

Policy Issues on Environmental Redispatch

May 26, 2011

BPA has finalized Interim Environmental Redispatch and Negative Pricing Policies to temporarily replace some electric generation with free federal hydropower as a last resort when necessary to (1) preserve system reliability; (2) meet Clean Water Act and Endangered Species Act responsibilities to avoid increased risk to protect salmon from excess spill; and (3) avoid inequitable cost shifts to BPA's Northwest customers. BPA's proposal has raised a number of important policy issues outlined here.

1) Is BPA discriminating against wind power?

The fundamental problem is that during periods of high runoff, there is simply too much power generation in BPA's balancing authority area, regardless of fuel type, and not enough demand for the electricity. As the balancing authority, BPA must reduce generation within its system so that the power produced does not exceed demand and the grid remains stable. However, federal hydroelectric projects must generate power during these periods to help avoid excess spill of water that can cause high levels of dissolved gas harmful to threatened and endangered salmon. BPA has obligations under the Clean Water Act and the Endangered Species Act to take any reasonable actions available to keep dissolved gas levels within prescribed limits. In this situation, BPA needs to turn off other, non-federal generation to comply with the agency's environmental responsibilities to protect fish and maintain system reliability.

All generation within BPA's balancing authority that has a need to run for such operational reasons are treated equally. For example, under Environmental Redispatch, resources that need to generate at minimum levels for reliability and safety purposes may submit a minimum generation level and will not be redispatched below that level.

BPA is applying its policies to wind generators no differently than any other generators. The only exception is that BPA applies Environmental Redispatch to other generation types first to avoid impacts to wind power until absolutely necessary. BPA provides free federal hydropower to replace all generation, regardless of fuel type, limited by Environmental Redispatch and does not compensate any generators.

BPA makes every reasonable effort to avoid Environmental Redispatch, especially its application to variable energy resources such as wind generation. If Environmental Redispatch must be triggered, BPA provides free hydropower to replace all non-federal generation, regardless of fuel type, so all load obligations are met. During Environmental Redispatch, BPA first limits thermal resources such as coal and natural gas generation to the lowest output possible without jeopardizing reliability and plant safety. Only if further reduction of non-federal generation is necessary would BPA then redispatch variable energy resources on a pro rata basis. This sequence protects wind generation from the effects of Environmental Redispatch ahead of other generation types.

BPA understands that Environmental Redispatch may reduce the revenues wind generators receive through Production Tax Credits and Renewable Energy Credits, even if they are provided with free federal hydropower. However, compensating wind generators for these losses would inequitably shift these costs to BPA customers who are not receiving the wind power. It could also lead other generators to



seek equivalent compensation for reducing their energy output. Compensating wind generators would jeopardize BPA's compliance with its obligations under its authorizing legislation.

2) Will Environmental Redispatch negatively impact renewable resource development in the Northwest?

BPA recognizes that its interim policies create an unfortunate financial impact on renewable resource developers. However, if BPA were to pay wind energy producers not to produce electricity, power rates would rise for retail customers in the same areas where wind projects are expanding. This would likely create resistance to further expansion of wind energy. BPA's position on renewable power development must remain consistent with its responsibilities to reliably operate the power system, comply with the Endangered Species Act and other environmental responsibilities and fulfill its statutory cost recovery obligations. Doing otherwise would create much greater risk to the Northwest power system and renewable development in the region.

Taxpayers pay Production Tax Credits, and utility retail customers who receive the renewable power ultimately pay for Renewable Energy Credits. If BPA paid wind producers to temporarily curtail their wind power and replace it with free federal hydropower, the cost of those Renewable Energy Credits and/or Production Tax Credits for these renewable resources would instead be shifted to BPA's customers, most of whom do not benefit from the wind power interconnected to BPA's system. Most of this wind power goes to others outside BPA's system. If these additional costs are imposed on these customers, they are likely to resist BPA's construction of new transmission and continued interconnection of more renewable resources in its balancing authority area by mounting legal and political challenges.

