US – MEXICO
Cross-border trade

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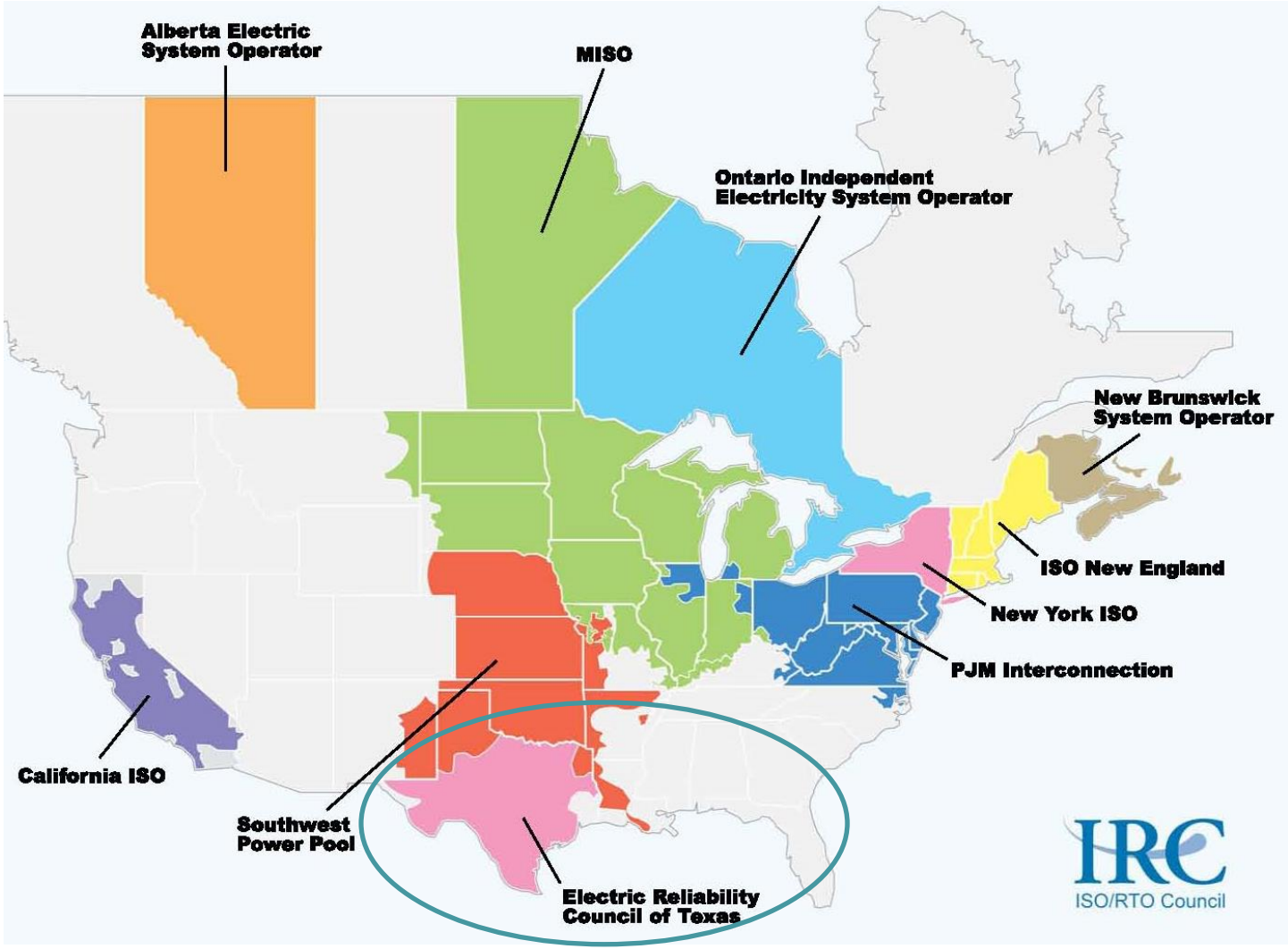
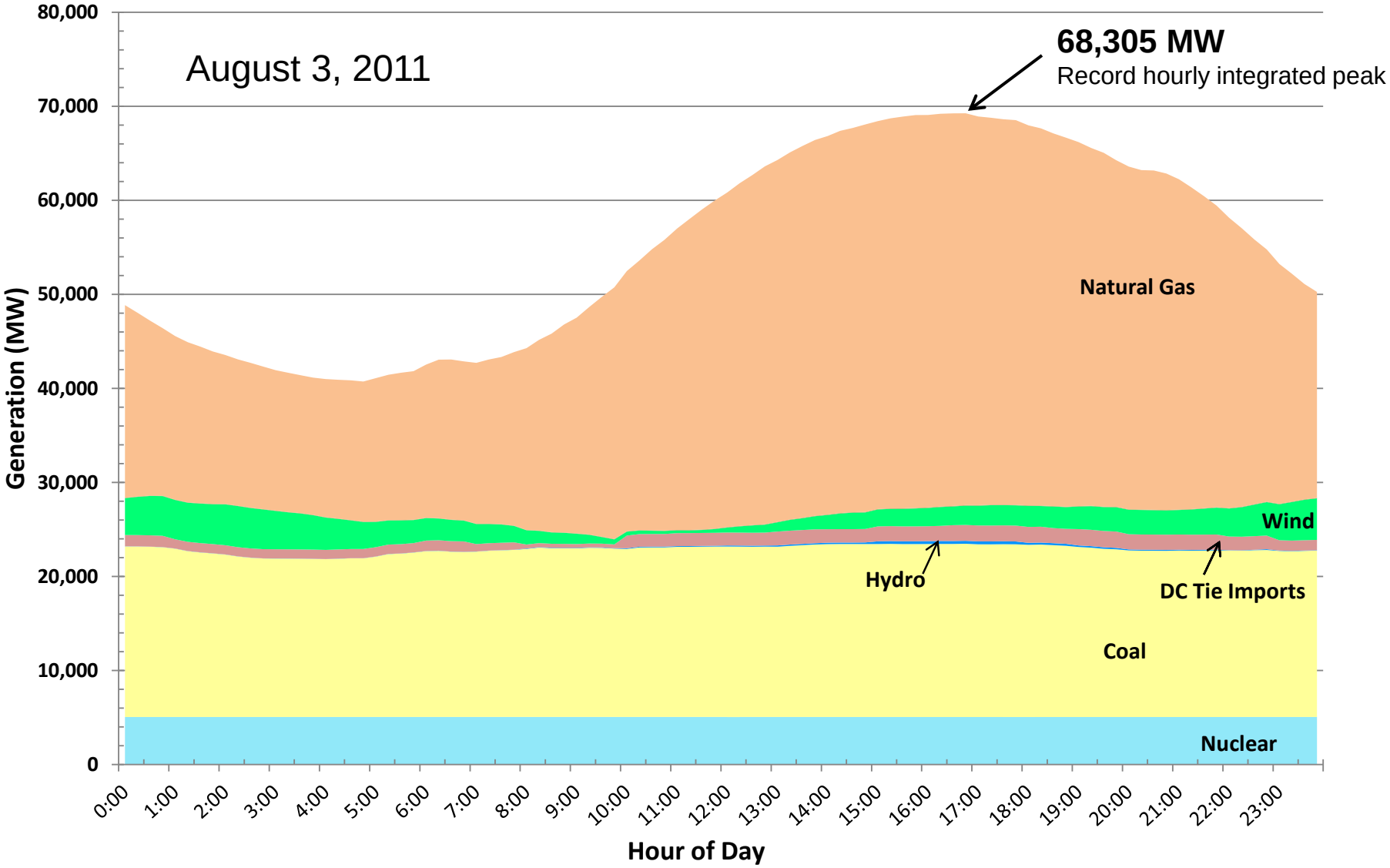
North American ISOs and RTOs

