The seal of the Public Utility Commission of Texas is a circular emblem. It features a central five-pointed star surrounded by a wreath of olive and oak branches. The words "PUBLIC UTILITY COMMISSION" are inscribed around the top inner edge, and "STATE OF TEXAS" is at the bottom. The entire seal is rendered in a light gray, semi-transparent style.

# **The ERCOT Wholesale Market**

*March 6, 2015*

*Chairman Donna L. Nelson*

*Public Utility Commission of Texas*

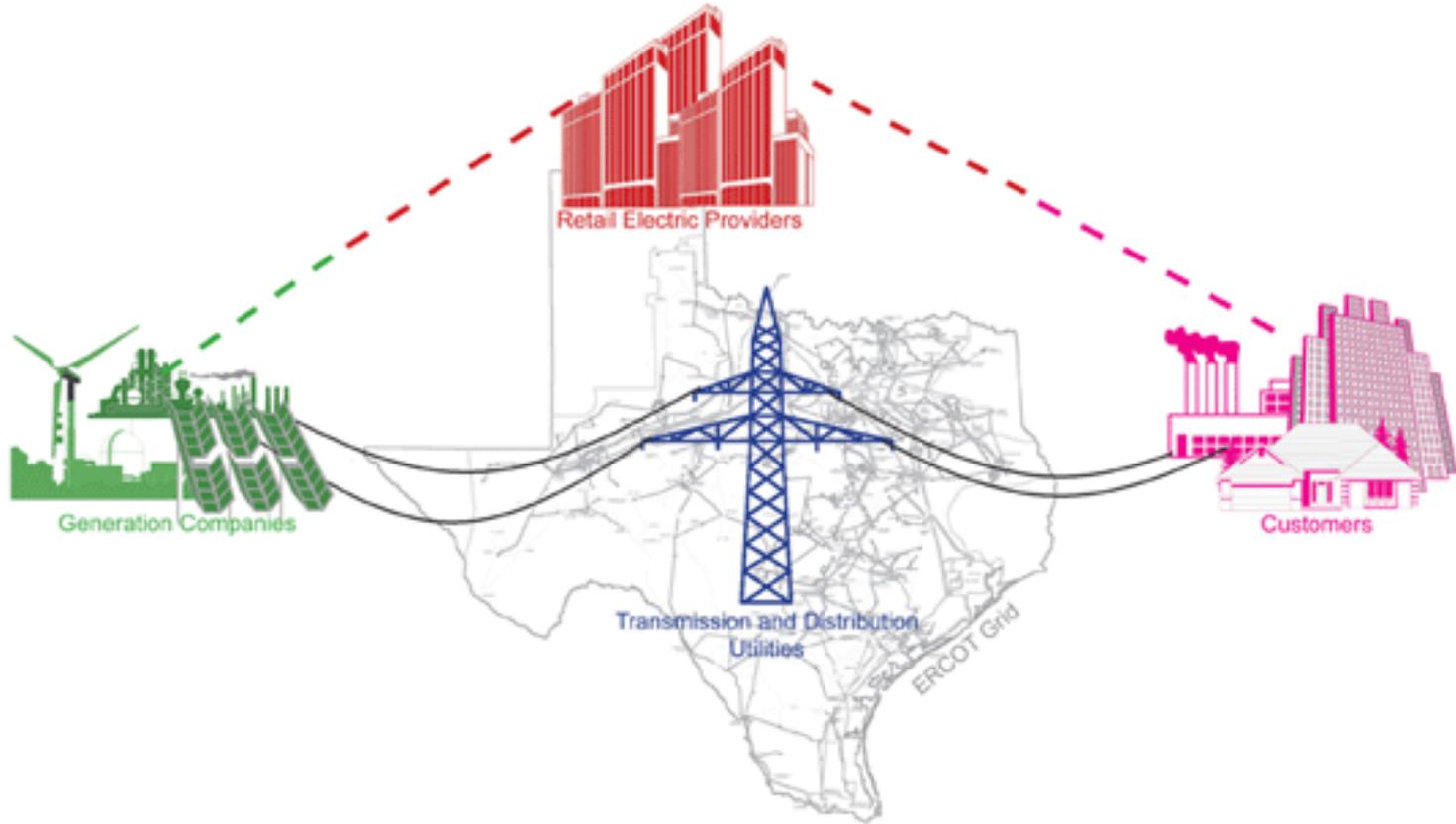
# ERCOT

ERCOT serves:

- **24 million** Texas customers
- **90 percent** of the state's electric load
- more than **43,000 miles** of transmission lines
- **550** generation units



# ERCOT



# ERCOT

## Who are the Players?

- Qualified Scheduling Entities (QSE)
- Load Serving Entities (LSE)
- Transmission Service Providers (TSP)
- Distribution Service Providers (DSP)
- Resource Entities

# ERCOT Wholesale Market

- Fully unbundled wholesale market
- ERCOT operates a single Balancing Area
- 5-Minute security constrained economic dispatch with day-ahead and ancillary services markets
- Generators are paid Locational Marginal Prices (LMPs) at node

# ERCOT

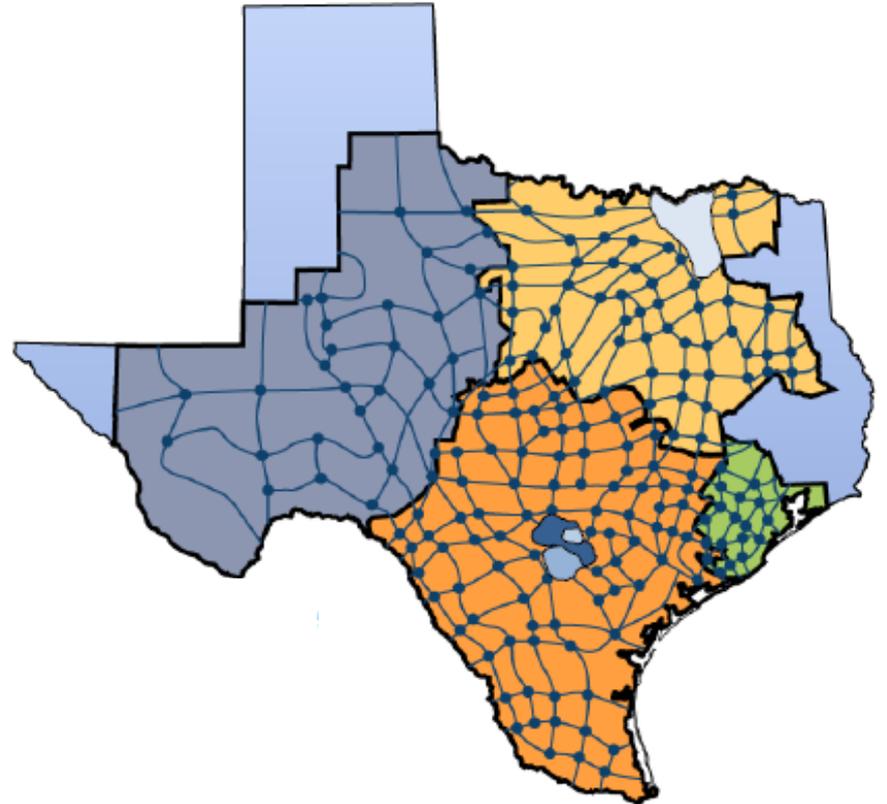
- Market participants bring generation on-line; ERCOT may start additional generation needed to maintain reliability
- Market participants submit offers for generation output
- ERCOT clears the market every five minutes, using the generation with the lowest bids to serve the load, subject to transmission constraints

# ERCOT

- Generators use price information to discern whether more or less generation output is needed in that area at that time
- In general, the set of generator output levels produced by this process is the lowest cost way that doesn't overload the transmission system to meet the system load for each five minute interval

