



FTR/ARR Funding and Education

FTRSTF

June 11, 2014

ARR/FTR Evolution

- Locational Marginal Pricing (LMP)
 - Consists of System, Congestion, and Loss Components
 - Congestion occurs when the least costly resources cannot be dispatched to meet demand due to physical limitations.
 - Congestion results in price uncertainty to purchase power to serve obligations
 - ARR/FTR Market
 - Developed in conjunction with LMP market in 1998 to provide hedging mechanism for Load Serving Entities for congestion
 - Auction based product allowed for non Load Serving Entities to participate and provide greater liquidity and price certainty
 - Long Term Transmission rights added in 2006

Planning Period	Revenue Adequacy
2007-08	100%
2008-09	100%
2009-10	97%
2010-11	85%
2011-12	81%
2012-13	66%
2013-14	72%

FTR Revenue Inadequacy Causes

- A. Infeasible ARR Stage 1A facilities
- B. Congestion along PJM borders
 - Increase in M2M flowgates
 - Inconsistent market flow calculation between real-time and M2M billing
 - External wind, outages, and topology differences
- C. Negative balancing congestion (Voltage Surrogates, Emergency Outages)
- D. Reduced Capability
 - Increase in transmission outages/RTEP upgrades
 - Increase in facility rating reductions (NERC derates)
 - Lower excess margin which could offset revenue inadequacy

Timeline

- January 2011: FTR Technical Conference was held describing ARR/FTR process, funding, modeling, PJM daily activities, and 2011/2012 Annual modeling
- March 2011: FTR Task Force Created
 - Resulted in several process improvements and small rule change related to zero cost bids
 - Member consensus for no major change
- April 2012: PJM published FTR Revenue Report and Options to Address FTR Underfunding
 - Described detailed revenue inadequacy causes, supporting data, and options that could address FTR underfunding
 - Monitoring Analytics produced separate report for options to address FTR underfunding
- October 2012-June 2013: FTR Task Force
 - Resulted in auction changes to allow modeling of normal limits to reduce infeasibilities on facilities over allocated in stage 1A or as a result of transmission outages.
 - Impact to be determined

ARR/FTR Long Term Transmission Rights (LTTR)

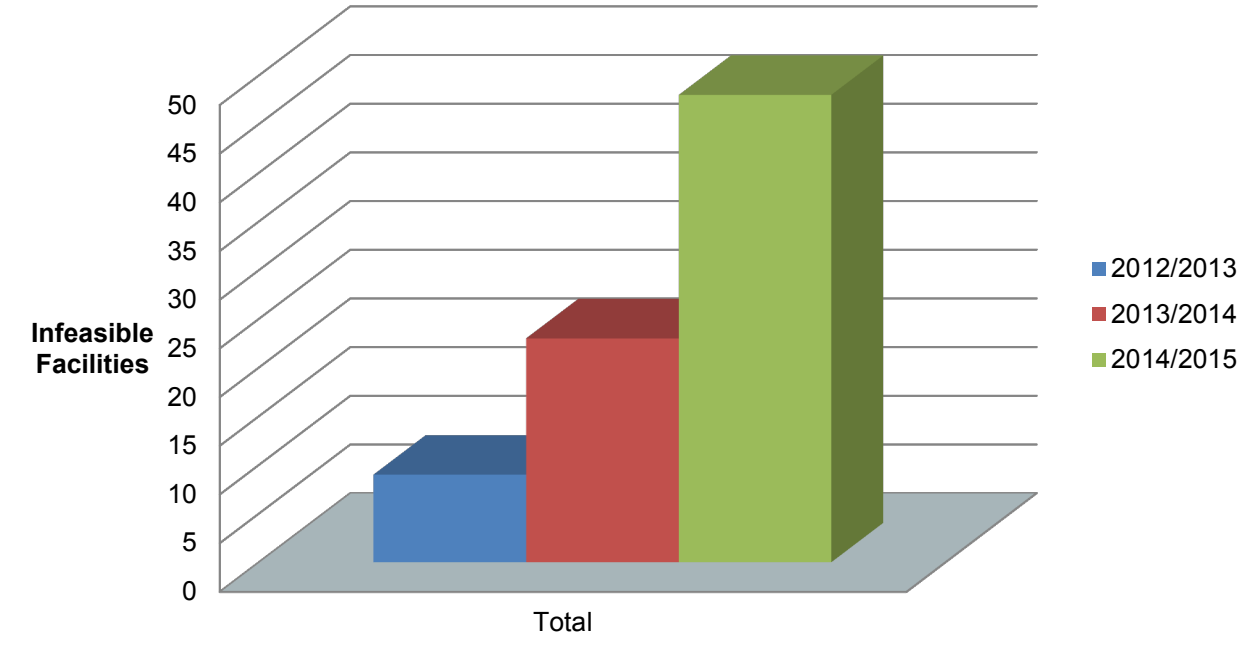
- 10 Year ARR rights
 - Provides a LTTR based on a priority Stage 1A ARR allocation for base load that ensures longer term certainty with flexibility to opt-out on an annual basis
 - Creates a link between the PJM planning process and the Stage 1A ARR allocation to ensure transmission system is upgraded to maintain Stage 1A ARRs for base load plus projected 10 year growth of base load
- Long Term FTR Auction
 - Provides a process to purchase Long-Term FTRs on an annual basis that covers one or three planning years.

