An Efficiency Power Plant in Three Years – An Interim Goal for the Northwest

Council document 2001-26

Overview

The Lesson of the Past Few Years

Over the last years of the 1990s, the Northwest and, for that matter, the entire West invested very little in new resources, whether generation or efficiency. During the years 1997 through 2000, Northwest utilities invested in efficiency at a pace that was roughly half as much as the Council determined to be cost-effective in its 1998 Power Plan. This is despite the fact that the Council's cost-effectiveness assessment was based on forecast power costs that were much less than current forecasts and very much less than the actual wholesale power costs experienced over the June 2000 to June 2001 period. The factors influencing that decline included the uncertainty about electricity industry restructuring and the mistaken expectation that the low market prices of the late 1990s would persist.

What seems likely is that electricity prices will be much more volatile than they have been in the past. The extreme volatility of the past year is an example. In such an environment, investments in efficiency that appear only marginally cost-effective during periods of lower prices will be extremely cost-effective during periods of higher prices. In fact, if the conservation[1] called for in the Council's 1998 Plan had been in place in the June 2000 to June 2001 period, more than 80 percent of its full cost would have been paid for at the average firm wholesale prices at the Mid-Columbia trading hub. If this conservation were in place today, it would produce additional savings for an average of 13 more years.

In response to the tight supplies and high prices of the past year, utilities have refocused on conservation, in particular on conservation measures that could be implemented quickly. For example, record numbers of compact fluorescent lights have been sold over the past year with incentives from regional utilities. However, the question now is what is going to happen over the next few years. At least two scenarios are possible. Prices have moderated and some are predicting an excess of new generation that, combined with more normal hydro conditions, would drive power prices down. This could presage another round of volatile prices by suppressing development until demand again overtakes supply. Alternatively, much of the generation currently in the development process or in the earliest stages of construction may not be completed as scheduled, leaving the region facing potential reliability issues when we again experience worse-than-normal hydro conditions.

Either scenario suggests that we ought to re-think our approach to conservation. Many analysts believe that volatility will be the norm in electricity markets. Rather than accelerating and decelerating conservation acquisition in response to the swings in market prices, we believe it makes

[1] This paper uses "efficiency" and "conservation" interchangeably. The definition of conservation is consistent with that used in the Northwest Power Act – reductions in the use of electricity resulting from improvements in the efficiency with which electricity is used.

more sense to sustain a level of investment that is justifiable in light of expected average prices and that can prove very valuable during periods of upward volatility. Such investment can insulate a portion of a utility's loads from that volatility and protect consumers. Moreover, sustainable investment in efficiency is more economically efficient. The infrastructure needed to implement much of the lowest cost efficiency resource – manufacturers, engineers, contractors, utility staff – cannot efficiently ramp their activity up and down with the variations of the power market.

Prospects for Sustainable Funding

What is the prospect that the region will provide sustainable funding for implementing the cost-effective amounts of conservation over the next several years? The signs are mixed. Two states in the region have instituted systems benefits charges. In Oregon, for example, the Legislature has created a mechanism to fund conservation and renewables efforts in investor-owned utility (IOU) service areas as part of its electricity restructuring legislation. This mechanism will begin operation in March of next year. A non-governmental, non-profit group, The Energy Trust of Oregon, will administer funds equal to 3 percent of revenues from the sale of electricity by the investor-owned utilities and is mandated to use those funds to develop conservation and renewable resources. Most of it is targeted for conservation, including low-income conservation. Low-income energy bill assistance is funded separately. Large customers will self-direct similar conservation and renewables efforts. That system should provide sufficient funding for customers of Oregon's investor-owned utilities. Public utilities can opt out of the system. Among the publicly owned utilities, some have and will continue to pursue efficiency improvements aggressively, some have not. What they will do in the future is unclear.

