FTR Auction Training

Training Objectives

At the completion of this training, you should be able to …

- Understand the concepts and principles of operation for the FTR auction.
- Describe PJM's role in the FTR auction.
- Explain the grid accounting changes as a result of implementing the FTR auction.
- Define the business rules for the auction, including who can participate, how and when to submit quotes, and the timing of the auction.
- Describe the Market Participant activities that can be performed using PJM eFTR (PJM's FTR auction system).

Agenda

- Background
- FTR Auction Features & System
- FTR Auction Example
- Grid Accounting Changes
- FTR Auction Business Rules
- Using PJM eFTR

Background

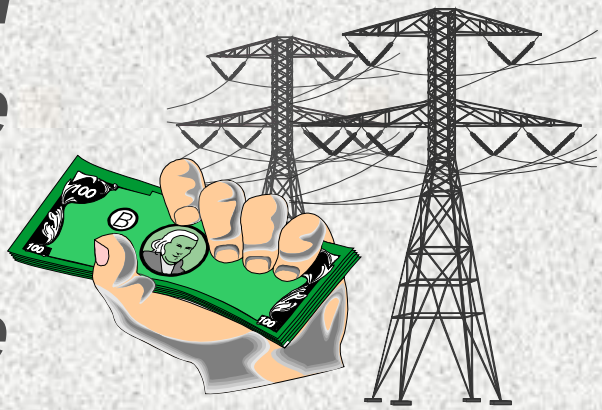
Why Do We Need FTRs?

- Challenge:
  - LMP exposes PJM Market Participants to price uncertainty for congestion cost charges
  - During constrained conditions, PJM Market collects more from loads than it pays generators
- Solution:
  - Provides ability to have price certainty
  - FTRs provide hedging mechanism that can be traded separately from transmission service

What Are FTRs?

Fixed Transmission Rights are …

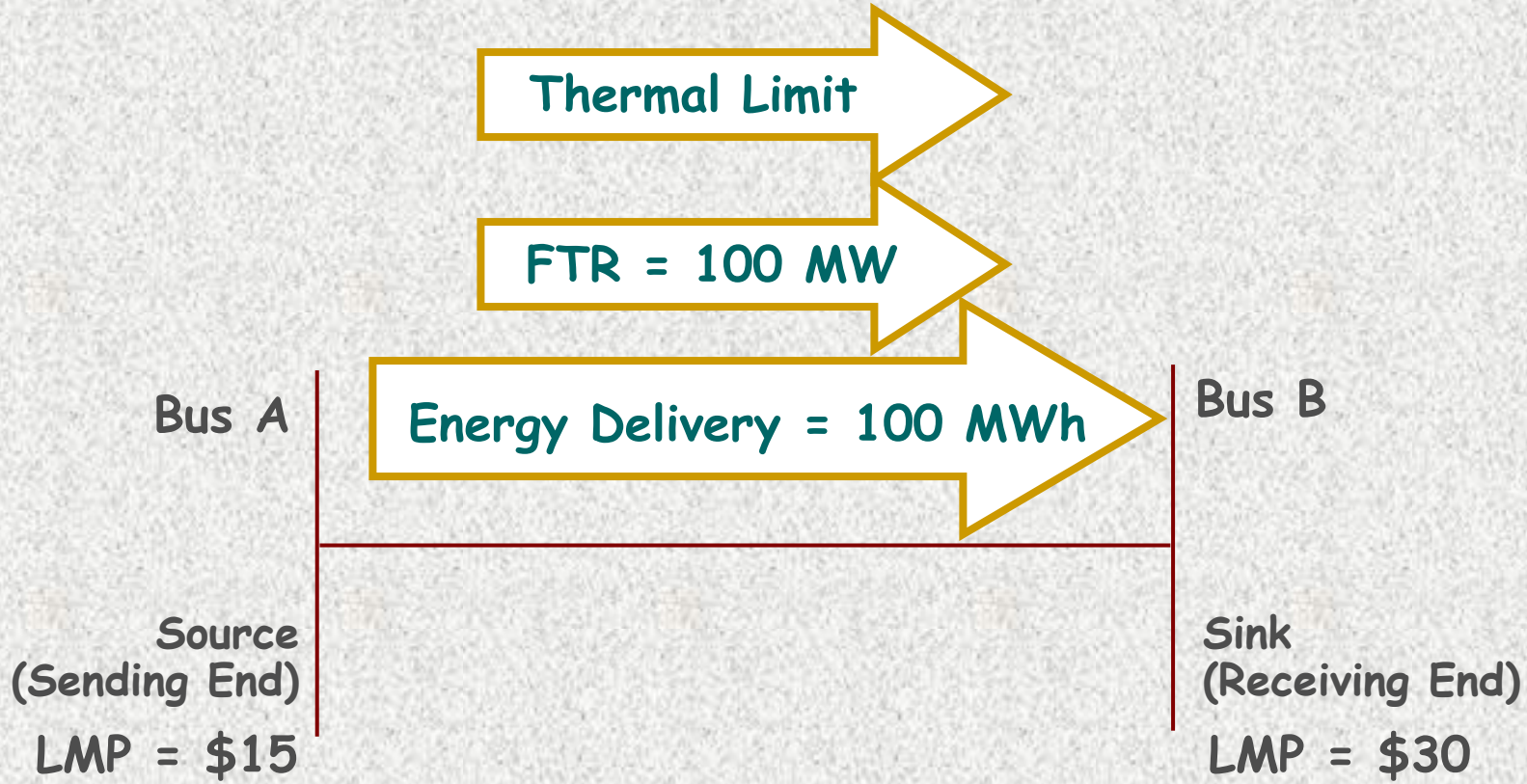
a financial contract that entitles holder to a stream of revenues (or charges) based on the hourly energy price differences across the path



