

# Outline for Discussion of Proposed FERC Audits of Transmission Paths

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## ***Introduction***

This summary is based on the work done for RMATS by Peak Power Engineering, Inc. under contract to NREL. The project focused on three transmission paths in the west that are important for delivering wind energy to load centers. The goal of the study was to determine how much physical transmission capacity may be available to accommodate wind generation, and to provide background that would indicate whether innovative transmission tariff products would have the potential to make transmission capacity available to wind generators on paths without sufficient firm capability. Given the variability of the wind resource, the objective was to match wind generation profiles with available transmission for a one-year period. Three paths were chosen: (1) TOT3, from southern WY to the Colorado Front Range load centers; (2) West of Naughton; (3) Montana to the Northwest. The experience with each of these paths is different, and will help highlight some of the issues that would be expected.

## ***Data***

The data collection process encountered several degrees of success. Each of the three cases is summarized here.

## **TOT3**

The best data came from the TOT3 path, and was obtained from WECC. The TOT3 constraint is not a single transmission line, and the actual constrained path depends in part on operational practice. There are several joint owners of this path, each of which is responsible for scheduling its share of power over the TOT3 path. Because of this mixed ownership and the capabilities of individual transmission lines in the path, there are differences between the aggregate ATC (available transmission capacity) and the ATC that is posted. ATC that is offered for sale is based on OTC (operational transfer capacity—the rated capacity of the line) less the capacity scheduled by the transmission operator. Each operator will normally hold back some capacity as a reserve, so posted ATC generally does not correspond to physically available capability.

ATC depends on a number of factors. In the West, inadvertent flow can be significant, and can reduce ATC. The inadvertent flow, also known as loop flow, is largely driven by the level of hydro generation in the northwest. During the recent drought years when hydro generation has been low, loop flow across TOT3 has declined significantly. This increases the ATC. During years of high hydro, loop flow also increases, reducing the ATC. OTC varies hourly based on operational conditions and contingencies.

Data for actual flows, and OTC was collected from the WECC database, after executing a confidentiality agreement. The quality of the data was generally good.

## **West of Naughton**

Data for this path is maintained by PacifiCorp. However, because this is not a scheduled path (it is operated internally by PacifiCorp) and because of equipment upgrades, the historical data was judged not to be a reasonable indicator of future performance.

## **Montana to the Northwest**

Data for this path was collected from WECC. However, the quality of the data was not sufficient to pursue further study of this path. Additionally, the serial nature of the path required to deliver wind power to the Northwest would have involved collecting data for other constrained paths, which was not feasible for this project.

## ***Approach***

Because of data limitations, the analysis was only completed on the TOT3 path. Hourly ATC (hATC) was calculated by estimating uncertainty factors that depend on how much of the physically available capacity is posted for sale. These factors represented possible reductions based on ownership and coincident schedules, variations in line ratings, and interactions with nearby areas. This issue stirred considerable controversy among various RMATS participants. Actual OASIS data was not available, which would have increased the accuracy of the results.

(More information on relevant calculations can be found on the WGA web site in the document *Determination of Available Transfer Capability Within the Western Interconnection* at [http://www.westgov.org/wieb/wind/6-01-01WECC\\_ATC.pdf](http://www.westgov.org/wieb/wind/6-01-01WECC_ATC.pdf).)

The project calculated the physical transmission capability available for each hour of the year. The resulting values are referred to as unused transmission capacity (UTC). This term is not generally accepted in the industry, and was defined for the study to differentiate capacity that is physically available vs. contractually available. The level of UTC depends on the OTC, and the actual flow (including loop flow) on the path.

## ***For Potential FERC Audits Data Issues are Critical***

Before an audit can be carried out sufficient data needs to be collected and archived by a responsible party. Recommend key data be defined carefully, and responsible parties designated to collect the data and perform QC on a regular basis to ensure data quality.

Key data should be collected hourly, and include:

- TTC (total transfer capability)
- OTC (if different than TTC)
- Estimates of loop flow and other influences on OTC
- ATC based on OASIS posting
- Actual flow
- TRM (transmission reliability margin)
- Data status flags
- Equipment upgrade flags (to denote significant equipment changes, upgrades, outages)

## ***Characterizing the Results of Transmission Audits***

Given the relatively large quantity of data, the results can be characterized in several ways:

- Tabulate the periods during the year when constraints are significant.
- Constraint-duration curves that show the percentage of time that the interface is constrained at various levels (annual or monthly).
- Average profiles of ATC, OTC, TRM, or other series of interest.
- Relationship between OASIS postings and OTC. Time series graph, or duration graph.
- Relationship between TRM, ATC, and OTC. Time series graph, or duration graph.
- Significant factors that contribute to OTC variations, and estimates of their impacts (?).