Montana also has a systems benefit charge established as part of its restructuring legislation. It is funded at the rate of 2.4 percent of utility revenues. The funds are administered by the individual utilities and can be used for conservation, low-income weatherization, low-income bill assistance and renewables. Public utilities that purchase power from Bonneville can use the portion of their Bonneville charges attributable to debt service on past conservation investments as an offset to the system benefits charge. This reduces the amount available for new conservation investment.

In Washington and Idaho, there is no overall system benefit charge, and utilities, both public and private, are pursuing efficiency improvements at different rates. Some utilities have been very aggressive, some have not.

We do know that many utilities will be implementing rate increases, which should increase many consumers' interest in and need for conservation. The Bonneville Power Administration is offering a discount on its wholesale rates to its utility customers that operate qualifying conservation and renewables programs. On the other hand, many utilities will be trying to recover high costs of power purchases made over the past year. Many may be inclined to cut conservation staff and expenditures on the grounds that the "energy crisis" has passed and costs must be cut. Some already have.

The New Power Plan

Over the next year or so, the Council will be developing a new power plan. As required by the Northwest Power Act, an important element of that plan will focus on evaluating the benefits and costs of investment in new and existing efficiency technologies and programs and the potential contribution of these technologies and programs to the region's energy supply. Equally important,

the plan will also address the policies necessary to achieve sustainable levels of investment in cost-effective efficiency throughout the region. This is consistent with both the Northwest Power Act and the energy policy recently adopted by the Western Governors. [2]

In developing the conservation elements of the power plan, the Council will work with the Bonneville Power Administration, individual utilities, industries, builders and developers , conservation advocates, state and local governments, tribes and other interested members of the public. The Council will form a Conservation Advisory Committee in the very near future to carry this work forward. While we believe we can accomplish this task over the next year or so, the complete process from conception to implementation will take some time. In the interim, it is important that the region not lose the momentum established for conservation over the last year.

Maintaining Momentum in the Interim

As a way of encouraging continued attention to cost-effective conservation at sustainable levels, the Council is proposing to adopt a tangible near-term conservation goal for the region and to challenge the region's citizens, utilities, and others responsible for conservation implementation to commit to achieving their share of that goal. In general, the proportion of regional load that each load-serving entity represents would determine the share. A tangible near term goal would be to commit to building roughly the equivalent of the output of a power plant – a large combined cycle combustion turbine – through conservation over three years. This would translate into approximately 100 average megawatts per year. As will be shown in the following sections, the Council believes such a goal is achievable and cost-effective.

The Council is seeking public comment on the following questions:

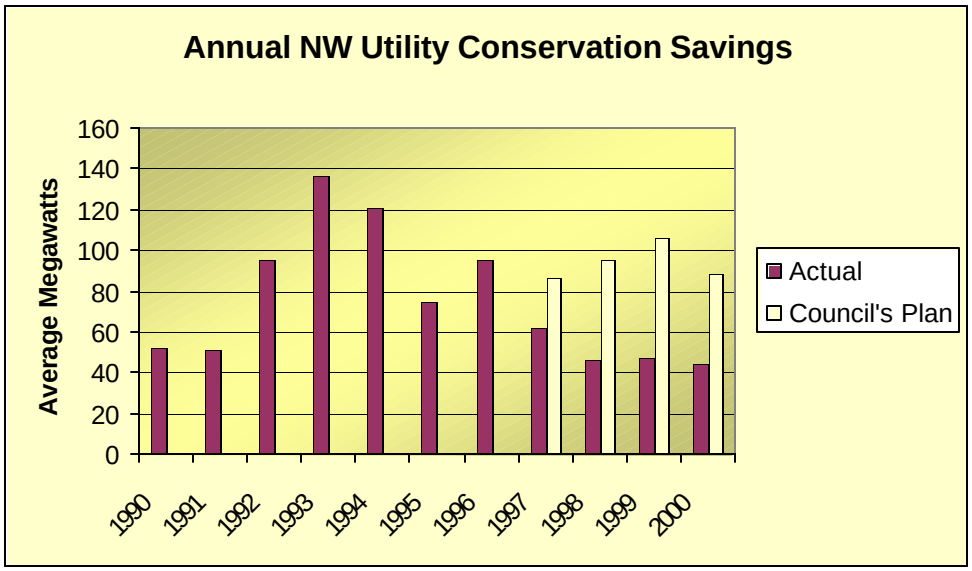
- Should the Council establish an interim conservation target?
- Are the target levels proposed appropriate?
- What kind of response to that target should the Council expect from those entities with conservation responsibility?
- What mechanisms and forums could be used to enhance the response?
- Is the method proposed for allocating the target to different entities reasonable and workable?

