capital recovery, is primarily made up of fuel (depending on capacity factor) and therefore is subject to the same uncertainties as oil and natural gas prices. The following information is used in this report for a simple-cycle combustion turbine power plant (1988 dollars), based on Northwest Power Planning Council data.

| | | |
|---|---|---|
| • Capital Cost (including siting and licensing cost and fuel inventory) | | $554/kW |
| • Annual Availability | | 85% |
| • Construction Lead Time | | 24 Months |
| • Siting and Licensing Lead Time | | 24 Months |
| • Fuel Cost | Variable | $3.16/MMBTU |
| | Fixed | Included in Capital Cost |
| • O & M Cost | Variable | 0.5 mills/kWh |
| | Fixed | $0.63/kW/Year |
| • Heat Rate | | 11,480 BTU/kWh |
| • Operating Life | | 30 Years |

Note: Data based on two 139 MW units (rated capacity).

A combined-cycle combustion turbine power plant is a combustion turbine with the addition of a heat recovery boiler and a steam turbine to capture the energy in the turbine exhaust. Electricity is produced from generators connected to the steam turbine and combustion turbine. The addition of combined-cycle equipment to a combustion turbine results in a more capital intensive power plant. However, because of more efficient use of fuel under normal capacity factors, the total cost of the electricity will be lower. This report uses the following information for a combined-cycle combustion turbine power plant (1988 dollars) based on Northwest Power Planning Council data.

| | | |
|---|---|---|
| • Capital Cost (including siting and licensing cost and fuel inventory) | | $636/kW |
| • Annual Availability | | 83% |
| • Construction Lead Time | | 36 Months |
| • Siting and Licensing Lead Time | | 24 Months |
| • Fuel Cost | Variable | $3.16/MMBTU |
| | Fixed | Included in Capital Cost |
| • O & M Cost | Variable | 0.1 mills/kWh |
| | Fixed | $7.51/kW/Year |
| • Heat Rate | | 7,620 BTU/kWh |
| • Operating Life | | 30 Years |

Note: Data based on one 420 MW plant (rated capacity).

A coal gasification combined-cycle power plant adds fuel flexibility to combined-cycle units. Fuel is derived from installing equipment at the site to convert pulverized coal into an intermediate quality gas. The deciding factor for installing this equipment will be the relative cost of fuels. The following information is used in this report for a coal gasification combined-cycle power plant (1988 dollars) based on Northwest Power Planning Council data.

| | | |
|---|---|---|
| • Capital Cost (including siting and licensing cost and fuel inventory) | | $1,874/kW |
| • Annual Availability | | 80% |
| • Construction Lead Time | | 39 Months |
| • Siting and Licensing Lead Time | | 48 Months |
| • Fuel Cost | Variable | $1.49/MMBTU |
| | Fixed | $8.60/kW/Year |
| • O & M Cost | Variable | 0.8 mills/kWh |
| | Fixed | $61.22/kW/Year |
| • Heat Rate | | 9,270 BTU/kWh |
| • Operating Life | | 30 Years |

Note: Data based on one 419 MW plant (rated capacity).

## Conservation

Conservation is the more efficient use of electricity and, in this report, is considered as a resource equivalent to one that generates electricity. This is based on the idea that one less megawatt needs to be generated at a new power plant for each megawatt of electricity saved. Conservation is an important part of the company's resource future. Programs such as water heater wraps and weatherization have been relatively successful. The conservation programs that the company has been involved in, as well as the existing and potential savings from these measures are included in the load estimates of the company.

**Residential Retrofit Weatherization Program** - Measuring the conservation savings from a weatherization program is at best difficult. Special care must be taken to avoid the pitfall of double-counting price elasticity consumption reductions against program savings. This problem is especially difficult in the case of WWP's program, where most weatherization projects were completed between 1979 and 1986—a period which produced an unprecedented increase in real electric costs of nearly 75%. The present estimate of program savings is eight average megawatts, or about 70 million kWh per year, which amounts to nearly 2,000 kWh per dwelling. Audits of expected savings averaged about 3,000 kWh per dwelling, with cumulative savings of over 100 million kWhs per year, or about 12 average megawatts. The lower post-elasticity responses correspond to a - 0.4 price elasticity coefficient. This is based on a study by the Northwest Power Planning Council during the summer of 1988, which indicated that about 60% of residential conservation was completed in investor-owned utility service areas, net of price effects. We estimate that five average megawatts of residential conservation is available as a discretionary resource, consistent with NPPC evaluation and cost.

12 Resid. WX
2 Water Heater wraps
2 Street Lights
16 aMW

**Residential Water Heater Wrap Program** - Logic similar to that used in weatherization is applied to this completed program. The savings is estimated at 1 average megawatt. Potential additional savings are addressed under appliance efficiency standards discussion below.

**Appliance Efficiency Standards** - New appliance efficiency standards have been incorporated in the load estimate. The cumulative savings in 1998 are 17 average megawatts, or about 600 kWh per customer.

**Residential Model Conservation Standards** - The MCS has been assumed to be fully implemented in the load forecast. Cumulative savings in 1998 are 12 average megawatts.

**Commercial and Industrial Conservation Programs** - The company has not operated commercial or industrial conservation programs, other than in an advisory capacity, except for a system-wide street light change-out program. Considerable uncertainty surrounds these customers. Based on a pro-rata share of the recent NPPC estimate of conservation potential for investor-owned utilities, WWP has estimated that 15 average megawatts of discretionary conservation may be available as a resource acquisition. Since the timing for resource acquisition is the mid-1990s, WWP expects to refine this estimate as implementation nears. WWP is monitoring customers' installations of energy conservation measures. WWP is also monitoring costs and new technologies as a part of its marketing effort. New construction already meets MCS levels, and is already incorporated in the load forecasts.

In summary, some additional conservation savings are available to WWP in the future. These savings are in addition to the existing efforts already in effect, any price-induced conservation measures and any gains from new building codes and other model conservation standards. WWP has estimated that there is a potential for 35 additional megawatts of conservation, in addition to what is already included in the load forecast, within its service territory. This amount can be acquired at a levelized nominal price of up to 50 mills/ kWh.

## Conventional Coal Plants

The company became involved with large coal plants in the early 1970s with the construction of a two-unit plant near Centralia, Washington. Construction costs are not as high as for a nuclear plant, but the fuel costs can be higher if coal transportation is required. Some coal plants are built at the source of the fuel, but this often requires a large capital investment in electric transmission facilities to get the power to the load.

Currently there are ownership shares available in existing coal plants that are considered surplus to the operating utility's needs. This study assumes that these purchase options will be gone by the time additional energy supplies are needed by the company in the mid-1990s.

Coal-fired generating plants are a commercially proven resource and should continue to be a viable resource option for the company. However, they do pose some environmental risks with ash and sludge disposal, and concerns of possible acid rain and "greenhouse effect" problems. Capital expenditures continue to be a concern because of the long lead time for construction and high capital cost. Because of low load growth projections in the company's service territory, a large coal plant doesn't fit the company's requirements, unless the company participates in a coal plant built for regional need. The report uses the following information for a pulverized coal-fired power plant (1988 dollars) based on Northwest Power Planning Council data.

| | | |
|---|---|---|
| • Capital Cost (including siting and licensing cost and fuel inventory) | | $1,825/kW |
| • Annual Availability | | 77% |
| • Construction Lead Time (months to first unit/complete plant) | | 60/72 Months |
| • Siting and Licensing Lead Time | | 48 Months |
| • Fuel Cost | Variable | $1.49/MMBTU |
| | Fixed | $8.60/kW/Year |
| • O & M Cost | Variable | 2.3 mills/kWh |
| | Fixed | $32.80/kW/Year |
| • Heat Rate | | 11,005 BTU/kWh |
| • Operating Life | | 40 Years |

Note: Data based on two 250 MW units (rated capacity).

## Distribution System Design

The distribution system is that portion of a utility's electrical network that connects the customer's load to the transmission system. It begins at the distribution substation where the voltage is reduced from the high transmission voltage to the distribution voltage. The distribution system includes all the facilities, such as poles, conductors, protective equipment, etc. required to move electrical energy safely and efficiently from the distribution substation to the customer's service connection point.

Through appropriate distribution system design modifications, energy savings can be realized but at an increased installation cost. For example, using a larger conductor on a distribution feeder can result in lower resistive losses. These energy savings can be realized in new feeder construction and rebuilds of the distribution system. The lifetime cost has to be evaluated to determine the most economic size of conductor.

WWP has identified three areas within the distribution system that have a potential for energy savings. The loss reduction areas are economic conductor sizing, installation of shunt capacitors, and economic transformer selection. Some savings have already been attained, however, further study is anticipated to determine additional savings. The savings have been reflected in the load forecast as a reduction in losses. Feeder voltage control has not been considered due to offsetting effects on the system.

In the case of line loss reduction by economic conductor sizing, the company has developed and has been using a methodology to evaluate the lifetime cost effectiveness of each proposed conductor. Variables include initial current, load factor, load growth, cost of energy, cost of demand and cost of money. Other benefits of increasing conductor size, besides a reduction in losses, include improved voltage levels, protective margins and emergency load transfer capability. The higher capital costs required by the use of larger conductors are currently being included in budgeted capital expenditures. The use of economically sized conductors increases the cost of new distribution construction by approximately 20%. For WWP, each year that economic conductors are installed will result in incremental savings of 0.2 to 0.4 average megawatts.

Line loss reduction by installation of shunt capacitors on distribution lines improves voltage levels and releases system capacity. Electric distribution lines typically have a reactive power component due to customer inductive loads, transformers, and inductive coupling between the power line conductors. This component results in line losses that must be made up by increased generation. Installation of capacitors at the source of the inductance is the most effective way to reduce the line losses and to reduce the generation requirements. As load grows, additional capacitors are purchased and installed on individual feeders. By 1990, the savings due to past and continuing capacitive correction are expected to be 15 average megawatts.

The choice of distribution transformers will affect losses on the distribution feeders, since each transformer has intrinsic core and coil losses. The use of improved core designs and larger wire in coils will reduce these losses, but the cost of the transformer will increase. A program using the company's cost parameters is being used to evaluate transformer bids. Since late 1981, this method has been used to buy more efficient and cost-effective distribution transformers. The higher capital expenditure required by the use of more efficient transformers is difficult to establish because most manufacturers now offer only low-loss units. When WWP began its program of evaluating transformer losses, the differential was approximately 10%. In 1987, this cost differential amounted to an estimated $146,000. By 1990, the savings due to reduced transformer losses are expected to be 2.5 average megawatts.

## Energy Storage

The company is monitoring information as it becomes available on all systems that have a potential to be used to ease peak load conditions in our service area. Energy shifting devices that will shift peak loads to off-peak hours and off-peak resources to peak hours are being evaluated. The company will evaluate the cost effectiveness of using these systems as more information becomes available and operating experience is gained. Additional hydro capability, such as pump storage, could also be used.

## Fluidized Bed

Fluidized bed combustion technology is in a period of refinement in the electrical generation industry with generation being currently constructed up through the 100 MW size. The manufacturing industry, the Department of Energy and various trade groups have been the major contributors to fluidized bed research and development. Because of its claimed versatility, excellent emissions control and fuel utilization characteristics, fluidized bed generation could be a promising energy resource for the future. Some concerns with this type of resource are being studied, such as erosion problems which would affect reliability.

The fluidized bed concept involves a process in which crushed and ground material (such as coal) is held in suspension with a cushion of air blown through a porous floor. The sulphur recovery is performed right in the fluidized bed with the addition of limestone to the bed. This may eliminate the need for large, expensive scrubber systems downstream from the combustion area as in conventional plants today.

The following information is used in this report for an atmospheric fluidized bed combustion power plant (1988 dollars) based on Northwest Power Planning Council data.

| | | |
|---|---|---|
| • Capital Cost (including siting and licensing cost and fuel inventory) | | $1,837/kW |
| • Annual Availability | | 81% |
| • Construction Lead Time | | 64 Months |
| • Siting and Licensing Lead Time | | 48 Months |
| • Fuel Cost | Variable | $1.49/MMBTU |
| | Fixed | $8.60/kW/Year |
| • O & M Cost | Variable | 4.8 mills/kWh |
| | Fixed | $37.1/kW/Year |
| • Heat Rate | | 9,885 BTU/kWh |
| • Operating Life | | 30 Years |

Note: Data based on one 197 MW unit (rated capacity).

## Fossil Fuel Price and Availability

The price and availability of fuel has a significant impact on the overall cost effectiveness of generating resources. In its resource planning, the company must incorporate these impacts when evaluating new generating resources. For this study, the company recognizes two primary fossil fuels as fuels for new resources. These fuels are natural gas and coal. It is generally agreed that there is an abundance of both natural gas and coal for the long term. The price of these fuels over the long term, however, is uncertain. Increasing concerns over environmental effects of fossil fuel use, especially coal, also created some uncertainty on the role of fossil fuel use in the Northwest.

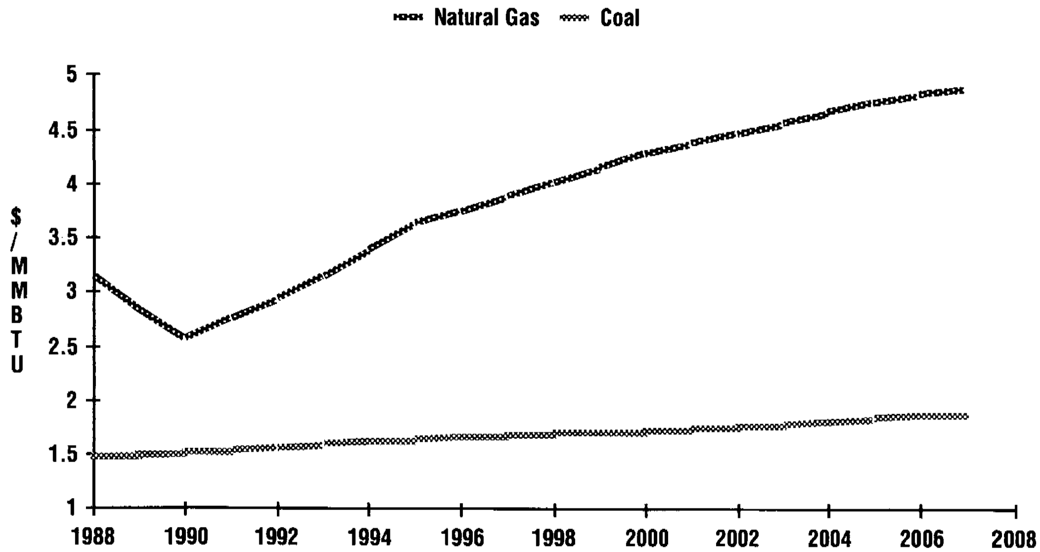
The recent decline in natural gas costs, combined with improvements in the performance of combustion turbines, has made the cost of energy generated from combined-cycle plants competitive for intermediate and base-load operation. Natural gas is also considered to be environmentally cleaner than other fossil fuels. The natural gas prices used for this study are based on Northwest Power Planning Council data. The price begins at $3.16/MMBTU in 1988, and escalates at an average real rate of 2.3% over the 20-year planning period. This price is based on a "hybrid" contract, which is the average of what firm and interruptible contracts are expected to be. The hybrid contract assumes the plant will be operated to back up non-firm hydropower.

Coal prices used in this study are also based on Northwest Power Planning Council data. Delivered coal prices begin at $1.49/MMBTU in 1988, and escalate at an average real rate of 1.3% over the 20-year planning period. This price is based on subbituminous coal from the Powder River Basin delivered by unit train to a Northwest site.

Figure A-1 below shows the expected natural gas and coal prices over the 20-year planning period based on Northwest Power Planning Council data.

## Fuel Cells

A fuel cell is a device which converts the chemical energy of a fuel directly to usable energy in the form of electricity and heat without fuel combustion as an intermediate step. The fuel cell is approximately 40% efficient when producing electricity and up to 80% efficient when operated in a cogeneration mode. Fuel cells generally show economic potential for commercial application such as restaurants, apartments and condominium complexes, and smaller sized industrial operations.




## NATURAL GAS AND COAL PRICE FORECAST

*Figure A-1*

The fuel cell can operate on any hydrocarbon fuel; however, currently natural gas is the only economic fuel available meeting the requirements of the cell. The cost of energy from a fuel cell is very high due to high capital costs. With improvement of the technology and mass production the costs should decline, allowing the fuel cell to become a part of WWP's resource alternatives.

