



# FTR Forfeiture (MIC) Education Presentation

January 28, 2013

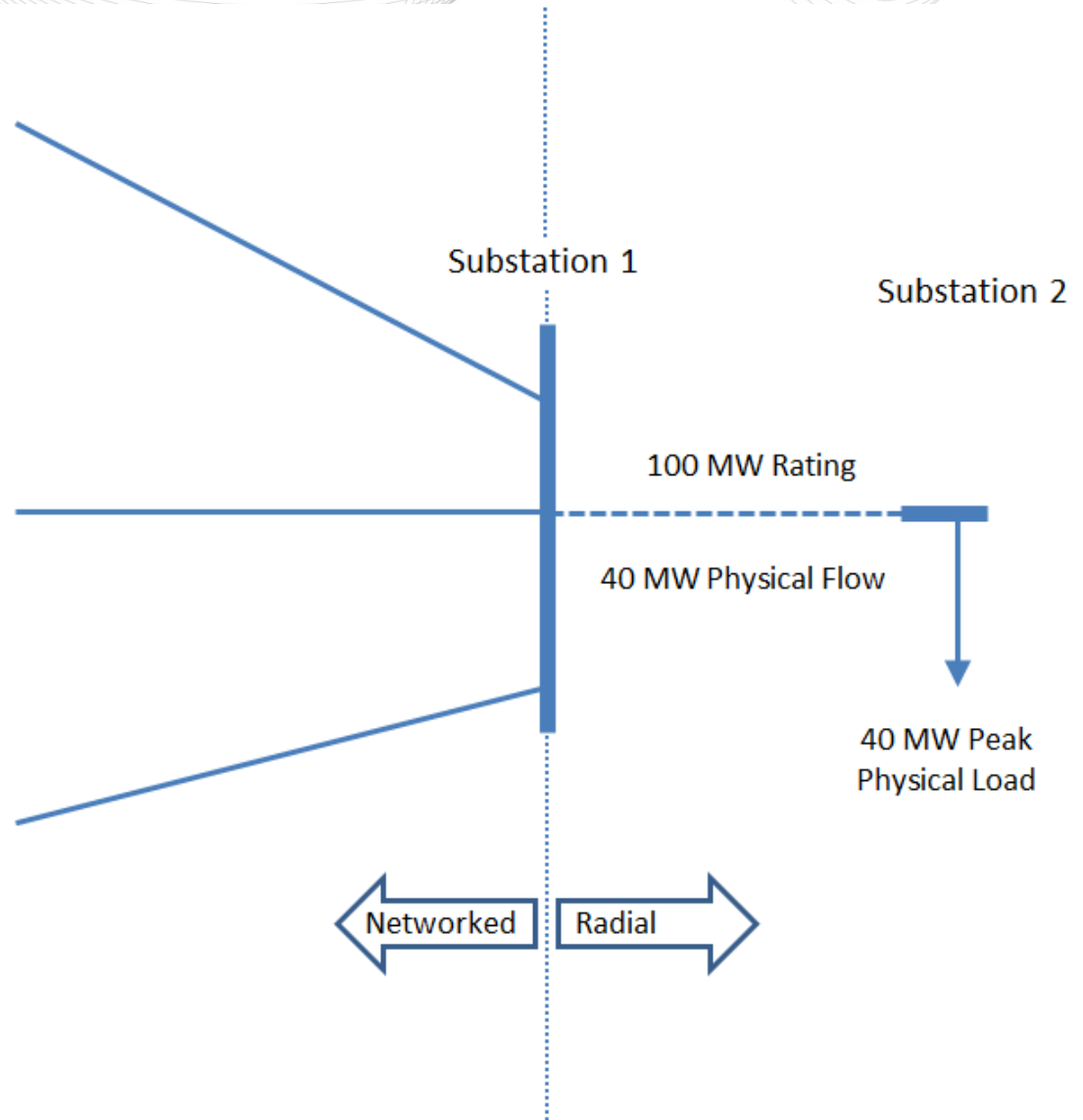
- History of the FTR Forfeiture Rule
  - Why it was implemented
- Financial Transmission Rights, Increment Offer/Decrement Bid, and Up To Congestion Transaction Overview
  - How virtual transactions impact FTRs
- Current FTR Forfeiture Rule