[2] See www.westgov.org/wga/policy/01/01_01.pdf

What Are We Capable of Doing and What Have We Done?

The Northwest has an admirable record of conservation development. Figure 1 shows conservation acquisitions by utilities in the region through the decade of the 1990s.[3]

Figure 1



As Figure 1 shows, the region is capable of developing conservation resources at a signifiant rate. Conservation acquisition peaked in 1993 at almost 140 average megawatts. The rate of acquisition, however, fell off dramatically in the latter years of the decade. The factors influencing that decline included the uncertainty about electricity industry restructuring that was pervasive during that period, and the apparent expectation that the relatively low wholesale power prices would persist.

In its Fourth Northwest Power Plan the Council identified approximately 1535 average megawatts of conservation opportunities that could be cost-effective to develop over a 20-year period. The Council's analysis estimated that by developing these resources, rather than relying on new gas-fired generation, the region could save $2.3 billion dollars in avoided electricity costs and reduce carbon dioxide emission by approximately 80 million tons. The plan's estimate of cost-effective conservation potential was based on a maximum total regional levelized cost of 3.0 cents/kilowatt-hour ($30 /MW-Hr). [4] Figure 1 shows the annual level of acquisition that the Council determined to be cost-effective for the years 1997 through 2000. Those estimates were based on expected future market prices that now look naïve. They began in the low to mid-2 cents/kilowatt-hour and rose gradually into the mid- to upper-2s/low 3s over the next 20 years. But even given those low avoided costs, actual acquisitions were approximately half the cost-effective acquisitions identified in the Council's Plan.

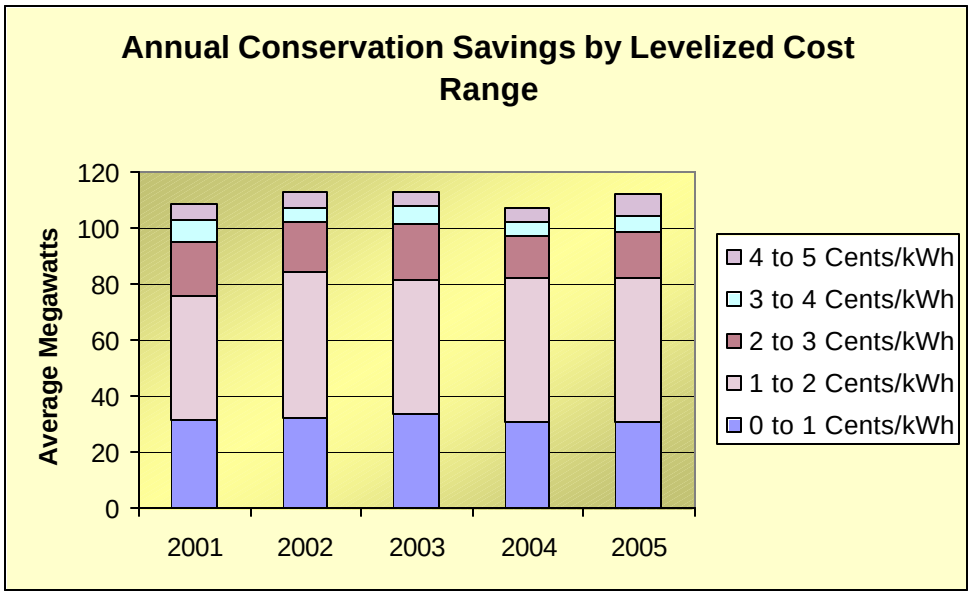
[3] Year 2000 actuals are preliminary and based on partial reporting of achievements.

