

**Tom Karier**  
Chair  
Washington

**Frank L. Cassidy Jr.**  
"Larry"  
Washington

**James A. Yost**  
Idaho

**W. Bill Booth**  
Idaho



**Joan M. Dukes**  
Vice-Chair  
Oregon

**Melinda S. Eden**  
Oregon

**Bruce A. Measure**  
Montana

**Rhonda Whiting**  
Montana

## **Issues for the Sixth Pacific Northwest Power and Conservation Plan**

Council Document 2007-22

# Issues for the Sixth Pacific Northwest Power and Conservation Plan

## Background

The Northwest Power and Conservation Council is beginning the development of its Sixth Power Plan. The Northwest Power Act requires the Council to review its 20-year regional power plan every five years. The Council wants to ensure that the Sixth Power Plan addresses issues that are important to interested parties in the Pacific Northwest. These parties help implement the Council's power plans, and the plan needs to provide the information and policy guidance that will help the region achieve the adequate, efficient, economic, and reliable power system that is our shared goal as required in the Northwest Power Act.

The purpose of this issue paper is to share the Council's initial views on important issues that need to be addressed in the next power plan, and to solicit views from the region on these and other important issues.

## Theme of the Power Plan

Each of the Council's five previous power plans has been organized around a general theme. Sometime these were explicitly stated, and other times they were implicitly suggested. The implicit theme of the Fifth Power Plan was dealing with price volatility and risk. That power plan was developed following the West Coast energy crisis of 2000-2001. The plan focused on adequacy of power supplies and the value of improved efficiency as a low-cost and low-risk approach to meet power needs.

As the Council prepares to develop the Sixth Power Plan, a special concern of the Pacific Northwest and the entire United States is climate change. Renewable portfolio standards and carbon control regulations have been established in many states in the Northwest and the wider West. In addition, CO<sub>2</sub> emissions targets have been adopted by the Western Climate Initiative and many individual states. The Council's 2007 paper on The Carbon Dioxide Footprint of the Northwest Power System<sup>1</sup> illustrated the difficult challenge the region faces to achieve these goals and still provide an economical and reliable power system for the region. The Council proposes that cost-effective reduction of the carbon dioxide footprint of the Northwest power system should be a major theme of the Sixth Power Plan.

## Major Issues

Consideration of price volatility and risk, and the resulting value of resource adequacy and improved efficiency will be integral elements of the Sixth Power Plan. However, additional issues have emerged since adoption of the Fifth Plan. In summary, the issues include:

- Climate change and related policies

---

<sup>1</sup> Pacific Northwest Power and Conservation Council. *Carbon Dioxide Footprint of the Northwest Power System*. November 2007. Council Document 2007-15.

- Meeting loads on an annual, daily, hourly, and sub-hourly basis
- Expanding the menu of resource choices
- Transmission constraints and their impacts on electricity markets and resource development
- Power plan interactions with the fish and wildlife program
- Appropriate avoided cost measures for resource decisions

Each of these issues is discussed below. Although they are described separately, the nature of these issues is that they overlap to a significant degree both conceptually and analytically. The Council invites the region to comment on these and other issues that should be included prominently in the Sixth Power Plan.

### ***Climate change issues and policies***

Regardless of one's views on climate change and human responsibility for it, the fact is that global climate is warming and many believe that human creation of greenhouse gases is playing a role. Policies are already in place to address the issue and more likely will appear before the power plan is finished.

Climate change policies that have been put in place in the region so far include renewable portfolio standards, limitations on CO<sub>2</sub> emissions from new power plants, and targets for overall CO<sub>2</sub> emissions that may lead to constraints on the operation of existing power plants. These policies will limit the resource choices that can be considered in the power plan. The objective of the power plan then becomes finding a combination of efficiency improvements, demand response, and generating resources that comply with the legal requirements at the lowest cost and least risk.

