**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
# The first technology for widespread customer load management

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CLEAN ENERGY DOESN'T GET ANY COOLER THAN THIS.

# 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

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# 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)**

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

**Source CEC Staff Report: CEC-400-2006-006-SF**

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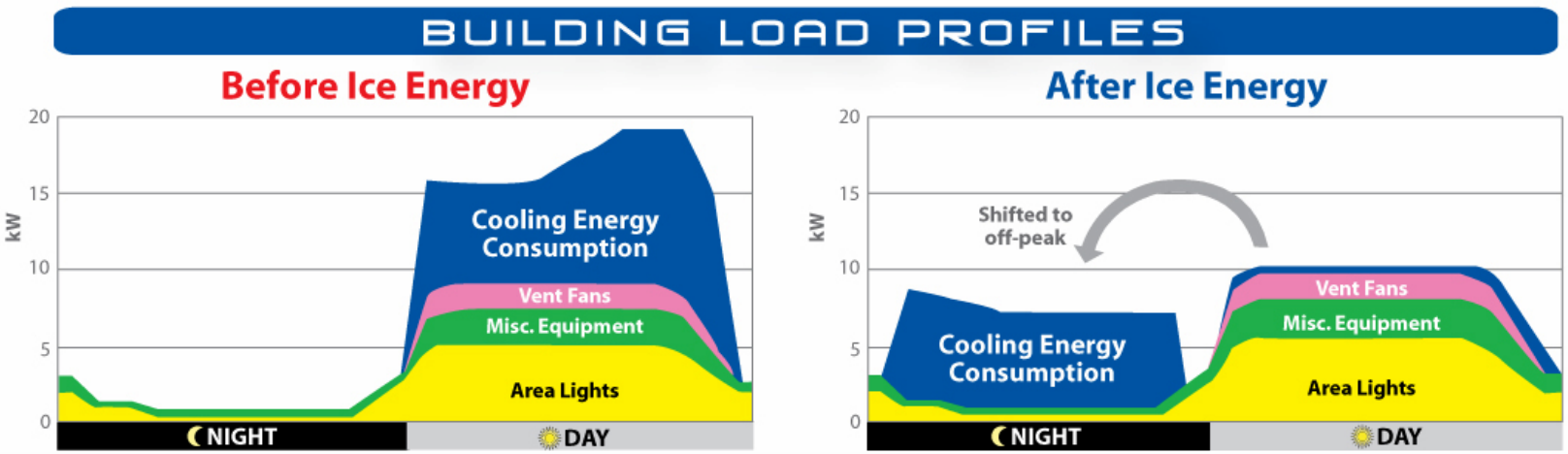
# Most Buildings Have a Poor Load Factor ~ 53%

