



PJM ARR FTR Markets Overview

PJM Market Simulation Department

April 1, 2025



Auction Revenue Rights Overview



Financial Transmission Rights Overview



Additional Topics

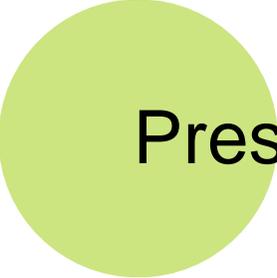
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Auction Revenue Right

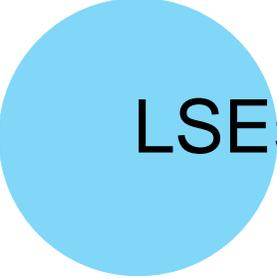
Entitlements to Firm Transmission Service Customers

ARR holders can

- Receive an allocation of the revenues from the annual FTR Auction
- Self-Schedule ARR in annual FTR auction to obtain FTR on same path
- Participate in any FTR auction

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Preservation of historical rights

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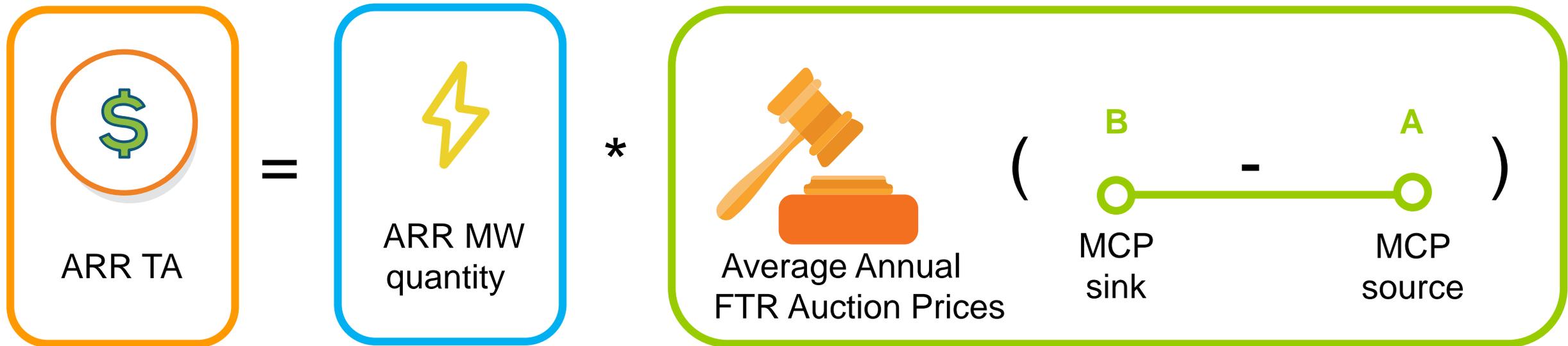
LSEs pay for added transmission capability/embedded costs

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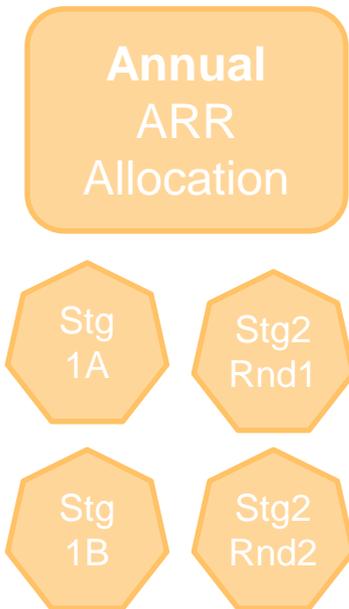
Alternative to FTRs for LSEs

ARR Target Allocation (ARR TA) =

ARR MW * (Average Annual FTR Auction MCP Sink – Average Annual FTR Auction MCP Source)



