Types of Congestion Revenue Rights

- Defined between source and sink Settlement Points
- Two Instruments:
  - Point-to-Point Options
  - Point-to-Point Obligations
- Settlement based on difference between sink and source Settlement Point Prices
CRRs are allocated, traded or auctioned in:

- Time-of-Use Blocks
- One month strips

<table>
<thead>
<tr>
<th>Mon</th>
<th>Tues</th>
<th>Wed</th>
<th>Thurs</th>
<th>Fri</th>
<th>Sat</th>
<th>Sun</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off-Peak</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Off-Peak (0100 – 0600)</td>
</tr>
<tr>
<td>Peak Week</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Peak Week (0700 – 2200)</td>
</tr>
<tr>
<td>Weekday</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Off-Peak (2200 – 0000)</td>
</tr>
</tbody>
</table>
CRR Settlements

Three Settlement Processes

• CRR Auction Settlement
• CRR Settlement
• CRR Balancing Account
CRR Auction

Charges and Payments for CRRs

Revenue Distribution
Auction Settlements: Outcomes

Outcome #1: Charge to CRR Account Holder for Awarded Bid in the CRR Auction

Outcome #2: Payment to CRR Account Holder for Awarded Offer in the CRR Auction

Outcome #3: Charge to CRR Account Holder for PTP Option Award Fee

Outcome #4: Charge to NOIE for Pre-Assigned CRRs
CRAH5 bids to buy a Peak WD block of 10 MWs of PTP Options in a Monthly Auction

Sets a Not-to-Exceed Price of $10/MW

<table>
<thead>
<tr>
<th>Source</th>
<th>Sink</th>
<th>MW</th>
<th>Price</th>
<th>Time Of Use</th>
<th>Buy or Sell</th>
<th>Hedge Type</th>
<th>Start Date</th>
<th>End Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>RN1</td>
<td>LZ1</td>
<td>10</td>
<td>10</td>
<td>Peak WD</td>
<td>Buy</td>
<td>OPT</td>
<td>07/01/2013</td>
<td>07/31/2013</td>
</tr>
</tbody>
</table>
• ERCOT executes Auction Process
• Auction clears CRRAH5’s PTP Options at Clearing Price of $2/MW
• Clearing Price less than Not-to-Exceed Price and Bid is Awarded
CRRAH5 bought:
- 10 MWs
- Peak WD (5x16) block of PTP Options
- Price of $2/MW
- 352 hr in July 2013

For one hour:

\[(\text{Price}) \times (\text{Quantity})\]
\[($2/MW) \times (10 \text{ MW}) = $20\]

For Entire Block:

\[20 \times 352 = $7040\]
Auction Settlements: Charge of an Awarded Bid

CRR Auction

Charges & Payments for CRRs

Revenue Distribution

PTP Option Purchase Amount

Option Purchase

\[ \text{OPTPAMT}_{crrh, (j, k), a} = \text{OPTPR}_{(j, k), a} \times \text{OPTP}_{crrh, (j, k), a} \]

Option Price

<table>
<thead>
<tr>
<th>crrh</th>
<th>CRR Account Holder</th>
<th>j</th>
<th>Source</th>
<th>k</th>
<th>Sink</th>
<th>a</th>
<th>CRR Auction</th>
</tr>
</thead>
</table>

Auction Settlements: Charge of an Awarded Bid

**PTP Obligation Purchase Amount**

\[ \text{OBLPAMT}_{crrh, (j, k), a} = \text{OBLPR}_{(j, k), a} \times \text{OBLP}_{crrh, (j, k), a} \]

**Obligation Price**

<table>
<thead>
<tr>
<th>(crrh)</th>
<th>CRR Account Holder</th>
</tr>
</thead>
<tbody>
<tr>
<td>(j)</td>
<td>Source</td>
</tr>
<tr>
<td>(k)</td>
<td>Sink</td>
</tr>
<tr>
<td>(a)</td>
<td>CRR Auction</td>
</tr>
</tbody>
</table>
Auction Settlements: Outcomes