Why Use FTRs?

- To create a financial hedge that provides price certainty to Market Participants when delivering energy across the PJM system
- To provide firm transmission service without congestion cost
- To provide methodology to allocate congestion charges to those who pay the fixed cost of the PJM transmission system

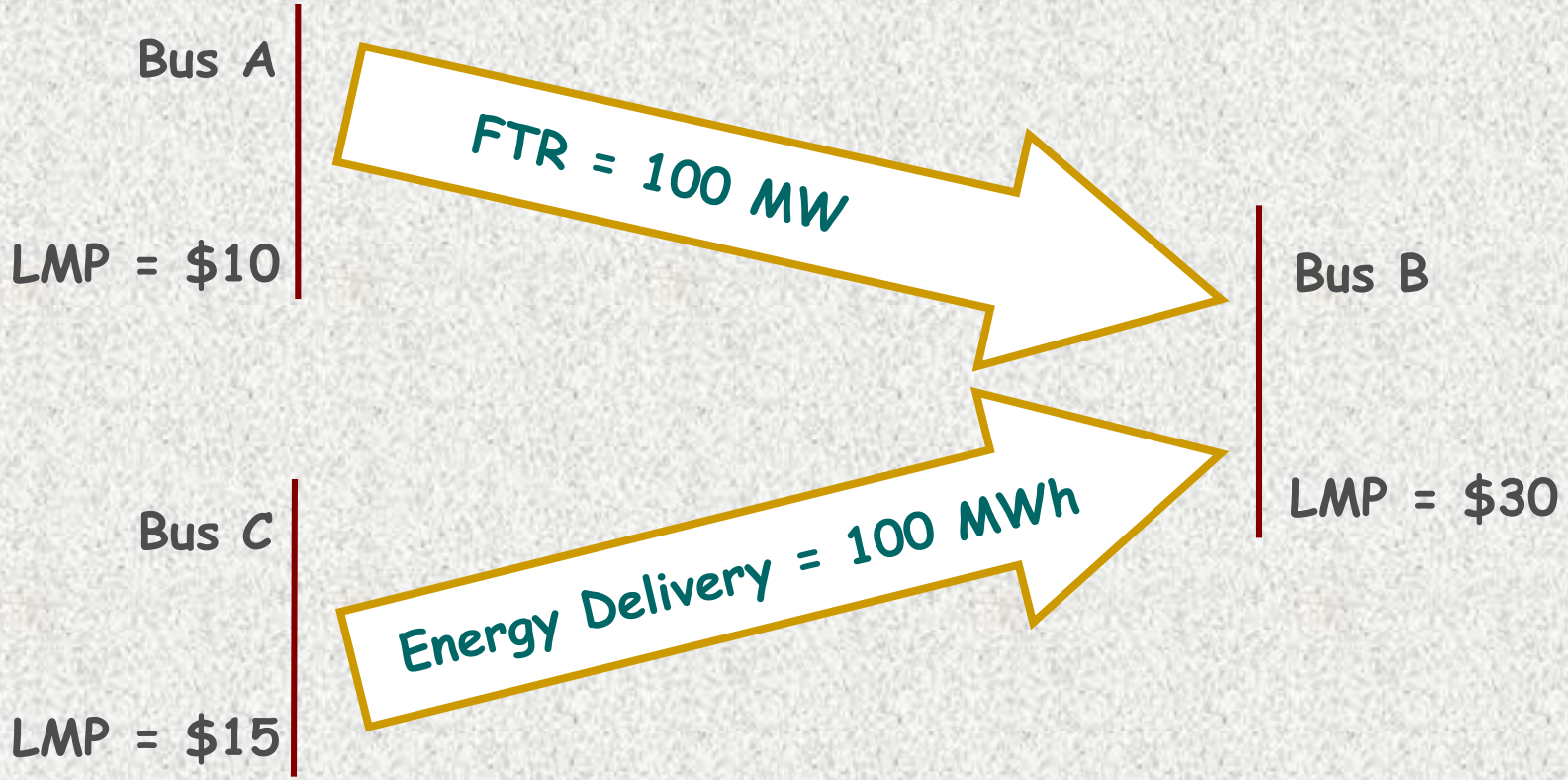
Energy Delivery Consistent with FTR



Congestion Charge = 100 MWh * ($30-$15) = $1500

FTR Credit = 100 MW * ($30-$15) = $1500

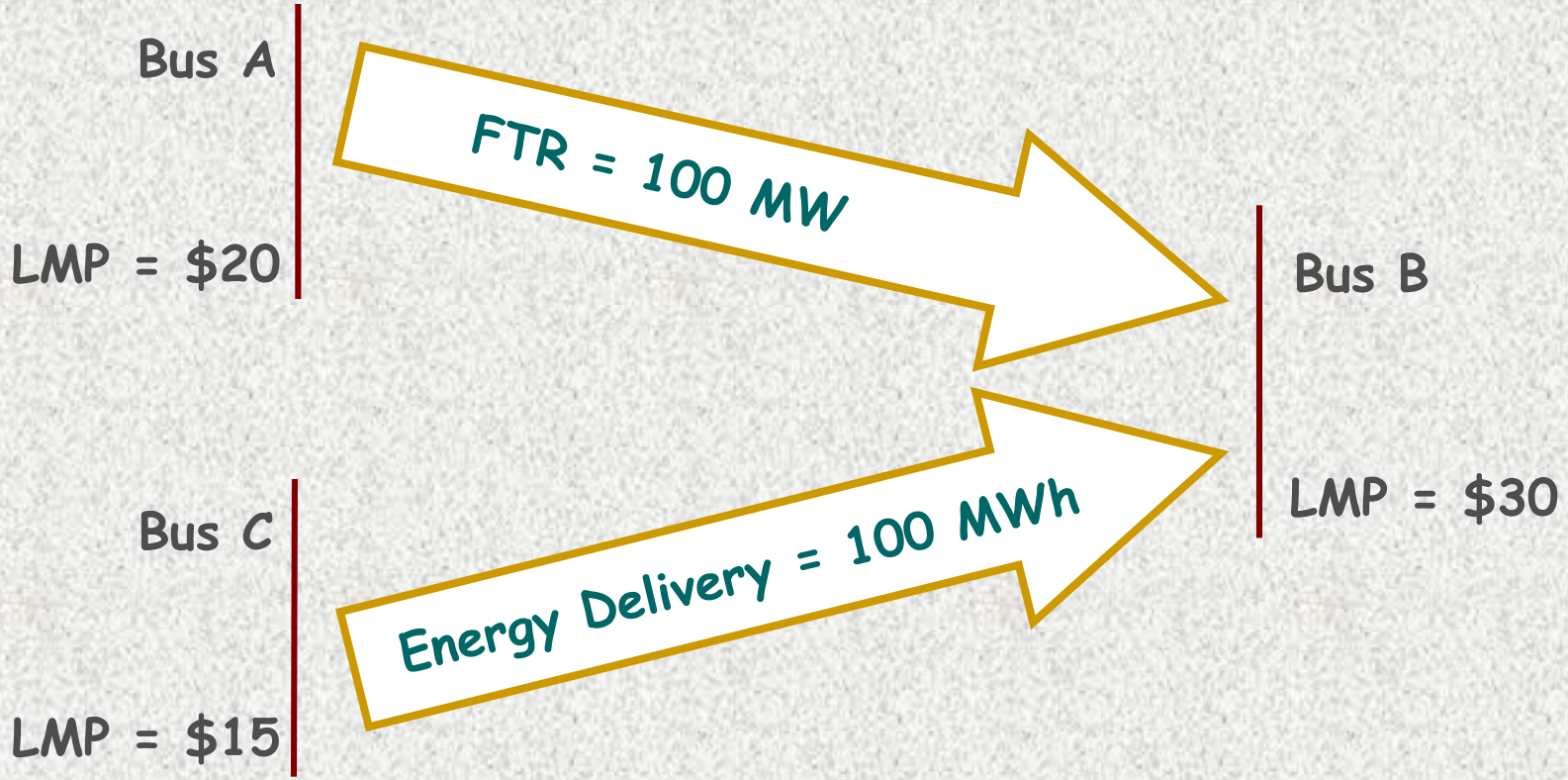
Energy Delivery Not Consistent with FTR (I)



