

BPA Stakeholder Discussion on PAC/ISO EIM Implementation: Controls for EIM Variable Transfers

November 21, 2013

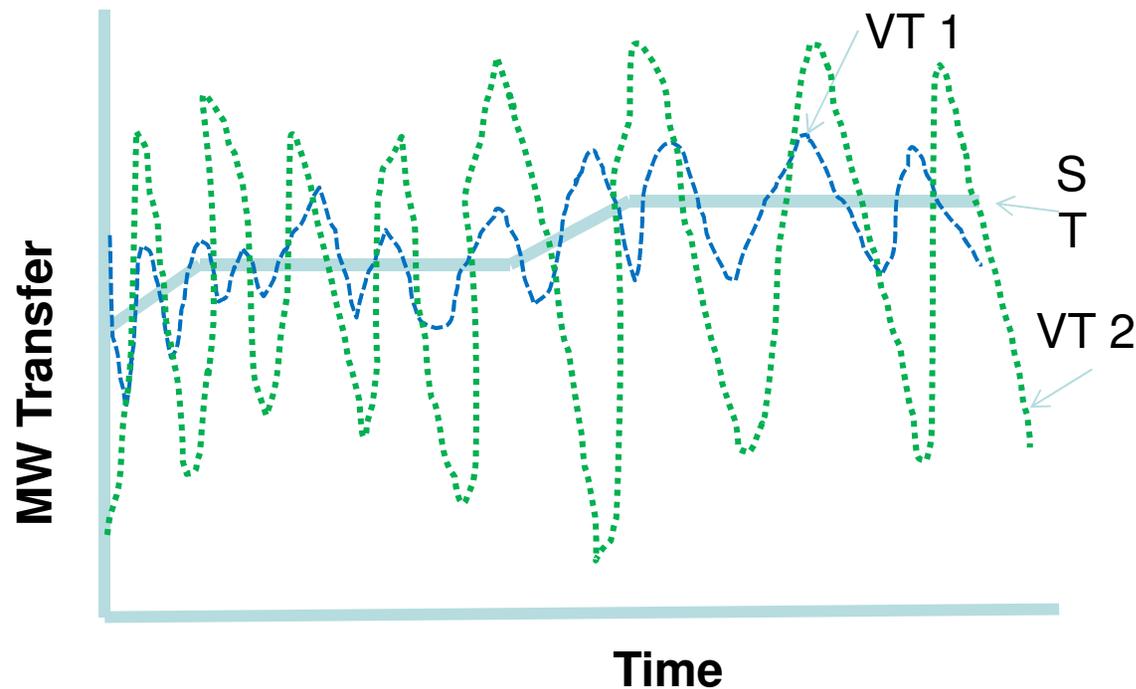
Pre-decisional/For Discussion Purposes Only



Purpose of Today's Discussion

- Provide an overview of Dynamic Transfer Capability (DTC).
- Provide more detail on the variable transfer solutions proposed in the October 28 meeting.
- Provide BPA's leaning for initial implementation.

What is Variable Transfer or DTC?



