Primer On
Financial Transmission Rights

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Mike Proctor
Missouri PSC
**Primer**: A book (or in this case, power point) that covers the basic elements of a subject.

**Warning**: You will not become an expert on MISO’s FTR Regime based on this primer. There are too many details and nuances to cover in a primer.

**Key Concepts**: Throughout this power point are slides marked KEY CONCEPT 1 through 7. These are the fundamental principles to keep in mind for FTRs. The rest is really just an exposition of those concepts.
KEY CONCEPT 1: FTRs

FTRs = Financial Transmission Rights

**Denomination:** MWs from a specified source to a specified sink; $FTR_{AB}(MW)$, where A is the source and B is the sink

**Rights:** to receive or pay the congestion price times the MWs from the specified source to the specified sink.

**Financial:** in contrast to physical, financial means the payment does not depend on energy being scheduled from the source to the sink.
KEY CONCEPT 2: Congestion Price

LMP (locational marginal price) at any CPN (commercial pricing node) has three components:

- Energy (does not vary with location)
- Losses (calculated to a reference bus)
- Congestion (calculated to a reference bus)

LMP difference between two CPNs is the sum of the per MW marginal cost of losses and congestion between those two locations.

In a hypothetical system with no losses, the LMP difference between two CPNs is the marginal cost of congestion between the two locations.

Congestion price is the difference in the marginal congestion price component between any two CPNs.
Simplified Calculation

Assumptions:

- No losses
- \( \text{LMP}_A = $15 \) and \( \text{LMP}_B = $20 \)

If you hold \( \text{FTR}_{AB}(100 \text{ MW}) \), how much would you receive/pay the RTO?

\[
\text{Congestion Price}_{AB} = \text{LMP}_B - \text{LMP}_A = $20/\text{MW} - $15/\text{MW} = $5/\text{MW}
\]

You Receive = \( 100 \text{ MW} \times $5/\text{MW} = $500 \)

If you hold \( \text{FTR}_{BA}(100 \text{ MW}) \), how much would you receive/pay the RTO?

\[
\text{Congestion Price}_{BA} = \text{LMP}_A - \text{LMP}_B = $15/\text{MW} - $20/\text{MW} = -$5/\text{MW}
\]

You Pay = \( 100 \text{ MW} \times -$5/\text{MW} = -$500 \)
What Determines Whether the Congestion Price is + or -?

Answer: The direction of the congestion which corresponds to the direction of the power flow on the congested transmission element.

Simple Example:
A 500 MW load at B is being served 400 MW from a generator at A and 100 MW from a generator at C.

The generator at A produces 400 MW at an LMP of $15, but would produce an additional 100 MW at an LMP of $18.
The generator at C produces 100 MW at an LMP of $20, but would produce 0 MW at an LMP of $18.
There is congestion between A and B, otherwise the LMP at A, B and C would be $18 and 500 MW would flow from A to B.

If you held an FTR from A to B, you would receive the LMP difference of $5 times the amount of the FTR.
If you held an FTR from B to A, you would pay the LMP difference of -$5 times the amount of the FTR.
KEY CONCEPT 3: Shadow Prices

**Shadow Price** is the incremental savings in cost in the market from adding 1 MW of transfer capability to a constrained transmission path.

If an additional MW can flow across the constrained transmission path, then the decrease in cost in the market is the savings that would occur from getting an additional MW from the lower LMP node located upstream of the constrained transmission path to replace a MW from the higher LMP node located downstream.

**Shadow Price** = Marginal Cost of Losses plus Marginal Cost of Congestion across the constrained transmission path in the direction of the power flow.

Absent marginal losses, the shadow price for a constrained transmission path is the congestion price across that path.
KEY CONCEPT 4: Congestion Rents

With locational pricing, generators are paid the LMP at their locations and loads pay the LMP at their locations.

With any congestion between generators and loads, the amount generators are paid will be less than the amount loads pay.

THE NOT-FOR-PROFIT RTO CANNOT KEEP THE DIFFERENCE!

The difference called CONGESTION RENTS must be distributed back to market participants.
Physical Hedging (SPP)

Physical Hedge: LSEs that want to hedge their generation costs enter into agreements, either to own or purchase physical power from GENCOs. The LSE purchases firm transmission from the RTO to deliver the energy from the GENCOs location to its LOAD and in return receives a Congestion Hedge from the GENCO to its LOAD. This hedge works in the following ways:

- The LSE is paid the LMP at the location of the GENCO (say $1,000).
- The LSE pay the LMP at the location of its LOAD (say $1,200).
- The LSE receives Congestion revenues from the GENCO to the LOAD to make up for the difference in the LMPs at the two locations (i.e., $200).

The net is zero: receives $1,000 + $200; pays $1,200.

The actual costs to the LSE are the costs of the GENCO agreement and the firm transmission service rather than the costs paid in the RTO market for LOAD.