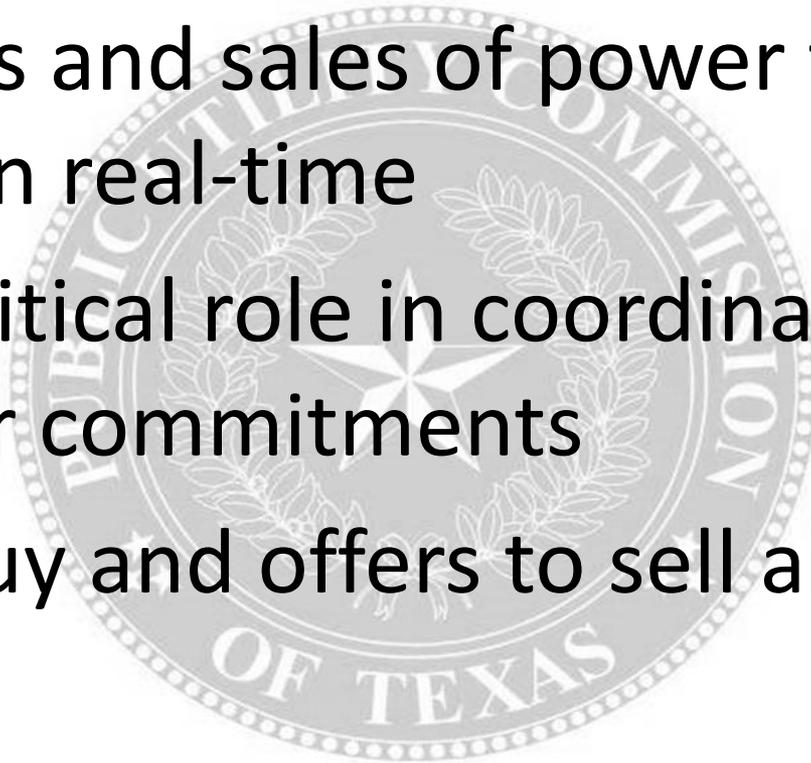
# ERCOT Wholesale Market

- Load-serving entities pay averaged load-zone price
- Load-zones
  - LZ\_North
  - LZ\_South
  - LZ\_Houston
  - LZ\_West
  - LZ\_AEN
  - LZ\_CPS
  - LZ\_RAYBN
  - LZ\_LCRA



# Day-Ahead Market

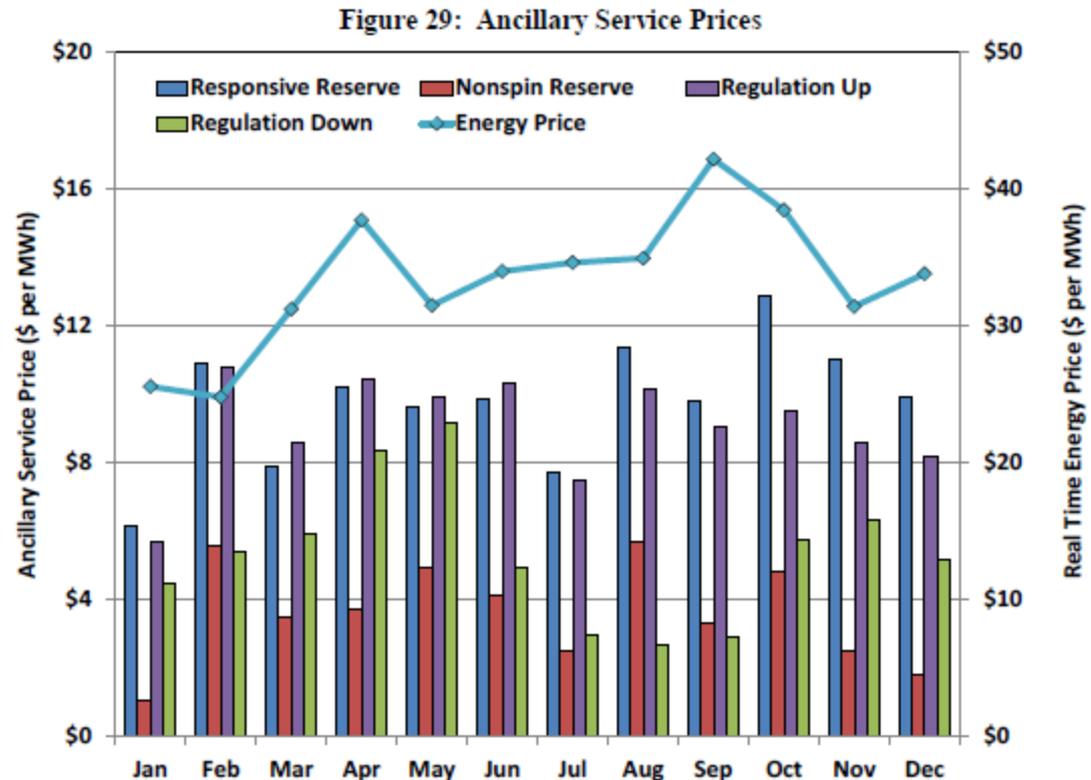
- Allows participants to make forward purchases and sales of power for delivery in real-time
- Plays a critical role in coordinating generator commitments
- Bids to buy and offers to sell are location specific