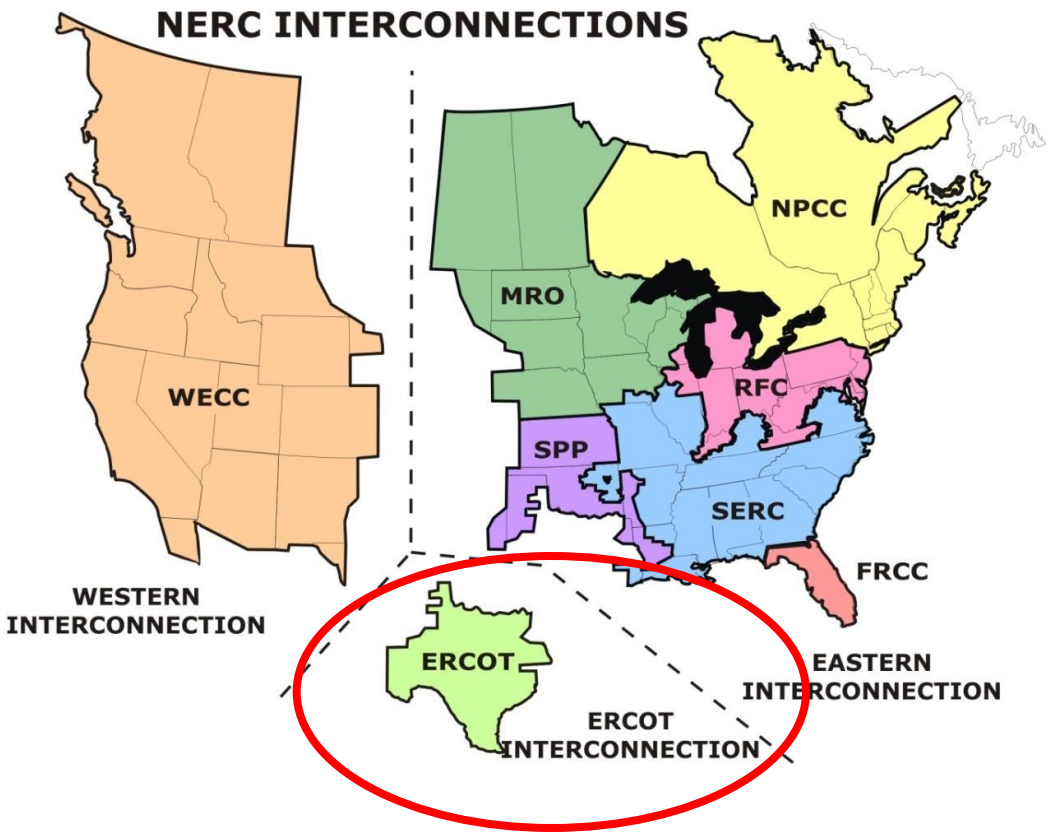
Independent System Operators and Regional Transmission Organizations are the 'air traffic controllers' of the bulk electric power grids



