



**ICE ENERGY®**

***INTELLIGENT STORAGE AT WORK.***

# Distributed Energy Asset Overview for Jordan Electricity Regulatory Commission

Presented by:  
Jennifer Quade, Director of Strategic Alliances

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# Ice Energy's Background

- Formed in January 2003 to commercialize patents, intellectual property, and trade secrets for Distributed Energy Storage for commercial buildings, telecom, and small data center cooling systems
- Costa Mesa, CA - Sacramento, CA - Windsor, CO
- Over 17 patents and trademarks received, many more pending
- Numerous Green Building, Sustainability, & Smart Grid Design Awards
- Leading Energy Investors:

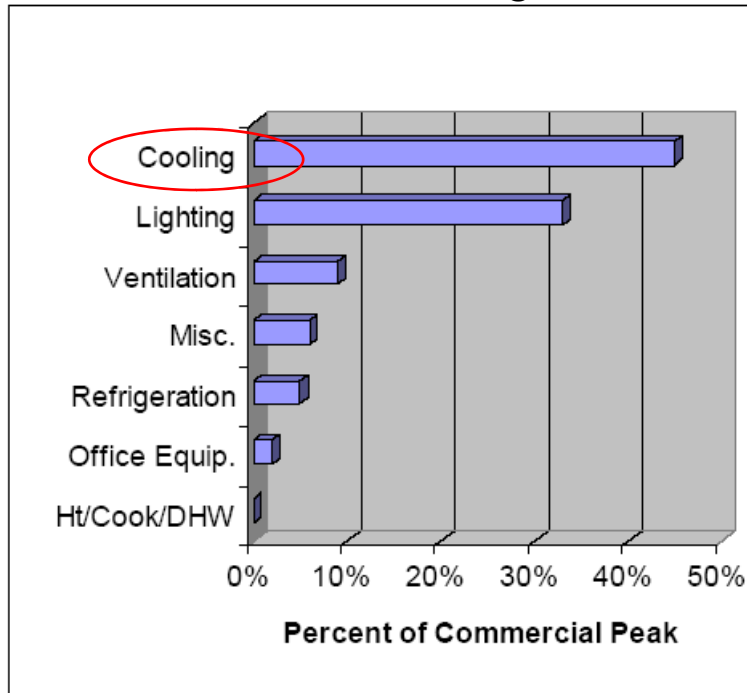


**EnergyCapital**  
Partners

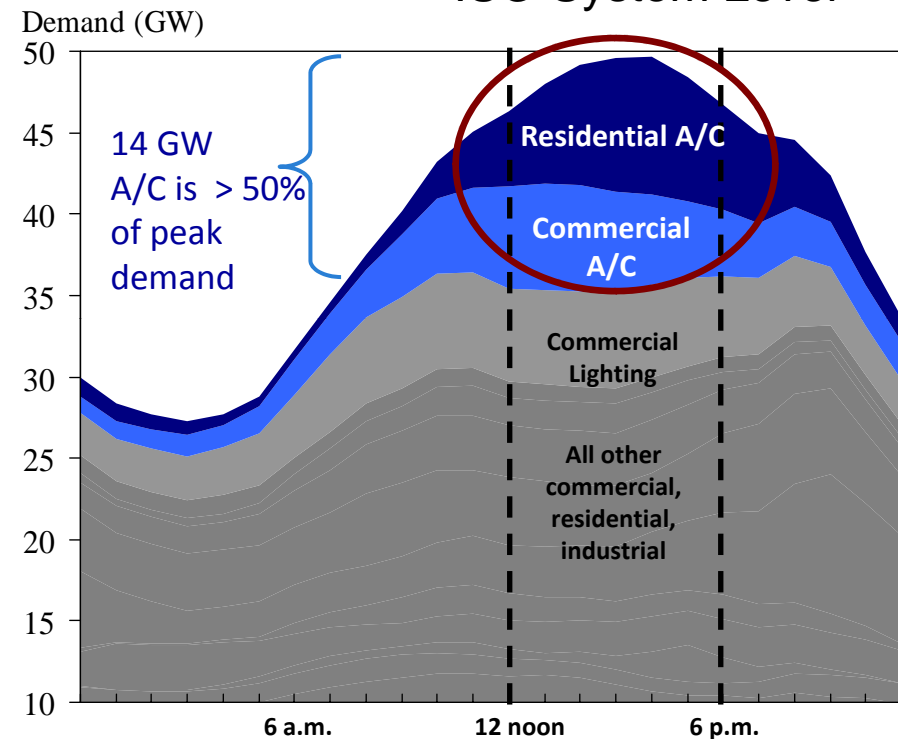


# The Problem: Summer Peak Demand driven by Building Air Conditioning

## Commercial Building Demand



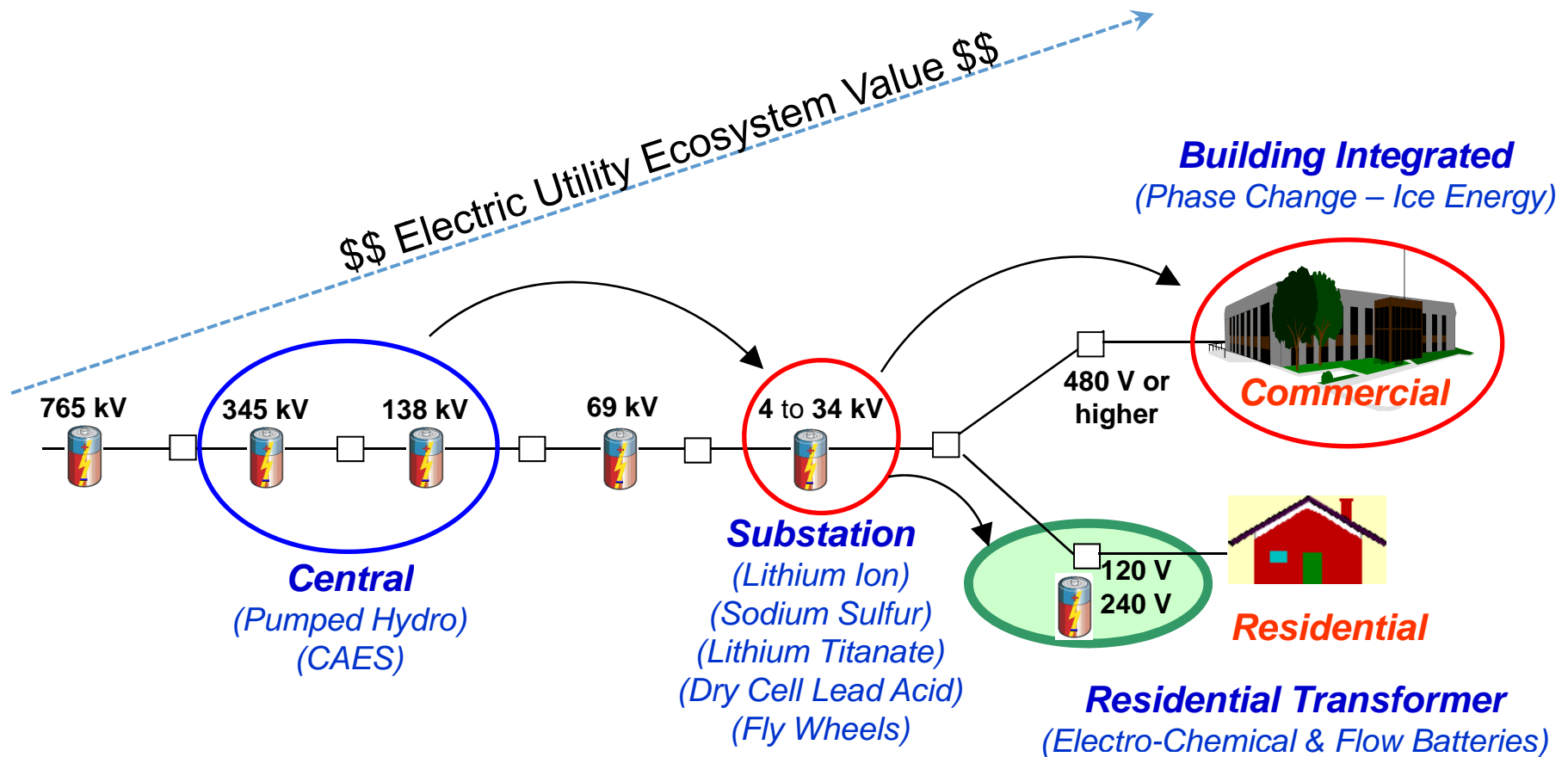
## ISO System Level



- Cooling is becoming about ½ the commercial load
- Commercial A/C load extends beyond the utility peak period