Some of the questions that need to be considered include:

- How do renewable portfolio standards (RPS) that differ among states affect the region?
- What will be the actual effect of renewable portfolio standards when special provisions of RPS policies such as cost caps, exclusion of some utilities, low-load growth exceptions, and ability to purchase offsets are considered?
- How might carbon reduction policies and resource choices impact electric system dispatch? What are the implications of dispatching resources to conform to carbon reduction requirements instead of minimizing cost?
- Growing reliance on wind to provide renewable energy raises integration issues that are being addressed by the Wind Integration Forum. What is the role of the hydro system in integrating wind? What are its limitations? How does use of the hydrosystem to integrate intermittent wind resources affect other uses of that system such as providing capacity and ancillary services? How do proposed modifications of hydro system operations for fish and wildlife and other purposes impact the availability of power system flexibility for integrating wind power and other intermittent resources?
- What options other than the hydro system exist for integrating wind and other intermittent renewable resources and providing the flexibility to meet hourly and daily loads and also provide needed ancillary services? What are the risks and limits to relying on natural gas to provide such services?

- How might climate control policies in other sectors of the economy affect electricity requirements? For example, plug-in hybrid electric vehicles or production of various types of biofuels could affect regional energy demand, but today the effects are uncertain.
- What are other options might reduce the CO<sub>2</sub> content of new electricity generation? What alternatives exist now, and what alternatives might become cost-effective with further research and development? Examples include nuclear generation, integrated gasified combined cycle (IGCC) or other fossil technologies with carbon capture and sequestration (CCS), or advanced renewable sources such as solar, wave, ocean thermal, tidal energy, and energy crops.
- The CO<sub>2</sub> Footprint paper showed that reducing CO<sub>2</sub> emissions to 1990 levels would require changes to existing coal fired resources. What are the economic costs and benefits of retiring or retrofitting existing coal generation plants to utilize CCS? How does the uncertainty of future carbon dioxide allowance prices or taxes affect this tradeoff?
- What opportunities exist for developing and using renewable energy credits and trading systems for ecological services or other “green products” to complement efforts to reduce greenhouse gas emissions and preserve fish and wildlife habitat?
- How will climate change affect water supply and hydroelectric generation? What mitigating actions are available to the region to offset undesirable effects of climate change?

### ***Meeting Loads on an Annual, Daily, Hourly and Intra-Hourly Basis***

In the past, regional planning has focused mainly on meeting annual energy requirements. However, we have recognized for many years that a time would come when assessing annual energy needs would not be sufficient. The Council believes that time is here and that the Sixth Power Plan will need to address not just energy planning, but also how the region can best meet electricity requirements on an hourly and daily basis.

The Northwest Power Act was created to respond when the region began to outgrow the energy capability of the hydroelectric system. Successful conservation efforts in the region have slowed the growth of electricity demand, but over 25 years the hydroelectric system has become a smaller share of the electricity supply. The region now has a diverse array of generating resources. However, much of the added non-hydro generation resources have been for the purpose of baseload generation. Baseload generation is not designed to vary operating levels on an hourly or daily basis. The region has continued to rely on the hydroelectric system for the flexibility to shape energy to meet fluctuating electricity use and to provide ancillary services.

Eventually the region is bound to outgrow the flexibility available from the hydroelectric system, just as it did the energy capability of the system. Some utilities in the region already have turned to construction of new generation for the purpose of serving capacity needs. It is still not clear exactly when new flexibility resources will be needed, but the time has been hastened by limitations on the flexibility of the hydroelectric system to help mitigate the impacts of the dams on salmon and steelhead, and more recently by significant additions to wind generation capacity. Wind generation is intermittent, subject to the whims of nature, and requires increased generation flexibility from other resources to integrate it into the power system, both on an hourly and sub-hourly basis. Renewable portfolio standards are expected to add much more

wind into the regional generation mix and further hasten the need to address increased flexibility in the regional generation and use of electricity.

The Council recognizes a growing need to analyze generation and load on a finer temporal scale. In the past, the Council developed models to assess the shape of demand, simulate resource operation, evaluate regional market prices of electricity, and determine loss-of-load probability -- all on an hourly basis. The Fifth Power Plan began to assess demand response as a way of providing flexibility on the demand side. Conservation cost-effectiveness has been assessed based on a time-of-day and seasonal basis since the 1996 Power Plan. The Resource Adequacy Forum is developing both capacity and energy adequacy standards for the region. In addition, the Council has assessed the effects of climate change forecasts on the seasonal patterns of hydroelectric generation and electricity demand.

