# Appendix P: Methodology for Determining Quantifiable Environmental Costs and Benefits



## BACKGROUND

Section 4(e)(3)(C) of the Act requires the Council to include in its power plan a "methodology for determining quantifiable environmental costs and benefits." The purpose of this Appendix is both to describe the Council's methodology for determining environmental costs and benefits and to explain how the Council has assessed environmental costs and benefits in its resource cost estimates.

The Council's Power Plan is based on the most cost-effective resources to meet the electricity needs of the region. The Act specifies priorities for types of resources. Energy efficiency is first priority and it receives a 10 percent cost credit compared to other alternatives. Efficiency is followed by renewable resources, high-efficiency resources, and finally, all others. With the exception of efficiency improvements, the other priorities are only tie breakers. It is cost that determines the most cost-effective resources for the Council's Plan.

The Act specifies that the costs of a conservation or generating resource are to include an estimate of "all direct costs" over the effective life of the resource, including "quantifiable environmental costs and benefits ... directly attributable" to the resource. More precisely, Section 3(4)(B) provides:

> For purposes of this paragraph, the term "system cost" means an estimate of all direct costs of a measure or resource over its effective life, including, if applicable, the cost of distribution and transmission to the consumer and, among other factors, waste disposal costs, end-of-cycle costs, and fuel costs (including projected increases), **and such quantifiable environmental costs and benefits as the Administrator determines, on the basis of a methodology developed by the Council as part of the plan, or in the absence of the plan by the Administrator, are directly attributable to such measure or resource.**[1]

An entire regulatory structure is in place at the national, state, and local levels to address environmental effects of various economic activities, including those related to the production and use of electricity. These regulations represent a collective choice of society about the

[1] The language can be read to apply only to potential Bonneville resource acquisitions and only following a particular determination by the Bonneville Administrator. Still, the Council takes this as instructive for evaluating the costs of all new resources considered in its Power Planning. In addition, Section 4(e)(3)(C) of the Act requires the Council to include in its power plan the "methodology for determining quantifiable environmental costs and benefits." Thus the purpose of this Appendix is both to describe the Council's methodology for determining environmental costs and benefits and to explain how the Council has assessed environmental costs and benefits in its resource cost estimates.

desirable and economically efficient mitigation of environmental effects. Where policies exist and are considered up to date, the Council assumes that policy makers have balanced environmental damage against mitigation alternatives and costs to determine the desirable levels of mitigation. However, regulatory policies evolve over time as better understanding of environmental effects is gained, previously negligible impacts become significant due to expansion of human activity, and the values of society change. Where policies have not been developed or are actively being considered for revision, additional mitigation costs should be considered in planning.

Most regulatory policies do not require full abatement of impacts, but rather seek the balance between the cost of mitigation and the damages of residual impacts. Environmental effects that remain after regulatory solutions are implemented should not be ignored, however they may not be quantifiable. In addition, some resource choices have accompanying environmental benefits that should be considered.

The Council's methodology for consideration of environmental costs in developing its power plan is described below. Bonneville also should follow this methodology, in addition to applicable existing requirements and regulations, when considering expenditures related to resource acquisition.

# METHODOLOGY

There are four components to the Council's methodology for including quantifiable environmental costs in planning. These are: 1) including the cost of meeting existing environmental regulations into the capital and operating costs of conservation and generating resources; 2) where possible, quantifying the potential costs of new regulations under consideration; 3) accounting for the environmental benefits that may be associated with specific resources, usually associated with improved efficiency, and 4) recognizing additional environmental effects that may remain after compliance with existing regulations even though they may not be readily quantifiable.

## *Cost of Existing Regulations*

The Council's planning assumes that all new generating resource alternatives meet existing environmental regulations. The costs of emissions reduction equipment and operations are included in resource costs, state limits on new power plant emissions are enforced, and various siting limitations, such as rivers and streams that fall in protected areas, are recognized. The Council also includes the cost of meeting existing regulations affecting conservation measures, such as PCB disposal from replacement of transformers, and mercury disposal from replacement of linear fluorescent lamps. In addition, hydro operations consistent with the Council's Fish and Wildlife Program are considered a constraint on the operation of the hydropower system. These reflect the cost of policy choices that have already been made.

