

Congestion Management Workshop
Session 3B:
Transmission Rights Issues

Motivation

Participants in the NW RTO effort have expressed concern about the unintended complexity of the system of Transmission Capacity Reservations (TCRs) proposed for IndeGO. Anticipating the need to modify this approach, some have inquired about systems of point-to-point financial rights, such as those in PJM:

- **What are point-to-point financial rights? (For the purposes of this presentation, these will be called FTRs.)**
- **How can one create an initial allocation of these FTRs?**
- **What are the the advantages of this system?**

This session responds to these questions, suggesting that point-to-point FTRs could allow the RTO to achieve many of the objectives reflected in the design of the IndeGO TCRs. In addition, the FTRs have some potential advantages that it is worthwhile to consider.

Agenda

- **Comparison of TCRs and FTRs**
- **Initial FTR Allocation Mechanisms**
- **FTR Auctions**
- **Trading FTRs**
- **Conclusion**

Comparison of TCRs and FTRs

Purpose of TCRs and FTRs

TCRs and FTRs provide fixed price transmission service under congestion management systems in which transmission users are charged congestion costs.

- **Actual congestion and actual redispatch costs are not known in advance. This uncertainty creates a demand for congestion hedges.**
- **Both TCRs and FTRs may be purchased for a known price for a pre-defined period of time. They are denominated in MWs between a source location and a sink location or over a particular transmission path.**
- **TCRs and FTRs enable market participants to obtain long-term transmission price certainty by “locking-in” transmission costs in advance.**

Overview of IndeGO TCRs

TCRs are tradable financial rights based on congestion clearing costs across specified inter-zonal transmission paths.

- **The owner of a TCR has the option to avoid paying the congestion clearing cost on a specified transmission path (also called a flow-gate) for a specific period of time.**
- **To hedge the congestion clearing costs for a bilateral transaction, a market participant must hold a portfolio of TCRs corresponding to the flows that this transaction causes across the pre-defined paths. (1% threshold for identifying affected paths.)**
- **TCRs are not required for scheduling transactions.**
- **There is not an unlimited quantity of TCRs. TCRs will be allocated up to the non-simultaneous transfer capability of each path.**

Overview of FTRs

FTRs are tradable financial rights based on congestion clearing costs between two locations (node, zone or hub) on the transmission system.

- **The owner of an FTR is paid the hourly cost of congestion (\$/MWh) between the two locations ($P_{POW} - P_{POI}$).**
- **To hedge the congestion costs for a bilateral transaction, a market participant must hold an FTR that matches the transaction in MWs and in locations (net injections and withdrawals). When this occurs, then the purchase of an FTR hedge fixes the price of transmission for that transaction.**
- **FTRs are not required for scheduling transactions.**
- **FTR owners receive congestion payments even if they are are not using the transmission system.**
- **There is not an unlimited quantity of FTRs. A feasible set of FTRs must correspond to a feasible security-constrained dispatch.**

Similarities Between TCRs and FTRs

There are a number of similarities between TCRs and the systems of FTRs implemented in PJM and NY:

- **Based on a financial settlement in which the RTO collects congestion clearing costs from users of the system and pays the money back out to owners of TCRs or FTRs.**
- **Use open-market auctions to sell TCRs or FTRs for fixed periods of time.**
- **Grandfather pre-RTO transmission contracts and claims. (Exempt TCRs)**
- **Use “auction revenue rights,” such as Exempt TCRs, as a mechanism for releasing the transmission capacity associated with grandfathered transmission claims for sale through the auction.**
- **Emphasize the opportunity for non-RTO secondary markets to use TCRs and FTRs to develop new financial hedging instruments.**
- **Award incremental TCRs or FTRs to those who fund market-based transmission expansion.**

TCR Limitations

It appears that the primary limitation of the TCR proposal is that it could be very difficult for market participants to trade the TCRs to hedge their congestion clearing costs.

To completely hedge the congestion clearing costs for a bilateral transaction, a market participant would potentially need to buy TCRs over a large number of interfaces.

