Making Commercial Buildings Responsive Loads

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Making Buildings Response Loads

• Why should Buildings be Responsive Loads
• What techniques have we used
• How do the results stack up
Why should Buildings be Responsive Loads

Electricity Supply is changing
Demand Profile is Changing too

California’s electrical grid throughout the day

- Daytime Loads before lots of Solar
- Daytime Loads reversing as more Solar installed
- This is the Ducks belly
- Lots Of Batteries in homes and business can reduce reversing day loads and offset evening peak loads

Source: CalISO
Projected effect of EV’s – the Dragon Curve
## Different Methods to pay for Demand Reduction

<table>
<thead>
<tr>
<th>Demand Response</th>
<th>Time of Use Pricing</th>
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<tbody>
<tr>
<td>paid to reduce demand</td>
<td>Price changes with availability</td>
</tr>
<tr>
<td>• Capacity Market</td>
<td>• DATOD</td>
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<tr>
<td>Infrequent, long notice 24 hours</td>
<td>Day Ahead Time of Day Pricing</td>
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<td></td>
<td>Hourly pricing set previous day</td>
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<tr>
<td>• Spinning Reserves</td>
<td>• Spot Pricing</td>
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<tr>
<td>30 min to 2 hours notice but 6 sec reporting required</td>
<td>Dynamic Market price</td>
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<tr>
<td>• Frequency Regulation</td>
<td>Various forms</td>
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<tr>
<td>30 sec to 2 min response</td>
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### Peak Demand Pricing
Based on max demand in a period
Load Management at a Retail Facility in Buffalo NY with multiple Roof Top AC Units
Techniques Deployed

**Energy Efficiency**
- Time Schedules
- Demand Based Ventilation
- Analytics for Sensor and Plant Failure

**Demand Limiting**
- Load Synchronization
- Load Shifting by Temperature change
With individual Controls, demand is quite variable
With Synchronized Control, Load is more even and Peak Demand lower
Load Synchronisation

Number of RTU Stages

- RTU 1 | 1
- RTU 1 | 2
- RTU 2 | 1
- RTU 2 | 2
- RTU 3 | 1
- RTU 3 | 2
- RTU 4 | 1
- RTU 4 | 2

Time
It works in reality
Load Shifting by changing Temperature Setpoint
Reducing Peak Demand by Ramping Setpoint back
Adding in pre-Cooling of the space
Results

Energy Consumption KWHr reduction 38%
• A number of time schedule and Plant faults discovered

Peak Demand Reduced by 17%
• Only Load Synchronization applied
• Time of Use ToU pricing not offered for this site

Simple Payback
• Less than 12 months