3) Why is BPA not paying wind energy producers to not generate power?

Wind generation has interconnected within BPA's balancing authority far beyond expectations in regional power plans, in part because of BPA's successful Open Access Transmission Tariff and Network Open Season policies. Tax incentives and Renewable Energy Credits received by wind producers based on generated power have also encouraged this rapid growth. However, those incentives and credits also create a financial motivation for wind generators to produce electricity even when there is no available market for it and when doing so could exacerbate the same reliability and environmental risks BPA must avoid. In this situation they would be unlikely to reduce generation in return for free federal hydropower because they could lose revenue by doing so.

This sets wind producers apart from traditional fossil-fueled and other thermal power generators. Surplus hydropower during high runoff periods readily displaces thermal generation because the generators could shut down, avoiding fuel and operational costs, while replacing their generation with low or zero-cost hydroelectricity.

The rapid growth of wind generation in the Northwest has added dramatically to the likelihood of seasonal electricity oversupply, but without the same market-driven relief mechanism that has long helped manage thermal generation in such circumstances. This situation has created new obstacles for BPA in meeting the agency's environmental, reliability and other mandates. BPA has aggressively pursued regional public processes to identify and pursue solutions and is providing free renewable hydropower when necessary to replace other generation. However, BPA does not believe ratepayers who do not receive the wind power should bear the additional cost of resolving the issue, as they would if BPA paid wind generators to limit generation when necessary for environmental and reliability reasons. Doing so would ignore the reality that wind generation and the associated renewable energy and production tax credits created the additional problems BPA is now facing.

BPA's interim policies are intended to ensure that we can continue to support renewable energy development within our system while also fulfilling our statutory responsibilities. We understand that wind projects affected by our interim policies may not receive Renewable Energy Credits and/or Production Tax Credits and could see their revenues, like BPA's own revenues, reduced during the limited periods when Environmental Redispatch is imposed. If wind projects could receive these credits for the wind they could have generated but for Environmental Redispatch, they could be held harmless. Many new wind projects are opting for Investment Tax Credits rather than Production Tax Credits, reducing the impact of Environmental Redispatch on those facilities because the credit is based on the capacity of the wind facility rather than electricity produced.

4) What are the cost implications of Environmental Redispatch as the Northwest wind fleet expands?

BPA's interim policies provide no revenue to BPA but could reduce the revenues of wind generators under certain wind and weather conditions. The magnitude of the impact depends on runoff and wind patterns and how those patterns relate to electricity demand.

BPA itself also routinely takes extensive and costly actions to maintain reliability and protect fish as runoff increases hydroelectric generation in the spring. For instance, the agency first offers very low cost or free federal hydropower to replace the output of thermal power plants. BPA ratepayers are also paying millions of dollars for flow deflectors at dams that allow increased spill of water without harming fish. When there is a lack of market for electricity, we also always utilize additional spill to the extent that it does not introduce harmful levels of dissolved gas before taking other actions.

Our analysis shows a one-in-three chance each year of high water flows in the Columbia Basin that last a month or more, which is the time Environmental Redispatch is most likely to be necessary. BPA analyzed the potential financial impacts of Environmental Redispatch on a projected 2012 wind fleet of 4,600 megawatts, which includes about 1,000 MW more wind generation than is now connected to BPA's system.

The analysis showed impacts on the wind fleet of about \$2.1 million to \$16.5 million due to loss of Production Tax Credits and Renewable Energy Credits under near-average water conditions, depending on the wind regime and the shape of the spring runoff.¹ In the most extreme and unusual case, with very high wind and water simultaneously peaking when power demand is low, the estimated financial impact could total as much as \$37 million. A further sensitivity analysis examining extraordinary scenarios such as the loss of long-distance transmission capacity or significantly reduced power demand identified a potential low-likelihood impact of \$50.5 million. This assumes a REC value of \$16 per megawatt-hour and a PTC value of \$22 per MWh, with 29 percent of the wind fleet receiving PTCs. Costs would increase proportionally with wind fleet expansion.