- In response to market participant behavior, on December 22, 2000 PJM filed with the FERC amendments to its Tariff as Section 5.2.1(b).
- The particular behavior consisted of:
  - Obtaining FTRs on never-congested radial paths
  - Then using INCs and DECcS to cause congestion on the path in the day-ahead market
  - Path never congested in real-time
  - Participant had the ability to control its profits
  - Behavior did not enhance market efficiency

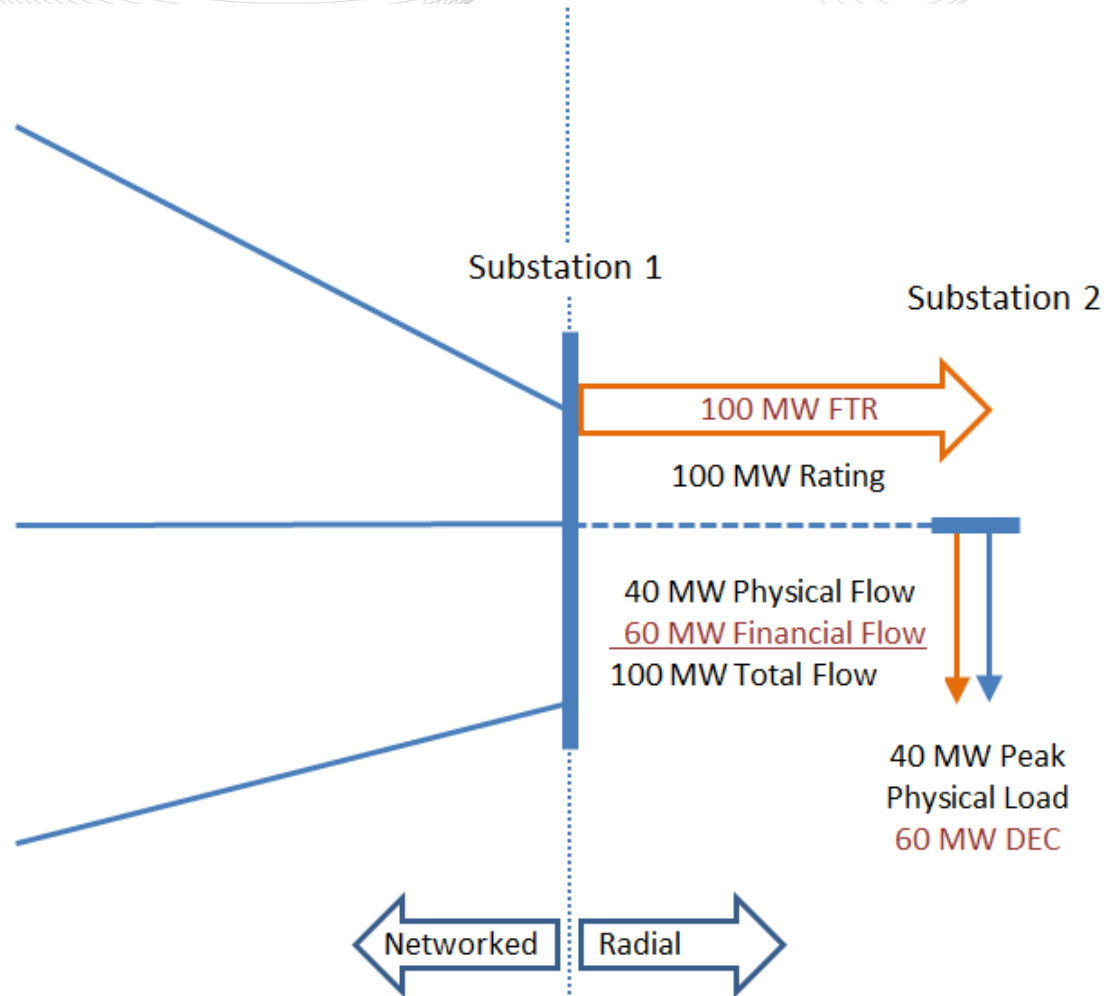


# Precipitating Event Example

- Radial path built to serve load years into the future
- Flow  $\ll$  Capability so never congested



