FTR Education

FTR Forfeiture Education

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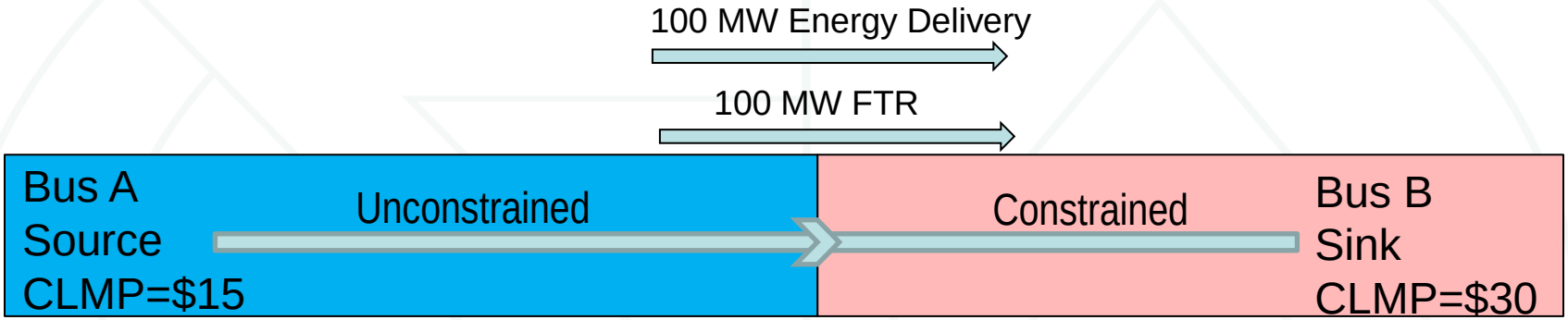
Monitoring Analytics

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 $CLMP_{Sink}$ – DA $CLMP_{Source}$)

FTR Example



Congestion Charge = 100MW * ($30-$15) = $1,500
Target Allocation = 100MW * ($30-$15) = $1,500

Net = TA – Charge = $1,500 - $1,500 = $0
FTR completely covers congestion cost

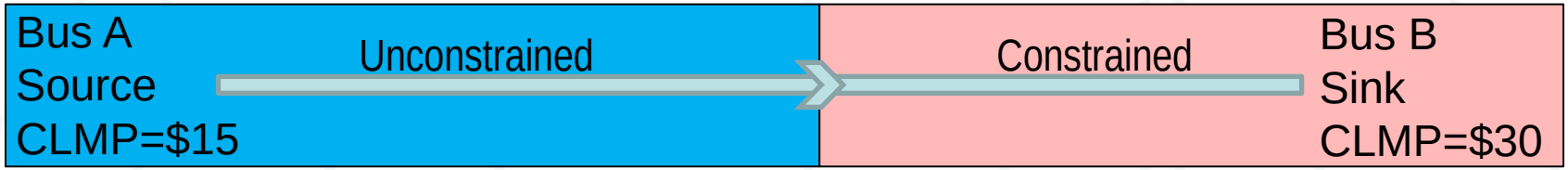
INC Offers/DEC Bids

- **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**

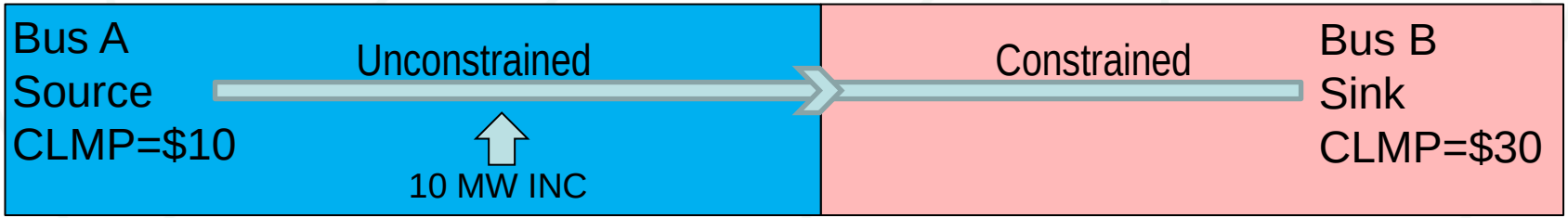
Violating FTR Forfeiture Rule for INCs/DECs