On the other hand, if BPA were to pay negative prices to persuade others to take hydropower instead of wind energy, the economic and environmental costs could be greater. Paying to curtail overgeneration supplies in the region could prompt new market pricing structures with significant negative prices when conditions suggest that large hydropower generators must sell their energy to control spill as required by their environmental obligations. Coal and other thermal generation might be encouraged to produce

¹ Our cost analysis is posted at:
http://www.bpa.gov/corporate/AgencyTopics/ColumbiaRiverHighWaterMgmnt/BPA_Overgeneration_Analysis.pdf

unnneeded energy longer than they do now until they, too, are paid to temporarily shut down and replace their power with clean hydropower.

5) Could spilling more water avoid Environmental Redispatch?

No.² Oregon and Washington have each established water quality standards that apply to dissolved gas levels in the Columbia and Snake rivers, with the Oregon standard slightly less restrictive. BPA and the Fish Passage Center³ have analyzed the difference in spill volumes depending on the different standards. Both found that moving to the Oregon standard alone might modestly reduce but would not eliminate the need to displace wind generation with federal hydropower in average water years. BPA's study found a reduction in wind displacement of perhaps 6 percent to 17 percent in an average water year, given the current size of the wind fleet. In high water years, all hydro turbines would already be generating at or near maximum capacity to help control gas levels, so increasing permissible levels of total dissolved gas in the river would have little effect on generation. In low water years, Environmental Redispatch is less likely to be required.

Biologists are most concerned about high levels of dissolved gas exceeding all state standards and continuing for extended periods of several days. Evidence is clear that such severe gas levels injure and kill fish. That is the circumstance Environmental Redispatch will help avoid. The policy is designed to provide the tools necessary to attempt to control gas levels before they reach a lethal range. The longer BPA waits to take action, the greater the chances that high gas levels could severely harm fish.

For comparative purposes, it may be useful to think of this situation as drivers might view speed limits. While different drivers might debate the safety of driving down highways at 55, 65 or 75 mph or faster depending on the highway and conditions, all would probably agree that driving 100 mph or faster would be extremely unsafe. In terms of dissolved gas, Environmental Redispatch is designed to help limit the potential for gas levels to accelerate into a range that all agree pose extreme and unacceptable hazards to fish.

6) Do BPA's interim policies send price signals in the right direction?

Yes. Again, taxpayers pay Production Tax Credits, and utility retail customers who receive the renewable power ultimately pay for Renewable Energy Credits. If BPA paid these costs instead, the financial burden would shift to ratepayers, most of whom do not receive the wind energy in question. We have no indication that this is the outcome Congress intended. It is also important to signal to wind developers that building more and more wind primarily for export outside the Northwest in a small geographical area cannot be sustained without more capital investment in transmission, storage or other solutions that address the unintended cost shifts of well-intended legislation. Determining the cost allocation of cost-effective capital investments will be an important part of defining potential mid to long-term solutions.

² The standard for total dissolved gas levels in water to protect fish is 110 percent of normal. When operating to benefit ESA listed fish, Oregon and Washington provide "waivers" up to 120 percent at the project tailrace. Washington also limits gas levels to 115 percent of normal at the project forebay.

³ A summary of these studies is posted at http://www.bpa.gov/corporate/AgencyTopics/ColumbiaRiverHighWaterMgmnt/TDG_Analysis_APR_2011.pdf

7) How would paying negative prices affect fossil-fuel generation?

If BPA paid negative prices to compensate wind projects for lost Production Tax Credit and Renewable Energy Credit revenue streams, other participants in the Northwest power market likely would seek comparable payments and could otherwise claim discrimination. Coal plants, for example, might expect payment of negative prices to shut down when they historically have accepted low-cost or free federal hydropower and stopped generating. This would give coal operators (and other generators) a new revenue stream that could affect the economics of their continued long-term operation.

8) Why does this issue affect BPA differently than other regions?

