

# Working together to address Northwest oversupply of power

*Summary of actions BPA considered to avoid Environmental Redispatch*

May 2011

On May 13, 2011, BPA finalized its decision to implement environmental redispatch to protect system reliability and fish and avoid shifting costs for wind incentives from taxpayers to its public customers. The difficult decision came at the end of nearly a year of work to find solutions for temporary periods when there is more power generation than there is demand. BPA and stakeholders identified some actions the agency has implemented and others BPA is pursuing. Some further actions may offer potential over the longer term.

In June 2010, wet, warm weather caused high flows on the Snake and Columbia rivers. At the same time, weather fronts moved through the Columbia River Gorge, producing more than 2,500 megawatts of wind energy from facilities connected to BPA's transmission system. The agency spilled large amounts of water, which can lead to dissolved gas levels that are harmful to fish, and was able to avoid the need to limit non-hydro generation, otherwise known as environmental redispatch. Under environmental redispatch, BPA replaces non-federal generation with federal hydropower at no cost to avoid excess spill and maintain the reliability of the power system.

Over the past year, BPA worked closely with the region to explore all available immediate and long-term alternatives to address the oversupply problem. BPA and stakeholders discussed possible measures in three public workshops beginning in October 2010. On April 8, BPA began weekly conference calls to brief interested parties on specific measures it is taking to anticipate oversupply conditions and avoid the need for environmental redispatch. BPA has concluded each call with requests for additional ideas for actions BPA could put in place this year, as well as ideas the region could implement as permanent, long-term solutions.

BPA views environmental redispatch as a last resort and a near-term, interim measure. The agency is working to add to the list of actions that may help avoid environmental redispatch now and into the future. The agency will also start a supplemental regional process to discuss possible long-term solutions.

## Implemented Solutions

BPA has implemented the following nine solutions to help delay or minimize the use of Environmental Redispatch this spring:

- **Coordinate transmission line maintenance outages**

BPA has rescheduled non-essential maintenance and construction on transmission lines so that maximum capacity is available to carry large amounts of electric generation to distant markets, from Canada to California. Exporting excess energy from the Northwest to other regions helps mitigate the oversupply conditions in our region and reduces the pressure on the Federal Columbia River Power System to spill water, mitigating dissolved gas problems and reducing the need for environmental redispatch.



BPA has also worked with other transmission operators and interconnected utilities, such as those in California, to coordinate maintenance and construction outages.

- **Restricted transmission maintenance operations**

BPA has developed and finalized guidelines for a Restricted Maintenance Operations procedure during high runoff. This will help BPA modify maintenance schedules by pushing non-essential maintenance operations into periods during which BPA has greater flexibility. This will also help maximize the amount of available transmission capacity to other regions, allowing as much of the region's surplus power to be exported as possible.

- **Increase north to south capacity on the California-Oregon Intertie**

This spring, BPA installed additional shunt capacitors at Captain Jack substation and added new series capacitor compensation on the John – Grizzly 500-kilovolt lines. These investments will help operate the California-Oregon Intertie to its full 4,800 megawatt rating. The improvements are expected to go into service approximately in early July.

- **Improve north to south intertie efficiency**

Today BPA relies on the operation of the Klamath Falls natural gas generation plant to maintain the full capability of the California Intertie. New operating procedures starting in June, combined with the investments described above, will allow full or near-full use of the California Intertie without relying on Klamath Falls generation.

- **Reduced light-load hour generation as much as possible**

To manage the oversupply of electricity in off-peak hours, BPA took steps to reduce hydro generation in those hours. Hydro projects that have some within-day flexibility (such as Dworshak and some Willamette projects) moved all but minimum generation amounts out of light load hours.

During periods of high flows, maximizing the availability of on-peak generation helps minimize the amount of off-peak generation. To accomplish this, non-essential unit outages at the hydro projects were moved out of the runoff season.

BPA also spilled at hydro projects without loaded turbines to minimize the amount of water that needed to be passed in off-peak hours. This spilled energy was limited by total dissolved gas levels consistent with the Clean Water Act and applicable waivers prior to implementing Environmental Redispatch. In addition, BPA coordinated with federal hydro independent projects, such as the projects on the Willamette River to spill water if possible rather than generate to reduce competing off peak generation and help avoid environmental redispatch for a period of time.

- **Thermal displacement**

BPA has provided significant amounts of hydroelectricity at little or no cost to displace thermal generation for significant periods of time. The thermal resources in BPA's balancing authority area have a nameplate rating of almost 7,000 megawatts of generation. When BPA implemented Environmental Redispatch for the first time May 18, about 100 megawatts of thermal generation was still on-line in BPA's balancing authority area. These were primarily co-generation facilities that rely on steam to maintain production processes.