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




Low capacity factor

High capacity factor

- ***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***

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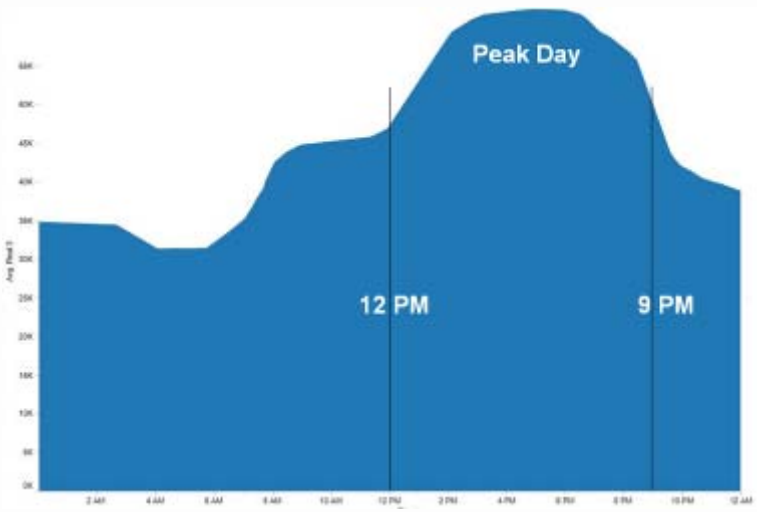
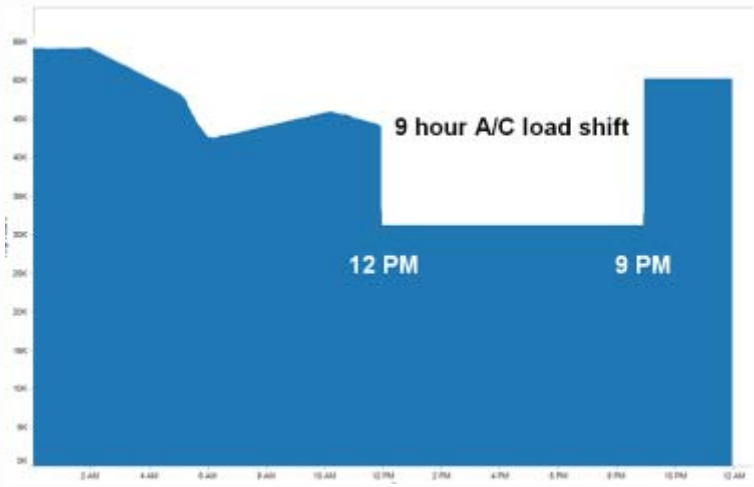
# Victorville, CA Police Station - Meter Data

## Electric Utility Meter Load Profile (inclusive of all loads)

**Before**




**After**




- 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)

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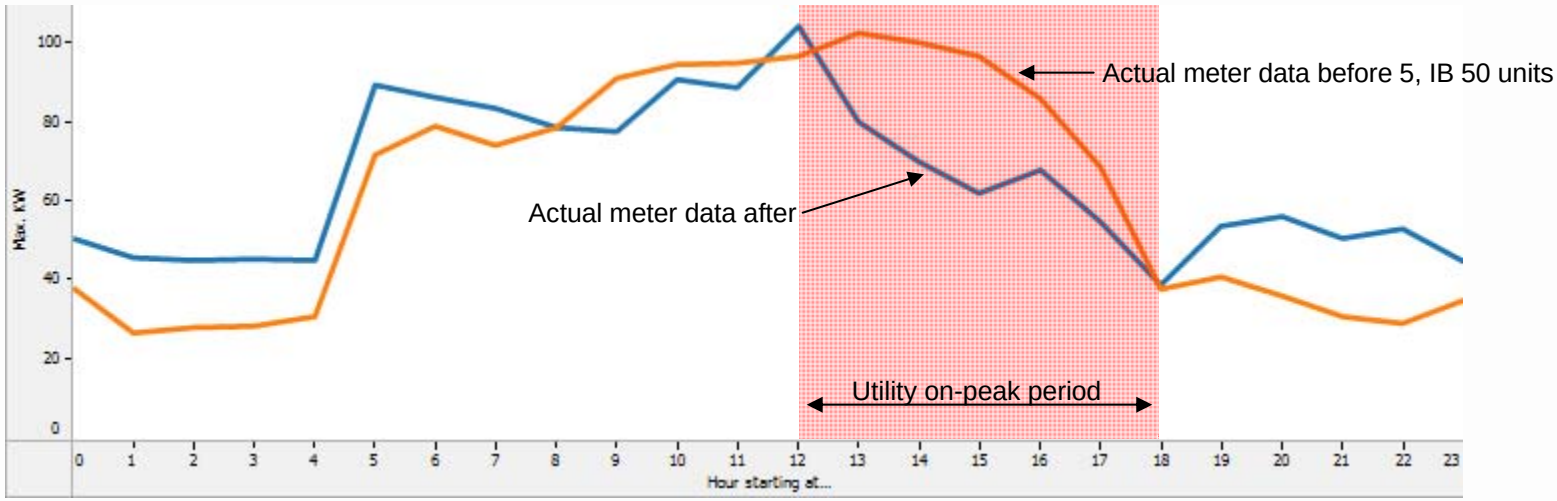
# CoolData® SmartGrid Controller Schedule/Dispatch/Measurement & Verification