- Radial path built to serve load years into the future
- Flow  $\ll$  Capability so never congested
- Path price consistently nil so 100 MW FTRs obtained for little or no cost
- 60 MW DEC bid caused path congestion
- For every FTR MW above cleared DEC MW, participant nets path-price difference as profit



- Radial path
- No RT congestion

Case 1: Pure Physical						
	Prices			Quantities		Settlement
	Substation 1	Substation 2	Path <sub>1-2</sub>	Load 2		Load 2
DA	\$30	\$30	\$0			
RT/BAL	\$30	\$30	\$0	40		-\$1,200
<b>TOTAL</b>						-\$1,200

Case 2: Observed Behavior; \$1/MWH Price-movement									
	Prices			Quantities			Settlement		
	Substation 1	Substation 2	Path <sub>1-2</sub>	Load 2	DEC	FTR <sub>1-2</sub>	Load 2	DEC	FTR <sub>1-2</sub>
DA	\$30	\$31	\$1	60	100		-\$1,860		\$100
RT/BAL	\$30	\$30	\$0	40	-60		-\$1,200	\$1,800	
<b>TOTAL</b>							-\$1,200	-\$60	\$100
							Physical Load: -\$1,200		
							Net Financials: \$40		

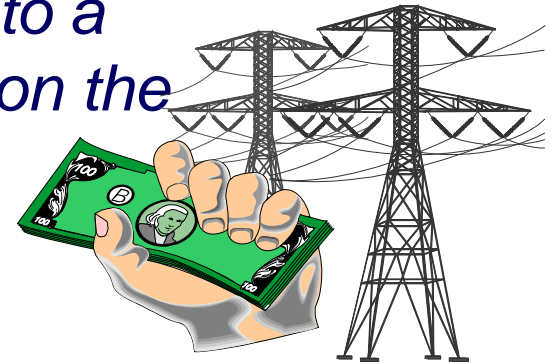
Case 3: Observed Behavior; \$100/MWH Price-movement									
	Prices			Quantities			Settlement		
	Substation 1	Substation 2	Path <sub>1-2</sub>	Load 2	DEC	FTR <sub>1-2</sub>	Load 2	DEC	FTR <sub>1-2</sub>
DA	\$30	\$130	\$100	60	100		-\$7,800		\$10,000
RT/BAL	\$30	\$30	\$0	40	-60		-\$1,200	\$1,800	
<b>TOTAL</b>							-\$1,200	-\$6,000	\$10,000
							Physical Load: -\$1,200		
							Net Financials: \$4,000		

- **The observed behavior did not:**
  - Enhance market efficiency/provide convergence
    - Moved day-ahead away from real-time, yet was rewarded
  - Provide incentive to bid efficiently
    - The higher the DEC bid, the more net profit!
- **Implementation was made under duress**
  - Behavior first observed early/mid-December 2000 and Tariff changes filed December 22

- History of the FTR Forfeiture Rule
  - Why it was implemented
- Financial Transmission Rights, Increment Offer/Decrement Bid, and Up To Congestion Transaction Overview
  - How virtual transactions impact FTRs
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- Financial Transmission Rights are ...
  - financial instruments awarded to bidders in the FTR Auctions that entitle the holder to a stream of revenues (or charges) based on the hourly Day Ahead congestion price differences across the path*



$$\text{DA LMP} = \text{System Energy Price} + \text{Marginal Loss Price} + \text{Congestion Price}$$



- 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

- Economic value based on Day-Ahead Congestion Prices
- Defined from source to sink
- Financial entitlement, *not* physical right
- Independent of energy delivery
- Must be simultaneously feasible

$$\text{FTR Target Allocation} = (\text{FTR MW}) * (\text{Congestion Price}_{\text{FTR Sink}} - \text{Congestion Price}_{\text{FTR Source}})$$

