California Energy Commission  
Docket No. 08-DR-01 June 19, 2008  
Energy Efficiency Committee Workshop  

Presentation related to CEC authority to adopt standards to shift peak demand via end use storage systems which store energy during off-peak periods for use during peak periods (PRC 25403.5).
Permanent Load Shifting

- **CPUC Final Decision 06-11-049** (Commissioner Chong)
  - Defines Permanent Load Shifting (PLS)
  - Finds use of DR funds for PLS to reduce peak load is reasonable
  - Q1-08, First IOU PLS Contracts for Ice Bear Storage
    - Trane, Honeywell, and Cypress execute contracts with PG&E and SCE
    - 140,000 megawatt hours of load shifting over 20-year life
Ice Bear unit - Ice Storage Air Conditioning

CEC Optional Compliance Method for 2008 Title 24

- Residential and Non-Residential Buildings Energy Efficiency
  - Residential ~ 50% reduction in building cooling energy in hot dry climates
  - Non-Residential ~ 20% reduction in building cooling energy
- 95% reduction in building cooling energy during peak period (Noon – 6 PM)

<table>
<thead>
<tr>
<th>Climate Zone</th>
<th>Standard cooling energy (TDV KBtu/sqft-yr)</th>
<th>ISAC cooling energy (TDV Kbtu/sqft-yr)</th>
<th>Reduction in cooling energy</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>23.23</td>
<td>11.36</td>
<td>51%</td>
</tr>
<tr>
<td>11</td>
<td>22.09</td>
<td>10.68</td>
<td>52%</td>
</tr>
<tr>
<td>12</td>
<td>14.33</td>
<td>6.9</td>
<td>52%</td>
</tr>
<tr>
<td>13</td>
<td>31.93</td>
<td>15.77</td>
<td>51%</td>
</tr>
<tr>
<td>14</td>
<td>32.07</td>
<td>15.63</td>
<td>51%</td>
</tr>
<tr>
<td>15</td>
<td>74.25</td>
<td>37.89</td>
<td>49%</td>
</tr>
</tbody>
</table>

Source: CEC Staff Report: CEC-400-2006-006-SF
Most Buildings Have a Poor Load Factor ~ 53%

Manage customer load by efficiently shifting A/C energy to the off-peak.

- **Enabling Technology for TOU rate switching**
  - Consume low cost, off-peak energy
  - Reduce expensive on-peak demand and on-peak energy
  - Zero loss storage measured at building meter
Electric Utility Meter Load Profile (inclusive of all loads)

- 45 kW peak day demand reduction
- 300 kWh load shifting per day (on peak to off peak)
- 105% high desert round trip storage efficiency (saves site energy)
- 6 hour minimum of storage per day summer (9 hours on shoulder months)
CoolData® SmartGrid Controller
Schedule/Dispatch/Measurement & Verification

Si Manufacturing Interval Meter Data, Average of 5 Consecutive Weekdays

Central control
Remote data storage
Highly scalable

- Demand Response
- Equipment Health
- Plug-in Hybrid charging

Ice Energy’s CoolData
CoolData® SmartGrid Controller

- “SmartGrid” ready
- Network communications
- Local scheduling and remote dispatch
- Direct load control for demand response of other building assets
- Real-time status, sub-metering, and data monitoring of customer equipment
- Performance analysis and automated diagnostics
- Configuration management
- Physical & Cyber security

Most advanced HVAC controller on the market

• 1-Wire Dallas Sensor Network
• NI LabVIEW Application Layer
• Web Server
• OSIsoft, PI Enterprise Layer
Ice Bear® 50 Hybrid Air Conditioner

From this...
Ice Bear® 30 Hybrid Air Conditioner

To this!!!!!
Advanced Technology for Lower Cost and Serviceability

- **Lower cost**
  - Integration of ice storage module, dedicated ice-make condensing unit, and new CoolData® smart grid controller & web server
  - 16 units on one truck
- **Longer 20-year asset life**
- **Greater reliability**
  - Isolated ice-make compressor, always factory quality
- **Hot swap pumps**
- **Easy service access doors**

**Ice Bear® 30**

- 5 Ton Cooling Output
- 6 hours of load shift
- 32 Ton-hour storage module (35 kWh)
- CoolData® Controller
- Compressor location
- Refrigerant pump
- Door on opposite side for service access to compressor and water pump
Thank-You

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Building Air Conditioning Energy Profile Drives System Peak

Highest Cost Energy

Real Time Energy Cost

Office Building A/C Energy Consumption
Create a market for off-peak wind and reduce the need to run on-peak generators.

*Bi-Directional Utility Controlled Regulation Energy Resource*

- **Increased Availability of Wind Resource Energy**
- **Lowest Cost Power**
- **Real Time Energy Cost**
- **Store Off-Peak Excess Wind Energy**
- **Add load when needed**

Graph showing KW Demand versus Time of Day with peaks and valleys indicating energy cost and demand.
Ice-on-coil Heat Exchanger