



Biennial Monitoring Report on the Fifth Power Plan

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Introduction

Major Findings of the Fifth Power Plan

The Northwest Power and Conservation Council adopted its Fifth Power Plan in December of 2004. The plan broke new ground in its analysis of uncertainty and volatility, and their associated risks for future power costs. The key conclusions embodied in the Fifth Power Plan were that the region should acquire improved energy efficiency at an aggressive and sustained pace. The benefits of this strategy were both lower costs and lower risks.

A second conclusion of the Plan was that wind energy is potentially cost effective. But the Plan also recognized that wind, and other intermittent generating resources, pose challenges for integration into the Northwest Power System. The plan called for a wind confirmation plan to be informed by the development of 500 megawatts of commercial scale wind generation between 2005 and 2009. Ultimately, the plan found that up to 5000 megawatts of wind could be developed over the 20 years of the Plan, assuming that transmission and integration issues could be addressed.

The Plan found that the region had a surplus of generating capability and that the need for new generation from coal or natural gas likely would not occur until after 2012; after the 5-year action plan period. During the 5-year action plan the Council pledged to work with others in the region to accomplish three important policy changes. These included: (1) adopting resource adequacy standards; (2) changing the role of the Bonneville Power Administration; and (3) addressing problems in the operation and expansion of the regional transmission grid.

Summary of Major Developments Since Adoption of the Fifth Plan

The regional economy, and in particular energy intensive industrial sectors, has been slow to recover from the 2000-2001 energy crisis that formed the backdrop for the Fifth Power Plan. Energy markets, globally, nationally and locally, have continued to experience high and volatile prices. These prices, combined with prominent attention to climate change, have provided the impetus for aggressive conservation activity, new federal energy policies, and increasing attention to renewable resource requirements at the state and utility level.

High energy prices and concerns about potential climate-change policy have also led to aggressive development of wind power in the Pacific Northwest in the two years since the Council adopted the Fifth Power Plan. New generation capacity and slow demand growth have increased the electrical supply surplus in the region, which further delays the need for new generating capability.

The Council, Bonneville, utilities, and other interest groups have been especially active over the two years since the Plan was adopted. This has included major initiatives to redefine the roles of Bonneville and its public utility customers in meeting growth in electricity needs, to develop and

adopt resource adequacy standards for the region, to improve transmission planning and expansion, to explain and reduce Bonneville's costs, and to better understand the requirements of integrating large amounts of wind generation into the regional power system.

Purpose of the Biennial Monitoring Report

The Council included in its Action Plan commitments to monitor and assess the assumptions and forecasts underlying the Plan, and to track the region's progress in implementing the plan. Action Item MON-7 states that the Council will provide a biennial monitoring report to document the status of the Power Plan and its implementation. This is the first biennial monitoring report for the Fifth Power Plan.

Assessment of the assumptions and forecasts included in the Plan address such issues as whether the demand forecast is representative of actual regional sales of electricity observed since the plan. Recent prices for natural gas, oil, and coal are compared to the forecast ranges and the volatility assumed in the Plan. Experience with the cost and efficiency of various generating resources is assessed for consistency with planning assumptions. Tracking new generation development and electric loads provides an indication of changing load/resource balances and possible changes in new resource needs.

The goals of the Council's Fifth Power Plan can be accomplished in many ways. Some activities can be pursued directly by the Council, Bonneville and regional utilities. Others are more effectively accomplished through legislative action, building code changes, appliance efficiency standards, or actions to transform markets for energy equipment. Implementation progress is the second major component of this biennial monitoring report.

Assessment of the Fifth Power Plan

Key Assumptions

Demand Forecast

Actual electricity sales in the region have not recovered from the 2000-2001 energy crisis to the extent assumed in the Plan's medium forecast. In particular, the energy intensive industrial sector continues to lag behind the forecast. In total, actual demand in 2005 was about 1000 average megawatts below the medium case, falling between the medium-low and medium forecasts. A preliminary estimate of 2006 sales shows continued recovery and a move toward the medium case forecast. The assessment of the demand forecast is described in Appendix A.