## Geothermal

Geothermal energy is currently being used economically world-wide and offers a wide variety of applications. Unfortunately, there are no identified potential geothermal sites existing in the Inland Northwest capable of supporting an electrical generating plant. The nearest identified sites to the company's territory capable of supporting power generation are located in southern Idaho and southeast Oregon. A pilot project at a southern Idaho site is producing energy, but at a cost in excess of 200 mills/kWh. Because of the lack of supply and uncertain cost in WWP's area, this option is not considered further for this report.

## Hydro

The company service area has been estimated to have a total hydroelectric potential of approximately 3,000 average MW. However, only 324 MW of this potential is ultimately developable due to environmental constraints, minimum streamflow requirements, economics, and friction/efficiency losses. Of the 324 MW, 194 average MW can be considered firm power. The actual cost of energy from these projects is highly site-specific, with general cost estimates ranging between 45 and 130 mills/kWh. The hydro estimates are based on a study conducted by the Idaho Water Resources Research Institute (WRRI) under contract with the U.S. Department of Energy. Any independent small hydro development for this study has been included in the QF analysis.

One of the problems with small hydro development with minimal storage is the distribution of energy production during a year. Estimates show that 50-80% of the developable hydroelectric power will be produced during only four months of the year (April through July). Because of the surplus energy available in the region during this four-month period, the value of power produced from a run-of-river hydroelectric facility will be less than that of a comparable thermal facility that is capable of uniform annual production.

## Hydro System Improvements

Table A-2 shows the company's preliminary estimate of its system hydro improvement potential. Generally, the increases reflect improved output due to turbine and generator replacement/rehabilitation. In most cases, the additional energy is based on a theoretical maximum. It may not be feasible to achieve this maximum at some plants; further studies are needed. This report assumes that once the studies are finalized, any hydro system improvement will be completed if it is shown to be cost effective.

The costs shown have been based on EPRI's "Guide For Hydroplant Modernization." Contingencies ranging from 10-20% have been added in each case.

**TABLE A-2**

**WWP's Hydro System Improvement Potential (in 1988 Dollars)**

| Hydro Plant Name | Present Capacity Rating MW | Present Annual Net Gen. MWh** | Potential Firm Capacity Increase MW | Potential Annual Firm Energy Increase MWh | Estimated Investment Dollars $(000) |
|---|---|---|---|---|---|
| Noxon Rapids | 554.0 | 1,823,195 | 6.4 | 15,600 | 6,000 |
| Cabinet Gorge | 230.0 | 1,075,356 | 10.8 | 41,760 | 26,600 |
| Post Falls | 18.0 | 83,749 | 2.3 | 10,680 | 6,930 |
| Long Lake | 72.5 | 442,070 | 11.6 | 61,200 | 1,617 |
| Little Falls | 36.0 | 199,120 | 5.3 | 26,830 | 4,200 |
| Monroe Street | 6.0 | 43,036 | * | * | * |
| Upper Falls | 10.2 | 76,416 | * | * | * |
| Nine Mile | 18.0 | 111,113 | * | * | * |
| Meyers Falls | 1.3 | 7,667 | * | * | * |
| **Total** | **946.0** | **3,861,722** | **36.4** | **156,070** | **45,347** |

*These hydro projects are presently being evaluated for improvement potential, including plant and site modifications. Upper Falls improvements depend on what is done at Monroe Street. Additional monies are being budgeted to finalize the study phase and provide preliminary site evaluation.

**A yearly average based on ten years of data for 1976 through 1986.

As mentioned previously, the company is considering an overhaul of its plants on the Spokane River that could add modestly to its hydroelectric generating capacity. Applications filed recently with the Federal Energy Regulatory Commission, and published the first week in February 1989, outline projects that would upgrade the company's Monroe Street, Nine Mile and Long Lake facilities. Those plants are among WWP's oldest, and are being evaluated to see if there is a potential for expansion.

The Monroe Street facility was WWP's first hydro plant and dates back to 1890. Its five generators produce about 6 MW of electricity. A penstock — the pipe from the river to the generator — diverts about as much as 2,400 cubic feet per second of Spokane River water through the turbines. The river flow at that point in the river is closer to 6,000 or more cubic feet per second. The company is considering combinations of two plans for Monroe Street. One would use the existing penstock and powerhouse, but replace the existing generators with a single unit capable of producing 13 MW of power. The old generators are 45% efficient, compared with the 88% efficiency achieved by modern equipment. The most ambitious plan would add a second powerhouse and a penstock reaching farther up the river. Together with the upgraded original plant, the new facility would generate 37 MW.

The studies of upgrades at Nine Mile and Long Lake are just beginning. The license applications filed with FERC suggest the Nine Mile Dam might be raised or replaced by a dam 10 feet higher, which would increase the reservoir behind it to 500 acres from 420 acres. Generating capacity there now is 18 MW. At Long Lake, a retention dam might be filled with a new penstock and powerhouse. Capacity there now is 72.5 MW. The company is in preliminary studies regarding these two projects and does not know yet how much power those projects could produce.

The Monroe Street costs will not be known until June. Using those costs in its planning studies, the company will then decide how to proceed.

Environmental studies will be conducted as part of the licensing process. No effect on Riverfront Park in downtown Spokane is expected from additional flows through the river's south channel, but there may be short-term disruptions while the channel is relined and the intake expanded. Licensing for the Monroe Street plant should be completed by the spring of 1991. The renovated facility would be ready a year later. The second powerhouse, if cost-effective, would not be completed until 1994.

## Load Management

Load management programs are helpful tools in shifting energy load from heavy on-peak hours to off-peak hours. These tools include specialty rates, interruptible rates, and direct load control devices. This report evaluates energy resource options and therefore load management programs are not included. As the need for additional peak resources becomes apparent, load management options will be evaluated against other peak resources.

## Nuclear

Although the company has been involved with nuclear energy production of electricity since 1966, the company is no longer considering future nuclear generation options. Nuclear power could still be an important source of energy in the future. However, nuclear power has lost the momentum it once had due to the long lead times required to construct a nuclear project, the extremely high construction costs, and the excessive regulation of that industry. Under these current conditions, the company will not be involved in any new nuclear projects.

## Options

Should WWP's loads grow rapidly in the near-term, more resources than just conservation will be needed. A new concept in resource planning, first proposed by the Northwest Power Planning Council, uses resource "options" to add flexibility to the scheduling of those resources which take a great deal of time from inception to completion.

Under the resource option concept, a resource proceeds through the time-consuming, but relatively inexpensive, siting, design and licensing stages. After completing those stages, it can be placed in a standby condition. In that condition, the project could be constructed, placed on hold or terminated, depending on the demand for electricity. Such options would provide a relatively low-cost resource inventory that would allow the company to be ready for high growth rates without prematurely committing to build for those growth rates.

The cost of developing options is typically small compared to the costs associated with resource construction. In addition, options substantially reduce the required time to complete resources. By having a licensed resource effectively "on hold," the period over which electricity needs must be forecast can be reduced to the resource construction period. WWP has two such options available, one of which is licensed and one of which is going through the licensing and permitting phase.

The first option is a licensed site available for future construction of coal-fired generating units, four miles southeast of Creston, Washington, in Lincoln County. Land options, licensing permits and a State Site Certification Agreement are being maintained by the company in order to keep this site available for future resource options. The company has received, when requested from the Environmental Protection Agency, extensions to the Prevention of Significant Deterioration Permit (PSD) for Creston. The company has finished working with the Energy Facility Site Evaluation Council to extend, for five years, the Site Certification Agreement. The agreement was signed by the Governor of the State of Washington in early February 1989. The site may be used as a regional resource depending upon other utilities' interests.

Another option currently being developed is the B. C. Hydro-WWP 230 kV Transmission Interconnection. It will provide a transmission intertie between the company's system at Spokane and the B. C. Hydro system near Trail, British Columbia, Canada. The main purpose of the proposed transmission line is to provide the customers of WWP and other Pacific Northwest utilities with access to a future source of economic power.

The intertie with B. C. Hydro is tentatively planned for completion in late 1995. However, construction will not begin until all power purchase contracts have been finalized and signed with B. C. Hydro, and the company is assured of a long-term power supply at a favorable cost. The favorable cost will include not only the purchase price of power, but also the recovery of capital costs of the intertie associated with the company's ownership share. If this resource option proves to be less cost effective than other alternatives, then this option will be placed on hold.

On October 15, 1987, the company filed an application with the Economic Regulatory Administration within the Department of Energy for a Presidential Permit to construct, operate, maintain and connect the double-circuit 230 kV transmission line with B. C. Hydro. The length of the proposed line is approximately 121 miles (from the international boundary to the proposed Marshall substation) and would require new right-of-way. Under the direction of the Department of Energy, an Environmental Impact Statement on the intertie is being prepared. Licensing is planned for completion by April 1990.

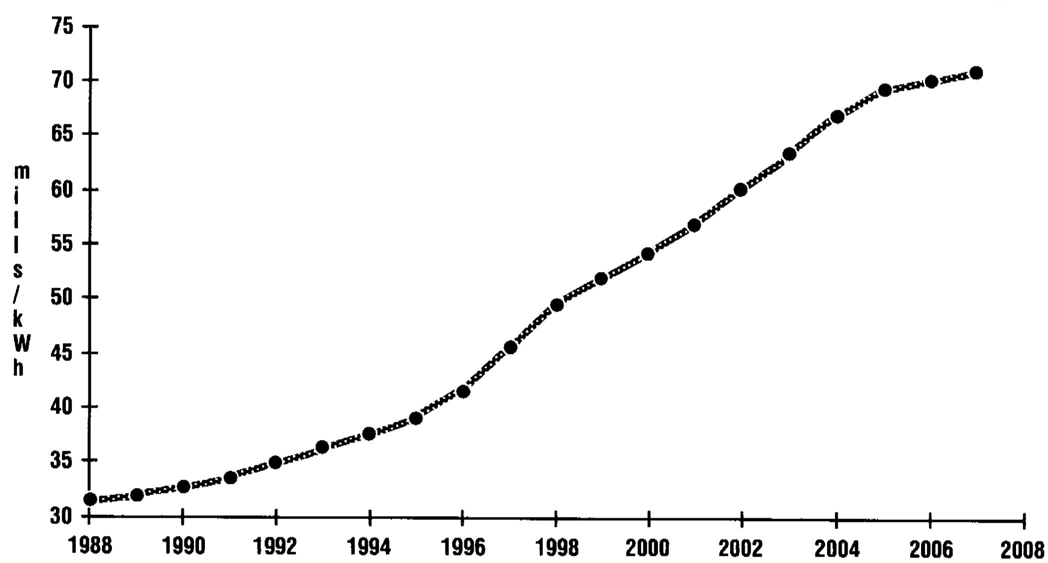
## Purchases

In the past, the company has had a significant share of its winter load requirements furnished by purchases or exchanges with other utilities.

For this report the company is assuming that any purchases available to it in the mid- to late-1990s will be priced at or below BPA's New Resource (NR) rate. The NR power is available to WWP and other investor-owned utilities (IOU) from BPA after seven years' notification. Purchases from other utilities will have to be below the NR rate to offset transmission costs in wheeling the power into WWP's system. One problem with the NR power is the uncertainty of what the NR rate will be in the future and the required seven-year lead time. As demand for purchases from BPA increases, the NR rate will increase as new generating resources are added to the NR resource pool. Figure A-2 below shows the NR Rate forecast at 75% load factor based on BPA's estimate.

**BPA NR Rate Forecast at 75% Load Factor**

*Figure A-2*




## Qualifying Cogeneration and Small Power

The Public Utility Regulatory Policies Act (PURPA) of 1978 requires utilities to purchase power from cogeneration and small power production facilities which qualify under PURPA and FERC's implementing rules. These facilities are commonly known as "qualifying facilities" or "QFs."

Cogeneration is the production of electricity and useful thermal energy through the sequential use of energy from a fuel source. Small power production is the production of electricity from renewable, biomass, or waste resources. Wind, hydro, ocean thermal, ocean wave, solar, etc. are all considered renewable resources. Biomass is any organic material not derived from fossil fuels. Waste is by-product materials other than biomass.

Stand-alone biomass generation (wood residue primarily from lumber mills) appears to be marginally cost effective when compared with conventional coal-fired thermal generation. Biomass-fired cogeneration systems in the Northwest appear to have potential as viable resource options. Small cogeneration systems (5 MW range) can be built at the fuel source, such as lumber mills, and as a result, will have minimal fuel costs. The use of steam from the cogeneration cycle by the host mill enhances the economics of such facilities. Costs of cogeneration facilities are highly site-specific. Costs used in this study for biomass-fired cogeneration facilities, are assumed to be the same as other cogeneration facilities.

The resource potential for other cogeneration facilities and small power production facilities in WWP's service area is good. QF development is valuable for several reasons, the first of which is that QFs can be added in smaller increments to more closely match load growth. QFs also have the benefit of having short construction lead times.

However, small scale technologies have some drawbacks. Reliability is questionable in some of the resource additions. In addition, QFs have been for the most part, nondispatchable, either because of contractual or economic reasons. For a large number of such facilities, utilities do not have the contractual means to shut down these resources when it is economical to do so. This can be overcome by developing contracts allowing for "economic dispatch."

There are also potential problems with interconnecting QFs to the company's system, a cost that needs to be considered. In some cases, QFs are sited in remote locations with limited service by WWP. Such QFs often require WWP to install significant system upgrades to handle the generation. Finally, QFs require significant contract administration efforts when compared to their modest amounts of delivered generation.

By the mid-1990s, when the company is forecasting a need for additional resources to meet forecasted requirements, much of the cogeneration potential will have already been utilized. Several large industrial customers are presently contemplating the addition of cogenerating units. These customers will either sell cogenerated energy to WWP, off-system to other utilities, or use the energy to reduce their load.

For this report, WWP has estimated that there is a potential of 156 megawatts of QFs in its service territory from industrial and large commercial customers. This number is based on data developed by the Bonneville Power Administration in its report entitled "Assessment of Commercial and Industrial Cogeneration Potential in the Pacific Northwest," December 1987. The BPA results were applied to specific WWP commercial and industrial data. This report also assumes that the majority of this cogeneration will be available at a levelized nominal price up to 50 mills per kilowatt-hour, although it is recognized that cost estimates for cogeneration facilities are highly site-specific.

## Solar

There are currently two solar power conversion systems available to convert radiant energy from the sun into usable electrical power. The first type consists of a field of heliostats (more commonly known as mirrors) that reflect the sun's rays to a central receiver point for indirect conversion to electricity. The second type utilizes a field of photovoltaic (solar cell) panels used to absorb the sun's rays for direct conversion to electricity. Each of these conversion technologies is proven and is commercially available, although the costs are high. In addition to the present high cost of solar energy, no capacity credit can be given to solar generation due to Pacific Northwest wintertime conditions when the time comes to evaluate capacity needs. Because of the associated high cost of energy, this alternative source of energy is not yet considered practical for development in the Northwest and as such, will be excluded from this report. However, individual use of solar for water and space heating could be cost effective. In addition, the use of photovoltaics has become more cost effective and will continue to be evaluated in the future.

## Wind

The process of converting power from the wind to useful energy has been around for many years. The company contracted with JBF Scientific Corporation of Wilmington, Massachusets, in 1981 to produce an analysis of the integration of wind electric generation into the WWP generating system. The cost of the wind turbines used in the study were approximately $1,560/kW (1988 dollars), but with only a 22% capacity factor, the cost of energy is approximately 121 mills/kWh. The conclusions reached were that the company's service territory does contain some areas with sufficient wind resource for the operation of large wind turbines, but that wind turbines are not economically viable to WWP during the 1985 to 1995 time period. Therefore, this technology is not considered a feasible resource option at the present time, but will be evaluated again in the mid-1990s.

# Public Involvement

Sharon L. Nelson, Chairman
Robert W. Bratton, Commissioner
Richard D. Casad, Commissioner

STATE OF WASHINGTON

WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION

*1300 Evergreen Park Dr. S. • Olympia, Washington 98504-8002 • (206) 753-6423 • (SCAN) 234-6423*

November 13, 1986

To All Parties Interested in Cause No. U-86-92

The attached proposed rules (WAC 480-100-251 and WAC 480-90-191) on Least Cost Planning were presented to the Commission on November 12, 1986. These rules are suggested as a possible alternative to the rules proposed in Cause No. U-86-92. The question of whether the Commission should initiate rule making on these new proposed rules will be on the agenda for November 26, 1986. Comments on these proposed rules may be forwarded to Paul Curl, Acting Secretary.

