

CHAPTER 19: METHODOLOGY FOR DETERMINING QUANTIFIABLE ENVIRONMENTAL COSTS AND BENEFITS AND DUE CONSIDERATION FOR ENVIRONMENTAL QUALITY, FISH AND WILDLIFE, AND COMPATIBILITY WITH THE EXISTING REGIONAL POWER SYSTEM

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KEY FINDINGS

One of the Northwest Power Act's required elements for the Council's power plan is "a methodology for determining [the] quantifiable environmental costs and benefits" of electric generating and conservation resources.¹ Having a method for determining environmental costs and benefits is an important part of the Council's effort to estimate and compare total costs of new resources and choose those that are the most cost-effective. In this chapter, the Council describes the methodology it is using to determine these quantifiable environmental costs and benefits. Implementation of the methodology is described in other chapters, particularly in the chapters on generating and conservation resources.

The primary method the Council has used to include quantifiable environmental costs in power planning has been to incorporate estimated costs of compliance with environmental regulations in the capital and operating costs of conservation and generating resources. These regulations reflect environmental policy choices that already have been made by governments and society, and the costs associated with compliance are directly attributable to the resource and largely quantifiable. The Council used this method through the first six power plans, and it is again central in developing the Seventh Power Plan.

The Council is deciding again in the Seventh Power Plan that it is not possible to develop quantitative cost estimates related to residual effects that remain after regulatory compliance and add them into new resource cost estimates in any reasonable way. Instead, the Council gives due consideration to residual and unregulated environmental effects that are hard to quantify through other means, including through scenario analysis and possibly qualitative risk adjustments or contingencies in the resource strategy.

The Act also instructs the Council to set forth its conservation and generation resource strategy in the power plan "with due consideration" for, among other things, "environmental quality" and "protection, mitigation, and enhancement of fish and wildlife and related spawning grounds and habitat, including sufficient quantities and qualities of flows for successful migration, survival, and propagation of anadromous fish." In addition to these factors, the Council is to give "due consideration" to the "compatibility with the existing regional power system" of the new resources considered for development in its plan.² This chapter also describes how the Council is giving due consideration to all these factors in crafting the resource strategy.

¹ Northwest Power Act, Section 4(e)(3)(C). The Act is available on the Council's website at <http://www.nwcouncil.org/reports/poweract/>.

² Northwest Power Act, Section 4(e)(2).



METHODOLOGY FOR DETERMINING QUANTIFIABLE ENVIRONMENTAL COSTS AND BENEFITS

In developing the new resource strategy for the power plan, the Northwest Power Act requires that the Council compare the “incremental system cost” of different generating and conservation resources and give priority to those resources which the Council determines to be “cost-effective.” In estimating the system cost of a particular resource, the Council must include any quantifiable environmental costs and benefits associated with that resource over its effective life.³ Section 4(e)(3)(C) of the Act then requires that the Council also include in the power plan the “methodology” the Council develops “for determining quantifiable environmental costs and benefits under section 3(4),” the section that defines what it means for a resource to be considered “cost effective.” The development and application of the methodology to quantify the environmental costs and benefits of resources is thus one important part of the work the Council is required to do in the development of its power plan in order to identify the most cost-effective conservation and generating resources to recommend for addition to the region’s power system over the twenty-year plan period.⁴

Several key concepts in developing a methodology are embedded in the language of the Act. One is that the methodology is to consider costs and benefits to the “environment,” as opposed to other types of costs. Another is that the costs and benefits have to be “quantifiable,” recognizing that not all environmental effects can be reduced to quantified costs and benefits. Moreover, the costs and benefits must be “directly attributable” to the resource, not incidental or indirect. Since none of these terms is defined in the Act, the Council has historically applied a common-sense understanding of these terms, as guided by the context of the Act and the discussions in the legislative history. For

³ Northwest Power Act, Sections 3(4), 4(e)(1).

⁴ Note that the Act states that the Council’s estimates of the “system cost” for the various new conservation measures and generating resources must include “such quantifiable environmental costs and benefits as the [Bonneville] Administrator determines, on the basis of a methodology developed by the Council as part of the plan ... are directly attributable to such measure or resource.” Northwest Power Act, Section 3(4)(B). Read strictly, the Council is to develop the methodology and include it in the plan. Then Bonneville is to use that methodology from the plan to determine the quantifiable environmental costs and benefits to assign to particular resources. Then, the Council would need to take Bonneville’s determination of quantifiable environmental costs and benefits and incorporate those numbers into the total resource cost estimate of each new resource being considered for incorporation into the 20-year resource strategy – in the power plan. The back-and-forth mechanism is not workable in practice, as the Council is required to both develop the quantification methodology and to use the resulting numerical estimate in the same draft and then final power plan. There is no explanation in the Act or in its legislative history for why Congress chose such a cumbersome mechanism. Practical experience quickly showed this to be unworkable for the power planning process from the outset, as it would make it impossible for the Council to timely prepare the power plan called for by Congress, the centerpiece of which is to be a conservation and generating resource strategy in which the resources are chosen on the basis of a cost-effectiveness comparison that begins by estimating all direct costs of the resources, including environmental cost estimates. In other words, the Council has to be able to develop *and* apply, in the same power planning process, the methodology for quantifying environmental costs and benefits in order for the Council to be able to select the most cost-effective resources for the plan. The customary practice has therefore been for the Council to provide Bonneville (and others) with the opportunity during the development of the draft power plan, and again between the draft and final power plans, to weigh in on the Council’s estimates of environmental costs. This is the course the Council and Bonneville have followed in all previous power plans, and how the Council is proceeding in the Seventh Power Plan.

