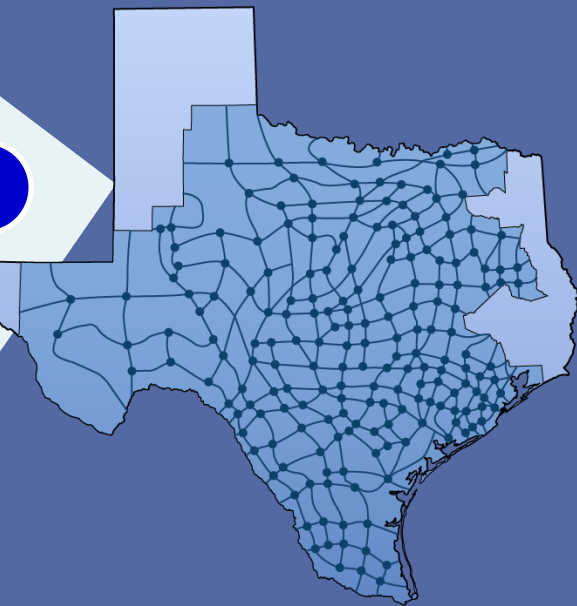
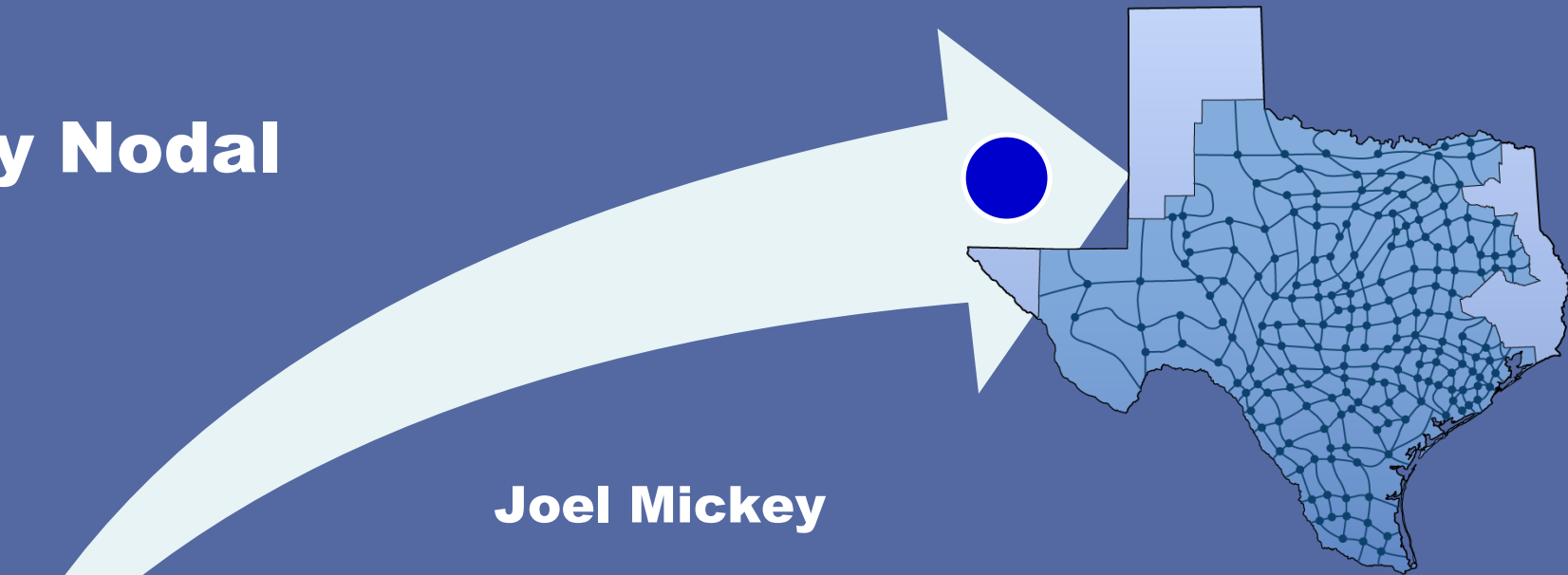
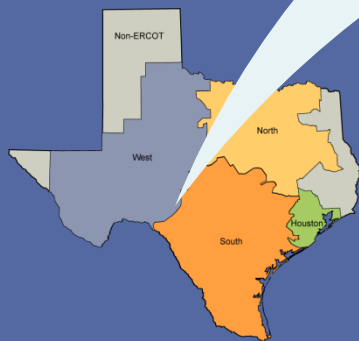