Congestion Charge = 100 MWh * ($30-$15) = $1500

FTR Credit = 100 MW * ($30-$10) = $2000

Energy Delivery Not Consistent with FTR (II)



Congestion Charge = 100 MWh * ($30-$15) = $1500

FTR Credit = 100 MW * ($30-$20) = $1000

Obtaining FTRs

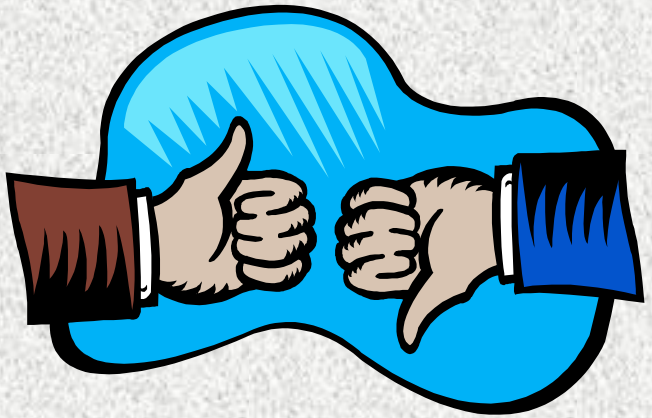
- Network service
  - based on annual peak load
  - designated from resources to aggregate loads
- Firm point-to-point service
  - may be requested with transmission reservation
  - designated from source to sink
- Secondary market -- bilateral trading
  - FTRs that exist are bought or sold
- FTR Auction -- centralized market
  - purchase “left over” capability

Characteristics of FTRs

- Defined from source to sink
- MW level based on transmission reservation
- Financially binding
- Financial entitlement, ***not*** physical right
- Independent of energy delivery

What are FTRs Worth?

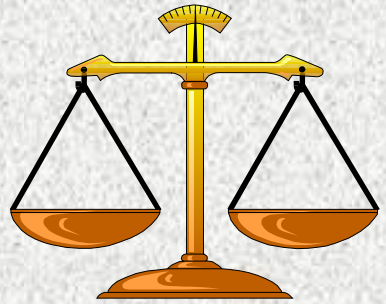
- Economic value determined by hourly LMPs
- Benefit (Credit)
  - same direction as congested flow
- Liability (Charge)
  - opposite direction as congested flow



What is the FTR Auction?

FTR Auction provides a method of auctioning the residual FTR capability that remains on the PJM transmission system at the time of the close of the auction quoting period.

- **Allows rights to be purchased without firm service**
- **Allows market participants to bid for FTRs and offer to sell existing entitlements**

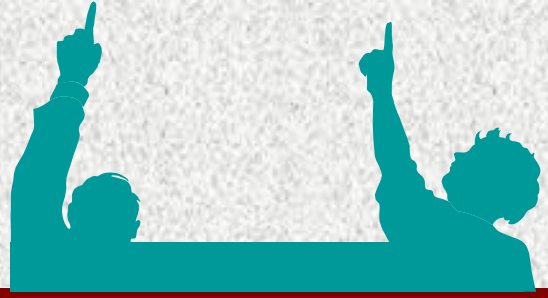


Why have an FTR Auction?