These developments, although they contributed to parts of past power plans, were not consistently and completely integrated into the plans. Thus, the Council believes the Sixth Power Plan the Council should address the issue of resource flexibility to meet hourly requirements more comprehensively. We have developed a new demand forecasting system that better addresses both short-term and long-term patterns of demand. Some flexible resources such as simple cycle turbines or water storage behind dams are traditional and well understood. However, there are other alternatives that are less well-understood and more difficult to assess with traditional models. Some examples include demand response programs, various electricity pricing strategies, plug-in hybrid cars that can be charged or drawn down as needs vary, innovative storage technologies, improved wind forecasting, and ramping controls on wind turbines. There are likely many other approaches to be considered and compared on the basis of cost, risk, and other characteristics.

Many of these alternatives can contribute to wind integration, but may affect the flexibility of the power system in other ways as well. The Wind Integration Forum is continuing its work in this area and should provide some input to the Sixth Power Plan. But the issue is broader than wind integration and should be analyzed in a more comprehensive manner.

### ***Expanding the Menu of Resource Choices***

The Council's paper on the CO<sub>2</sub> footprint of the regional power system demonstrated that significant effort will be required to reach Western Climate Initiative, state, and potential national greenhouse gas reduction targets. Conventional low-carbon resource alternatives are limited in potential and are expensive. Natural gas-fired generation is subject to substantial fuel availability and price risk. Some technologies for reducing carbon dioxide releases to the atmosphere, such as post-combustion carbon separation, carbon sequestration, and advanced nuclear power, remain under development and may be difficult to put in place, certainly in the first decade of the power plan.

Higher prices and CO<sub>2</sub> limitations mean that efficiency improvements will be especially important. It will be an objective of the Sixth Power Plan to expand the efficiency supply curve to provide additional options at higher avoided cost levels. The Council will take a fresh look at renewable and low-carbon generating technologies, system operation strategies, and sequestration technology to see if some of them have become viable sources of cost-effective approaches to meeting renewable portfolio standards and CO<sub>2</sub> reduction targets.

Traditional resource choices are limited in the carbon constrained world that is developing. These conventional sources of generation and conservation have been well characterized in past power plans. In the new power plan, the Council proposes to explore further resource alternatives holding promise in this new world including:

- What efficiency options are available at higher avoided cost levels?
- What are the cost-effectiveness and feasibility of “smart grid” options including opportunities for savings based on smart meters and automated evaluation of savings from real time pricing incentives that consider not only electricity cost savings, but overall business efficiency and profitability?
- What are the cost, commercial status and potential for emerging renewable resources including wave, tidal current, and solar thermal options?
- What is the availability of “conventional” renewable resources including wind, geothermal, biomass and solar photovoltaics at higher avoided cost levels?
- What are the most promising advanced natural gas and coal technologies? What carbon separation technologies are available for new and retrofit applications? What are the prospects for carbon sequestration in the Northwest?
- What are the most promising nuclear generation designs, and what are the current state of and future prospects for nuclear waste processing, storage, and disposal?

The Sixth Power Plan should highlight these resources where promising and explore ways to encourage their development if they are cost-effective and contribute to meeting other policy goals.

### ***Transmission constraints and impacts on electricity markets and resource development***

Adequate transmission capacity and its efficient operation and management are essential to a reliable and economical power system. The Fifth Power Plan addressed a list of transmission problems and encouraged the region to move forward to resolve them. There has been progress over the last few years to address some of the most urgent problems. These efforts are headed by different regional and West-wide organizations, such as Columbia Grid, the Northern Tier Transmission Group, WECC, NTAC, and perhaps others in the West.

In the Sixth Power Plan, the Council will need to assess the progress in improving transmission capacity and operation. Some resource alternatives continue to be transmission constrained, which will affect their timing and cost. The role of transmission may be especially important in determining the feasibility of acquiring enough renewable resources to meet RPS requirements within proposed cost limitations. To the extent that generating plant locations, distributed generation, efficiency improvements, or demand response contribute to alleviating transmission constraints they have additional value that should be considered.

Transmission decisions and impacts are both highly location and situation specific and often not just regional but multi-regional. Transmission expansion planning studies that would be analogous to what the Council does in resource planning would require analytical capability and models that the Council does not now possess. However, the Council is actively involved in a number of regional and West-wide transmission planning forums that are involved in such analysis. The intent of this involvement is, among other things, to help ensure that the resource

actions of the Fifth Power Plan are carried out as well as possible. Should this role change for the Sixth Power Plan?