- **A market participant would need to find a way to buy each of the required TCRs in the secondary market or in the auction, facing the risk that there might be gaps in its portfolio because one or more TCRs might not be available at a reasonable price.**
- **This set of TCRs would need to be adjusted as the distribution matrix is updated, e.g., in the event of a contingency.**

Potential of Point-to-Point FTRs

Systems of point-to-point FTRs have the potential for addressing this limitation of the IndeGO proposal, while also accomplishing other objectives that appear in the design of the TCRs:

- **Move away from contract path scheduling.**
- **Preserve the use of existing paths/flowgates.**
- **Provide efficient congestion price signals for short-run usage of the grid and long-run expansion decisions.**
- **Use an auction to efficiently allocate TCRs.**
- **Grandfather existing transmission claims while not restricting the availability of TCRs to new market participants through the auction.**
- **Provide a system of tradable transmission rights that would make it simple for market participants to hedge their congestion clearing costs.**
- **Facilitate allocation of incremental TCRs for market-based transmission expansion.**

Initial FTR Allocation Mechanisms

Initial FTR Allocation Mechanisms

FTRs can be initially assigned and sold through a number of general mechanisms:

- **Direct Assignment:** Assigned in conjunction with the grandfathering of existing claims to use the transmission system.
- **Assignment in Conjunction with Firm Transmission Service:** Assigned to entities purchasing network or firm point-to-point service.
- **Centralized Auction:** Assigned through periodic auctions.

After the initial assignment of rights, trading can occur by buying and selling through the secondary market.

- Secondary market exchanges could be operated by power exchanges, financial institutions or other market participants.
- FTRs may be repackaged to create new types of congestion cost hedges.

FTR Allocation Mechanisms

PJM and New York have implemented transmission pricing systems that include point-to-point FTRs. (FTRs are called TCCs in New York.)

This section describes in detail the initial allocation procedures that were used in New York, since it appears that there could be a number of parallels to the proposed IndeGO process for allocating TCRs.

Step 1: NY Allocation to Grandfathered Agreements

Pre-NYISO firm transmission agreements in New York were grandfathered, with few exceptions.

- **Agreements between the New York transmission owners and third parties (OATT and pre-OATT) were continued, in general, according to the terms of the contracts. Transmission customers have a one time option to convert their grandfathered rights to TCCs.**
- **Existing transmission agreements among the New York transmission owners were grandfathered and converted to TCCs.**

Step 2: NY Allocation to Native Load

The New York transmission owners were assigned existing transmission capacity for native load (ETCNL).

- **ETCNL is an entitlement that reflects each transmission owner's use of the transmission system to serve its native load.**
- **The ETCNL allocations are based on a single feasible load flow (NERC base case planning study), taking into account previously grandfathered claims. ETCNL claims are pro-rated if they over-subscribe interfaces.**
- **Each transmission owner makes point-to-point designations of ETCNL from its generation facilities (owned or contracted) to its native load that are consistent with the base case load flow.**
- **ETCNL is a form of “auction revenue right,” not a right to TCCs. It is used to allocate auction revenues between the transmission owners.**
- **ETCNL expires as load opts for retail access.**

Step 3: NY Allocation of Residual TCCs

After the NYISO has established a feasible set of grandfathered rights, grandfathered TCCs and ETNCL, the residual transmission capacity is allocated to the transmission owners as Residual TCCs.

- **Allocation is based on the “interface MW-mile methodology,” which is a negotiated methodology applied to the base case power flow.**
- **The transmission owners are required to release unsold Residual TCCs into the TCC auction, but they are allowed to sell their residual TCCs through a direct sale over the OASIS prior to the auction (except for the 8/4/99 transitional auction).**

NY Allocation of TCCs To or From Zones

In practice, many pre-ISO transmission claims in New York were grandfathered by transforming them into claims on a set of interfaces, or paths, between zones.

- **Defined the interface claims as TCCs between zones**
- **Congestion payments for TCCs that go to or from zones are calculated based on zonal prices.**
- **“Zonal LBMPs” are a weighted-average of the underlying nodal prices, which are used for zonal settlements.**
- **There is an underlying definition of each zonal TCC in terms of a portfolio of point-to-point TCCs. This is based on the distribution factors for the zone in the base case load flow.**
 - *Removes ambiguity in the event that zones are split or otherwise changed.*
 - *Necessary for the TCC auction model.*

Would such procedures make it possible to define FTRs for transmission paths in the Northwest?