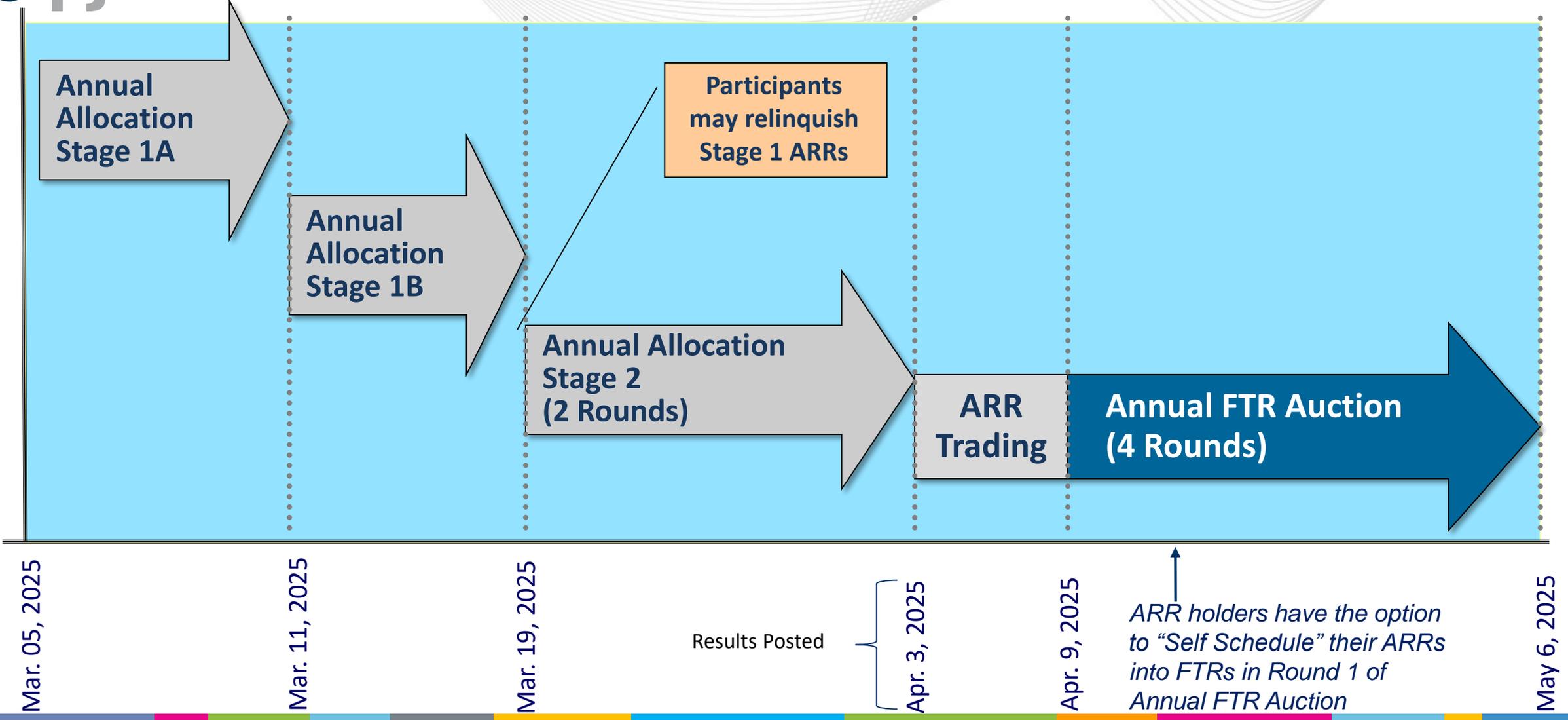
4 main events per year



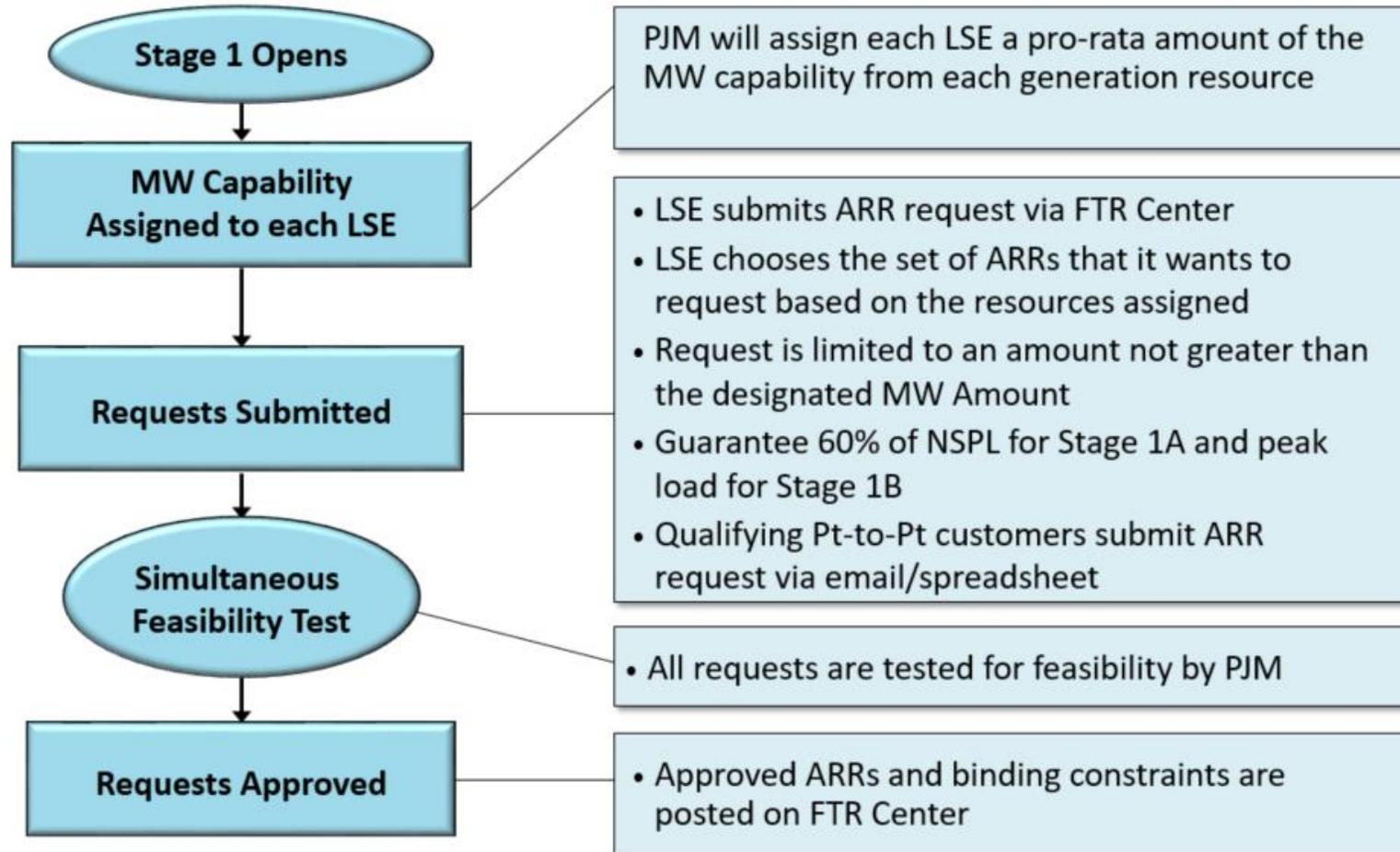
ARR Round	Source Pnode	Sink Pnode	Capability (MW)
Stage1A	Active historical resources or Qualified Replacement Resources	Aggregate Network Customer Load in the Transmission Zone or other designated Load Aggregation Zone	Guarantee 60% of Network Service Peak Load (NSPL)
Stage1B	Same as stage1A, plus Hub, Zone and Interface	Same as stage1A	Up to Network Service Peak Load (NSPL) (subject to proration)
Stage2 Round1	Any available generator, interface, hub, zone	Same as stage1A, and any available generator, interface, hub, zone	Up to Network Service Peak Load (NSPL) (subject to proration)
Stage2 Round2	Same as Round1	Same as round1	Up to Network Service Peak Load (NSPL) (subject to proration)