[4] Total regional cost includes all costs paid for conservation including administration costs. Unlike power purchases, consumers who benefit from conservation savings are usually willing to bear some portion of its costs.

How Much Conservation is Available at What Cost?

Figure 2 shows the annual level of conservation acquisition by levelized cost block over the several years that staff believes it is feasible to develop. This is based on analysis from the last power plan that looked at accelerating conservation implementation in response to higher prices.

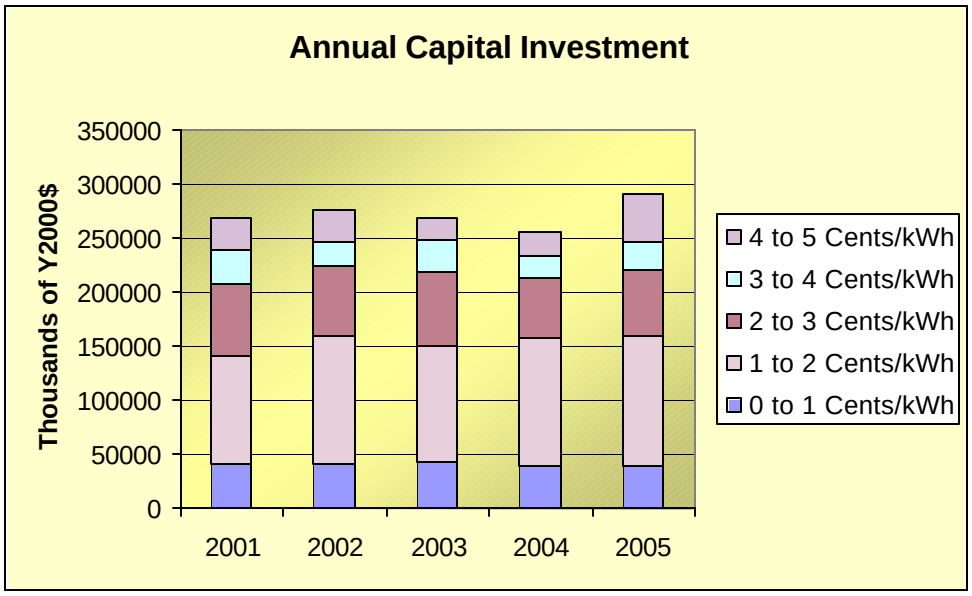
Figure 2 – Annual Incremental Conservation Potential



This shows that over the next three to four years, there is approximately 100 average megawatts per year at maximum levelized costs up to 3 to 4 cents/kilowatt-hour. The great majority of the savings have a levelized cost of 3 cents/kilowatt-hour or less. The average levelized cost of the conservation up to a maximum of 5 cents/kilowatt-hour is around 2 cents/kilowatt-hour.