Why Nodal



Joel Mickey

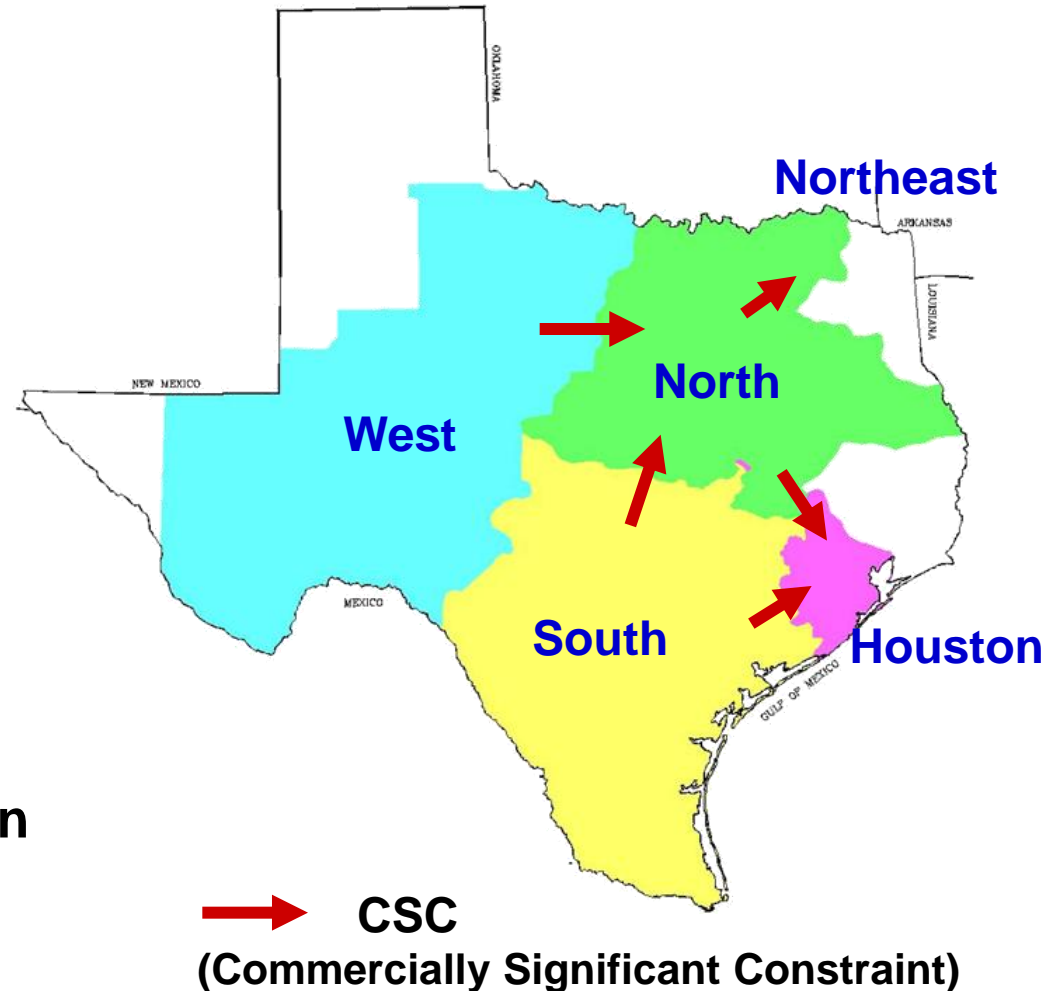
Director of Grid Operations

Sunset Review Commission

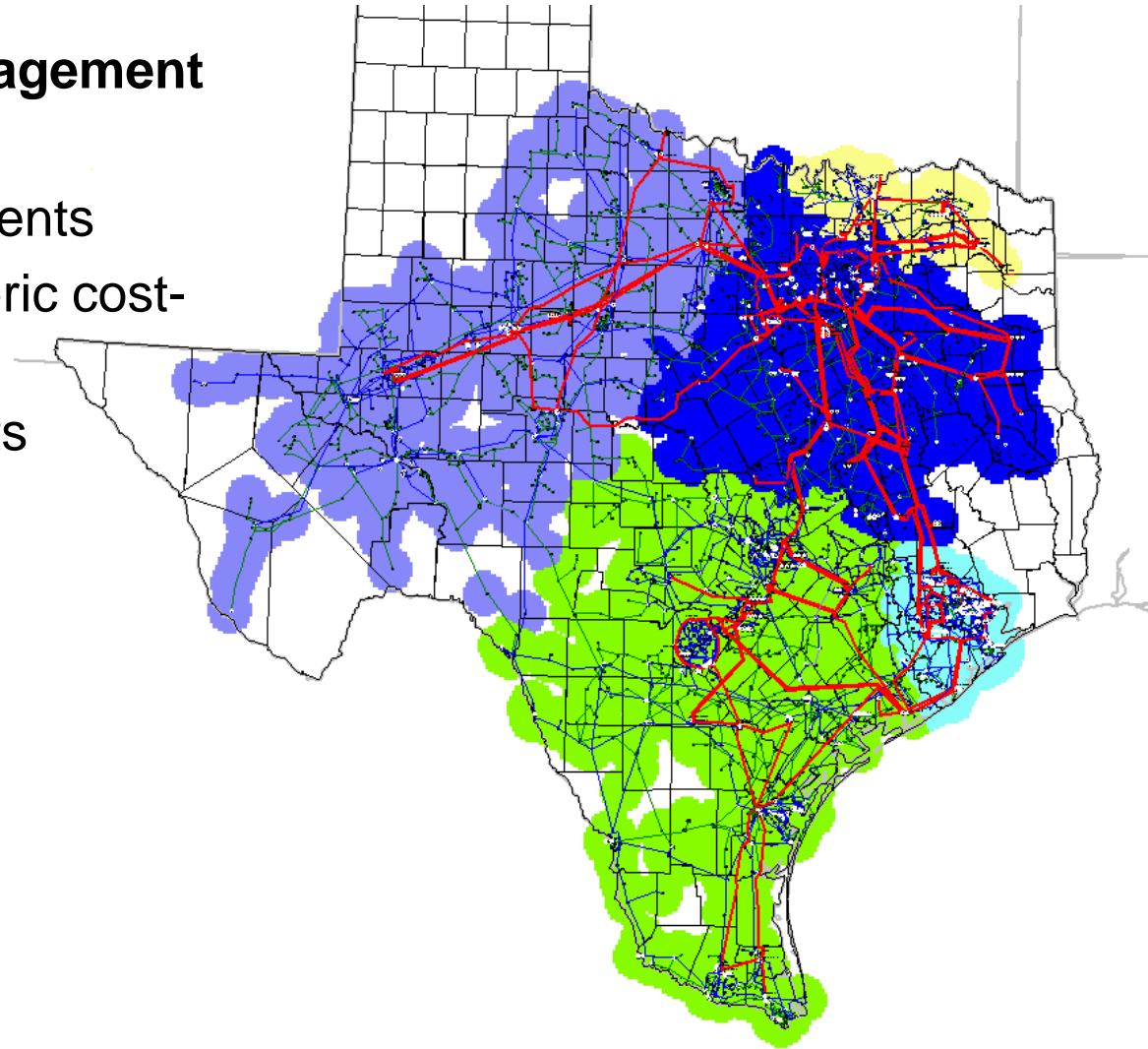
27 October 2009

Current ERCOT Market Model

- Zonal portfolio model
- Four wholesale pricing “nodes” (congestion zones)
- Five CSCs for inter-zonal congestion management
- Average shift factors within congestion zones
- Zonal portfolio schedule & bidding
- Zonal balancing energy deployed by ERCOT
- Zonal congestion costs directly assigned based upon cost causation



- **Local Congestion Management**
 - Unit-specific deployments
 - Mitigated offers (generic cost-based)
 - Local congestion costs uplift to all load



Zonal and Nodal's Differences

Zonal Model	Nodal Model
Great flexibility for market participants	More precise price signals
Simpler market model – only 5 prices and 5 CSCs	Directly assigned local congestion costs
It's easy for market participants to sign bilateral contracts	Mathematically, lower production costs

Improving the Zonal Model

Current Market Model	System Operation
Portfolio scheduling, bidding, deployment	Unit by unit, bus by bus, line by line
<ol style="list-style-type: none">1. It is a challenging task to manage local congestion as the system needs to disaggregate the portfolio schedules and deployments to the unit level.2. ERCOT must “guess” the response from zonal portfolio schedules and deployments to form baseline for local congestion management.	