**Outcome #1**
Charge to CRR Account Holder for Awarded Bid in the CRR Auction

**Outcome #2**
Payment to CRR Account Holder for Awarded Offer in the CRR Auction

**Outcome #3**
Charge to CRR Account Holder for PTP Option Award Fee

**Outcome #4**
Charge to NOIE for Pre-Assigned CRRs
• CRRAH3 offers a Peak WD block of 5 MWs of PTP Obligations in a Monthly Auction

• Sets Minimum Reservation Price At $8/MW

### Monthly Auction

<table>
<thead>
<tr>
<th>CRR ID</th>
<th>Source</th>
<th>Sink</th>
<th>MW</th>
<th>Price</th>
<th>Time Of Use</th>
<th>Buy or Sell</th>
<th>Hedge Type</th>
<th>Start Date</th>
<th>End Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>12345</td>
<td>RN4</td>
<td>LZ3</td>
<td>5</td>
<td>8</td>
<td>Peak WD</td>
<td>Sell</td>
<td>OBL</td>
<td>07/01/2012</td>
<td>07/31/2012</td>
</tr>
</tbody>
</table>
• ERCOT executes Auction Process

• Auction clears CRRAH3’s PTP Obligation at Clearing Price of $8/MW

• Clearing Price meets CRRAH3’s Minimum Reservation Price and Offer is Awarded
CRRAH3 sold:
- 5 MWs
- Peak WD (5x16) block of PTP Obligations
- Price of $8/MW
- 336 hr in July 2012

For one hour:

\[
(-1) \times (\text{Price}) \times (\text{Quantity}) = -40
\]

For Entire Block:

\[
-40 \times 336 = -13,440
\]
Auction Settlements: Payment of an Awarded Offer

CRR Auction

Charges & Payments for CRRs

Revenue Distribution

PTP Obligation Sale Amount

\[ \text{OBLSAMT}_{crrh, (j, k), a} = (-1) \times \text{OBLPR}_{(j, k), a} \times \text{OBLS}_{crrh, (j, k), a} \]

Obligation Sale

Obligation Price

<table>
<thead>
<tr>
<th>crrh</th>
<th>CRR Account Holder</th>
</tr>
</thead>
<tbody>
<tr>
<td>j</td>
<td>Source</td>
</tr>
<tr>
<td>k</td>
<td>Sink</td>
</tr>
<tr>
<td>a</td>
<td>CRR Auction</td>
</tr>
</tbody>
</table>
Auction Settlements: Payment of an Awarded Offer

**CRR Auction**
- Charges & Payments for CRRs
- Revenue Distribution

**PTP Option Sale Amount**

\[ \text{OPTSAMT}_{crrh, (j, k), a} = (-1) \times \text{OPTPR}_{(j, k), a} \times \text{OPTS}_{crrh, (j, k), a} \]

<table>
<thead>
<tr>
<th>crrh</th>
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</tr>
</thead>
<tbody>
<tr>
<td>j</td>
<td>Source</td>
</tr>
<tr>
<td>k</td>
<td>Sink</td>
</tr>
<tr>
<td>a</td>
<td>CRR Auction</td>
</tr>
</tbody>
</table>
Auction Settlements: Outcomes

**Outcome #1**  
Charge to CRR Account Holder for Awarded Bid in the CRR Auction

**Outcome #2**  
Payment to CRR Account Holder for Awarded Offer in the CRR Auction

**Outcome #3**  
Charge to CRR Account Holder for PTP Option Award Fee

**Outcome #4**  
Charge to NOIE for Pre-Assigned CRRs
PTP Option Minimum Bid Price and Award Fees

- Minimum Bid Price for PTP Options
  - Currently $0.01
  - Reviewed by TAC Annually

- Award Fee for PTP Options that clear below Minimum Bid Price

- Difference between Minimum Bid Price and Option clearing price
• CRRAH5 bids to buy 20MWs of Off-Peak PTP Options in a Monthly Auction