One possible approach would be to focus further on characterizing the areas in and adjacent to the Northwest in which renewable development looks the most promising (sometimes called renewable energy zones) and working with the various transmission planning entities to ensure that transmission to deliver that power is examined.

- How can the Council's power planning best incorporate transmission issues?
- Can the plan provide useful guidance on transmission capacity expansion?

### ***Power Plan Interactions with the Fish and Wildlife Program***

By law, the Council's fish and wildlife program is incorporated into the power plan. The linkages have been relatively limited in the past. Most importantly, hydrosystem operations to improve fish passage in the fish and wildlife program act as constraints on the capability of the hydroelectric system, except in defined power emergency situations. Hydro operations in such emergencies, though rare, can have adverse effects of fish. The Council has attempted to minimize these events further by selecting a low-risk resource plan with adequacy standards intended to provide a low-risk power system, as well as a system unlikely to require emergency operations that might affect fish.

There may be opportunities to increase the coordination between the fish and wildlife program and the Sixth Power Plan. Many of these opportunities are related to the growing concern about climate change, CO<sub>2</sub> mitigation, and increased use of wind power, and are therefore related to other issues raised in this paper. Some questions to consider are:

- What is the quantitative relationship between changes in hydrosystem operations to benefit fish and wildlife and the availability of flexibility from the hydro system? How might hydrosystem operations be affected by increased needs to shape intermittent wind generation and what are possible effects on fish operations?
- Does development of additional water storage projects, if cost-effective, have potential benefits for fish as well as for power?
- How does growing competition for consumptive water use affect power and fish? How do water use efficiency improvements affect the power system and fish and wildlife?
- Are there opportunities for negotiation with Canada on increased coordination of water releases or additional generation at Canadian dams that might benefit both the Columbia River power system and fish?
- Does the growing use and value of carbon credits, or other tradable environmental credits, present opportunities for new power plants to offset carbon emissions, or other environmental impacts, by investing in improved fish and wildlife habitat?
- How might climate change affect electricity demand, hydropower generation patterns, and salmon migration?

### ***Appropriate Avoided Cost Measures for Resource Decisions***

In the last couple of power plans, the wholesale electricity price forecast at the Mid-Columbia pricing point has been used as an indication of the avoided cost of electricity generation. This is

an important input to the Council's assessment of conservation cost-effectiveness. It is also used by others as an indication of avoided electricity costs for other purposes.

In the Council's recent proposed revision to its electricity price forecasts, some issues were raised by the fact that electricity price forecasts decreased in spite of increases in natural gas and coal prices and higher capital costs for most generating resources. The cause of the decreased electricity price forecast was traced to the inclusion of renewable portfolio standards into the Aurora<sup>XMP™</sup> market model of western electricity markets. By forcing resources to be built beyond what would be provided by a competitive market, an enduring surplus is created. In addition, the renewable resource portfolio standards tend to add resources that have low marginal operating costs. These resources enter the supply curve at the bottom and force other resources up the dispatch stack. As a result, the marginal operating cost of the resource that actually meets the load requirement is no higher -- and it is usually lower -- than before. Under these conditions the long-term market price forecast will be lower than the fully allocated cost of marginal resources. Additional payments must be made to cover otherwise out-of-the-market capital costs of new resources. These can be in the form of capacity payments in the wholesale market, or cost recovery through rates by a regulated utility.

This raises issues about the appropriate measure of avoided costs for different uses. If one is assessing the remarketing value of surplus generation, or short-term sales into the wholesale markets, then the market price is an appropriate measure. However, if one is assessing the long-term avoided cost of new generating resources that could be avoided by conservation, then the market price with surplus supplies will underestimate the true avoided costs. In this case, the portion of capital costs that is unrecovered in the market price would need to be added to market prices to get an appropriate avoided cost.

- How should carbon costs be reflected in the avoided cost used for conservation programs? If one goal is to reduce the carbon footprint of the region's power supply, conservation may provide significantly more carbon dioxide reduction per dollar than developing additional non-carbon generation.
- What is the relationship between the cost-effectiveness threshold for resources and avoided cost? For example, risk premiums reflect the value of a resource to a portfolio of loads and resources. The Fifth Power Plan demonstrated the insurance or hedge value of conservation resources. How should these be incorporated or addressed by utilities and regulators?