In February, BPA offered coal-fired thermal generation owners a flexible displacement energy product designed to meet their power delivery obligations under specifically defined high streamflow conditions that result in oversupply of power. Although no owners have accepted the offer to date, it did stimulate

additional discussions about non-standard products. Those discussions improved our understanding of thermal generators marginal costs, delivery requirements, and ancillary services and capacity needs.

- **Non-standard transactions**

As a result of the discussions mentioned above, BPA executed multiple non-standard transactions with counterparties that will provide BPA the flexibility to deliver up to 514,000 megawatt-hours at critical times through May and June.

In April, BPA offered a spill swap to owners of non-federal hydro generation. Under a spill swap, BPA would replace a non-federal hydro project's generation with federal hydro generation. Although this offer did not result in a spill swap arrangement, it initiated valuable discussions, some of which resulted in other energy transactions.

BPA also has arranged a spill-energy exchange with Mid-Columbia hydropower producers. BPA will substitute federal hydroelectric generation for their generation to help control gas levels in the Columbia River below Chief Joseph Dam.

- **Offer low-cost or free hydropower**

To help create a market incentive for power producers to substitute federal hydropower for their fossil fuel generation, BPA has offered significant amounts of energy at zero cost. As of May 25, BPA has disposed of more than 150,000 megawatt-hours of power with no revenue for BPA Power Services.

- **Increase irrigation pumping**

BPA positioned Banks Lake to make use of additional hydropower. Banks Lake is an irrigation source that requires water pumped from the reservoir behind Grand Coulee Dam. This pumping creates load that can utilize federal hydropower. By taking actions a few weeks ago, BPA has set up Banks Lake to create maximum demand for pumping through the runoff season.

- **Reduce balancing reserves for wind**

BPA reduces balancing reserves if studies indicate the reduction can effectively reduce total dissolved gas that would otherwise be inconsistent with water quality standards. This action still allows wind projects to generate, but they must stay closer to their forecast.

Decreasing balancing reserves allows for more hydro generation because water that would otherwise be held behind the dams or spilled to balance ups and downs in wind energy is instead sent through turbines. Running water through turbines creates less total dissolved gas than spilling water. BPA took this action prior to implementing environmental redispatch in mid May.

- **Improve weather/generation forecasting**

BPA has aggressively improved its capabilities to forecast and anticipate weather and other conditions – including temperature, precipitation and streamflow – that could influence the potential oversupply of electricity.

BPA works with the weather and hydrologic research communities, particularly the National Oceanic and Atmospheric Administration, to bring state-of-the-science forecasting models and techniques into operational use for direct input into agency decision-making processes. Our aim is to improve weather and streamflow forecast accuracy and increase our lead time in anticipating potentially disruptive weather and hydrologic events like cold snaps, heat waves, wind ramps and both high and low water events.

In addition, BPA has put in place improved weather forecasting tools to improve the scheduling accuracy of variable generation such as wind. This helps stretch the reserve capacity provided by the hydro system to support the additional wind interconnections we expect.

To help provide the region better wind and weather information, BPA installed 14 anemometers from the Oregon and Washington coast to the inland Columbia Basin. Data from the anemometers is publicly available, including an innovative data visualization known as the “[wind sock display](#).” Using the displays BPA developed system dispatchers can see significant changes in wind speed and direction approaching the wind generation area.

BPA also developed its own in-house wind generation forecasting system to improve the accuracy of wind generation scheduling and better manage its balancing reserves. BPA’s [aggregate wind generation forecast](#) for its balancing authority area is available to the industry and the public. Increased situational awareness and forecasting will help optimize hydro operations, anticipate oversupply conditions and reduce reserve requirements, which will allow for increased generation rather than spill during periods of high dissolved gas.

## Mid-Term Solutions

BPA will work to implement the following five measures in the next one to four years:

### ■ **Improve use of existing transmission interties**

BPA recently collaborated with a group of utilities from the Northwest and California to explore ways to maximize the use of the existing transmission lines to California. This group (known as the Transmission Utilization Group or TUG) recently reported that historically, the California-Oregon Intertie capacity is lower during high runoff periods than summer periods. This is because the spring season has traditionally been targeted for both power plant and transmission line maintenance. The report recommended creating flexible outage schedules between Northwest and California parties to maximize intertie use. BPA has initiated follow-on discussions with California utilities to begin factoring spring operational issues into long-term outage coordination on both sides of the border and to maximize transmission availability during high runoff and high wind periods.