the most part, whether and what costs are “environmental” in nature, or “quantifiable,” or “directly attributable” has been without significant controversy. But questions about the meaning and application of these concepts do occur, and at times the Council has to exercise its judgment and discretion in making these determinations on a reasonable basis.

Even if environmental effects of resources cannot be quantified as costs or benefits, that does not mean these effects are irrelevant in the Council’s power planning process. Section 4(e)(2) of the Act calls for the Council to develop the scheme for implementing conservation measures and developing generating resources “with due consideration” for, among other things, “environmental quality” and the “protection, mitigation, and enhancement of fish and wildlife and related spawning grounds and habitat, including sufficient quantities and qualities of flows for successful migration, survival, and propagation of anadromous fish.” Important environmental effects that cannot be quantified as hard resource cost estimates are still taken into consideration in some fashion by the Council through these provisions. That is the subject of the second part of this chapter.

Costs of compliance with environmental regulations

The primary method the Council has used to include quantifiable environmental costs in power planning has been to incorporate the estimated costs of compliance with environmental regulations in the capital and operating costs of conservation and generating resources. The Council used this method through the first six power plans, and it is again central in developing the Seventh Power Plan.

The Council’s planning assumes that all generating and conservation resources – existing and new - - will meet existing federal, state, tribal, and local environmental regulations. Therefore, the Council includes what it estimates to be the costs of compliance with these regulations as part of the total cost estimates for new resources. This includes the costs of complying with regulations governing fuel extraction and production, air and water emissions, land use siting protections, waste disposal, and fish and wildlife protection and mitigation. These regulations reflect environmental policy choices that already have been made by governments and society, and costs associated with compliance are directly attributable to the resource and largely quantifiable.

Generating resource characteristics are described in Chapters 9 (existing generating resources) and 13 (new generating resource alternatives), Chapter 12 discussed distributed solar photovoltaic generating resources and conservation resources. Together with the much more detail in Appendix I on the environmental effects of electric power production, these descriptions include known environmental effects from the use of each resource and any environmental regulations that address these effects. Chapter 13 also identifies the estimated capital and operating costs of new generating resource alternatives, which include estimated capital and operating costs to comply with environmental regulations. The environmental compliance costs are not always able to be broken out and displayed separately, as they form just one of the many elements of the capital installment costs or the ongoing fixed and variable operating costs. However, to the extent practicable, the costs for new generating resources are based on equipment or projects that satisfy known environmental



regulations. Chapter 12 describes the conservation measures analyzed as part of the plan, including their costs. Those costs also include whatever environmental compliance costs that are quantifiable and directly attributable to these measures.⁵

The Council's cost estimates in the plan for new resource alternatives are provided at different levels of detail. Resource alternatives whose estimated levelized costs are low enough to be likely candidates for selection in the plan's resource strategy have the most detailed cost estimates, and the costs are included in the Regional Portfolio Model. These include a variety of natural gas-fired plants, wind and solar generation, and a variety of conservation and demand response measures. The Council did not develop detailed resource cost estimates for new resource alternatives that have no chance to be selected for the resource strategy based on a preliminary assessment of costs, lack of commercial availability, or lack of significant generating potential (or some combination of all three factors). This includes, at this time, the siting of new coal or nuclear thermal plants in the region. Thus the environmental compliance cost estimates for those plants are less developed in the plan.

One other issue concerns how to account for environmental regulations that have been proposed by an agency with regulatory authority, but which the agency has not yet finalized. The Council could address proposed regulations in a number of ways in the new resource cost estimates, decided on a case-by-case basis as circumstances allow. For the Seventh Power Plan, the only proposed regulation significantly relevant in the early stages of the analysis of new resource costs was the Environmental Protection Agency's proposed regulation of greenhouse gas emissions from new, modified or reconstructed power plants, under §111(b) of the Clean Air Act. EPA issued a final regulation on August 3, 2015.⁶

Whether and how to address regulatory compliance and compliance costs for natural gas plants with new carbon emission regulations proposed and then finalized under §111(b) has been a relatively simple consideration. This is because EPA designed the proposed rule so that the most efficient new-generation gas-fired plants comply with the new emissions standards. Plants which meet or exceed EPA's §111(b) regulations were selected for consideration in the power plan resource strategy. The capital and operating costs of these new gas plants are included in the cost estimates highlighted in Chapter 13 and included in the Regional Portfolio Model.