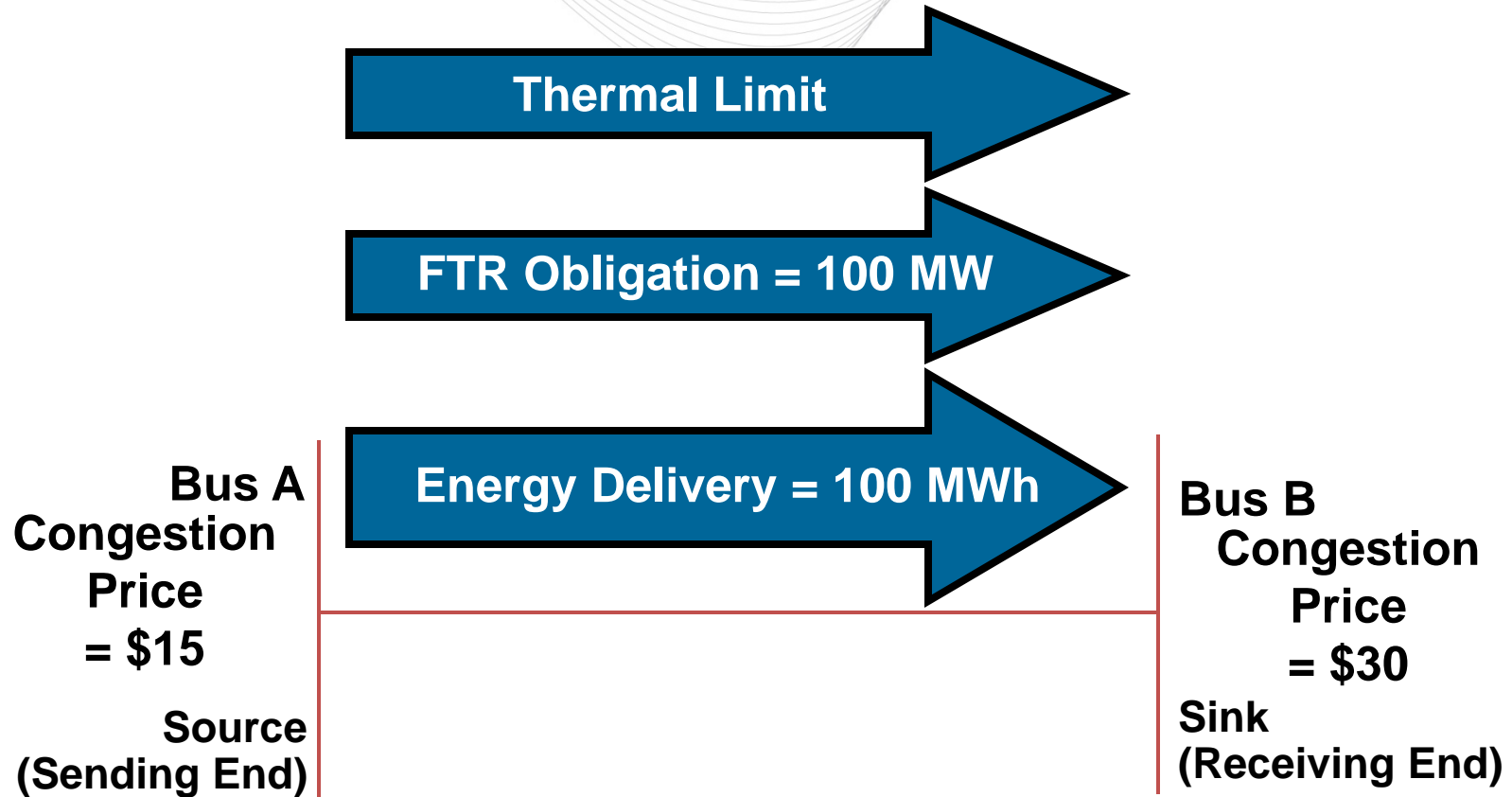
- FTR Target Allocation is equal to the FTR MW amount times the congestion price difference from the FTR sink point to the FTR source point
- Congestion Price based on the clearing prices from Day-Ahead Market
- If  $\text{Congestion Price}_{\text{FTR Sink}} < \text{Congestion Price}_{\text{FTR Source}}$ 
  - the FTR is a liability if FTR defined as Obligation
  - the FTR has zero value if defined as Option