## *Potential Cost of New Regulations*

Some environmental policies are still evolving or are being reconsidered. In some cases these are certain enough to include the costs in the plan directly. For example, mercury emissions

limits have been assumed to become requirements and the cost added to new coal plants costs.[2] Similarly, the cost of recycling compact fluorescent lamps which contain trace amounts of mercury has been included in this measure's cost.

In other cases increased regulation is likely, but details have not been settled. In the Sixth Power Plan, this is the case with carbon control policies. While many states have renewable portfolio standards and limits on emissions from new power plants, carbon pricing policy is being actively discussed but is still highly uncertain in terms of its level and structure. Renewable portfolio standards and new plant emissions limits are included in the Council's analysis as existing regulations. However, carbon pricing policy is quantified as an uncertainty. Several scenarios explore the likely effects of different levels of carbon pricing on resource costs and choices.

## *Consideration of Environmental Benefits*

For some resources, primarily efficiency improvements, there are associated environmental benefits. Where quantifiable, the Council counts these as a cost savings. For example, high efficiency clothes washers not only save energy, they also reduce water and detergent use. These are treated as positive environmental externalities in the Council's planning. The direct environmental benefit of reduced electricity use is not credited as an environmental benefit against the cost of conservation, but is instead reflected as reduced costs of avoided generation technologies.

## *Residual Environmental Costs*

The regulations set through policy making are assumed to be acceptable levels of mitigation by society as discussed above. Also, where serious policy discussions are underway to change regulations, the Council attempts to reflect the potential changes in its planning. However, regulations seldom completely eliminate the environmental effects of electricity production and use. To the extent possible, the effects of residual emissions or other environmental effects should be considered in resource decisions.

In some cases, the Council has included unregulated mitigation requirements and cost into its planning. For example, the Council takes into account concerns about indoor air quality in homes that are highly sealed and insulated. In its first power plan and all subsequent plans the Council's Model Conservation Standards required that heat exchangers be installed to provide adequate ventilation in such homes to prevent indoor air quality problems. Ventilation

[2] At issue here are the costs of existing coal units w/o flue gas desulphurization (Boardman is the only remaining regional example). The Council assumed costs regarding mercury abatement based on the Clean Air Mercury Rule (CAMR), issued by the Bush EPA in March 2005. CAMR established Hg emission limits for new coal units but exempted existing units. For most new pulverized coal-fired units, the CAMR limits could be achieved through "co-benefit" Hg removal (~90 percent) by required sulfur and particulate control equipment. Activated carbon filters would be required for IGCC plant compliance. (So in practice CAMR represented "business as usual" for most new and existing pulverized coal units though touted as new mercury control regulation.) Our new coal-fired power plant costs are consistent with CAMR (activated carbon filters for IGCC units; no equipment in addition to FGD & particulate control for new PC units, no new costs for existing units w/o FGD (i.e., Boardman)). However, CAMR was challenged in court and vacated by the DC Circuit Court in February 2009. The EPA withdrew its petition for review and is now developing new standards in accordance with the DC circuit court opinion. The new standards will likely require compliance by existing as well as new plants.

requirements are now included in building codes. Other potential problems of a similar nature should be considered and mitigated where cost-effective.

The Council has not usually considered the effects of residual emissions to be reliably quantifiable. However, there have been extensive efforts to quantify such environmental costs, many undertaken for the purpose of balancing the cost of mitigation and the cost of residual damages. A recent example is from the National Research Council.[3] Other examples include USDOE/Commission of European Communities (1992)[4] and European Commission (1995)[5]. The Council methodology recognizes such effects and acknowledges these costs in evaluating resources, but in an unquantified manner. Bonneville, in making resource decisions, should list residual environmental effects and consider the possible costs when considering alternative resource choices. The magnitude of the costs should be considered based on credible literature such as the National Research Council and the others referenced, but this methodology recognizes that the residual environmental costs related to a particular resource very often cannot be explicitly calculated.

[3] "The Hidden Costs of Energy: Unpriced Consequences of Energy Production and Use." The National Academies Press. 2009. http://www.nap.edu/catalog.php?record_id=12794#description

[4] U.S. Department of Energy and the Commission of European Communities. *U.S. - EC Fuel Cycle Study ORNL* (Reports No. 1 through 8). 1992 through 1998.

[5] European Commission. *Externalities of Energy EUR 16520-25* (Volumes 1 through 6). 1995.