Compliance costs for a new coal-fired power plant might be more difficult to assess and compare. However, as noted above, the Council did not need to develop for the Seventh Power Plan detailed resource cost estimates for new coal plants with detailed estimates of the costs of compliance with the emissions standards proposed and then just finalized by EPA under §111(b). This is because preliminary analyses indicated that a new coal plant would not be a cost-effective resource to include in the resource comparison or the resulting resource strategy. This was because costs of meeting existing state-level requirements indicate that new coal plants would not be a cost-effective

⁵ The role in the power plan of the estimated costs of environmental compliance for *existing* generating resources is not relevant to the methodology for determining and comparing the estimated costs of new resources, and is discussed instead in the second part of this chapter.

⁶ <http://www.epa.gov/airquality/cpp/cps-final-rule.pdf>. The final rule is not yet effective – it will become effective 60 days after publication in the Federal Register, which has not yet occurred as of September 9, 2015.

resource for the region and hence not likely to be built in the region within the 20-year plan period. Instead, many of the region's existing coal plants are retiring early, due primarily to the economics of compliance with these and other regulations.

Residual environmental effects after compliance with environmental regulations

Compliance with environmental regulations reduces the impact of new resources on the environment, and the financial costs of that compliance can be quantified. Environmental regulation usually controls or mitigates for a large portion but not all of the effects on the environment from a new resource. Examples are obvious: not all emissions from a fossil fuel-fired power plant are controlled by regulation; not all bird kills from wind turbine operations are prevented; not all adverse effects on fish habitat from a new hydropower resource are prevented or mitigated. The issue for the Council's methodology is whether and how to consider environmental effects not prevented or mitigated completely by environmental regulations, and in particular whether these residual effects can in some way be quantified as environmental resource costs and included in the comparison of new resource system costs.

In most cases, the relevant regulatory body has determined that further reduction in environmental effects is not necessary to protect the public interests, or that the additional costs of further reduction significantly outweighs the benefits. One approach the Council could take is to decide that these residual effects do not constitute damage or "cost" at all. It is within reason to say that the relevant government entities authorized to address these environmental effects have already determined, through the environmental regulations they have enacted, the environmental costs of these resources.

Even so, the Council has recognized in past power plan methodologies that residual environmental effects do exist and should be considered in power planning in some way, even if not through quantitative assigning of dollar costs to those effects. Moreover, the Council recognizes that this category logically includes not just residual environmental effects after regulatory compliance, but also environmental damage or social costs of environmental effects that are not yet comprehensively regulated, such as an environmental cost related to the methane emissions associated with the production and use of natural gas. Recognizing that effects exist is one thing; quantification of these effects as resource costs has been a different issue, however. The Council's past experience has been that the methods and information have not been sufficient to allow for reasonable estimates of the costs to society of environmental effects that exist after regulatory compliance.

The Council is deciding again in the Seventh Power Plan that it is not possible to develop quantitative cost estimates related to these residual effects and add them into the new resource cost estimates in any reasonable way. There are a number of reasons for this. One reason is that in most cases the existing information is simply not sufficient to identify reasonable quantitative estimates of costs for these effects, at least not without dedication of more staff and agency resources to this one task than the Council has available. Another is that while information may be sufficiently available to incorporate costs of this nature for a very few environmental effects, (such as the "social cost of carbon" estimates developed by the U.S. Interagency Working Group on Social Cost of Carbon), the



lack of consistent treatment across the range of residual and unregulated effects would likely skew the new resource cost comparisons in an unreasonable way. Third, it is useful to be able to compare new resource costs at the level of the costs actually imposed on the power system itself, as the costs of adverse environmental effects have already been internalized to a great degree through regulation. Instead, the Council gives due consideration to residual and unregulated environmental effects that are hard to quantify through other means, including through scenario analysis and possibly qualitative risk adjustments or contingencies in the resource strategy.

The best example in this power plan relates to the social or damage cost of carbon emissions, the area in which arguably the best information exists about efforts to quantify social or damage costs of a resource that go beyond regulatory compliance costs. The Council is not adding an estimate of the social cost of carbon to the baseline new resource cost estimates for new gas plants. This is in part because EPA *used* the social cost of carbon estimates developed by the Interagency Working Group to develop the emission standards for new gas and coal plants under §111(b), deeming the proposed regulations as protective of society from these damage costs. Moreover, adding a “social cost of carbon” cost estimate to the costs of a gas plant, but not, for example, a cost estimate for the social costs of the adverse effects to fish and wildlife resulting from the residual effects of a new renewable resource – effects that presumably exist, but for which there is not good information for reasonable quantification – would skew the resource cost comparison. Instead, as described in Chapter 15 in particular, the Council analyzed several scenarios in which a “cost of carbon” has been added to reflect the not-yet-regulated effects and damage from carbon emissions, from both new and existing sources. The resulting resource strategies with these carbon costs are compared to each other and to scenarios that do not include such costs or reflect other forms of carbon policies and costs.