Very truly yours,

Paul Curl

Paul Curl
Acting Secretary

Attachment

NEW SECTION

WAC 480-100-251 LEAST COST PLANNING. (1) Purpose. Each electric utility regulated by the commission has the responsibility to obtain sources of energy supply or energy demand reductions to meet additional loads at the least total cost to the utility and its ratepayers. Therefore, a "least cost plan" shall be developed by each electric utility with the guidance of the commission staff. Provision for structured involvement by the public and other interested parties shall be made during development of the plan. Details of the process may be specified by commission letter.

(2) Definitions.

(a) "Least cost plan" means a plan for obtaining additional sources of energy supply or reductions in energy demand for the least total cost to utilities and their ratepayers.

(b) "Plan" means the least cost plan required by these rules.

(3) Each electric utility shall submit to the commission on a biennial basis, commencing September, 1987, a long-range (twenty year) resource plan. This least cost plan shall include:

(a) A range of forecasts of future demand growth using:

(i) End-use methodologies which calculate number, type, and efficiency of electricity end-uses in each customer class; and

(ii) Econometric methodologies which examine the impact of economic changes on electricity consumption. Historic figures used in these assessments shall be provided.

(b) An assessment of all supply options including conservation, renewable energy resources (e.g., wind, solar, geothermal, hydro power, biomass), cogeneration, power purchases from other utilities, and thermal resources (e.g., coal and nuclear). Historic figures used in these assessments shall be provided.

(c) An assessment of all demand options to achieve the full potential for cost-effective conservation and load management investments. Historic figures used in these assessments shall be provided.

(d) The integration of supply and demand options based on the relative cost-effectiveness of each option evaluated on a consistent basis.

(e) A short-term (two-year) implementation plan.

(4) All plans, beginning with the September, 1989, plan, shall include a progress report which relates the new plan to the previously filed plan.

(5) The plan will be used to evaluate the performance of the utility and the reasonableness of tariff filings seeking rate increases.

NEW SECTION

WAC 480-90-191 LEAST COST PLANNING. (1) Purpose. Each gas utility regulated by the commission has the responsibility to obtain sources of energy supply or energy demand reductions to meet additional loads at the least total cost to the utility and its ratepayers. Therefore, a "least cost plan" shall be developed by each gas utility with the guidance of the commission staff. Provision for structured involvement by the public and other interested parties shall be made during development of the plan. Details of the process may be specified by commission letter.

(2) Definitions.

(a) "Least cost plan" means a plan for obtaining additional sources of energy supply or reductions in energy demand for the least total cost to utilities and their ratepayers.

(b) "Plan" means the least cost plan required by these rules.

(3) Each gas company shall submit to the commission on an annual basis, commencing June 1987, a least cost plan for future natural gas supplies. The plan shall be designed to consider all potential methods of reducing company costs and shall include (at a minimum):

(a) Forecasts of future gas demand for firm and interruptible markets for one, five, and twenty years.

(b) The ratio of spot market to long-term purchases for firm markets.

(c) Opportunities for access to multiple pipeline suppliers.

(d) The effect of conservation programs on load leveling.

(e) Opportunities for storage.

(f) Participation in the gas futures market.

(g) The extent to which future demand will be met by conservation.

(h) Where assessments are based on historic figures, those figures shall be provided.

(4) All plans, beginning with the September, 1989, plan, shall include a progress report which relates the new plan to the previously filed plan.

(5) The plan will be used to evaluate the performance of the utility and the reasonableness of tariff filings seeking rate increases.

## Before The
## Washington Utilities and Transportation Commission

## COMMENTS BY THE WASHINGTON WATER POWER COMPANY
## On The
## Electric Utility Least Cost Planning Rule
## Thursday, January 29, 1987, 9:30 a.m.
## Commission Hearing Room, Olympia, Washington

The Washington Water Power Company offers the following comments on the Commission's proposed Least Cost Planning Rule.

First, it has been and is the Company's past and present policy and practice in meeting electric load to use least cost as the primary objective.

Second, the proposed rule has a laudable purpose, but may not improve our ability to actually implement a least cost plan. We believe that the supply and demand variability issue is large; inaccuracies of loads, reliability of resources, and uncertainties in costs cannot be ignored. The cost of planning must be balanced by our ability to evaluate the possible futures desired or expected. In other words, the results we may get from this effort may not lead to those expected.

Third, the process as we read it needs to incorporate options in terms of its submission requirements. The cost, ability, and needs of the affected utilities are different. We believe that there are different appropriate planning techniques for utilities. For example, utilities with rapid growth and with immediate resource acquisition decisions certainly have more extensive planning needs than do slowly growing utilities, like Washingtion Water Power, with no resource acquisitions planned for several years.

Fourth, we have the following specific recommendations:

--the "guidance of the commission staff" should be modified to reflect a cooperative effort theme.

--the structured public involvement provision should occur after the September 1987 Plan is submitted. We consider this issue complex, difficult, and expensive, and recommend that the development of effective public involvement should occur prior to the 1989 filing.

--the focus on "additional sources" of demand should be changed to encompass all loads served, both existing and new. Least cost planning should not simply be reserved for new loads and new resources, but for all loads and resources.

--we consider the forecasting ability of "end-use methodologies" to be inadequate and expensive for our needs, and that any benefits from them will be swamped by natural variability; providing both "end-use" and "econometric" evaluation is redundant; therefore, Section 3(a) should have "(i) or (ii)" rather than "(i) and (ii)".

--the September 1987 filing deadline affords the Company little time to provide anything other than presently developed methods and procedures which may not fully correspond to a strict interpretation of the rule; a recognition of this short time-frame with a focus on the September 1989 Plan would be more appropriate. Furthermore, since our current plans indicate that at this time we will make no resource commitments until after 1989, we believe that a 1989 focus will still provide timely information to the Commission addressing utility performance and tariff reasonableness.

--the biennial submittal is reasonable, but provision for changes in a rapidly changing energy economy are needed.

--in case the Comission is looking at the Northwest Power Planning Council's Plan as a model for Washingtion Water Power's plan, we believe that would be inappropriate. The Regional Plan is for a large area and justifies a greater amount of sophistication and expense; the Company generally supports the Regional Plan, but we believe that this level of complexity would not be justified for a small utility growing at less than 20 megawatts per year.

--unlike Puget Sound Power and Light, Washington Water Power provides electric service in both Washingtion and Idaho. Our planning framework is established to provide a least cost plan for the whole Company. We are concerned about the multi-jurisdictional questions that may arise during the development and implementation of our least cost plan.

Finally, a complete and thorough discussion regarding the specific definition of "Least Cost" should occur; we believe the appropriate timing for this discussion would be soon after the September 1987 filing. It should include, at the least, a full exploration of ratepayer costs, utility costs, shareholder costs, and societal costs.

The Company supports generally the written comments of Puget Sound Power and Light and Pacific Power and Light. In the context of electric utility planning, many of the written comments provided by the natural gas utilities are appropriate.

Respectfully submitted by Randall H. Barcus, Senior Economist and Least Cost Planning Coordinator for The Washington Water Power Company.

January 28, 1987

STATE OF WASHINGTON
WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION
1300 S. Evergreen Park Dr. S.W. • Olympia, Washington 98504-8002 • (206) 753-6423 • (SCAN) 234-6423

September 21, 1987

Mr. Paul Redmond, President
Washington Water Power Company
P.O. Box 3727
Spokane, Washington 99220

Dear Mr. Redmond:

Pursuant to WAC 480-100-251, please begin the process of preparing a least cost electric plan. The first step should be to develop, in consultation with WUTC staff, a work plan and public participation strategy.

As mentioned in the rule, the work plan should address the "content and timing of, and reporting for the least cost plan and the public involvement strategy...."

Steve Aos, the Policy Planning Administrator for the WUTC, will be the lead staff contact for this effort.

Sincerely,

Paul Curl

Paul Curl
Acting Secretary

cc: ✓ Randy Barcus

FINAL LEAST-COST PLANNING RULE - the process is initiated with a letter from the WUTC

NEW SECTION

A P P E N D I X A

WAC 480-100-251 LEAST COST PLANNING. (1) Purpose and process. Each electric utility regulated by the commission has the responsibility to meet its load with a least cost mix of generating resources and improvements in the efficient use of electricity. Therefore, a "least cost plan" shall be developed by each electric utility in consultation with commission staff. Provision for involvement in the preparation of the plan by the public shall be required. Each planning cycle will begin with a letter to the company from the commission secretary. The content and timing of, and reporting for the least cost plan and the public involvement strategy shall be outlined in a work plan developed by the company after consulting with commission staff.

(2) Definitions. "Least cost plan" or "plan" means a plan describing the mix of generating resources and improvements in the efficient use of electricity that will meet current and future needs at the lowest cost to the utility and its ratepayers.

(3) Each electric utility shall submit to the commission on a biennial basis a least cost plan that shall include:

(a) A range of forecasts of future demand using methods that examine the impact of economic forces on the consumption of electricity and that address changes in the number, type, and efficiency of electrical end-uses.

(b) An assessment of technically feasible improvements in the efficient use of electricity, including load management, as well as currently employed and new policies and programs needed to obtain the efficiency improvements.

(c) An assessment of technically feasible generating technologies including renewable resources, cogeneration, power purchases from other utilities, and thermal resources (including the use of combustion turbines to utilize better the existing hydro system.)

(d) A comparative evaluation of generating resources and improvements in the efficient use of electricity based on a consistent method, developed in consultation with commission staff, for calculating cost-effectiveness.

(e) The integration of the demand forecasts and resource evaluations into a long-range (e.g., twenty-year) least cost plan describing the mix of resources that will meet current and future needs at the lowest cost to the utility and its ratepayers.

(f) A short-term (e.g., two-year) plan outlining the specific actions to be taken by the utility in implementing the long-range least cost plan.

(4) All plans subsequent to the initial least cost plan shall include a progress report that relates the new plan to the previously filed plan.

(5) The least cost plan, considered with other available information, will be used to evaluate the performance of the utility in rate proceedings, including the review of avoided cost determinations, before the commission.

**Washington Water Power**

November 11, 1987

Mr. Steve Aos
Policy Planning Administrator
Washington Utilities and Transportation Commission
1300 South Evergreen Drive S. W.
Olympia, WA 98504-8002

Dear Mr. Aos:

In response to the Commission's request to the Company to prepare a least cost electric plan, pursuant to WAC 480-100-251, we have enclosed for your review and approval a work plan and public participation strategy.

We have begun the analytical activities in anticipation of your request, incorporating the additional work requirements along with our regular load/resource planning methods.

We look forward to your concurrence with our work plan.

Sincerely,

Randall H. Barcus

Randall H. Barcus
Least Cost Planning Coordinator

/jr

Enclosure



The Washington Water Power Company P.O. Box 3727 Spokane, Washington 99220 (509) 489-0500
SERVING EASTERN WASHINGTON AND NORTHERN IDAHO WITH ELECTRICITY AND NATURAL GAS

**DRAFT**

# Least Cost Planning Work Plan
# The Washington Water Power Company
# and the
# Washington Utilities and Transportation Commission

**November 1987**

1. Major Milestone Time Frames

•November 1987 - Commission approval of work plan for first least cost plan.
•January 1988 - Load forecast and economic assumptions prepared.
•March 1988 - Revised system model, resource planning model, and Commission Staff model completed.
•May 1988 - Complete sensitivity analyses for alternative assumptions.
•June 1988 - Draft Least Cost Plan published for internal review and sent to Technical Advisory Committee for written comments.
•July 1988 - Technical Advisory Committee meeting to discuss assumptions, models, and results.
•September 1988 - Complete internal corporate review, publish Draft Final Least Cost Plan.
•October 1988 - Hold a public meeting for the general public and for members of the Technical Advisory Committee to make oral or written comments.
•November 1988 - Present the Company's 1988 Least Cost Plan to Commission.

2. Major Planning Activities

•Supply and Demand-Side Options.
We have been researching and developing supply curves for elective conservation programs, demand-side peak load management, and generic power generation resources.

•Model Development.
We are presently developing a mini- "System Model" to provide simulation capabilities over a large number of alternative scenarios. We have developed a streamlined version of a Resource Planning Model which we will use to select resources in the Commission Staff's "Spreadsheet Model."

3. Reports to Commission Staff

•Load Forecasts.
We will submit to Staff documentation of our 20-year load forecasts, including alternative growth scenarios, in January 1988.

•Economic Assumptions.
We will develop economic assumptions, resource costs, and other assumptions generally consistent with the Northwest Power Planning Council, and by Puget Sound Power and Light, in their respective "least cost plans." We will report our exceptions to Staff by January 1988.

•Draft Least Cost Plan.
We will furnish to Staff and to a Technical Advisory Committee a fully documented plan in early June 1988. We intended to seek written comment within 30 days from this group. We will hold a Committee meeting in late July 1988 to address the comments.

•Final Draft Least Cost Plan.
We expect to release, for public comment, a Draft Final Least Cost Plan in early September 1988. This will be available to the general public, as well as the Technical Advisory Committee.

•1988 Least Cost Plan.
We will present our Final Report, incorporating public comments, to the Commission in mid-November 1988, or later as schedules permit.

•Continuing Activities.
After receiving approval from the Commission, we will seek direction from the Commission and Staff on improvements leading towards filing the 1990 Plan, including implementation of the actions expected to be undertaken.

Model development and associated research will be a continuing process, including monitoring of the Northwest Power Planning Council and other utilities' least cost planning methods.

4. Public Involvement

•Technical Advisory Committee.
The Company intends to form a committee comprised of technically capable individuals from State and Regional level agencies and organizations interested in least cost planning. In addition, we will seek local service area involvement by interested individuals to attempt to encompass the full range of views.

Because the Company expects to stipulate to many assumptions used in the Region, we expect that a single meeting in Spokane will be adequate to address concerns. We will, of course, welcome written comments extending past any meeting deadlines up to our filing in November 1988 of the Final Report.

•Customer Involvement.
The Company is presently in a surplus power condition and expects to make no resource acquisitions (conservation or power) other than lost opportunity resources. We are confident that we can respond to public comment in a single public meeting which we plan for early October 1988. At this meeting, members of the Technical Advisory Committee can make additional comments on the Draft Final Report.

•Future Involvement.
As the Company moves from surplus toward deficit, conservation and power resource acquisition decisions will become more frequent. At such time, in consultation with the Commission, we plan to expand our public participation.

**Washington Water Power**

**Robert E. Henriques**
Manager
Resources, Thermal & Planning

May 3, 1988

Mr. Jerry Wallace
Budget Officer
University of Idaho
Moscow, ID 83843

Subject: Least Cost Planning - Technical Advisory Committee

Dear Mr. Wallace:

The Washington Water Power Company (WWP) has been directed by the Washington Utilities and Transportation Commission to prepare a least cost electric plan (see attached letter). A key element of the process is solicitation of public involvement and formation of a Technical Advisory Committee. Participants in the Committee will have a unique opportunity to review, comment upon and influence WWP's future resource strategies.

You have been suggested as an individual who may have an interest in becoming a member of the Committee. If not, you may be aware of someone within your organization who would like to participate. We believe that it would be to our mutual benefit and we would be pleased if you or an appointee would represent your interests on the Committee.

Our schedule calls for completion of a draft plan by late June. If you accept the position, you will be provided a copy of the draft plan as soon as it is available. A meeting of the Committee is tentatively scheduled for July, at which time we would answer questions and receive your input.

Please let me know by May 16 if you are willing to support the process in any way. We look forward to working with you.

Sincerely,

Robert E. Henriques

Robert E. Henriques

HDY/jr
Attach.