## FTR Credits and Congestion Charges

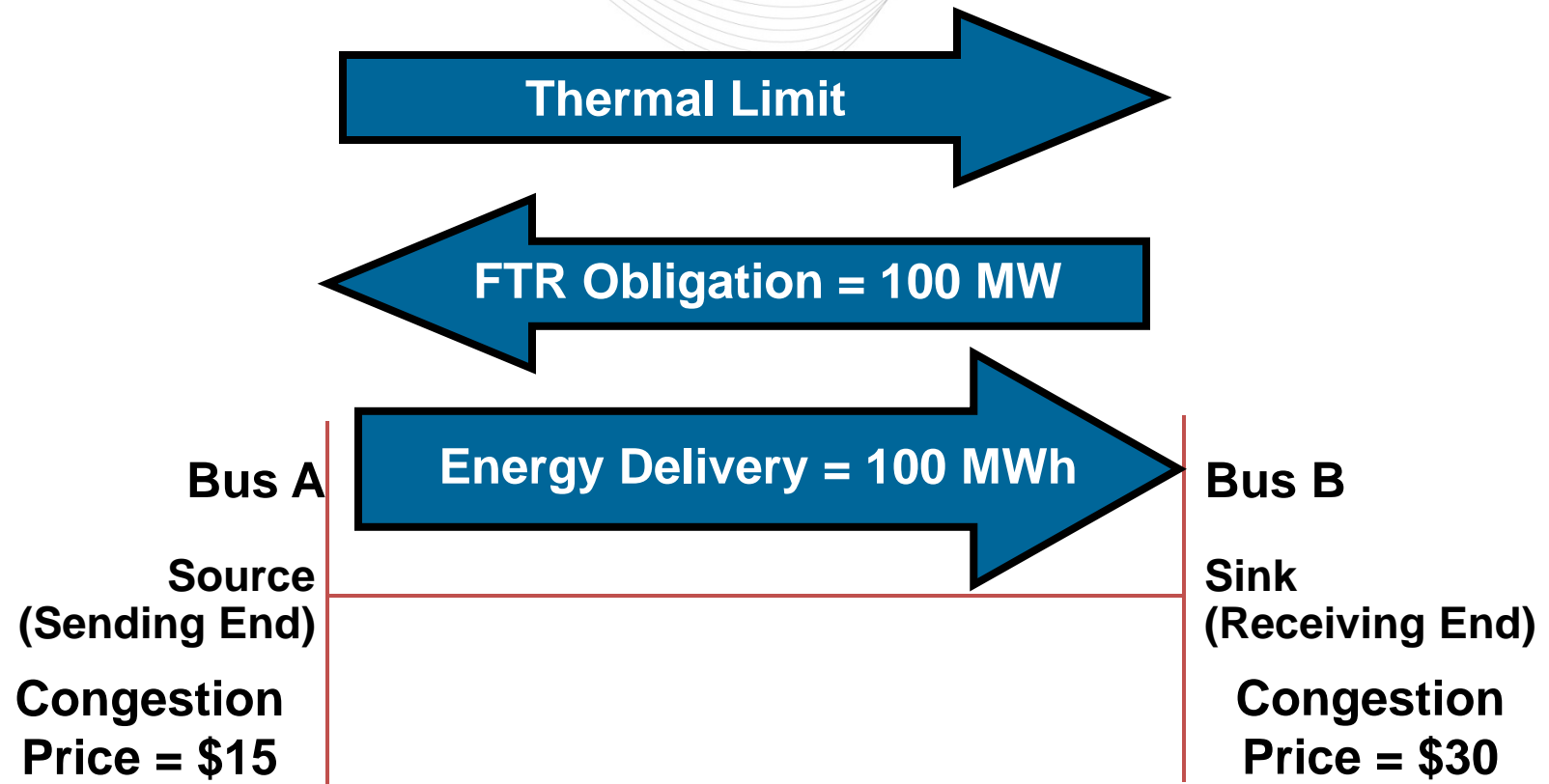
**Congestion Charge =  
MWh \* (Day-ahead Sink Congestion Price - Day-ahead Source Congestion Price)**