The Columbia River, its dams and the many protected species within it exist in the Pacific Northwest. We are dealing with a challenge that must address the realities as they exist in the Pacific Northwest.

The Northwest faces a different set of issues than other regions, especially given the size of its hydroelectric power resource and the environmental requirements that surround it. High seasonal runoff requires that the hydroelectric system generate thousands of megawatts of energy through operations necessary to avoid harm to fish, regardless of the power demand at the time. This creates an unavoidable supply of power in many years that BPA must distribute through its system. This is not a new situation, and the regional energy industry has long adjusted to the seasonal increase in hydropower by reducing thermal generation. However, the rapid growth of wind energy supported by BPA's transmission system has added to this occasional seasonal oversupply of energy. Production Tax Credits and Renewable Energy Credits also create a situation where BPA's offer of free power is not sufficient to induce displacement of wind energy.

9) What did BPA do to try to avoid Environmental Redispatch?

Following a close call during a period of heavy precipitation in June 2010, BPA recognized a growing potential for temporary oversupply of power and began publicly exploring all available options. BPA discussed available measures in three public workshops with interested parties beginning in October, 2010. Beginning April 8, BPA began weekly conference calls to brief interested parties on the specific measures it is taking this spring to anticipate oversupply conditions and avoid Environmental Redispatch. Each call concludes with requests for additional ideas for actions we could take this year.

We are pursuing some ideas from these meetings. For example, we are working with other hydro operators to pursue "spill swaps," where BPA could replace hydro generation at dams not facing the environmental constraints we are, to allow the Columbia River dams to run more water through their turbines to manage dissolved gas levels.

For a full list of examples and details of immediate actions that BPA has undertaken to avoid Environmental Redispatch and longer-term actions BPA is pursuing, see the related "Working together to address Northwest oversupply of power."

10) Could new market mechanisms avoid the need for Environmental Redispatch?

We have explored new market mechanisms to help support wind integration and encourage the development and provision of balancing reserves necessary to manage unscheduled wind ramp events either up or down. However, these mechanisms appear unlikely to make a significant contribution to resolving the temporary oversupply situation BPA faces during high runoff periods.

These new solutions may help slightly reduce the fundamental problem of oversupply that we are facing in the Northwest. That's because this is not a problem of balancing short-term changes in wind generation. The fundamental issue is that the federal hydroelectric system needs to generate under certain circumstances to meet Clean Water Act requirements at the same time that a rapidly growing wind fleet has economic incentives to maximize its production under all conditions. We will continue to explore the development of new market mechanisms, but their incremental contribution to solving the oversupply problem will probably be modest.

11) Are there other mid- to long-term solutions?

Yes, additional interregional transmission and large-scale energy storage could help. Both are capital-intensive, and BPA is actively pursuing both. Both options would incur substantial costs, raising questions about who would invest in such solutions and who should pay for them.

Transmission: Additional transmission between the Northwest and other Western power markets would potentially increase loads to absorb excess hydro, wind and other generation. BPA is actively discussing expansion of the direct-current intertie to southern California by several hundred megawatts with the Los Angeles Department of Power and Water and other California parties. BPA also is discussing an intertie open season with Northwest and Southwest parties that could increase effective use of the alternating current transmission line to California.

A number of major transmission projects proposed in the Western Interconnection could increase transmission capacity among the Canadian, Northwest and Southwest regions. Realizing any of these decades-long, multi-billion dollar projects will require agreement among dozens of utilities and government entities.

Power Storage: Energy can be stored behind dams in the form of water. However, federal dams in the Northwest can store only about one-sixth of the average year's runoff. The rest flows downriver and, in high-runoff years, can increase dissolved gas levels and lead to excess hydroelectric generation and the potential need for Environmental Redispatch.