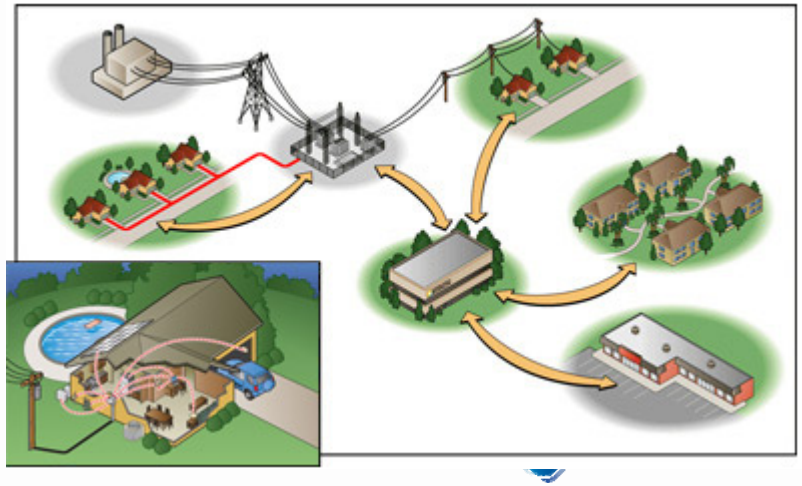
Si Manufacturing  Interval Meter Data, Average of 5 Consecutive Weekdays




**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

- 1-Wire Dallas Sensor Network
- NI LabVIEW Application Layer
- Web Server
- OSIsoft, PI Enterprise Layer

*Most advanced HVAC controller on the market*

# Ice Bear® 50 Hybrid Air Conditioner

***From this…***

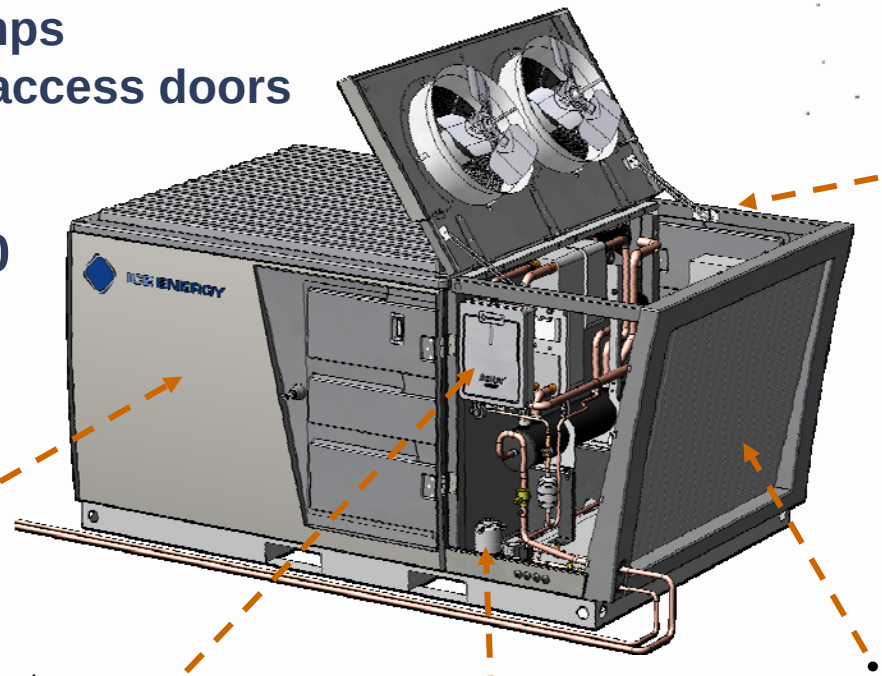
# Ice Bear® 30 Hybrid Air Conditioner

***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**




- Door on opposite side for service access to compressor and water pump

- 5 Ton Cooling Output
- 6 hours of load shift
- 32 Ton-hour storage module (35 kWh)

