BONNEVILLE POWER ADMINISTRATION

backgrounder

November 2006

BPA adopts new tools for transmission congestion

The summer of 2005 was a wake-up call. Although it was no secret that the Pacific Northwest transmission grid was becoming increasingly congested, that summer brought a startling number of instances where the grid exceeded operating transfer capability (OTC), the industry-accepted standard for safe operating conditions. Although these exceedances were brief, 16 of these events did require emergency actions to curtail schedules or redispatch generation. The principal cause was congestion due to the volume of nonfirm schedules on the internal network paths along the I-5 corridor of the Bonneville Power Administration's transmission grid.[1]

It was clear that, if the system's reliability was to be safeguarded, measures to manage congestion were needed. Historically, BPA has accepted all nonfirm transmission schedules. This worked when the system had excess capacity. But, in recent years, changes in markets, generation and load patterns have stressed the capability of the transmission system and reduced its flexibility and ability to accommodate all requests for service.

When system conditions, such as congestion, cause the system to exceed OTC limits, dispatchers are forced to take corrective action in real time. This puts the system at risk for contingencies that could have catastrophic consequences, such as a major cascading outage.

A key issue has been the inability to distinguish in real time which transmission schedules are affecting specific network flowgates and thus which are contributing to congestion. BPA's ability to manage network congestion has been limited to curtailing schedules after exceeding an OTC limit. In addition, it has only been possible to implement curtailments to relieve congestion on flowgates that have curtailment calculators. While certainly useful, these calculators are imprecise instruments that may cut transmission schedules in amounts greater than needed to provide congestion relief, leading to additional disruption in the marketplace.

In April 2006, BPA published a white paper, "Challenge for the Northwest: Protecting and managing an increasingly congested transmission system," which described the congestion problem and identified some of the

[1] In the summer of 2005, congestion was concentrated in the I-5 corridor. In 2006, congestion tended to be on paths in central Washington state, not in the I-5 corridor.

changes over the years that had affected the transmission system. The paper concluded by saying, "The longer the problem of congestion goes unaddressed, the worse it will be. It will be important for BPA customers and other stakeholders to become involved and support work to address the congestion issue."

The region steps up

Users of the Pacific Northwest transmission grid responded vigorously and constructively. BPA commends the region for its cooperation and help in addressing this critical issue. A Congestion Management Steering Committee was set up, which included executives of regional utilities and representatives of customer groups.[2] Technical representatives of those utilities and customer groups, as well as others, participated in workgroups throughout the summer. Because the problem was pressing, they focused on tools to address congestion that could be put in place by the summer of 2007.

Based on input from the workgroups, the Steering Committee proposed that BPA adopt three approaches to deal with congestion for the summer of 2007. In early September, BPA hosted a public workshop to provide an overview of the Steering Committee's proposed approaches, followed by an opportunity for questions and comment. In addressing workshop participants, BPA Transmission Vice President Brian Silverstein said, "Our goal is to find a cost-effective way of addressing congestion, and not just cost effective for BPA. We want an approach that makes the most sense to the region."[3]

In late September BPA adopted the Steering Committee's recommendations. BPA is now developing specific proposals to achieve the objectives of those recommendations and hopes to implement tools to manage congestion in time for this coming summer. This new direction is outlined below. In effect, it provides the next chapter to the white paper published this past spring.

But, while the Steering Committee's recommendations may be a concluding chapter to the white paper, they are not the last word on the subject. The Steering Committee focused on what was doable by next summer. A number of other tools and policies have potential to prove useful in dealing with congestion, but they will require more time to analyze and test. BPA expects to work with its regional partners to continue this work in a "phasing approach." The projects described below are considered interim measures and pilots and are expected to inform future steps beyond 2007.

Interim (or bridge) approach

In the short term, BPA will employ an interim approach to manage congestion on a limited basis until the following two options can be tested and solidified. Under the interim approach, when a dispatcher determines there is an OTC problem, BPA will stop scheduling[4] additional nonfirm and hourly firm on the affected path(s) for the two hours following the event. This would apply to only four cutplanes – Paul-Allston, South of Allston, North of Hanford and North of John Day. These flowgates have been targeted because they are the paths most likely to experience OTC exceedances.

The idea is to avoid "digging the hole deeper." Where a path is experiencing congestion, BPA and the Steering Committee believe it doesn't make sense to accept additional nonfirm and hourly firm schedules until it is clear that the problem has been fixed.

BPA plans to use deemed[5] points of receipt/points of delivery (POR/POD) to model flows in the hour(s) follow-

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[2] Members of the Steering Committee included representatives of Avista Corp., Idaho Power Company, western Montana G&T, Northwest Independent Power Producers Coalition, PacifiCorp, PNGC Power, Portland General Electric, PowerEx Corp., Public Power Council, Renewable Northwest Project, Seattle City Light, Snohomish Public Utility District and the Bonneville Power Administration.

[3] At the same time it has been addressing congestion, BPA also has been shoring up long-term reliability of the transmission system with an extensive capital program and has invested $1.2 billion in infrastructure since 2000. In 2006, BPA completed 13 major projects.

[4] For purposes of this paper, the term "scheduling" also includes new reservations.

[5] With deeming, models make an aggregate assumption of the amount of flows coming from or going to a particular geographic region because data may not be available for each individual generator or load in a timely manner. The effectiveness of this approach will depend on how closely the deeming approximates actual flows.

ing an exceedance to halt any new nonfirm and hourly firm schedules for those hours. Once the BPA dispatcher determines that system conditions have sufficiently stabilized, BPA would resume accepting nonfirm and hourly firm transmission schedules. But if congestion remains, BPA would still not accept new schedules.