- Facilitates a more robust and liquid market for transmission entitlements
- Allows PJM Market Participants to submit bids to purchase residual entitlements and to submit offers to sell existing entitlements
- Maximizes efficiency of FTR trading by providing automatic reconfiguration of FTRs

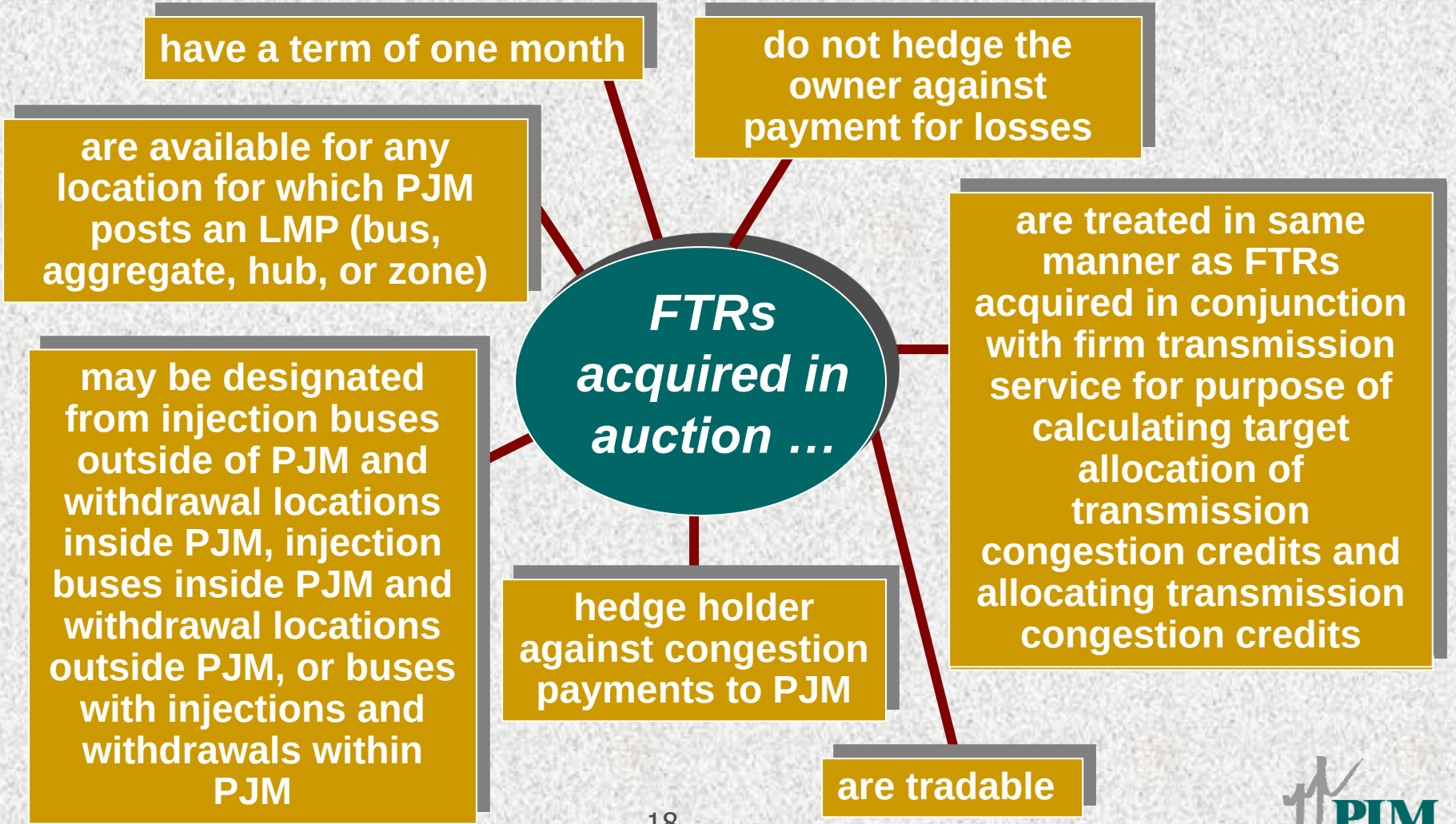
Features & System

