# Thermal Storage in New England Shifting energy to reduce utility bills

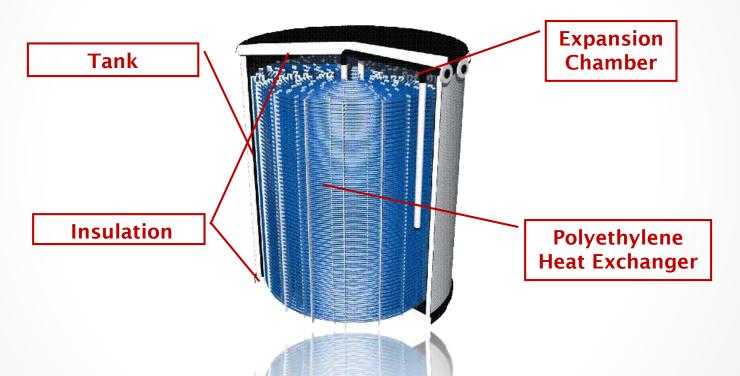


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# The IceBank®: Simple, Elegant

Ice-on-Coil Internal Melt Technology



Tank is 10% polyethylene tubing, 80% tap water, and 10% expansion space Model 1190 (7.5' in diameter, 8.5' tall): 16-25kW load shift for 6 to 10 hours



# Utility Bill Basics

- 1. There are three ways to lower electric costs in Massachusetts:
  - a) Buy fewer units of energy.
  - b) Purchase power when it's cheaper, at night.
  - c) Negotiate a better rate.





# Utility Bill Basics

# 2. Commercial Rates are Different than Residential Rates:

- a) Residential Rates are based solely on Usage (kWh)
- b) Commercial Rates are based on a mixture of Usage (kWh) and Demand (peak kW).



### Eversource's Greater Boston Rates

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Note: this is no easier to read when printed out.

# The Demand Charge Effect

#### **Eversource Greater Boston T-2 rate**

Energy (usage):

Day: \$0.08/kWh \$0.262/kWh

Night: \$0.008/kWh \$0.008/kWh

Demand: \$29.20/KW/Month

How big an effect is the Demand Charge??

Energy is 69% less expensive at night



### Demand Charge Effect.....

### Do the Math (Back of the Envelope)

#### **Conventional Chiller System**

Demand Cost /month 1000 tons x 0.8 kW/ton = 800kW 800 kW x \$30.00 = \$24,000/month

#### **Energy Usage for Chiller for Month**

1000 tons x 10 Hrs x 75% x 0.8 kW/ton x 22 days/month = 132,000 kWh

#### Approximate Cost for Demand / kWh

24,000/132,000 kWh/month = 0.182/kWh

Therefore Daytime Energy = \$0.08 + \$0.18 = 26 cents/kWh



### NYC Installations

#### One Bryant Park





Rockefeller Center

#### 55 Water Street





Goldman Sachs HQ

#### Others:

1155 Avenue of the Americas (Durst Bldg)
140 West Street (Verizon)
787 Seventh Ave. (AXA Equitable)
The New School
730 Third Ave. (TIAA-CREF)
Fordham Plaza
522 Fifth Ave. (Morgan Stanley)
11 Madison Ave. (Credit Suisse)
Park Avenue Plaza (Fisher Bros.)
111 8<sup>th</sup> Avenue (Google East Coast HQ)
NYU-Poly Brooklyn Campus



### Case Study

### Northern New Jersey School District



#### The Challenge:

- School district wanted to add cooling to their largest high school, but had limited money for upgrades
- No additional electrical capacity available at the site; a substation upgrade would cost many thousands of dollars