• Sets a Not-to-Exceed Price of $2/MW

### Monthly Auction

<table>
<thead>
<tr>
<th>Source</th>
<th>Sink</th>
<th>MW</th>
<th>Price</th>
<th>Time Of Use</th>
<th>Buy or Sell</th>
<th>Hedge Type</th>
<th>Start Date</th>
<th>End Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>LZW</td>
<td>HBW</td>
<td>20</td>
<td>2</td>
<td>Off Peak</td>
<td>Buy</td>
<td>OPT</td>
<td>12/01/2015</td>
<td>12/31/2015</td>
</tr>
</tbody>
</table>
• ERCOT executes Auction Process

• Auction clears CRRAH5’s PTP Options at Clearing Price of $0.002351/MW

• Clearing Price less than Not-to-Exceed Price and Bid is Awarded

• Clearing Price is less than the Minimum Bid Price
• CRRAH5 was awarded:
  • 20 MWs
  • Off-Peak (7x8) block of PTP Options
  • Clearing Price of $.002351/MW
  • 248 Off-Peak hrs in December 2015

• For one hour, the PTP Option Award Fee is:

\[
(\text{Price}) \times (\text{Quantity}) = \left(0.01 - 0.002351\right) \times (20 \text{ MW}) = 0.15298
\]

• For Entire Block:

\[
0.15298 \times 248 = 37.94
\]
PTP Option Award Charge (Fee) Amount

\[ \text{OPTAFAMT}_{crrh, a} = \sum_{bp} \sum_{h} \sum_{(j,k)} \left( \text{Max} \left(0, \text{OPTMBP}_{(j,k), a, h, bp} - \text{OPTPR}_{(j, k), a, h, bp} \right) \right) \]

PTP Option Purchase (MW)

<table>
<thead>
<tr>
<th>( crrh )</th>
<th>CRR Account Holder</th>
<th>( a )</th>
<th>CRR Auction</th>
</tr>
</thead>
<tbody>
<tr>
<td>( j )</td>
<td>Source</td>
<td>( h )</td>
<td>Operating Hour</td>
</tr>
<tr>
<td>( k )</td>
<td>Sink</td>
<td>( bp )</td>
<td>CRR bid period</td>
</tr>
</tbody>
</table>
Auction Settlements: Outcomes

**Outcome #1**
Charge to CRR Account Holder for Awarded Bid in the CRR Auction

**Outcome #2**
Payment to CRR Account Holder for Awarded Offer in the CRR Auction

**Outcome #3**
Charge to CRR Account Holder for PTP Option Award Fee

**Outcome #4**
Charge to NOIE for Pre-Assigned CRRs
Pre-Assigned CRRs (PCRRs)

• Allocated to Non-Opt-In Entities (NOIEs) based on their annual nominations

• Based on the long-term supply contracts of NOIEs

• Cost is a percentage of the CRR Auction clearing price
### Auction Settlements: Charge for an Allocated PCRR

**Trigger #4**

- CRRAH4 (QSE4) nominates CAPACITY option of PCRRs

#### PCRR Nomination Checklist

- Non-Opt-In Entity (NOIE)
- Long term commitments prior to 9/1/1999
- Nominate for:
  - Capacity
  - Refund

#### PCRR Pricing Factors

<table>
<thead>
<tr>
<th>Type of Resource</th>
<th>PCRR PTP Options</th>
<th>PCRR PTP Obligations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nuclear, Coal, Lignite, Combined Cycle</td>
<td>10%</td>
<td>5%</td>
</tr>
<tr>
<td>Gas Steam</td>
<td>15%</td>
<td>7.5%</td>
</tr>
<tr>
<td>Hydro, Wind, Simple, Other</td>
<td>20%</td>
<td>10%</td>
</tr>
</tbody>
</table>
• CRRAH4 nominates CAPACITY option of PCRRs
• CRRAH4 nominates for 15 MWs of PTP Options
• CRR Account Holder / NOIE has a Coal Resource

**Monthly Auction**

<table>
<thead>
<tr>
<th>Source</th>
<th>Sink</th>
<th>MW</th>
<th>Time Of Use</th>
<th>PCRR Type</th>
<th>Hedge Type</th>
<th>Start Date</th>
<th>End Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>RN4</td>
<td>LZ2</td>
<td>15</td>
<td>PeakWD</td>
<td>Capacity</td>
<td>OPT</td>
<td>07/01/2013</td>
<td>07/31/2013</td>
</tr>
</tbody>
</table>
Trigger #4