Fuel Prices

Natural gas prices in 2005 averaged near the high end of the Council's Fifth Power Plan forecast range due to hurricanes Katrina and Rita. But 2006 prices are expected to fall near the middle of the forecast range. Oil prices in 2005 and 2006 were above the high end of the Council's forecast range. Like natural gas, coal prices experienced a cyclical increase in late 2005 and early 2006, but have since fallen back into the Council forecast range.

An examination of other forecasts of oil prices indicates that the Fifth Plan assumptions are probably too low. However, the war in Iraq and general unrest in the Middle East continue to support high oil prices. Neither supply nor demand has fully responded to the higher prices of

the last couple of years. Nevertheless, a devalued dollar will result in prices higher than assumed in the Fifth Plan. Fortunately, oil prices have little direct effect on the Council's Power Plan, either for generation or for electricity consumption.

The plan anticipates volatility in natural gas prices similar to what we experienced in 2005. There is insufficient information to justify increasing the Council's anticipated natural gas price range at this time. Even if it were decided that the natural gas price range should be raised, it is doubtful that there would be a significant effect on the Council's Plan, particularly the short-term action plan. The probable effect of higher natural gas prices would be to make conservation and wind more attractive. However, the near term acquisition on conservation and wind in the Plan are constrained by expectations of maximum feasibility and resource needs respectively. A more detailed description of the fuel price assessment is in Appendix B.

Electricity Prices

The electricity price forecasts for the Fifth Power Plan average very close to actual electricity prices between 2005 and September, 2006. Actual prices contain significantly more volatility than the forecast, however. This reflects the pattern that was observed in natural gas prices as a result of hurricanes Katrina and Rita in the summer of 2005. In addition, the effect of a good snow pack and an early runoff resulted low electric prices in the spring of 2006. Such electric price volatility was modeled in developing the Power Plan.

A change in natural gas prices would affect the electricity price trend forecast, especially in the near term. In the long term, sensitivity studies done for the Fifth Plan showed that higher natural gas prices would have little effect on long-term electricity prices due to compensating changes in fuel choice and plant dispatch. See Appendix C for a more detailed discussion.

Resource Costs

Wind: The pace of wind power development has far exceeded the recommendations of the Fifth Power Plan. Several factors, including high and volatile natural gas prices, the pending expiration of the production tax credit, and risks of climate change policy drive this development. With the rapid pace of wind development has come significant escalation in the costs of developing wind power projects. In addition to the robust demand for wind turbines, other factors have contributed to the substantial increase in the cost of wind projects. Two of these are a weakening dollar and cyclically high commodity prices. This increase in wind costs is expected to be a cyclical phenomenon. We still expect long-term declines in wind costs due to improved technology and materials. However, the passage of state renewable portfolio standards could prolong the higher costs by keeping demand for wind generation development high. Additional information on wind will be developed through the wind integration action plan. Completion of that analysis is high priority. Appendix D describes recent changes in the cost of wind power.

Gas-Fired Technologies: An assessment of recent experience regarding capital costs and efficiency of gas-fired generating technologies shows that the assumptions used in the Fifth Power Plan remain representative. The remaining factor in the total cost of power from these plants is fuel prices, which are addressed above. Recent work on capacity adequacy standards has shown that summer generating capacity issues may become more prominent for the region.

In addition, rapidly growing wind generation creates a need for resources that can be cost effective for firming intermittent generation. Some natural gas-fired generation technologies may be more cost effective in this context. Further analysis of these issues will be needed in the next power plan. See Appendix E for an analysis of the cost and efficiency experience in natural gas-fired generation since the Fifth Power Plan.

Coal: The assessment of coal based generation technologies identified some changes that should be investigated further. Super-critical coal generation technology appears to be advancing more quickly than gasified combined cycle (IGCC) technology. In the Fifth Power Plan, super-critical technology was used as information to shape future cost and efficiency of traditional coal plants.