The LSE is not paid the congestion hedge unless energy flows.
Financial Hedging (MISO)

Financial Hedge: LSEs that want to hedge their generation costs enter into forward contracts for power from an RTO Hub. The LSE purchases an FTR from the RTO Hub to its LOAD. This hedge works in the following ways:

- At the delivery date the LSE sells the contract at the LMP at the RTO Hub (say $1,000)
- The LSE pays the LMP at the location of its LOAD (say $1,200)
- The LSE receives FTR revenues from the RTO Hub to the LOAD to make up for the BASIS difference in the LMPs at the two locations. (i.e., $200)

  The net is zero: Receives $1,000 + $200; pays $1,200.

The actual costs to the LSE are the fixed costs of forward contract and the FTR rather than the costs paid in the RTO market for LOAD. The LSE receives the FTR revenues whether or not any power flows.
KEY CONCEPT 5: Separation of Financial from Physical

Financial hedging is a supporting component for competitive electricity markets; either at the wholesale or at the retail level.

Physical hedging is a supporting component for regulated utilities.

MISO adopted an FTR model to accommodate competitive electricity markets at both the wholesale and retail levels.

KEY CONCEPT is the separation of the FTR payment from actual physical delivery of power from the source to the sink. This is what allows financial hedging.
FTR REGIME: How MISO Market Participants Acquire FTRs

MISO Market Participants purchase FTRs in auctions that are facilitated by MISO (annual auction and monthly auctions).

Annual Auction: FTRs are auctioned separately for on-peak and off-peak periods in each of four seasons (Dec-Feb; Mar-May; Jun-Aug; Sep-Nov).

Monthly Auctions: Sale of unsold FTR capability and to facilitate trading between Market Participants.

Some Market Participants are allocated Auction Revenue Rights (ARRs) prior to the operation of these auctions.

ARRs are the rights to either acquire an equivalent (MW from A to B) FTR or receive the auction revenues from the sale of that FTR to another party.

MISO allocates ARRs to Transmission Customers based on the firm transmission rights held prior to the operation of the MISO Day 2 markets.

ARRs eligible for allocation are for sources and sinks that correspond to those physical transmission rights.

Limited to the capacity of each generation source and in total to the peak load of a network transmission customer, or to the contract demand of a point-to-point firm transmission customer. (See Module C, Section 43 for details)
FTR Regime Limitations

**FTRs are scarce:** In order to have FTRs funded, the MWs granted cannot exceed the physical flows on the MISO transmission system.

**FTRs may not be fully funded:** If the FTRs granted do exceed the physical flows on the MISO transmission system, then there will not be sufficient dollars collected by MISO to pay all of the FTR holders an amount equal to the congestion price times their denominated MWs.

In the allocation of ARRs and in the FTR auctions, MISO must *estimate* the quantities of FTRs available, and all ARRs allocated and FTRs sold must meet a *simultaneously feasible test (SFT).*

In order to estimate FTRs available a power flow model is used that must account for two difficult to estimate elements:

- Loop flows – The flow of power onto the MISO transmission system from neighboring transmission systems; and
- Transmission outages – both scheduled and forced outages.

This has been the primary focus of the MISO FTR work group.
Take a 5 Minute Break

The remaining material goes beyond primer level and is fairly detailed.
Those paying for long-term (1 year or greater) firm transmission service are allocated ARRs because they are paying the embedded cost of the transmission system and are therefore entitled to hedge their physical or financial transactions at no additional cost.
MISO Implementation: ARR Allocations

Basic ARR allocation scheme – based on sources held prior to implementation of MISO Day 2 Market:

Stage 1A: Nominate up to 50% of peak demand (Candidate Baseload ARR Rights).
Restoration of non-feasible Nominated Stage 1A Candidate ARRs.

Stage 1B: Nominate up to 100% of peak demand (Candidate Peak ARR Rights).

Stage 2: The residual amount of ARRs available but not allocated in stages 1A and 1B.
Stage 1A Source Qualifications

Sources eligible in Stage 1A are from the Baseload Resource Source Set (BRSS) consisting of generating resources or PODs (for point-to-point service) with a capacity factor or scheduling factor of 50% or greater in 36 months prior to the MISO Day 2 markets.

ARRs allocated in Stage 1A are called Long Term Transmission Rights (LTTRs).

After the first year of ARR allocations, a market participant is guaranteed the MW quantity for a Stage 1A ARR for up to the prior year’s allocation (LTTRs) from the same source.

The cost of any infeasible Stage 1A ARRs allocated in subsequent allocations will be funded by all LTTR Holders in proportion to their share of MWs of LTTRs.
Restoration Stage

After Stage 1A and before Stage 1B, any ARRs nominated in Stage 1A that MISO determines to be infeasible and that have a capacity (scheduling) factor above 70% (for weekdays), it will attempt to restore through the use of counterflow ARRs.

