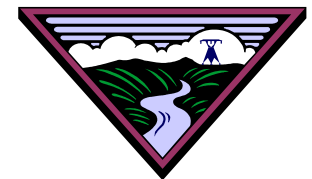


# BPA Storage and Shaping Service

## *Recent Developments and Challenges*

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# Overview

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- Brief update on recent activities
- Within-hour impacts of wind integration
- Federal Hydro System advantages
- Valuing Storage and Shaping Service
- Transmission challenges



# Background

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- Last year at UWIG, we discussed our efforts to assess the costs of integrating wind into the Federal Columbia River Hydroelectric System.
- We also talked about our efforts to price a Storage and Shaping Service for new wind projects.
- Our analytical and pricing efforts are now complete.
- Our analysis of day-ahead and within-hour impacts was largely consistent with the findings of the Eric Hirst study.
- We established a price of \$6.00/MWh for Storage and Shaping Service, not inclusive of transmission.



# Within Hour Impacts

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- The key finding of the Hirst study was that wind forecast errors are not correlated with load forecast errors and therefore the incremental contribution to variance from introducing wind into the BPA control area is quite small.
- Analysis of the data, extended over a longer period of time, and close collaboration with the Transmission Business Line, verified this finding.
- Applying the same methodology that the TBL uses to size its control area regulation requirement, we quantified the incremental average regulation requirement from introducing up to 1000 MW of wind into the system. This value was less than 100 MW.



# The Value of Surplus Capacity

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- Hirst argued that the BPA system had 6,000 MW of surplus capacity. This was judged to be overly optimistic. However, under most conditions, BPA *does* have a healthy surplus of short-term capacity and this surplus is a valuable asset for BPA. It gives us an advantage in dealing with the “tail events” that result from integrating wind.
- When wind generation differs substantially from its schedule in a way that dramatically exacerbates regulation requirements, BPA can lean on its hydro units to remedy the imbalance. Other systems will likely have less of this type of flexibility and will have to carry larger amounts of reserves.
- Moreover, the ~100 MW of regulating capacity does not eat substantially into BPA’s overall surplus capacity inventory and therefore its opportunity costs are limited.



# S&S Service Mechanics

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- Wind project X, interconnected to the BPA control area, schedules and delivers energy into the BPA system on an hourly basis.
- At the end of each day, PBL averages the scheduled (and delivered) Peak and Off-Peak generation from the project. This amount of power is then redelivered a week later in flat Peak and Off-Peak blocks.
- The one week delay allows the end-use customer to plan its system for redelivery volumes and takes the hour-to-hour uncertainty out of the wind generation.
- Features are very similar to a service provided to BPA by PacifiCorp for Wyoming projects and comparable to a service that BPA provides to PGE to integrate the Vancycle Wind Project.



# Pricing Storage and Shaping

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- Team analyzed an array of important issues that affect the costs of providing this service:
- Minimum generation constraints.
- Seasonal capacity headroom.
- Impacts on spill.
- Expected price differences between heavy load and light load hours.
- Impacts on Slice customers.
- These factors all influence the Power Business Line's opportunity cost of offering the service.
- Used standard BPA hydro and price models to value the service.



# Pricing Storage and Shaping

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- The essential intuition of pricing Storage and Shaping Service is as follows:
- At any one time, you have two things happening – wind generation coming into the system and a outgoing scheduled redelivery of power from the previous week. To the extent that the amounts of energy entering and leaving the system are identical, BPA does not have to lean on its system capacity to make the redelivery. To the extent the values differ, BPA must deploy system capacity that can otherwise be used for secondary marketing.
- We spent considerable time looking at the week-to-week correlation of wind generation and determining how much capacity, on average, we would have to withhold to ensure we could satisfy our net redelivery obligation.



# Pricing Storage and Shaping

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- We defined an “expected” case based on the statistics and then chose an appropriate point on the distribution of monthly net redelivery volumes that gave us a statistical edge on the service.
- We were more conservative during times of the year when the BPA system tends to be relatively constrained.
- The opportunity costs of withheld capacity were quantified by assessing changes in the volume and diurnal shape of marketable secondary energy and then valuing these MWhs against a forward price curve.
- We also assessed the impacts on our ability to load factor the system at night, since variable amounts of wind power will cause us, under certain circumstances, to run the system above minimum generation levels to assure we have enough ramp-down capability to absorb the wind.



# Pricing Storage and Shaping

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- Our \$6.00/MWh price includes the intra-hour regulation and load-following costs, the opportunity costs of withheld capacity, and an adder for risk. If other utilities can beat our price, we encourage them to step up and offer the service.
- We will be working actively with our Operations and Real Time groups, and the TBL, to closely monitor these costs as we gain experience marketing the service. Our intention is to offer approx 350-400 MW of the service over the balance of the current rate period (through 2006.)
- We have assumed no changes to the rules for generation imbalance with respect to Storage and Shaping Service. Generators will still be liable for deviations from their schedules.
- The \$6.00/MWh will be escalated annually at the GDP Implicit Price Deflator, same as the PTC.



# Transmission Challenges

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- Because of the way that the regional grid is configured, Storage and Shaping Service requires two wheels – one *into* the BPA system and one *out* of the BPA system.
- Starting with two Point-to-Point wheels, the transmission costs can increase the price of S&S Service to as high as \$18.00/MWh.
- Developing strategies to manage the transmission costs is a critical challenge facing BPA as we attempt to sell this service to entities outside of our control area.
- We have been working very hard to create service features that will reduce these transmission costs.
- Developments include capping the redelivery volumes at 50% of the project's nameplate rating and potentially using NT transmission for imports.



# Capped Redelivery Volumes

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- We have reduced the costs of transmission for the redelivered energy by capping the amount of power that we will redeliver at 50% of the nameplate rating of the project.
- During times when, say, a 100MW project generates above 50MW on average for a day, we will store the incremental energy above 50MW beyond the 1-week redelivery period. We will then draw down from this storage account during hours when the redelivery obligation is less than 50MW.
- This reduces the amount of transmission that must be reserved for the wheel out and also increases its utilization factor, thus considerably reducing its cost. (For long-term transmission the cost is reduced by over 50%)



# Importing on NT Transmission

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- Most regional utilities use Network Transmission (not Point-to-Point) to import power into their systems.
- Since the costs of Network Transmission are already paid for (either by the merchant function or by native load), imports can be consummated at no incremental cost.
- BPA's Power Business Line has a more complicated relationship to Network Transmission than most regional utilities. BPA's power customers, rather than the Power Business Line itself, have the rights to NT transmission.
- We have an agreement in place with a large group of our customers that allows us to use their NT transmission rights to import power into our system on a non-firm basis. Combined with capped redelivery volumes, this could reduce the cost of S&S Service to as low as \$10.50/MWh delivered.
- The NT agreement has some excellent features – flexibility, no incremental cost. But it expires in 2011 and it is non-firm.



# Importing on NT Transmission

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- The short-term nature of our NT transmission access and the fact that it involves non-firm imports creates a series of risks that we have yet to fully quantify and allocate equitably between the Power Business Line, interested utilities and wind generators.
- Ultimately, the question boils down to whether we can extend the NT agreement, the extent to which the BPA grid is going to get more or less constrained over time, the form and cost of transmission under future regulatory environments, and the extent to which an open access transmission environment will allow the PBL to maintain its ability to provide public benefits.
- Simple questions like that...
- We look forward to engaging the region on these difficult and important questions and crafting a strategy that works for BPA and regional stakeholders.



# Contact Information

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