

FTR Education

FTR Forfeiture
Education

January 28, 2014

Seth Hayik

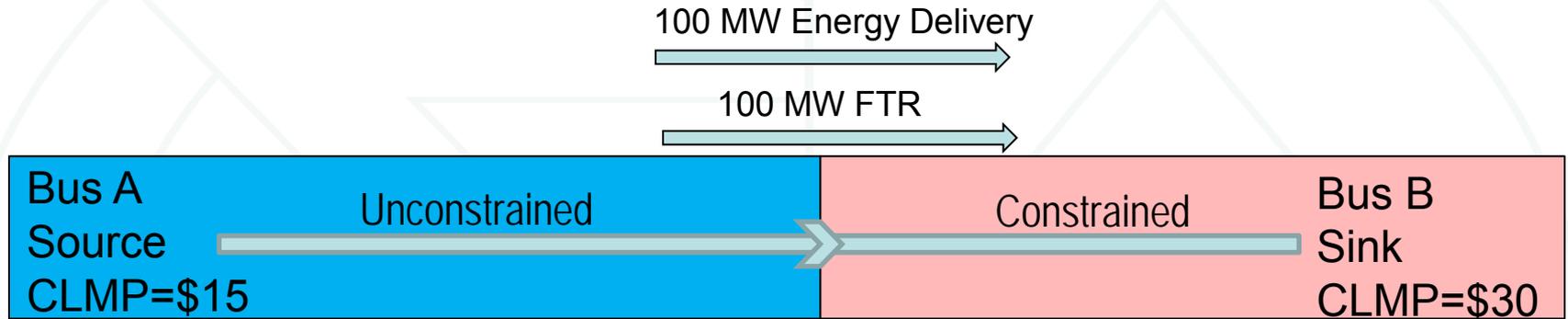


Monitoring Analytics

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_{Sink} – DA CLMP_{Source})**

FTR Example



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

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

Net = TA – Charge = $\$1,500 - \$1,500 = \$0$

FTR completely covers congestion cost

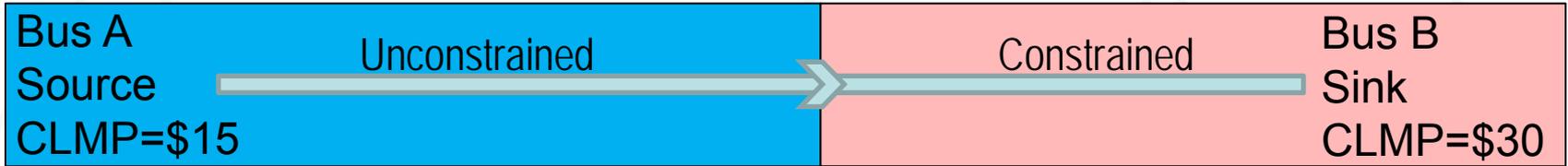
INC Offers/DEC Bids

- **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**

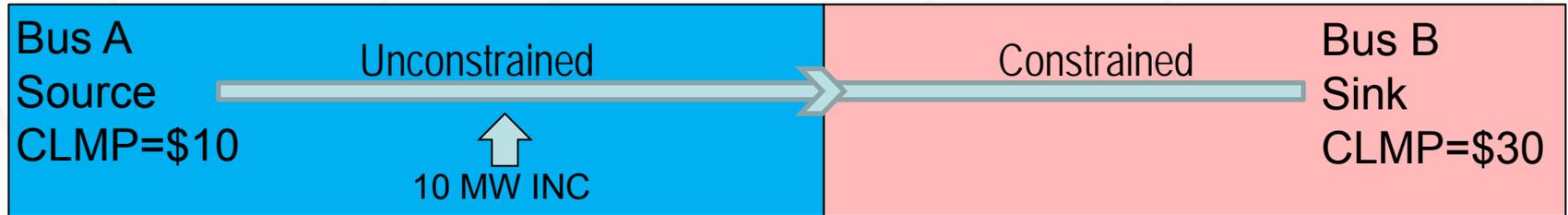
Violating FTR Forfeiture Rule for INCs/DECs