### ■ **Evaluate distribution of power east to displace coal generation**

BPA is considering actions that would help deliver additional power east to Idaho. This would require BPA to add a scheduling and reservation point at Summer Lake, a point on the AC intertie south of Bend. BPA is currently evaluating this option, which would likely take several months to implement. We note, however, that during the spring runoff period, Idaho Power tends to have a significant amount of hydro and wind generation within its system and may have limited ability to absorb excess energy from the western part of the Pacific Northwest during peak hydro conditions.

### ■ **Seek more flexibility on use of Canadian storage**

BPA and BC Hydro negotiated an agreement in fall 2010 to allow the use of additional reservoir storage in Canada, if available, for storage of surplus water in spring and release later in the summer. With the high volume forecast, current runoff conditions and flood control requirements, however, there will likely be little storage space available until late in the season, possibly in July.

BPA has begun a public process to review proposed terms with BC Hydro to coordinate use of additional Canadian reservoir space not managed under the Columbia River Treaty. BPA and BC Hydro have

approved a non-binding memorandum of understanding, outlining the draft terms of a proposed long-term non-Treaty storage agreement that would run through 2024.

If negotiations are successful, the agreement would provide operational flexibility and flow shaping from Canadian storage to produce power and non-power benefits for BPA, BC Hydro and other Canadian and U.S. interests.

- **Modify Production Tax Credit and Renewable Energy Credit legislation**

Some BPA stakeholders have suggested pursuing legislative changes that would allow free replacement hydropower to qualify for Production Tax Credits during Environmental Redispatch. Under current law, wind generators receive PTCs and RECs only for energy they generate, not when their power is displaced.

If wind projects cannot receive RECs and/or PTCs due to our interim policies, their revenues may be 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.

BPA has urged state regulators and legislators to consider a limited provision allowing variable generators to count as qualified RECs the amount of electricity that would have been generated but for environmental redispatch.

## Long-Term Solutions

BPA is exploring the following three potential solutions that are expected to take more than four years to implement.

- **Build new Interties**

BPA has worked with California and Northwest utilities to examine opportunities to increase intertie capacity through construction of a new high-voltage line between the regions. BPA is working with others to explore an Intertie Open Season similar to its Network Open Season to determine if there is sufficient interest. This effort would take five to 10 years to complete and would likely cost billions of dollars.

- **Increase energy storage capacity**

Northwest federal hydro projects can store only about one-sixth of one average year's runoff. Increased energy storage could absorb more runoff and, potentially, excess wind energy. BPA already works with Canadian and California utilities to store energy in their hydro systems where possible. We are working with the Bureau of Reclamation to evaluate increasing energy storage in Banks Lake irrigation reservoir near Grand Coulee Dam. We are also involved in two major smart grid demonstration projects that could increase energy storage through demand response and other techniques. We are exploring opportunities with Pacific Northwest National Laboratories to demonstrate grid-scale battery storage technologies. All of these efforts could eventually provide some relief from environmental redispatch by storing additional hydro or wind energy during the spring season and mitigating the need to spill water, but they are all likely to take several years at minimum to have an impact on system operations.

- **Apply Smart Grid technologies**

BPA is conducting customer utility outreach, benchmarking and other forms of research and strategic discussions to guide the development of large-scale demand response pilots in the region. Demand

response can potentially help provide additional reserves for wind balancing, freeing up federal hydro generation during high runoff periods and mitigating spill

BPA is sponsoring 12 utility-focused demand response pilots. The pilots test a variety of demand response technologies to meet different requirements, including shifting use from times of peak load and increasing and decreasing load to adjust to variable resources. For example, we are testing whether thermal storage devices can be dispatched to heat up ceramic bricks when the wind is blowing, store the heat, 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 tap into large industrial loads to help with wind integration.

BPA is 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 home energy systems, distributed generation and numerous other resources on the targeted list of smart grid assets.

## **Actions BPA considered or attempted**

### **■ Operate the hydro system at marginally higher total dissolved gas levels**

Some parties have asked BPA to pursue a higher allowed level of dissolved gas consistent with Oregon standards rather than the more conservative Washington standard. The current TDG standards are a part of court-ordered hydro operations, as well as the federal agencies' Biological Opinion actions required to avoid harm to ESA-protected salmon and steelhead.