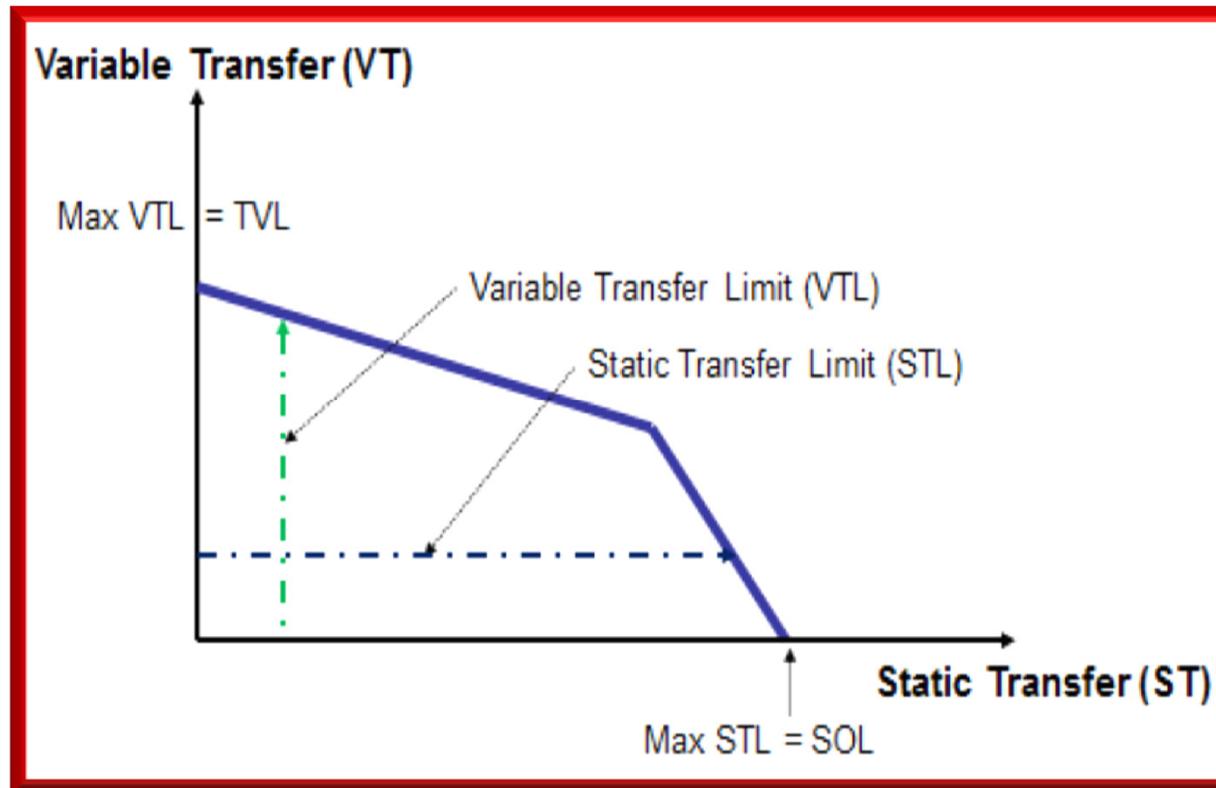
Variable Transfer (VT): Refers to the physical variations in actual power flows across a path / flowgate that are generally unpredictable and repetitive during a defined time period (e.g. 30 minutes).

Static Transfer (ST): Conventional transfers across a path / flowgate, usually made up of fixed hourly schedules between defined PORs (Points of Receipt) and PODs (Points of Delivery).

Why Was the Issue of Transfer Variability Limits Studied?

- Additional large and frequently varying Dynamic Transfers on top of stressed static conditions raised concerns for System Operators in 2005;
- TOPs concerned about increasing Dynamic Transfers to facilitate wind integration without assessing impact on transmission grid.
- In 2009 BPA did initial studies and calculated the DTC for some paths
- DTC task force refined the methodology to include the reliability and equipment impact criteria and develop a common methodology to develop a nomogram.
- How much and how frequently can transfers vary every 5 minutes outside of ramp periods?

Variable Transfer Limit Nomogram



- Sum of the variable transfers plus the static transfers on a path must be less than or equal to the SOL; $ST + VT \leq SOL$
- Variable Transfer Limit is calculated for a path using source and sink to stress the path

DTC Policy and Business Practices

- Too much variable transfer on the transmission system can cause excessive voltage excursions, unacceptable changes in the needed arming of Remedial Action Schemes (RAS) and other adverse reliability impacts.
- BPA currently controls variable transfers on its transmission system through its DTC policies and business practices.
- The current Dynamic Transfer Capability: Requesting and Awarding Access - Pilot, Version 4 Business Practice requires source and sink information sufficient to run a study.