- Annual Allocation Stage 1A allows ARR requests from historical generation resources to zone
- Total ARR MWs capped at historical generation capability and zonal base load
 - Zonal Base Load equals minimum of daily peaks for 10/22-10/21 period (i.e. 10/22/2013-10/22/2014)
- Proration not allowed in Stage 1A
 - Transmission Limits must be increased to allow Stage 1A requests to clear (i.e. ignore SFT)
 - Translates into FTR Revenue Inadequacy because over subscribed system
 - Constraints infeasible may be upgraded through 10-year Stage 1A process
 - Grand Prairie Gateway Project approved by PJM board to address ComEd stage 1A infeasibilities

Stage 1A Allocation – Infeasible facilities

- Quantity of Infeasible facilities have increased over last several years
 - Increased Transmission Outages
 - Increased uncompensated power flow (i.e. Loop Flow)
 - Additional M2M Flowgates

PJM ARR Stage 1A Infeasible Facilities





Stage 1A Allocation – Inadequacy

Planning Period	Congestion dollars (\$millions)	Total FTR Revenue Inadequacy (\$ millions)	FTR Revenue Inadequacy %	FTR Revenue Inadequacy from Stage 1A Infeasible ARR's (\$ millions)	Stage 1A Infeasible ARR's % of FTR Revenue Inadequacy
2012/2013	\$622.6	\$288	68%	\$75	26%
2013/2014 (June thru March)	\$1,698	\$575	75%	\$164	29%

FTR revenue shortfall from Stage 1A infeasible facilities continues to increase

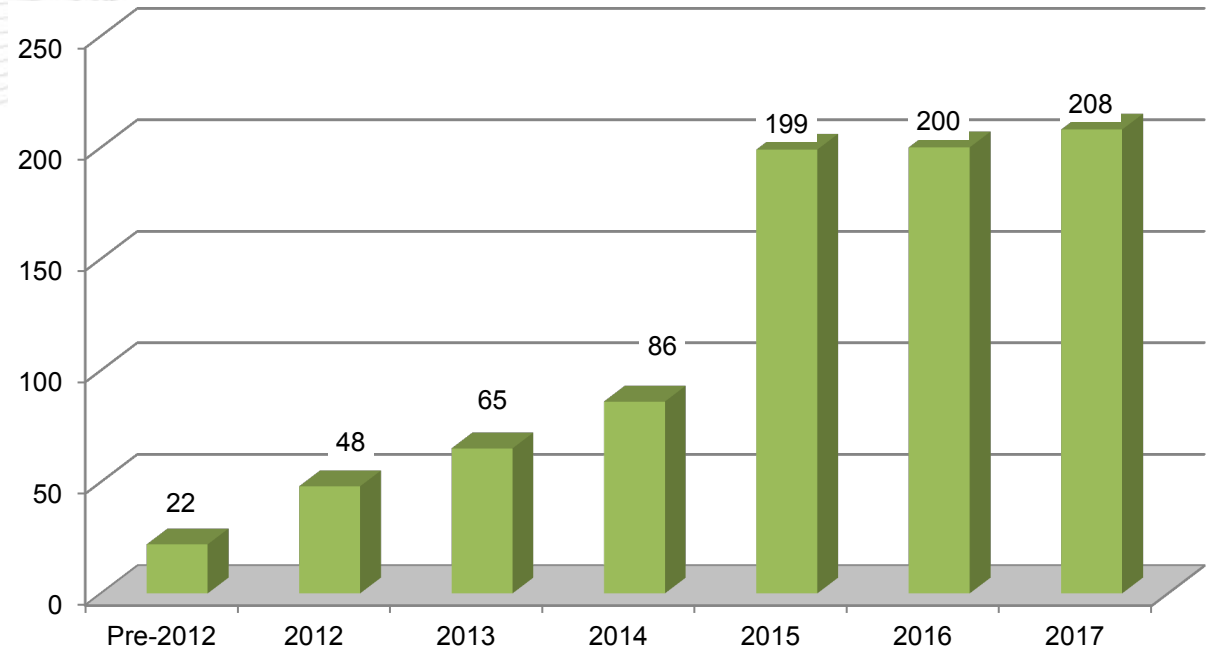
- Inadequacy of Stage 1A ARR's calculated as follows:
 - Value the MWs of infeasible Stage 1A ARR's utilizing the day-ahead congestion prices (MW * (DA Sink LMP – DA Source LMP)*hours in period)
 - Day-ahead congestion LMPs used because the MWs of infeasible ARR's translates into additional FTR MW capability available in FTR auctions as either Self Scheduled FTR's or purchased FTR's.
 - PJM can “buy back” capability on infeasible facilities by utilizing excessive auction revenue but this is difficult and only moves the risk of inadequacy into the FTR auctions as reduced revenues.