- CoolData® Controller

- Refrigerant pump

- Compressor location

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# Thank-You

www.ice-energy.com

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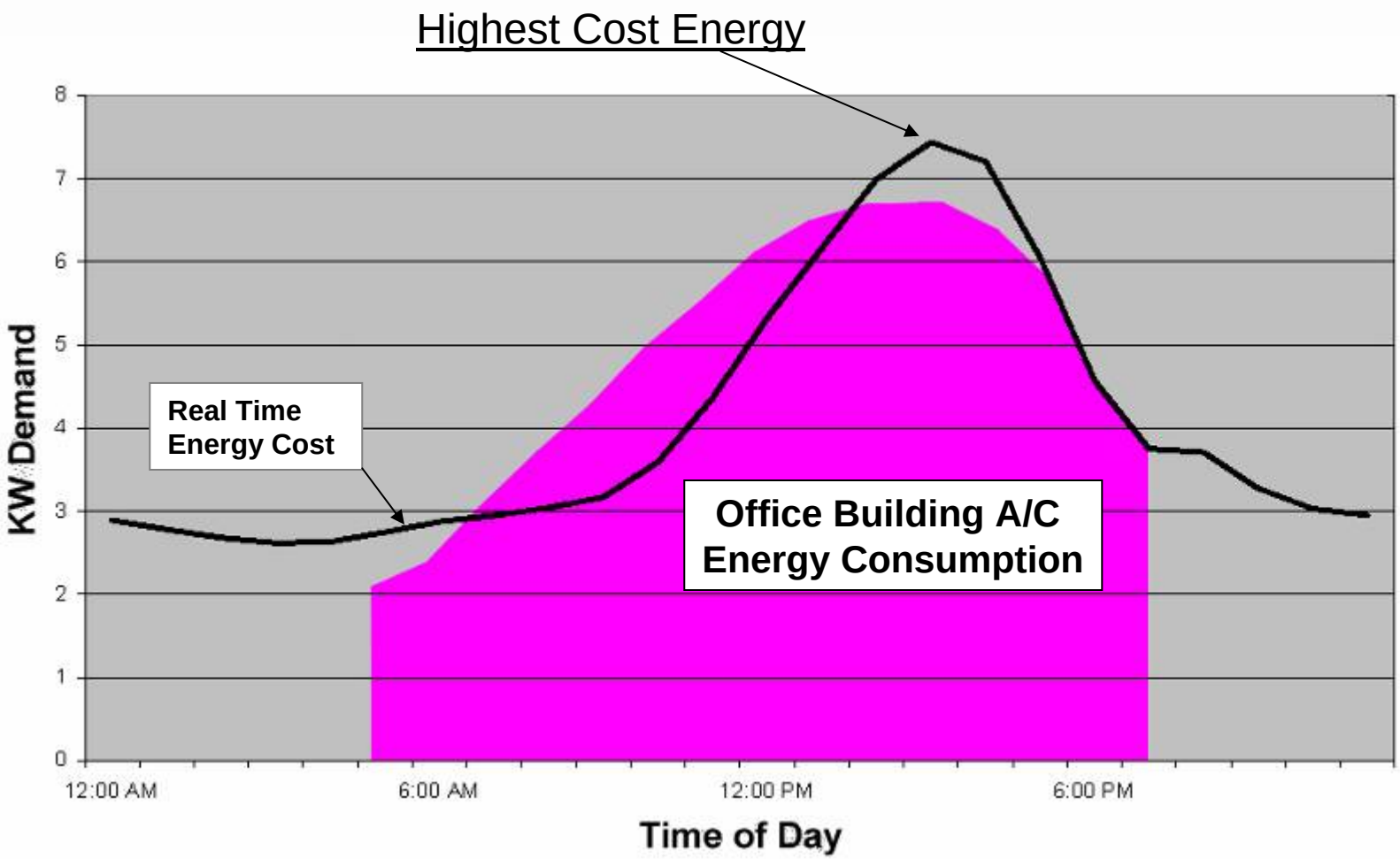
# Building Air Conditioning Energy Profile Drives System Peak

