WHITE PAPER

Financial Transmission Rights (FTR)/Congestion Revenue Rights (CRR) Analysis

Get ahead with ABB Ability™ PROMOD®
Market participants and system operators are facing unprecedented challenges imposed by the risks of price “spikes” and operational issues caused by low prices.
In addition to the financial and physical risks associated with the energy markets, transmission congestions can also dominate price formations of a given asset. Transmission congestions can cause the total locational marginal price (LMP) for a Pnode to experience much higher volatility compared to the nearby trading Hub or Zone.

Auction Revenue Rights (ARR) and Financial Transmission Rights (FTR) are designed by Independent System Operators (ISOs) for market participants to hedge against transmission congestion risks. ARRs are allocated annually to firm transmission service customers and entitle the holder to receive an allocation of the revenues from the Annual FTR Auction. FTRs allow market participants to offset potential losses (hedge) related to the price risk of delivering energy to the grid. FTRs are a financial contract entitling the FTR holder to a stream of revenues (or charges) based on the day-ahead hourly congestion price difference across an energy path.

When it comes to hedging and trading in today’s volatile energy markets, utilities and financial institutions need every advantage they can get. ABB Ability™ PROMOD®, an integrated electric generation and transmission market simulation system, is a powerful tool to gain market advantages over all market curves.
For over 40 years, PROMOD has been applied in both nodal and zonal market analysis to support decisions for a spectrum of business models, such as independent system operators (ISOs), independent power producers (IPPs), load serving entities (LSEs), financial institutes, etc. Much like ISO day-ahead or real-time markets, PROMOD market simulations are based on SCUC and SCED calculations.

The main objectives of PROMOD forecasts are to:

• Evaluate LMPs of major trading hubs/zone or a portfolio of pricing nodes (Pnodes), congestions or transmission loss driven LMP separations between a source and sink pair, and
• Simulate power flow pattern measured by flowgate power flows or generation capacity factors under different fundamental conditions.

Physical and financial power markets provide profit opportunities for market participants through active trading and hedging activities.

Available power markets can be sorted into the following categories:

1. ISO organized markets:
   a. Day-ahead and real-time markets. Bids and offers (including virtual and point-to-point obligation bids) are matched, subject to network security and other constraints, and co-optimized with ancillary services.
   b. ARR markets. By participating in annual ARR allocations, firm and network transmission customers can recover a part of their congestion cost from the day-ahead market.
   c. FTR markets. FTRs are a method to bypass congestion charges associated with PJM’s locational marginal pricing or LMP. They give market participants the ability to attain a better price certainty when delivering energy across the grid.

2. Over-the-counter (OTC) financial and physical swap:
   a. LMPs of major trading hubs and zones. LMPs are averaged by on-peak/off-peak periods, and daily/weekly/monthly/seasonal/yearly strips.
   b. LMP basis separation between zones and hubs. Basis products are also traded in on-peak/off-peak periods, and daily/weekly/monthly/seasonal/yearly strips.
   c. Nodal exchange market. Nodal exchanges are a third-party trading platform and clearing house, which usually opens after the ISO FTR auction, to provide power future contract exchanges at commercially significant hubs, zones and nodes.
The congestion components of the LMPs from the day-ahead market are the revenue source of FTR markets. The revenue of the annual FTR market will then be delivered to ARR holders. OTC trading happens in every market day, but trading liquidity generally increases when FTR auctions start or end.

High OTC trading volumes also happen when market conditions change, such as the activation of a major transmission upgrade or a new generator entry, the start of a long-term transmission or generation outage, etc. The paces of OTC and ISO markets are typically synchronized through trading activities, with occasional divergence due to timing of auctions and market efficiency. The FTR auction mechanism maximizes the quote-based bid value of a set of simultaneous feasibility test satisfied FTRs. The awarded FTRs during a FTR auction are limited by available transmission capability under N-0 and N-1 contingencies and considers all existing FTRs and new FTR bids/offers. Therefore, physical limits of the transmission system, impacted by transmission outages and upgrades, are considered in every FTR auction.

