

# FTR Education

FTR Forfeiture  
Education

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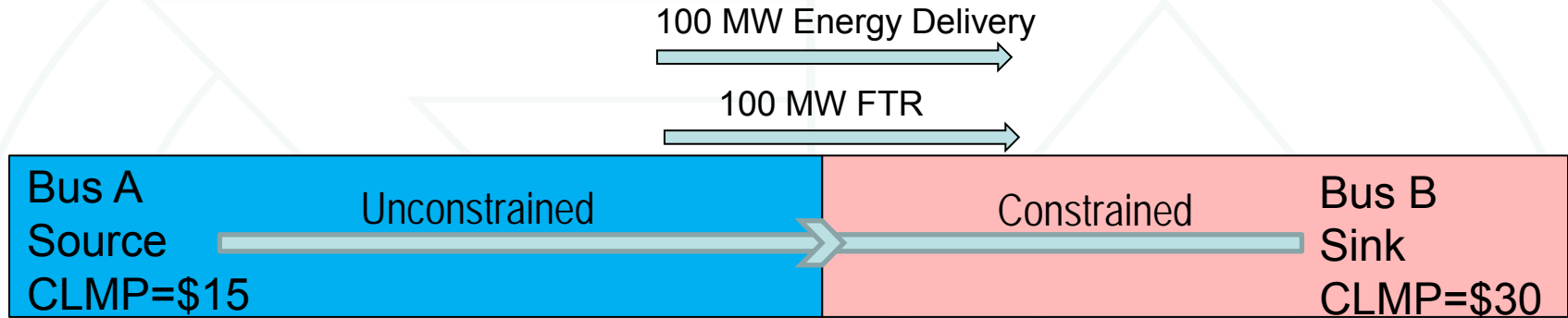


Monitoring Analytics

# FTR Basics

- **An FTR is a financial product that offsets congestion costs**
- **Buy/sell FTRs:**
  - Long Term Auction
  - Annual Auction
  - Monthly Auction
  - Bilateral Transactions
- **Target FTR revenues equal the congestion component of the DA LMP between the sink and source points**
  - **Target Allocation = FTR MW(DA CLMP<sub>Sink</sub> – DA CLMP<sub>Source</sub>)**

# FTR Example



Congestion Charge =  $100\text{MW} * (\$30 - \$15) = \$1,500$

Target Allocation =  $100\text{MW} * (\$30 - \$15) = \$1,500$

Net =  $\text{TA} - \text{Charge} = \$1,500 - \$1,500 = \$0$

FTR completely covers congestion cost

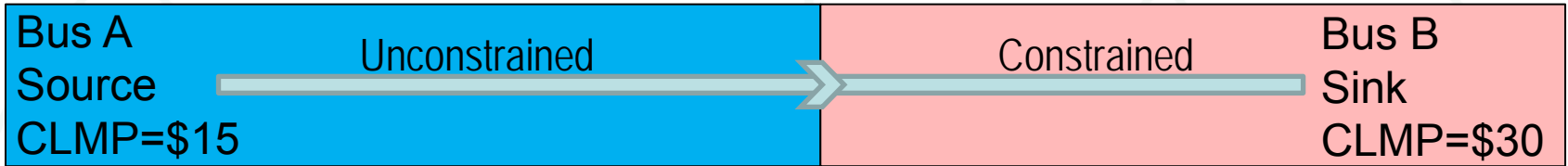
# INC Offers/DEC Bids

- **Increment Offers (INC) and Decrement Bids (DEC)**
  - **Virtual injection (INC) or withdrawal (DEC) of energy from the system**
    - **Only in Day-Ahead Market**
    - **Deviations may occur in Real-Time Market**
  - **Can be submitted at any hub, zone, aggregate or single bus for which an LMP is calculated**

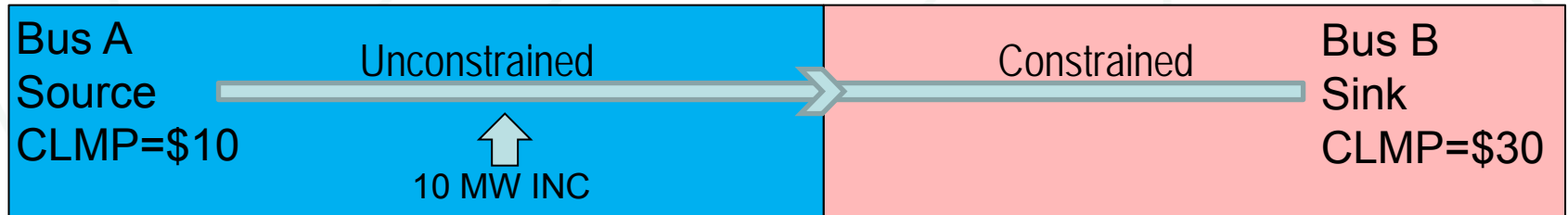
# Violating FTR Forfeiture Rule for INCs/DECs