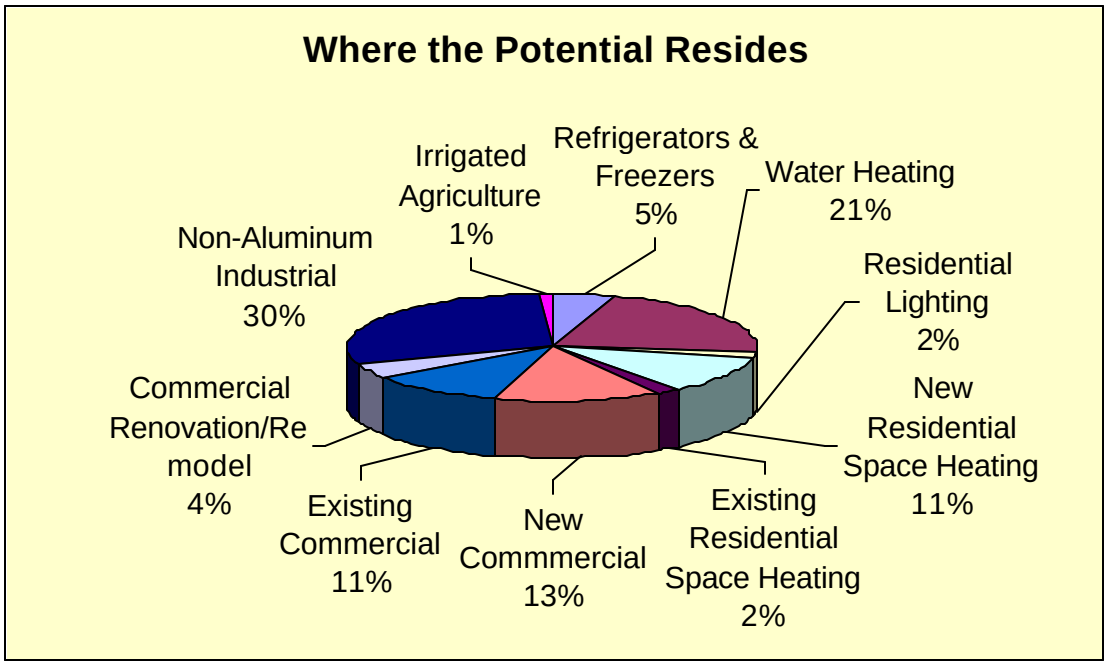
As shown on Figure 3, over the next three to four years, the total annual costs of developing the conservation up to the 4 cents/kilowatt-hour level are approximately $250 million/year, including utility administrative costs. Limiting conservation development to 3 cents/kilowatt-hour would have an annual cost of approximately $220 million/ year. These costs would not be solely the responsibility of the utility system. We expect these costs to be split in some proportion between the participating end-users and the systems' ratepayers. End-users benefit directly from power cost reductions as well as, in many instances, non-energy benefits such as increased productivity, greater comfort, reduced maintenance costs, reduced environmental emissions, etc. Moreover, these expenditures would not be entirely incremental to current conservation budgets. At least 50 percent of this amount is already incorporated in utility commitments to the Northwest Energy Efficiency Alliance, Bonneville's Conservation and Renewables Discount and Conservation Augmentation budget, and the Oregon Energy Trust. This does not include the plans of investor owned utilities outside the state of Oregon or the plans of major public utilities such as Seattle, Tacoma, Eugene, Snohomish Public Utility District and Clark Public Utilities nor does it include the participating end user's contribution.

Figure 3 – Annual Cost of Conservation



As shown in Figure 4, almost 60 percent of the conservation potential lies in the commercial and industrial sectors. This implies that the conservation investment should contribute directly to making the economy of the Northwest more efficient and more risk resistant.