# Day-Ahead Market

Market participants sell ancillary services in the day-ahead market

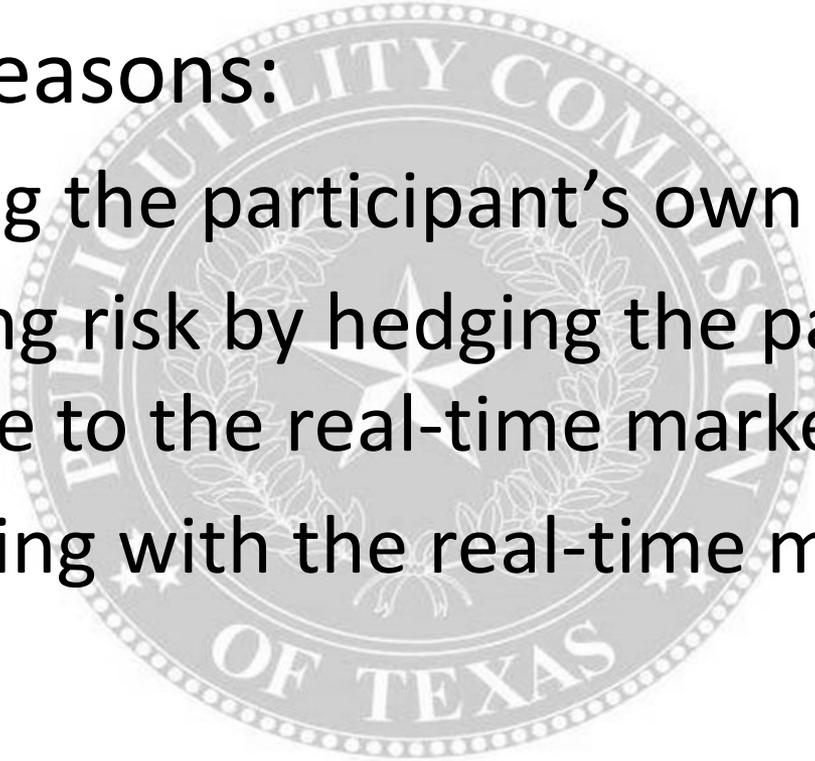
- Responsive Reserve
- Non-Spin Reserve
- Up Regulation
- Down Regulation



# Day-Ahead Market

Day-ahead transactions are made for a variety of reasons:

- satisfying the participant's own supply
- managing risk by hedging the participant's exposure to the real-time market
- arbitraging with the real-time markets



# Real-Time Market

- Resources are dispatched competitively based on Energy Offer Curve and system needs

The QSE that represents the resource provides Energy Offer Curve

- Loads are price takers and pay for all energy not previously arranged through a trade or the day-ahead market