- Compare largest impact injection/withdrawal to examined DEC/INC, keep if greater than or equal to 75%
  - $|\text{dfax}_{\text{max-withdrawal}} - \text{dfax}_{\text{INC}}|$  or  $|\text{dfax}_{\text{min-withdrawal}} - \text{dfax}_{\text{INC}}| \geq 75\%$
  - $|\text{dfax}_{\text{max-injection}} - \text{dfax}_{\text{DEC}}|$  or  $|\text{dfax}_{\text{min-injection}} - \text{dfax}_{\text{DEC}}| \geq 75\%$
- If INC or DEC  $|\text{dfax}| \leq 5\%$ , discard

# INC/DEC Impact on FTRs



$$\text{Target Allocation} = 100\text{MW} * (\$30 - \$15) = \$1,500$$

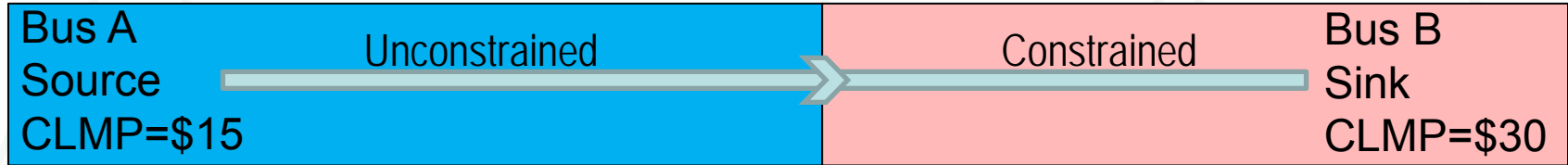


$$\text{Target Allocation} = 100\text{MW} * (\$30 - \$10) = \$2,000$$

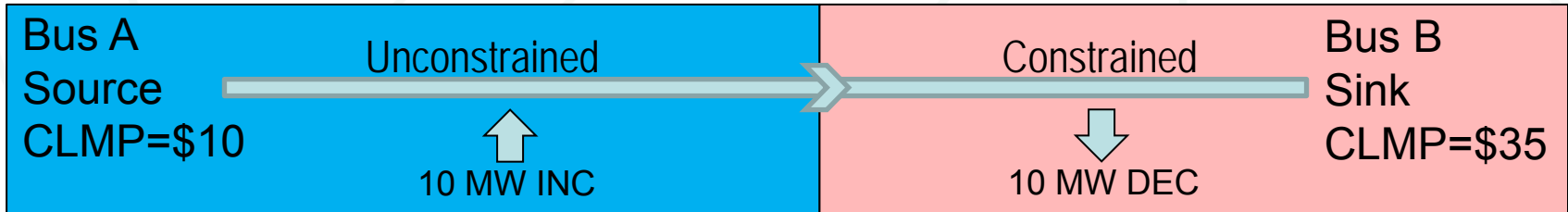
# UTC Transactions

- **Up-To Congestion Transactions (UTCs)**
  - **Allow participants to set a price they are willing to pay for congestion**
    - **If congestion is less than bid, transaction is scheduled in Day-Ahead Market**
  - **These transactions are paired injection/withdrawal bids**
    - **Subject to deviations in Real-Time Market**
  - **Can be submitted at any node in the subset of nodes posted on the PJM OASIS**