EIM Variability on BPA's Network

- PAC (like many other BPA customers) has historically used the BPA network to dynamically balance its own generation and load within its balancing authority.
- The 5-minute EIM generation dispatches result in different variable transfers across BPA's network than those studied.
- In the EIM, multiple resources are responding to balance multiple loads and generation across the entire EIM footprint determined by a Security Constrained Economic Dispatch.
- Since BPA cannot use its traditional DTC studies to analyze the impact of the EIM variable transfers across our network BPA must develop other controls to mitigate potential reliability impacts.

Operational Goals for New Controls

- The 5-minute EIM dispatches do not adversely impact RAS arming, voltage control limitations, or reliability, and existing dynamic uses of the system are protected.
- BPA dispatchers have sufficient visibility and controls to be aware of the impact of the EIM (in real-time and prospectively) and be able to take necessary actions to maintain the reliability of the system.

Commercial Goals for New Controls

Implementation of the EIM must allow BPA to:

- Maintain existing quality of service to customers;
 - E.g. no increase in firm curtailments, including no increase in need for NT Redispatch events or decreased ability to provide NT Redispatch;
- Protect other existing dynamic usage;
- Maintain flexibility for future dynamic uses on BPA's system;
- Maintain BPA's ability to review and modify its dynamic use policies;
- Provide service consistent with Open-Access principles, including to potential future EIM participants.

Process for Achieving these Goals

- BPA has worked with the ISO and PAC to develop certain controls and to provide sufficient data in order to manage the impact of the EIM and achieve the goals and principles discussed above.
- Specifically BPA must determine how to populate the values of the controls for managing the EIM variable transfers.

COI vs. Network

- Different tools and business practices may be appropriate to manage dynamic usage on interties and BPA's network.
- COI
 - Implementation of the EIM does not necessarily require a unique set of operational tools and business practices on the COI.
- Network
 - Additional controls are being developed to effectively manage reliability and commercial impacts on BPA's network. Absent the development of new tools and business practices, BPA would have limited visibility and controls over the unique variable nature of the EIM dispatches on the network.