Quantifiable environmental benefits

The Act calls for a methodology to be capable of determining not only the quantifiable environmental costs, but also the quantifiable “environmental benefits” of new resources. In past power plans, the concepts and existing information have not been sufficient to allow the Council to quantify in dollar terms the environmental benefits of new resources, or even to identify these benefits and beneficial effects other than in a general sense. The only example even close to this concept that has been factored into the resource cost estimates in the past involved investments in new energy-efficient clothes washers and dishwashers. These washers not only save energy but also reduce the amount of water used. As a proxy for the environmental benefit associated with less water use and thus the need for less water and wastewater treatment, the Council used the reduced water and wastewater bills paid by consumers who directly benefit as part of the resource cost estimates for the more efficient clothes washers. The reductions in the amount of water also benefit the environment, although the broader environmental benefits in this one example have not been quantified, and would be difficult or impossible to quantify reasonably.

The particular issue for the Seventh Power Plan has been whether the Council can and should factor into the costs of a new resource a quantitative estimate of the environmental benefit of being



able to reduce some existing activity that has an environmental cost. That is, whether and how to account for environmental benefits that occur when an existing harmful environmental activity can be reduced or eliminated by an investment in a new power system resource.⁷

The example that dominated the early discussions of the Seventh Power Plan has been the fact that installing energy-efficiency measures (such as a ductless heat pump) in a home where wood is burned for heat may result in less burning of wood and thus reduced particulate air emissions. The reduction in particulate emissions benefits the environment and human health, especially in areas that are not in attainment with particulate emissions standards. The question is whether and how to account for these benefits in assessing the costs of the energy-efficiency measure itself; that is, in the estimate of what it costs to install and operate the ductless heat pump in a house that also burns wood to heat. The consumer savings in reduced wood purchases – like the water savings attributable to energy efficient washers – are a direct benefit of installing the ductless heat pump, savings that can be quantified and are included in the resource costs. The broader environmental and health benefits are a more difficult challenge, however. Clearly the Council (and the region) should consider these benefits to the environment and public health in some fashion in conservation planning and in developing new resource strategies. But the questions for the power plan methodology itself have been whether it is possible to quantify in dollars – as part of the “costs” of the ductless heat pump for comparison to other resources – the health and environmental benefits that result from burning less wood and reducing air emissions, and whether these quantified benefits could be said to be the “direct” benefits of and “directly attributable” to the new resource (e.g., the installation of the ductless heat pump), or incidental or indirect as the result of contingent behavior choices (e.g., some people might choose to burn less wood after installation; others might choose to burn as much as before so as to be warmer). All these questions make it difficult to quantify in dollars (for the new resource cost estimates) in a systematic way the broad environmental benefits that may be related to investments in certain resources.

The issues with regard to any effort to try to quantify environmental benefits are similar to those discussed above with regard to residual environmental effects and the concepts of environmental and social damage costs. Reasonable quantitative estimates in dollars for the bulk of environmental benefits of this nature do not exist. The Council does not have the resources or capability to develop them even if it were possible – the Council is a power planning entity and not a general environmental quality agency, and so is dependent on the work of others in this realm and relies on existing information. Moreover, broader environmental effects are rarely as directly attributable to the relevant resource or conservation measure as other costs or as any consumer savings that might directly accrue. To incorporate figures for a few environmental benefits of this type (even if that were possible) but not for most could lead to oddly skewed resource cost comparisons, and to a situation in which some resources are compared on the basis of costs and benefits the power system directly bears to other resources that include a value not borne by the power system. For all these reasons,

⁷ Note that it does not make sense to include as a quantified “benefit” in the resource cost estimate of one new resource (e.g., a conservation measure) the fact that the region could avoid investments in another new resource with an environmental cost (e.g., a coal plant). As long as the environmental costs of the second new resource are properly captured in its resource cost estimates that is sufficient -- to do more would constitute double counting the same quantified effect.

the Council decided not to attempt to engage in piece-meal quantification of a few environmental benefits to add to resource costs.

The general principles described apply to the one example studied during the beginning of the planning process – the wood smoke example. For these reasons the Council concluded it was not able at this time to quantify in dollars these broader environmental benefits and add them directly into the base resource cost estimates for these conservation measures. At the same time, the Council recognizes and gives consideration to the very real environmental and human health benefits that result from these energy-efficiency investments and the resulting reduction in particulate emissions. The Council developed the conservation supply curves for the Seventh Power Plan without including an estimate of the health benefits, but is separately describing and highlighting the environmental and health benefits associated with these measures. See Chapter 12. Utilities and other entities in the region that invest in these measures may well be justified by the social benefits of reduced particulate emissions, regardless of whether the measures are cost-effective as compared to other energy-efficiency measures or generating resources on the basis of the energy costs and benefits alone.