Step 4: NY Auction

In the TCC auction, the transmission capacity available to support the sale of TCCs will be:

- **Capacity associated with ETCNL.**
- **Capacity associated with Residual TCCs that has not already been sold by the transmission owners.**
- **Capacity associated with TCCs released for sale in the auction.**
- **Capacity not committed to support any grandfathered rights, grandfathered TCCs, ETCNL or residual TCCs.**

The auction methodology will be described in the the next section.

NY Auction Revenues

- **The auction revenues associated with ETCNL and Residual TCCs are paid to the transmission owners.**
- **Revenues from the sale of TCCs released for sale in the auction are paid directly to the owner of the TCC.**
- **Any excess auction revenues are allocated to the transmission owners using the interface MW-mile methodology.**

All revenues received by a transmission owner are credited against its transmission revenue requirement to reduce its license plate TSC.

PJM Allocation of FTRs

Prior to each month, PJM allocates FTRs to parties purchasing network service and firm point-to-point transmission service.

Requests for new service will be processed on a first-come, first-serve basis.

FTRs will be assigned to a new network service or firm service applicant only if such FTRs are simultaneously feasible in conjunction with all currently outstanding FTRs.

Transmission customers purchasing network or point-to-point transmission service pay the embedded cost rate for this service.

PJM Network Service

Each network service customer is eligible to receive a set of FTRs from its designated network resources to the aggregate load buses of the network service customer in a zone (or to the border of the PJM control area).

- **FTRs are assigned in an amount less than or equal to the capacity of each designated resource from the location of each network resource to the aggregate load buses of the network service customer in a zone (or to the border of the PJM control area).**
- **The assigned FTRs for a zone must be equal to or less than the network service customer's peak load for that zone.**

PJM Firm Point-to-Point Service

Each firm point-to-point transmission service customer can request FTRs equal to the number of megawatts of firm service being provided between the receipt and delivery points of the firm service.

A firm service customer (either network or point-to-point) has the option to not take FTRs with its transmission service. The customer may also elect to take FTRs only from certain points of delivery and receipt.

PJM FTR Auctions

PJM currently conducts monthly auctions of FTRs following the allocation of FTRs to network and point-to-point service customers for that month.

Any FTR that is simultaneously feasible in conjunction with outstanding FTRs is available for sale in the auction.

The FTR auction revenues, net of payments to FTR sellers, are allocated among the regional transmission owners in proportion to their respective transmission revenue requirements.

FTR Auctions

FTR Auctions

Auctions are used for allocating transmission rights in PJM, NY and California, and have also been proposed in IndeGO, Desert Star, Ontario and NEPOOL.

The auctions for point-to-point FTRs (including nodes, hubs and zones) implemented in PJM and NY have some advantages:

- **Market participants can bid for congestion hedges between two specific locations, for example, from a generator to a hub. This eliminates the need to enter the auction or secondary market to buy a portfolio of flow-based hedges to hedge a single transaction.**
- **The auctions provide a well-defined mechanism for ensuring that FTRs have not been oversold and that all simultaneously feasible FTRs are made available to market participants.**
- **The auctions allow market participants to “reconfigure” the FTRs to provide congestion hedges to support new trading patterns.**

Timing of Auctions

PJM and NY hold periodic FTR/TCC auctions for all transmission capacity that has not been pre-allocated.

- **PJM auctions FTRs monthly. PJM offers only short-term FTRs in the auction, but market participants can obtain long-term FTRs by purchasing long-term firm service.**
- **The NYISO sells TCCs in a semi-annual auction using a methodology that allows for sales of TCCs of different durations. In the most recent auction, TCCs with duration of 6 months and 2 years were available.**
- **The NYISO has also started monthly auctions so that market participants can “reconfigure” the outstanding set of TCCs for monthly periods of time.**

In both regions, market participants have expressed an interest in holding FTR auctions even more frequently.

