Congestion Revenue Rights
Agenda

Topics:

I. Background of Congestion Hedging (TCRs) in Zonal

II. Changes in Congestion Hedging (CRRs) in Nodal
   A. CRR Market Trial Events (timeline, activities)
   B. CRR Go-Live Events

III. Available Resources, Documentation, Sources
Objectives

Using the information in this presentation you will be able to:

• Identify differences between TCR and CRR markets
• Describe scheduled CRR Market Trial activities
• Describe go-live transition events
• Identify training opportunities
• Identify location of other CRR resources
At the end of this presentation you will be able to:

1. **Identify the differences between the TCR market and the CRR market.**
   1. While upside down.
   2. Underwater.
   3. On Neptune.

2. **Identify the training opportunities available for learning about CRRs.**
   1. While juggling 4 chainsaws.

3. **Recite from memory the scheduled CRR Market Trial activities.**
   1. Backwards.
   2. In Morse Code.

4. **Write a detailed 15 page essay discussing the go-live transition between the TCR market and the CRR market and its relation to world peace.**

5. **Identify the location of further CRR resources.**
   1. Then recreate them in their entirety.
   2. In Sanskrit.
Zonal Overview
### Key Differences

<table>
<thead>
<tr>
<th>Hedging Instruments</th>
<th>Zonal Market</th>
<th>Nodal Market</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Flowgate Rights (5)</td>
<td>• Point-to-Point Options (1000s)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Point-to-Point Obligations (1000s)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Possible Flowgate Rights</td>
</tr>
<tr>
<td>Hedging Approach</td>
<td>Complicated</td>
<td>More straight-forward</td>
</tr>
</tbody>
</table>

Transmission Congestion Rights

- TCRs have been active in ERCOT since 2002
- Annual/Monthly timetable
  - Allocated and Auctioned Annually
  - Auctioned Monthly
2009 Zonal Market: 5 CSCs

TCR – Flowgate Right that entitles you to the \textit{Shadow Price} of a CSC if it becomes binding.

\textbf{Shadow Price}

- How much \$ ERCOT would save in the balancing market if the CSC limit were 1MW higher.
Determine how much power flows on each CSC.

- Generator in North, Load in South, 100MW
- This contract is not hedged by 100MW North South
- Most power flows North South
  - Some power flows North West
  - Some power flows North East

Conclusion:
- Would need to buy some combination of North South, North West, North East to properly hedge that contract
Nodal Overview
Topics in this overview:

- Types of Congestion Revenue Rights
- Obtaining CRRs
  - Auctions
  - Allocations
Congestion Revenue Rights

Types of Congestion Revenue Rights

Point-to-Point (PTP) Congestion Revenue Rights
- Designated point of injection (source) and point of withdrawal (sink)
- Settlement price related to LMP diff. between Source & Sink
- If flowing power from source to sink causes power to go on a binding constraint, that constraint shadow price will affect clearing price/settlement price

Flowgate Rights
- No active flowgates to be implemented in Nodal
## Congestion Revenue Rights

### Types of PTP CRRs

<table>
<thead>
<tr>
<th></th>
<th>PTP Obligations</th>
<th>PTP Options</th>
</tr>
</thead>
</table>
| **Target Payment** | \[
\left( \frac{\text{MW}}{\text{Owned}} \right) \times \left( \frac{\text{Sink Price} - \text{Source Price}}{\text{Source Price}} \right)
\] | \[
\left( \frac{\text{MW}}{\text{Owned}} \right) \times \text{Max}(0, \frac{\text{Sink Price} - \text{Source Price}}{\text{Source Price}})
\] |
| **Clearing Price** | Can be negative | Only non-negative clearing price |
| **Credit Impact**  | Takes up more space in credit limit constraint in the CRR optimization | |
Congestion Revenue Rights

Primary Methods of Obtaining CRRs

<table>
<thead>
<tr>
<th>Auctions</th>
<th>Allocations</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Annually</td>
<td>• Annually</td>
</tr>
<tr>
<td>• Monthly</td>
<td>• Standard Monthly</td>
</tr>
<tr>
<td>• Balance of Year</td>
<td>• Special Monthly</td>
</tr>
<tr>
<td></td>
<td>• Balance of Year</td>
</tr>
</tbody>
</table>

Bilateral Trading:
CRR MPs can register bilateral trades in the CRR system
(after CRR Auction Payment confirmation)
## CRR Allocations for NOIEs only