DUE CONSIDERATION FOR ENVIRONMENTAL QUALITY; FOR PROTECTION, MITIGATION, AND ENHANCEMENT OF FISH AND WILDLIFE; AND FOR COMPATIBILITY WITH THE EXISTING REGIONAL POWER SYSTEM

Section 4(e)(2) of the Northwest Power Act sets for a list of considerations the Council has to take into account as the Council develops the new resource strategy for the power plan:

“The plan shall set forth a general scheme for implementing conservation measures and developing resources pursuant to section 6 of this Act to reduce or meet the Administrator's obligations with due consideration by the Council for (A) environmental quality, (B) compatibility with the existing regional power system, (C) protection, mitigation, and enhancement of fish and wildlife and related spawning grounds and habitat, including sufficient quantities and qualities of flows for successful migration, survival, and propagation of anadromous fish, and (D) other criteria which may be set forth in the plan.”⁸

This part of Chapter 19 illustrates how the Council gave consideration to these factors in developing the Seventh Power Plan. Note that the considerations listed in the Act are not general considerations of what is best for environmental quality in the Northwest, or what is best for fish and wildlife, or what is the best future course for the power system's existing resources. The Council is not an environmental quality agency, a fish and wildlife agency, or an owner or operator of existing plants. The considerations for the Council at this point instead are quite specific to developing the new conservation and power resource strategy to reduce or meet Bonneville's obligations: What can the Council do -- as it analyzes new resource alternatives and selects the resource strategy's mix of new conservation measures, generating resources, and demand response measures -- to assess, protect, and enhance the region's environmental quality and fish and wildlife resources? And do so with a resource strategy that is also compatible with the existing region power system and sustains its benefits.

The Council considers these factors while also complying with its other responsibilities under the Act in developing the resource strategy and the power plan. For example, other provisions of the Act and the Council's analyses might drive the Council towards including a robust set of conservation measures as part of the power plan resource strategy. But the required considerations of environmental quality and fish and wildlife and compatibility with the existing system add important weight to that strategy, too. Aggressive and ongoing implementation of energy-efficiency measures is not just a lower cost way of maintaining benefits of the regional power system. Such a strategy

⁸ The reference to “section 6” of the Act is to the section of the Northwest Power Act authorizing Bonneville to acquire new resources, and specifying the conditions, standards and procedures for doing so, including consistency with the Council's power plan.



also helps the region avoid or delay development of generating resources that have adverse effects on the environment and fish and wildlife, whether those effects can be quantified as resource costs or not. In this sense, the factors listed in Section 4(e)(2) for due consideration in crafting the resource strategy are not separate and distinct concepts that the Council considers in a vacuum and that lead to separate and distinct power plan elements. Instead, these are considerations integrated into every aspect of the power plan analyses and elements at every stage of the power planning process, from decisions about resource inputs and assumptions to various modeling scenarios, to the final resource strategy.

In this context, it is also clear what this provision does not mean and what these considerations are not: Developing a new resource strategy for the power plan with due consideration to protecting, mitigation, and enhancing fish and wildlife does not mean that the Council, in the power plan, is to revisit or make new decisions on flow or other measures to protect, mitigate, and enhance fish and wildlife that were the subject of the Council's decisions in its fish and wildlife program. The development of the fish and wildlife program with its measures and objectives to protect, mitigate, and enhance fish and wildlife comes from a separate process the Council is to follow, set forth in Section 4(h) of the Act. The Act requires the Council to develop the fish and wildlife program *prior* to the review of the power plan. And the procedures and standards in Section 4(h) highly circumscribe the development of the fish and wildlife program by the Council, including provisions that require the Council to base the program's measures and objectives largely on the recommendations from state and federal fish and wildlife agencies and the region's Indian tribes that begin the program amendment process. See Chapter 20. Thus subsequently crafting a new resource strategy for the power plan under Sections 4(d-g) of the Act while giving due consideration to fish and wildlife does not allow or require the Council to revisit what the measures and objectives for fish and wildlife should be.

Similarly, the "due consideration" factors in Section 4(e)(2) do not authorize or allow the Council to make decisions in the power plan to change, shut down, or remove existing power system resources. The Council does not have the authority or the direction from Congress to make decisions on existing resources. Moreover, the legal implications of the power plan for Bonneville are in guiding Bonneville's acquisitions of new resources under Section 6 of the Act. The power plan does not guide decisions Bonneville might make with regard to investments in maintenance, operation, or upgrades to existing resources. To the contrary, one of the due considerations for the Council in developing the plan's resource strategy is, as noted above, how compatible that resource scheme is with the existing regional power system.

Within that context, the following examples illustrate how the Council gave due consideration for environmental quality, fish and wildlife, and compatibility with the existing system in developing the resource strategy for the Seventh Power Plan:

The Council analyzed and documented the effects of new and existing resources on the environment and fish and wildlife. The generating resource chapters (Chapters 9 and 13, together with Appendix I) provide significant detail on what is known about the effects of both new and existing generating resources and the region's associated transmission system on the environment and fish and wildlife. These chapters (and Chapter 20) also describe the environment regulations and protection and mitigation efforts already in place to address these effects; the particular current environmental concerns and conflicts specific to the regional power system; and proposed and



prospective regulations and policies being advanced by some to address these concerns. The estimated costs of compliance with environmental regulations have been included in the new resource costs, as described in the first part of this chapter. But the Council's analysis and considerations of power resource effects on environmental quality have gone well beyond what can be quantified in resource costs, and the Council duly weighed these considerations as it developed the resource strategy for the plan.