**FTR Target Allocation =  
MW \* (Day-ahead Sink Congestion Price - Day-ahead Source Congestion Price)**



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

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



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

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

- FTRs are financial instruments used to hedge congestion costs
- FTRs can be acquired in the Annual FTR Auction, Long Term FTR Auction, Monthly FTR Auction, or Secondary Market
- FTRs must be simultaneously feasible

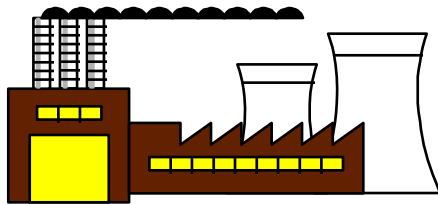


- Any market participant can submit increment offers and decrement bids at any hub, transmission zone, aggregate or single bus or eligible external interface for which an LMP is calculated
- Increment Offer (INC) looks like a “virtual generator”
- Decrement Bid (DEC) looks like a “virtual load”
- It is not required that physical generation or physical load exists at the location that is specified in the increment offer or decrement bid
- Increment Offers and Decrement Bids are financial instruments in the Day-ahead market ONLY!



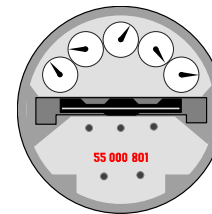
## Increment Offers

- Looks like a spot sale or dispatchable resource
- “If the price goes above X, then I will sell to the day-ahead PJM spot market”



## Decrement Bids

- Looks like spot purchase or price sensitive demand
- “If price goes below X then I will buy from the day-ahead PJM spot market”

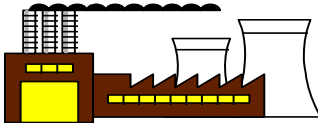


- Cover one side of a bilateral transaction
- Cover InSchedules deal
  - allows opposite party access to real-time LMP while you participate in day-ahead
- Protect a day-ahead generation offer
  - Use a decrement bid
- Arbitrage Day ahead to Real-time pricing
  - Use an increment offer or decrement bid
- Hedge Day ahead Demand bid
- Hedge Operating Reserve Charges



# Example #1 - Increment Offer

## Day-ahead



Participant offers 100 MW at

\$30



Assume Day ahead LMP= \$25

Increment Offer does not clear

Day-ahead position is 0



## Real-time

Increment Offer did not clear

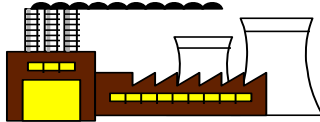


Balancing Settlement =  
0 (no deviation)

Net position = 0

## Example #2 - Increment Offer

### Day-ahead



Participant offers 100 MW at  
\$30

 Assume Day ahead LMP= \$35

Day ahead Settlement = 100 MW \*  
\$35 = \$3500 credit



### Real-time



Assume Real-time LMP = \$20

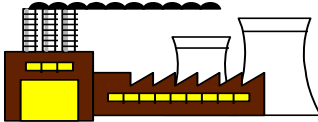
Deviation from DA  
schedule = -100 MW

Balancing Settlement = -100 MW \*  
\$20 = -\$2000 credit

Net position = \$3500 - \$2000  
= \$1500 credit

## Example #3 - Increment Offer

### Day-ahead



Participant offers 100 MW at  
\$30

 Assume Day ahead LMP= \$35

Day ahead Settlement = 100 MW \*  
\$35 = \$3500 credit



### Real-time



Assume Real-time LMP = \$40

Deviation from DA  
schedule = -100 MW

Balancing Settlement = -100 MW \*  
\$40 = -\$4000 credit

Net position = \$3500-\$4000  
= -\$500 credit

# Example #1 - Decrement Bid

## Day-ahead



Participant bids 100 MW at  
\$20  
Assume Day ahead LMP= \$25  
Decrement bid does not clear  
Day-ahead position is 0