# UTC Impact on FTRs



$$\text{Target Allocation} = 100\text{MW} * (\$30 - \$15) = \$1,500$$

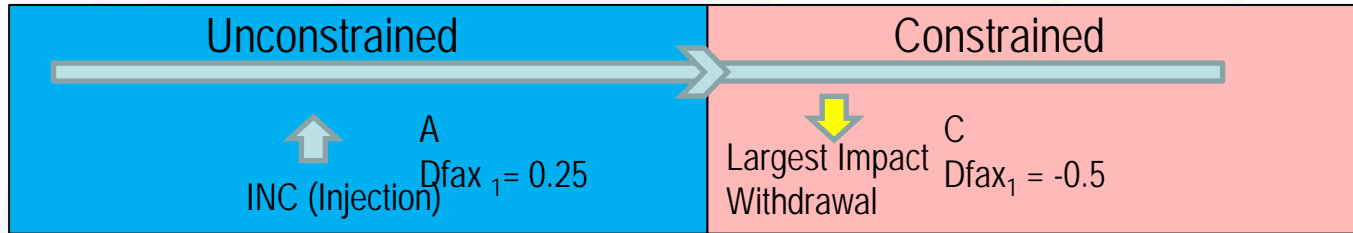


$$\text{Target Allocation} = 100\text{MW} * (\$35 - \$10) = \$2,500$$



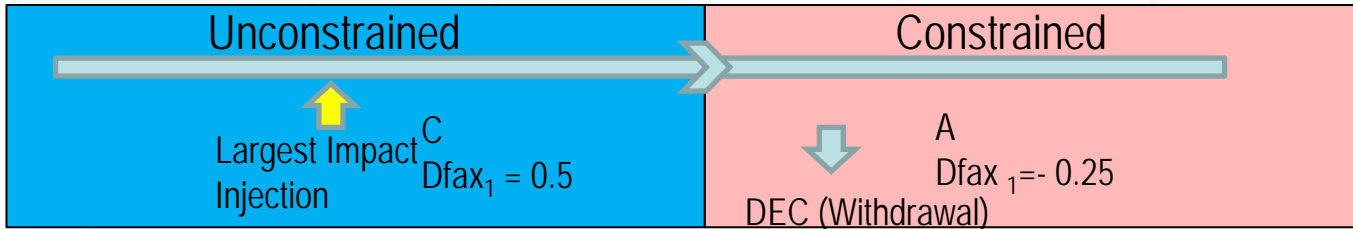
# Violating FTR Forfeiture Rule

## INC Offer



$$D_{\text{fax}} \Delta_{75\%} = |-0.5 - 0.25| = 0.75$$

## DEC bid



$$D_{\text{fax}} \Delta_{75\%} = |0.5 - (-0.25)| = 0.75$$

# Violating FTR Forfeiture Rule for UTCs

- **PJM implementation:**
  - **Calculate  $dfax_{net}$  of UTC pair**
    - $Dfax_{source} - dfax_{sink}$
  - **If:  $dfax_{net} \geq 0.75$  keep UTC**

# Violating FTR Forfeiture Rule for UTCs

- **IMM implementation:**
  - **Calculate  $\text{dfax}_{\text{net}}$  of UTC pair:**
    - If  $|\text{dfax}_{\text{source}}| > |\text{dfax}_{\text{sink}}|$  then  $\text{dfax}_{\text{net}} = \text{dfax}_{\text{source}} - \text{dfax}_{\text{sink}}$
    - If  $|\text{dfax}_{\text{sink}}| > |\text{dfax}_{\text{source}}|$  then  $\text{dfax}_{\text{net}} = \text{dfax}_{\text{sink}} - \text{dfax}_{\text{source}}$
  - **Exclude UTCs with  $\text{dfax}_{\text{net}} = 0$**
  - **Determine net injection or withdrawal:**
    - **Injection if  $|\text{dfax}_{\text{source}}| > |\text{dfax}_{\text{sink}}|$  (source is closer)**
    - **Withdrawal if  $|\text{dfax}_{\text{sink}}| > |\text{dfax}_{\text{source}}|$  (sink is closer)**

# FTR Forfeitures for UTCs (cont.)

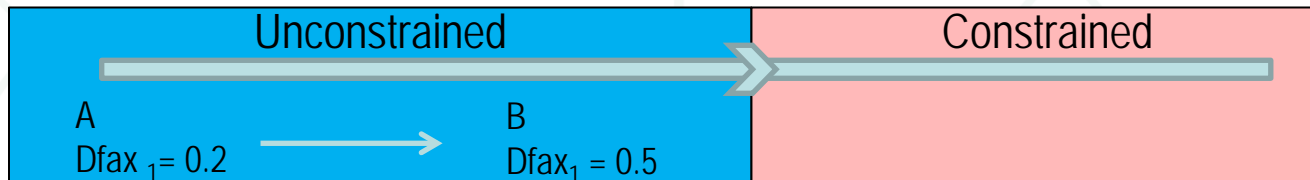
- **Include only UTCs that would increase congestion on a constraint**
  - **Consider shadow price of constraint**
  - **Consider net dfax of UTC pair**
- **Include UTC transactions under same conditions as INC/DEC rule; where:**
  - **$|\text{dfax}_{\text{max-withdrawal}} - \text{dfax}_{\text{net UTC Injection}}|$  or  $|\text{dfax}_{\text{min-withdrawal}} - \text{dfax}_{\text{net UTC Injection}}| \geq 75\%$**
  - **$|\text{dfax}_{\text{max-injection}} - \text{dfax}_{\text{net UTC Withdrawal}}|$  or  $|\text{dfax}_{\text{min-injection}} - \text{dfax}_{\text{net UTC Withdrawal}}| \geq 75\%$**