The Washington Water Power Company P.O. Box 3727 Spokane, Washington 99220 (509) 489-0500
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**DRAFT**

# Least-Cost Planning Work Plan
# The Washington Water Power Company
# and the
# Washington Utilities and Transportation Commission

**July 1988**

Major Milestone Time Frames

- August 1988 - Commission staff model finalized and utilized in the development of selected scenario alternatives.
- October 1988 - Complete sensitivity analyses for alternative assumptions.
- November 1988 - Draft Least-Cost Plan published for internal review and sent to Technical Advisory Committee for written comments.
- December 1988 - Technical Advisory Committee meeting to discuss assumptions, models, and results.
- February 1989 - Complete internal corporate review, publish Draft Final Least-Cost Plan.
- March 1989 - Hold a public meeting for the general public and for members of the Technical Advisory Committee to make oral or written comments.
- April 1989 - Present the company's 1989 Least-Cost Plan to Commission.

Washington Water Power

Robert E. Henriques
Manager
Resources, Thermal & Planning

July 18, 1988

Mr. Steve Aos
Policy Planning Administrator
Washington Utilities and Transportation Commission
1300 South Evergreen Drive S. W.
Olympia, WA 98504-8002

Dear Mr. Aos:

As a follow up to our previous discussions, this letter is to inform you of a schedule change in the company's least-cost planning process. This change has been necessitated by factors which are beyond both of our control. We have enclosed a list of revised major milestone time frames, which are part of our approved work plan.

Please inform me if this schedule change meets with the Commission's and your approval.

Thank-you for your continued support in our least-cost planning efforts.

Sincerely,

Robert E. Henriques

Robert E. Henriques

HDY/jr

Attach.



The Washington Water Power Company P.O. Box 3727 Spokane, Washington 99220 (509) 489-0500
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# Washington Water Power

**Paul A. Redmond**
Chairman of the Board,
President and
Chief Executive Officer

July 18, 1988

Ms. Sharon L. Nelson, Chairman
Washington Utilities and Transportation Commission
1300 S. Evergreen Park Dr. S.W.
Olympia, WA 98504-8002

Dear Sharon:

Thank-you for your letter of June 29. In it you suggest that we review progress of the least cost planning process and that we restate our commitment to this effort. I agree that we have reached an appropriate point to do both.

It is my understanding that there have been some delays in the development of the Commission's Least Cost Planning Model. Without the model, it has been virtually impossible to begin evaluating resource alternatives. However, we have been proceeding with related activities which are not dependent on the model. We anticipate receiving a fully functional version of the model in the near future.

Your information and mine is the same regarding cooperation between Water Power's staff and the Commission staff. There appears to be an equal desire on the part of our respective employees to make the least cost planning process work. I believe that this is due, at least in part, to clear direction and a continuing commitment from the highest levels of both the commission and the company.

To fully utilize the public involvement process, including the technical advisory group, we believe the delays in model development require slippage of the entire least cost planning schedule. As I write this, the details of such a slippage are being discussed at the staff level. According to our discussions with Steve Aos, you have been made aware of this situation. Because this is a joint effort and because we are genuinely committed to successful implementation of least cost planning, a minor delay to improve the quality of the product seems preferable to the alternative.



The Washington Water Power Company P.O. Box 3727 Spokane, Washington 99220 (509) 489-0500
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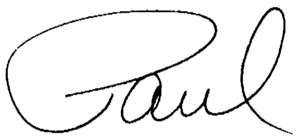
The objectives of better planning and improved regulation make development of a meaningful least cost plan a top priority of mine and The Washington Water Power Company.

Sincerely,



Paul A. Redmond
Chairman of the Board and Chief Executive Officer

SFA/jr

Washington Water Power

Robert E. Henriques
Manager
Resources, Thermal & Planning

November 23, 1988

Mr. Jerry Wallace
Budget Officer
University of Idaho
Moscow, ID 83843

SUBJECT: Least-Cost Planning - Technical Advisory Committee

Dear Mr. Wallace:

We have enclosed a draft copy of our Least-Cost Planning Report for your review. The draft includes Chapters 1 through 5 plus Appendix A and a summary of computer model results that show the revenue and rate impacts to the company based on resource acquisition scenarios.

Because of the holidays during the latter part of December, we have scheduled the Committee meeting for Thursday, January 5, 1989 from 9:00 a.m. to 4:00 p.m., with lunch provided. The meeting will be held in the Corbin Room at Cavanaugh's Inn at the Park here in Spokane, Washington.

We would appreciate your input (written or oral) regarding the economic assumptions used (Chapters 4 and 5), the range of load growths (Chapter 4), and the resource data (Appendix A). Also, any suggestions on how to present the results of the model output would be helpful.

We appreciate your continued involvement in WWP's Least-Cost Planning process. Thank you for your help and hope to see you on January 5.

Sincerely,

Robert E. Henriques

Robert E. Henriques

HDY/jr
Enc.



The Washington Water Power Company P.O. Box 3727 Spokane, Washington 99220 (509) 489-0500
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# Technical Advisory Committee Members for Least Cost Planning - Electric

**Mr. Fred Adair**
Research Analyst
House Energy & Utilities Committee
205 House Office Building
Campus Mail AS-33
Olympia, WA 98504

**Mr. Steve Aos**
Washington Utilities and Transportation Commission
Chandler Plaza Building
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**Mr. John Bjork**
City of Spokane
W. 808 Spokane Falls Blvd.
Spokane, WA 99204

**Mr. Andrew Cahn**
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Office of Public Counsel
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**Mr. Bill Campion**
Associate Dean, School of Business
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**Mr. Ken Canon**
Industrial Customers of Northwest Utilities
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**Mr. Bob Cooper, President**
Spokane Area Economic Development Council
Box 203
Spokane, WA 99210

**Mr. Tom Faull**
Idaho Public Utilities Commission
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Boise, ID 83720

**Mr. Jonathan Lesser**
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809 Legion Way SE, FA-11
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**Mr. Jim Litchfield**
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851 SW Sixth, Suite 1100
Portland, OR 97204

**Ms. Stephanie Miller**
Idaho Public Utilities Commission
Statehouse
Boise, ID 83720

**Mr. Phil Moeller**
Senate Energy & Utilities Committee
415 JAC Building
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Olympia, WA 98504

**Mr. William Nicholson**
Manager, Corporate Energy Services
Potlatch Forest Industries
P. O. Box 3591
San Francisco, CA 94119-3591

**Mr. Terry Novak**
City Manager
City of Spokane
W. 808 Spokane Falls Blvd.
Spokane, WA 99204

**Mr. Bob Sallee**
Technical Assistant to the President
Inland Empire Paper Company
N. 3320 Argonne Road
Spokane, WA 99212

**Dennis Scott**
Public Works Director
Spokane Board of County Commissioners
W. 1116 Broadway Avenue
Spokane, WA 99201

**Mr. Marc J. Sullivan**
Executive Director
Northwest Conservation Act Coalition
3429 Freemont Place No, #308
Seattle, WA 98103

**Mr. Jerry Wallace**
Budget Officer
University of Idaho
Moscow, ID 83843

**Mr. Phil Welker**
Energy Policy Specialist
Northwest Power Planning Council
450 West State
Boise, ID 83720

# WWP's Least-Cost Planning Technical Advisory Committee

## January 5, 1989
## Agenda

| | | |
|---|---|---|
| I. | Welcome<br>• Introduction of participants<br>• History of Events & Current Schedule<br>• Purpose of this meeting | Bob Henriques |
| II. | Resource Planning<br>• Overview of planning process<br>• Load/Resource analysis | Doug Young |
| III. | Planning Process<br>• Resource options<br>• Least-cost planning<br>• Model's usefulness and limitations | Dennis Vermillion |
| IV. | Other Issues | |
| V. | Closing Remarks | Bob Henriques |

**LCP - Summary of TAC Meeting Notes**
**January 5, 1989**

The Technical Advisory Committee meeting produced many comments, suggestions, and questions valuable to WWP's Least-Cost Planning effort. Since the majority of the comments fell under a handful of topics, we have grouped the comments into categories rather than list them in the order they occurred throughout the day. This should make the meeting notes more easy to follow. The categories identified for these notes are:

- General Topics
- Resource Planning and Related Issues
- Resource Cost Information
- WUTC Least-Cost Planning Model
- Load Forecast
- Conservation Resources and Related Issues

All of the comments contained in the meeting notes will be reviewed and incorporated in the final Least-Cost Plan where appropriate. The TAC meeting notes will be part of Appendix B - Public Involvement.

General Topics:

The company will accept written comments at any time. Best efforts will be made to incorporate the comments received at the March 2 public meeting (7 p.m. in the WWP auditorium) as well as comments received at the TAC meeting into the final LCP report. An executive summary and two-year action plan will be completed for the public meeting. Each TAC member will receive a copy plus a copy of the final draft LCP as soon as they are completed.

Resource Planning and Related Issues:

The Least-Cost Plan resulting from the LCP process will be a Company plan and not the commission's. The WUTC will not sign off on the report and give pre-construction approval. There is a good possibility that the report will be used in future rate cases. The company will be able to defend its resource decisions in future rate proceedings by referencing the Least-Cost Plan.

There was much discussion on critical water planning and the planned use of WWP's Northeast combustion turbine. The company resource planning is based on critical water assumptions, which means the company plans to meet its firm loads even under the worst multi-month period of actual historical streamflows (critical period). A better explanation in the report of WWP's planning criteria and critical water planning would be helpful. It was also noted that since Northeast CT is in place it can be an economically flexible and very significant resource. A description in the report of how the company handles CT energy in the planning process would also be helpful. It was also suggested that WWP evaluate the economics of CT operation using interruptible gas service since not many gas suppliers will commit to a 20-year gas contract because of pipeline capacity, gas price, or other uncertainties.

The efforts of WWP's Wholesale Marketing Group were a topic of discussion. Questions such as "...Should the company be selling power out of the system if there is a chance that the company is under high load growth scenarios? Are long-term sales being factored in? Do you plan on the medium load forecast only?" were asked. The company always looks at the long-term effects on customers of any long-term sale under many different scenarios. The Wholesale Marketing Group uses models to look at alternative scenarios and their effect on rates and revenue requirements.

Between 1994-2000, it appears the company will have to acquire resources to meet its energy deficiencies. There was considerable interest in what WWP is doing to plan for these acquisitions, and how the company will incorporate capacity needs in its energy planning. These topics will be discussed in the Two-Year Action Plan and/or Chapter 6 - Long-Term Strategy of the final LCP.

The "Lost Opportunity" resource concept was discussed (and how WWP's view differs from the NPPC). The company views resources such as the Spokane River hydro projects as lost opportunity resources because they could be taken away by another entity. The NPPC, on the other hand, views them as a resource within the region, regardless of who owns and operates them.

On page 12 of the draft report, it is stated that the amount of purchased power the company would contract for is limited to 10% of the company's system load. It was suggested that a discussion of the methodology behind this rule of thumb be included in the report.

Resource Cost Information:

WWP uses resource information developed by regional entities, such as the Northwest Power Planning Council. The company feels that the generic resource information developed by the NPPC is the best available for use in Least-Cost Planning.

It was suggested that all resource cost information used in the LCP modeling process be summarized in one table for easy comparison. The base line data for fuel prices should also be shown in this format. An explanation of the data displayed in these tables (such as table A-1) would also be helpful. The explanation should include references for the base line data, how the costs are derived from the base line data, whether the costs are levelized real or nominal prices, what discount rate is used, etc.

Under the Qualifying Cogeneration and Small Power section in Appendix A, a 150 aMW cogeneration resource is identified in WWP's service territory. This estimate is derived by combining market research data specific to WWP's service territory and results from BPA's December 1987 study titled "Assessment of Commercial and Industrial Cogeneration Potential in the Pacific Northwest." It was suggested that the methodology behind the 156 aMW estimate be more clearly defined in the report. It was also suggested that WWP perform its own detailed study to determine the the cogeneration resource potential (and costs) in its service territory (perhaps with the help of BPA). This study could also look at turning off certain industrial customers (e.g. the paper process industry) for a few hours each day with the right price incentive and promoting gas instead of electricity in the industrial sector as potential peak and energy resources.

Under the Distribution System Design section of Appendix A, distribution system voltage reduction is identified as a potential resource. There was considerable interest in distribution system loss savings. The NPPC sees this as a significant resource option that should be thoroughly investigated. Since there was not a member of WWP's distribution engineering staff present at the meeting, it was suggested that members of the NPPC staff contact WWP's staff to discuss the savings potential and the methodologies behind the estimates in the report.

Under the Wind section of Appendix A, it is stated that, based on WWP's wind resource study, wind is uneconomical in the company's service territory. There was interest in seeing the results of the study listed in the Appendix.

<u>WUTC Model:</u>
There was a considerable amount of confusion interpreting the summary of results of the representative model runs listed in Appendix C and as a result, there were several suggestions made for improvement. The model outputs currently appear to show the company "unbuilding" resources as the deficit decreases from one year to the next. This situation occurs periodically over the 20-year planning horizon as certain contracts and resources drop out of the resource stack. This misconception could be cleared up by showing the accumulative resource additions in each year, by showing the net surplus/deficit figures at the bottom of the summary page, by explaining what happens to surplus resources when the deficits

decrease, and by explaining the causes of the decrease in deficits (e.g.- the expiration of the Puget sale contract in the year 2002).

There were also several suggestions on what resource acquisition scenarios could be tested with the model and what parameters could be changed for sensitivity analysis. The company used BPA's NR rate as a surrogate for purchase prices under the assumption that the NR rate would be the ceiling price for purchases in the Northwest. It was suggested that a scenario with varying escalation rates on the NR rate be tested. Also, scenarios such as 100% coal plant acquisition, 100% combined cycle CT acquisition, etc. could be tested to identify some of the cost extremes. The availability of resources (e.g. the amount of conservation and cogeneration potential available) and lead times of resources should be tested as well as the availability of fuels.

Discussion on some of the potential uses of the WUTC model outside of the LCP context included rate cases and avoided cost determination. It was pointed out that the model is being used for LCP analysis only (to compare the relative effect on rates and revenue requirements of alternative resource acquisition plans) and should be closely scrutinized before being used for any other reason.

<u>Load Forecast:</u>
The load forecast was a topic of great interest. One of the biggest difficulties in Resource Planning is not knowing exactly what the changing markets are producing in regard to future loads. Currently, the company forecasts

loads over the 20-year planning horizon. The 1988 load figure in the 20-year load forecast is 1/2 actual and 1/2 forecast.

There was interest in the industrial sector of the forecast. WWP has 15 industrial customers which make up 82% of the company's industrial load. These customers are monitored and evaluated in more detail. The question was asked whether the company asks these customers what their business outlook is like when preparing the forecast. Each of these customers has an account representative assigned to them who is in frequent contact with them. With the recent announcements that Boeing and Sacred Heart Hospital would be building new facilities in the company's service territory, it was asked how the company deals with projected new building construction in the load forecast.

There was considerable interest in the technical aspects of the load forecast. An explanation of price elasticity estimates and of conservation estimates should be included. Also, regarding the demand forecast scenarios assumptions listed on page 22, it was asked why items 3 and 4 affect the low forecast. The high rate increase assumption under the high scenario, the 50% increase in growth rates of personal income, and the price assumption using an overall price increase of 6.3 percent annually were questioned. These concerns should be addressed in the next draft LCP.

<u>Conservation / MCS / Efficiency Standards, etc.:</u>

Topics related to conservation resources (such as MCS, efficiency standards, etc.) probably consumed more time than any other topic throughout the day.

The summary paragraph on conservation identifying a 20 MW conservation resource (20 MW @ 50 mills/kWh, single point estimate) seemed to be confusing to the group. Several questions regarding the methodology behind the estimate were asked and it was suggested a more detailed summary be included in Appendix A. There was a great deal of interest in commercial and industrial conservation potential in the company's service territory. Questions and comments such as the following were received:

- Under the high load growth scenario, the company should have more than the 20 MW of conservation potential based on the medium forecast.
- Has the company studied various industrial options in order to conserve energy?
- The company should evaluate commercial and industrial conservation programs.
- Utilities should play more of a role in energy efficiency education.
- There was confusion on what is discretionary conservation and what the company is going after. Industrial customers do not appear to be included in this group. It appears that discretionary conservation is an undefined resource. This should be cleared up in the report.
- There appears to be a real savings opportunity in new equipment. The company should investigate the benefits of paying for new, more efficient equipment for industrial customers .

- Conservation programs in store lighting should also be investigated.
- The company should look to BPA to determine a reasonable amount and types of conservation measures appropriate for WWP.