Stage 1 Allocation – Historical Resources

Generation Retirements

- Requires remapping historical resources to an equivalent generator or creating a dummy generator for ARR/pricing purposes only
 - Idea was to preserve the historical transmission system rights
 - May create additional Stage 1A infeasibilities
- Substantial amount of retirements not expected when Stage 1A process originally designed.

Historical Generation Retirements



15.4% of Stage 1 historical generation has retired or submitted deactivation notices representing 25,543.7 MWs

Stage 1A infeasibility impact

Oak grove-Galesburg

7/12/2012

FTR Market

External world flow	141
Rating	215
Allowed Market Flow	74
Stage 1A ARR MW Market Flow	158
Stage 1A over allocated amount	84
FTR Market Flow	158

Day-Ahead Market

Day-ahead external world flow	175
Day-ahead Rating	215
Day-ahead Market Flow	40
Day-ahead Revenue Inadequacy	-\$152,959

Real-Time Market

Real-time external world flow	180
Real-time rating	215
Real-time Market Flow	35
Balancing Revenue	-\$4,175



Stage 1A ARRs could not be prorated which resulted in FTR market flow > Day-ahead Market flow and negative day-ahead revenue adequacy

Day-ahead and Real-Time market flows close and results in only small amount of negative balancing congestion

Long Term Transmission Rights

FERC Compliance Requirements

Code of Federal Regulations:

PART 42 – LONG-TERM FIRM TRANSMISSION RIGHTS IN ORGANIZED ELECTRICITY MARKETS

Guidelines for Design and Administration of Long-term Firm Transmission Rights.

1. The long-term firm transmission right should specify a source (injection node or nodes) and sink (withdrawal node or nodes), and a quantity (MW).
2. The long-term firm transmission right must provide a hedge against day-ahead locational marginal pricing congestion charges or other direct assignment of congestion costs for the period covered and quantity specified. Once allocated, the financial coverage provided by a financial long-term right should not be modified during its term (the “full funding” requirement) except in the case of extraordinary circumstances or through voluntary agreement of both the holder of the right and the transmission organization.

FERC Guidelines for Design and Administration of Long-term Firm Transmission Rights (cont).

3. Long-term firm transmission rights made feasible by transmission upgrades or expansions must be available upon request to any party that pays for such upgrades or expansions in accordance with the transmission organization's prevailing cost allocation methods for upgrades or expansions.
4. Long-term firm transmission rights must be made available with term lengths (and/or rights to renewal) that are sufficient to meet the needs of load serving entities to hedge long-term power supply arrangements made or planned to satisfy a service obligation. The length of term of renewals may be different from the original term. **Transmission organizations may propose rules specifying the length of terms and use of renewal rights to provide long-term coverage, but must be able to offer firm coverage for at least a 10 year period.**