Improving the Zonal Model

Current Market Model	System Operation
Model flow	Actual flow
Monthly Average Zonal Shift Factors to CSCs	Each unit has different Shift Factors to CSCs
<ol style="list-style-type: none">1. Big difference between calculated flow and actual flow.2. Discrepancy between expected flow impact and actual flow impact of a zonal dispatch.3. Inefficient dispatch: e.g. the result from 200 MW of zonal dispatch can be achieved by 100 MW of unit-specific dispatch.	

Improving the Zonal Model

Current Market Model	System Operation
Limits set for calculated flow in the market model	Physical limit: actual limit for a constraint in the real system
Due to the difference between calculated flow and physical flow, operators have to set limits to control calculated flow so as to mimic the effect of physical limit on physical flow.	

Improving the Zonal Model

Current Market Model	System Operation
Portfolio + Unit-specific Ramp Rate	Unit-specific physical Ramp Rate
<ol style="list-style-type: none">1. There may be inconsistency between portfolio ramp rate and unit-specific ramp rate.2. It is difficult to consider unit-specific ramp rate in a zonal portfolio model. Current ERCOT system does not respect unit-specific ramp rate in market clearing (but we do in OOME).	

Improving the Zonal Model

Current Market Model: Local Congestion Management	System Operation
Local congestion costs are uplifted to all load.	Market participants do not have incentive to help resolve local congestion on their own initiative. The market heavily depends on operations to resolve local congestion.

ERCOT-Desired Changes to be Covered by Nodal

- 1. Utilize Resource-specific scheduling, bidding and deployment**
- 2. Utilize Resource-specific ramp rates in dispatch**
- 3. Utilize Resource-specific shift factors**
- 4. Issue dispatch instructions every five minutes**
- 5. Assign local congestion costs directly**
- 6. Develop financial incentives for participants to follow schedules and instructions**
- 7. Develop scheduling rules and/or market mechanisms to mitigate effects of block schedules**
- 8. Develop mechanism to ensure deliverability of Ancillary Services**

ERCOT Nodal: Change Summary

Zonal	Nodal
<ul style="list-style-type: none"> • Day-ahead market for AS capacity • No Day-ahead market for Energy 	<ul style="list-style-type: none"> • DAM co-optimizes Energy, AS and CRR.
<ul style="list-style-type: none"> • Local congestion uplifted 	<ul style="list-style-type: none"> • All local constraints enforced
<ul style="list-style-type: none"> • Day-Ahead and Hourly-Ahead Studies 	<ul style="list-style-type: none"> • DA and HA Reliability Unit Commitment
<ul style="list-style-type: none"> • Auctioned Transmission Congestion Rights (TCRs) 	<ul style="list-style-type: none"> • Auctioned Congestion Revenue Rights (CRRs)
<ul style="list-style-type: none"> • Portfolio -based Offers by Zone 	<ul style="list-style-type: none"> • Resources-specific Offers
<ul style="list-style-type: none"> • No Visual Bidding 	<ul style="list-style-type: none"> • Visual Bidding allowed
<ul style="list-style-type: none"> • Balancing Energy services every 15 minutes • Zonal congestion management by portfolio for • Commercially Significant Constraints (CSCs) • Resource specific deployment for local congestion 	<ul style="list-style-type: none"> • Dispatch at least every 5 minutes • All deployment and congestion management • will be resource-specific • Enhanced Local Frequency Control
<ul style="list-style-type: none"> • Zonal market clearing prices for balancing energy for generation and loads 	<ul style="list-style-type: none"> • Nodal Locational Marginal Pricing (LMP) for generation • Zonal weighted LMP for loads