<table>
<thead>
<tr>
<th></th>
<th>Period</th>
<th>Requires NOIE Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual Allocation</td>
<td>2 calendar years</td>
<td>Yes</td>
</tr>
<tr>
<td>Standard Monthly Allocation</td>
<td>1 month</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Allocate previously requested but not allocated amounts)</td>
</tr>
<tr>
<td>Special Monthly Allocation</td>
<td>1 month</td>
<td>Yes</td>
</tr>
<tr>
<td>Balance of Year Allocation</td>
<td>7 months (balance of year after 6 monthly auctions)</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Congestion Revenue Rights

Types of Allocated CRRs For NOIEs

- Baseload
  - For Solid Fuel & Combined Cycle units
- Capacity
  - For all other units
- Refund
Types of Allocated CRRs for NOIEs

**Baseload**
- Up to 100% of grandfathered contract/plant capacity
- Options cost 10%
- Obligations cost 5%

**Capacity**
- Limited to 40% of calendar year MW-hrs
- Options cost 15-20% depending on unit type
- Obligations cost 7.5-10%

**Refund**
- Settled at lesser of awarded qty. or CRR/output schedule
- Purchase price = $0
- Not tradeable in CRR Auctions
Example of matching CRR with a contract

- Generator = Big Coal, Load/delivery point in South Load Zone (LZ_South), 100MW

- This contract is hedged by 100MW Source = Big Coal, Sink = LZ_South (PtPObligation/Option CRR)

- Hedging contracts is conceptually simpler with CRRs than TCRs
## Congestion Revenue Rights (CRR) Auctions

<table>
<thead>
<tr>
<th>Auction Type</th>
<th>Period</th>
<th>Network Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual Auction</td>
<td>2 calendar years</td>
<td>55% of capacity for year 1, 15% for year 2</td>
</tr>
<tr>
<td>Monthly Auction</td>
<td>1 month</td>
<td>90% capacity</td>
</tr>
<tr>
<td>Balance * of Year Auction</td>
<td>7 months (balance of year after 6 monthly auctions)</td>
<td>55% capacity</td>
</tr>
</tbody>
</table>

*Occurs *once*, several months after Nodal Go-Live
Network Capacity if no PCRRs:

- Basically the line rating in the model is “reduced" to the percent being auctioned.
- So for 100MVA line,
  - 15 auctioned off two years into future
  - Up to 55 available in annual (less the sales of up to 15 from previous auction), and
  - Up to 90 available in the monthly (less the previous sold qty of up to 55 in previous auctions)

Note that previous sales/allocations can be offered in by other CRRAHs.
Congestion Revenue Rights

Network Capacity if PCRRs:
• Example, 180MVA line with 80 PCRRs allocated
• PCRRs get 100% of their allocation staged in as:
  • Annual auction-
    • Line is reduced to (assuming Year 1 of annual Auction) 0.55*180 = 99,
    • but .55*80 = 44 of the capacity is consumed by the PCRR,
    • So only 55 is up for sale
Congestion Revenue Rights

Network Capacity if PCRRs:

• Same example, 180MVA line with 80MVA PCRRs allocated
  • **Monthly auction**-
    • For monthly, ERCOT does not reduce the PCRR amount by the 90% scaling factor, so
      • Line is reduced to $0.90 \times 180 = 162$,
      • But $100\% \times 80 = 80$ of the capacity for PCRR
      • So only 82 is up for sale (Scaled capacity – PCRR)

Again noting that previous sales/allocations can be offered in by others
CRRs are allocated, traded or auctioned in:

- Time-of-Use Blocks (3)
- Sold in 1-month strips (ie monthly granularity)
- Linked bids respected in Annual Auction

*(single times of use for contiguous mos. within calendar year)*

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<thead>
<tr>
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<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Off-Peak (0100 – 0600)</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Peak Weekday (0700 – 2200)</td>
<td></td>
<td>Peak Weekend (0700-2200)</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Off-Peak (2300 – 2400)</td>
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</tbody>
</table>
CRRs are allocated, traded or auctioned in (continued):

- **Annual Auction** - 7x24 can be bid, but will be awarded in 3 time-of-use pieces (may be struck for different time-of-use amounts)
- **Monthly Auction** - same as annual for 7x24, but time-of-use will be the same quantity
- **Bilateral Trades**
  - Can occur at daily granularity, and will be time of use for the day (not individual hours),
  - Also subject to ERCOT credit check
III. Overview of System Implementation