ERCOT's Peak Day Generation Fuel Mix



U.S./Canadian Bulk Power Grids



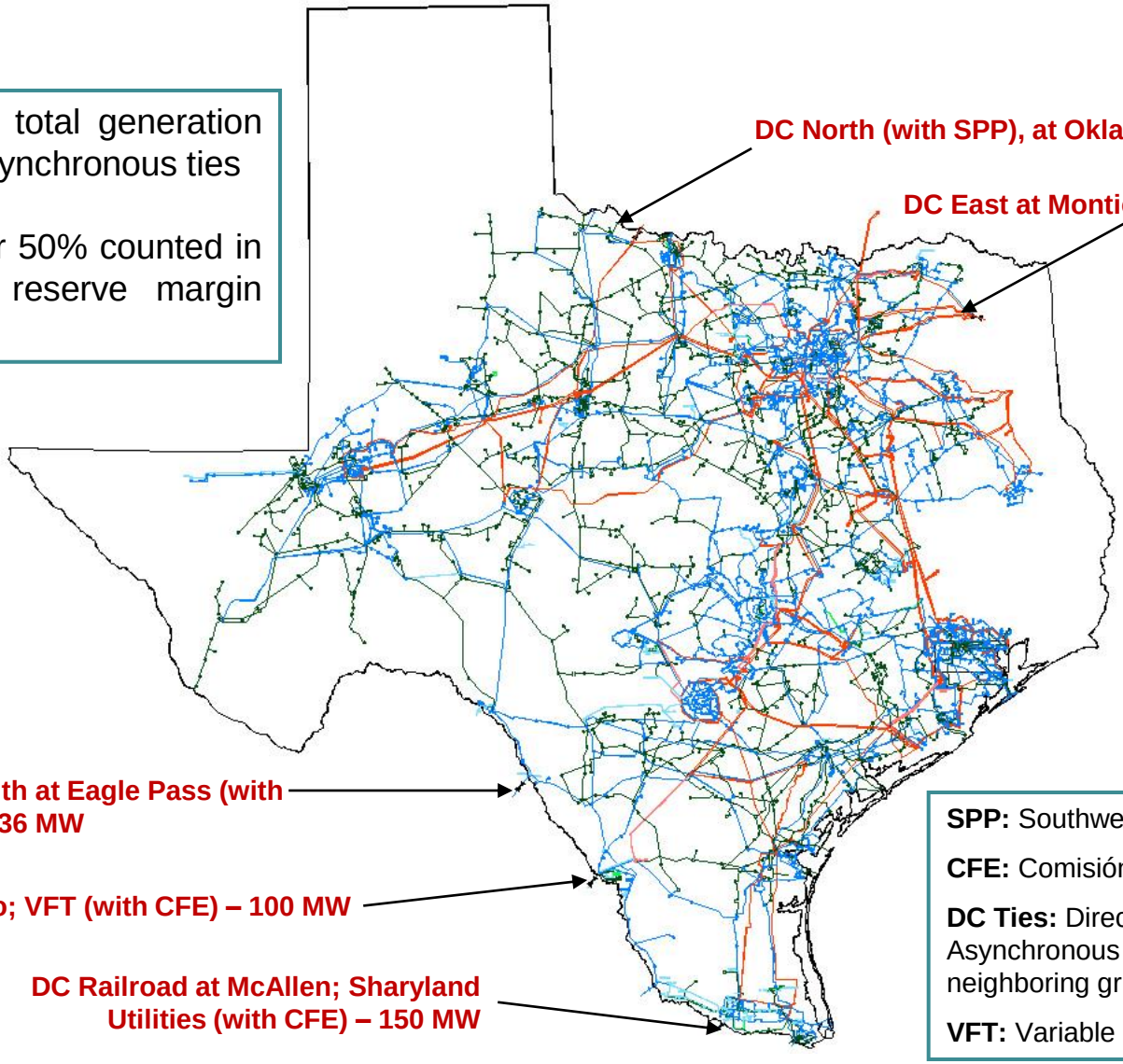
- The ERCOT Region is one of 3 grid interconnections in USA-Canada
- The ERCOT grid:
  - Covers 75% of Texas land
  - Serves 85% of Texas load
  - >40,000 miles of transmission lines
  - >550 generation units
  - Physical assets are owned by transmission providers and generators, including municipal utilities and cooperatives

ERCOT connections to other grids are limited to direct current (DC) ties, which allow control over flow of electricity