Auctions

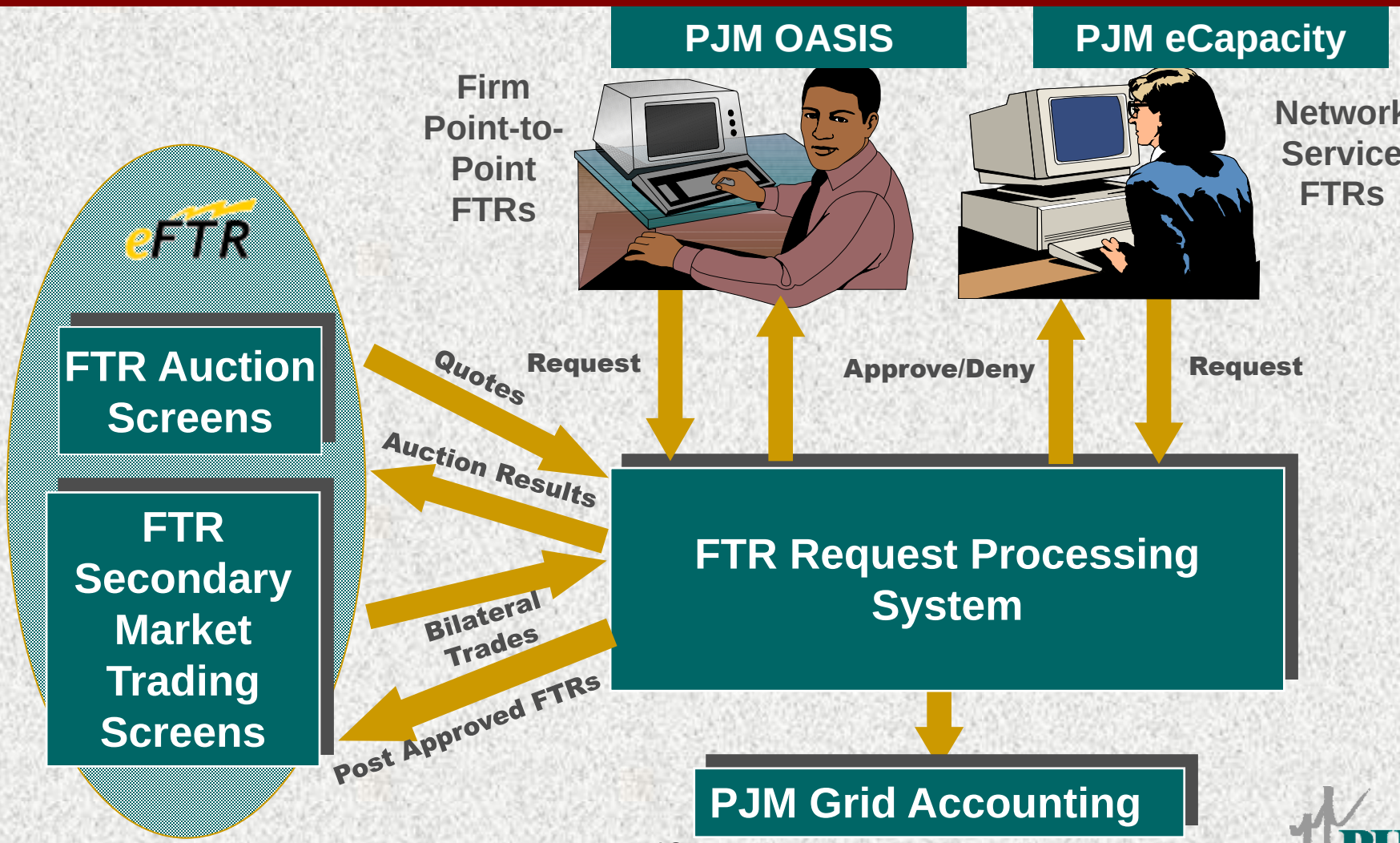


- Scope
  - any holder can offer FTR for sale
  - any transmission customer or PJM member can bid for & acquire any number of FTRs
- Frequency
  - single round monthly auction
  - separate auctions
    - on peak -- hours ending 0800 to 2300
    - off peak -- hours ending 2400 to 0700, weekends, and holidays