- 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



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

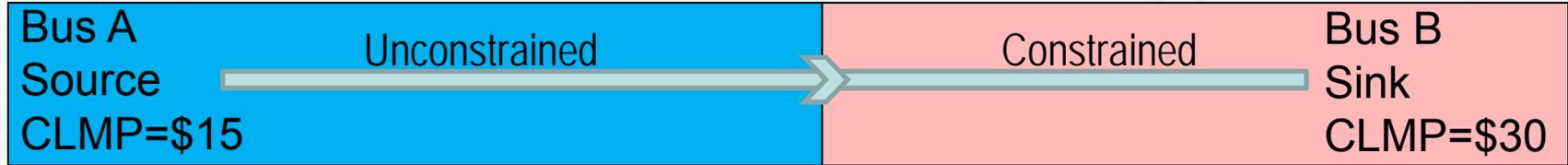


$$\text{Target Allocation} = 100\text{MW} * (\$30 - \$10) = \$2,000$$

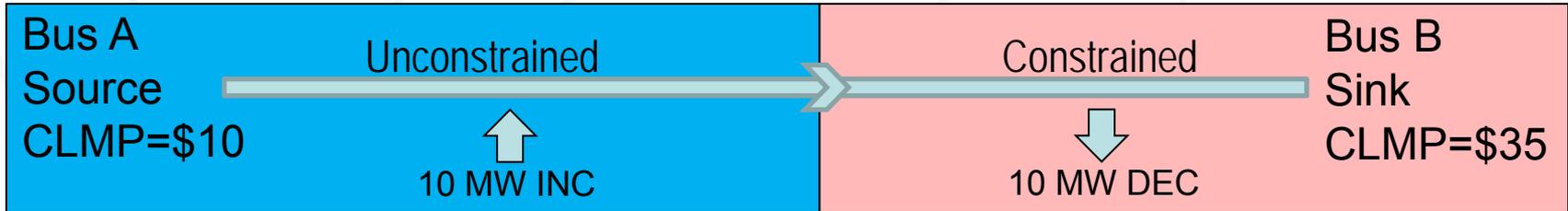
UTC Transactions

- **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



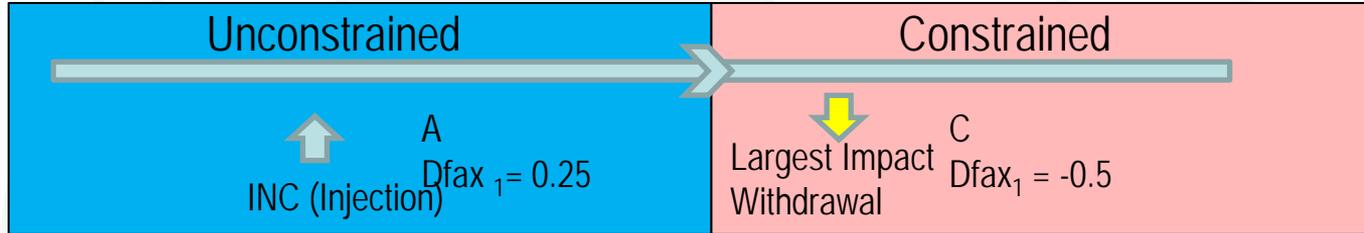
$$\text{Target Allocation} = 100\text{MW} * (\$30 - \$15) = \$1,500$$