Counterflow ARR is an eligible Stage 1A ARR that was not nominated but would provide counterflow necessary to enable an otherwise infeasible but eligible Stage 1A ARR to be restored in part or in total.

MISO uses a constrained optimization program in the restoration phase to determine the infeasible ARRs to be restored and the counterflow ARRs to be allocated.

Maximize the restored MWs
Minimize the counterflow MWs

Any counterflow ARRs allocated will only be assigned for a period of 10 years after allocated or until a resource is retired, whichever is shorter.
Stage 1B Source Qualifications

Peak Reserved Source Set consists of all sources in the BRSS plus any additional sources having long-term transmission service the year prior to the implementation of the MISO Day 2 markets.

Excludes any ARRs allocated in Stage 1A. Both stages 1A and 1B include eight independent nominations, one for each of four seasons for on-peak and off-peak time periods. In both stages, nominations are limited in order to meet the SFT.
Stage 2 Rights

Not all of the MWs available for allocation will be allocated in stages 1A and 1B.

Stage 2 MWs are the MW difference between the Stage 1 nomination cap (e.g., peak load or PTP rights) and the sum of ARRs allocated in Stage 1.

MISO informs the Market Participant of its Stage 2 allocation in MW and as a percentage of the total Stage 2 MWs.

Each market participant will then receive the corresponding percentage share of the dollar value of the system capability sold in the annual FTR Auction that was not otherwise disbursed to ARR Holders allocated in stage 1.
Replacing Resources

MISO tariff allows market participant to designate new or changed resources to be eligible as a source in ARR allocations to replace an existing resource.

General rules:

Remove the existing resource and any ARRs received from most recent ARR allocations

New base-load resources are eligible up to what is feasible from the most recent stage 1A ARR allocations.

New non-base-load resources are eligible up to what is feasible from the most recent stage 1 ARR allocations.
FTR Auction Issues

FTR Auctions are open to any “market participant,” including financial groups that may not be involved in hedging either a physical or financial power transaction. AC set up the FTR Ad Hoc Group to look into all issues related to the purchase of FTRs in the auction – are the FTR Auctions meeting their intended purpose? That report will be distributed at the March AC meeting.

Sub topics included in the report:

- What level of earnings (profits = difference between what is received and what is paid for FTRs) are those buying FTRs in the FTR Auctions receiving;
- Are the FTR Auctions considered to be mature markets; and
- Who are receiving these profits?
KEY CONCEPT 7: FTR Auction Purposes

Purposes of FTR Auctions
(from the FTR Ad Hoc Group White Paper)

Sell remaining transmission capacity not allocated during the ARR allocation process (see stage 2 on previous slide).
Provide FTR holders an opportunity to liquidate congestion hedge positions by either:
  - Converting FTRs to cash;
  - Reconfiguring congestion hedges to meet changing needs.
Provide LSEs, suppliers, marketers, traders or any other market participant a means to purchases congestion hedges to manage market risks.
Provide a source of revenues that help to fund the full congestion costs to FTR holders.
Profits from Buying and Holding FTRs

Revenues = payments from MISO to FTR Holders of FTRs purchased in the FTR Auctions.
Costs = payments to MISO for FTRs purchased in the FTR Auctions.
Profits = Revenues – Costs

The revenues received by MISO from the sale of FTRs goes back to FTR Holders from stage 2 revenue rights.

Any unsold FTRs results in fewer FTR payments by MISO which means a higher level of funding for other FTR Holders.
A Difficult Question

Some level of profit is needed in order to maintain the liquidity of the FTR Auctions.

If the congestion costs are lower than the price paid for the FTR, profits are negative and buyers will lower their offer prices.

At lower offer prices, MISO receives lower levels of revenues to distribute back and incurs the obligation to pay out the congestion rents.

What is a “normal” level of profits required to attract buyers to the FTR Auctions?
Another Difficult Question

What is the difference between hedging and speculating in the FTR market?

**Hedging has some physical context** (e.g.,)
- LSE is responsible for load
- Generator delivers electricity to the market
- Power Marketer facilitates physical transactions

**Speculation has no physical context**
- FTRs are purchases solely to earn the FTR revenues
- Note, FTRs can also be sold in bilateral contracts, but MISO is not informed or included in any such transactions.

**Bottom Line:**
- It is possible to distinguish between FTR market participants that are transmission customers, holding long-term firm transmission rights and those that are not.
- It is not possible to distinguish between FTR market participants that are involved in hedging as apposed to speculation.
Final Disclaimer

While I may believe everything in this primer is accurate, those using this should check out the accuracy at the source. For FTRs, the source is the MISO Tariff at Module C, Section 43.

It's not great reading, but it's fairly clear.