Auction Bidding

- **Each bid to purchase or sell an FTR/TCC will identify receipt and delivery locations.**
 - *In New York, these locations may be zones as well as nodes.*
 - *In PJM, these locations may be hubs or nodes.*
 - *Bids can be between any combination of receipt and delivery locations.*
 - *Bids may be for counterflow.*
- **Each bid will state the maximum price in dollars per MW that the buyer is willing to pay for the FTR/TCC. It will pay no more than its bid, but may pay less.**
- **Market participants that own FTRs/TCCs may release them for sale through the auction.**
 - *In PJM, the seller may place a reservation bid on the sale.*
 - *In New York, the seller may reserve its TCC by bidding for it in the auction. This approach addressed market participant concerns about “withholding.”*

Determination of Winning Bidders

The highest valued set of FTRs (based on bids) that is simultaneously feasible (in combination with existing FTRs) is awarded.

The procedures to determine the winning bidders in the auction and the market-clearing price for each FTR are similar to the procedures used for security-constrained dispatch (SCD).

- **SCD software minimizes the sum of the costs of dispatching generators to balance load, subject to the constraint that the flows that result from the dispatch cannot violate any security criteria.**
- **In the FTR auction, the auction software *maximizes* the sum of the bids for the awarded FTRs, subject to the constraint that flows corresponding to the total set of outstanding FTRs must not violate any security criteria.**
 - ***FTRs are modeled as pairs of injections and withdrawals in the model.***

FTR Auctions and FTR Obligations

The FTRs in PJM and NY are directional “obligations,” which means that they entail a payment obligation if the congestion costs (POW-POI) are negative.

- **This “obligation” property of FTRs does not alter the risk-hedging quality of the FTRs, since the payment on an FTR from A to B will still offset the congestion clearing cost between these locations.**
- **It does, however, have implications for the FTR auction:**
 - *Potentially enables the RTO to make a larger set of FTR risk hedges available on networked systems.*
 - *Seamlessly accommodates trading of counterflow FTRs.*

TCRs are also directional. However, the IndeGO report states that they are options, which means that they would not entail a payment obligation if the congestion clearing cost for the path were negative.

Reconfiguration Through the FTR Auction

Auctions provide a mechanism for the efficient reconfiguration of the FTRs purchased and sold in the auction.

- **When many different, but mutually exclusive, sets of rights could be sold for the transmission system, the auction will allocate the feasible set that market participants value the most (i.e., bids the most for).**
- **The FTRs acquired in an auction may be different from those sold into the auction.**
- **The FTRs acquired in an auction may even differ from any of the outstanding FTRs.**
- **The FTRs available in an auction are not limited by pre-judgements concerning the quantity of FTRs available over different flow-gates.**
- **Based on the bids, the total transmission capacity available in the auction is “reconfigured” into a new set of FTRs, that is valued most highly by the bidders.**

FTR Auction Market Prices and Settlements

The market clearing prices in the FTR auction are determined by the marginal bids for purchasing FTRs that are accepted in the auction.

- **The marginal bids determine the market clearing prices for *all* FTRs, even those with different POIs and POWs.**
- **Intuitively, this occurs because all of the FTRs can be related by their distribution factors relative to the binding constraints in the auction load flow.**

Each FTR buyer in the auction will pay the market-clearing price for the FTRs it purchases; each FTR seller will receive the market-clearing price for the FTRs it sells. Any remaining residual auction revenue will be allocated to the transmission owners, to be credited against their transmission revenue requirement.

Advantages of FTR Auctions

FTR auctions have many of the same advantages as the IndeGO proposal to auction TCRs:

- **They provide all market participants with access to congestion hedges.**
- **They provide a mechanism for valuing future congestion clearing costs.**
- **They provide an efficient mechanism for allocating and reallocating congestion hedges.**

Advantages of FTR Auctions

However, there are some additional advantages to auctions that have been designed for point-to-point FTRs.