- ERCOT executes PCRR Allocation Process
  - Allocation Process awards PCRRs
- ERCOT executes Auction Process
  - Auction Process sets price of awarded PCRRs

- Auction sets Clearing Price at $10/MW
- NOIE is charged for its allocation
• CRRAH4 was allocated:
  - 15 MWs
  - Peak WD (5x16) block of PTP Options
  - Price of $10/MW
  - Pricing Factor of 10% for Coal

• For one hour:
  \[
  \frac{((\text{Price} \times \text{Quantity}) \times \text{(Pricing Factor)})}{\text{Price} \times 15 \times 10\%} = $15
  \]

• For Entire Block:
  \[
  $15 \times 352 = $5280
  \]
Auction Settlements: Charge for an Allocated PCRR

PCRR PTP Option Amount

\[ \text{PCRROPTAMT}_{crrh, (j, k), a, tech} = \text{PCRROPTF}_{tech} \times \text{OPTPR}_{(j, k), a} \]

PCRR Option pricing Factor

Option Price

<table>
<thead>
<tr>
<th>crrh</th>
<th>CRR Account Holder</th>
</tr>
</thead>
<tbody>
<tr>
<td>j</td>
<td>Source</td>
</tr>
<tr>
<td>k</td>
<td>Sink</td>
</tr>
<tr>
<td>a</td>
<td>CRR Auction</td>
</tr>
<tr>
<td>tech</td>
<td>Resource Technology</td>
</tr>
</tbody>
</table>
Auction Settlements: Charge for an Allocated PCRR

PCRR PTP Obligation Amount

If the **Price** is greater than Zero, then:

PCRR Obligation pricing Factor

Obligation Price

PCRRROBLAMT \(crrh, (j, k), a, tech\) = PCRRROBLF \(tech\) * OBLPR \((j, k), a\) *

PCRR PTP Obligation quantity

<table>
<thead>
<tr>
<th>crrh</th>
<th>CRR Account Holder</th>
</tr>
</thead>
<tbody>
<tr>
<td>j</td>
<td>Source</td>
</tr>
<tr>
<td>k</td>
<td>Sink</td>
</tr>
<tr>
<td>a</td>
<td>CRR Auction</td>
</tr>
<tr>
<td>tech</td>
<td>Resource Technology</td>
</tr>
</tbody>
</table>
Auction Settlements: Charge for an Allocated PCRR

PCRR PTP Obligation Amount

If the Price is less than Zero, then:

\[
\text{PCRRROBLAMT}_{crrh, (j, k), a, \text{tech}} = \text{OBLPR}_{(j, k), a} \times \text{PCRRROBL}_{crrh, (j, k), a, \text{tech}}
\]

<table>
<thead>
<tr>
<th>crrh</th>
<th>CRR Account Holder</th>
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</thead>
<tbody>
<tr>
<td>j</td>
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<tr>
<td>a</td>
<td>CRR Auction</td>
</tr>
<tr>
<td>tech</td>
<td>Resource Technology</td>
</tr>
</tbody>
</table>
• CRRAH4 (QSE4) nominates REFUND option of PCRRs

CRRAH4 receives the PCRRs at no cost.
CRR Auction

Charges and Payments for CRRs

Revenue Distribution
**CRR Auction Settlement**

CRR Auction Net Receipts* + PCRR Revenues → CRR Auction Revenues → Pay to QSEs representing Load

*PTP Option Award Fees are not included in this distribution.

Distribution occurs once a month.
Auction Settlements: CRR Auction Revenues

Collection & Distribution of CRR Auction Revenues

- Charges for Awarded CRR Bids (same Zone)
- Payments for Awarded CRR Offers (same Zone)
- Charges for Awarded CRR Bids (different Zones)
- Payments for Awarded CRR Offers (different Zones)

Zonal Revenues

Non-Zonal Revenues
Auction Settlements: CRR Auction Revenues

**Trigger**

- CRR Sale Amount Totals for Zone 1:
  - $-25,000
    - $-15,000 for Options
    - $-10,000 for Obligations