Operational Controls

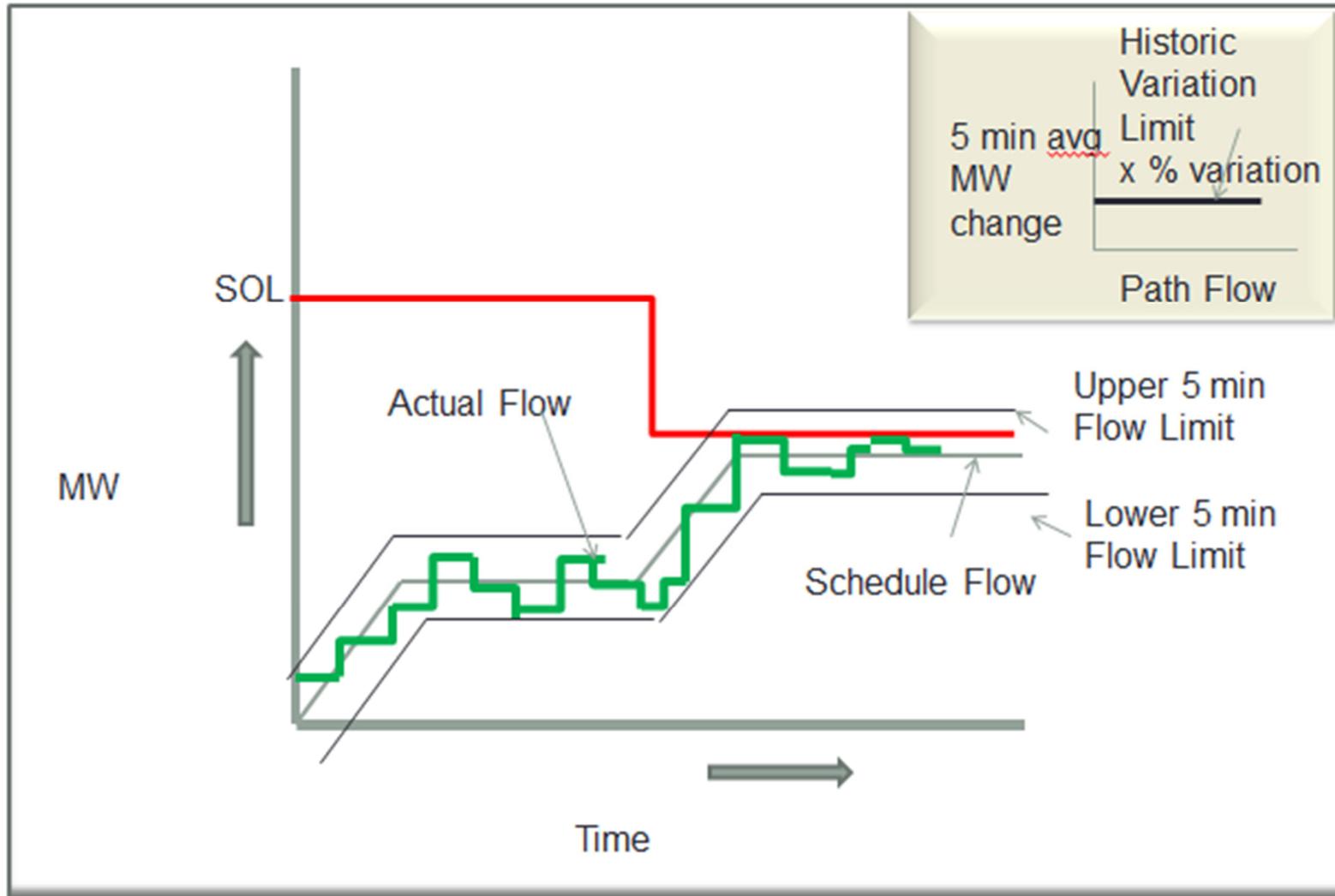
- The primary controls on flows and variability being proposed to manage potential operational impacts of the PAC-CAISO EIM include:
 1. System Operating Limits (SOLs) are not exceeded due to the EIM flows;
 2. Variable transfers from the EIM do not exceed an Upper 5-minute Delta Flow Limit;
 3. Variable transfers from the EIM do not exceed a Lower 5-minute Delta Flow Limit;

5-Minute Delta Flow Limits Alternatives

1. Historic Use Static Limits

- Limits would be calculated for each flowgate based on PAC's historic dynamic usage.
- For resources that are expected to be offered into the EIM, historic five minute actuals would be analyzed to determine the variability for each generator and the impact of generator variability across each flowgate.
- The net coincidental impact by flowgate would be determined and a operational limit selected.

Alternative 1 In Action



Historic Use Static Limit Example

- Scenario for a Network Flowgate (i.e. North of John Day):
 - The flowgate SOL is 2800MW.
 - The upper 5-minute delta flow limit on the flowgate is +100MW.
 - The lower 5-minute delta flow limit on the flowgate is -100MW.
 - The actual flow on the flowgate is 2750MW.

- The EIM, via SCED, would ensure that the next 5-minute dispatch does not violate any of the following constraints:
 - A delta flow greater than +50MW (due to SOL of 2800 MW)
 - A delta flow greater than +100MW (due to upper 5-min flow limit of +100MW)
 - A delta flow greater than -100MW (due to lower 5-min flow limit of -100MW)

- Based on the most limiting constraints above, the next EIM 5-min dispatch would be limited to:
 - A delta market flow between -100MW and +50MW
 - The most limiting constraints are SOL for upper limit and lower delta limit.