# **Issues for the Sixth Pacific Northwest Power and Conservation Plan: An Addendum on Regional Views**

The Council received several thoughtful and helpful comments on issues that are of interest to the region. The comments we received supported the importance of the issues described in the Council's paper. They also suggested additional issues and provided more detail on important aspects of the broad issues the Council discussed. Rather than modifying the Council's paper, it was decided to summarize in this addendum what was heard from others in the region in response to the proposed issues.

## **Climate change issues**

The Council's issue paper suggested that the Sixth Power Plan would have a theme that related to the effects of various policies and regulations relating to climate change. This was expressed as "cost-effective reduction of the carbon dioxide footprint of the Northwest power system." Some took this as an indication that the power plan might neglect the statutory objective of the power plan, which is "to assure the Pacific Northwest of an adequate, efficient, economical, and reliable power supply." That was not the Council's intent. By a theme, the Council was proposing the primary context within which the plan would be developed. For example, the context and theme of the 1991 power plan was "a time for action," reflecting a need to add resources to address an impending deficit. And the Fifth Power Plan's theme reflected planning within the context of the market risks demonstrated by the Western energy crisis of 2000 and 2001.

By proposing the theme for the Sixth Power Plan the Council was recognizing that renewable portfolio standards, greenhouse gas emission targets, and legislation addressing power plant CO<sub>2</sub> emissions are the focal context within which the Sixth Plan will be developed. The theme statement in the issue paper has been changed to clarify the Council's intent. It now reads "...cost-effective reduction of the carbon dioxide footprint of the Northwest power system, while assuring an adequate, efficient, economical, and reliable power supply."

Comments indicated that the Council should not approach the climate change policy issue by focusing narrowly on the current policies and regulations. The Council was encouraged to look at the issue broadly, recognizing that policies are recent or still being developed and interpreted, and that future attitudes and information could change. As one commenter put it:

"Rather, instead of responding to specific actions, we believe the Council is in a unique position to take a broader view by creating a document that looks ahead to inform such decisions in the region and provides a basis for creating sound policies."

Another common recommendation relating to climate change was that the Council should calculate the costs of various policies to the region's citizens and assess the possible economic

impacts of those costs. Further, the Council was encouraged to communicate these findings clearly to regional legislators, policy makers, and citizens. The following comment is an example of this concern:

“Climate change and green house gas emission policies are creating a new challenge for regional energy planning. Various state, regional (Western Climate Initiative), and possibly federal-level green house gas legislation could affect the region’s ability to deliver economical and reliable power. The Power Plan should address how these regulatory policies and legislative actions will affect energy costs and reliability for consumers in the Pacific Northwest. The region’s policy-makers need to understand the economic impact of carbon reduction policies on the power system, how such policies could affect reliability, and the possibility of unintended impacts these policies may have on our region.”

The Council was also encouraged to track and regularly update its analysis of the carbon footprint of the region’s power system.

### **Meeting Loads on an Hourly, Daily, Hourly and Intra-Hourly Basis**

All commenters recognized the importance of this issue. The comments often took the form of encouraging the Council to analyze the capability of the hydroelectric system and its use. Growing demands on the flexibility of the hydroelectric system for wind integration, load following, capacity, and regulation on one hand compete with reduced flexibility to aid salmon migration on the other hand. One expression of this issue was:

“There are many responsibilities placed on the Northwest river systems that include flood control, recreation, irrigation, transportation, fish and wildlife and power production. The Council’s Power Plan is a great opportunity to shed light on the many uses of the Columbia River system and to illustrate the trade-offs required as additional uses for the river are contemplated.”

Related to issues of the hydrosystem was a recommendation that “The Council and BPA should coordinate development of a uniform hydro capacity standard that is sufficiently detailed that utilities can determine need.”

Concerns were raised that various policies about uses of the river are not discussed within the whole context of various uses. The Council was encouraged to “..inquire further into the quantitative relationship between reduced hydrosystem flexibility and resulting carbon emissions.”