### Case Study

### Northern New Jersey School District



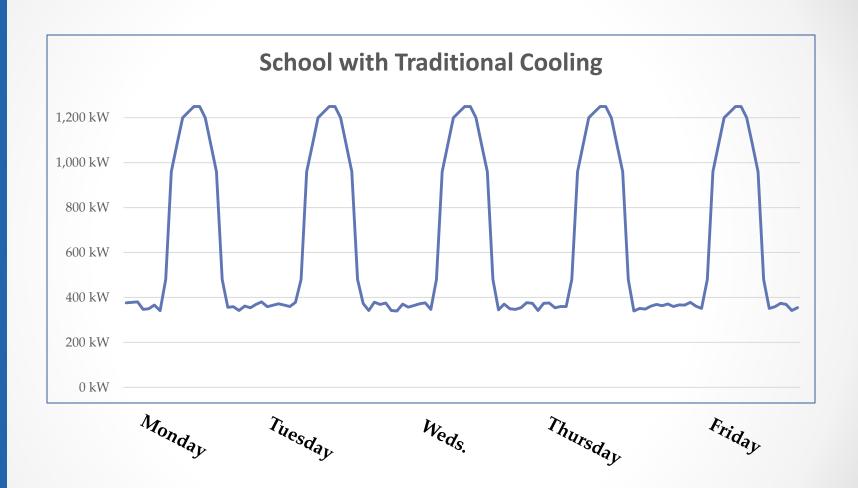
#### **The Solution:**

- An ice-based chilled water system: two ~150-ton Trane air-cooled chillers and 12 Calmac IceBanks.
- Partial storage: the chiller makes ice at night, and then both the chiller and the ice operate during the day to meet the building's 500 ton load.
  - O Downsizing the chiller saves money and limits connected electric load.
  - The chiller operates at its max efficiency at night and during the day, and the ice provides the balance.

CALMAC Mfg. Corp.

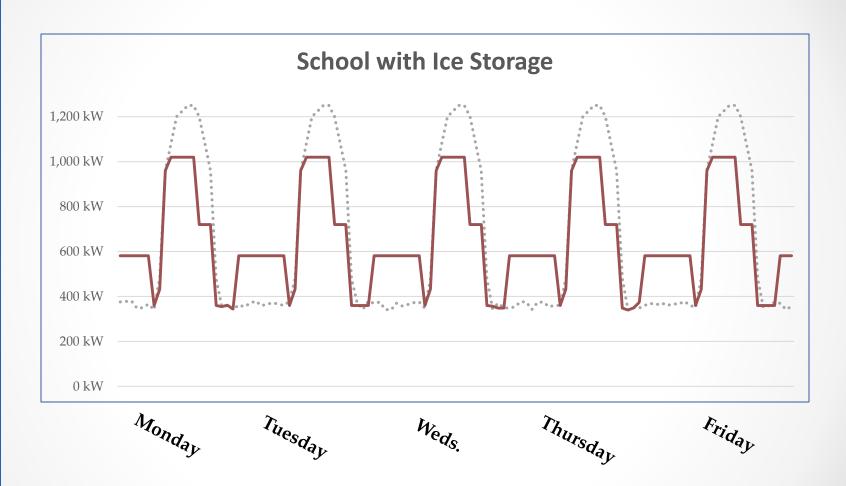
• The Trane Ice Completion Module is the glue that keeps this system operating effectively.

# Ice Storage & Schools



Schools have a particularly spiky peak - in many U.S. market (Florida, Ohio, Minn.), K12 projects account for >50% of all Calmac jobs.

# Ice Storage & Schools



By shaving 250 kW, we saved this customer over \$30,000 per year. NJ's rates are about two-thirds as high as Boston's.



The pre-packaged system also includes controls that be viewed

and modified remotely.



# Benefits of Ice Storage

### To the consumer:

- First cost savings: storage avoided the need for very expensive substation upgrade
- Annual electricity savings of roughly 10%
- Replicable school district in negotiations to buy additional, identical packages for other schools

### To the grid:

- Major congestion relief, targeted at the source of peak
- Higher load factor on the grid --> less T&D infrastructure
- More "smart assets" in key places; this is essentially a 250 kW/ 2.0 MWh battery in a highly congested region.



### Questions?