ERCOT Asynchronous Connections

1,106 MW total generation from non-synchronous ties

553 MW or 50% counted in summer reserve margin calculation



DC North (with SPP), at Oklaunion – 220 MW

DC East at Monticello (with SPP) – 600 MW

DC South at Eagle Pass (with CFE) – 36 MW

DC Laredo; VFT (with CFE) – 100 MW

DC Railroad at McAllen; Sharyland Utilities (with CFE) – 150 MW

SPP: Southwest Power Pool

CFE: Comisión Federal de Electricidad

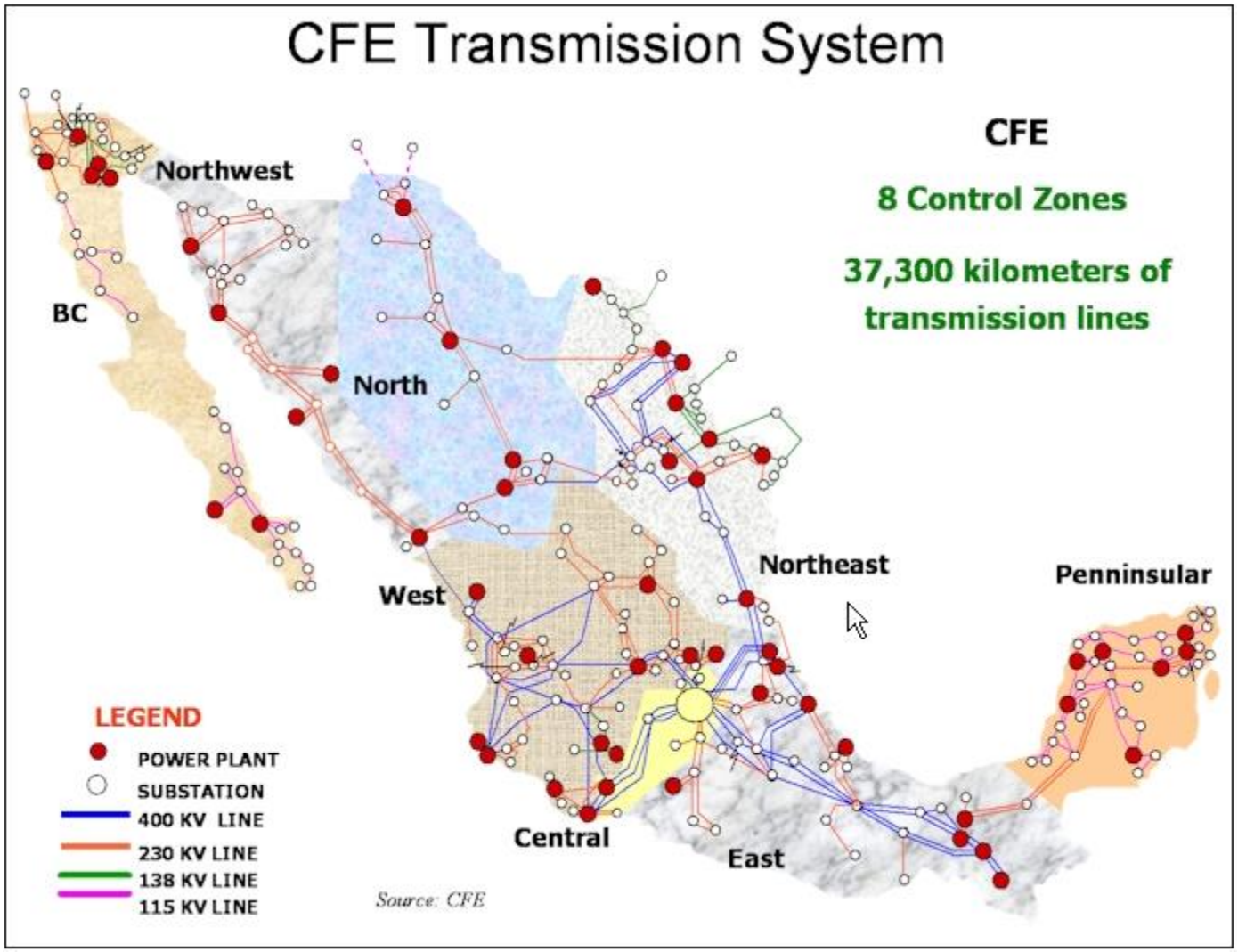
DC Ties: Direct Current ties – Asynchronous connections with neighboring grids

VFT: Variable Frequency Transformer

CFE DC Ties with ERCOT

- **36 MW at Eagle Pass DC Tie**
- **100 MW at Laredo Variable Frequency Transformer (VFT)**
- **150 MW at the Railroad-DC Tie (McAllen-SharyLand)**
  - Will expand to 300MW soon as originally designed