- CRR Purchase Amount Totals for Zone 1:
  - $50,000
    - $30,000 for Options
    - $20,000 for Obligations

**Outcome**

Total Revenue
Sum of Sales and Purchases

- $-15,000 + $-10,000 + $30,000 + $20,000 = $25,000
CRR Zonal Revenue

CRRZREV\_z,a =

\[
\sum_h \left( \sum_{crrh} (\sum_j \sum_k \text{OBLSAMT}_{crrh,(j,k),z,a,h} + \sum_j \sum_k \text{OPTSAMT}_{crrh,(j,k),z,a,h} + \sum_j \sum_k \text{OBLPAMT}_{crrh,(j,k),z,a,h} + \sum_j \sum_k \text{OPTPAMT}_{crrh,(j,k),z,a,h}) \right)
\]

<table>
<thead>
<tr>
<th>crrh</th>
<th>CRR Account Holder</th>
</tr>
</thead>
<tbody>
<tr>
<td>j</td>
<td>Source</td>
</tr>
<tr>
<td>k</td>
<td>Sink</td>
</tr>
<tr>
<td>a</td>
<td>CRR Auction</td>
</tr>
<tr>
<td>z</td>
<td>Congestion Zone</td>
</tr>
<tr>
<td>h</td>
<td>Hour</td>
</tr>
</tbody>
</table>
Auction Settlements: CRR Auction Revenues

- CRR Sale Amount Totals inter-Zone: -$13,000
  - -$8,000 for Options
  - -$5,000 for Obligations

- CRR Purchase Amount Totals inter-Zone: $40,000
  - $30,000 for Options
  - $10,000 for Obligations

Total Revenue
Sum of Sales and Purchases

-$8,000 + -$5,000 + $30,000 + $10,000 = $27,000
CRR Auction

CRR Non-Zonal Revenue

\[ \text{CRRNZREV}_a = \sum_{h} \left( \sum_{crrh} \sum_{j} \sum_{k} \right) \text{OBLSAMT}_{crrh,(j,k),a,h} + \]
\[ \sum_{crrh} \sum_{j} \sum_{k} \text{OPTSAMT}_{crrh,(j,k),a,h} + \]
\[ \sum_{crrh} \sum_{j} \sum_{k} \text{OBLPAMT}_{crrh,(j,k),a,h} + \]
\[ \sum_{crrh} \sum_{j} \sum_{k} \text{OPTPAMT}_{crrh,(j,k),a,h} \]

- crrh: CRR Account Holder
- j: Source
- k: Sink
- a: CRR Auction
- h: Hour
Auction Settlements: CRR Auction Revenues

Collection & Distribution of CRR Auction Revenues

PCRR Revenues (different Zones)
PCRRROBLAMT, PCRROPTAMT

PCRR Non-Zonal Revenues

PCRR Revenues (same Zone)
PCRRROBLAMT, PCRROPTAMT

PCRR Zonal Revenues
- PCRR Purchase Amount Totals for Zone 1: $12,000
  - $10,000 for Options
  - $2,000 for Obligations

Total Revenue
Sum of Purchases

$10,000 + $2,000 = $12,000
PCRR Zonal Revenue

\[ \text{PCRRZREV}_{z,a} = \sum_h \left( \sum_{crrh} \sum_j \sum_k \sum_{tech} \text{PCRRROBLAMT}_{crrh,(j,k),z,a,tech,h} + \sum_{crrh} \sum_j \sum_k \sum_{tech} \text{PCRRLOPTAMT}_{crrh,(j,k),z,a,tech,h} \right) \]

<table>
<thead>
<tr>
<th>crrh</th>
<th>CRR Account Holder</th>
</tr>
</thead>
<tbody>
<tr>
<td>j</td>
<td>Source</td>
</tr>
<tr>
<td>k</td>
<td>Sink</td>
</tr>
<tr>
<td>a</td>
<td>CRR Auction</td>
</tr>
<tr>
<td>tech</td>
<td>Resource Technology</td>
</tr>
<tr>
<td>h</td>
<td>Hour</td>
</tr>
<tr>
<td>z</td>
<td>Congestion Zone</td>
</tr>
</tbody>
</table>
Auction Settlements: PCRR Auction Revenues