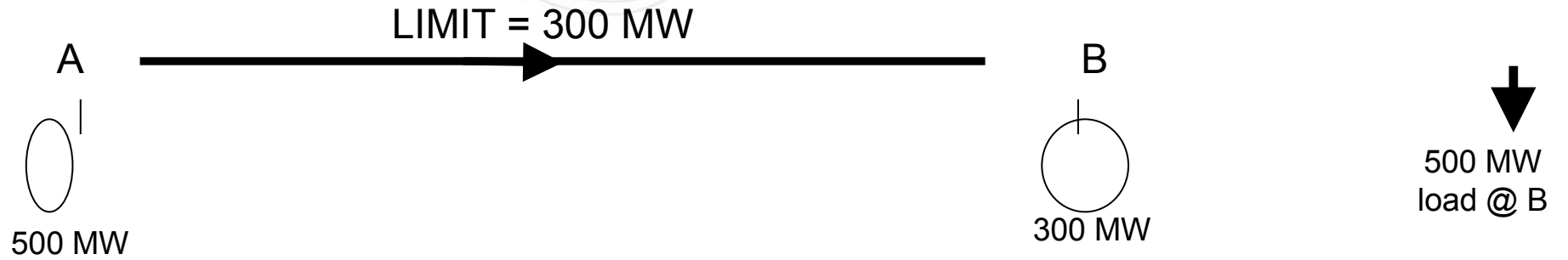
FERC Guidelines for Design and Administration of Long-term Firm Transmission Rights (cont).

5. Load serving entities must have priority over non-load serving entities in the allocation of long-term firm transmission rights that are supported by existing capacity. **The transmission organization may propose reasonable limits on the amount of existing capacity used to support long-term firm transmission rights.**
 - FERC added this guideline in recognition of the expected reluctance of transmission organizations to commit all of their existing grid capacity to long-term firm transmission rights due to uncertainty regarding load growth, changes in power flows and the full funding requirement. This will also help to accommodate load serving entities that prefer short-term rights. In addition, commentators claim that the principal need for long-term firm transmission rights is to support long-term power supply arrangements for base load generation, not peaking or intermediate generation.
6. A long-term transmission right held by a load serving entity to support a service obligation should be re-assignable to another entity that acquires that service obligation.
7. The initial allocation of the long-term firm transmission rights shall not require recipients to participate in an auction.

Possible Stage 1 changes

1. Allow proration in Stage 1A
 - Improves FTR funding by removing infeasibilities
 - Improves confidence in FTR values
 - Minimal impact on ARR revenues
 - More constrained ARR/FTR facilities usually increases ARR credits (i.e. 2014/2015 ARR credits higher although less ARRs cleared)
 - Revenue Adequacy should improve and provide confidence to FTR bidders to not devalue bids
 - Stage 1A 10-Year process still exists
2. Remove Stage 1 historical resources when they physically retire
 - Units do not exist so transmission system rights from generator not necessary
 - Should reduce stage 1A infeasibilities
 - Creates correct model

Example: Balancing Congestion



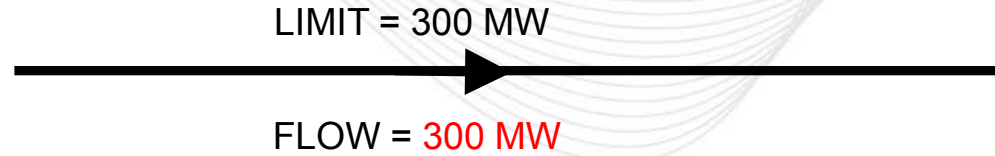
- FTR awarded for 300 MW from A to B



Example – Revenue Adequate (DAY AHEAD)

LMP @ A = \$50

LMP @ B = \$80



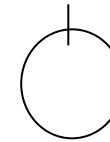
500 MW

300 MW



500 MW @ \$50

200 MW



300 MW @ \$80

DAY AHEAD	A	B	TOTAL
Gen MW	300 MW	200 MW	500 MW
Gross Gen Rev	\$15,000	\$16,000	\$31,000
Load MW	0 MW	500 MW	500 MW
Load Payment	\$0	\$40,000	\$40,000
Congestion Charge	--	--	\$9,000
FTR ALLOCATION			\$9,000 300MW * (\$80 - \$50)



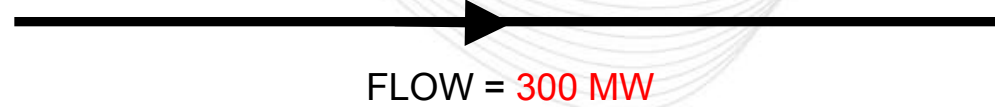
Example – Revenue Adequate (REAL TIME)