Congestion costs for source/sink pairs cleared in FTR markets are driven by market fundamentals. The OTC market reacts more quickly to daily market dynamics through daily trading activities, compared to monthly FTR markets and annual ARR allocations. With the assistance of PROMOD fundamental models, market participants can identify the optimal timing between different types of markets to maximize their profit margin and minimize their risk exposures.
Timing is everything in today’s power markets.

There are multiple scenarios that can illustrate the volatility of ARR/FTR markets and the importance of the timing of market entries. For example, Figure 1 shows FTR auction clearance of PJM BGE zone to PJM WESTERN HUB spreads in different FTR auctions as compared to ARR revenue realized in the PY17-18 annual FTR auction.

The blue bars in the figure represent ARR revenues, while the orange line represents FTR values. The connected red dots are the PROMOD forecast for PY17-18 BGE/WESTERN HUB spread performed in December 2016 and February 2017. ARR revenues are updated every year after the final round of annual FTR auction. The total ARR revenue allocated to BGE zone increased from $39 million to $145 million, then declined to $52 million in PY17-18 annual FTR auctions. In comparison to the low frequency ARR allocations, FTR auctions are held multiple times per year to refresh the PY17-18 nodal congestion costs.

The OTC market is another parallel market that marks a more dynamic track of the zonal LMPs and Zone/Hub LMP spreads. The trajectory of the OTC curves are usually closely correlated to FTR auction clearances. Continuous trading activities in FTR and OTC markets can help to bridge the gaps between ARR annual allocations. Without effective hedging strategies, market participants can be exposed to considerable financial risk. For the BGE example in particular, 64% of revenue drop or $93 million loss has materialized for PY17-18 in ARR allocations even before the actual day-ahead market settlements. Besides the BGE zone, several zones in PJM experienced more than 30% of ARR revenue drop in PY17-18, such as AEP, APS, and COMED zones.

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**Figure 1**
PY17-18 PROMOD FTR forecast vs. actual long-term and annual auction results and realized ARR revenue
Source: ABB Ability™ Velocity Suite, 2017
Stay ahead of the ARR, FTR and OTC market curves.

PROMOD market simulations can provide timely LMP and congestion forecasts for a given set of hubs/zones, as well as a portfolio of pricing nodes. Since the market drivers are modeled in PROMOD in a time series format, the produced market forecasts will show time patterns for any market changes.

For example, major transmission upgrades were planned in the BGE zone to be completed in June 2017. Including the schedule of BGE transmission upgrades in PROMOD resulted in a decrease in the forecasted BGE/WESTERN Hub spread for the monthly auction after Jun 2017. The PROMOD forecast BGE/WESTERN Hub spreads for PY17-18 was in the range of $2.4 and 2.6/MWh, compared to $5.1 and 5.5/MWh, FTR auction clearance in Dec 2016 and similar value in OTC market during Dec 2016 to Feb 2017. In the annual FTR auctions in April 2017, the same BGE/Western Hub FTR cleared in the range of $2.1 and 2.5/MWh.

For ARR account holders, the opportunity for hedging their ARR revenue can be accomplished by bidding offsetting FTR paths in the Dec 2016 or earlier long-term FTR auctions, or selling BGE/Western spreads in either FTR or OTC markets. For trading shops chasing market margins, PROMOD’s nodal forecast can provide clear views of congestion pattern changes, and therefore build up a portfolio of the FTR bids/offers to adapt to the market changes.

The reformation of modern power markets is resulting in a diversified generation mix, fast-growing renewable resources, and retirement of less efficient coal generation, all of which contribute to more dynamic market environment with changing power flow pattern. ABB Ability PROMOD is a trusted, proven tool in power market and transmission analysis to serve a variety of business and research priorities for ISOs, utilities, financial institutes, market monitoring units and FERC regulatory departments.

PROMOD makes it possible to stay ahead of the moves of OTC, FTR and ARR markets, giving market participants a powerful advantage to maximize their profit margin and minimize their risk exposure.