## Real-time

Decrement bid did not clear

Balancing Settlement =  
0 (no deviation)

Net position = 0

## Day-ahead

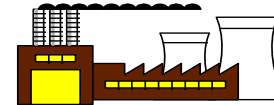


Participant bids 100 MW at  
\$20  
Assume Day ahead LMP= \$15

Day ahead Settlement = 100 MW \*  
\$15 = \$1500 charge



## Real-time



Assume Real-time LMP = \$25  
Deviation from DA  
schedule = -100 MW

Balancing Settlement = -100 MW \*  
\$25 = -\$2500 charge

Net position = \$1500-\$2500  
= -\$1000 charge



## Example #3 - Decrement Bid

### Day-ahead

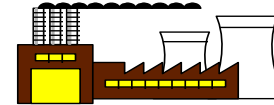


Participant bids 100 MW at  
\$20  
Assume Day ahead LMP= \$15

Day ahead Settlement = 100 MW \*  
\$15 = \$1500 charge



### Real-time



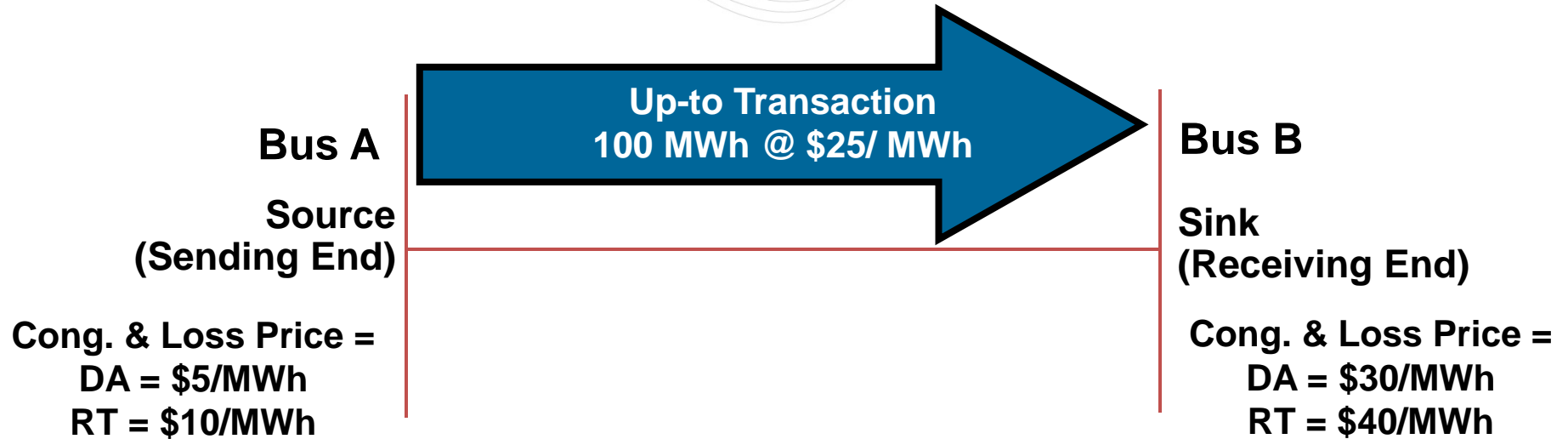
Assume Real-time LMP = \$10  
Deviation from DA  
schedule = -100 MW

Balancing Settlement = -100 MW \*  
\$10 = -\$1000 charge

Net position = \$1500 - \$1000  
= \$500 charge

- An up-to congestion transaction is a conditional transaction that permits a market participant to specify a maximum of a \$50/MWh price spread between the transaction source and sink in the Day-Ahead Market
- Up-to congestion transactions are cleared based on the price difference between source and sink (Congestion and Loss component of LMP)
  - **Day-Ahead Charge** = Transaction MWh \*  
(Sink DA LMP – Source DA LMP)
  - **Balancing Charge** = -Transaction MWh \*  
(Sink RT LMP – Source RT LMP)

