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*Generating Electric Power in
the Pacific Northwest*

Implications of Alternative Technologies

*Christopher G. Pernin, Mark A. Bernstein, Andrea
Mejia, Howard Shih, Fred Rueter, Wilbur Steger*

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1700 Main Street, P.O. Box 2138, Santa Monica, CA 90407-2138

1200 South Hayes Street, Arlington, VA 22202-5050

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Summary

The Pacific Northwest faces some critical energy issues over the next 20 years. There is significant uncertainty about energy supplies, energy prices, and the implications of competitive energy markets. Therefore, as energy demands continue to rise, it is important for the states in the region to understand the risks and opportunities of different energy supply and demand options. This report addresses issues in electricity supply and demand for four states in the Pacific Northwest: Idaho, Montana, Oregon, and Washington.

For much of the past 50 years, these states have relied heavily on hydroelectric power to meet their energy needs, and this inexpensive electricity has helped keep electricity rates low in the region, compared with the rest of the United States. However, the region cannot add much new hydroelectric capacity, so increasing demands for electricity in the future will have to be met by other sources. It is expected that the bulk of new electricity-generating capacity will come from natural-gas-fired power plants. While the combined share of electricity generated by hydroelectric and natural-gas-fired plants is expected to remain the same through 2010 (together, they provide 86 percent of the capacity in the region, the remainder being provided primarily by coal and nuclear plants), the proportion generated by natural gas will rise dramatically. Table S.1 summarizes the shares of current and future expected generating capacity in the region. The changes in the shares provided by the two major sources will have a number of consequences for the states in the region.

Table S.1
Shares of Current and Future Generating Capacity
Provided by Hydroelectricity and Natural-Gas-Fired
Combined-Cycle Generation
(percent)

Source	Year	
	2000	2010 (forecast)
Hydroelectricity	82	64
Natural gas	4	22

SOURCE: Energy Information Administration (EIA) forecast from *Annual Energy Outlook 2002* (adapted from EIA, 2002c).

While natural-gas plants are efficient and relatively inexpensive to operate, they are more expensive than the existing hydroelectric infrastructure; therefore, electricity rates will tend to be higher in the future. In terms of air pollution, natural-gas-fired plants are cleaner than oil- or coal-burning facilities, but they will still add emissions to the region, including precursors to local pollution as well as greenhouse gases.

Uncertainties and Risks in the Electricity Portfolio

Hydroelectricity in the Pacific Northwest has significant capacity uncertainties. The amount of hydroelectric power generated in any one year depends on the amount of rainfall in the region. Twenty percent swings in energy generation between wet and dry years are not unheard of. From a business standpoint, this uncertainty presents concerns because it affects costs.

Dams are a threat to the well-being of native fish populations, with dam construction particularly affecting wild salmon populations, so removal of the four lower Snake River dams has been discussed. Removing the dams could aid in restoring fish populations but would reduce the hydroelectric capacity in the region.

Uncertainties are also associated with the future price of natural gas and the future capability to supply gas to the region. It is therefore important for policymakers to examine the potential of alternative technologies and policies to help hedge against potential price and supply volatility. The growth in demand for natural gas could be moderated by increasing the diversity of supply sources, and the growth of electricity demand could be moderated by increasing energy efficiency. The electricity portfolio does not need to have an equal percentage of different alternatives, but reducing the 86 percent share of hydroelectric power and natural-gas-fired combined-cycle generation on the margin could help reduce risk and uncertainty.

One option would be to increase the share of supply sources that have less future price uncertainty, for example, renewable technologies such as wind and solar power. While renewable-generation technologies can be more expensive than natural-gas-fired generation, adding renewable generation into the national electric system could reduce pressure on future natural-gas prices. The EIA estimates that by 2020, natural-gas prices could be 5 to 10 percent lower with renewables than they are forecast to be without renewables (EIA, 2002a). The EIA also notes that with 10 percent of generation being supplied by renewable

sources, the reductions in gas prices would nearly outweigh the extra costs of renewable generation.

Another option would be to reduce the growth of electricity demand by improving energy use in buildings and developing more efficient electricity-using appliances. Moderating future demand would reduce the need for new electricity-generating capacity and reduce growth in natural-gas use.

Energy-intensive industries (primarily aluminum) that consume a significant amount of power in the Northwest and rely on long-term, low-cost contracts purchased directly from the Bonneville Power Administration (BPA) and other suppliers of bulk electric power are particularly affected by the allocation of cost-based federal hydroelectric power.¹ There has been considerable debate about whether these industries should continue to receive preferential prices for electricity.

Assessing the Impacts of Different Energy-Generation Options

This report addresses the macroeconomic impacts of options that would diversify the Pacific Northwest's electricity portfolio and may help hedge against uncertainties in natural-gas prices and supplies. The Policy Insight Model developed by Regional Economic Models, Inc. (REMI) is used to estimate the economic and net-employment impacts of including more renewable-generation options (wind and solar power) and more energy efficiency in the electricity mix of the Pacific Northwest. Three scenarios are compared against a base case modeled after the EIA forecast for the region:

- Shifting 20 percent of future natural-gas-fired generating capacity to energy efficiency and/or renewable generation (wind and/or solar power).
- Replacing the electricity produced by the lower Snake River dams with combinations of natural-gas-fueled generation, energy efficiency, and wind power.
- Replacing the electricity needed by the direct-service industries (DSIs) with energy efficiency.

¹These industries have recently received a partial renewal of those contracts for an additional five years, from 2001 to 2006.

