TIP 237: Bidirectional Multipath Dynamic Transfer Analysis

Context

The Pacific Northwest has an installed wind generation capacity of over 3,000 MW as of December 2010, with planned installation doubling this capacity by 2014.

To integrate these resources successfully depends on the ability to understand, adapt, and manage them. Intermittency, both in periodicity and magnitude, is an essential challenge to that integration.

Description

One of the main approaches for integrating large amounts of intermittent energy sources requires Dynamic Transfers. Dynamic Transfer is the means by which the electrical output of a generating resource is balanced in real time by an entity other than the Balancing Authority in which the resource resides. It is one of the most important techniques to reliably and cost-effectively integrate large amounts of variable renewable generation resources. This technique would allow a dispatcher in one balancing authority to control and take responsibility for supplying balancing reserves for a generator located in another balancing authority. While providing greater operational flexibility, it requires that adequate provisions are made for the effect of real-time variation on the transmission system.

The Dynamic Transfer Limits Study is one of five Wind Integration Team projects BPA committed to in 2009. Prior to this study, there was no established method in the literature to evaluate the impact of, and set limits on, Dynamic Transfers. Working in conjunction with the Columbia Grid Wind Integration Study Team (WIST), BPA and Maxisys developed a quantitative methodology to assess the impacts of dynamic transfers on the BPA transmission system. The study evaluated transmission reliability impacts resulting from increased dynamic transfers across major PNW transmission paths and established the portion of the existing transmission capability available to accommodate dynamic transfer.

This project is intended to improve the new dynamic transfer methodology. The project will evaluate improvements in the methodology; implement prototype tools to study key transmission paths

Why It Matters

FERC Order 890-B states that a transmission provider is obligated to provide generator imbalance service if it is able to acquire resources to do so. If the transmission provider is unable to provide or procure generation imbalance services, the transmission provider must facilitate the use of dynamic scheduling to provide these services, while insuring that any dynamic schedule used for these services can be utilized without adversely affecting reliability. While limited use of dynamic transfers and variability for load following is a normal part of system operation, the large scale deployment of thousands of megawatts of intermittent resources, with the dynamic transfers to manage associated balancing resources, is resulting in new operational challenges that must be addressed to ensure system reliability.

Goals and Objectives

The project will evaluate improvements to the methodology developed previously. Sound mathematical modeling will be explored and assumptions will be defined.

Phase 1: This phase of the project will engage the development of an improved methodology that provides the following:

1) Extends the optimization algorithm to include bidirectional flow
2) Extends linearized formulation using the powerflow Jacobian to consider the impact of dynamic transfers on limited reactive sources
3) Develops the complex relationship between multiple dynamic transfers

Phase 2: In this phase a cost-modeling approach will be developed and methods to assess the transmission service cost of providing Dynamic Transfer service will be investigated.

Phase 3: This phase will propose an approach to implement dynamic transfer and also identify any reliability impact due to Dynamic Transfer. The information can then be displayed in the control center for dispatcher monitoring and decision making.

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Project Start Date: October 2010

Project End Date: September 2012

Reports & References

Dynamic Transfer Limit Study Methodology:

1. "Assessing the Impact of Dynamic Transfers on Transmission System Operation", Brian Tuck and R. Ramanathan, February 15, 2010.
2. "Bidirectional Multipath Dynamic Transfer Analysis", Brian Tuck and Ramu Ramanathan, BPA internal White paper, Feb. 2011.
3. "Dynamic Transfer Limits Computational Methodologies", Brian Tuck and Ramu Ramanathan, BPA internal White paper, Sept. 2011.
4. "Dynamic Transfer Methodology, Initial Results and Observations", Brian Tuck and Ramu Ramanathan, BPA internal White paper, Dec. 2011.
5. "Dynamic Transfer Capability Task Force Phase 1 Report", Wind Integration Study Team, March 16, 2011.
6. "Dynamic Transfer Capability Task Force Phase 2 Report", Wind Integration Study Team, July 2011.
7. "Dynamic Transfer Capability Task Force Phase 3 Report", Wind Integration Study Team, Dec. 2011

Funding

Total Project Cost:	$456,000
BPA Share:	$456,000
External Share:	None
BPA FY2012 Budget:	$194,000

Participating Organizations

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