The lead time of conservation resources was also discussed. It is becoming evident that the lead time for conservation resources is much longer than previously thought. The industrial conservation resource is thought to have a 5-year lead time and the conservation resource used in the LCP model should probably be given at least a 5-year lead time. It was suggested that the company start soon developing conservation programs in order to have the conservation resource available when needed. It was also suggested that the company tap the expertise of other entities in the northwest, such as BPA, for valuable insight in developing these programs.

This is the first year that Appliance Efficiency Standards have been included in the 20-year load forecast and consequently there were questions regarding Appliance Efficiency Standards. There were also questions regarding weatherization and MCS such as the following:

- What is the methodology behind the company's weatherization program?
- Would WWP build CTs before MCS?
- What would WWP do if MCS is not passed?
- What is WWP's position on making payments to builders for MCS?

It was suggested that a description of the company's current position and future actions regarding weatherization and MCS be included in the report.

Other general comments received included:

- How many houses could be converted from electric hot water heaters to natural gas?
- Puget Power lists new efficient shower heads as a cheap resource. The company should consider using a program of dispensing new shower heads for energy savings.
- The competitive bidding process currently being developed by the WUTC will include industrial conservation as a resource option available for bid.

CITY OF SPOKANE, WASHINGTON · FOUNDED IN 1881 ·

JAN 5 1989

Mr. Robert E. Henriques, Manager
Resources, Thermal & Planning
The Washington Water Power Co.
P.O. Box 3727
Spokane, WA 99220

Subject: **Least-Cost Planning - Technical Advisory Committee**

Dear Mr. Henriques:

In the temporary absence of Terry Novak, I am responding to your 23 November letter regarding Least-Cost Planning. We appreciate the opportunity to review and comment on this draft report.

First, the methodology used in arriving at the potential power increases (Ref. Table A-2) is not stated, therefore, we cannot comment on the appropriateness. We would appreciate being informed on such methodology. In that regard, we suspect many older generating units may be inefficient and could be replaced in present locations with more efficient units - particularly those that operate much of the year or year-round. In summary, it appears that Table A-2 has rather conservative estimates of potential firm capacity increases. For instance, at Post Falls, turbine replacement, intake flow channel improvements, and/or additional units should result in more than 2.3 MW additional capacity. Incidentally, please share with us results of analyses of Monroe Street, Upper Falls, Nine Mile, and Meyers Falls.

There is a large disparity in optimum river flows for generation between the WWP Hydroelectric Stations on the Spokane River and the City's Upriver Station. We believe if such WWP capacities were increased, the overall generating efficiencies for both organizations would be improved.

We believe load management can be used to shave peak demands. This is something that could have significant savings to the utility and, therefore, for the community. For that reason, load management options is an area we recommend for the LCP.

As for future electrical demand - the last decade's situation should be used as the most reasonable scenario tempered with mild optimism for the next two decades or so. Therefore, the medium value of 1.10% seems most reasonable and we would agree with the overall range of .10% to 2.10%.

MANAGER-ENGINEERING SERVICES
*SKYWALK LEVEL-MUNICIPAL BUILDING / SPOKANE, WASHINGTON 99201-3334 / (509) 456-4370*

The least-cost planning process and its attendant reports should be utilized as ongoing tools of management. Annual updates would be most worthwhile and we assume Washington Water Power will proceed accordingly.

Sincerely,

Irving B. Reed, Manager
Engineering Services

ajg

**Washington Water Power**

*1889-1989*

**Robert E. Henriques**
Manager
Resources, Thermal & Planning

January 20, 1989

Bill Campion
Associate Dean, School of Business
Eastern Washington University
c/o Mail Stop 46
Cheney, WA 99004

SUBJECT: Least-Cost Planning - Technical Advisory Committee

Dear Mr. Campion:

We have enclosed a copy of the Technical Advisory Committee Meeting minutes. Your review of these minutes would be appreciated and we would welcome any comments you may have. We are proceeding with our final draft LCP Report and hope to incorporate many of the suggestions that were received during the meeting.

We are also enclosing the written comments received from the City of Spokane. Any written comments that you might have would also be acceptable.

We appreciate your participation and continued involvement in WWP's Least-Cost Planning process. Again, thank-you for your help.

Sincerely,

Robert E. Henriques

Robert E. Henriques

HDY/jr

Encl.



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Potlatch

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January 18, 1989

Mr. Robert E. Henriques
Manager
Resources, Thermal and Planning
Washington Water Power
P. O. Box 3727
Spokane, WA 99220

Dear Mr. Henriques:

Thank you for providing a copy of the draft least cost plan for my review. Attached are the notes I made in reviewing the report. I regret that I was unable to attend the discussion of the draft on January 5 in Spokane, as I am sure I would have enhanced my understanding of your draft and the process.

As you proceed with your efforts in least cost planning, I strongly encourage you to remain focused on your service area as opposed perceptions thereof that you may find in subsets of regional planning efforts. Eastern Washington and northern Idaho are very different than other parts of the Northwest and what may be valid in Bellevue or Salem may not be appropriate in Pullman or Lewiston. Additionally, the issues of non-economic costs, such as environment, health, safety, etc., need to be addressed explicitly. Do not let the existence of a computer model, however attractive, divert you from the more fundamental issues and discussion of why they affect least cost planning.

I encourage you to continue to involve both large customers and potential resource suppliers, as well as regional planners and Commission staff, in your development of the least cost plan. I also hope you find the specific comments attached beneficial. Please call if I may provide further input.

Sincerely yours,

William J. Nicholson

WILLIAM J. NICHOLSON
Manager, Corporate Energy Service

WJN:ng

Attachment

cc: Mr. John Eliason w/attachment
Mr. Gary Ely w/attachment
Mr. Charles Pottenger with attachment and draft plan

W. J. Nicholson
1/18/89

## NOTES ON WWP DRAFT LEAST COST PLANNING REPORT

1. Introduction. Does the criteria for least cost planning described by the WUTC require consideration of non-dollar or non-cash costs? If so, the criteria beyond dollars or cash should be clearly stated in the introduction. If not, how will you address issues, such as customer economics, safety, environmental concerns, health aspects and societal impacts?

2. Introduction. Recognizing that the WUTC is the driving force in the regulatory area, what involvement with the IPUC might you anticipate? In developing long range plans regulatory prudence suggests that the effort be made to involve the Idaho jurisdiction as much as they wish. There is little point in responding to one commission on a subject as important as this one without the other being aware and, if they wish, involved.

3. Company Profile, Pg. 3. As an electric and gas utility, a least cost plan for WWP should recognize that many services used by customers can be supplied by either gas or electricity. From the Company's perspective the ability to provide either service, albeit not in the whole service area, needs to be addressed. The effort should not be limited to electric operations only; if it is, that limitation should be stated up front.

4. Economic Development, Pg. 4. In addition to economic development (attracting new business, such as Boeing), the Company should also emphasize the maintenance of the current economic base in its service area. As an example, consider the portion of the economic base in eastern Washington and northern Idaho represented by the forest products industry. The forest products industry is being challenged by interests who believe the forests, particularly federal and state forests, should not be used for timber. The controversy involves wilderness legislation, forest plans, etc. The available timber supply is decreasing because of these entanglements and decisions and, as a result, the processing base and related employment may continue to shrink. The permanent closure of the plywood plant at Lewiston is the most recent example of shrinkage of the processing base.

5. Page 4, ¶2. The economics of the transmission line and the potentially available resources in British Columbia need to be combined when comparing them to alternative resources available to the Company.

6. Page 5, ¶3. Should one infer that present wintertime capacity is supplied by the Company because of surplus conditions?

7. Page 6, ¶2. Long term is 10 to 15 years. Define short term. Is it up to ten years?

8. Page 6, ¶3 and 4. Here is a place to identify the role of WWP's gas activities in the least cost plan. Gas is a competitive energy source in residential service, as is wood. Gas is the basis for power generation, whether cogeneration or stand alone units. Another activity that may be considered either competition or a resource is electric efficiency improvements or conservation.

9. Northwest Power Planning Council, Pg. 6. To this point I've seen no mention of the Power Council, its planning activities and how this plan relates to the regional plan. BPA also does regional related planning. Does the WWP least cost plan integrate with other plans in the region and, if so, how?

10. Page 7, ¶1. Diversity of resource options and short lead times are generally desirable, but if the economic resource is conservation, is there really any concern with depending upon it solely, given that it is really available? The only concern that comes to mind is that the present resource mix does not have sufficient diversity and depending on conservation to meet increased load leaves one in the present state of resource diversity. Perhaps you should state your belief about the present state of resource diversity at WWP as a basis for integrating resource diversity into the least cost plan.

11. Page 8, Figure 2-2. Suggest using a larger figure. The lettering is difficult to read. Why not use a minimum size for figures of half a page? Get the caption all on the same page.

12. Page 8, Figure 2-1. The area of immediate interest, 1989 to 1995, is nearly impossible to interpret. Clearly, under high and medium load forecasts load-resource balance arrives soon.

13. Definitions. You need a glossary in which definitions are provided. Define high, medium and low loads among other terms.

14. Page 8, ¶1. A reader is interested in the magnitude of these resource changes, but starting from the beginning, does not know how big is big.

15. Page 9, ¶3. Define region. Here you begin to relate this plan and Company information to the region.

16. Page 9-10. Lost Opportunities. Another significant form of lost opportunity is customer installation of high pressure boilers with the potential for later additions of steam turbines. Once a boiler is constructed it is used for a long time and is costly to change. Also in new construction, both commercial and industrial, the installation of energy efficiency (conservation) and the inherent capability to generate power is likely installed at the beginning.

17. Page 11, ¶5. How does the 20aMW of conservation compare to the conservation estimates for the region reviewed in the Power Council planning effort? Comparisons to the regional plan undoubtedly will be made by many reviewers of the plan. Because the Council has been studying the subject so long, their work is likely to be the standard and WWP will have the burden of explaining perceived inconsistencies.

18. Pages 11 and 12. PURPA Acquisitions. I can find 90aMW of potential PURPA acquisitions in Lewiston, Idaho. Whether they meet the competitive cost criteria may be another matter, but the total of 156aMW of PURPA potential in the service area seems low.

19. Page 12, ¶2. Is the limitation of ten percent of load on purchases applicable to purchases from other utilities or from all other sources? Both the limitations on percentage and type of resource are critical to development of the plan. Somewhere I presume you discuss the reasons for the limitations. Does that limitation apply now?

20. Page 12, ¶3. Combustion Turbines. The use of combustion turbines is always more economically attractive if there is a use for the exhaust heat. Even if the combustion turbines are used for peaking, there may be a practicality of configuring them in a cogeneration mode.

21. Page 12, ¶3. Coal Fired Plant. Could the coal fired plant be a larger resource with multiple owners, as are WWP's present coal fired ownerships?

22. Page 15, ¶1. To better understand WWP's electric customers, write about the electric heat customers as one group and non-electric heat customers as another. Wood and natural gas are good substitutes for electricity for heating, and perhaps cooking, but they don't do well at lighting and motors. The amount of electric heat in competition with wood and gas relative to less substitutable electricity uses is critical for understanding.

23. Page 16, Figures 3-3 and 3-4. Again, show for electric heat and non-electric heat customers. Try to convey to the reader a sense of the market place.

24. Page 17, ¶3. Does the large commercial/small industrial category in the text correspond to the commercial category in Figure 3-5? If so, it's confusing. Don't let your rate schedule classifications get in the way of thinking about markets.

25. Page 17, Figure 3-5. Other, 16%, is too big a category to be labeled that way. Is it primarily agricultural? Are there other significant (>5%) segments?

26. Page 18, Figure 3-6. The categorization of 29% of the defined commercial sector as manufacturing plus other is troubling. From an analytical point of view one wonders what other is. An example of manufacturing, I suppose, is the particleboard plant in Post Falls, which is on Schedule 21 in Idaho. These categories you've described do not fit their usual definitions.

27. Page 18, ¶1. Industrial Sales. It will be helpful to the reader to gain some idea of the magnitude of the reductions in industrial load by magnitude, timing, whether the loss is permanent or temporary, etc. Also from a planning perspective there appears to be alternate fuel/energy load and self generation load that you have an opportunity to serve in the future. That load should be quantified.

28. Page 20, Economic Assumptions. Have you challenged Data Resources in their work? You should know a lot about your own service area. Others that use Data Resources in their planning often change forecasts based on local or product or sector information.

29. Page 20, ¶3. Here I begin to get the sense that this process is driven by an economic model, probably as part of a computer program. Will I find a discussion of the logical precepts of the model and why it is applicable to the WWP service area or is it a given?

30. Page 20, Economic Assumptions. Do the 8.1% and 7.3% growth rates include inflation? If yes, say so. Why does DRI estimate the Spokane rate and why do you accept the forecast?

31. Page 20, ¶4. Why are the assumptions made? The Power Council Supplement to their plan suggests considerable industrial and commercial conservation is available. Why do you not consider it?

32. Page 21, ¶1. The industrial load forecast survey you send out includes a tenth year estimate. My memory of one I sent in showed a very large increase (nearly 30 MW) between the fifth and tenth year. Perhaps that is a unique case but it covers a lot of no growth.

33. Page 21, ¶1. "reaches 60 percent of saturation." How is saturation defined?

34. Page 21, ¶2. I do not understand "special relationships between users of electricity" in a modeling context.

35. Page 21, ¶3. This is the first point where you identify utility loads; munis, coops, etc. No more street lights will be installed; in an economy growing at 7.3% will there be more streets? Are there not conservation possibilities in an 8.5% loss factor in transmission and distribution?

36. Page 22, ¶1. Your industrial electric loads are large enough for specific questions to be asked by the regulators regarding the assumptions you are making. You should discuss the assumptions you are making with the larger customers so that no one gets surprised. If, for instance, you assumed a plant would close or invest in self generation and the plant management were not aware that you were making that assumption and the assumption became public, there would be some exciting moments in the Marketing Department at a minimum.

37. Page 22, Forecast Characterization. If the medium forecast is 50/50, is high 10/90 and low 90/10? Please state. Is the 1% absolute difference between low and medium and medium and high the difference chosen? How does it relate to the regional approaches of PNWPPC and BPA?

38. Page 22-23, High and Low Forecasts. Are either the high or low forecasts realistic? You have a fascination with closing industrial plants. In the low forecast if half the industrial plants closed and the jobs disappeared, might not the population decline? Or will large portions go on and stay on welfare?

39. Page 22, ¶6. Given the rate stabilization arrangements in place in both 1989 and 1990 in Washington and Idaho, a 30% increase in 1991 is going to be exciting. Planning should have its foundations in reality; I have a very hard time believing the high and low forecasts could be real.

40. Page 23, table. This comparison is helpful to some degree, but some discussion would be helpful regarding what the reader should conclude.

41. Page 24, ¶2. I strongly agree that there are significant non-economic factors to discuss in least-cost planning. To this point in the text I've not found such a discussion. Can you usefully gather work done by the Power Council to assist you in preparing your own non-economic issues analysis?

42. Page 24, WUTC Model. A more critical view of the WUTC model, as you describe it, is a standardized mechanical model for generalized simulation of an electric utility. Clearly it is not tailored to a specific utility service area. Any creative use of the model is clearly up to the user. To the extent that output from the model can be useful, the reader must have a clear understanding of the economic environment in the specific service area, the significant factors that can have impacts on the outcome, and the assumptions the user is applying. This model provides format and some structure. It does not do least cost planning in the creative analytical sense. The burden is on the user to convey to the reader separate from the model the economic background, the key factors, and the assumptions made. The most important question the user has to answer is WHY? This question needs to be answered point by point by point. The greatest danger to those doing the least cost planning is becoming model centered! Your should make every possible effort to avoid that problem and to convey to the reader that you have avoided that problem.

43. Page 28, table. You should discuss why there are only three key variables and why there is low load growth with declining real gas and coal prices, etc. Clearly with declining fuel prices and lower loads, low fuel prices have not spurred the economy. Has there been direct substitution for electricity use? Or does the analysis go to substitution and other market place effects?

44. Page 29, Limitation Discussions. The discussion is interesting and useful, but seems almost wholly focused on avoided cost.

45. Appendix A, Table A-1. Given the high gas costs experienced in the recent past I suggest you also present the gas turbine based cases also with gas prices experienced when the Canadian border price was near $5/MMBTU. We need to continue to recognize the volatility potential in gas and oil.