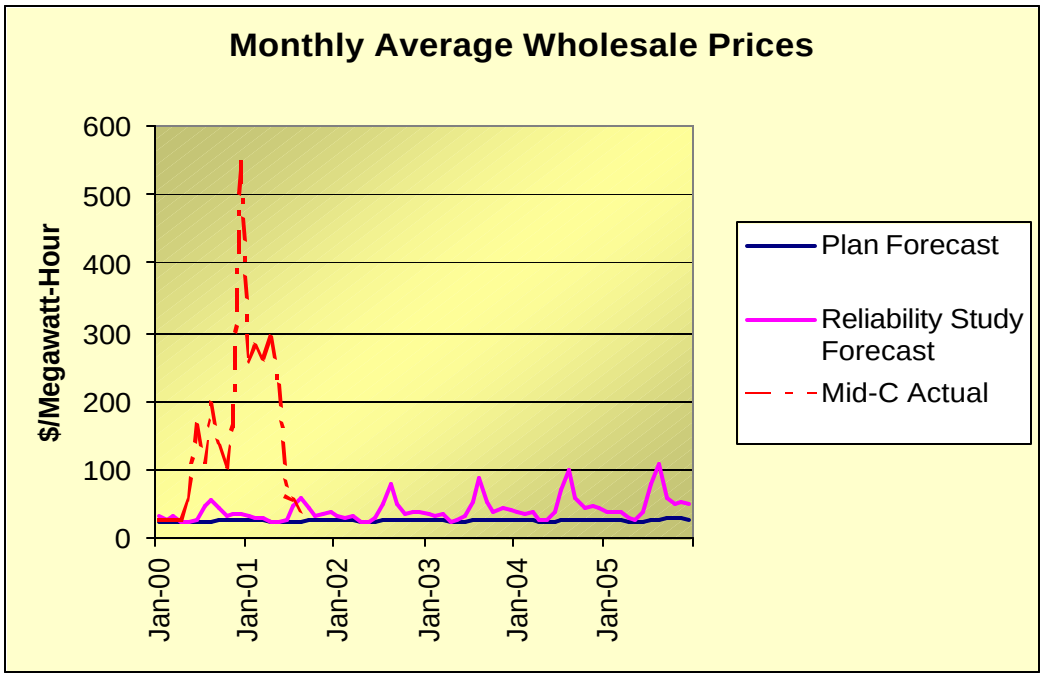
Figure 4 – Conservation Potential by End Use



How Much is Cost-effective

Cost-effectiveness is a relative term. If the point of comparison is the fully allocated cost of power from a new combined cycle combustion turbine, Council staff's current estimate is a levelized cost of approximately 36 to 37 $/megawatt-hour (2000 $) or 3.6 to 3.7 cents/kilowatt-hour.[5] Alternatively, one might compare the cost of conservation with the long-term cost of power on the market. Figure 5 shows a comparison of the market price forecast used in developing the conservation levels in the Council's last plan compared with a more recent price forecast and the actual wholesale prices of the past year.

Figure 5 – Wholesale Price Forecasts



The line marked "Plan Forecast" was the estimate of market prices used in the Council's last power plan. It was produced in 1995 before the wholesale market was very well developed and before the Council had incorporated a more sophisticated model of the West Coast power market into its analyses. The line marked "Reliability Study Forecast" was developed in early 2000 using AURORA™, a commercial model of the West Coast electricity markets. AURORA is a "market fundamentals" model. This means that market prices are set by the operating cost of the most expensive power plant that has to operate to meet load. The analysis assumed average loads and hydro conditions. The results demonstrate the typical increase in prices across the summer months driven by air-conditioning loads in California and the Southwest. The analysis uses a forecast of natural gas prices that many would think is optimistic, i.e., leading to lower electricity prices than we are likely to actually see. It also assumes orderly development of new resources where developers have perfect knowledge of future prices and new resources are added to the system only when they can make an adequate return on investment. As a consequence, the results of this model do not reflect the effects of periods of oversupply and undersupply on prices. While this forecast reflects significantly higher prices than the plan forecast, it does not capture the market behavior (Mid-C Actual) experienced over the past year.

[5] Fully allocated costs include both fixed and operating costs.

Using the reliability study forecast, we would expect average annual market prices beginning in the mid- 3 cents/kilowatt-hour range and trending upward, reaching 5 cents/kilowatt-hour by 2005 and continuing upward thereafter. Market prices higher than the cost of power from a new combined cycle power plant reflect the operation of older, less efficient plants during periods of high demand. On the basis of this forecast, conservation acquisitions up to a levelized cost of 4 cents/kilowatt-hour would clearly be justifiable in the near term. Acquisitions in the 4 to 5 cents/kilowatt-hour range can also be justified where the measures involved yield higher-valued summer period savings or where the conservation would otherwise be a "lost opportunity." Lost opportunity measures are typically measures involved in new construction or long-lived capital equipment where retrofit to higher efficiency is not practical. However, limiting the target to the conservation costing up to 4 cents/kilowatt-hour has little impact on the target level.

