Overview of Demand Response in ERCOT

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September 16, 2021
Various categories of Demand Response

Administered by ERCOT
- Load Resource Participation in ERCOT’s Ancillary Services and Real-Time energy market
- Emergency Response Service (ERS)

Non-ERCOT Administered
- TDSP Load Management Programs
- 4-Coincident Peak (CP) Load Reduction
- Price-responsive Demand response
- Distributed Generation Price Response
Load Resource Participation in ERCOT’s Ancillary Services and Real-Time energy market

- Controllable Load Resources (CLR) – Load Resources capable of following SCED base points
  - 6 CLRs ≈ 300 MW of registered capacity
  - Does not include Energy Storage (charging CLRs)

- Non-Controllable Load Resources – Blocky loads with both a 10-minute ramp capability for manual deployments and automatic deployment through Under Frequency Relay
  - 600+ Load Resources with ≈ 7,000 MW of registered capacity
  - General observation across Summer Peak
    - Willing Participation (Offers+Self Arranged) ≈ 3,100 MW
    - Actual Participation (Awards+Self Arranged) ≈ 1,380 MW
    - Available Quantity from Willing Participation ≈ 1,720 MW
Demand Response (administered by ERCOT)

Emergency Response Service (ERS)
- 4 ERS service types (Non-Weather Sensitive-10, Non-Weather Sensitive-30, Weather Sensitive-10, Weather Sensitive-30)
- Currently 3 four-month Standard Contract Terms (SCT) per year
  - December 2021, changing to 4 SCT’s per year
- Procure 8 time periods per SCT
- $50 Million/yr spend limit
- ≈1000 MW and 24,000+ sites are typically participating
- Only procure Weather Sensitive types during peak time periods during Winter and Summer Standard Contract Terms
TDSP Load Management Programs

• Programs administered by the 4 Transmission and Distribution Service Providers (Oncor, CenterPoint, AEP, TNMP)

• Programs are available:
  – Weekdays only from June 1 through September 30
  – Between the hours of 1 p.m. to 7 p.m.

• Historically ≈ 250-350 MW available

• 2021 estimated at:
  – 303 MW Jun-Jul
  – 324 MW Aug-Sep

• Deployed through ERCOT instruction during Energy Emergency Alert Level 2
4-Coincident Peak (CP) Load Reduction

• The Four Coincident Peaks in ERCOT are the highest-Load 15-minute settlement intervals in each of the four summer months (June, July, August, September).

• Current estimated value of 1 MW 4CP load Reduction for a Transmission connected IDR customer on Oncor’s system ~$38,000

4CP Days

<table>
<thead>
<tr>
<th>Date</th>
<th>ESIID</th>
<th>NOI</th>
<th>HE 17 Reduce MW</th>
</tr>
</thead>
<tbody>
<tr>
<td>8-Jun</td>
<td>3,711</td>
<td>20</td>
<td>1,880</td>
</tr>
<tr>
<td>13-Jul</td>
<td>3,429</td>
<td>19</td>
<td>2,765</td>
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<tr>
<td>13-Aug</td>
<td>3,691</td>
<td>20</td>
<td>2,416</td>
</tr>
<tr>
<td>1-Sep</td>
<td>5,200</td>
<td>20</td>
<td>2,803</td>
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</table>

NearCP Days

<table>
<thead>
<tr>
<th>Date</th>
<th>ESIID</th>
<th>NOI</th>
<th>HE 17 Reduce MW</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-Jun</td>
<td>3,771</td>
<td>12</td>
<td>912</td>
</tr>
<tr>
<td>9-Jun</td>
<td>4,812</td>
<td>18</td>
<td>1,961</td>
</tr>
<tr>
<td>1-Jul</td>
<td>3,691</td>
<td>20</td>
<td>1,148</td>
</tr>
<tr>
<td>2-Jul</td>
<td>3,940</td>
<td>10</td>
<td>1,472</td>
</tr>
<tr>
<td>8-Jul</td>
<td>2,542</td>
<td>8</td>
<td>722</td>
</tr>
<tr>
<td>9-Jul</td>
<td>2,934</td>
<td>13</td>
<td>1,135</td>
</tr>
<tr>
<td>10-Jul</td>
<td>3,455</td>
<td>12</td>
<td>1,324</td>
</tr>
<tr>
<td>14-Jul</td>
<td>2,863</td>
<td>18</td>
<td>1,399</td>
</tr>
<tr>
<td>6-Aug</td>
<td>2,837</td>
<td>13</td>
<td>1,495</td>
</tr>
<tr>
<td>7-Aug</td>
<td>3,462</td>
<td>13</td>
<td>1,479</td>
</tr>
<tr>
<td>10-Aug</td>
<td>3,783</td>
<td>18</td>
<td>1,642</td>
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<tr>
<td>11-Aug</td>
<td>3,754</td>
<td>20</td>
<td>1,980</td>
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<tr>
<td>12-Aug</td>
<td>3,690</td>
<td>19</td>
<td>2,358</td>
</tr>
<tr>
<td>14-Aug</td>
<td>3,804</td>
<td>21</td>
<td>2,590</td>
</tr>
<tr>
<td>28-Aug</td>
<td>3,432</td>
<td>17</td>
<td>2,275</td>
</tr>
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*The 4-CP days in the tables above are from 2020*
REP/NOIE Demand Response + 4CP