- PCRR Purchase Amount Totals inter-Zone: $8,000
  - $6,500 for Options
  - $1,500 for Obligations

Total Revenue
Sum of Purchases

$6,500 + $1,500 = $8,000
PCRR Non-Zonal Revenue

\[
\text{PCRRNZREV}_a = \sum_{h} \left( \sum_{crrh} \sum_{j} \sum_{k} \sum_{\text{tech}} \right) \text{PCRRROBLAMT}_{crrh,(j,k),a,\text{tech},h} + \sum_{crrh} \sum_{j} \sum_{k} \sum_{\text{tech}} \text{PCRRLOPTAMT}_{crrh,(j,k),a,\text{tech},h} \right)
\]

- \text{crrh} \quad \text{CRR Account Holder}
- \text{j} \quad \text{Source}
- \text{k} \quad \text{Sink}
- \text{a} \quad \text{CRR Auction}
- \text{tech} \quad \text{Resource Technology}
- \text{h} \quad \text{Hour}
The CRR Auction Revenue Distribution (CARD) invoice will pay the net Auction revenues to QSEs who represent Load Disbursement based on:

- Monthly Load Ratio Share
- Zonal and Non-Zonal
- ERCOT Peak load interval
Zonal Revenue Distribution

Pay to QSEs representing Load - Zonal (LRS)
• Zone 1 Amount Totals: $37,000
  • $25,000 for Options and Obligations
  • $12,000 for PCRRs
• QSE4’s LRS = 10%
  • Zonal peak load interval for month
  • LRS at peak interval

CRR Monthly Revenue
(Sum of Revenue) * (Monthly Load Ratio Share Zonal)

-1 * ($25,000 + $12,000) * 0.1 = -$3,700
CRR Auction Revenue Distribution

**Load-Allocated CRR Monthly Revenue Zonal Amount**

\[ \text{LACMRZAMT}_{z, q} = (-1) \times \sum_{a} (\text{CRRZREV}_{z, a} + \text{PCRRZREV}_{z, a}) \times \text{MLRSZ}_{z, q} \]

**Monthly Load Ratio Share Zonal**

<table>
<thead>
<tr>
<th>z</th>
<th>A 2003 ERCOT CMZ.</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>CRR Auction</td>
</tr>
<tr>
<td>q</td>
<td>A QSE</td>
</tr>
</tbody>
</table>
Non-Zonal Revenue Distribution
CRR Auction Revenue Distribution

- Inter-Zone Amount Totals: $35,000
  - $27,000 for Options and Obligations
  - $8,000 for PCRRs
- QSE4’s LRS = 20%
  - ERCOT peak load interval for month
  - LRS at peak interval

CRR Monthly Revenue
(Sum of Revenue) * (Monthly Load Ratio Share)

\[-1 \times (\$27,000 + \$8,000) \times 0.2 = -\$7,000\]
Load-Allocated CRR Monthly Revenue Non-Zonal Amount

\[ \text{LACMRNZAMT}_q = (-1) \times \sum_a (\text{CRRNZREV}_a + \text{PCRRNZREV}_a) \times \text{MLRS}_q \]

<table>
<thead>
<tr>
<th>a</th>
<th>CRR Auction</th>
</tr>
</thead>
<tbody>
<tr>
<td>q</td>
<td>A QSE</td>
</tr>
</tbody>
</table>
Module Conclusion

CRR Auction
- Participation in DAM
  - Energy
  - AS
  - PTP Obligations
- DAM Commitment
  - Make-Whole
- Settlement of CRRs purchased in the Auction
- Charges & Payments for CRRs
- Revenue Distribution

CRR Balancing Account
- Reconcile CRR Short payments

DAM
- Settlement of CRRs purchased in the Auction
- Revenue Neutrality

RUC
- Commitment
  - Make-Whole
  - Clawback
- Decommitment

Real-Time
- Real-Time Activities
  - Imbalances
  - Base Point Deviations
  - Other odds & ends
- Settlement of PTP Obligations purchased in the DAM
- Real Time Ancillary Service Settlements
- Revenue Neutrality