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

BPA and the Fish Passage Center also studied this issue to determine whether a shift to Oregon's standard would reduce the frequency and severity of environmental redispatch events. The studies found that in high water years, the different standards yield little actual difference in spill to avoid environmental redispatch. This is because many of the hydro projects are already in forced spill conditions, meaning they have to spill to maintain system reliability. Dissolved gas levels can exceed both states' levels under these conditions, which is occurring this season.

During average water years, a higher standard appeared to moderately reduce the need to displace wind generation with federal hydropower to protect fish by between 25 and 100 megawatt months. This corresponds to roughly 6 to 17 percent less displacement of wind energy than under the lower TDG standard under these specific conditions.

■ **Pay wind energy producers to reduce their generation**

The proposal that BPA compensate wind generators as a buffer against the negative financial impact of environmental redispatch results from business models depending on federal PTCs and the value of RECs available for compliance accounting for state renewable portfolio standards.

Federal taxpayers pay PTCs, and utility retail customers who receive the renewable power ultimately pay for RECs. If BPA paid wind producers to temporarily curtail their wind power and substituted free federal hydropower for it, the cost of supporting RECs and/or PTCs for these renewable resources would instead be borne by BPA's power customers. These customers do not benefit from the wind facilities interconnecting to BPA's system, as most of the output (roughly 85 percent) is sent to other parties.

■ **Provisional hydro drafts ahead of high water**

BPA worked with other agencies – the U.S. Corps of Engineers and Bureau of Reclamation – and utilities to maximize available reservoir space to manage river flows and control hydroelectric generation. BPA was granted three feet of space below flood control at Grand Coulee to manage multiple constraints and uncertainty related to flows, loads and variable generation.

Beyond this limited amount of reservoir space, BPA would be unlikely to achieve dedicated flexibility to support a draft to help further avoid Environmental Redispatch. Additional drafts beyond this limited reservoir space would present too much risk to achieving other high-priority, non-power objectives. While BPA will continue to seek flexibility to manage multiple constraints, that flexibility is likely to be transitory and occur only in the context of broader system objectives, such as achieving BiOp flow objectives and other non-power constraints over a wide variety of potential outcomes.

■ **Non-standard marketing actions**

BPA pursued several non-standard marketing actions that did not result in transactions, including:

- **Wind displacements:** BPA offered to displace wind generation in exchange for free light load hour transmission service.
- **Energy for transmission swaps:** BPA offered parties free federal hydropower. In exchange for taking this free hydropower, BPA would provide free transmission services.
- **Increased irrigation pumping / time-shifting irrigation pump load:** BPA attempted to contract for load shifts with Mid-Columbia irrigating utilities for spring 2011, but contracts provisions and time limitations prevented any transactions.
- **Energy swaps:** BPA offered to provide power to others in exchange for energy BPA would receive later.

To date, counterparties have indicated they are not interested in these transactions, but BPA will continue to pursue them.

■ **Synchronize scheduling with California Independent System Operator**

Parties recommended resolving the current disconnect between the transmission scheduling and reservation timelines of the California Independent System Operator and BPA. They asserted that by better aligning these timelines, more power could be sold and scheduled to California. Despite the disparities between the two transmission providers, BPA's June 2008 and June 2010 hourly data shows that during the high water events, the intertie is fully utilized. BPA determined this action would not provide any benefit during oversupply conditions.

- **Look at protocols for reducing inadvertent flows on the intertie**

BPA heard a suggestion to look at protocols for assigning transmission to avoid inadvertent (unscheduled) flows on the California-Oregon Intertie that could contribute to congestion. BPA and the California Independent System Operator monitor COI unscheduled flow. When unscheduled flow is contributing to a capacity issue, CAISO enacts mitigation procedures to maintain flows to schedule.

- **Increasing diversions to replenish irrigation aquifers**

BPA considered actions to maximize power consumption by increase pumping to irrigation aquifers. BPA does not believe these actions are feasible because significant investment in infrastructure would be required beyond what is likely to be cost-effective.

Combined, these actions could result in withdrawal rates in the range of 1,000 to 2,000 cubic feet per second. To put the impact in context, flows on the Columbia River are typically in the 300,000 to 450,000 cubic feet per second range during high runoff periods.

BPA is no longer pursuing this action for two reasons:

- 1) Idaho irrigators do not have access to wholesale power markets, and if they did, transmission capability to Southern Idaho is constrained.
- 2) Aquifer discharge options all require payment to execute. Since our policy under the ER ROD is not to pay to displace (power or water), this option is not feasible.

If conditions changed to remove these constraints, BPA would reopen its exploration of these potential options.