The Council developed estimates of the costs that existing system resources must bear to comply with environmental regulations, including significant new regulations that have been adopted since the last power plan. The Council went beyond just describing the effects of existing system resources on environmental quality and fish and wildlife and developed estimates of costs that existing system resources must bear to comply with environmental regulations, including significant new regulations that have come into effect since the last power plan. Many, but not all, of these new regulations affect coal-fired power plants, as described in Chapter 9 and Appendix I. The main reason the Council did so is based on the fact that whether existing plants are used (or dispatched) at any particular time and to what extent depends to a significant extent on their operating costs, as compared to operating costs that other plants bear and costs of buying power on the market. For the Council to be able to estimate what the region might expect in the future as output from the existing system resources, the Council needs to estimate these future operating costs, including estimates of the future operation and maintenance costs of compliance with environmental regulations. Including these costs in the analyses helps the Council understand under what conditions, to what extent, at what costs, and with what effects will the existing plants run. Understanding how much energy and capacity the existing system might produce and at what costs is important to know in order to assess the effects and costs of new resources that might be used to meet or reduce load not met by the output of the existing system and that may have less adverse environmental effects at the same time.

The owners and operators of existing plants may also incur future capital investments or may have to make significant structural and operational changes in order to comply with new environmental regulations. The Council developed estimates for these capital investments and effects as well. Assuming that plant owners make the capital investments necessary for compliance, then only ongoing operating costs and not capital investments affect in any substantial way whether plants dispatch and produce power at any particular time. For that reason these capital costs have not been entered into the regional portfolio model as relevant to whether the model (or the region) will operate these plants to produce power through the planning study. Even so, the owners of these plants will have to decide in the future if these capital investments for environmental compliance are worth making, or whether to cease or reduce or significantly alter operations and avoid these needed investments. Those business decisions are not for the Council, and so the Council assumes in the baseline analysis that the plants will continue to run and that the necessary capital investments will be made to comply with all new environmental regulations, unless the owners or regulators of the plants have scheduled their shutdown (as with the Boardman, Centralia, and North Valmy coal plants) or conversion to a fuel other than coal. The estimates of future capital costs for environmental compliance are then also part of total projected system costs, except in modeling scenarios in which plants have been removed from the system in order to analyze the effects on the new resource strategy and its costs (see Chapters 9 and 15 and below).



The Council considered the impacts of greenhouse gas emissions and climate change with regard to the existing power system in particular, as part of evaluating and developing resource strategies for the next 20 years that may reduce carbon emissions and help the system adapt to climate change. The environmental quality topics of primary interest in the Seventh Power Plan, as it was in the Sixth, have been carbon emissions from the power system and climate change. The description in the first part of this chapter of the methodology for quantifying environmental costs discussed this issue with regard to *new* resources. But most of the attention in the power plan process has been focused on the system's *existing* resources, especially the region's existing coal plants. Greenhouse gas emissions from the existing system and various policies in place or proposed to deal with them are described in Chapter 9 and Appendix I. Chapter 15 describes a set of scenarios that the Council ran to assess the implications for the power system of various ways to address and reduce greenhouse gas emissions from the existing system, including analyzing the effects of a range of carbon costs as a risk factor; adding in just one set cost for carbon emissions, based on the social cost of carbon work done by the federal Interagency Work Group; and reducing the emissions by reducing the output from the region's coal plants. The Council also assessed those and other scenarios for their effects on the ability of the region as a whole (not as individual states) to comply with the emissions standards for existing plants proposed and recently finalized by EPA under §111(d) of the Clean Air Act.⁹ These scenarios analyses are intended to inform the region about the nature and costs of resource strategies that can reduce carbon emissions

The Council is also assessing the effects of climate change itself on system resources and resource needs. This includes assessing the effects of a rise in winter and summer temperatures and thus changes in temperature-dependent loads, as well as changes in the output of the hydro system resulting from possible changes in runoff patterns and flows. See Appendix M in particular for details. The Council considered modeling in the Regional Portfolio Model scenarios based on these effects. Preliminary modeling indicated that the possible changes in load shape (i.e., lower winter loads and higher summer loads) are limited in the near-term, and thus would not alter resource decisions required within the period covered by the action plan. Long-term impacts are subject to too wide a range of uncertainty to make the modeling useful at this time. The Council concluded that it would be best to delay these scenarios until after the release of an updated set of forecasts for climate-impacted stream flows based on the IPCC-5 climate change analysis. The Council did use its GENESYS model to estimate hydrosystem resource impacts based on the state of the data to date, as described in Appendix M.