- September 1, 2020 – Largest system wide DR response in 2020 - 2860 MW

- 4CP day with high prices in South Zone only
  - High price > $200

- Greatest contributor was 4CP response

<table>
<thead>
<tr>
<th>Day</th>
<th>Day Type</th>
<th>Total System DR</th>
<th>4CP Competitive</th>
<th>4CP NOIE</th>
<th>Indexed Real-Time (IRT)</th>
<th>Indexed Day-Ahead (IDA)</th>
<th>NOIE Price Response</th>
<th>Peak Rebate (PR)</th>
<th>Other Direct Load Control (OLC)</th>
<th>Category Total</th>
<th>Overlap</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-Sep-20</td>
<td>4CP, High Prices (South)</td>
<td>2,860</td>
<td>1,335</td>
<td>1,448</td>
<td>65</td>
<td>-</td>
<td>967</td>
<td>0</td>
<td>41</td>
<td>3,875</td>
<td>1,015</td>
</tr>
</tbody>
</table>

Observation: High price days rarely occur on 4CP days during years with greater reserve margin
Settlement-Only Distributed Generation in ERCOT 2010-2020

<table>
<thead>
<tr>
<th>SODGs</th>
<th># Units</th>
<th>MW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-Renewable</td>
<td>233</td>
<td>598</td>
</tr>
<tr>
<td>Renewable + Storage</td>
<td>59</td>
<td>333</td>
</tr>
<tr>
<td>TOTALS</td>
<td>292</td>
<td>931</td>
</tr>
</tbody>
</table>

SODGs are:
- <10 MW
- If >1 MW and inject to grid, must register with ERCOT
- If <1 MW, registration optional
FERC Order 2222

- This rule enables DERs to participate alongside traditional resources in the regional organized wholesale markets through aggregations, opening U.S. organized wholesale markets to new sources of energy and grid services.

- This rule also allows several sources of distributed electricity to aggregate in order to satisfy minimum size and performance requirements that each may not be able to meet individually.

- ERCOT has implemented rules pertaining to Distributed Generation separately from Demand Response

- ERCOT is closely monitoring development in other regions
Key Issues for Demand Response

- Price Responsive Demand Response misaligned with local reliability objective
  - Demand Response today responding to Zonal price versus Locational Marginal Price (LMP) signal
  - Demand Response can play more effective role in resolving local reliability issues
  - Misalignment may be exacerbated by sharp increases in localized loads (e.g., construction of large data mining facilities)

- 4-Coincident Peak (CP) Load Reduction
  - Historically, Peak Load hours and energy scarcity hours coincided
  - Scarcity hours in summer continue to shift from Peak Load hours to Net-Peak Load hours, which raises a question about the long-term efficacy of 4-CP Load Reduction

- Explore removal of 60% limit on Load Resources providing RRS
  - Requires NPRR
  - NPRR939 implementation needed to stagger NCLR Load Resource deployment
  - Minimum 1420 MW of RRS requirement will continue to remain
Recent Demand Response Developments

- Enable NCLRs to participate in Non-Spin
  - NPRR1093 Load Resource Participation in Non-Spinning Reserve has been submitted

- ERCOT Contingency Reserve Service (ECRS) implementation will enable more Load Resource participation
  - Current implementation schedule is post EMS Upgrade

- Implement NPRR939 to allow ERCOT to deploy Load Resources providing Responsive Reserve Service in multiple ~500 MW tranches

- Aggregated Load Resources
  - Recent interest from DR providers to aggregate residential or commercial loads like A/C or water heaters to provide Ancillary Services
  - Interest also includes adding rooftop PV & batteries
  - Most significant issues are around validation rules for performance and size of aggregation
Thank You!