# UTC Forfeitures: PJM and IMM Differences

PJM Implementation	IMM Implementation
$Df_{ax_{net}} = df_{ax_{source}} - df_{ax_{sink}}$	$Df_{ax_{net}} = df_{ax_{larger}} - df_{ax_{smaller}}$
If $df_{ax_{net}} \geq 0.75$ forfeit	Based on UTC source/sink, determine if net withdrawal or injection
	Using shadow price of constraint, determine if UTC helps or harms constraint
	If UTC harms, compare UTC net $df_{ax}$ to largest impact injection/withdrawal on that constraint

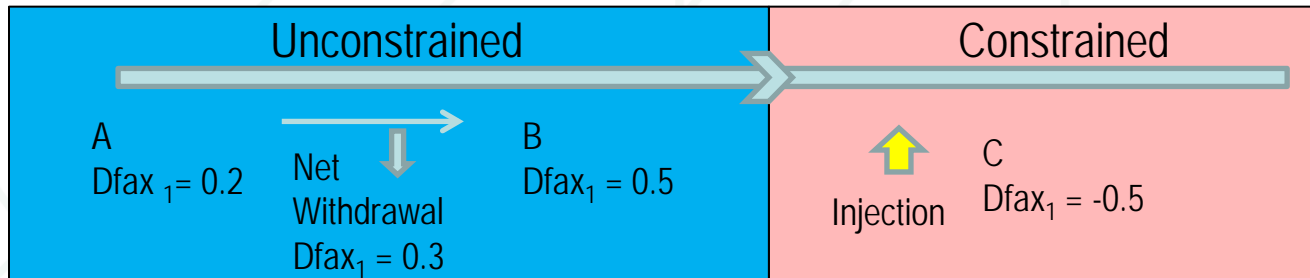
# Current UTC FTR Forfeiture Example

PJM



$$\text{PJM } D_{\text{fax}} \Delta_{75\%} = 0.2 - 0.5 = -0.3$$

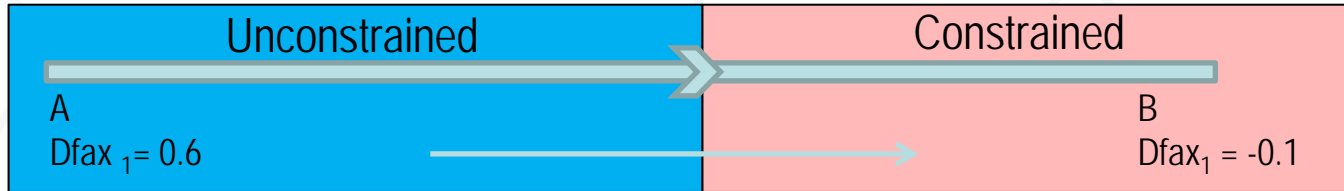
IMM



$$\text{IMM } D_{\text{fax}} \Delta_{75\%} = |-0.5 - 0.3| = 0.8$$

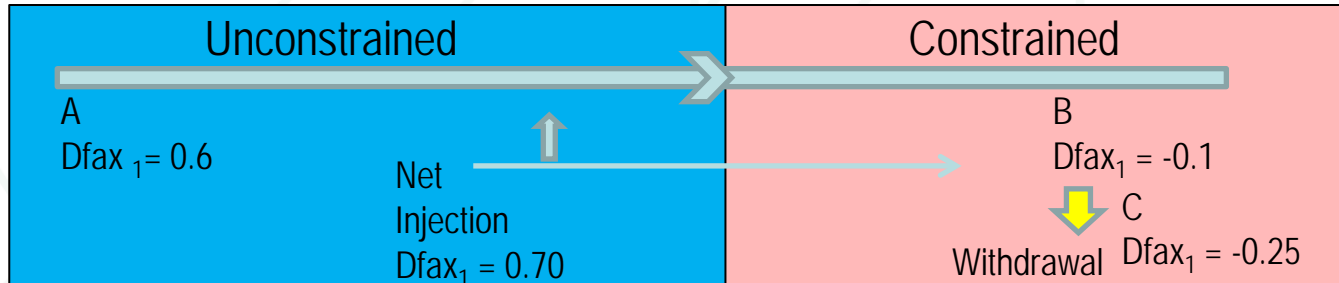
# Current UTC FTR Forfeiture Example

PJM



$$\text{PJM } D_{fax} \Delta_{75\%} = 0.6 - (-0.1) = 0.70$$

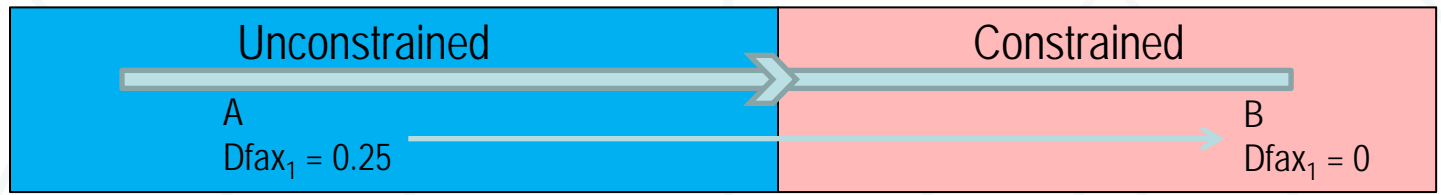
IMM



$$\text{IMM } D_{fax} \Delta_{75\%} = |-0.25 - 0.70| = 0.95$$

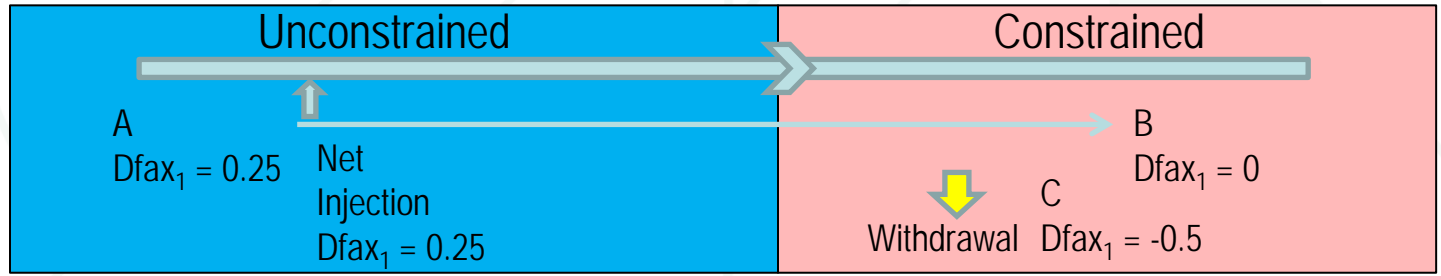
# Current UTC FTR Forfeiture Example

PJM



$$\text{PJM } D_{fax} \Delta_{75\%} = 0.25 - 0.0 = 0.25$$

IMM



$$\text{IMM } D_{fax} \Delta_{75\%} = |0.25 - (-0.5)| = 0.75$$