The assessment found that the availability of all types of coal plants should be raised from the mid-80 percent range to 90 percent. Reaching 90 percent availability for an IGCC plant would require installing a spare gasifier, which would increase the capital cost of the plant. For most coal-based technologies the assessment found that efficiency experience is slightly lower than the assumptions in the Power Plan. Only super-critical coal technology seemed to be performing a bit more efficiently than assumed in the Power Plan. In future power plan analysis, the Council should evaluate a CO₂ sequestration-ready IGCC plant, consider the availability of petroleum coke as a fuel source for gasification, and investigate emerging technologies for carbon capture from conventional pulverized coal plants. These changes should be explored in analysis and tested before the next power plan, but would not affect the near-term action plan in the Fifth Power Plan. The coal assessment is described in Appendix F.

Other Generating Technologies: There are a number of other generating technologies that were considered in developing the Fifth Power Plan, but for various reasons did not make it into the portfolio of resources recommended in the plan. These include nuclear, geothermal, biomass, hydropower, ocean and tidal current, oil and petroleum coke, solar, and wave energy. Some new information is available on geothermal and hydroelectric potential and cost and this should be explored before the next plan revision. Nuclear generation is getting increasing attention and will benefit from incentives provided in the 2005 Energy Policy Act. It is also being considered in a couple of regional utilities' IRPs. Commercial feasibility still appears to be very late in the Council's planning horizon, but the development of advanced designs needs to be monitored. Other technologies are early in their development and do not require updating until the next plan is developed. These technologies are described in Appendix G.

Load - Resource Balance

The Power Plan estimated that the region was about 1,500 average megawatts surplus in 2005, which was a dramatic change from a 4,000 average megawatt deficit in 2000. This change was accomplished through a combination of large demand reductions and the addition of new generating resources. The plan forecast that the surplus would remain about 1,500 average megawatts in 2007.

However, due to slow demand recovery and significant new wind generation, the surplus now is estimated to reach 2,400 average megawatts in 2007. Based on the fact that non-DSI loads are below the medium forecast, as noted above, the actual surplus may be somewhat larger. This

increased surplus would delay the need for new electricity generation capability beyond the time estimated in the Plan. Appendix H documents the change in load-resource balance.

Implementation status

Conservation

An assessment of the region's success in meeting the Council's aggressive conservation targets in 2004 through 2006 shows that the region has been largely successful in meeting the targets, at least through 2005. Although the region as a whole is close to meeting the conservation targets in the Plan, there are several utilities that fall far short. These shortfalls are offset by the fact that some large utilities are substantially exceeding their share of the targets. The cost of acquiring this conservation seems well aligned with the assumptions used in the plan. In working with utilities to implement conservation and develop IRPs, staff is seeing resurgence in commitment to energy efficiency improvement. Appendix I documents the conservation implementation in the two years since the adoption of the Fifth Power Plan.

Demand response

Progress has been slower in development of the 500 megawatts of demand response called for in the Plan. Some utilities have developed demand response programs, and demand response provided between 150 and 250 megawatts of load reduction during the July 24 heat event in 2007. However, there does not seem to be great interest in firming up demand response as a resource that has a quantified supply curve and agreed measures of value. As the current surplus declines, and as peaking grows to become a greater concern in the region, we expect demand response to gain more attention. Demand response experience is described in Appendix J.

Generating Resources

A new cycle of resource development has occurred since adoption of the Fifth Plan. The Plan foresaw little need for new capacity prior to 2010, and recommended no major resource acquisitions other than 500 megawatts of wind to help confirm the resource potential. However, nearly 1,900 megawatts of new capacity, primarily wind and natural gas, has entered service or is under construction since adoption of the Plan. Wind plant construction is driven by extension of the federal production tax credit, the California renewable portfolio standard and high natural gas prices. Current thinking is that the wind production tax credit is likely to be extended, possibly for several years, but at a declining rate. In combination with the aggressive 2010 renewables target in California and developing state renewable portfolio standards in the Pacific Northwest, this will likely lead to a continued rapid rate of wind power development in the Northwest. A preliminary estimate prepared for the Northwest Wind Integration Action Plan project is for 1,200 to 2,200 megawatts of wind power development from 2007 through 2009. Generating resource development is addressed in Appendix G.