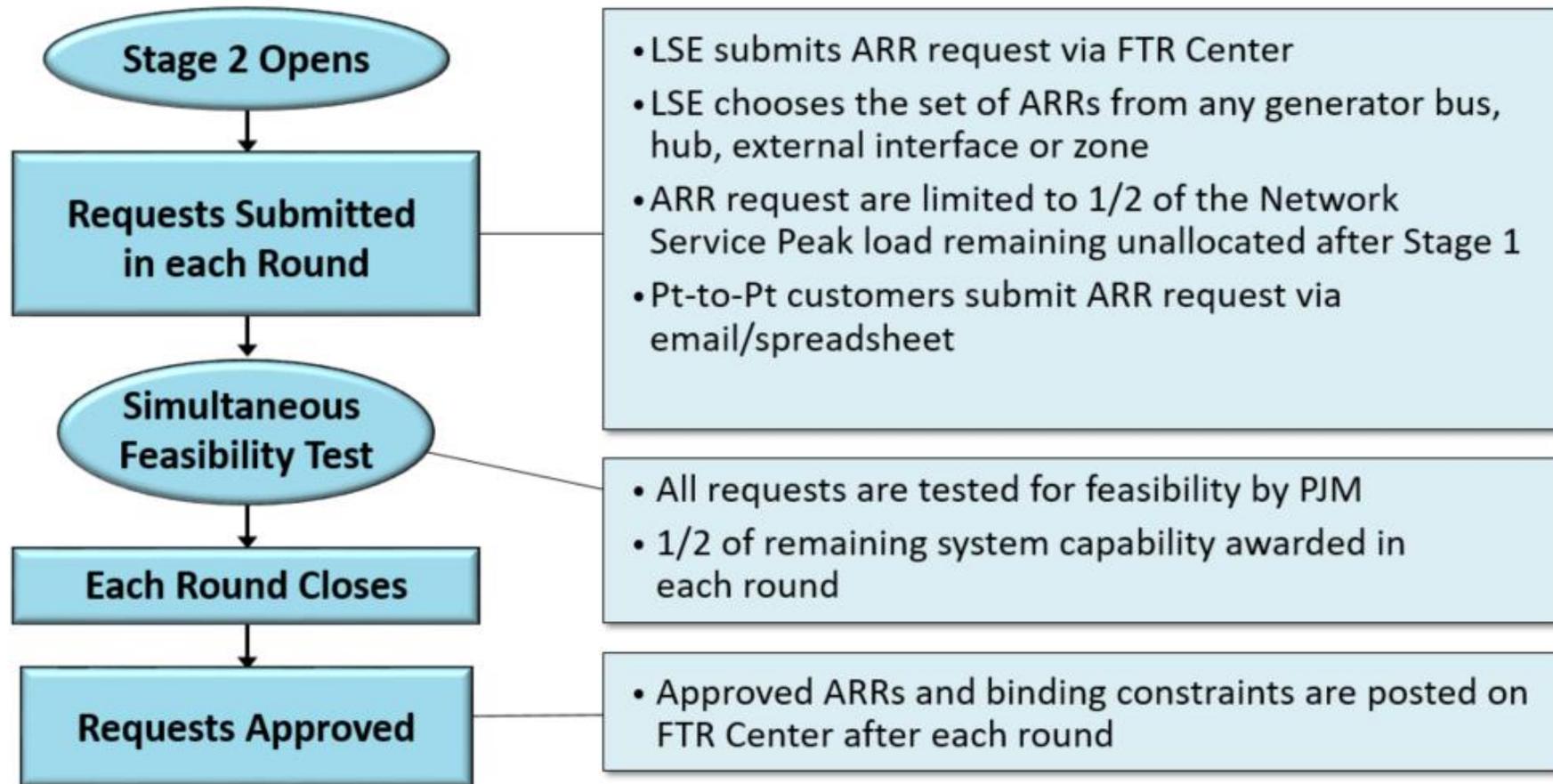
Annual ARR/FTR Market Timeline



Stage 1 - Annual Allocation Process



Stage 2 - Annual Allocation Process



Stage 2 is an iterative allocation process that consists of two sequential rounds, with 1/2 of the remaining system ARR capability allocated in each round

Test to ensure that all subscribed transmission entitlements are within the capability of the existing transmission system

Test to ensure the PJM Energy Market is revenue adequate under normal system conditions

NOT a system reliability test

NOT intended to model actual system conditions

Daily ARR Reassignment: as load MWs change after allocation

Residual ARRs: monthly product

Incremental ARR products

- RTEP IARR: initiated by PJM
- Interconnection IARR: initiated by members
- Attachment EE IARR: initiated by members

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FTR Overview

Financial Transmission Right

Financial instruments awarded to bidders

Entitles the holder to a stream of revenues (or charges) based on the hourly Day Ahead congestion price differences across the path

Protect load serving entities (LSEs) from congestion price uncertainty in DA

Mechanism for allocation of DA excess congestion charges

FTRs provide hedging mechanism that can be traded separately from transmission services

Means of congestion price discovery/ARR valuation in advance of DA