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

INC/DEC Impact on FTRs



Target Allocation = 100MW * ($30-$15) = $1,500

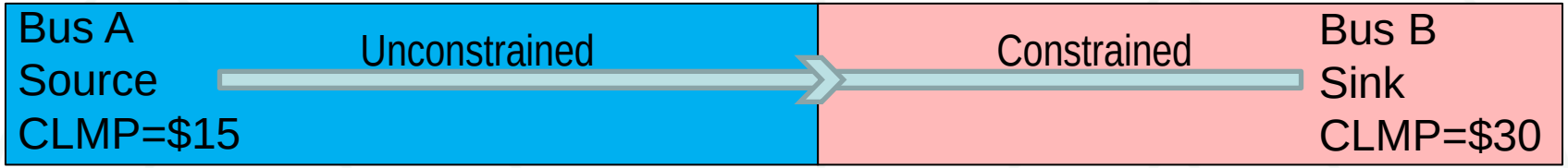


Target Allocation = 100MW * ($30-$10) = $2,000

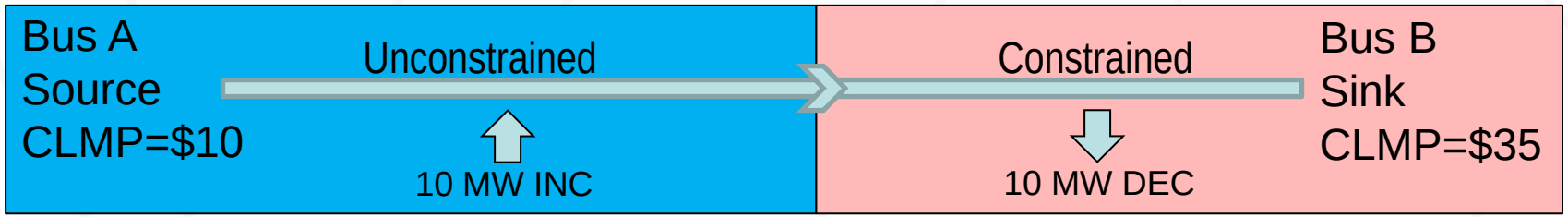
UTC Transactions

- **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 inection/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



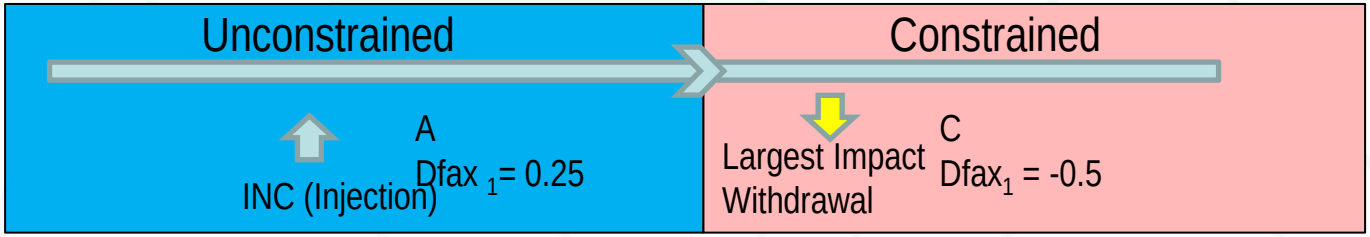
Target Allocation = 100MW * ($30-$15) = $1,500



Target Allocation = 100MW * ($35-$10) = $2,500

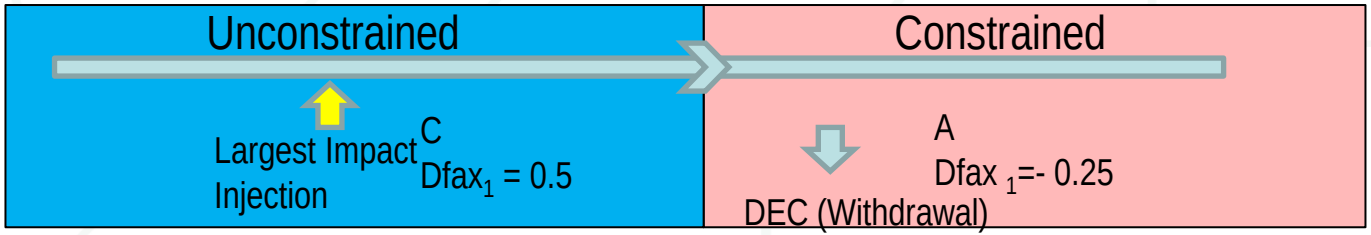
Violating FTR Forfeiture Rule

INC Offer



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

DEC bid



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

Violating FTR Forfeiture Rule for UTCs

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

Violating FTR Forfeiture Rule for UTCs

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

FTR Forfeitures for UTCs (cont.)