46. Appendices. Suggest numbering pages in the next draft.

47. Page A-2, ¶2. If a gas turbine used as a peaking unit could be integrated in a cogeneration application, one could get low cost gas costs/kwh. This thought is also applicable for firming hydrogeneration.

W. J. Nicholson
1/18/89

48. Page A-2, ¶3. You may wish to describe the environmental impacts of generation of electricity for the various resources, including conservation and cogeneration.

49. Page A-2, ¶4. Does the capital cost difference of about 30 mils/kwh between natural gas combined cycle and coal gasification combined cycle represent only addition of coal gasification, or are there other technical differences such as turbines, pollution, etc.

50. Page A-5, line 4. Real electric costs?

51. Page A-5, 6; Industrial Conservation. In Maine I understand conservation won in a bidding contest. You might see how it is doing, the type of conservation developed, etc.

52. Page A-6, Utility Conservation. The Power Council draft identifies potential savings in transmission and distribution. Are these potential savings available on WWP's system?

53. Page A-7, Greenhouse Effects and Acid Rain. While coal may have more impact than natural gas on these issues, do not leave the impression that using natural gas is not without problems. There are four greenhouse gases and natural gas contributes three of them; coal only contributes two, but in larger quantities for carbon dioxide.

54. Page A-9, Generator Location and Distribution Losses. Cannot some distribution losses be reduced by siting generation near outlying loads? For example, would a cogeneration facility in the Clearwater Valley, say at Pierce or Kamiah, Idaho, create distribution savings greater than the same sized unit in downtown Spokane? Or vice versa?

55. Page A-9, Energy Storage. Does not WWP utilize the daily storage capability in the hydroelectric system? Should it be mentioned here?

56. Page A-9, Fluidized Bed. I understand from engineer/constructors that fluidized beds are not all a bed of roses. There are severe erosion problems, which would affect reliability. Also, fluidized beds can be designed to burn nearly any specific fuel, but there are serious questions about their ability to burn fuels other than the one in the design.

57. Page A-10, Fuel Cells. Does this technology include the micro cogeneration technology appearing at small commercial establshments in California?

58. Page A-13, Wood Fired Generation. The Company operates Kettle Falls, a wood fired condensing plant. Recent news articles identify WWP's interest in another unit in northern Idaho. Where is wood fired generation discussed?

59. Page A-14, 15; BC Hydro and Transmission. The Company needs to address the alternate resources available through conservation and cogeneration before committing to the transmission line. The transmission line and power costs should form the base for the Company's present avoided cost.

60. Page A-17, QFs. Your assumption regarding all developable QFs being completed by the mid-1990s is astonishing. From the perspective of only Potlatch Corporation, there is considerable technical potential for cogeneration that is unlikely to be developed by that time. I am quite concerned with your reliance on the BPA study and apparently not looking around your service area for what really might be there. The name plate rating on QFs at Potlatch at Lewiston will be 110 MW in mid-1990 with the completion of the fourth unit. A key factor in looking for QF potential in the forest products industry is the thermal demands at a site and the benefits of replacement of the boiler at the site.

61. Appendix C. To obtain hopefully helpful comment on the model output from those not intimately involved in the computer world, you should provide a literate discussion of what you believe you learned from the runs you made. Then readers may be able to offer some insight and focus on preliminary conclusions and why you reached them.

62. Appendix B. Public involvement, both in review of the plan and in the development of resources, is critical. How will that involvement be accomplished in all the places you operate? How will resource suppliers know you are in the market? What public process will you use to select resources? How do you propose to meet the possible differing requirements in Idaho and Washington?

WWP100

**Washington Water Power**

*1889-1989*

**Robert E. Henriques**
Manager
Resources, Thermal & Planning

February 1, 1989

Mr. William J. Nicholson
Manager, Corporate Energy Service
Potlatch Corporation
244 California Street, Suite 610
San Francisco, CA 94111

Dear Mr. Nicholson:

Thank-you for your notes you made while reviewing the Least-Cost Planning Report. Our plans are to incorporate many of the suggestions and comments that were received into the final report. Your specific comments were very timely.

We agree with your statements as explained in the cover letter. The company is using regional data when it is not available within the company. Before final resource decisions are made, studies will be done to verify the data as it pertains to WWP's service area. Least-cost planning for this report evaluates the economics of different energy resource scenarios. We ar looking at least-cost planning as another tool to be used in future decisions regarding resource acquisitions. Other non-economic issues, as mentioned in the report, will be considered and evaluated in the final decision process.

Again, we appreciate your participation and involvement in WWP's least-cost planning process.

Sincerely,

Robert E. Henriques

Robert E. Henriques

HDY/jr



The Washington Water Power Company P.O. Box 3727 Spokane, Washington 99220 (509) 489-0500 / 1-800-727-9197
SERVING EASTERN WASHINGTON AND NORTHERN IDAHO WITH ELECTRICITY AND NATURAL GAS

Washington Water Power

**Robert E. Henriques**
Manager
Resources, Thermal & Planning

February 14, 1989

Mr. Steve Aos
Washington Utilities and Transportation
Commission
Chandler Plaza Building
1300 Evergreen Park Drive South
Olympia, WA 98504

Dear Mr. Aos:

As mentioned at the Technical Advisory Committee meeting in January, we have enclosed for your review and comments Chapter 6, "Long-Term Strategy," and Chapter 7, "Action Plan." Also enclosed is a copy of the letter with comments from the Potlatch Corporation.

Thank-you for your continued involvement in our Least-Cost Planning process. If you have any questions or comments, please don't hesitate to call.

Sincerely,

Robert E. Henriques

Robert E. Henriques

HDY/jr

Encl.



The Washington Water Power Company P.O. Box 3727 Spokane, Washington 99220 (509) 489-0500
SERVING EASTERN WASHINGTON AND NORTHERN IDAHO WITH ELECTRICITY AND NATURAL GAS

**Washington Water Power**

*1889-1989*

February 17, 1989

Chamber of Commerce
314 First, P.O. Box 205
Asotin, WA 99402

The Washington Water Power Company is working on its first formal Least-Cost Planning Report, in cooperation with the Washington Utilities and Transportation Commission, and a related program, Resource Management Report, for the Idaho Public Utility Commission.

Least-Cost planning is a resource option study that utilizes demand- and supply-side resources to develop the Least-Cost electrical supply strategy for an uncertain future. These study efforts provide an opportunity for the company, state regulators, and the public to join together in developing a reliable low-cost electric plan for meeting future electricity demands.

Last fall, WWP formed a Technical Advisory Committee to seek comments and input on key planning assumptions from a variety of representative organizations and governmental agencies throughout our service area.

Our next step is to invite public input and participation. You, and/or representatives of your organization, are invited to attend and participate in the WWP Least-Cost Public Meeting on Thursday, March 2, 1989, beginning at 7:00 p.m., in the Coeur d'Alene Room at the Shilo Inn (formerly the Gateway) at E. 923 - 3rd Avenue, Spokane.

A brief presentation on the draft WWP Least-Cost Plan will be made, and then comments will be solicited from those in attendance. Written comments can be submitted at any time prior to the public meeting or that night. Public comments will be incorporated in the final report.

The complete draft Least-Cost Plan Report will be available at the March 2 meeting for inspection and review. Enclosed is an executive summary and a 2-year action plan that outlines some of the points covered in the draft for your review prior to the public meeting.



The Washington Water Power Company P.O. Box 3727 Spokane, Washington 99220 (509) 489-0500 / 1-800-727-9197
SERVING EASTERN WASHINGTON AND NORTHERN IDAHO WITH ELECTRICITY AND NATURAL GAS

Should you have any specific questions or need clarification prior to the meeting, please feel free to call me at (509) 482-4521. Written comments should be sent to my attention at WWP.

Sincerely

H. Douglas Young
Contracts & Resource Administrator

wpc/63E

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Clark-White & Associates

TO: KENT ADAMS
WASHINGTON WATER POWER
FROM: CLARK-WHITE & ASSOCIATES
DATE: FEBRUARY 22, 1989
RE: PRINT INSERTIONS
"LEAST-COST PLANNING"
2 Column x 9" (18")

SCHEDULED INSERTIONS

| | |
|---|---|
| SPOKESMAN REVIEW/SPOKANE CHRONICLE<br>SUNDAY, FEBRUARY 26, 1989 | $666.90 |
| LEWISTON MORNING TRIBUNE<br>SATURDAY, FEBRUARY 25, 1989 | $232.92 |
| IDAHONIAN/DAILY NEWS<br>SATURDAY, FEBRUARY 25, 1989 | $121.50 |
| COEUR D'ALENE PRESS<br>SATURDAY, FEBRUARY 25, 1989 | $167.40 |
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# Notice of Public Planning Meeting

## Least-Cost Electrical Supply Plan

WWP invites participation and input from individuals and organizations in developing a plan to acquire reliable low-cost energy supplies to meet future electrical demands.

Least-cost planning is a planning process that utilizes demand- and supply-side resources to develop a least cost electrical supply strategy for an uncertain future. The Washington Water Power Company is working on its first formal least-cost planning report, in cooperation with the Washington Utilities and Transportation Commission, and a related program, Resource Management Report, for the Idaho Public Utility Commission.

The complete draft of the WWP Least-Cost Plan will be available at the meeting.

A brief presentation on the plan will be made, and then comments will be solicited from those in attendance. Written comments can be submitted at any time prior to or during the meeting. Public comments will be incorporated into the final report.

**Meeting Time**

**7:00 pm**

**Thursday, March 2, 1989**

**Coeur d'Alene Room**

**The Shilo Inn**
**(Formerly The Gateway Hotel)**
**E. 923 - 3rd in Spokane**

**Direct written comments or questions to Doug Young, (509) 482-4521 at Washington Water Power, Spokane.**

WWP100

*"Building on a Century of Service"*
*1889-1989*

**The Washington Water Power Company**
*P.O. Box 3727, Spokane, WA 99220*

# CITIZENS UTILITIES COMPANY

ADMINISTRATIVE OFFICES · HIGH RIDGE PARK · STAMFORD, CONNECTICUT 06905 · 203/329-8800




February 24, 1989

H. Douglas Young
Contracts & Resource Administrator
The Washington Water Power Company
P. O. Box 3727
Spokane, WA 99220

Dear Mr. Young:

This will acknowledge receipt of your letter of February 17, 1989, which was received here today, concerning Washington Water Power's Least-Cost Planning Report and your invitation to attend the WWP Least-Cost Public Meeting. Although I cannot attend the meeting, I have referred your letter to Mr. Richard B. Hieber who is Citizens' Vice-President, Electric.

I anticipate that Mr. Hieber or another representative of Citizens will be in touch with you further concerning the subject of Least-Cost Planning.

Sincerely,

John H. Engel
John H. Engel
Assistant Vice President
and Senior Attorney

JHE:cab

cc: R. B. Hieber

RECEIVED—W.W.P. CO.
POWER SUPPLY DEPARTMENT
FEB 27 1989

026.7

LEAST COST PLANNING
PUBLIC MEETING
THE SHILO INN - SPOKANE, WASHINGTON
March 2, 1989

I. Attendees:

WWP - Henriques, Young, Vermillion, J. Johnson, Glendinning, Fukai, Bryan, S. Anderson, Lafferty, R. Curtis, A. Meyers, R. Pierce, K. Zentz, R. Strenge

There were 10 non-WWP people in attendance including: Peter Spinney from the WUTC, Spokane City Manager Terry Novak, Tom Ferry from Citizens' Utilities, Oggie Clough of Idapine, and David VanHersett.

II. Meeting Overview:

Bob Henriques opened the meeting at approximately 7:05 p.m. and gave a brief description of the topics that would be covered during the evening.

III. WUTC Remarks:

Peter Spinney gave a brief history of the evolution of least cost planning in Washington and discussed the Puget Sound Power and Light Least Cost Planning process. He also described the development of the Least Cost Planning model and briefly addressed the development of a competitive bidding process in Washington.

IV. WWP Least Cost Planning History:

Bob Henriques summarized WWP's Least Cost Planning activities during the last two years and discussed the joint development of the Least Cost Planning model between WWP and the WUTC. He discussed the Technical Advisory Committee which consists of a group of 21 organizations, customers, and government agencies which were invited to participate in WWP's Least Cost Planning process. At a meeting in January 1989, 18 of these groups participated in the initial review of WWP's Draft Least Cost Plan.

V. Least Cost Plan Summary:

Doug Young presented a summary of the various elements that have gone into WWP's Least Cost Planning process and also described some of the general results of Least Cost Planning. The following items were discussed:

A. WWP's strategy to diversify resource acquisitions to meet load and the types of fuels required by these resources.

B. WWP's Range of Load Forecasts - It was noted that between the high and low load forecast (2.1% annual load growth and 0.1% load growth, respectively), over a 20-year period, there is a difference of approximately 375 aMW.

C. Resource Reductions - It was stated that over the next 20 years WWP will lose resources providing 366 MW of capacity and 144 aMW.

D. Resource Options - Because of the variability in the future, including load estimates, WWP's strategy will incorporate the "banking" of resource options that can be made available as conditions require implementation.

E. Lost Opportunity Resources - WWP will develop these resources as they become available. Such resources may be developed ahead of need if cost effective.

F. Review of WWP's Resources and Requirements - Visuals showing WWP's 20-year energy surpluses and deficiencies were presented and as an example, the year 1994 was discussed in some detail.

G. Critical Water Planning - WWP's policy of critical water planning was discussed along with criteria used for determining the long-term need for new energy resources. It was stated that WWP would require sustained deficiencies of more than 50 aMW before contemplating new resource additions. This strategy puts the company's resource development about halfway between critical water and median water planning.

H. Company reviewed the various demand and supply side resource alternatives evaluated in the least cost plan with special emphasis on the five "most promising" resource alternatives.

I. Rate Impacts of New Resources - A graphical format of least cost plan model outputs was displayed showing the expected impact on retail rates of implementing various new resource alternatives.

J. Conclusion - It was stated that no single resource plan does an optimum job of meeting WWP's requirements under all load growth conditions. Flexibility will be required in the company's resource planning process to meet ever changing conditions.

K. Long-Term Strategy - WWP presented a listing of the various elements comprising its long-term resource development strategy and also discussed a two-year action plan which will be implemented to sustain this strategy.

VI. Questions and Answers:

1. Question (Mr. Novak): If cogeneration is one of the company's major themes for future resources, why did the company send the Spokane Waste to Energy Resource to Puget Power? Was this the result of WWP's concern about the political aspects of the Waste to Energy Project? If the Waste to Energy Project were to be expanded, would WWP be interested in purchasing the power?

   Answer (Mr. Henriques): The company did not reject the Spokane Waste to Energy Resource because of political uncertainties. At the time the Waste to Energy Plant was offered to the company, we believed it was in the best interest of both the city and Washington Water Power for the power to be sold at a higher price to Puget Sound Power and Light. WWP would evaluate any expansion of the Waste Energy project as a potential future resource along with other resource alternatives. This would also be true of construction of other possible waste to energy facilities, such as the Kootenai County project Mr. Novak mentioned during the meeting.

2. Question (Mr. Novak): What is WWP's role in the implementation of building energy codes and the payment of energy credits?

   Answer (Mr. Lafferty): WWP is currently involved in the legislative process which is currently under development. Bob gave a brief update of where this legislation stands.

3. Question (Mr. Novak): Is WWP going to buy into the third AC interconnection?

   Answer (Mr. Henriques): WWP, along with all the other regional utilities has been studying this option all through its development phases. At the current time, the price the Bonneville Power Administration has put on this project may preclude it as a viable option for meeting the WWP's future resource needs.

4. Question (Anonymous): What is the reason for the differences between the "existing resources" number of 1,467 MW on page 1 of the handout compared to the resource numbers shown on page 4.

   Answer (Mr. Young): Figures shown on the first page of the handout are existing peaking resource capabilities, while the figures on page four show energy quantities for the year 1994. It was explained that capacity resources are figured to meet January peak loads while energy resources are those available to meet the annual average load.

(The remainder of the questions asked at the meeting were from Mr. Van Hersett.)

5. Mr. Van Hersett asked for Mr. Spinney's phone number.

6. Questions: What is the origin of the Least Cost Planning computer model? What type of computer is required? Can the public get access to this model? Will the model be available so that runs could be made based on public input? How can one get on the mailing list for the Least Cost Planning publications and results?