FTR Characteristics



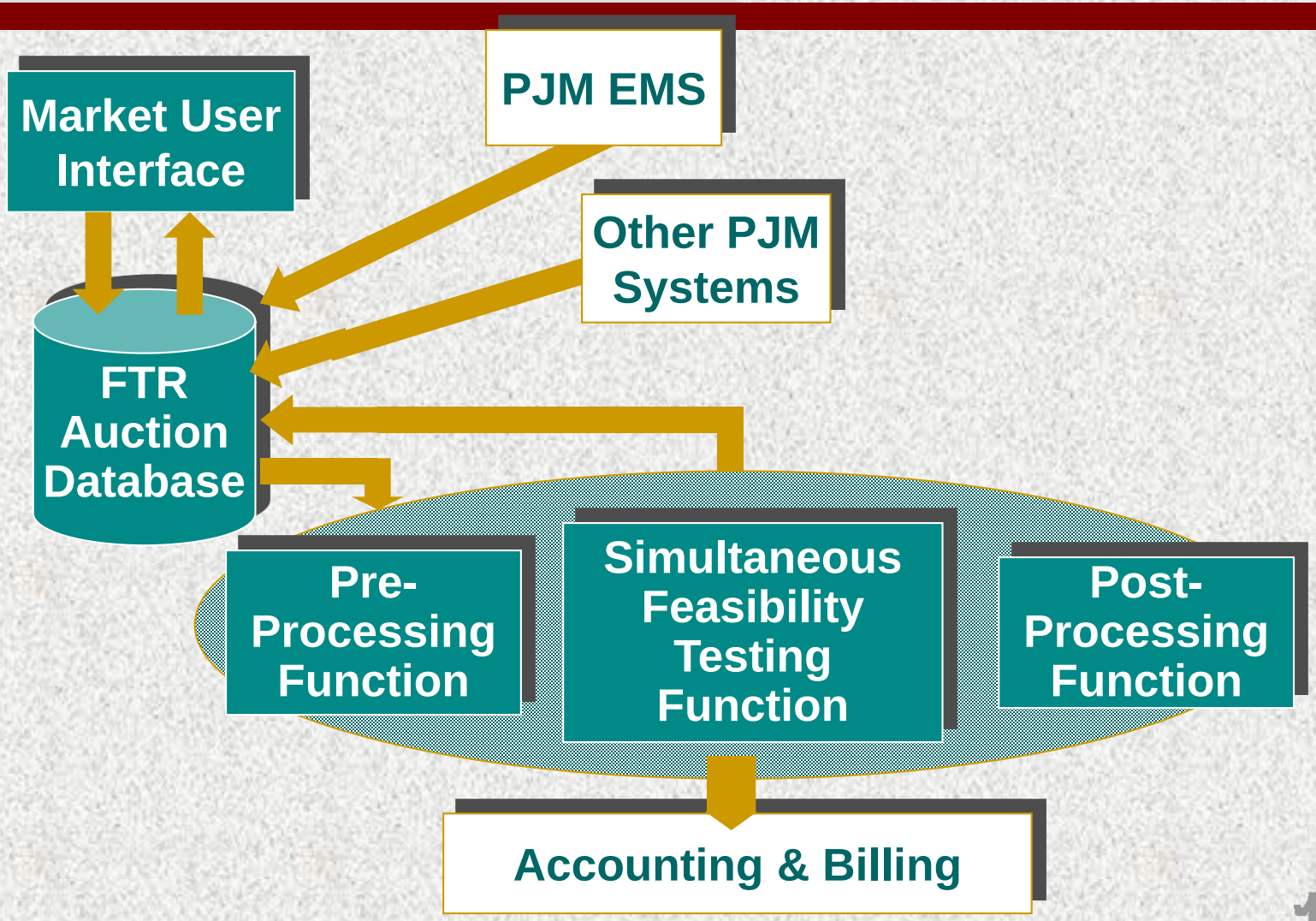
FTR Auction External Interfaces



PJM eFTR …

is an internet application that allows PJM Market Participants to participate in PJM's FTR auction and secondary market

Auction Subsystems



Market User Interface

- Logging in
- Viewing market messages
- Submitting quotes
- Viewing public auction results
- Viewing private auction results
- Participating in Secondary Market
- Managing FTR portfolios
- Responding to error messages

Pre- Processing Function

- Evaluates quotes and prepares set of FTRs to be tested for simultaneous feasibility test (SFT)
- Ensures outage information & facility rating information is retrieved
- Prepares network model for SFT
- Prepares base case for power flow study
- Sets-up models for SFT (on peak and off peak)

SFT Function

- Evaluates simultaneous feasibility of all outstanding FTRs, in conjunction with new FTRs to be awarded or surrendered by auction participants
- Selects highest bid-based valued combination of feasible additional FTRs
- Determines the market clearing price of every FTR to and from the reference bus

SFT Assumptions

- Network topology
- Circulating flows
- Existing FTRs
- Single contingency criteria