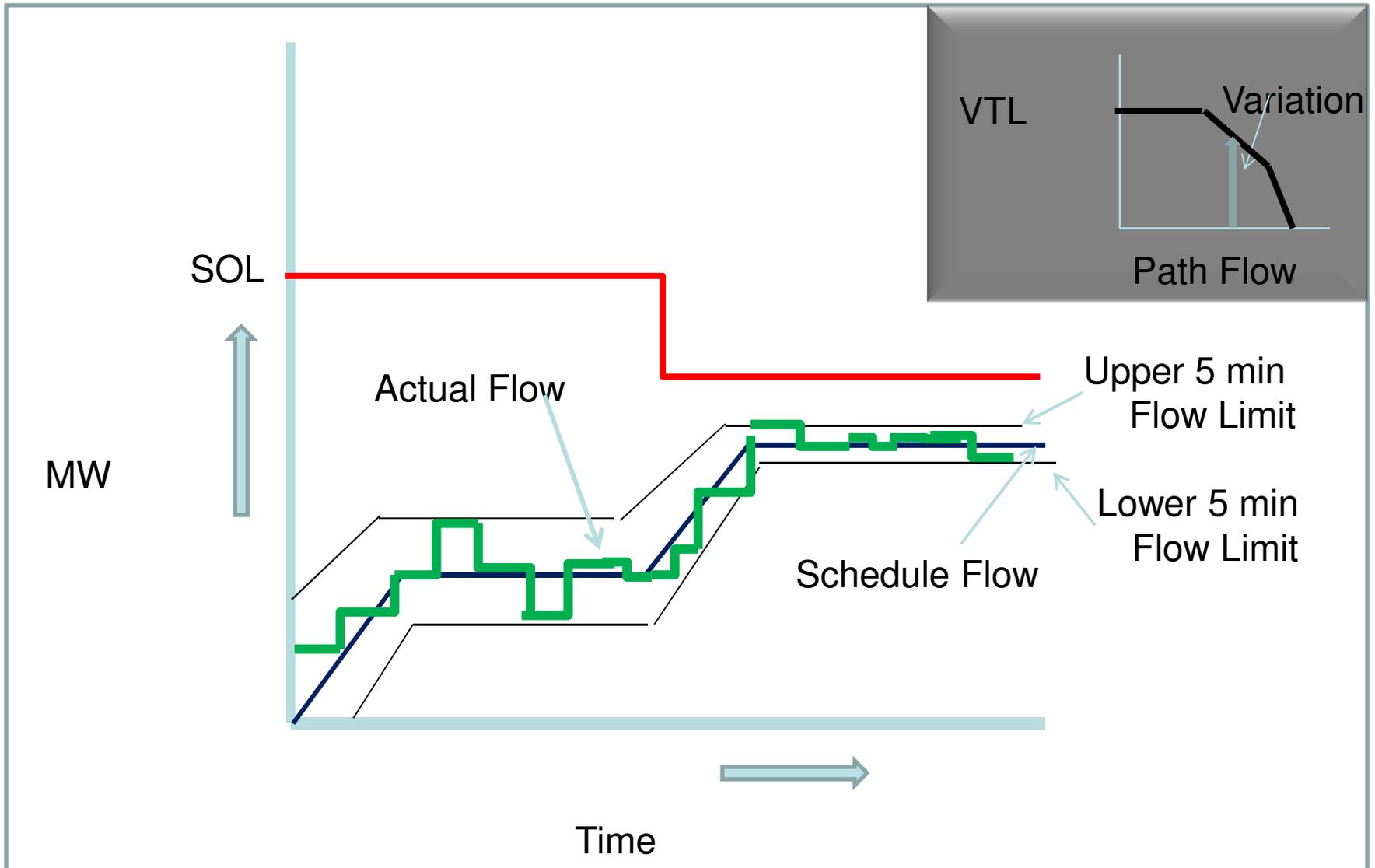
* Fictional scenario, not intended to represent any actual system condition

5-Minute Delta Flow Limits Alternatives

2. Offline Nomogram Variable Limits

- Nomograms would be developed that provide a relationship between path flows and variable transfers available on flowgate/path.
- The variable transfer limit would be the lesser of the nomogram limit or the RAS arming limit for each flowgate.
- DTC awards already allocated on each path would be subtracted from the upper and lower variable limits.