Results and Conclusions

It is concluded that diversifying the electricity mix in the Pacific Northwest is likely to have little impact on the economy. In some cases, there is a slight negative impact, and in some cases, a slight positive impact. Figure S.1 shows the impact on gross regional product of replacing 20 percent of future *new* natural-gas generation with combinations of energy efficiency and renewable generation. Three options are shown in the figure. The ranges reflect different input assumptions: The lower bound assumes moderate gas prices and conservative assumptions about the costs of renewable generation and energy efficiency. The upper bound assumes rising gas prices and improved technologies for renewable generation and energy efficiency. The range of the impacts is small, from -0.2 percent to +0.2 percent of gross regional product.

Displacing a portion of the future natural-gas-fired capacity would have environmental as well as economic effects. If 20 percent of the expected additions of natural-gas combined-cycle capacity were replaced with renewable-generation alternatives that produced no emissions, the amount of carbon dioxide (CO₂) emissions displaced by 2020 would be about the same as the total emissions produced in the region in 1998 (approximately 42,000 kt). These changes would be accompanied by reductions in sulfur dioxide (SO₂) and

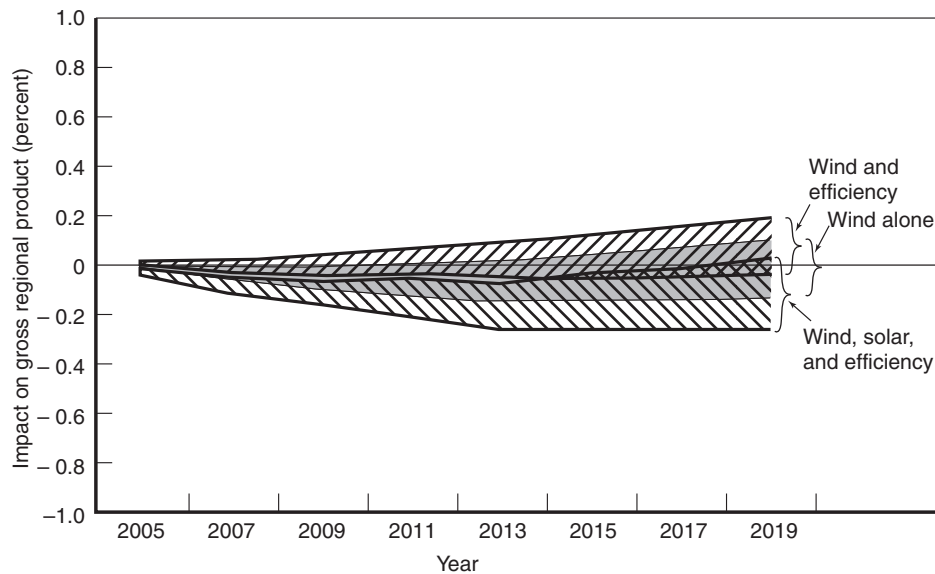


Figure S.1—Economic Impact of Replacing 20 Percent of Future Natural-Gas Capacity with Renewable Generation and Energy Efficiency

nitrogen oxides (NO_x) emissions that would be felt over the entire Pacific Northwest region.

The lower Snake River dams could also be replaced with alternatives without creating negative economic consequences; for some options, as shown in Figure S.2, their replacement could produce positive net employment in the region. Finally, investing in enough energy efficiency to equal the demand of the DSIs could result in positive economic impacts, potentially adding from 0.3 to 0.6 percent to the gross regional product by 2020.

In summary, the electricity portfolio could be diversified through efficiency and renewables without much impact on the economy, either positive or negative. Diversification could therefore provide an opportunity to hedge against future volatility in natural-gas prices and supply and hydroelectric production, while also providing other benefits to the region, including environmental benefits.

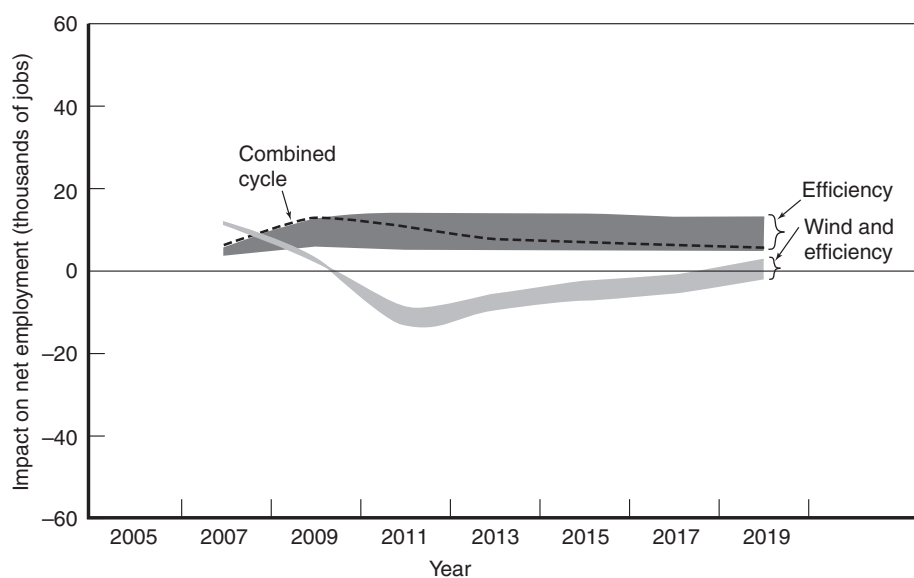


Figure S.2—Impacts on Net Employment of Replacing the Four Lower Snake River Dams with Energy Efficiency, a Combination of Wind Power and Efficiency, and Combined-Cycle Generation