LMP @ A = \$50

LIMIT = 300 MW

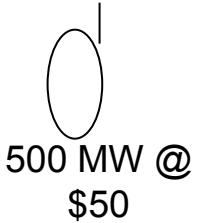
LMP @ B = \$80

Load B higher
In Real Time



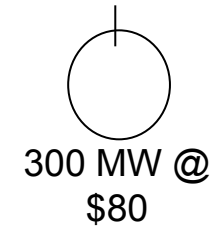
550 MW

300 MW



GEN B higher
In Real Time

250 MW



BALANCING	A	B	TOTAL
Gen MW DELTA	0 MW	50 MW	50 MW
Gross Gen Rev	\$0	\$4,000	\$4,000
Load MW DELTA	0 MW	50 MW	50 MW
Load Payment	\$0	\$4,000	\$4,000
Congestion Charge	--	--	\$0

Example – Revenue Adequate (SETTLEMENT)

REVENUE ADEQUACY =
(DAY AHEAD + BALANCING CONGESTION) – FTR ALLOCATIONS

DAY AHEAD CONGESTION = \$9,000

BALANCING CONGESTION = \$0

FTR ALLOCATIONS = \$9,000

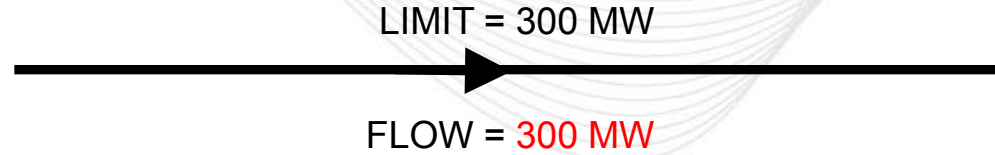
$(\$9,000 + \$0) - \$9,000 = 0 =$ **REVENUE ADEQUATE**



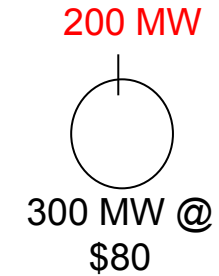
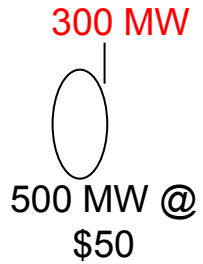
Example – Revenue Inadequate (DAY AHEAD)

LMP @ A = \$50

LMP @ B = \$80



500 MW



DAY AHEAD	A	B	TOTAL
Gen MW	300 MW	200 MW	500 MW
Gross Gen Rev	\$15,000	\$16,000	\$31,000
Load MW	0 MW	500 MW	500 MW
Load Payment	\$0	\$40,000	\$40,000
Congestion Charge	--	--	\$9,000
FTR ALLOCATION			\$9,000 300MW * (\$80 - \$50)

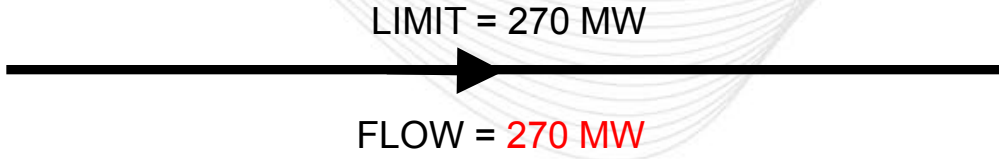


Example – Revenue Inadequate (REAL TIME)

90% of Line Rating used in Real Time for voltage surrogate

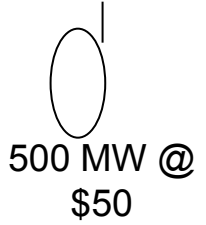
LMP @ A = \$50

LMP @ B = \$80



500 MW

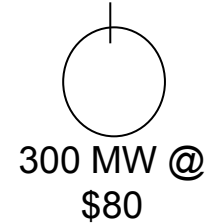
270 MW



GEN A lower due to rating

GEN B higher due to rating

230 MW



BALANCING	A	B	TOTAL
Gen MW DELTA	-30 MW	30 MW	0 MW
Gross Gen Rev	-\$1,500	\$2,400	\$900
Load MW DELTA	0 MW	0 MW	0 MW
Load Payment	\$0	\$0	\$0
Congestion Charge	--	--	-\$900

Example – Revenue Inadequate (SETTLEMENT)

$$\text{REVENUE ADEQUACY} = (\text{DAY AHEAD} + \text{BALANCING CONGESTION}) - \text{FTR ALLOCATIONS}$$

$$\text{DAY AHEAD CONGESTION} = \$9,000$$

$$\text{BALANCING CONGESTION} = -\$900$$

$$\text{FTR ALLOCATIONS} = \$9,000$$

$$(\$9,000 - \$900) - \$9,000 = -\$900 = \text{REVENUE INADEQUATE}$$