Any PJM Member meeting market entry and credit requirements, mostly:

Load Serving Entities (LSEs)

Hedge/protect against congestion price volatility in Day-ahead

Financial Participants

Price arbitrage and assumption of congestion risk for potential profit

Generators

Hedging

Source Pnode Name	Sink Pnode Name	Cleared MW	Cleared Price	Class Type	Hedge Type	Trade Type	Period Type	Start Day	End Day
Source 1	Sink 1	25.5	954.09	WkndOnPeak	Obligation	Buy	AUG	8/1/2023 4:00	8/31/2023 4:00
Source 2	Sink 2	200	1805.02	24H	Obligation	Buy	AUG	8/1/2023 4:00	8/31/2023 4:00
Source 3	Sink 3	18	1.94	WkndOnPeak	Option	Buy	MAR	3/1/2024 5:00	3/31/2024 4:00
Source 4	Sink 4	10.2	-18.67	OnPeak	Obligation	Sell	DEC	12/1/2023 5:00	12/31/2023 5:00
Source 5	Sink 5	1.4	1	DailyOffPeak	Option	Buy	AUG	8/1/2023 4:00	8/31/2023 4:00

-  Source
-  Sink
-  MW
-  Price
-  Hedge type
-  Class type
-  Trade type
-  Period type/Term

An **on-peak** FTR product is valid for hours ending 0800 to 2300 weekdays, except NERC holidays.

A daily **off-peak** FTR product is valid for hours ending 2400 to 0700 on all days, inclusive of weekends and holidays.

A **weekend/holiday on-peak** FTR product is valid for hours ending 0800 to 2300 on weekends and NERC holidays.

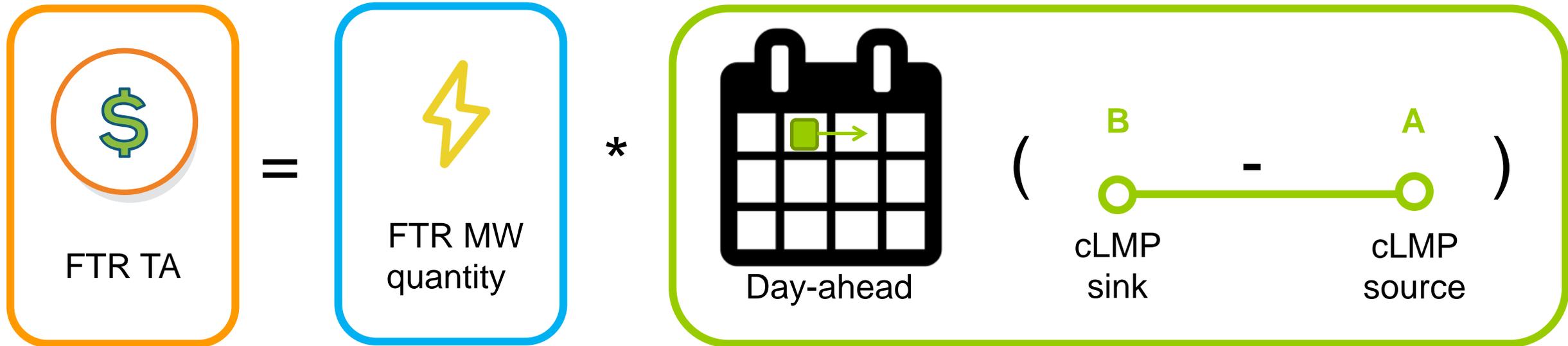
A **24-hour** FTR product is valid for hours ending 0100 to 2400 on all days.