A. CRR Market Trial Events
B. CRR Go-Live Events
## CRR Market Trials Events

### Market Trials Timeline
**October 8, 2009**

<table>
<thead>
<tr>
<th>2010</th>
<th>JAN</th>
<th>FEB</th>
<th>MAR</th>
<th>APR</th>
<th>MAY</th>
<th>JUN</th>
<th>JUL</th>
<th>AUG</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Begin CRR Auction &amp; Trading Activities</td>
<td>CRR Auction for March</td>
<td>Auction for April</td>
<td>Auction Multi-Month</td>
<td>Annual Auction</td>
<td>Auction for July</td>
<td>Auction for August</td>
<td>Auction for 168-Hr Test</td>
</tr>
</tbody>
</table>

### CRR Market
- CRR Connect / Qualify
- Post CRR Model

### Systems Cutover

**PROGRAM MILESTONES**
- Phase 3: Real-Time Markets
- Phase 4: DAM / RUC
- Phase 5: Full Functional Integration

**Auction for 168-Hour Test**
CRR Go-Live Events

- Nodal Go-Live

Auction Events

Allocation Events
CRR Go-Live Events

2010
OCT  NOV  DEC
Monthly Auction Bid Window

2011
JAN  FEB  MAR  APR  MAY  JUN  JUL

AUCTION EVENTS

Monthly Auction Notice
Monthly Auction Results

ALLOCATION EVENTS

Nominations for Special Monthly Allocation
CRR Go-Live Events

2010
OCT | NOV | DEC

Monthly Auction Bid Window

Monthly Auction Notice

Monthly Auction Results

2011
JAN | FEB | MAR | APR | MAY | JUN | JUL

Auction Events

Allocation Events

Nominations for Special Monthly Allocation
CRR Go-Live Events

2010
OCT | NOV | DEC | 2011
JAN | FEB | MAR | APR | MAY | JUN | JUL

- Monthly Auction Bid Window
- Monthly Auction Notice
- Monthly Auction Results

Auction Events

Allocation Events

Nominations for Special Monthly Allocation
CRR Go-Live Events

First 6 Monthly Auctions

Nominations for Special Monthly Allocation
In September 2011 ERCOT will execute first annual auction for 2012/2013.

- Steady State
  - Standard Monthly Auctions (thru end of year)
IV. Available Resources, Documentation, Sources
CRR Courses Offered by ERCOT

Congestion Revenue Rights Course

- Discussion of basic CRR and CRR Settlement Concepts
- Online and Classroom

CRR Market User Interface Training

- Takes user on a guided tour of all the CRR application screens
- Online

Both available via ERCOT LMS

Nodal Market Education Curriculum

- ERCOT Nodal 101
- ERCOT 101 for Wind Generation
- Economics of LMP
- Transition to Nodal Markets
- Basic Training Program
- Load Serving Entity 201
- Network Model Management
- *Congestion Revenue Rights*

- Transmission 101
- Generation 101
- Generation 201
- Generation 301
- Settlements 301
- NOIE QSE Operations

Nodal Market Education Website: [http://nodal.ercot.com/training/courses/index.html](http://nodal.ercot.com/training/courses/index.html)
Contact: [NodalTraining@ERCOT.com](mailto:NodalTraining@ERCOT.com)
Hands-On Settlements Workshops

- **Workshop 1**: *Congestion Revenue Rights Settlements*
- **Workshop 2**: Day-Ahead Market Settlements
- **Workshop 3**: Reliability Unit Commitment Settlements
- **Workshop 4**: Real-Time Settlements
## 2010 Workshops

<table>
<thead>
<tr>
<th>Workshop Type</th>
<th>Date(s)</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>RUC/RTM</td>
<td>February 23</td>
<td>Austin – MET Center</td>
</tr>
<tr>
<td>RUC/RTM</td>
<td>March 9</td>
<td>Garland - City of Garland Fire Administrator Building</td>
</tr>
<tr>
<td>Congestion Revenue Rights</td>
<td>March 9</td>
<td>Houston - Norris Conference Center</td>
</tr>
<tr>
<td>RUC/RTM</td>
<td>March 23</td>
<td>Houston - Calpine</td>
</tr>
<tr>
<td>RUC/RTM</td>
<td>March 29</td>
<td>Newark, NJ - PSEG</td>
</tr>
</tbody>
</table>
For CRR information, see these resources:

- Nodal Protocols Section 7
- CRR Market Trials Handbook
- CRR Market Submission Interface Handbook
- TCR-CRR Transition Plan
- CRR Handbook (User Guide—future release)