The Council analyzed the effects on the system and on the new resource strategy of removing or reducing the output of existing resources, in response to regional interest. There are interest groups and individuals interested in seeing certain existing system resources shut down or removed for environmental and cost reasons, including the coal plants, the nuclear Columbia Generating Station, or the lower Snake River dams. They have not asked the Council to include the

⁹ EPA issued a final rule under Section 111(d) on August 3, 2015. <http://www2.epa.gov/sites/production/files/2015-08/documents/cpp-final-rule.pdf>. The new rule governing carbon emissions from existing power plants is not yet effective – it will become effective 60 days after publication in the Federal Register, which has not yet occurred as of September 9, 2015.

removal of these existing plants in the Seventh Power Plan resource strategy, as all know that is not the Council's power plan task under the Northwest Power Act. They have been interested instead in whether and how the Council might analyze the economic viability and environmental effects of these existing plants, and in understanding how the plan's new resource strategy might react to regulatory and economic developments affecting the output of the existing system. Thus in the power plan the Council is not analyzing, deciding, or recommending whether the existing plants remain viable or should close or change operations. But to the extent the Council has information indicating that existing plants may or will shut down, reduce output, or change operations in the future, for whatever reason, the Council has included those considerations in developing a new resource strategy, so that the region is able to maintain an adequate, economical, and reliable power supply. Moreover, as it has done in the past, the Council is again analyzing scenarios that inform the public of the system implications *if* resources were to be removed or their operations altered. The focus of the analysis is on assessing what new resources would fill in the gaps in a least-cost manner, estimating the total costs, and considering the comparative economic and environmental implications. See Chapter 15 for the analysis of these scenarios. Scenarios analyzed for this plan include a scenario removing coal-fired carbon emissions from the system, and two scenarios reflecting a planned and unplanned shut down of a major generating resource of 1,000 megawatts. This is roughly comparable to the size of either the Columbia Generating Station or the lower Snake River dams, although neither resource is specifically modeled for shutdown.

The Council considered non-quantifiable environmental benefits and residual environmental effects in analyzing resources and developing the new resource strategy. As discussed in the first part of this chapter, there are, in concept, environmental effects from the use of various resources that are as yet unregulated or that are residual after regulations. There are also benefits to the broader environment that result from implementation of new resources that allow for a reduction in an existing activity that causes environmental damage. The Council could not and did not quantify in dollars the environmental damage or benefits of this nature. The Council does, however, give them consideration in developing the resource strategy. In many ways, it is an additional consideration for aggressive implementation of energy efficiency and demand response measures. One issue raised in the power plan discussions has been the potential opportunity the region has to reduce carbon emissions from existing sources by implementing new non-carbon emitting resources and conservation measures. The Council has addressed this opportunity largely through the scenario analyses described above. Methane emissions associated with natural gas production has been another area of consideration, discussed in Chapters 9 and 13 and Appendix I.

In the power plan and its resource strategy the Council continues to endorse and implement "Protected Areas" throughout the Pacific Northwest, areas that the Council recommends be off limits to new hydroelectric development to protect fish and wildlife. Beginning in 1988, the Council adopted what are called the "protected areas" as an element of the Council's fish and wildlife program and power plans. In these provisions, the Council calls on the Federal Energy Regulatory Commission (FERC) not to license a new hydroelectric project in river reaches with valuable fish or wildlife resources that the Council identified and mapped in a "protected areas" database by the Council. The protected areas provisions also call on Bonneville not to provide transmission support if such a project were to receive a license. To date, FERC has not licensed a new hydroelectric project in a protected area identified by the Council.



In the power plan context, protected areas represent a judgment by the Council that due to potential effects on habitat, flows, and passage, the adverse effects on and environmental costs to important fish and wildlife resources are too great to justify including new hydroelectric projects in these areas except under certain limited conditions.¹⁰ This is particularly important because the existing power system is already bearing substantial costs to protect and mitigate for its impacts on fish and wildlife resources. The power plan context is also important in that the protected areas designations extend throughout the entire Northwest (essentially the same as the Bonneville service territory), not just within the Columbia River Basin, representing a part of the resource strategy for the region's power system as well as comprehensive plan for the region's waterways and new hydroelectric development. As the Council evaluates the potential and cost-effectiveness for new hydroelectric development in each power plan, it includes the effects of protected areas in limiting the extent of that potential. The Council also gives due consideration to fish and wildlife and the quality of their environment by including a set of development conditions to protect fish and wildlife as new hydroelectric projects are licensed and developed in areas outside of the protected areas designated by the Council.

The Council analyzed and developed a resource strategy that assures that Bonneville and the regional power system may reliably deliver the flows and other passage measures and implement other measures beneficial to fish in the Council's fish and wildlife program or otherwise required in some way. As described above, due consideration for fish and wildlife in developing the new resource strategy involves (1) assessing the effects of new resources on fish and wildlife and estimating the costs of compliance with regulations intended to address those effects, as part of the total resource costs for new resources, and (2) limiting the potential of new hydroelectric resource development itself to protect fish and wildlife. This has also meant, as noted above, that when there is an interest expressed by regional participants as to what would be the power system implications of a decision to shut down or remove an existing resource that affects fish and wildlife, the Council has been willing to provide that analysis in the power plan, even as the decision or even the question of whether to remove an existing resource is not for the Council in crafting a new resource strategy aimed at resource acquisitions by Bonneville and others.