   Answers (Mr. Spinney, Mr. Henriques, and Mr. Young): Mr. Spinney responded to the specifics regarding the computer model and explained that it would be available but at the present time has not been "fully documented and packaged." The model runs on a personal computer using LOTUS software and it soon will be available on Microsoft EXCEL. All of those in attendance were asked to give their name to Mr. Strenge if they desire to receive future publications and announcements regarding WWP's Least Cost Planning process.

7. Question: What does WWP mean by PURPA resources? Does this include independent power producers? Does the WWP Least Cost Planning document include information regarding assumptions for future resource costs of the various resource alternatives?

   Answer (Mr. Henriques): For the purposes of Least Cost Planning, WWP has not made a distinction between PURPA resources as defined by federal law and independent power producers. The costs assumed for the various resource alternatives are included in the complete Least Cost Planning appendices.

8. Question: Does WWP purchase conservation?

   Answer (Mr. Barcus): When the company does enter the resource acquisition made, WWP will evaluate conservation along with other resource alternatives. The WUTC competitive bidding process will include criteria for evaluating conservation as a competitive resource.

9. Question: Would WWP be willing to pre-purchase conservation programs to have them "on call" similar to the way the company has "banked" the coal plant site?

   Answer (Mr. Barcus): Conceptually, WWP would have no problem studying this approach. Inclusion of this strategy could well be a part of the two-year action plan. Mr. Van Hersett was invited to put his proposals in writing to the company.

10. Question: Would a competitive bidding process result in WWP sponsored projects competing directly with independent power projects in the bidding process?

    Answer (Mr. Henriques and Mr. Spinney): The company would not likely enter its own competitive bidding process. Instead, the Company would evaluate the alternatives presented in the competitive bidding process and compare them to the cost effectiveness of WWP initiating its own resource construction or other resource alternatives.

11. Question: What is the status of the competitive bidding rule-making process?

    Answer (Mr. Spinney): Later in April there will be opportunities for public involvement and comment regarding the WUTC's proposed competitive bidding process. There will likely be a hearing on the subject in eastern Washington.

12. Question: When would WWP be in a position to acquire a new resource?

Answer (Mr. Henriques): With the possible exception of lost opportunity resources, WWP will not require resources during the next two years. It is likely that there will be competitive bidding process in place thereafter. The company currently evaluates proposals under the avoided cost rules that have been implemented by both the Washington and Idaho Public Utility commissions.

VII. Meeting Closure

Mr. Henriques stated that WWP will submit its Least Cost Plan in finalized form to the WUTC in April. This publication will include a summary of the public meeting held on March 2, 1989. Attendees were again invited to leave their name with Mr. Strenge to receive copies of future publications and notices.

Mr. Henriques adjourned the meeting at approximately 8:30 p.m.

wpc/6705

# Model Output Summary

# Model Output Summary

The WUTC Least-Cost Planning Model was used by WWP to evaluate alternative resource acquisition plans to the company. The model produces total revenue requirements, resulting retail rates and a weighted average incremental resource cost indicator. The specific resource plans tested, and associated model results, are summarized below.

## Alternate Resource Plans

Resource plans were formulated to meet load under low, medium, and high load growth scenarios. As stated in Chapter 5, each of these plans were also subjected to varying coal and natural gas escalation rates. Under the low load growth scenario, the company does not need to acquire new resources over the planning period and therefore, a "do nothing" resource plan was tested. Under the medium and high load growth scenarios, several resource plans were tested.

As resource plans were formulated to meet load under medium and high load growth scenarios, four basic patterns, or acquisition strategies, emerged. Each acquisition strategy emphasized the acquisition of either cogeneration (up to 156 MW), utility purchases, combined-cycle combustion turbines, or conventional coal plants. All resource plans first acquired varying amounts of conservation and cogeneration (some amounts of cogeneration acquisition was assumed in all resource plans tested) with the remaining load being met by emphasizing one of these four resources. The costs of these resources are summarized in Appendix A. Representative examples of typical resource plans tested are summarized in the tables below:

### Cogeneration Emphasis
### Representative Resource Acquisition Plans Emphasizing Cogeneration

**Megawatts Acquired under Medium Load Growth**

| | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|---|---|---|
| Conservation | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 |
| Cogeneration | 58 | 75 | 87 | 87 | 87 | 87 | 87 | 87 | 105 | 121 |
| Purchase | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Comb. Cyc. CT | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Coal Plant | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

**Megawatts Acquired under High Load Growth**

| | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|---|---|---|
| Conservation | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 35 |
| Cogeneration | 132 | 156 | 156 | 156 | 156 | 156 | 156 | 156 | 156 | 156 |
| Purchase | 0 | 4 | 28 | 28 | 28 | 28 | 50 | 84 | 100 | 100 |
| Comb. Cyc. CT | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 21 | 51 |
| Coal Plant | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

## Utility Purchase Emphasis
## Representative Resource Acquisition Plans Emphasizing Utility Purchases

**Megawatts Acquired under Medium Load Growth**

| | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|---|---|---|
| Conservation | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 |
| Cogeneration | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 |
| Purchase | 13 | 30 | 42 | 42 | 42 | 42 | 42 | 42 | 60 | 76 |
| Comb. Cyc. CT | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Coal Plant | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

**Megawatts Acquired under High Load Growth**

| | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|---|---|---|
| Conservation | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 35 |
| Cogeneration | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 90 |
| Purchase | 42 | 70 | 94 | 94 | 94 | 94 | 116 | 150 | 187 | 217 |
| Comb. Cyc. CT | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Coal Plant | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

## Combined-Cycle Combustion Turbine Emphasis
## Representative Resource Acquisition Plans Emphasizing Combined-Cycle Combustion Turbines

**Megawatts Acquired under Medium Load Growth**

| | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|---|---|---|
| Conservation | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 |
| Cogeneration | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 |
| Purchase | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Comb. Cyc. CT | 13 | 30 | 42 | 42 | 42 | 42 | 42 | 42 | 60 | 76 |
| Coal Plant | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

**Megawatts Acquired under High Load Growth**

| | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|---|---|---|
| Conservation | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 35 |
| Cogeneration | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 90 |
| Purchase | 42 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| Comb. Cyc. CT | 0 | 20 | 44 | 44 | 44 | 44 | 66 | 100 | 137 | 167 |
| Coal Plant | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

## Conventional Coal Plant Emphasis
## Representative Resource Acquisition Plans Emphasizing Conventional Coal Plants

**Megawatts Acquired under Medium Load Growth**

| | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|---|---|---|
| Conservation | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 |
| Cogeneration | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 |
| Purchase | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Comb. Cyc. CT | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Coal Plant | 13 | 30 | 42 | 42 | 42 | 42 | 42 | 42 | 60 | 76 |

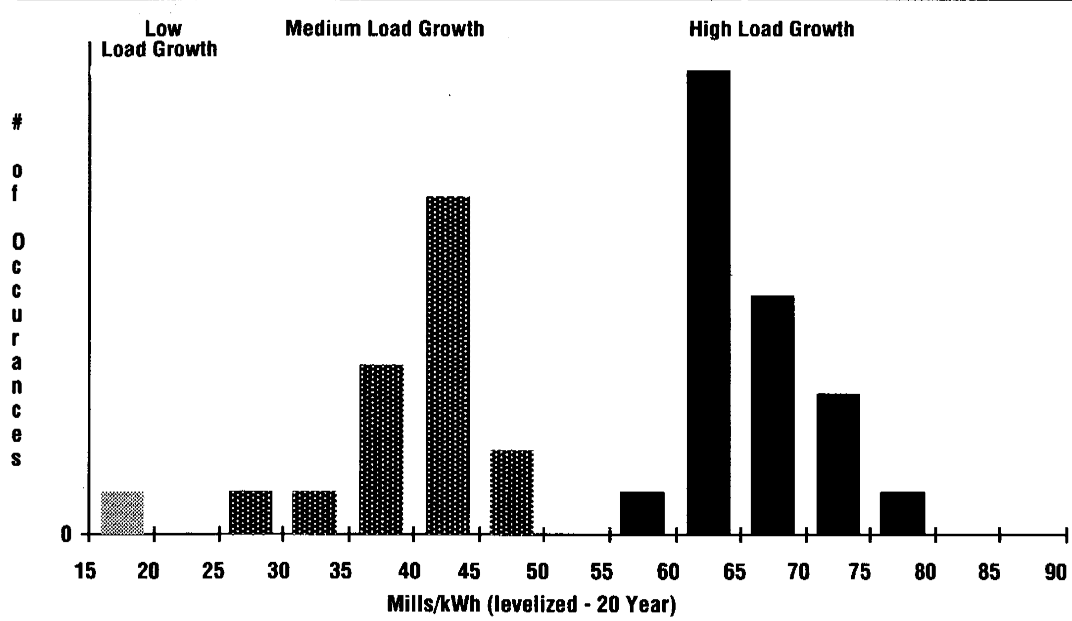
**Megawatts Acquired under High Load Growth**

| | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|---|---|---|
| Conservation | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 35 |
| Cogeneration | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 90 |
| Purchase | 42 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| Comb. Cyc. CT | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Coal Plant | 0 | 20 | 44 | 44 | 44 | 44 | 66 | 100 | 137 | 167 |

## Summary of Results

The WUTC model produces a weighted average incremental resource cost indicator as one of its outputs. This indicator is determined by taking the resource amounts input to meet load by year, weighted by their proportion of the total amounts to produce a weighted cost indicator for each year. New resource capital costs and supply curve resources are entered as levelized costs while utility purchases, fuel, and O&M costs are entered as nominal costs in determining the weighted cost indicator for each year. The resulting yearly weighted cost indicators are levelized over the 20-year planning period to obtain the weighted average incremental resource cost indicator.

Figure C-1 shows the range of occurances of the weighted average incremental resource cost indicator resulting from each resource plan tested.



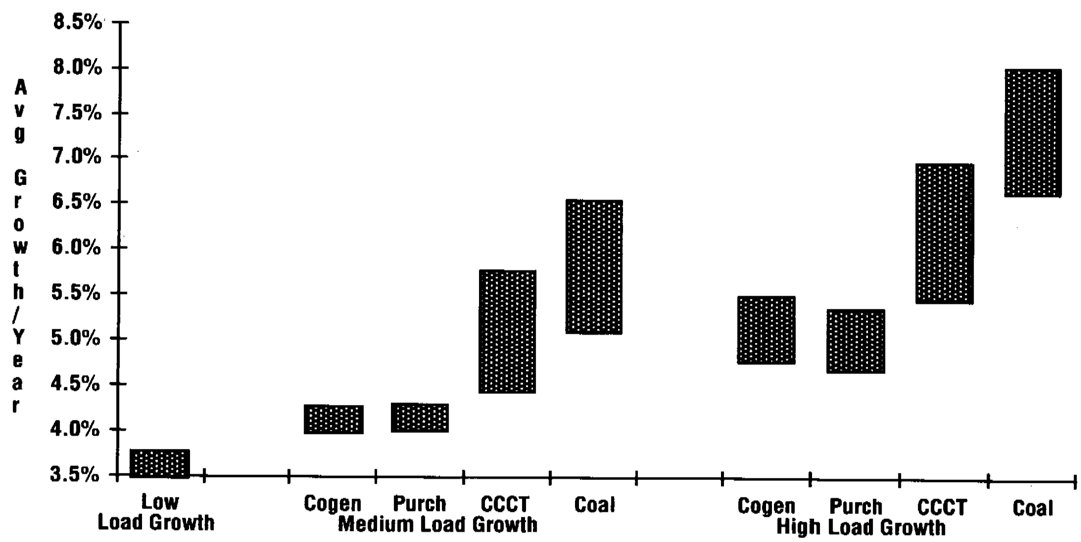

## Weighted Average Incremental Resource Cost Indicator

*Figure C-1. Mills/kWh (Levelized - 20 Year)*

As shown in Figure C-1, the resource cost indicator ranges from 15 to 80 mills/kWh. The resource cost indicator was highly dependent on the load growth scenario used. As the timeframe for acquiring new resources diminishes, and as low cost resource supplies (such as conservation and cogeneration) are exhausted, the need for more expensive resources is increased, causing the cost indicator to increase significantly. (The natural gas and coal variable assumptions had predictable effects on the indicator, but were much less significant compared to load growth.) Under the low load growth scenario, the indicator ranged from 15 to 20 mills/kWh since the company does not need new energy resources. Under the medium load growth scenario, the indicator generally ranged from 25 to 50 mills/kWh. As more expensive resources are acquired under the high load growth scenario, the indicator generally ranged from 55 to 80 mills/kWh.As previously mentioned, the WUTC model also produces

## Comparison of Growth Rates for Nominal Revenue Requirements under Alternative Resource Acquisition Strategies

*Figure C-2.*




total revenue requirements and resulting retail rates as outputs. The model calculates the Average Growth Rate per Year for nominal revenue requirements and retail rates which the company is using as indicators of the cost effectiveness of alternative resource plans. Figures C-2 and C-3 summarize the Average Growth Rates per Year for nominal revenue requirements and nominal rates, respectively, resulting from the resource plans tested.

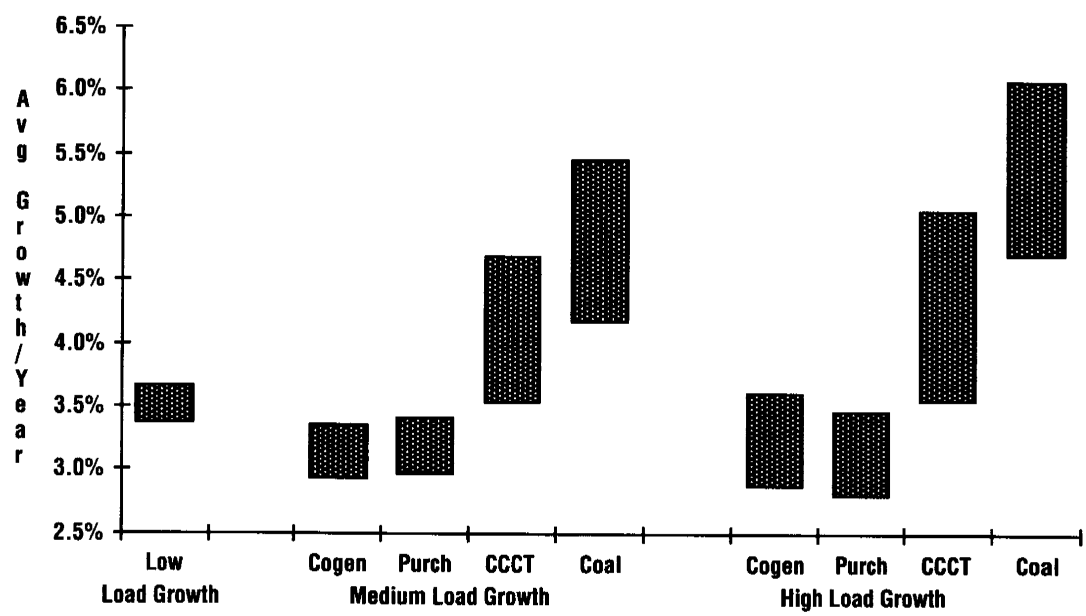
The categories in Figures C-2 and C-3 are grouped according to the load growth and resource acquisition strategies discussed earlier. The figures illustrate the range of growth rates produced by each resource acquisition strategy.

The resulting growth rates indicate that after conservation resources are acquired, resource plans emphasizing cogeneration and utility purchases appear to be the most cost effective. In the event that the availability of cogeneration and utility purchases diminishes greatly, combined-cycle combustion turbines and conventional coal plants could be used to meet load. The results indicate that combined-cycle combustion turbines are generally more cost effective than coal plants. However, in some cases, such as under high natural gas and low coal escalation, the coal plants may become more cost effective.

Load growth, natural gas, and coal escalation variables again had predictable effects on the results. The resulting growth rates for nominal revenue requirements increased as load growth was increased and as higher cost resources were acquired. Interestingly, however, the growth rates for nominal retail rates remained somewhat stable as load growth was increased.

Nominal rates appear to be more dependent on the type of resource acquired rather than load growth.

The conclusion reached from these results is that there is no single resource plan which is ideal for all possible future scenarios. Resource plans emphasizing cogeneration and utility purchases appear to be the most cost effective. However, the cost and availability of these resources over the long term is uncertain. Combined-cycle combustion turbines could be a cost-effective alternative over the long term, provided fuel costs remain low. The company should position itself to be flexible allowing the company to react quickly as uncertainties in resource costs, availability, and need become more defined.