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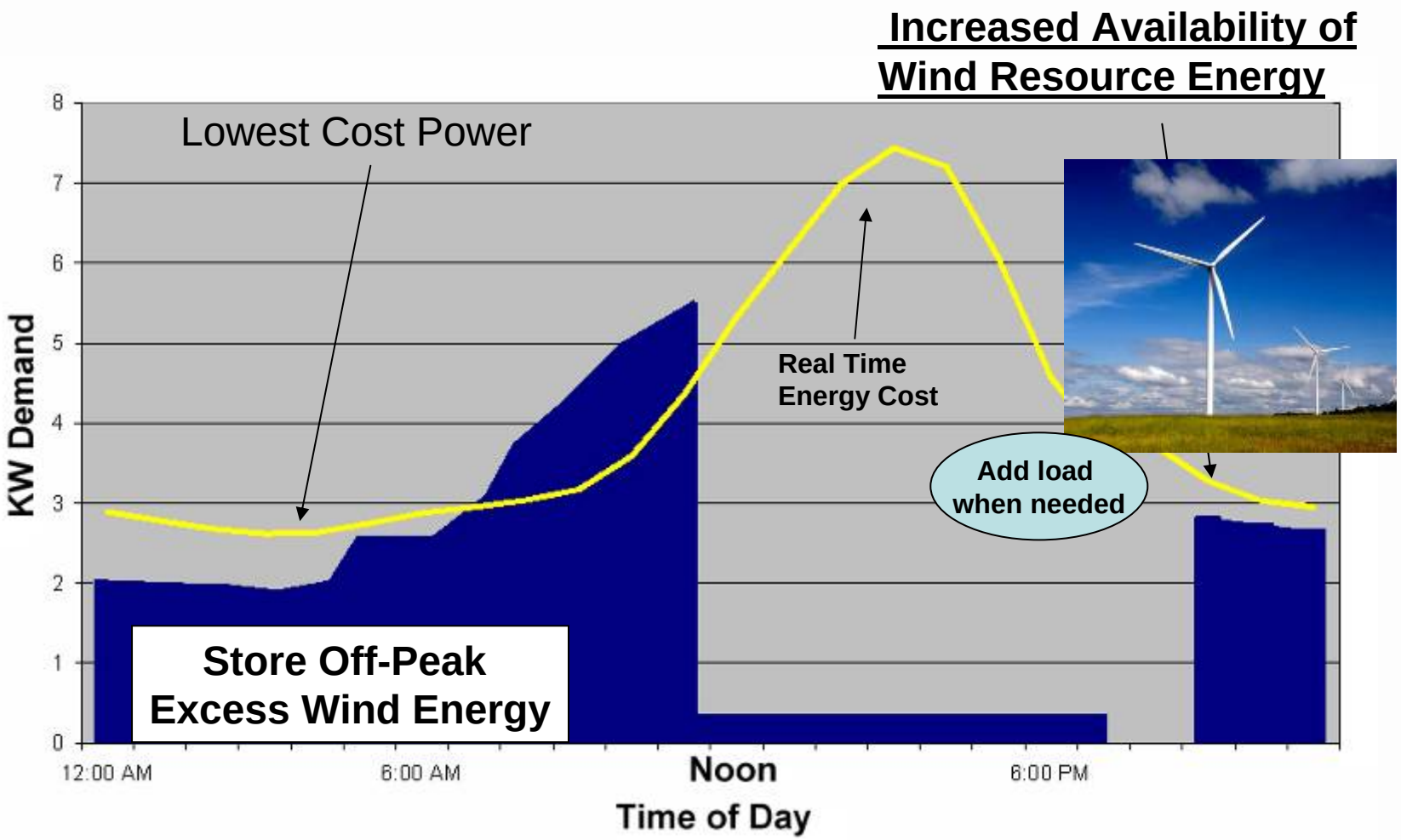
## Create a market for off-peak wind *and* reduce the need to run on-peak generators

***Bi-Directional Utility Controlled Regulation Energy Resource***

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# Ice-on-coil Heat Exchanger