# The Value of Energy Storage Increases as it Approaches the Edge of the Grid



# The Solution: Distributed Energy Storage

## Two types of Ice storage products are available today

1. Designed for utilities to reduce 3 phase motor loads on a group of C&I loads on a feeder and offers SCADA and SmartGrid-enabled aggregation and **UTILITY CONTROLS** (Ice Bear)
2. Designed for large consumers, like large buildings and city centers, and offers **LOCAL CONTROLS** to building owners (Calmac)

Southern California Public Power Authority  
Member Utilities & Ice Energy  
53 MW for 6 hours daily during summer peak  
63 Gigawatt hours peak shift annually



Credit Suisse, NY - NYSERDA & CALMAC  
1 MW, 2 Gigawatt hours peak shift annually



# ICE ENERGY

*Intelligent Distributed Energy Storage.*

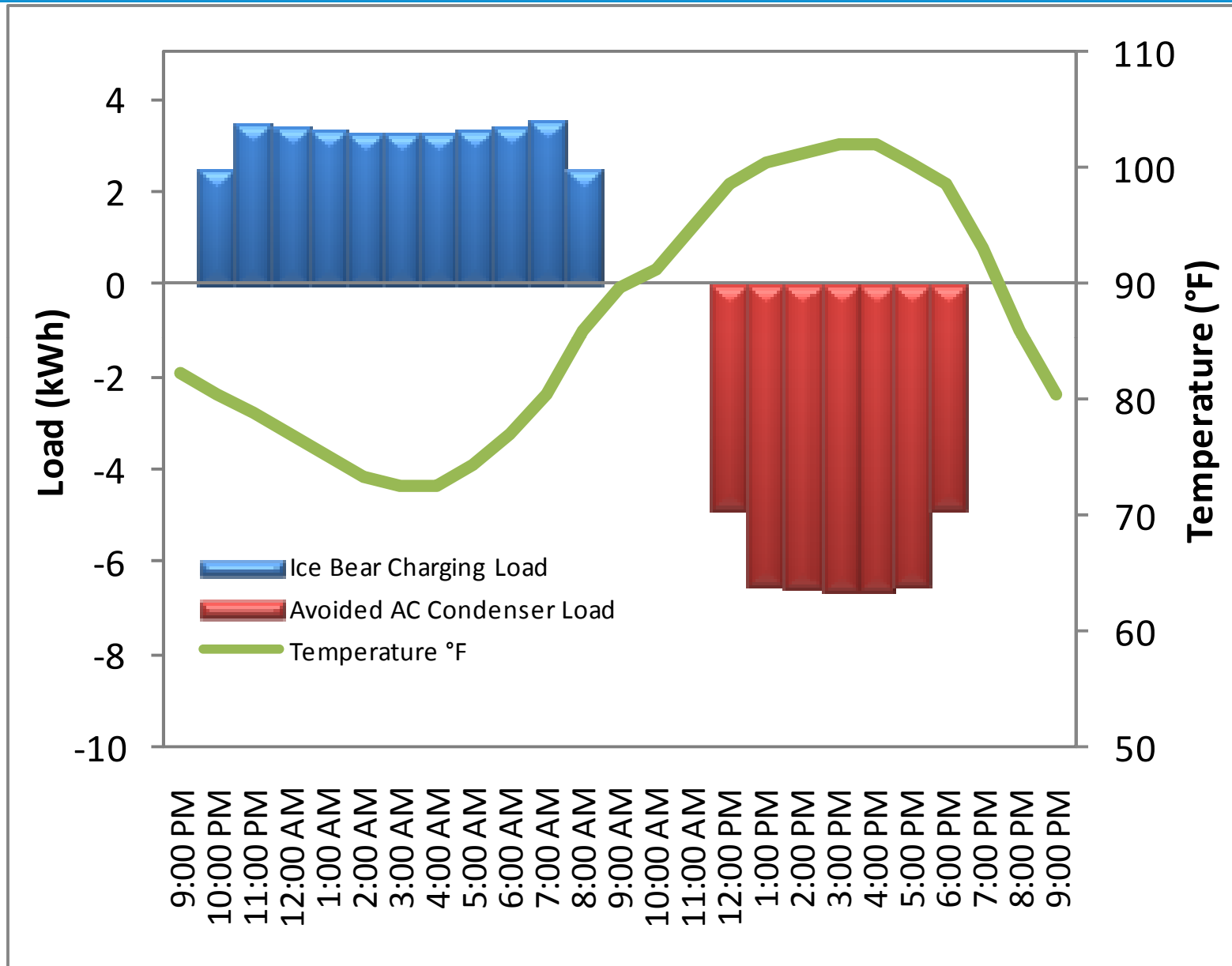




# Ice Bear Unit and Ice Ready Rooftop Unit



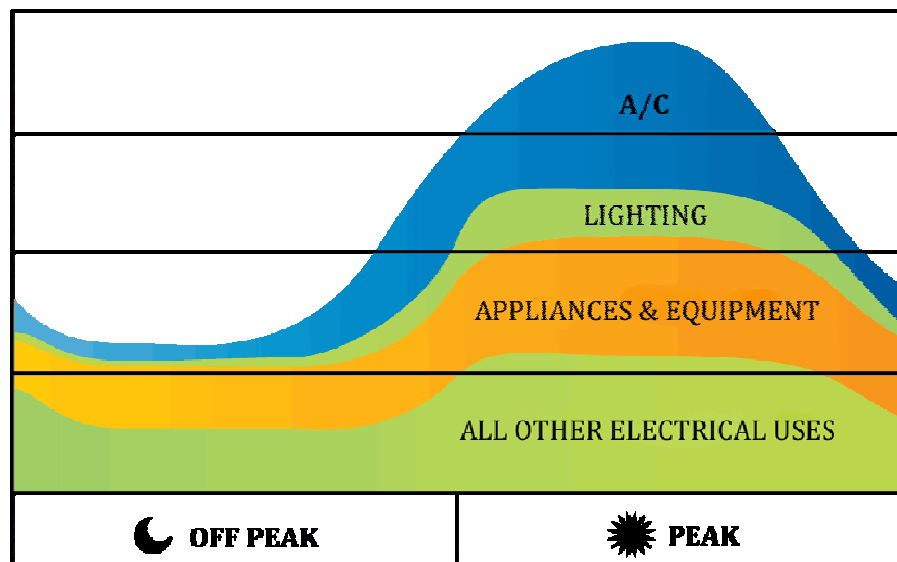
# Ice Bear Standard Resource Load Shape



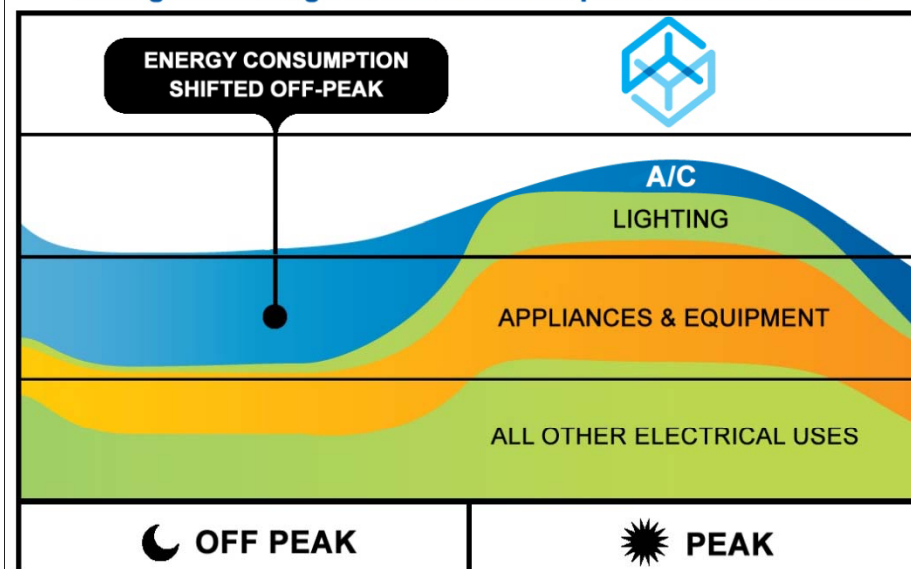


# Typical Commercial Building Load Shape

**TYPICAL 24 HOUR BUILDING ELECTRICAL LOAD PROFILE**



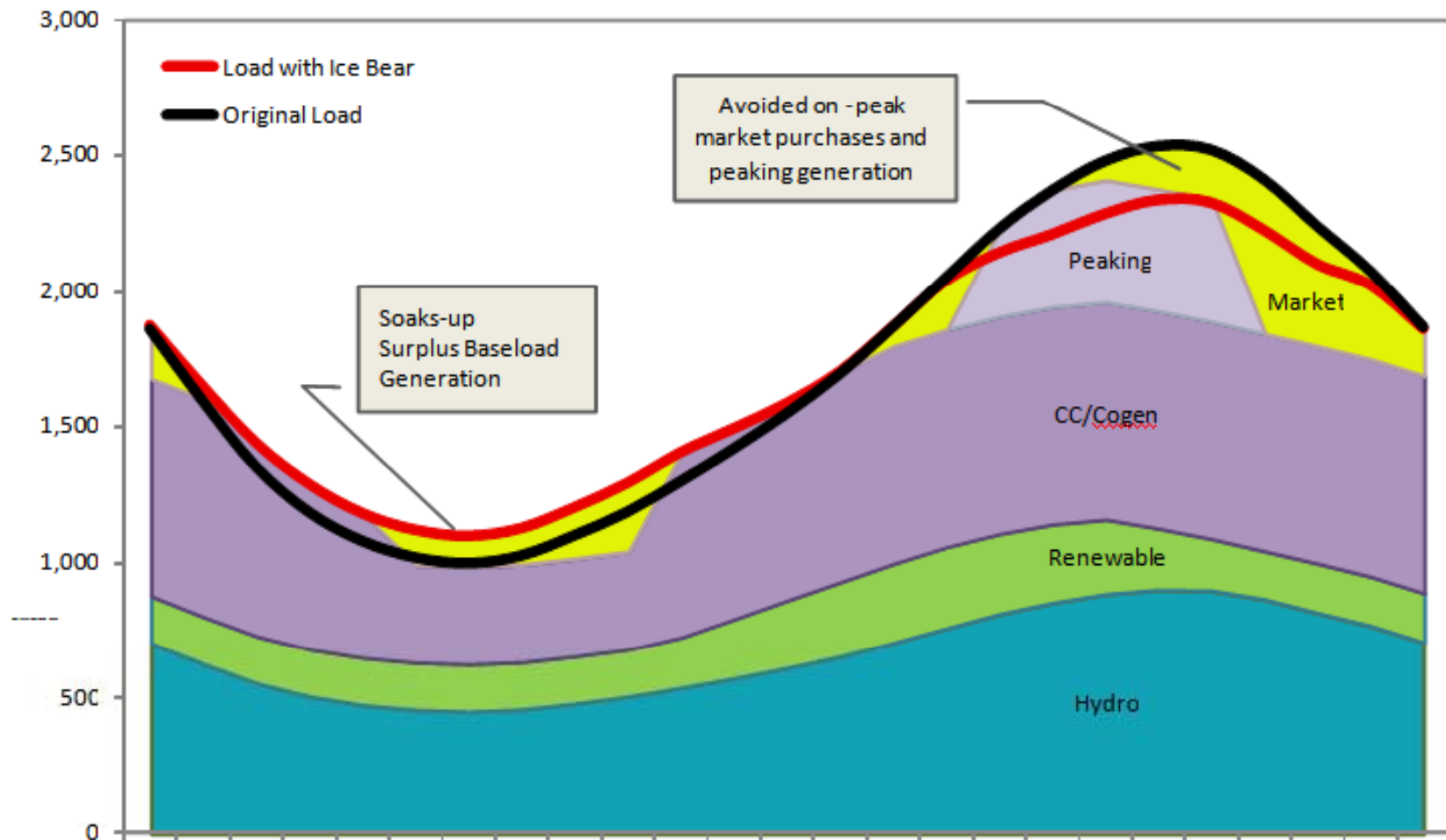
**Intelligent Storage At Work: Reshape the Load Profile**