## Comparison of Growth Rates for Nominal Rates under Alternate Resource Acquisition Strategies

*Figure C-3.*

# Requirements and Resources

**THE WASHINGTON WATER POWER COMPANY**
REQUIREMENTS AND RESOURCES

| Figures are megawatts. | -1988- | | -1989- | | -1990- | | -1991- | | -1992- | | -1993- | | -1994- | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Peak | Average | Peak | Average | Peak | Average | Peak | Average | Peak | Average | Peak | Average | Peak | Average |
| REQUIREMENTS | | | | | | | | | | | | | | |
| 1 System Firm Loads | 1440 | 815 | 1471 | 841 | 1488 | 851 | 1485 | 850 | 1483 | 848 | 1504 | 858 | 1534 | 866 |
| 2 Exports -Puget Sound Power & Light Co #1 | 55 | 28 | 55 | 28 | 55 | 28 | 55 | 14 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3 -Puget Sound Power & Light Co #2 | 100 | 75 | 100 | 75 | 100 | 75 | 100 | 75 | 100 | 75 | 100 | 75 | 100 | 75 |
| 4 -Seattle City Light | 0 | 15 | 0 | 15 | 0 | 15 | 0 | 15 | 0 | 15 | 0 | 15 | 0 | 15 |
| 5 -Pacific Gas and Electric Co | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 25 | 0 | 25 | 0 | 25 | 0 | 25 |
| 6 -San Diego Gas & Electric Co | 112 | 27 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7 -So California Edison Co | 0 | 8 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 8 -Sandpoint PP&L | 5 | 2 | 5 | 2 | 5 | 2 | 5 | 2 | 5 | 2 | 5 | 2 | 5 | 2 |
| 9 -WIDCo PP&L | 8 | 5 | 8 | 5 | 8 | 5 | 8 | 5 | 0 | 0 | 0 | 0 | 0 | 0 |
| 10 -BPA Exchange WNP #3 | 0 | 27 | 0 | 27 | 0 | 27 | 0 | 27 | 0 | 27 | 0 | 27 | 0 | 27 |
| 11 -PP&L 1989 Firm Sale | 0 | 0 | 0 | 44 | 50 | 50 | 150 | 50 | 150 | 50 | 150 | 50 | 150 | 50 |
| 12 TOTAL REQUIREMENTS | 1720 | 1002 | 1639 | 1045 | 1706 | 1053 | 1803 | 1063 | 1738 | 1042 | 1759 | 1052 | 1789 | 1060 |
| RESOURCES | | | | | | | | | | | | | | |
| 13 System Hydro | 922 | 340 | 922 | 340 | 922 | 340 | 922 | 340 | 922 | 340 | 922 | 340 | 922 | 340 |
| 14 Contract Hydro | 221 | 107 | 221 | 107 | 221 | 107 | 221 | 107 | 221 | 107 | 221 | 106 | 221 | 104 |
| 15 Canadian Entitlement Return | -14 | -4 | -13 | -4 | -13 | -4 | -13 | -3 | -12 | -3 | -11 | -3 | -10 | -3 |
| 16 Restoration | 0 | 3 | 0 | 3 | 0 | 3 | 0 | 3 | 0 | 3 | 0 | 3 | 0 | 3 |
| 17 Small Hydro | 6 | 6 | 7 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| 18 Total Hydro | 1135 | 452 | 1137 | 454 | 1138 | 454 | 1138 | 455 | 1139 | 455 | 1140 | 454 | 1141 | 452 |
| 19 Cogeneration -Other | 10 | 8 | 10 | 9 | 11 | 9 | 11 | 9 | 11 | 9 | 11 | 9 | 11 | 9 |
| 20 Combustion Turbine | 68 | 54 | 68 | 54 | 68 | 54 | 68 | 54 | 68 | 54 | 68 | 54 | 68 | 54 |
| 21 Imports -CSPE | 50 | 18 | 48 | 17 | 49 | 16 | 49 | 16 | 45 | 15 | 40 | 14 | 36 | 14 |
| 22 -Pacific Gas and Electric Co | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 150 | 25 | 150 | 25 | 150 | 25 |
| 23 -San Diego Gas & Electric Co | 0 | 48 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 24 -So California Edison Co | 80 | 8 | 80 | 8 | 80 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 25 -Grant PUD | 50 | 0 | 50 | 0 | 50 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 26 -BPA (Suppl & Entitlem Capacity) | 27 | 0 | 26 | 0 | 26 | 0 | 26 | 0 | 24 | 0 | 21 | 0 | 19 | 0 |
| 27 -BPA (Contract #39216) | 80 | 68 | 80 | 68 | 80 | 67 | 77 | 65 | 77 | 65 | 77 | 65 | 77 | 65 |
| 28 -BPA Exchange WNP #3 | 82 | 27 | 82 | 27 | 82 | 27 | 82 | 27 | 82 | 27 | 82 | 27 | 82 | 27 |
| 29 -B C Hydro | 0 | 17 | 0 | 17 | 0 | 17 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 30 Thermal -Centralia | 192 | 163 | 192 | 163 | 192 | 163 | 192 | 163 | 192 | 163 | 192 | 163 | 192 | 163 |
| 31 -Kettle Falls | 47 | 40 | 47 | 40 | 47 | 40 | 47 | 40 | 47 | 40 | 47 | 40 | 47 | 40 |
| 32 -Colstrip #3 | 105 | 77 | 105 | 77 | 105 | 77 | 105 | 77 | 105 | 77 | 105 | 77 | 105 | 77 |
| 33 -Colstrip #4 | 105 | 77 | 105 | 77 | 105 | 77 | 105 | 77 | 105 | 77 | 105 | 77 | 105 | 77 |
| 34 TOTAL RESOURCES | 2031 | 1057 | 2030 | 1011 | 2033 | 1007 | 1900 | 993 | 2045 | 1007 | 2038 | 1005 | 2033 | 1003 |
| 35 Reserves | -234 | 0 | -237 | 0 | -239 | 0 | -239 | 0 | -238 | 0 | -240 | 0 | -243 | 0 |
| 36 NET RESOURCES | 1797 | 1057 | 1793 | 1011 | 1794 | 1007 | 1661 | 993 | 1807 | 1007 | 1798 | 1005 | 1790 | 1003 |
| 37 SURPLUS OR DEFICIT | 77 | 55 | 154 | -34 | 88 | -46 | -142 | -70 | 69 | -35 | 39 | -47 | 1 | -57 |

## THE WASHINGTON WATER POWER COMPANY
REQUIREMENTS AND RESOURCES

| Figures are megawatts. | -1995- Peak | -1995- Average | -1996- Peak | -1996- Average | -1997- Peak | -1997- Average | -1998- Peak | -1998- Average | -1999- Peak | -1999- Average | -2000- Peak | -2000- Average | -2001- Peak | -2001- Average |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| REQUIREMENTS | | | | | | | | | | | | | | |
| 1 System Firm Loads | 1560 | 875 | 1585 | 885 | 1601 | 894 | 1614 | 902 | 1628 | 910 | 1648 | 921 | 1667 | 932 |
| 2 Exports -Puget Sound Power & Light Co #1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3 -Puget Sound Power & Light Co #2 | 100 | 75 | 100 | 75 | 100 | 75 | 100 | 75 | 100 | 75 | 100 | 75 | 67 | 50 |
| 4 -Seattle City Light | 0 | 15 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 5 -Pacific Gas and Electric Co | 0 | 25 | 0 | 25 | 0 | 25 | 0 | 25 | 0 | 25 | 0 | 25 | 0 | 25 |
| 6 -San Diego Gas & Electric Co | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7 -So California Edison Co | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 8 -Sandpoint PP&L | 5 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 9 -WIDCo PP&L | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 10 -BPA Exchange WNP #3 | 0 | 27 | 0 | 27 | 0 | 29 | 0 | 32 | 0 | 32 | 0 | 32 | 0 | 32 |
| 11 -PP&L 1989 Firm Sale | 150 | 50 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 12 TOTAL REQUIREMENTS | 1815 | 1069 | 1685 | 1012 | 1701 | 1023 | 1714 | 1034 | 1728 | 1042 | 1748 | 1053 | 1734 | 1039 |
| RESOURCES | | | | | | | | | | | | | | |
| 13 System Hydro | 922 | 340 | 922 | 340 | 922 | 340 | 922 | 340 | 922 | 340 | 922 | 340 | 922 | 340 |
| 14 Contract Hydro | 221 | 93 | 197 | 81 | 197 | 81 | 197 | 81 | 197 | 81 | 197 | 81 | 197 | 81 |
| 15 Canadian Entitlement Return | -8 | -3 | -7 | -2 | -6 | -2 | -6 | -2 | -6 | -4 | -9 | -5 | -9 | -5 |
| 16 Restoration | 0 | 3 | 0 | 3 | 0 | 3 | 0 | 3 | 0 | 3 | 0 | 3 | 0 | 3 |
| 17 Small Hydro | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| 18 Total Hydro | 1143 | 441 | 1120 | 430 | 1121 | 430 | 1121 | 430 | 1121 | 428 | 1118 | 427 | 1118 | 427 |
| 19 Cogeneration -Other | 11 | 9 | 11 | 9 | 11 | 9 | 11 | 9 | 11 | 9 | 11 | 9 | 11 | 9 |
| 20 Combustion Turbine | 68 | 54 | 68 | 54 | 68 | 54 | 68 | 54 | 68 | 54 | 68 | 54 | 68 | 54 |
| 21 Imports -CSPE | 32 | 13 | 28 | 12 | 23 | 12 | 23 | 11 | 20 | 6 | 10 | 5 | 9 | 5 |
| 22 -Pacific Gas and Electric Co | 150 | 25 | 150 | 25 | 150 | 25 | 150 | 25 | 150 | 25 | 150 | 25 | 150 | 25 |
| 23 -San Diego Gas & Electric Co | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 24 -So California Edison Co | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 25 -Grant PUD | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 26 -BPA (Suppl & Entitlem Capacity) | 17 | 0 | 14 | 0 | 12 | 0 | 11 | 0 | 12 | 0 | 17 | 0 | 16 | 0 |
| 27 -BPA (Contract #39216) | 77 | 65 | 77 | 27 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 28 -BPA Exchange WNP #3 | 82 | 27 | 82 | 27 | 82 | 29 | 82 | 32 | 82 | 32 | 82 | 32 | 82 | 32 |
| 29 -B C Hydro | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 30 Thermal -Centralia | 192 | 163 | 192 | 163 | 192 | 163 | 192 | 163 | 192 | 163 | 192 | 163 | 192 | 163 |
| 31 -Kettle Falls | 47 | 40 | 47 | 40 | 47 | 40 | 47 | 40 | 47 | 40 | 47 | 40 | 47 | 40 |
| 32 -Colstrip #3 | 105 | 77 | 105 | 77 | 105 | 77 | 105 | 77 | 105 | 77 | 105 | 77 | 105 | 77 |
| 33 -Colstrip #4 | 105 | 77 | 105 | 77 | 105 | 77 | 105 | 77 | 105 | 77 | 105 | 77 | 105 | 77 |
| 34 TOTAL RESOURCES | 2029 | 991 | 1999 | 941 | 1916 | 916 | 1915 | 918 | 1913 | 911 | 1905 | 909 | 1903 | 909 |
| 35 Reserves | -246 | 0 | -249 | 0 | -250 | 0 | -251 | 0 | -253 | 0 | -255 | 0 | -257 | 0 |
| 36 NET RESOURCES | 1783 | 991 | 1750 | 941 | 1666 | 916 | 1664 | 918 | 1660 | 911 | 1650 | 909 | 1646 | 909 |
| 37 SURPLUS OR DEFICIT | -32 | -78 | 65 | -71 | -35 | -107 | -50 | -116 | -68 | -131 | -98 | -144 | -88 | -130 |

**THE WASHINGTON WATER POWER COMPANY**
REQUIREMENTS AND RESOURCES

| Figures are megawatts. | -2002- | | -2003- | | -2004- | | -2005- | | -2006- | | -2007- | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Peak | Average | Peak | Average | Peak | Average | Peak | Average | Peak | Average | Peak | Average |
| REQUIREMENTS | | | | | | | | | | | | |
| 1 System Firm Loads | 1688 | 944 | 1711 | 957 | 1734 | 969 | 1757 | 983 | 1780 | 996 | 1803 | 1009 |
| 2 Exports -Puget Sound Power & Light Co #1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3 -Puget Sound Power & Light Co #2 | 33 | 25 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 4 -Seattle City Light | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 5 -Pacific Gas and Electric Co | 0 | 25 | 0 | 25 | 0 | 25 | 0 | 25 | 0 | 25 | 0 | 25 |
| 6 -San Diego Gas & Electric Co | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7 -So California Edison Co | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 8 -Sandpoint PP&L | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 9 -WIDCo PP&L | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 10 -BPA Exchange WNP #3 | 0 | 32 | 0 | 32 | 0 | 32 | 0 | 32 | 0 | 32 | 0 | 32 |
| 11 -PP&L 1989 Firm Sale | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 12 TOTAL REQUIREMENTS | 1721 | 1026 | 1711 | 1014 | 1734 | 1026 | 1757 | 1040 | 1780 | 1053 | 1803 | 1066 |
| RESOURCES | | | | | | | | | | | | |
| 13 System Hydro | 922 | 340 | 922 | 340 | 922 | 340 | 922 | 340 | 922 | 340 | 922 | 340 |
| 14 Contract Hydro | 197 | 81 | 197 | 82 | 197 | 82 | 197 | 72 | 142 | 58 | 142 | 53 |
| 15 Canadian Entitlement Return | -9 | -5 | -9 | -5 | -13 | -5 | -13 | -5 | -10 | -4 | -10 | -4 |
| 16 Restoration | 0 | 3 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 17 Small Hydro | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| 18 Total Hydro | 1118 | 427 | 1118 | 427 | 1114 | 425 | 1114 | 415 | 1062 | 402 | 1062 | 397 |
| 19 Cogeneration -Other | 11 | 9 | 11 | 9 | 11 | 9 | 11 | 9 | 11 | 9 | 11 | 9 |
| 20 Combustion Turbine | 68 | 54 | 68 | 54 | 68 | 54 | 68 | 54 | 68 | 54 | 68 | 54 |
| 21 Imports -CSPE | 9 | 5 | 8 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 22 -Pacific Gas and Electric Co | 150 | 25 | 150 | 25 | 150 | 25 | 150 | 25 | 150 | 25 | 150 | 25 |
| 23 -San Diego Gas & Electric Co | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 24 -So California Edison Co | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 25 -Grant PUD | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 26 -BPA (Suppl & Entitlem Capacity) | 16 | 0 | 16 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 27 -BPA (Contract #39216) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 28 -BPA Exchange WNP #3 | 82 | 32 | 82 | 32 | 82 | 32 | 82 | 32 | 82 | 32 | 82 | 32 |
| 29 -B C Hydro | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 30 Thermal -Centralia | 192 | 163 | 192 | 163 | 192 | 163 | 192 | 163 | 192 | 163 | 192 | 163 |
| 31 -Kettle Falls | 47 | 40 | 47 | 40 | 47 | 40 | 47 | 40 | 47 | 40 | 47 | 40 |
| 32 -Colstrip #3 | 105 | 77 | 105 | 77 | 105 | 77 | 105 | 77 | 105 | 77 | 105 | 77 |
| 33 -Colstrip #4 | 105 | 77 | 105 | 77 | 105 | 77 | 105 | 77 | 105 | 77 | 105 | 77 |
| 34 TOTAL RESOURCES | 1903 | 909 | 1902 | 905 | 1874 | 902 | 1874 | 892 | 1822 | 879 | 1822 | 874 |
| 35 Reserves | -259 | 0 | -261 | 0 | -263 | 0 | -266 | 0 | -268 | 0 | -270 | 0 |
| 36 NET RESOURCES | 1644 | 909 | 1641 | 905 | 1611 | 902 | 1608 | 892 | 1554 | 879 | 1552 | 874 |
| 37 SURPLUS OR DEFICIT | -77 | -117 | -70 | -109 | -123 | -124 | -149 | -148 | -226 | -174 | -251 | -192 |