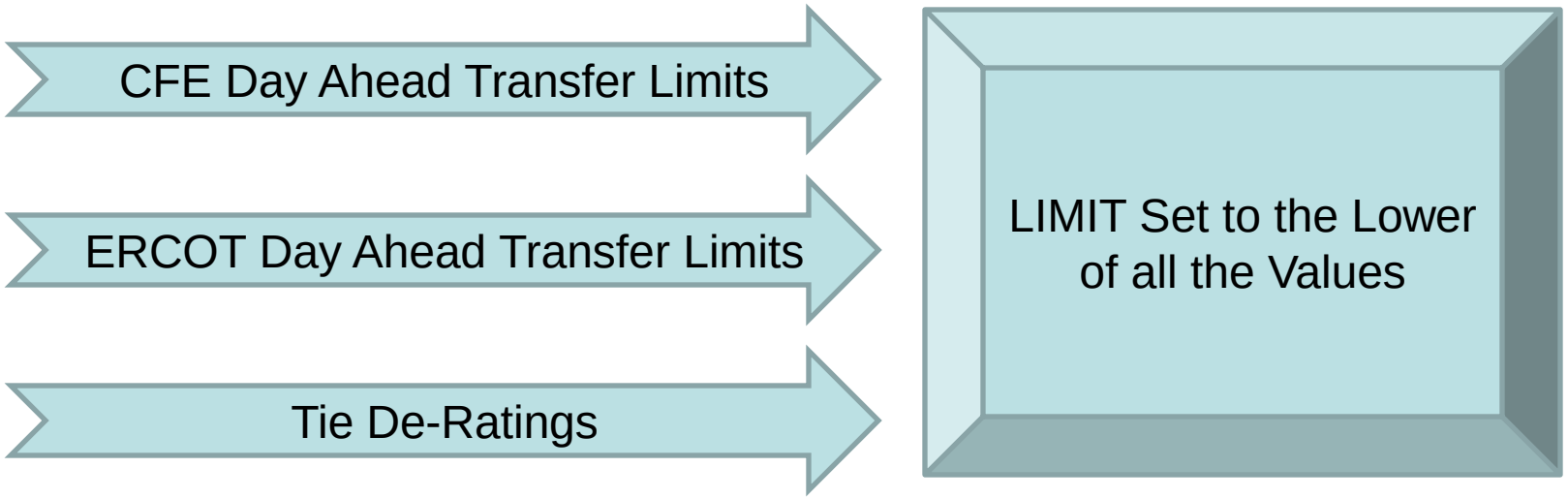
CFE system


CFE Transmission System
CFE
8 Control Zones
37,300 kilometers of transmission lines
Northwest
BC
North
West
Northeast
Penninsular
Central
East
LEGEND
POWER PLANT
SUBSTATION
400 KV LINE
230 KV LINE
138 KV LINE
115 KV LINE
Source: CFE

DC Tie benefits

- **DC Ties are asynchronous interconnections that work like a clutch**
  - Can precisely control the direction and flow of power
- **CFE benefits economically by importing low-cost power from the ERCOT region**
  - Efficient modern fleet with low-price gas as the marginal fuel
  - High penetration of wind energy
- **ERCOT gets reliability benefits by importing surplus CFE power when ERCOT reserves are low**
  - Complementary system load profiles: CFE system peaks in June; ERCOT not until August
  - For example, ERCOT benefitted from DC Tie imports during Energy Emergency Alerts in February and August, 2011

Day Ahead Operations – Limit Calculations



- **Limits are initially calculated Daily (can be changed to weekly, etc)**
- **CFE to provide ERCOT limits by 16:00**
- **Most constrained transfer limits will be made public and posted**
- **Limits will be recalculated in real-time based on system conditions as needed**

Schedule Curtailment Process

Modification of Operating Conditions

- Due to reliability issues, the limits for the DC-Ties Change

CFE/ERCOT

- CFE/ERCOT operator identifies the amount of Flow that needs to be curtailed on the DC-Tie. The Tie-Operator will indicate any operational de-ratings in the Tie to CFE and ERCOT