As noted earlier, acquisition up to these levels implies annual conservation costs in the neighborhood of $240 to $250 million/year. While this level of expenditure is substantial, it is below past levels of expenditure, it is a relatively small increment to current spending and it is cost-effective on the basis of what many would say is an optimistic (i.e., low) view of future electricity prices.

It should be noted that the risk profile of an investment in conservation is significantly different than the risk profile of a gas-fired combustion turbine or reliance on the spot market. The conservation is essentially all capital cost. Once you have made the investment, you can't avoid the costs. The cost of power from the gas turbine is largely operating cost - primarily fuel. When the power market is operating competitively, prices will be closely tied to fuel prices, which can themselves be volatile. At other times, such as this past year, spot market prices for electricity will be more volatile that the underlying fuel price.

The point is that both conservation and gas turbines present risks, but they are different risks. Including 300 megawatts of fixed cost conservation along with 4000 megawatts of new gas turbines is a prudent diversification of the region's portfolio of power system investments. If, over the next 15 years, the region experiences a year of price volatility in which the average wholesale price is only half what it was over the past year, the savings from the conservation investment would cover approximately 40 percent of the total cost noted above in that one year.

The Target

On the basis of the foregoing, staff recommends a short-term target of at least 100 average megawatts per year over three years. This translates into a bit more than the energy output of a typical single-unit natural gas-fired combined cycle combustion turbine power plant (270 average megawatts) and the period, three years, is approximately the time it takes to plan, site, permit and construct such a generating unit. Staff recommends communicating that goal as "building a efficiency power plant." The reasons are:

- The goal communicates that conservation is an energy resource like generation;
- Expressing the goal as a generation equivalent makes it tangible in a way that the public can understand.
- The goal communicates commitment to a diverse resource portfolio for the region. The region currently has almost 4000 megawatts of new, gas-fired generation either recently completed or under construction. The goal expresses the commitment to get less than 10 percent of that figure through efficiency.

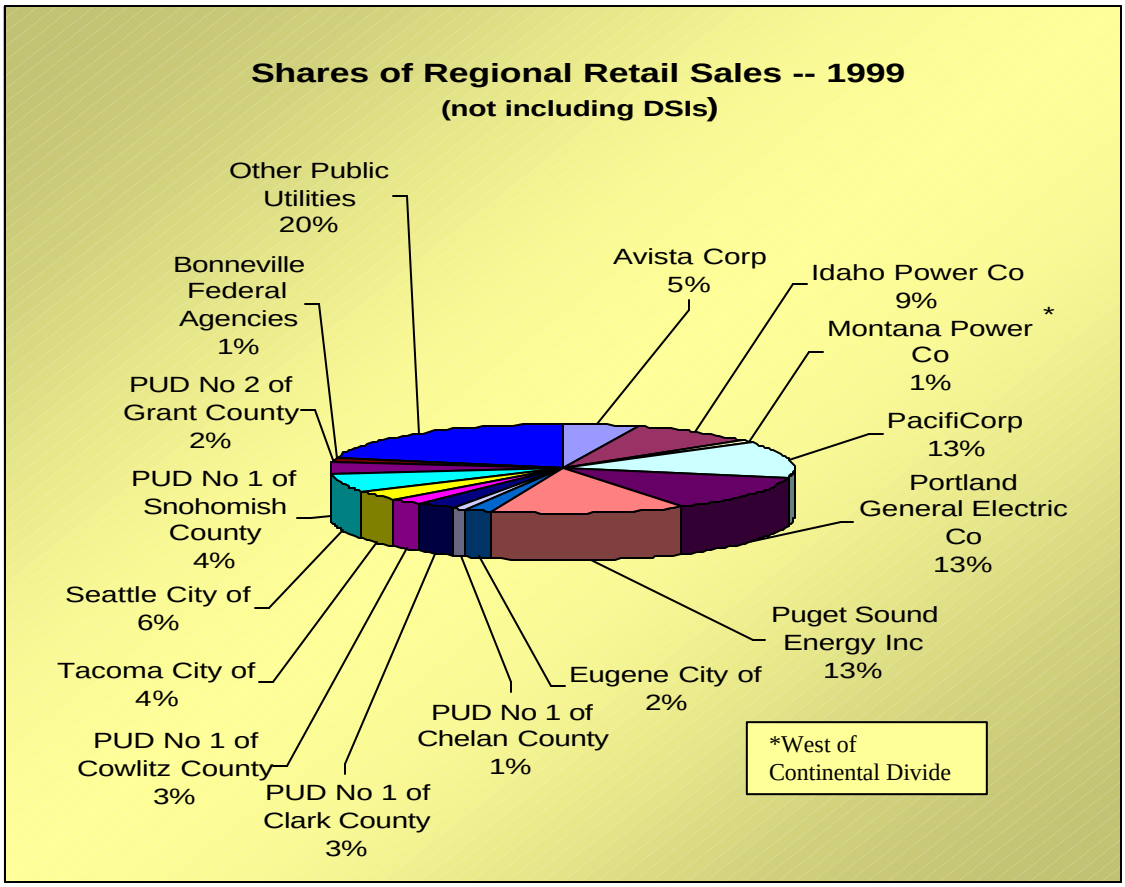
Who's Responsible for How Much?