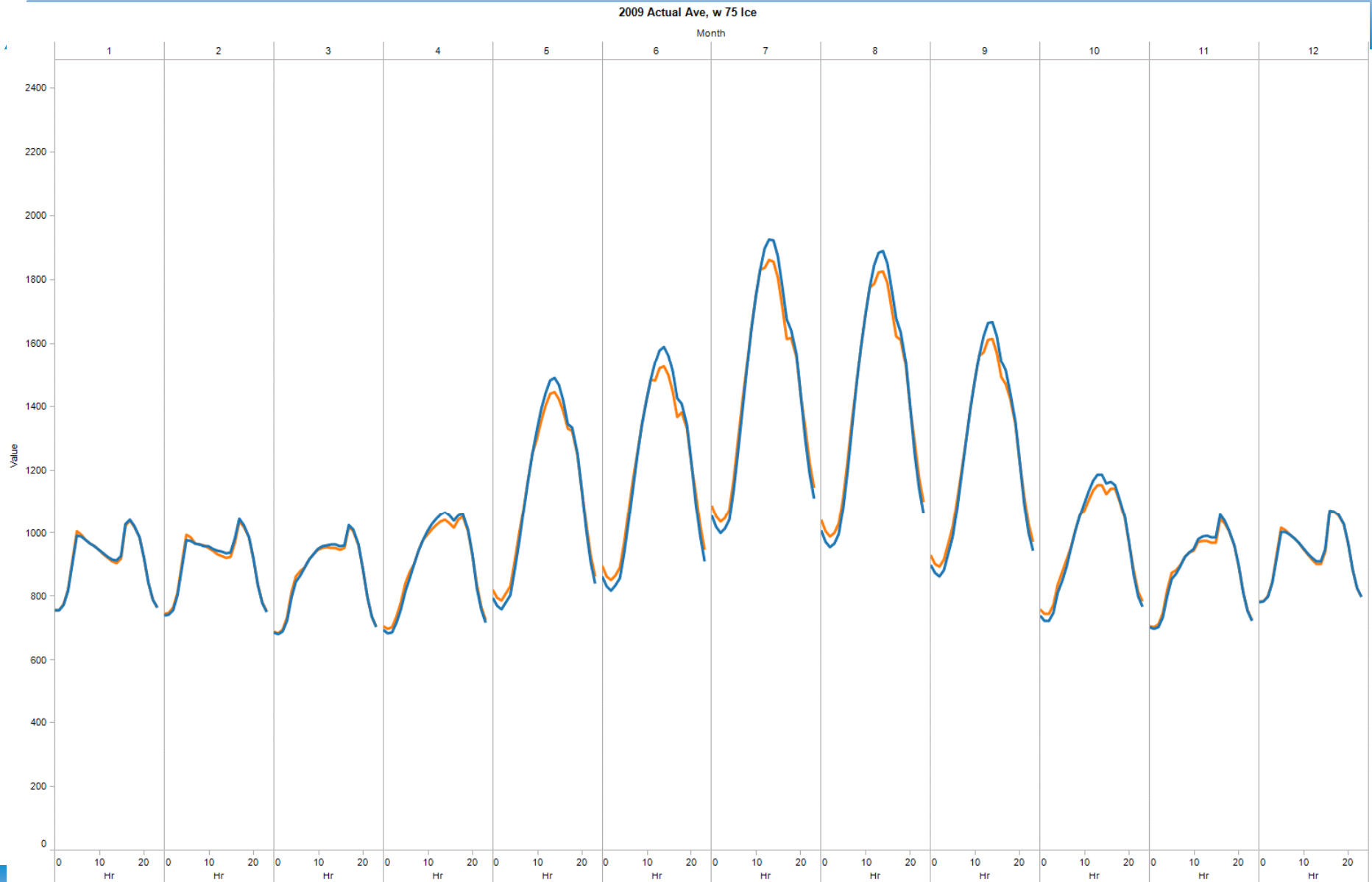
Improves Utility System Load Factor

# Example Electric Utility Generation Dispatch

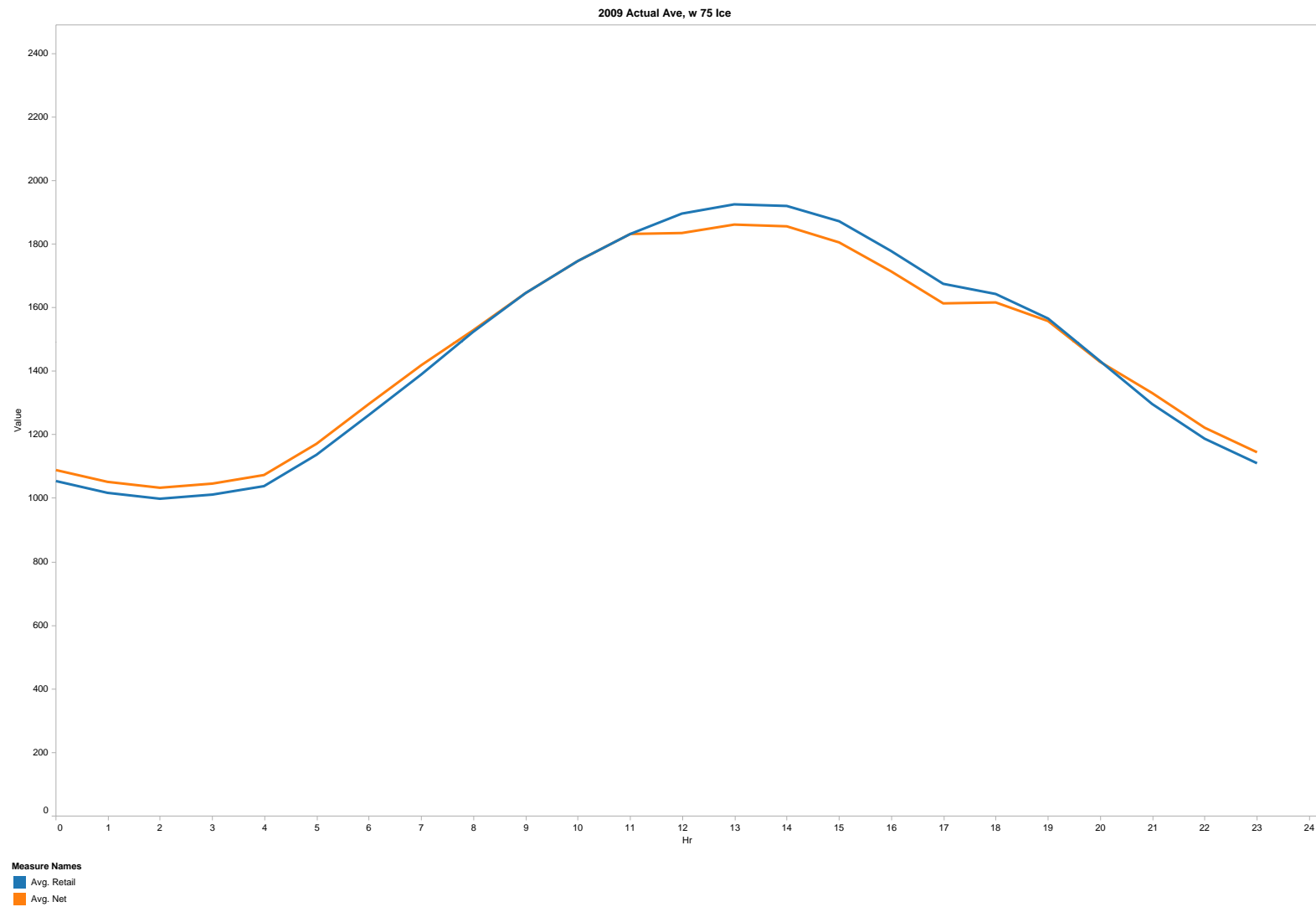
200 MW Ice Bear System



# Example Utility Load Curve by Month by Hour with 75 MW Ice Bear Storage



# Example Utility Monthly Load Curve with 75 MW Ice Bear Storage



# Ice Energy is more than just the Ice Bear



**cost-effective,  
scalable storage  
& performance**

Distributed resources

Real-time control

**Aggregated units managed as a single resource.**



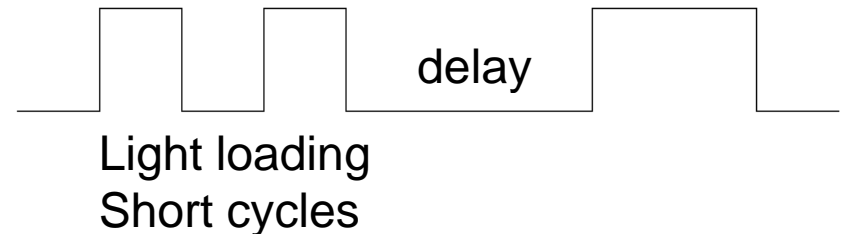
CoolData Smart Grid Architecture:

- Reliable
- Scalable
  - Supports 30,000 On-line Users
  - Supports 100 GigaWatts of distributed resource