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

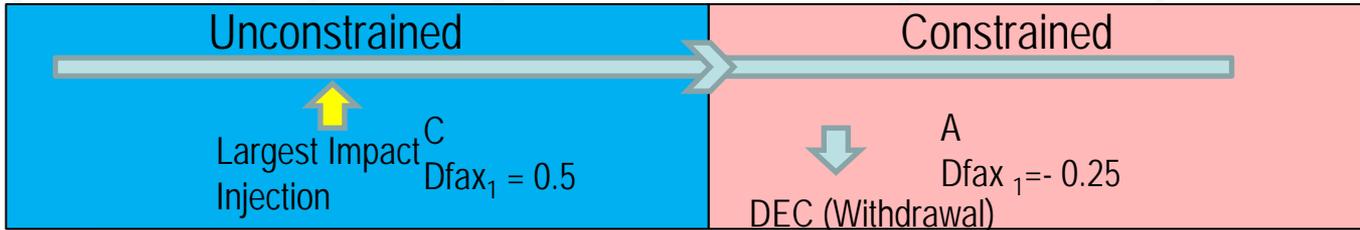
Violating FTR Forfeiture Rule

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 dfax_{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.)

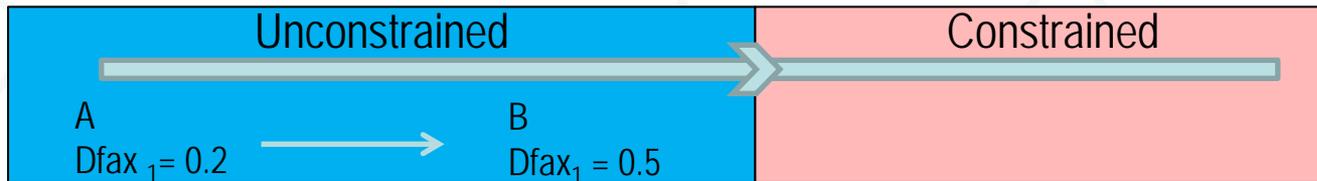
- **Include only UTCs that would increase congestion on a constraint**
 - **Consider shadow price of constraint**
 - **Consider net dfax of UTC pair**
- **Include UTC transactions under same conditions as INC/DEC rule; where:**
 - **$|\text{dfax}_{\text{max-withdrawal}} - \text{dfax}_{\text{net UTC Injection}}|$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