# Real-Time Market

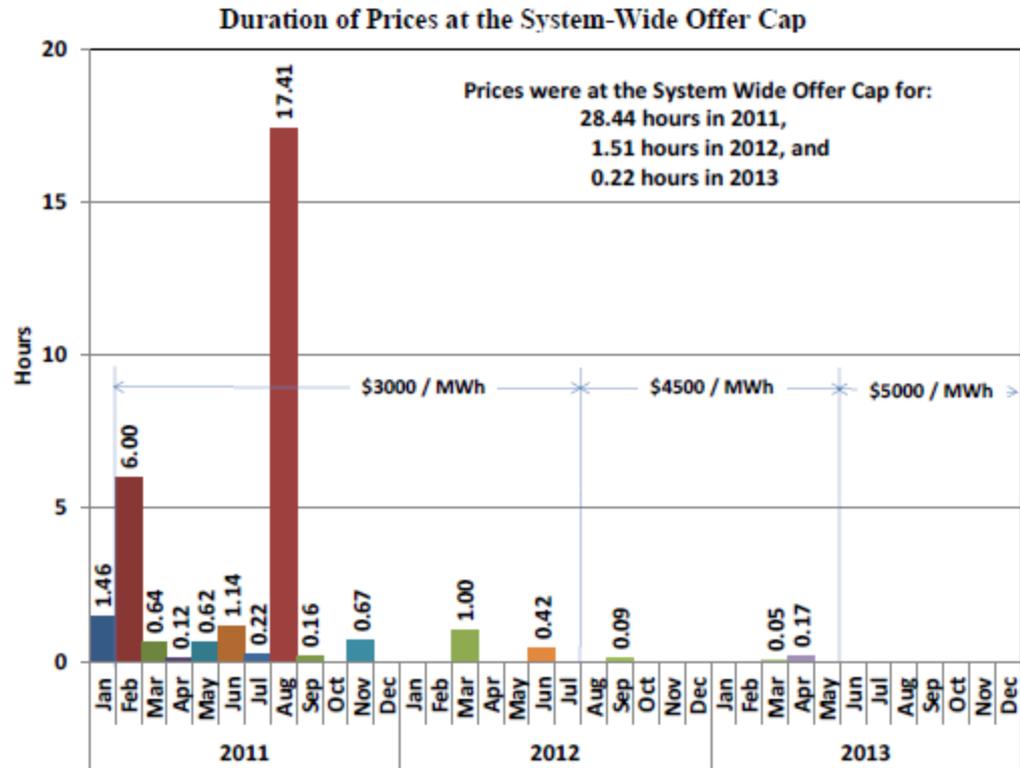
- Only a small share of the power produced in ERCOT is transacted in the spot market
- Prices in the real-time energy market set the expectations for prices in the forward markets

	Average Real-Time Electricity Price (\$ per MWh)			
	2010	2011	2012	2013
<b>ERCOT</b>	\$39.40	\$53.23	\$28.33	\$33.71
<b>Houston</b>	\$39.98	\$52.40	\$27.04	\$33.63
<b>North</b>	\$40.72	\$54.24	\$27.57	\$32.74
<b>South</b>	\$40.56	\$54.32	\$27.86	\$33.88
<b>West</b>	\$33.76	\$46.87	\$38.24	\$37.99
<b>Natural Gas (\$/MMBtu)</b>	\$4.34	\$3.94	\$2.71	\$3.70