FTR Cost =

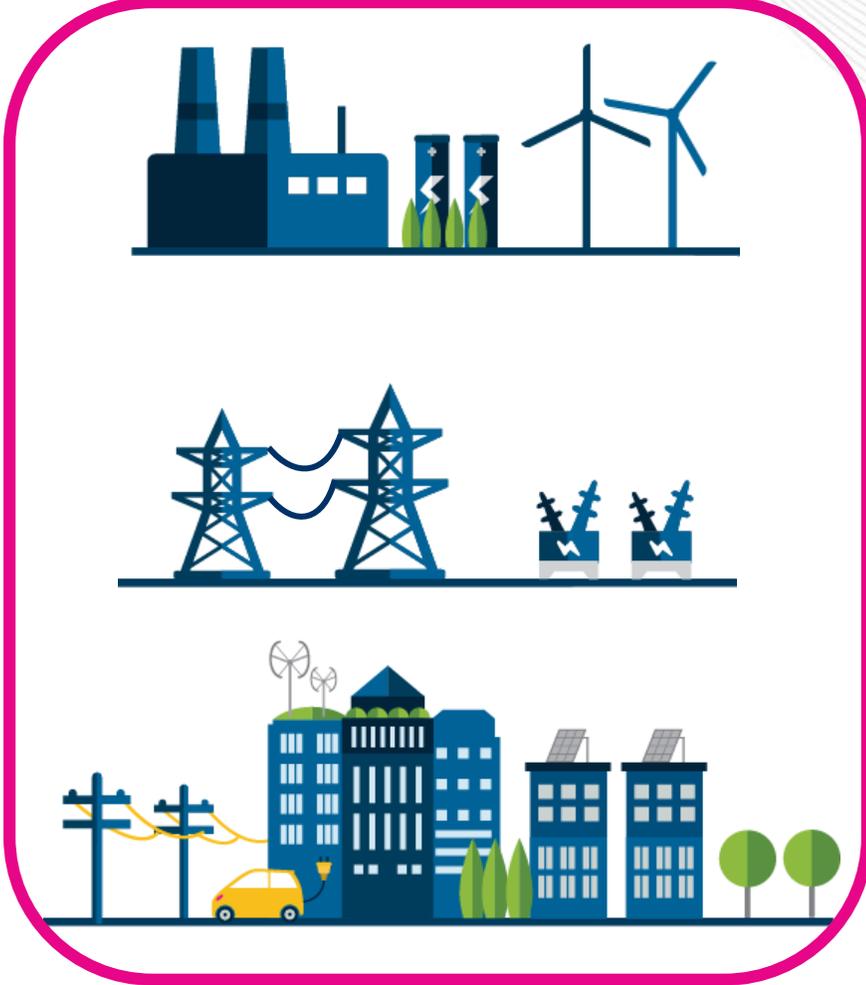
FTR MW * (FTR Auction Market Clearing Price (MCP) Sink – FTR Auction MCP Source)



$$\text{FTR Target Allocation (FTR TA)} = \text{FTR MW} * (\text{DA cLMP Sink} - \text{DA cLMP Source})$$

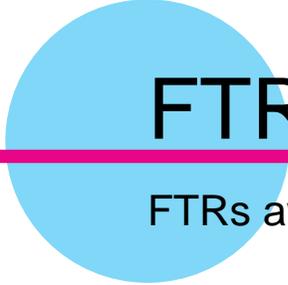


Entire PJM System Capability



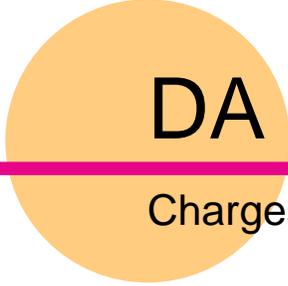
ARR Allocations

ARRs allocated (MWs)



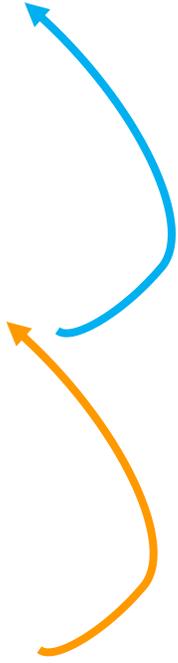
FTR Auctions

FTRs awarded to highest bidders (MWs&Price)



DA Hourly Congestion

Charges collected from DA Market Participants



FTRs can be acquired in two forms

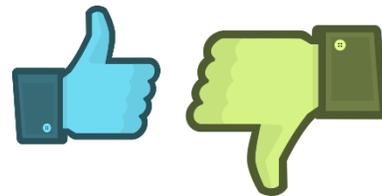
What are FTR Obligations Worth?

Benefit

- The hourly congestion value is positive
- FTR same direction as the congested flow

Liability

- The hourly congestion value is negative
- FTR opposite direction to the congested flow



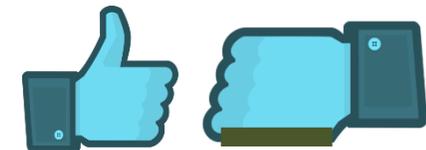
What are FTR Options Worth?