Just as important as these, however, and at the core of how the power plan relates to protecting fish and wildlife, is the work the Council does to develop the lowest-cost new resource strategy that helps ensure Bonneville is able to implement the flow and other measures in the fish and wildlife program (and elsewhere) and yet assure for the region an adequate, efficient, economical, and reliable power supply. This is primarily described in Chapter 20, and in the assessment of the output of the hydroelectric system in Chapter 9. The plan's resource strategy has to make sure that Bonneville and the regional power system have adequate and reliable resources so as to be able to deliver reliably the flows and other measures called for in the fish and wildlife program (and elsewhere, such as in the court-ordered spill requirements of past years) to protect fish and wildlife.

¹⁰ The protected areas provisions allow the Council to make an exception if a proposed hydropower project will provide "exceptional survival benefits" to fish and wildlife resources as determined by the relevant fish and wildlife agencies and tribes.

In addition, the Council has been willing in the past, if regional participants are interested, in assessing the power system implications (and the resulting effects on the new resource strategy) of one or more scenarios that include system operations for fish and wildlife different or greater than those currently in the fish and wildlife program. This is comparable to the Council analyzing the power system implications of decisions to shut down or remove an existing resource (as described above), even as the decision the Council makes in the power plan's resource strategy does not relate to or affect decisions about the existing resource – or, in this case, have any relation to changing system flows for fish and wildlife. The Council's engagement with the region in the development of scenarios for analysis in the Seventh Power Plan did not identify any scenarios of this type.

The Council identified and considered the effects of renewable resource development, especially cumulative impacts, and associated transmission development on the environment and fish and wildlife. The generating resource Chapters 9 and 13 and Appendix I describe the effects on the environment and fish and wildlife from renewable resources, including new wind towers and solar energy installations. This includes describing the environmental and land use regulations that address those effects, and the costs of compliance as part of new resource costs.

Some participants sought additional considerations. In the 2013-14 process to amend its fish and wildlife program, the Council received recommendations and comments from a number of state fish and wildlife agencies and tribes concerned about the adverse effects on fish and wildlife from the construction and operation of renewable generating plants and accompanying transmission. They recommended that the Council address these effects in its program and power plan, including:

“The NPCC should develop programs and processes to evaluate the impacts on fish and wildlife resources of all new energy sources (past, proposed, and potential) and associated transmission infrastructure. The NPCC should support a region-wide assessment of suitability for siting terrestrial and aquatic energy projects, prioritize possible sites, and examine potential site-specific and system-wide impacts to fish and wildlife. The outputs from this analysis should include a map of priority power generation development sites and power generation exclusion zones or protected areas, as was done for hydropower. The NPCC, as part of the program, should provide an explicit evaluation of transmission system expansion and its potential to impact fish and wildlife as part of development scenarios and assessments and assess, analyze, and identify appropriate mitigation measures.”

For reasons explained in the 2014 Fish and Wildlife Program itself, the program was not an appropriate venue to consider and address the effects on the environment and on fish and wildlife associated with the region's boom in renewable resource development.¹¹ These effects are within the considerations required of the Council in the power plan, however, as described above. The issue is whether there is more that the Council can do in the power plan to assess and address

¹¹ For further explanation, see “(21) Renewable energy development and the effects on wildlife and fish,” at pp. 329-30 of Appendix S to the 2014 Fish and Wildlife Program. <http://www.nwcouncil.org/fw/program/2014-12/program/>. See also the discussion of transmission effects on wildlife on p. 283 of the same document.

these effects other than to quantify the environmental compliance resource costs for an appropriate cost-effectiveness comparison in shaping the resource strategy. Commenters on this topic (in response to an issue paper released by the Council) from state and federal energy agencies, utilities, and energy conservation groups took a stance opposite to the fish and wildlife agencies and tribes, recommending the Council not get involved and commenting that existing siting agencies, laws, regulations, and procedures are sufficient to address these effects. In this context, the Council considered the effects of renewable energy and transmission development on fish and wildlife and habitat in this power plan by:

- Describing in as comprehensive detail as possible in the generating resource chapters (9 and 13 and Appendix I) the environmental and fish and wildlife effects of renewable resource development, what environmental and land use regulations address those effects and at what cost, and what issues remain that spark the concerns of the fish and wildlife agencies and tribes with these resource developments.
- Identifying, highlighting and considering the transmission system's effects on the environment and fish and wildlife, including a discussion as to how those environmental effects have been addressed and how effectively. See Appendix I in particular. The Council is not a transmission planner and does not make recommendations and decisions on transmission, other than to recognize it as a cost and an issue in generating resource development. At the behest of the fish and wildlife agencies and tribes, the Council is making more of a commitment than in past power plans to highlight and consider the transmissions system effects on the environment in developing the power plan and crafting the resource strategy. This includes a call to those who do have decision-making power over the siting of renewable resources and transmission – largely, state energy facility siting agencies, utilities that provide transmission services, and federal agencies managing public lands – to investigate further, take those concerns seriously, and address them to the extent possible.