Utility IRPs

Council staff is participating in technical advisory committees for all utilities that are actively engaged in integrated resource planning (IRP). The near-term focus on conservation and wind or other renewables in the Council's plan is shared by most utilities. We have found that the Council's plan provides basic data and assumptions that many utilities use in their planning.

Many utilities foresee additional generating resource needs before the Council's Power Plan does. The Plan recognized that this was likely to be the case because of the significant amount of independent power generation included in the regional resources counted by the Council. Natural gas and coal are the main IRP resources in the long term, but some utilities are beginning to look at advanced nuclear designs after 2020. Most utilities are reluctant to commit to integrated gasification combined cycle (IGCC) plants at this time although the technology is being considered as a possibility in the future. Appendix K describes the status and characteristics of utility IRPs.

Policy Developments

Adequacy Standards: The Northwest Resource Adequacy Forum has completed its task of developing voluntary adequacy standards for the region. The Council has adopted the three major components of the standards: (1) an energy adequacy standard; (2) an adequacy warning implementation plan; and (3) a pilot capacity adequacy standard. The participation in the Adequacy Forum's steering and technical committees has been excellent and the standards appear to have wide support in the region. The Adequacy Forum will continue to refine the standards as the region gains experience. The energy and capacity standards are expected to be incorporated into the Western Electricity Coordinating Council (WECC) reliability rules, scheduled to be completed in late 2007. See Appendix L for further discussion of the adequacy standards.

Bonneville Role: There has been an intense effort over the last two years to define a new role for Bonneville in the regional power system, as recommended in several regional processes including the Council's Fifth Power Plan. This effort, called the Regional Dialogue, appears to be making progress toward achieving goals that have generally been agreed to within the region, and which are included in the Council Plan's recommendations. Comments on Bonneville's Regional Dialogue proposal closed on October 31, 2006. Negotiations are continuing on several aspects of the proposal, and on the details of how the change in policy will be implemented. In spite of many details that remain to be fleshed out, progress toward agreement is encouraging. Bonneville is scheduled to complete a record of decision on the policy in January. For further discussion, see Appendix M.

Transmission Changes: The Council described several important problems in the regional transmission system in its Fifth Power Plan. The Grid West organization intended to address most of these problems, but the region could not agree on implementing the Grid West proposal. A follow-on effort by a smaller number of utilities centered around Bonneville, called ColumbiaGrid, may address some of the issues, but is moving very carefully and slowly. Another effort by a different group of utilities on the east side of the region, called the Northern Tier Transmission Group (NTTG), has just been initiated. The Northwest Transmission Assessment Committee (NTAC) continues to look at transmission issues on a region-wide basis. Meanwhile, the 2005 Energy Policy Act gave expanded authority for reliability and transmission to FERC (Federal Energy Regulatory Commission) and NERC (National Electric Reliability Council). NERC and WECC (Western Electricity Coordinating Council) are undertaking initiatives to improve transmission system operations. This effort will address several of the problems, but with a west-wide perspective, which may preclude regional organizations like

ColumbiaGrid and NTTG from needing to act in these areas. Transmission issues and efforts to address them are included in Appendix N.

Federal Energy Legislation: The Energy Policy Act of 2005 (EPAcT 2005) contained numerous provisions that will affect the Pacific Northwest to some degree. Expanded FERC and NERC authority in the area of reliability may help resolve some of the transmission problems cited in the Power Plan. WECC implementation of these provisions may also help encourage compliance with the voluntary adequacy standards developed by the Northwest Adequacy Forum and adopted by the Council.

In addition, EPAcT 2005 contained many provisions to encourage energy efficiency and demand response and to support development of specific types of generating resources. For example, there are new energy tax credits for clean coal, advanced nuclear, and several other innovative or renewable technologies. The effects of EPAcT 2005 on energy efficiency are further discussed in Appendix I. Appendix O contains a discussion of other legislative changes at the federal and state level that will likely affect implementation of the Power Plan.