A Benefit

- The hourly congestion value is positive
- FTR same direction as the congested flow

Not a Liability

- The hourly congestion value is zero
- FTR opposite direction to the congested flow



FTR Option cannot have negative value

Annual Auction

- Multi-round
- Multi-period
- Multi-product
- Entire system capability minus approved Long-Term FTRs

Long-Term Auction

- Multi-round
- Purchase residual system capability, assuming self scheduling of ARRs

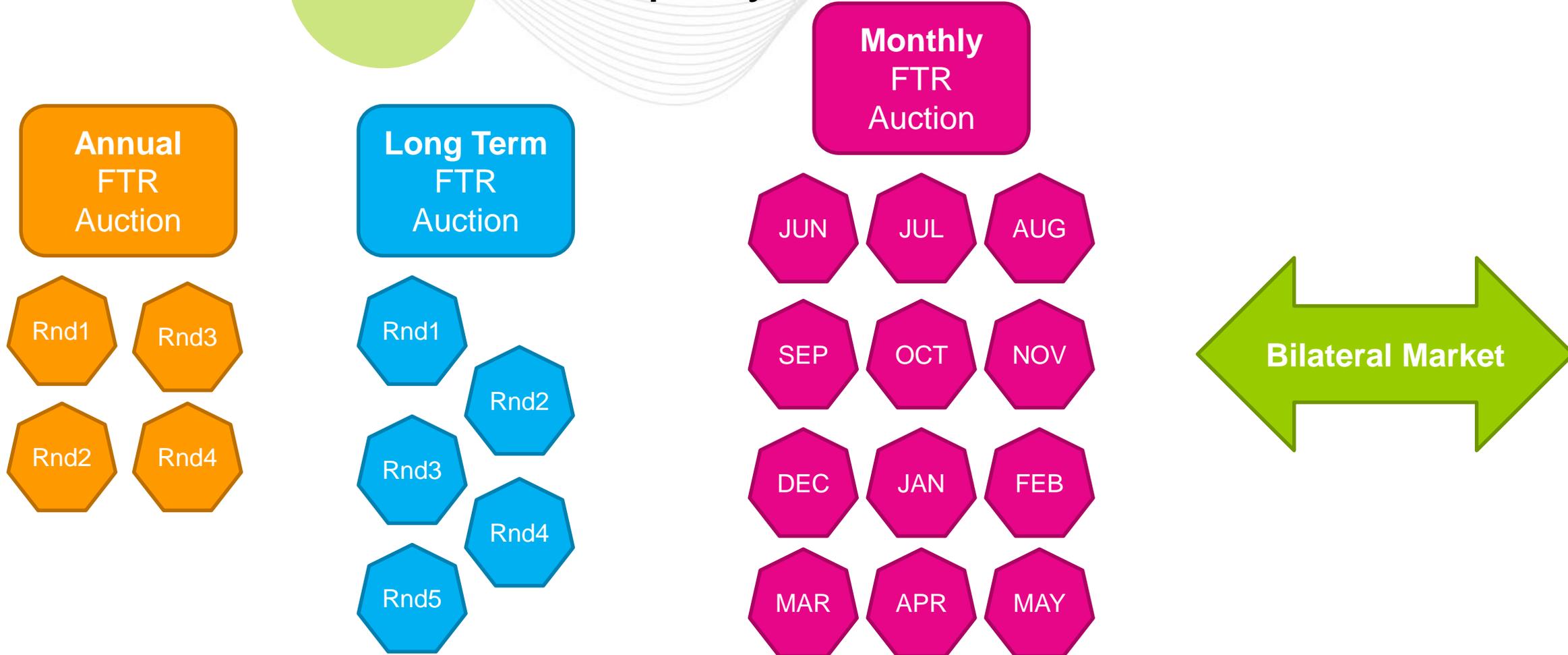
Monthly Auction

- Purchase “left over” capability

Secondary Market

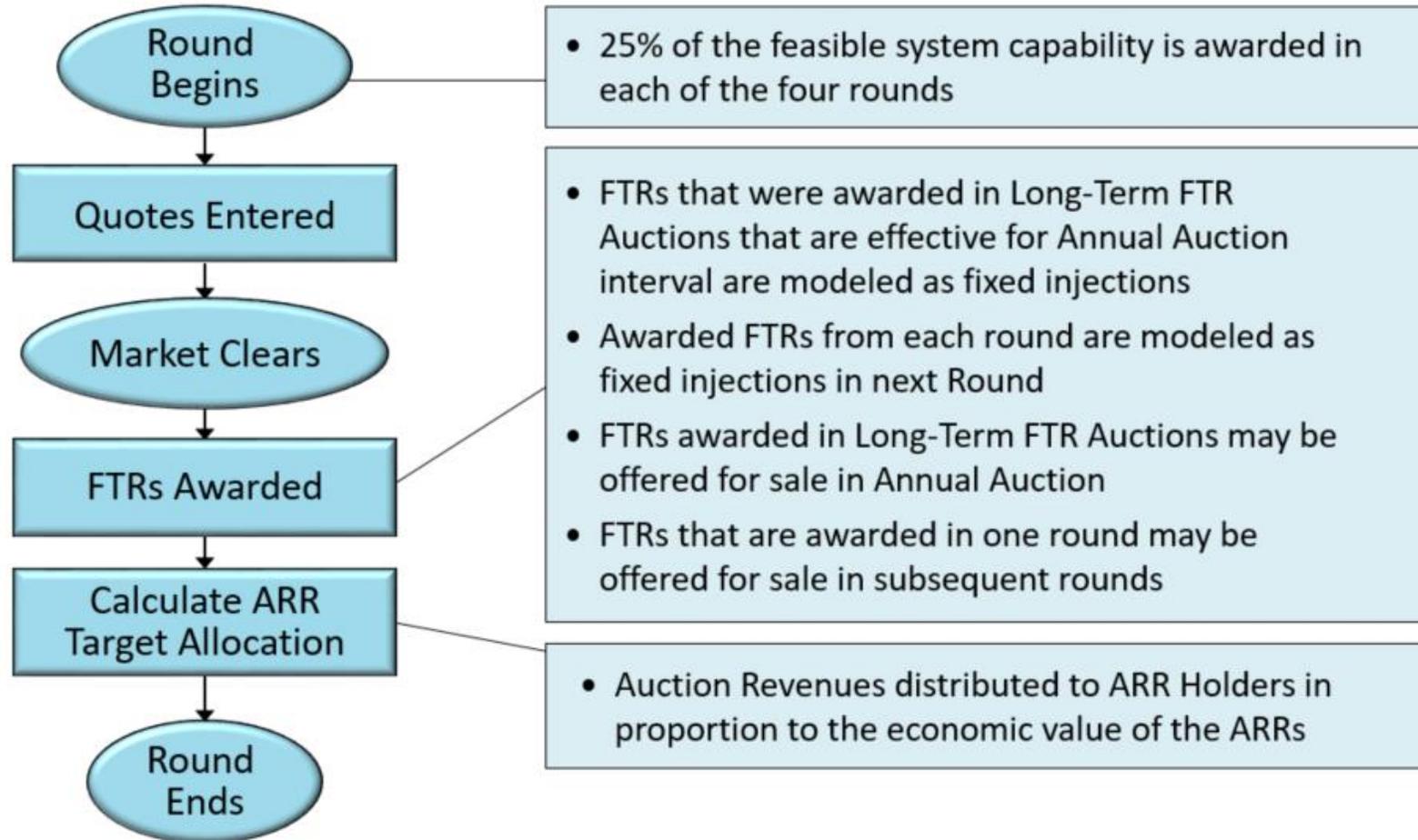
- Bilateral trading

21 events per year



Features	Annual FTR Auction	Long-term FTR Auction	Monthly FTR Auction
Capability Auctioned	Entire FTR capability of the transmission system minus approved Long-term FTRs	Residual FTR capability of the transmission system assuming self-scheduling of current planning period ARR	Residual FTR capability of the transmission system
Auction Format	Multi-round – 4 rounds each week during April	Multi-round – 5 rounds 2-3 months apart across the planning period	Single round each month
FTR Products	Obligations Options	Obligations	Obligations Options
FTR Class Types	OnPeak DailyOffPeak WkndOnPeak 24H	OnPeak DailyOffPeak WkndOnPeak 24H	OnPeak DailyOffPeak WkndOnPeak 24H
FTR Period	All (One planning period)	YR1 (One planning period) YR2 (One planning period) YR3 (One planning period)	Any individual remaining months of the planning period: JUN, JUL, AUG, SEP, OCT, NOV, DEC, JAN, FEB, MAR, APR, MAY