# Current FTR Forfeiture Rule: Candidate FTRs

- $DA\ LMP_{sink} - DA\ LMP_{source} > 0$
- $Dfax_{sink} > -10\%$  or  $dfax_{source} < 3\%$
- $|dfax_{source} - dfax_{sink}| \geq 10\%$
- $(DA\ LMP_{sink} - DA\ LMP_{source}) > (RT\ LMP_{sink} - RT\ LMP_{source})$ 
  - Exclude sinks at zone, hub or interface

# Current FTR Forfeiture Rule: FTR Forfeiture Amounts

- **FTR only forfeits once an hour**
- **FTR Cost = Hourly Clearing Price \* FTR MW**
- **Forfeiture Amount = Revenue – FTR Cost**

# FTR Forfeiture Impact on Market

- **Level of FTR forfeitures**
  - **Less than one percent of total target allocations**
  - **Affects few participants**
- **Provides disincentive to gaming**
  - **Significant impact on market**



# FTR Forfeitures

	FTR Target Allocations	FTR Forfeiture Total	Forfeiture Percent of Target Allocation	Unique Participants
10/11	\$ 1,685,752,912	\$ (1,822,441)	0.108%	37
11/12	\$ 991,574,073	\$ (1,090,858)	0.110%	33
12/13	\$ 906,817,614	\$ (523,378)	0.058%	28
13/14*	\$ 503,258,187	\$ (496,876)	0.099%	19

\*Includes FTR Forfeitures June 2013 through October 2013. Sep and Oct FTR forfeitures include UTC forfeitures according to PJM methodology

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