State Policy: Much of the state energy legislation activity has revolved around renewable portfolio standards. Montana and Washington have standards in law and Oregon is developing aggressive goals for legislative action. Washington and Oregon have adopted improved appliance efficiency standards, and all states have updated, or will soon be updating, their building energy codes. An Idaho interim legislative committee is working on a state energy policy.

Policy changes in California can also affect the Pacific Northwest. California has adopted aggressive enforceable renewable portfolio standards, resource adequacy requirements, and climate change mitigation policies. In addition, California has developed a Market Redesign and Technology Upgrade (MRTU) to correct the flaws in the design of the California energy market.

Implications for Long-Term Plan and Action Plan

Likely Effects of Major Changes on the Plan

The implications of the biennial assessment of the Power Plan can be looked at from two perspectives, the long-term resource plan, and the short-term action plan. Long-term resource choices that require no action for the next several years do not require near-term plan revisions. To the extent that some findings would require significant change to the near-term action plan, however, revision could be needed. Therefore, implications for near-term actions are addressed first.

The Council Plan's near-term resource actions are focused on conservation and commercial scale wind development. Conservation development is progressing well so far. Wind development has far exceeded the amount called for in the Action Plan, but this provides ample opportunity to assess the integration issues that the commercial scale development was intended to inform.

Rapid wind development, combined with slow recovery of industrial electricity demand, has increased the regional surplus of generating capability. The effect of a higher surplus would be to push other resource acquisitions farther into the future, providing additional time to achieve conservation savings and confirm the ability and cost to integrate wind into the regional power system. At the same time, the region needs to be wary of overbuilding generation capability. Some surplus protects against high and volatile electricity prices. Too much surplus can result in a high cost electric system and increase the cost of Bonneville's power by lowering the market value of nonfirm hydropower generation.

The other focus of the near-term Action Plan is on regional energy policy actions related to ensuring adequate power supplies, changing Bonneville's role, and resolving regional transmission issues. The resource adequacy actions in the Power Plan have been achieved, but there will be continued attention needed to implement and refine the standards. The Regional Dialogue process appears to be making good progress toward protecting the region's access to the Federal Columbia River Power System. While the actors that were contemplated in the Plan to address the region's transmission problems have changed, due to the failure of Grid West, the inception of ColumbiaGrid and NTTG, and the increased responsibility and authority given to FERC, NERC and WECC by national energy legislation, there is still progress being made in solving these problems. No modifications to the Plan are necessary to continue that progress.

Federal and state policy developments contain many provisions that will encourage and support achieving Power Plan goals for conservation and efficient, clean generating alternatives. The development of aggressive renewable portfolio standards in the region and California will require some rethinking of the Council's planning goals and strategies. The Council's mandate in the Northwest Power Act is to develop a least cost power plan for the region. Renewable portfolio standards impose a different objective into the process that needs to be integrated somehow into the Council's planning process.

Recommendations

The Council recommends that no substantial changes be made to the Fifth Power Plan as a result of this biennial assessment. The near-term actions that are contained in the Power Plan continue to be desirable and justified, and the region is progressing well to carry out those actions.

Some of the changes in fuel prices and generating resource characteristics could change the long-term resource recommendations if the Power Plan analysis were redone. However, no change in near-term actions would be required by possible changes in the long-term resource plan. For this reason, we do not recommend a complete reevaluation of the portfolio analysis at this time. Staff will continue its ongoing monitoring of Plan assumptions and the progress in implementing the Plan. In addition, staff will continue to stay abreast of emerging changes in technology for both generation and conservation.

During the next year, staff will need to pay particular attention to some of the changes observed in the biennial assessment. Some additional analysis and testing should be done to update fuel price and demand forecasts to reflect the latest Council views. The effects of some of the changes observed in coal technologies should be evaluated for their potential effects on the long-term resource portfolio. Petroleum coke may become a feedstock for IGCC plants and the

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market for it needs to be better understood. New information on geothermal and hydroelectric generation needs to be evaluated and used to update estimates of the availability and cost of those resources.

Other near-term actions in the Power Plan and the Power Division Work Plan remain relevant and should be pursued as planned.

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