- **Market participants can bid for congestion hedges between any two specific locations, including zones and hubs, eliminating the complexity of buying a portfolio of flow-based hedges to hedge a single transaction.**
- **The SCD methodology for the auctions automatically ensures that FTRs have not been oversold, while also ensuring that all feasible FTRs are made available to market participants.**
- **The auction design allows the reconfiguration of existing FTRs to provide valuable congestion hedges to support new trading patterns.**
- **Because the FTRs are obligations, the FTR auction seamlessly accommodates buying and selling of counterflow FTRs. This is equivalent to buying and selling redispatch services on an unbundled forward-market basis.**

Trading FTRs

Trading FTRs

In comparison with TCRs, FTRs have the potential to simplify trading in the electricity markets created by the NW RTO:

- **Single FTR needed to hedge a bilateral transaction.**
- **Simplified trading based on zonal FTRs.**
- **Simplified trading based on FTRs to and from hubs.**

Hedging Congestion Costs with FTRs

In order to hedge the congestion cost for a bilateral transaction with an FTR, a market participant needs only a single point-to-point FTR.

- **The congestion charge for a 1 MW transaction from location A to location B is completely hedged by a 1 MW FTR from location A to location B.**
- **This FTR could be purchased in the FTR auction or in the secondary market.**
- **The hedge that is required will not change as a result of the actual flows on the transmission system.**

In contrast, a market participant must succeed in buying a specific and possibly large set of TCRs in the auction or secondary market to provide a flow-based hedge for a single bilateral transaction.

- **This set of TCRs would need to be adjusted as the distribution matrix is updated.**

Hedging Congestion Costs with FTRs

However, FTRs need not be traded “as is” to provide congestion hedges. They can be modified in the secondary market to provide congestion hedges between other combinations of locations:

- **They can be broken into pieces.**
 - *An FTR from G to L can be broken down into an FTR from G to another location, and an FTR from that other location to L.*
 - *These FTRs could then be sold separately, to hedge separate transactions.*
- **Or they can be pieced together.**
 - *An FTR from G to another location, plus an FTR from another location to L, can be combined to form an FTR from G to L.*
 - *This mechanism permits FTRs that were originally intended to hedge one set of transactions to hedge another set instead.*
- **They may be grouped into congestion risk-hedging portfolios.**

FTRs and Trading

The concern about FTRs has been that there may not be large markets for FTRs between specific points of injection and points of withdrawal. This has led to the conclusion that liquidity could be enhanced by trading congestion hedges across a relatively small number of flowgates.

PJM and NY have adopted an alternative approach of developing zones and hubs (in PJM) to enhance and simplify the trading of FTRs and energy.

- **Market participants have stated that the PJM Western Hub is one of the most liquid electricity trading markets anywhere.**
- **Marketers have estimated that only about 5-10% of their trades “go physical” in PJM.**

FTRs Between Zones

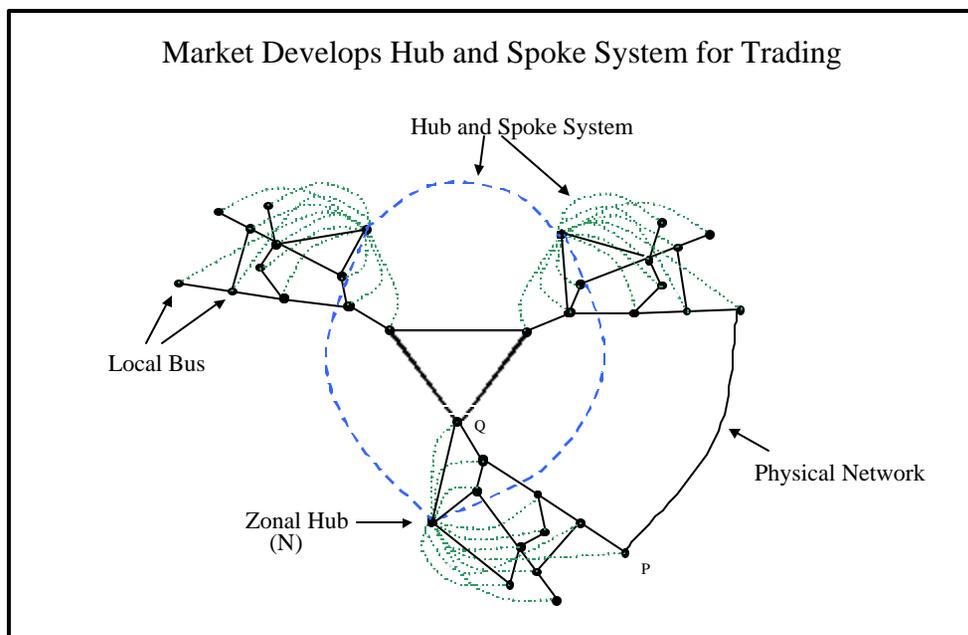
In New York, TCCs may be bought and sold between pre-defined “zones,” which are separated by interfaces, rather than between specific nodes.