Additional storage of energy in the form of water could help absorb the large amounts of power produced by additional runoff and, potentially, excess wind energy when Environmental Redispatch might otherwise be needed. BPA already works with Canadian and California utilities where possible to provide power to meet their load, while they hold water in reservoirs for later use to generate power. We are also working with the Bureau of Reclamation to evaluate additional energy storage potential at Banks Lake irrigation reservoir near Grand Coulee Dam. We are involved in two major smart grid demonstration projects that could help store additional energy through demand response and other techniques. Finally, we are exploring opportunities with Pacific Northwest National Laboratories to demonstrate grid-scale battery storage technologies.

12) Has BPA explored other additional options?

BPA has many additional research, technology and other initiatives underway that may help improve the management, generation and marketing of energy in ways that could help ease the need for Environmental Redispatch. While some could provide near-term relief, others may take years to fully develop.

Implement displacement auctions

BPA's Bulk Marketing organization has undertaken several different initiatives to ensure that as much regional thermal generation is displaced as possible to delay any need for Environmental Redispatch. We started discussions with regional parties last year to better understand their operating requirements and economic needs. On Feb. 16, we issued a standard displacement offer to all of the region's thermal generators stipulating terms and conditions under which we would be prepared to sell low-priced hydro energy to displace their generation. Although not a "displacement auction," this represented a good faith effort to offer power at very low prices and in significant quantities such that buyers could take their power plants off line for extended periods of time.

Although no owners have accepted the offer so far, it stimulated further discussion of less traditional, "non-standard" energy products. Those discussions improved our understanding of thermal generators' marginal costs, delivery requirements and ancillary services and capacity needs.

As a result of these discussions, BPA executed multiple "non-standard" transactions that will provide BPA the flexibility to deliver up to 1,375 megawatts during light load hours and 875 megawatts during heavy load hours at critical times through May and June, which could help avoid Environmental Redispatch. The transactions include:

- Put options, which allow BPA to decide when it gives the other party the energy. BPA has signed four of these contracts.
- Energy swaps, under which BPA will trade energy that it is generating for other energy from another source later. BPA has signed one such contract.

Technology deployment and improvements in transfer capacity

Work is now underway that will help operate the California-Oregon Intertie as close as possible to its full 4,800 MW rating. This will ensure that as much Northwest electricity as possible can fulfill demand in California, helping ease oversupply of power in the Northwest and the need for Environmental Redispatch. These improvements are expected to be complete soon. In addition, BPA is working with other system operators in the Pacific Northwest and California to examine opportunities for cost-effective upgrades to transmission interties between the regions. Such upgrades would improve BPA's ability to move large amounts of electricity off its system.

BPA recently installed equipment at Captain Jack substation and key 500-kV lines along the California-Oregon Intertie to increase the reliability of the COI and Western Interconnection and increase capacity limits during certain outage conditions. BPA is completing operational studies to calculate the full impact of these improvements.

Smart Grid technology

BPA is conducting customer utility outreach, benchmarking and other research and strategic discussions to guide the development of large-scale demand response pilots in the region. Demand response can potentially help adjust load to help support wind integration and restore value and flexibility to the Federal Columbia River Power and Transmission System.

BPA is now sponsoring 12 demand response pilot projects with utility partners. The demand response pilots test a variety of demand response technologies to meet different requirements, including shifting use during times of peak load and increasing and decreasing load to adjust to variable resources. For

example, we are testing whether energy can be dispatched to heat up ceramic bricks when the wind is blowing, store the heat and then distribute the warmth to building occupants later. In this way, the ceramic bricks act as a battery to store the extra wind energy. This concept can work with cooling systems and water heaters as well. We're also exploring ways to test if we can tap into large industrial loads to help with wind integration.

BPA is also a participant in a Pacific Northwest Smart Grid Demonstration Project led by Battelle Memorial Institute, Pacific Northwest Division. One of the project's primary objectives is to apply smart grid capabilities to support the integration of renewable resources. The project includes eleven utilities and five infrastructure partners. The five-year project involves 112 megawatts of responsive resources featuring both load and generation, scheduled to be up and running by September 2012. These assets include everything from home energy systems, distributed generation, and numerous other resources on the targeted list of smart grid assets.