Post-Processing Function

- Transfers results to FTR auction database for posting on the MUI
  - FTRs awarded
  - FTRs sold
  - MW
  - prices
- Transfers results to Accounting & Billing system

FTR Auction Process & Time Line

PJM determines and posts expected non-simultaneous estimates of Available FTR Capability for each interface (5)

Ten days prior to start of auction month, auction closes

PJM posts FTR auction results *within 2 business days of quoting period closing*

Fifteen days prior to start of auction month, participants may submit bids to purchase or offers to sell FTRs

PJM performs FTR auction clearing analysis

Submitting Valid Quotes

- Market
- FTR source
- FTR sink
- Buy/Sell flag
- MW
- Price
- Class
- *Only on peak and off peak FTRs in Auction*
  - *for 24 hour sale, need to submit two quotes*

Determining Winning Quotes

Maximize bid-based value of FTR market

Winning bids and offers are simultaneously feasible with prior committed FTRs

Determining Winning Quotes

- Download data from FTR market user database
- Solve linear program problem
- Check simultaneous feasibility of FTR auction solution
- Repeat Steps 2 & 3
- Upload results to FTR market user interface

Step 1: Download Data from Database

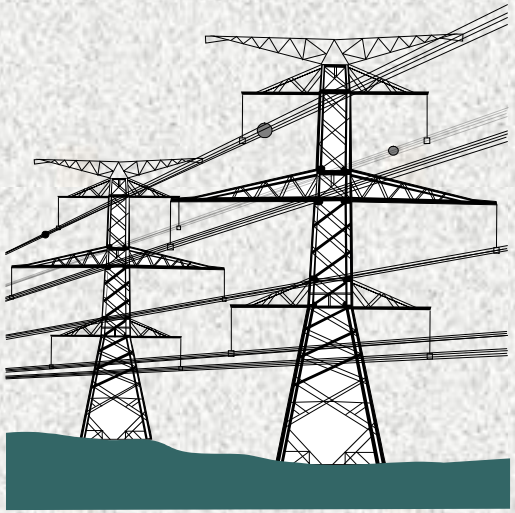
- *Uncompensated Parallel Flow Injections*
- *Transmission Outages*
- *FTRs (Firm Transmission Service Reservations)*
- *Facility Ratings*
- *FTR Quotes (Buy or Sell)*
- *PJM Network Model*
- *List of Contingencies*
- *Aggregate Price Definitions*

Optimization Engine

Step 2: Solve Linear Program Problem

Objective:

- Determine highest valued combination of FTRs to be awarded in auction
- Calculate clearing prices
  - differences in LMP at sink and source of FTR



Step 3: Check Simultaneous Feasibility

Goal:

Ensure that there are sufficient revenues for transmission congestion charges to satisfy all FTRs obligations for the auction under expected conditions

- **subject to transmission facility rating limits**
- **subject to transmission interface rating limits**
- **first contingency criteria**

Step 5:
Post FTR Auction Results

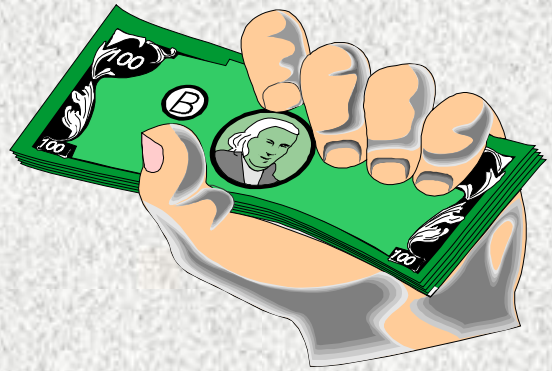
- *Uncompensated Parallel Flow Injections*
- *Transmission Outage Schedules*
- *FTRs (Firm Transmission Service Reservations)*
- *Facility Ratings*
- *FTR Quotes (Buy or Sell)*
- *PJM Network Model*
- *List of Contingencies*
- *Aggregate Price Definitions*

FTR Auction Software

- *FTRs Awarded in Auction*
- *FTRs Sold in Auction*
- *Nodal Prices*
- *Aggregate Prices*
- *Binding Constraints*

Settlements

- Winning bidders pay market price for FTRs acquired in auction
- FTR sellers are paid market price of the FTRs they surrender to PJM
- Market price is different for each path



Allocations of Revenues

- Net FTR Auction revenue allocated to RTOs pro-rata, according to transmission revenue requirement