# System-Wide Offer Cap

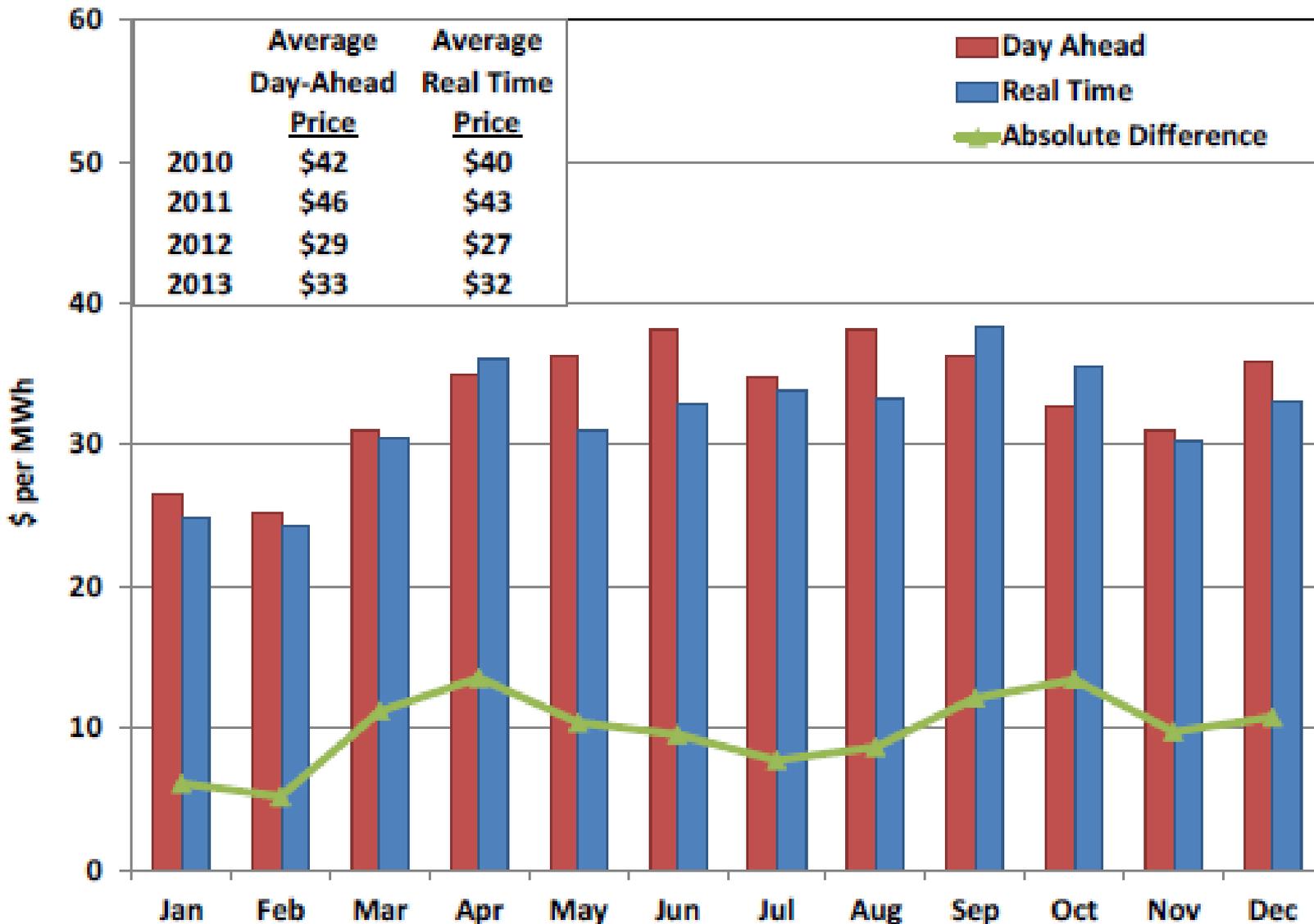
The system-wide offer cap reflects the value of electricity during scarcity

- \$5,000 as of June 2013
- \$7,000 as of June 2014
- \$9,000 as of June 2015



2013

### Convergence between Forward and Real-Time Energy Prices



# Congestion

- Congestion occurs when actual or scheduled flows of electricity over a line or piece of equipment are constrained below desired levels
- Congestion Revenue Rights (CRR) are financial instruments that result in a charge or a payment to the owner when the grid is congested in the day-ahead market
  - CRRs are used as a hedge or an investment

**Figure 45: CRR Auction Revenue, Payments and Congestion Rent**