Staff proposes that the Council adopt this interim target and ask each entity responsible for conservation delivery to commit to building their share of the efficiency CT over the next three years. These entities include utilities, the Oregon Energy Trust, and, where major retail consumers have direct access to the power market, the consumers. Shares would be determined by each entity's share of regional load. Based on 1999 loads, the responsibility for energy savings by utility would be approximately as shown on Figure 6. The Regional Technical Forum, working with Council staff, has developed a web site that will greatly facilitate both the selection of measures or programs that utilities would offer and the reporting of accomplishments.

However, the intent is not to have a rigorously enforced target for each entity or to dictate what conservation programs are undertaken or how they are delivered. The intent is rather to put a spotlight on the importance of continued attention to improving the efficiency with which we use electricity and establish an expectation that all will do their part. The Council recognizes that some utilities in the region are already planning for more than "their share" of this goal and applauds them for their initiative. The Council also believes that there are some who have planned on doing less. The Council hopes that this will encourage them to reach farther.

There are some issues that will have to be resolved. There is an issue as to whether utilities that purchase part of their load from Bonneville pay for all the conservation in their territory or only that part served by their own resources. Those customers typically have the ability to maintain their load on Bonneville while being able to sell on the market their own resources made available as a result of the conservation savings. To the extent that is the case, the data in figure 6 assigns responsibility on the basis of load, it makes no assumptions regarding what the source of the funding may be. The data in figure 6 also assigns major direct access customers to the utility. Where the customer has direct access, the utility cannot be held responsible for the conservation investment. We would expect direct-access customers to be responsible for their own share.

Figure 6



Source: U.S. Department of Energy, Energy Information Agency

Opportunities for Public Comment

Please submit comments on this issue paper and, specifically to the questions on Page 3, by the close of business Friday, November 16, 2001. Public comments also will be accepted at the Council's November 8, 2001 meeting in Idaho Falls, Idaho and its December 12 Work Session in Portland, Oregon. Please address all comments to Mark Walker, Director, Public Affairs, Northwest Power Planning Council, 851 SW Sixth Avenue, Suite 1100, Portland, Oregon, 97204. Comments will also be accepted via e-mail at comments@nwppc.org. Please indicate that you are commenting on Council document 2001-26.