## SmartGrid - Aggregated Distributed Energy Resource Management

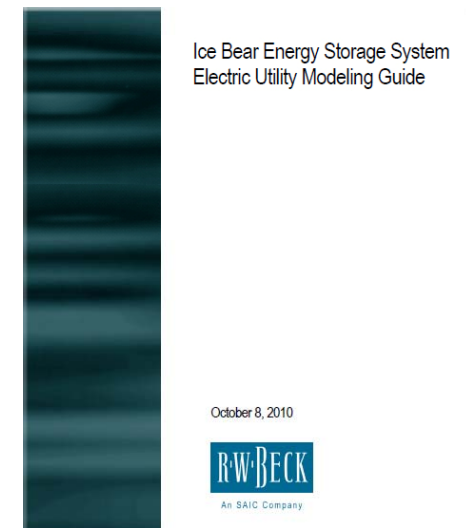
- Energy management system/remote terminal unit is tightly integrated into the energy storage device
- Real-time status, sub-metering, data monitoring of equipment
- Dispatched Load Control
  - Ice Assist & Adaptive Cycling
  - Switched Loads
- Energy Efficiency
  - Intelligent Compressor Control
  - AC Tune-up
  - High efficiency AC unit purchase options for customer



# Ice Bear Energy Storage Benefits

A fleet of Ice Bear units will eliminate 1,000's of 0.7 poor load factor, 3-Phase A/C inductive motor loads for 6 hours or longer daily.

- Avoided or Delayed T&D System Improvements
- Reduction in Reactive Power Requirements
- Improved System Power Factor & Voltage Support
- Increased System Power Transfer Capability
- Improved Daily Electric System Load Profile
- Avoided Electric System Marginal Losses
- Eliminates Fault Induced Delayed Voltage Recovery (AC Stalling)
- Credits for Improvements in System Efficiency
- Avoided or Delayed Simple Cycle Peakers
- Enabling of Building Integrated, Renewable Energy Only Resources





# Designed for Utility Ownership and Load Optimization

6 hour continuous daily operation

1 MW ~ 1GWh annual load shift

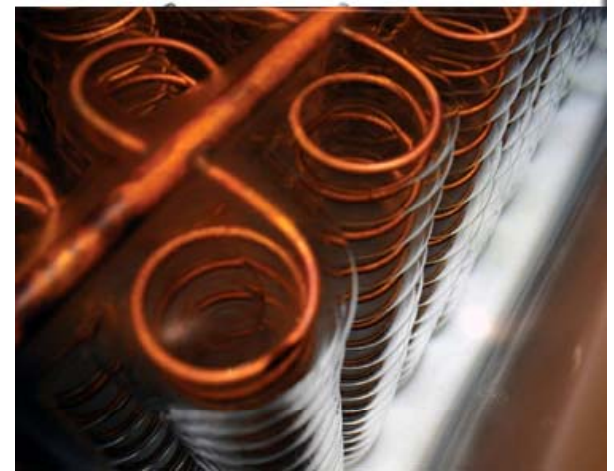
Networked dispatchable and scheduled energy resource

Integrated metering, measurement, and validation

Highest efficiency storage  $\approx 88\% + 12\% = 100\%$

25 Year Asset Life, No Performance Degradation

Earth Abundant Materials Ice & Copper



CoolData Smart Grid Controllers



# Recent Highlights

- CSI Grant SUN + ICE, SunPower, Target, Ice Energy, KEMA, Sandia Labs
- HVAC Partnerships – Carrier and Trane offering Ice-Ready rooftop units
- Glendale – Upgraded and replaced most city owned HVAC units + Ice
- FirstEnergy – EPRI IDER SmartGrid Project with Staples in Howell, NJ
- Ontario – Large Demo Grant with Toronto-Hydro and Veridian



Paul Hauser Director of REU



Ice Bear and Trane Ice-Ready RTUs



# Customer Acquisition & Commissioning

## Mature, High Quality, & Turnkey





# Panda Express



## Ice-Ready RTUs Directly from Trane & Carrier





# Office Building



# A Winning Combination = Sun + Ice + Wind





# Frees Up Existing Feeder Capacity

From “keeping the lights on” to  
“keeping the air conditioners running” to  
“keeping the vehicles charged”



# Questions?

## Thank you!

Jennifer Quade

Director of Strategic Alliances

[jquade@ice-energy.com](mailto:jquade@ice-energy.com)