Alternative 2 In Action



Offline Nomogram Variable Limit Example

- Scenario for a Network Flowgate (i.e. North of John Day):
 - The flowgate SOL is 3800MW.
 - The upper 5-minute delta flow limit on the flowgate is 3200MW.
 - The lower 5-minute delta flow limit on the flowgate is 2800MW.
 - The actual flow on the flowgate is 2900MW.

- The EIM, via SCED, would ensure that the next 5-minute dispatch does not violate any of the following constraints:
 - A delta flow greater than +900MW (due to SOL of 3800 MW)
 - A delta flow greater than +300MW (due to upper 5-min flow limit of 3200MW)
 - A delta flow greater than -100MW (due to lower 5-min flow limit of 2800 MW)

- Based on the most limiting constraints above, the next EIM 5-min dispatch would be limited to:
 - A delta market flow between -100MW and +300MW
 - The most limiting constraints are the lower delta limit and the upper delta limit

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BPA Staff Recommendation

- BPA's staff currently recommends a phased approach beginning with Alternative 1, but, simultaneously initiate development of Alternative 2.
- BPA staff believes that Alternative 1 provides sufficient controls to meet the operational and commercial goals and can be implemented by October 2014.
- Alternative 2 has the potential to provide superior controls and may ultimately provide benefits beyond the EIM. However, implementation by October 2014 is not likely, given the complexity of system design work.
- BPA's recommendation is to pursue a combined approach. In actual implementation we will continuously develop, test, and refine the specific details of the approach and its merits based on the actual performance and overall effectiveness.

Next Steps

- December 18 – Tentative EIM Stakeholder meeting
- BPA hopes to begin implementation of an Alternative in December.
- Further review and analysis of the implementation will be provided in future stakeholder meetings.
 - Including performance testing in market simulations starting Summer 2014
- Please submit your comments by December 13 to TechForum@bpa.gov with “EIM Stakeholder Meeting” in the subject line. Your comments will help inform BPA decision-making.

BACKGROUND

Process Overview

- BPA has continued to work with the ISO and PAC, as well as with other stakeholders, on managing the implementation of their EIM, targeted for startup in October 2014.
- That work has been productive, and has remained consistent with the principles and issues discussed in our September 27, 2013 stakeholder meeting.
- That work has also led to the proposal of certain tools and policy questions regarding the use of those tools.
- These solutions were initially discussed on October 28.

Process Overview (Contd.)

- BPA is targeting decision on these by the end of November.
- These tools can be monitored and evaluated for their effectiveness during:
 - Market simulations prior to initial implementation (target Summer 2014)
 - Initial implementation (target October 2014)

Principles for EIM Implementation

- Use of the BPA transmission system will be consistent with non-discriminatory access and Open Access principles.
- Operation of the transmission system will be consistent with NERC and WECC reliability standards.
- Our own customers in neighboring Balancing Authorities receive fair and comparable service.

General Areas of Focus

- Transmission operations
 - One of BPA's general principles is that it must run its system in a reliable manner, consistent with NERC and WECC Reliability Standards. Also, BPA needs confidence that it has the people and systems to sustain reliable operations.
- Transmission commercial and policy
 - One of BPA's general principles is that its transmission system is used consistent with non-discriminatory access and Open Access principles, as described in its OATT, and that service to existing customers is not degraded. Any implementation of EIM must be demonstrated to be consistent with this principle.
- Service to BPA customers within PAC's BA
 - One of BPA's principles is that it can continue to fulfill its contractual and statutory obligations to its own customers in EIM Entity Balancing Authority Areas.

Coordinated Flowgates & Paths

- The criteria for determining which paths and flowgates will require coordination and the implementation of the described operational controls are envisioned to be based on:
 1. Flowgates and paths where the impact of the redispatch of any single pairs of resources that are expected to offer a bid range into the EIM is greater than 10% OR;
 2. The impact of any single resources offering a bid range serving one of the EIM Entity loads is greater than 10%.

Note: 10% is the threshold used for curtailments and ATC evaluation.