	Annual and Long-Term FTR Auctions	Monthly FTR Auctions Next Calendar Month	Monthly FTR Auctions Remaining Month
FTR Obligations	Valid Sources & Sinks are limited to: <ul style="list-style-type: none"> • Hubs • Zones • Aggregates • Interface Buses • Generator Buses 	Valid Sources & Sinks include any single bus or combination of buses for which a Day-Ahead LMP is calculated & posted: <ul style="list-style-type: none"> • Hubs • Zones • Aggregates • Interface Buses • Generator/Load Buses 	Valid Sources & Sinks are limited to: <ul style="list-style-type: none"> • Hubs • Zones • Aggregates • Interface Buses • Generator Buses
FTR Options	<ul style="list-style-type: none"> • Only a subset of paths will be eligible for FTR Options in order to prevent potential auction clearing performance issues • Only FTR Options \geq \$1 will clear • Option Product not available in Long-Term FTR Auction 		



Purpose

- Ensure the transmission system is capable to support the simultaneous feasibility of Stage 1A ARRs up to 60% of Network Service Peak Load inclusive of the projected ten-year load growth

Challenges

- Some transmission zones are expected high load growth in the next 10 years

Results

- If any upgrades are anticipated, they will be coordinated with other corresponding teams

Bilateral Trading of existing FTRs only

FTRs can be split into smaller increments (duration/mw/period)