The Council was encouraged to evaluate alternative technologies for new generating capacity and flexibility resources. The work of the Wind Integration Forum was recognized and more analysis of the alternatives for integrating large amounts of wind into the power system was encouraged.

## **Expanding the Menu of Resource Choices**

There was support for the plan providing information on available technologies for energy and capacity that will be compatible with renewable portfolio standards and carbon limits. In addition, many commenters wanted an expanded list of cost-effective efficiency actions to help them achieve more conservation. For example, “The Plan must identify the options available to the region for additional energy efficiency measures.”

Many utility organizations raised the issue of whether it would be better for cost-effectiveness determination to be done at the local level rather than at the regional level. They argue that utilities face individual and unique avoided costs and efficiency opportunities. For example:

“..more efforts to determine whether cost-effectiveness for purposes of conservation is more appropriately determined at a local level, given the various conservation opportunities available within differing service territories, the increased incentives consumer-owned utilities will have to achieve conservation under tiered rates, and recent state regulations requiring greater conservation achievements by individual utilities.”

and,

“The Council should thoroughly explore various alternatives for increasing energy efficiency throughout the region. As part of that evaluation, the Council needs to examine its own policies that may be impeding the wider implementation of energy efficiency measures. [We] continue to be concerned over the rigid definition of “cost-effectiveness” used by the Council and BPA when evaluating potential conservation measures and utility programs. The current convention limits the ability of many cooperatives to pursue energy savings that are available in their service territories. We suggest that the cost-effectiveness standard the Council applies be updated and made more flexible in order to capture long-term opportunities that will otherwise be lost to the region.”

These issues relate to the Council’s resource acquisition criteria, cost-effectiveness determinations, and avoided cost calculations.

## **Other Issues**

Most commenters recommended that the Council maintain the approach to transmission issues that it adopted in the Fifth Power Plan. That is, that the Council should encourage and track progress, but not attempt to actually plan transmission expansion or modify operations. As one comment put it:

“...the role the Council adopted with respect to transmission expansion issues pursuant to the Fifth Power Plan continues to be the appropriate role under the Sixth Power Plan. FERC policy will drive increasing involvement by utilities in regional planning groups, such as ColumbiaGrid, that are well equipped to produce studies and coordinate

expansion plans. [We] encourages the Council to continue to rely on utilities and these regional planning groups and remain involved in them. The Plan itself should not attempt to guide transmission investment. Transmission investment will continue to be determined by resource choices made by load-serving utilities.”

A couple of comments, in contrast, suggested that the Council should get more involved in transmission planning, especially in the area of wind integration needs.

A few comments addressed the role of natural gas. Three basic comments appeared. First, was that the Council should assess the supply, deliverability, and cost of natural gas. Second, the role of natural gas as a fuel for capacity resources needs to be assessed in light of the absence of an intraday natural gas market and adequate natural gas storage capability. And finally, the Council was encouraged to consider the direct use of natural gas as an electricity saving resource and a tool for reducing carbon emissions.

Other comments related to keeping the Council plan up-to-date. The Council was encouraged to create a flexible power plan that could be kept up to date. Because the plan is used in some state regulatory proceedings, it becomes important to make sure that it does not fall seriously out of line with energy developments that may have occurred since the plan was adopted.

Other suggestions included analysis of the potential effects of electric vehicles, or more generally the potential effects of climate change actions in other sectors of the economy on the power system, consideration of the potential future role of smart grid technologies, and evaluation of the potential of nuclear technology. One comment suggested addressing only responsible nuclear technology, which would require satisfactory solutions to the nuclear waster storage problem.

A public utility organization pointed out the importance of the Council coordinating its plan with Bonneville’s 2008 Resource Program, which is a planning effort Bonneville is undertaking this year.

The Council appreciates the regional interest in its power plan as evidenced by the many comments we received. This summary should not be considered a comprehensive listing of comments the Council received. Individual comments are posted on the Council website, [www.nwcouncil.org](http://www.nwcouncil.org). Further, the Council expects additional issues to emerge as we work through the planning process. The region will have many opportunities to comment on assumptions and issues as we develop the Sixth Power Plan. In addition, the Council encourages interested parties to participate in the planning process by joining advisory groups or interacting directly with Council members or their staff.

---

q:\sixthplan\drafts\issuepapers\addendum to issues ip.doc