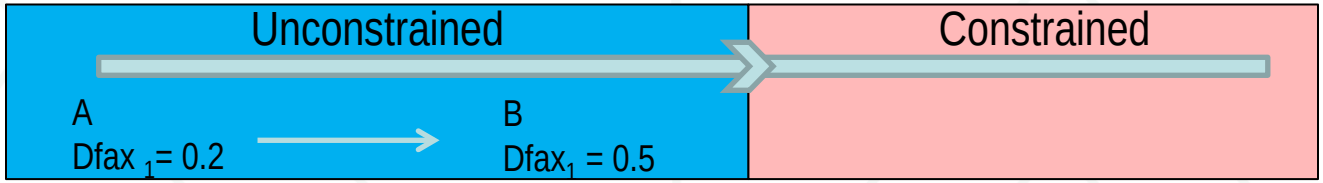
- Include only UTCs that would increase congestion on a constraint
  - Consider shadow price of constraint
  - Consider net dfax of UTC pair
- Include UTC transactions under same conditions as INC/DEC rule; where:
  - $|dfax_{max\text{-}withdrawal} - dfax_{net\ UTC\ Injection}|$ or $|dfax_{min\text{-}withdrawal}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

UTC Forfeitures: PJM and IMM Differences

PJM Implementation	IMM Implementation
$Dfax_{net} = dfax_{source} – dfax_{sink}$	$Dfax_{net} = dfax_{larger} – dfax_{smaller}$
If $dfax_{net}$ >= 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 dfax to largest impact injection/withdrawal on that constraint