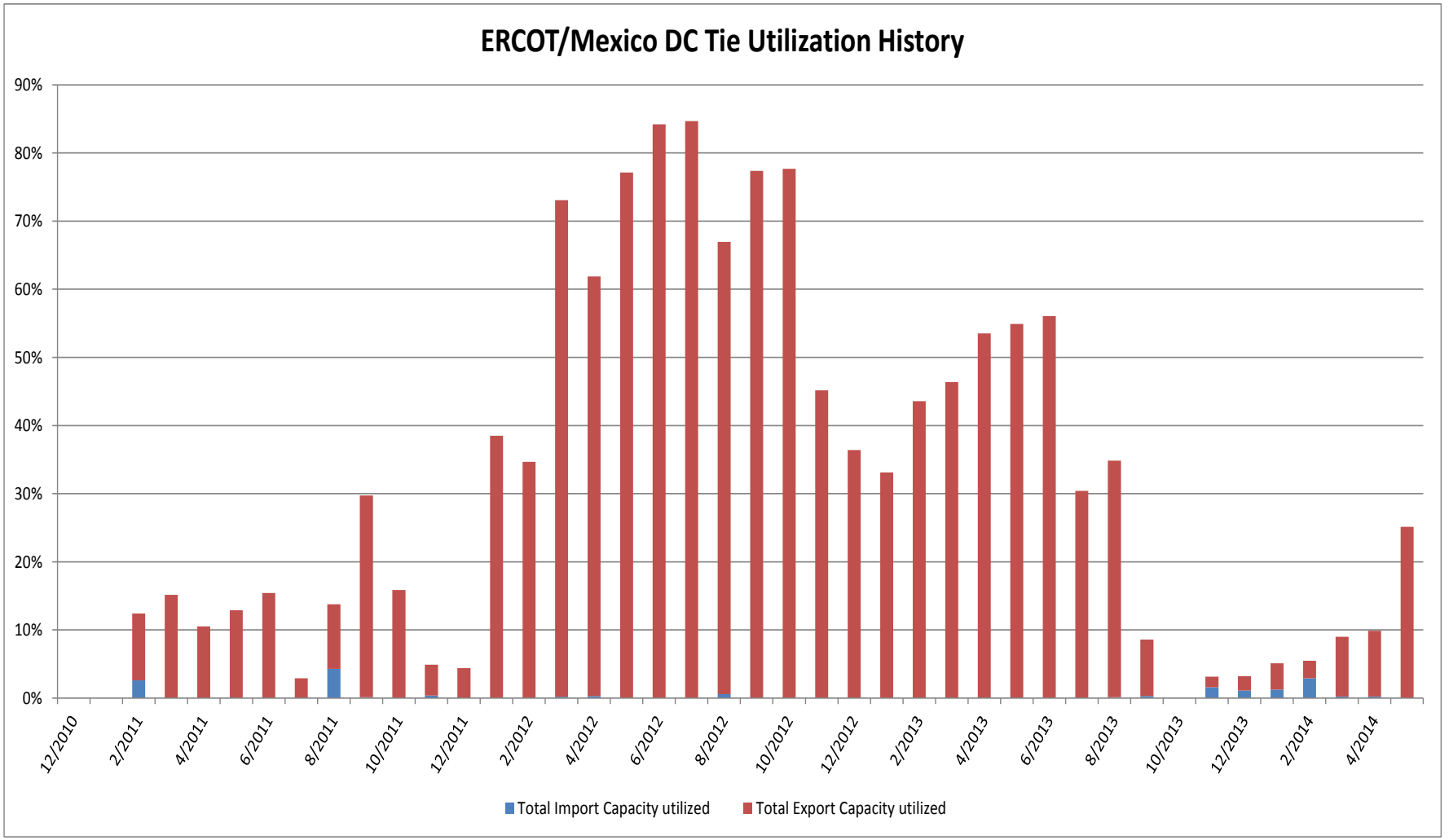
ERCOT Tie Operator

- ERCOT is notified of the curtailment via E-Tag.
- The Tie-Operator receives new instructions for net schedule interchange from CFE
- The DC-Tie flow is properly adjusted to the new limit