FTRs cannot be reconfigured

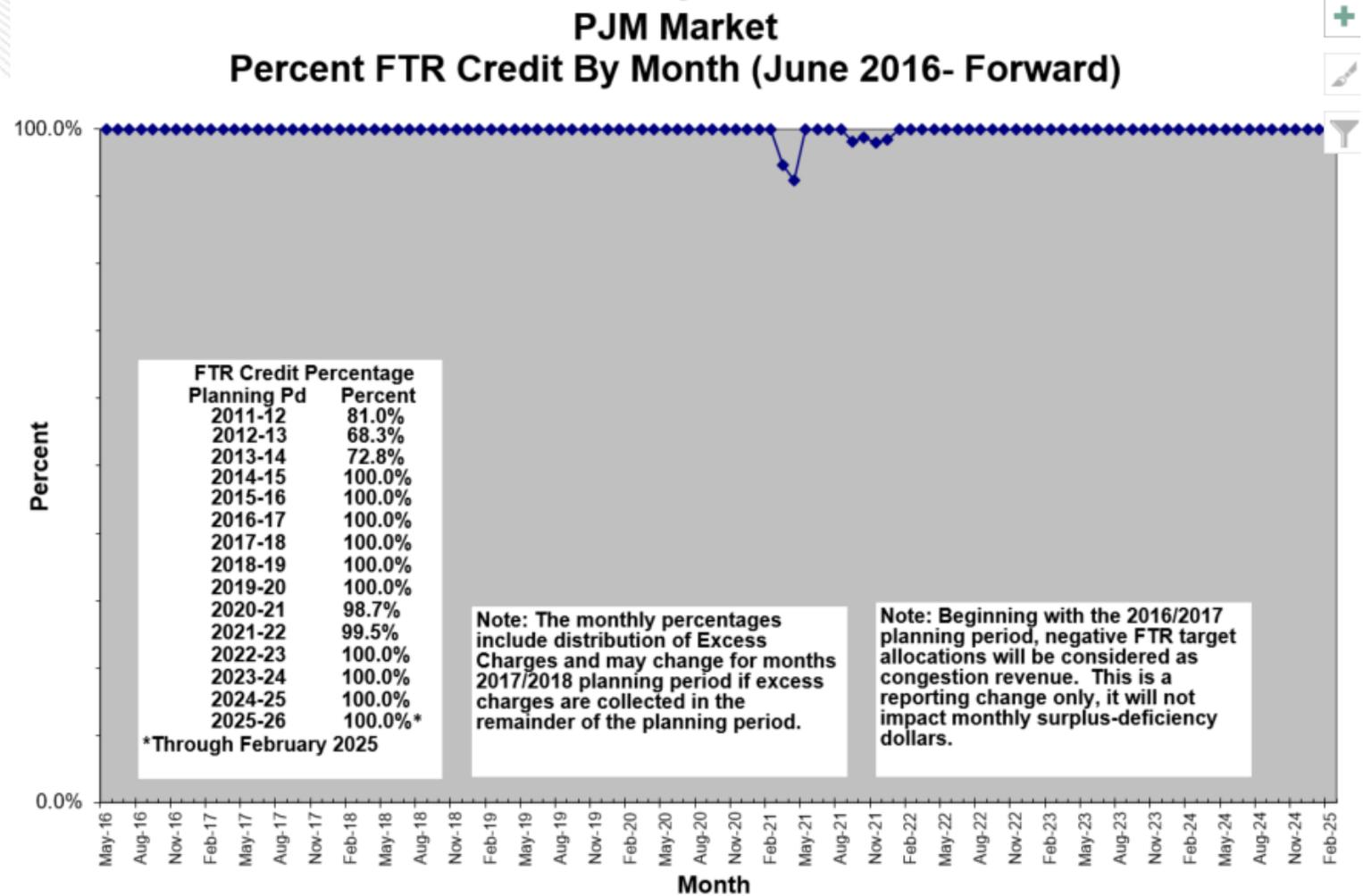
- Path and product type (Option or Obligation) must remain same

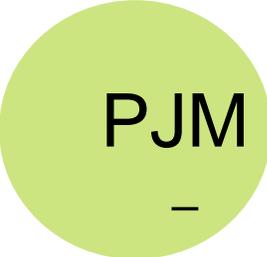
New owner takes on cost responsibility of purchased FTR



Metrics – Revenue Adequacy

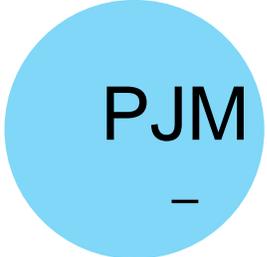
[FTR Credit By Month](#) file is published on the [FTR page](#), under the Revenue Adequacy section



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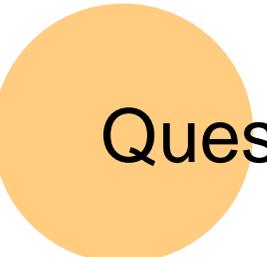
PJM Manual 06: Financial Transmission Rights

– <https://www.pjm.com/-/media/DotCom/documents/manuals/m06>

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PJM Financial Transmission Rights web page

– <https://www.pjm.com/markets-and-operations/fttr.aspx>

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Questions to FTRGroup@pjm.com