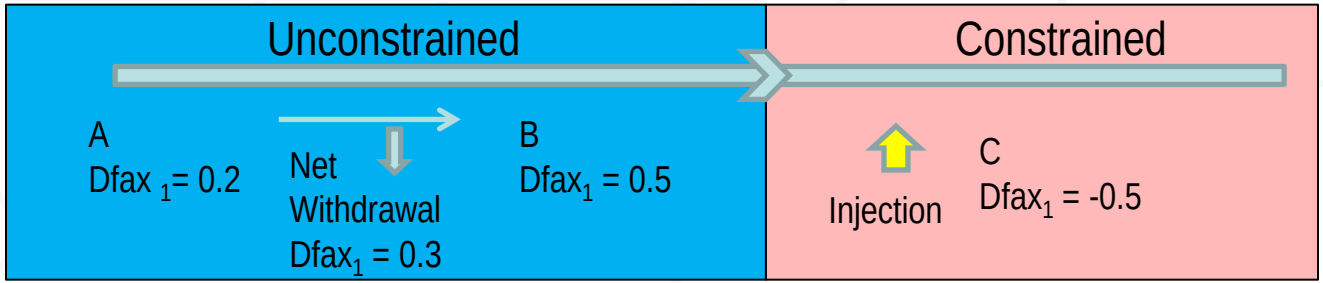
Current UTC FTR Forfeiture Example

PJM



PJM Dfax $\Delta_{75\%}$ = 0.2 – 0.5 = -0.3

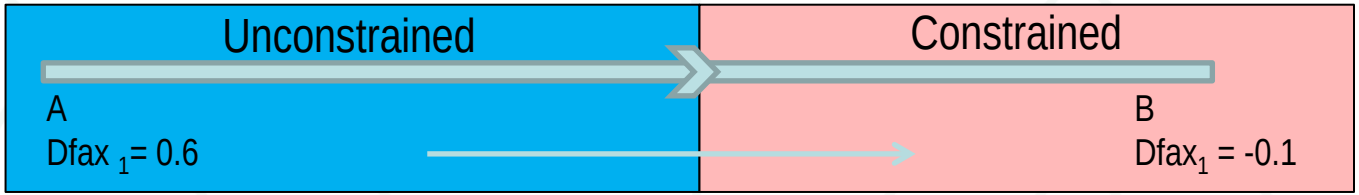
IMM



IMM Dfax $\Delta_{75\%}$ = |-0.5 – 0.3| = 0.8

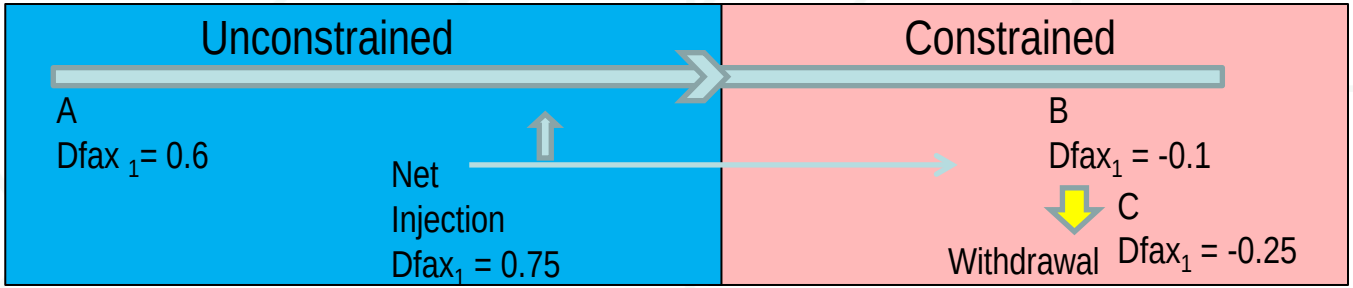
Current UTC FTR Forfeiture Example

PJM



PJM Dfax $\Delta_{75\%}$ = 0.6-(-0.1) = 0.70

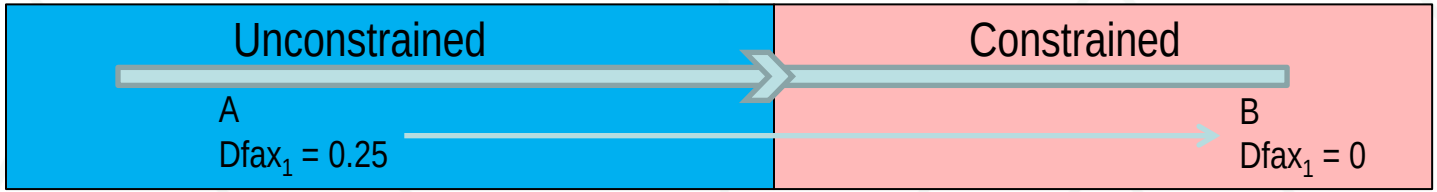
IMM



IMM Dfax $\Delta_{75\%}$ = |-0.25 – 0.70| = 0.95

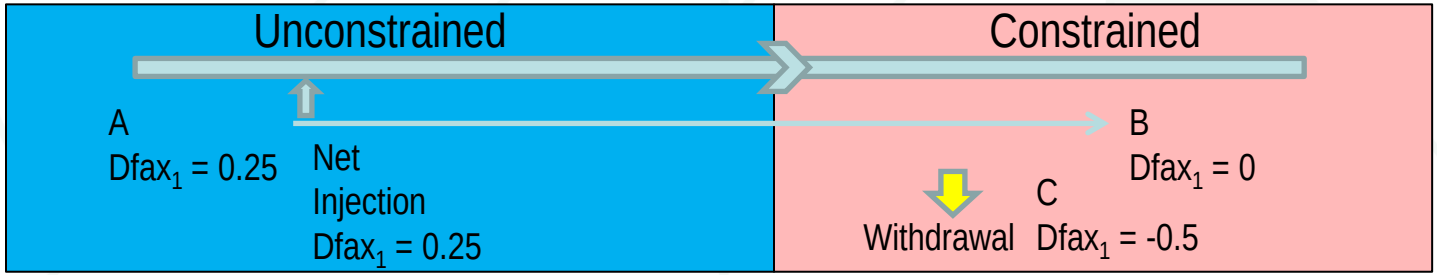
Current UTC FTR Forfeiture Example

PJM



PJM Dfax $\Delta_{75\%}$ = 0.25 - 0.0= 0.25

IMM



IMM Dfax $\Delta_{75\%}$ = |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%**
- **$|dfax_{source} – dfax_{sink}|$ >= 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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