# Up-to Congestion Transactions Example



$$\text{Day-Ahead Charge} = 100 \text{ MWh} * (\$30/\text{MWh} - \$5/\text{MWh}) = \$2,500$$

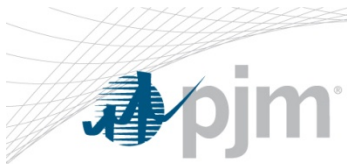
$$\text{Balancing Charge} = -100 \text{ MWh} * (\$40/\text{MWh} - \$10/\text{MWh}) = -\$3,000$$

- History of the FTR Forfeiture Rule
  - Why it was implemented
- Financial Transmission Rights, Increment Offer/Decrement Bid, and Up To Congestion Transaction Overview
  - How virtual transactions impact FTRs
- Current FTR Forfeiture Rule

- FTR selection criteria
  - FTRs sourcing or sinking at Zones, Hubs, or Interfaces are excluded
  - FTRs where Day-Ahead Sink LMP < Day-ahead Source LMP are excluded
  - Include only FTRs where difference in price between FTR source and FTR sink point is greater in day-ahead market vs. real-time market
  - Include only where constraint impacts FTR path > 10%
  - Company and Affiliates are treated as a single organization

- **Constraint and Day-ahead Selection Criteria**
  - Increment or Decrement bids in which 75% or more of the energy injected or withdrawn is reflected in constrained path between FTR source and sink points
  - UTC bids in which 75% or more of MWs is reflected in constrained path between FTR source and sink points
  - Bids relieving congestion are excluded
  - Regional Interface Constraints are excluded
  - INC, DEC, or UTC Bids at Zones, Hubs, or Interfaces are excluded.
  - Company and Affiliates are treated as a single organization

- FTR Forfeiture will never be less than zero
  
- If the FTR auction clearing price is positive
  - $\text{FTR Forfeiture} = \text{FTR target allocation}_{\text{hourly}} - \text{FTR auction clearing price}_{\text{hourly}}$
  
- If the FTR auction clearing price is negative
  - $\text{FTR Forfeiture} = \text{FTR target allocation}_{\text{hourly}}$



# FTR Forfeiture for Increment Bid

Day-ahead LMP= \$5  
Real-time LMP=\$4

Day-ahead LMP= \$10  
Real-time LMP=\$7

The difference in price between FTR source and FTR sink point is greater in day-ahead market vs. real-time market

FTR Source ————— FTR Sink

Constraint impacts FTR if >10%

Constrained Path

A ————— B

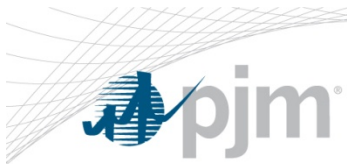
Impact at least 75%

■ C ————— D ■

Injection at Increment bid

Withdrawal at decrement bid with highest impact relative to increment bid





# FTR Forfeiture for Decrement Bid

Day-ahead LMP= \$5  
Real-time LMP=\$4

Day-ahead LMP= \$10  
Real-time LMP=\$7

The difference in price between FTR source and FTR sink point is greater in day-ahead market vs. real-time market

FTR Source ————— FTR Sink

Constraint impacts FTR if >10%

Constrained Path

A ————— B

Impact at least 75%

■ C ————— D ■

Withdrawal at decrement bid

Injection at increment bid with highest impact relative to decrement bid



# FTR Forfeiture for Up-To Congestion Bid

Day-ahead LMP= \$5  
Real-time LMP=\$4

Day-ahead LMP= \$10  
Real-time LMP=\$7

The difference in price between FTR source and FTR sink point is greater in day-ahead market vs. real-time market

FTR Source ————— FTR Sink

Constraint impacts  
FTR if >10%

Constrained Path

A ————— B

Impact at least 75%

■ C ————— D ■

Injection at  
source of Up-To  
congestion bid

Withdrawal at sink of Up-To  
congestion bid