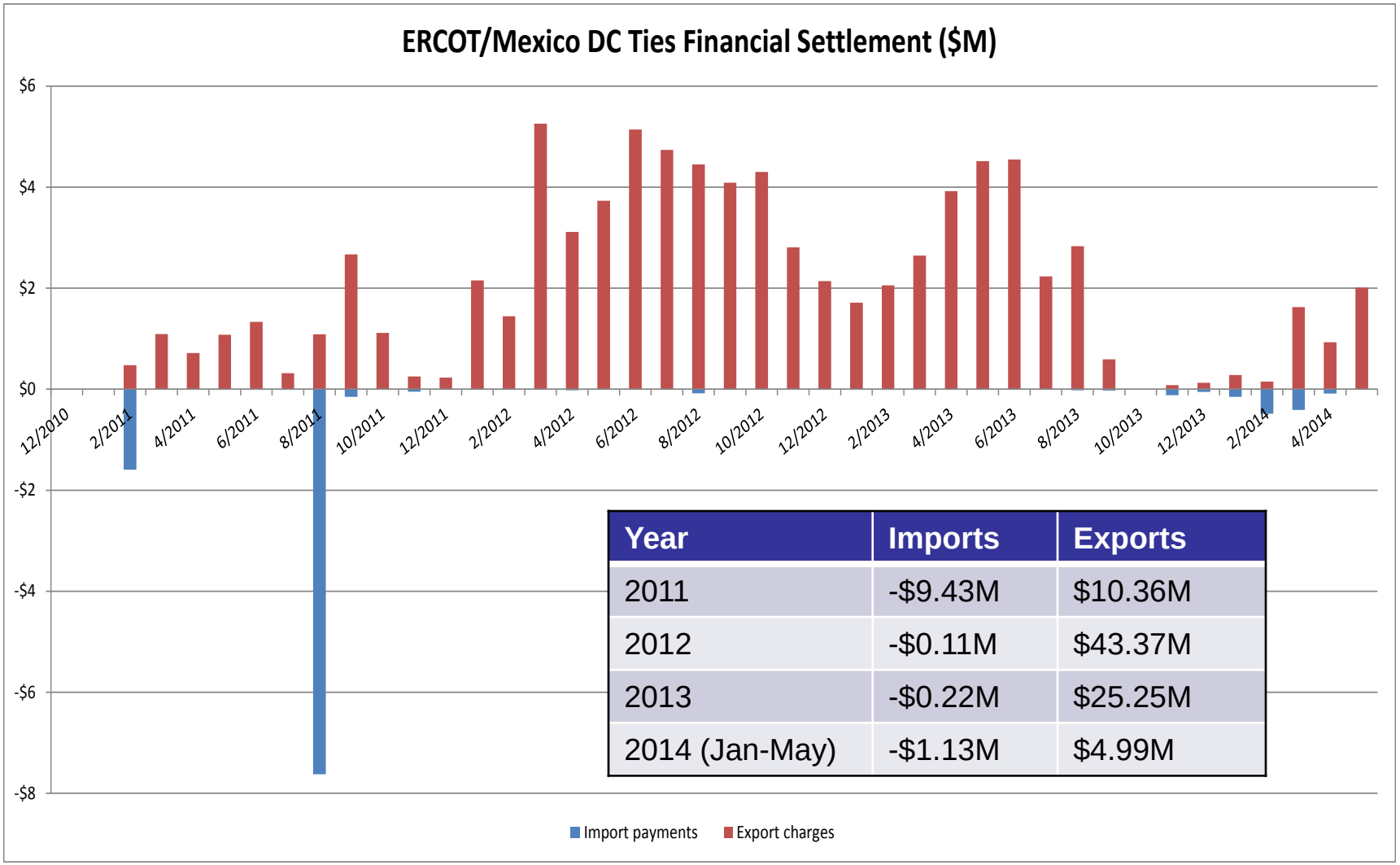
DC Tie Settlements

- **Exports and imports are scheduled by Qualified Scheduling Entities (QSEs)**
- **Exports are treated like additional real-time adjusted metered Load on the system**
  - Exporting QSE is subject to all other charges incurred by load-serving QSEs, including:
    - Ancillary Services
    - ERCOT Administrative Fee
- **Imports are treated like wholesale generation**
  - Paid the Load Zone Settlement Point Price for the DC Tie
  - Imports during grid emergencies are settled differently than commercial imports

Export/Import Capacity Usage 12/10 – 4/14



Export/Import Payments 12/10 – 4/14



Year	Imports	Exports
2011	-$9.43M	$10.36M
2012	-$0.11M	$43.37M
2013	-$0.22M	$25.25M
2014 (Jan-May)	-$1.13M	$4.99M