- **TCC bids in the auction may be to go to and from zones, i.e., for specific paths.**
- **The NY ISO calculates “Zonal LBMPs,” which are a weighted-average of the underlying nodal prices.**
- **When the POI or POW for a TCC is a zone, the congestion charge is calculated using the zonal price for this location.**

Market Hubs Simplify Trading

Another alternative is to turn a locational pricing system into a hub-and-spoke system to simplify trading.

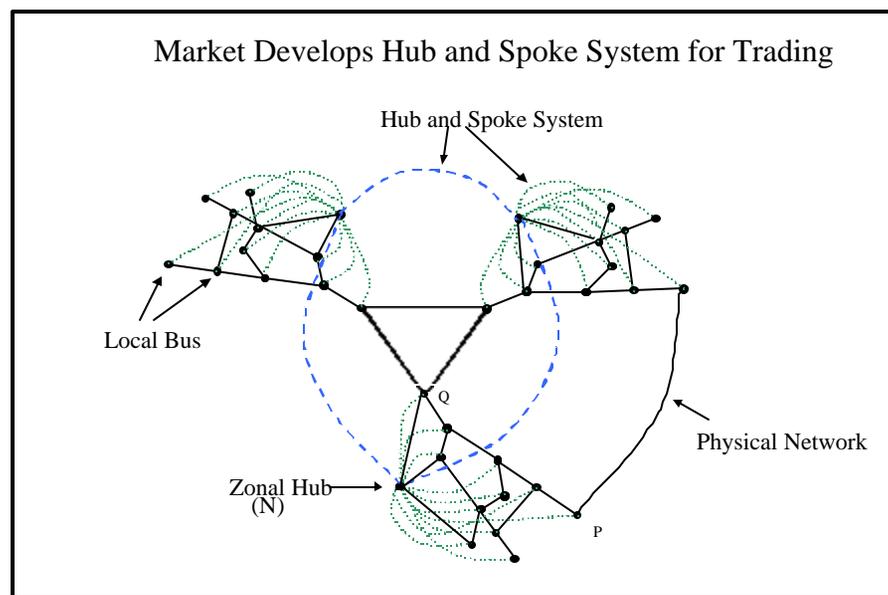
- **Hub prices could be the price at specific locations, or the weighted average of prices at many locations (PJM West).**
- **LMP differences define the cost of moving to and from the local hub, and also between hubs.**



FTRs and Market Hubs

FTRs can easily be redefined to provide hedges relative to any trading hub.

- **A financial right from location P to location Q is financially equivalent to two FTRs, one from location P to the hub and a second from the hub to location Q.**
- **The development of trading hubs has increased the size of the market for FTRs into the hub, out of the hub, and between hubs.**



Conclusion

Potential Advantages of FTRs, as implemented in PJM and NY:

- **Market participants can bid for congestion hedges between any two locations, including zones and hubs, eliminating the complexity of buying a set of flow-based hedges to hedge a single transaction.**
- **Simplified FTR trading may occur based on market hubs and zones.**
- **The auction methodology insures that FTRs are not oversold, while also ensuring that all feasible FTRs are made available to market participants.**
- **The auction design allows the reconfiguration of existing FTRs to support new trading patterns, as well as the buying and selling of counterflow FTRs.**
- **The creation of FTRs between zones might allow trading of a type of flow-gate rights among market participants.**

Potential Disadvantage:

- **The FTRs designed and auctioned in these regions have been obligations.**