BPA will let customers know when nonfirm and hourly firm schedules will be limited. The agency hopes to have a system in place next spring that will enable customers to see when requests will be denied.

Ultimately, BPA hopes it won't have to use the "bridge" tool for long. It is considered a stopgap until the tool called "hourly ATC for limiting nonfirm network schedules" (see below) is up and running.

Hourly ATC for limiting nonfirm network schedules

BPA intends to develop a way to determine on an hourly basis the transmission network's available transfer capability (ATC).[6] It would use this proactive tool to manage nonfirm and hourly firm transmission schedules on internal network flowgates. Nonfirm and hourly firm schedules will not be accepted when it appears that there is no ATC. A key to making this approach effective and economical is the ability to determine how much capacity is actually being used on the network and thus how much remains available to market.

New OATI[7] software will help automate the short-term ATC methodology. By using the deeming approach to modeling and tagging information, BPA will work toward developing an hourly flow-based ATC model that would be used to grant nonfirm and hourly firm transmission requests. This will help BPA manage impacts on flowgates ahead of time.

In simplest terms, nonfirm and hourly firm sales that keep the system within OTC will be approved, while sales that would cause an OTC exceedance will be denied.

This proactive tool contrasts with the current system where all nonfirm and hourly firm schedules are accepted and real-time reactionary actions must be taken when OTC exceedances occur. Limiting nonfirm and hourly firm transmission requests will reduce the need for real-time curtailments.

BPA expects to begin selling transmission from the wesTTrans OASIS[8] in March 2007 and expects to begin limiting nonfirm and hourly firm sales, if needed, once it develops a methodology for forecasting hourly network flows. BPA will provide training to customers on both wesTTrans and the use of this tool for limiting nonfirm and hourly firm schedules before it is implemented.

Within-hour reliability redispatch

Within-hour redispatch of federal and nonfederal generation would be used to reduce flows on cutplanes that become congested, so that schedules do not need to be cut to relieve congestion. Redispatch is a reactive tool to reduce flows on congested paths while minimizing negative effects on other paths or schedules. BPA expects that it would not need to implement redispatch very often if nonfirm and hourly firm transmission reservations are successfully limited on the four flowgates identified above.

Instead of going to a curtailment calculator and cutting schedules within the hour when a path exceeds OTC, BPA would first look to redispatch federal and nonfederal generation based on voluntary bids from participating generators. A benefit of this approach is that all existing firm and nonfirm transmission schedules would remain intact for that first hour. This redispatch tool, in combination with tools limiting nonfirm and hourly firm schedules in the following hour(s), is designed to prevent the use of curtailment calculators or other measures that would interrupt schedules.

For this coming summer, BPA will only include generators within its control area in the within-hour redispatch

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6 Available transfer capability is the measure of the electric transfer capability remaining in the transmission network over and above committed uses.

7 OATI is a company supplying software.

8 OASIS stands for Open Access Same-time Information System; access is via the Internet.

program. If it is successful, BPA plans to expand redispatch bidding to generators outside the control area once greater automation is available.

Under this approach, participating generators would ramp up or ramp down (increment or decrement) generation within the hour based on previous bids and direction from BPA dispatchers. Price would be determined by the generation owner, with a price cap set at $400 per megawatt-hour, based on the current cap established by the Federal Energy Regulatory Commission. BPA would select the bids in order of cost per megawatt-hour of relief. Contracts to acquire and provide redispatch will be set up between BPA and participating generators.

Participants would provide hourly bids giving the price they are willing to pay or collect and the amount of generation they can move within 10 minutes, as well as any additional generation they can move beyond that. These bids would be placed into a pool to be used for redispatch when needed.

BPA would then calculate the amount of flowgate relief provided and costs of each bid and provide dispatchers with an electronic list of calls they can make to redispatch. The list would necessarily be limited to calls dispatchers can make within minutes. If there is not enough voluntary redispatch in the stack, the next step would be to schedule transmission curtailments to relieve congestion.

BPA plans to limit its payments for this pilot to $1 million. The $1 million would fill the gap between the amount paid to incrementing generation and the amount paid by decrementing generation. Redispatch bids will be reviewed, and bidders will be asked to explain the basis for their bids as part of the pilot.

The pilot program will apply to the same four cutplanes identified in the "interim" tool. This redispatch tool has a number of goals that include ensuring all commercial schedules are delivered, avoiding use of curtailment calculators, selecting the most effective generators for redispatch and minimizing redispatch costs.

The schedule

Work will continue throughout the winter in an effort to put in place the tools to better manage congestion as soon as next summer. A number of details remain to be worked out. These include determining the accuracy of the model for deeming PORs and PODs; assessing the effects of these tools on firm and nonfirm transmission schedules; and, in the case of the redispatch tool, verifying that it provides the expected relief and can be monitored to determine that lines are unloading as expected. As congestion management tools are tested and implemented, BPA also will evaluate the impacts of limiting acceptance of transmission schedules on users of the transmission system and power markets.

For now, BPA's Transmission staff is using a "keep it simple" philosophy. There isn't a lot of time to develop very complex approaches by next summer. As one Transmission manager put it, "If this was easy, someone would have done it already."

For additional background on what led up to these tools and how the transmission grid has changed, go to the white paper entitled "Challenge for the Northwest: Protecting and managing an increasingly congested transmission system" available at: *www.bpa.gov/corporate/pubs/Congestion_White_Paper_April06.pdf*.