EVALUATING C&I DR EVALUATION

Vijay Gopalakrishnan (ERS)

IEPEC, August 21, 2019
Denver, CO
SPECIAL THANKS TO CO-AUTHORS AND CONTRIBUTORS:

Tracy Dyke-Redmond, Eversource
Alexandra Bothner, Eversource
Ralph Prahl, Ralph Prahl and Associates
Jon Maxwell, ERS
Allison Donnelly, Formerly of ERS
Ken Agnew, DNV GL
Tom Ledyard, DNV GL
Jason Symonds, Formerly of DNV GL
**SUMMARY OF STUDY**

**Batteries**

**Thermal storage**

**Manual curtailment**

**Controls/BMS**

**DISPATCH STRATEGIES**

1. Daily
2. Event (triggered by utility)
3. Custom (to forecast ICAP hour and/or mitigate facility peak demand)
## SUMMARY OF SCOPE

<table>
<thead>
<tr>
<th>Metric</th>
<th>Vendor 1</th>
<th>Vendor 2</th>
<th>Vendor 3</th>
<th>Vendor 4</th>
<th>Vendor 5</th>
<th>Vendor 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology</td>
<td>Manual curtailing</td>
<td>BMS controls</td>
<td>Thermal storage</td>
<td>Thermal storage</td>
<td>Battery</td>
<td>Battery</td>
</tr>
<tr>
<td>Targeted customer type</td>
<td>Large</td>
<td>Large</td>
<td>Cold storage</td>
<td>W/packaged HVAC units</td>
<td>Large</td>
<td>Medium and large</td>
</tr>
<tr>
<td>Target count for year 1</td>
<td>17</td>
<td>18</td>
<td>2</td>
<td>9</td>
<td>3</td>
<td>1</td>
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<tr>
<td>Achieved count for year 1</td>
<td>18</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>
**Research Objectives**

- Successful customers
- Value streams
- Degree of automation
- Barriers

**Impact**

- Magnitude of reductions
- Net-energy impacts
- Complementarity with other strategies
  - M&V strategy
  - Cost-effectiveness

**Process**

- Customer recruitment
- Motivations
- Satisfaction
- Non-energy benefits
- PA satisfaction
## DISPATCH STRATEGIES

<table>
<thead>
<tr>
<th>Season</th>
<th>Strategy</th>
<th>Manual Curtailment</th>
<th>BMS/Controls</th>
<th>Thermal Storage 1</th>
<th>Thermal Storage 2</th>
<th>Battery 1</th>
<th>Battery 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Summer</strong></td>
<td>Daily</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Utility-triggered event</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Vendor-forecasted ICAP</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Facility peak</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td><strong>Winter</strong></td>
<td>Utility-triggered event</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Facility peak</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>
SELECTION OF IMPACT EVALUATION METHOD

Vendor Analysis Methodology

Can affected equipment be isolated and metered?

Yes

Does the facility have building interval data?

Yes

Interval data analysis (regression and/or settlement)

No

Equipment measurement

No

Can affected equipment be isolated and metered?
## Summary of Evaluation Methods

<table>
<thead>
<tr>
<th>Vendor</th>
<th>Technology</th>
<th>Evaluation Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manual Curtailment</td>
<td>Curtailment</td>
<td>Utility interval data analysis</td>
</tr>
<tr>
<td>BMS/Controls</td>
<td>Software</td>
<td>Utility interval data analysis</td>
</tr>
<tr>
<td>Thermal Storage 1</td>
<td>Refrig. thermal storage</td>
<td>Refrig. equipment measurement</td>
</tr>
<tr>
<td>Thermal Storage 2</td>
<td>HVAC thermal storage</td>
<td>HVAC equipment measurement</td>
</tr>
<tr>
<td>Battery 1</td>
<td>Battery</td>
<td>Battery measurement</td>
</tr>
<tr>
<td>Battery 2</td>
<td>Battery</td>
<td>Battery measurement</td>
</tr>
</tbody>
</table>

### Process Method (All)
Utility staff and vendor interviews, participant surveys
Settlement baseline

- ISO NE methodology, used to verify compliance with program requirements
- 10 non-event, non-holiday weekdays leading up to event day
- Adjusted for same-day load prior to the event

Regression baseline

- Uses data from the entire season
- Regression with weather and other applicable variables to calculate baseline event-day load
SETTLEMENT AND REGRESSION BASELINES FOR MANUAL CURTAILMENT

Average Hourly Event Reduction (MW)

Settlement Baseline

Regression Baseline

6-Aug

3-Jul

29-Aug
Findings

The batteries and manual curtailment solutions reduced load as reported.

The thermal storage solutions’ performance was as reported for one vendor and will need to be re-evaluated for the second vendor.

Settlement and regression baselines are both required to sufficiently characterize the impact of manual curtailment offerings.
FINDINGS
(CONTINUED)

Recruiting approaches ranged from almost entirely vendor-driven to almost entirely utility account executive (AE)-driven.

Customer education is a critical step in the recruitment process.

Participating customers were highly satisfied.
EVALUATION-ORIENTED RECOMMENDATIONS

- Employ two baselines to sufficiently evaluate manual curtailment offerings
- Direct-equipment measurement is appropriate for energy storage evaluations
- Standardize reporting requirements for all participating vendors.
- Involve the M&V contractors during the DR tests to minimize customer burn-out.
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