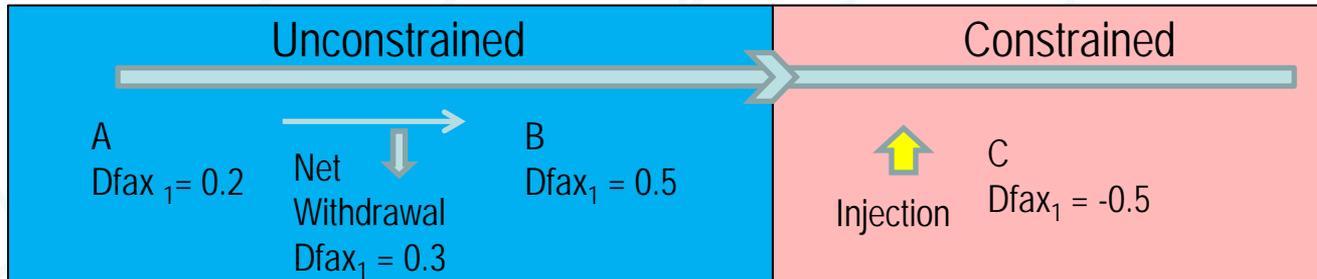
Current UTC FTR Forfeiture Example

PJM



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

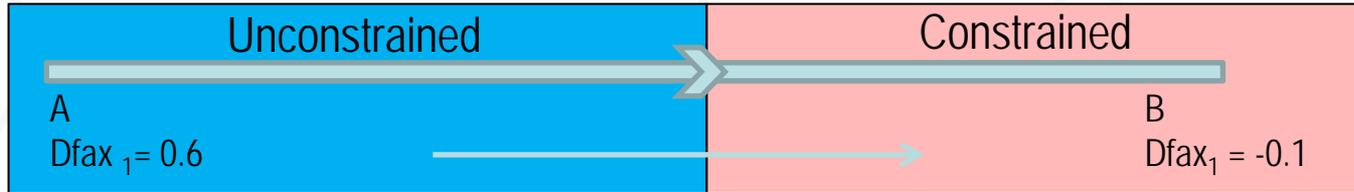
IMM



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

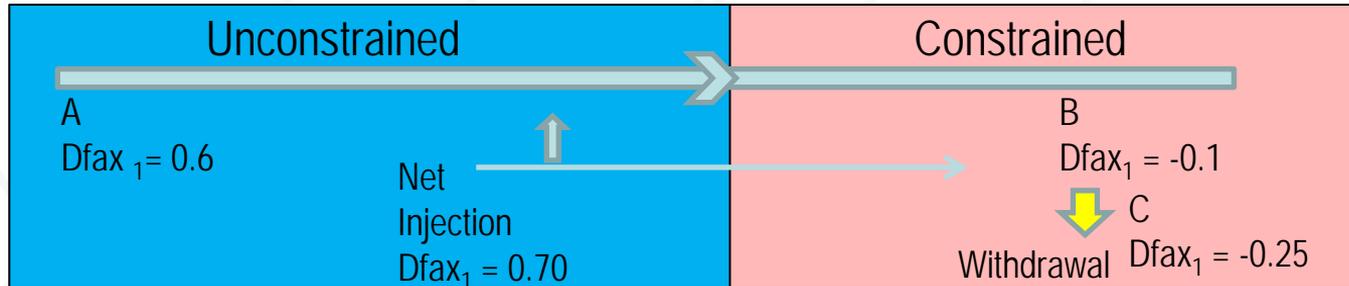
Current UTC FTR Forfeiture Example

PJM



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

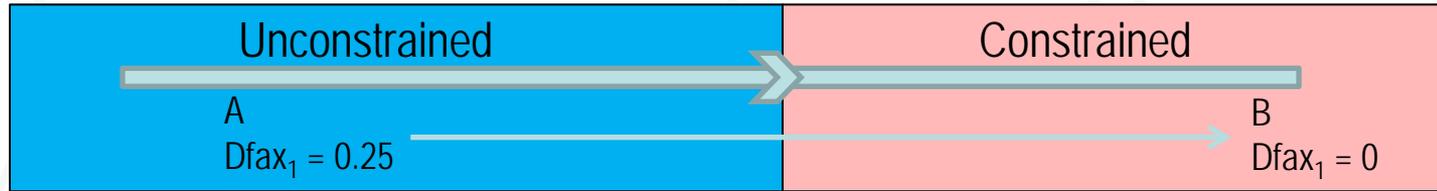
IMM



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

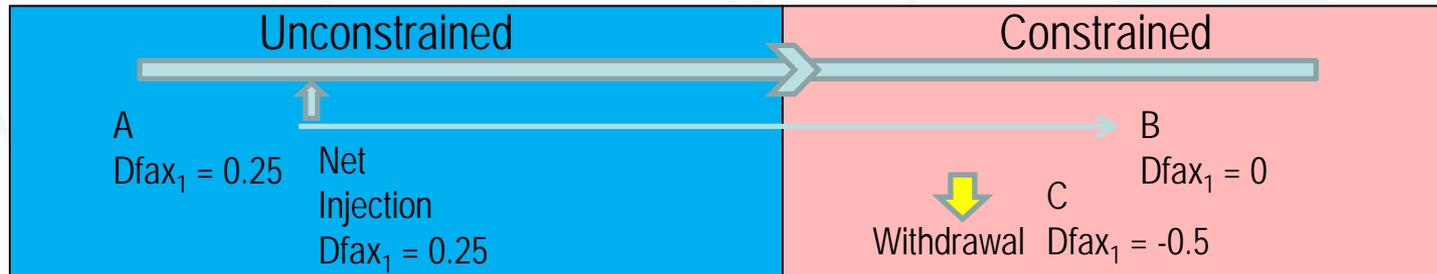
Current UTC FTR Forfeiture Example

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

Monitoring Analytics, LLC
2621 Van Buren Avenue
Suite 160
Eagleville, PA
19403
(610) 271-8050

MA@monitoringanalytics.com
www.MonitoringAnalytics.com

