



PPRAC Energy Storage Work Group

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Baltimore, MD





Ingersoll Rand advances the quality of life by **creating comfortable, sustainable and efficient environments.**

Ingersoll Rand (NYSE:IR) advances the quality of life by creating comfortable, sustainable and efficient environments. Our people and our family of brands—including Club Car®, Ingersoll Rand®, Thermo King® and Trane®—work together to enhance the quality and comfort of air in homes and buildings; transport and protect food and perishables; and increase industrial productivity and efficiency. We are a \$13 billion global business committed to a world of sustainable progress and enduring results.



Our Global Footprint

Manufacturing, Distribution & Office Locations



America

384 Climate
75 Industrial
24 Corporate



Europe, Middle East,
India, and Africa

137 Climate
31 Industrial
21 Corporate



Asia Pacific

134 Climate
59 Industrial
2 Corporate

LOCATIONS

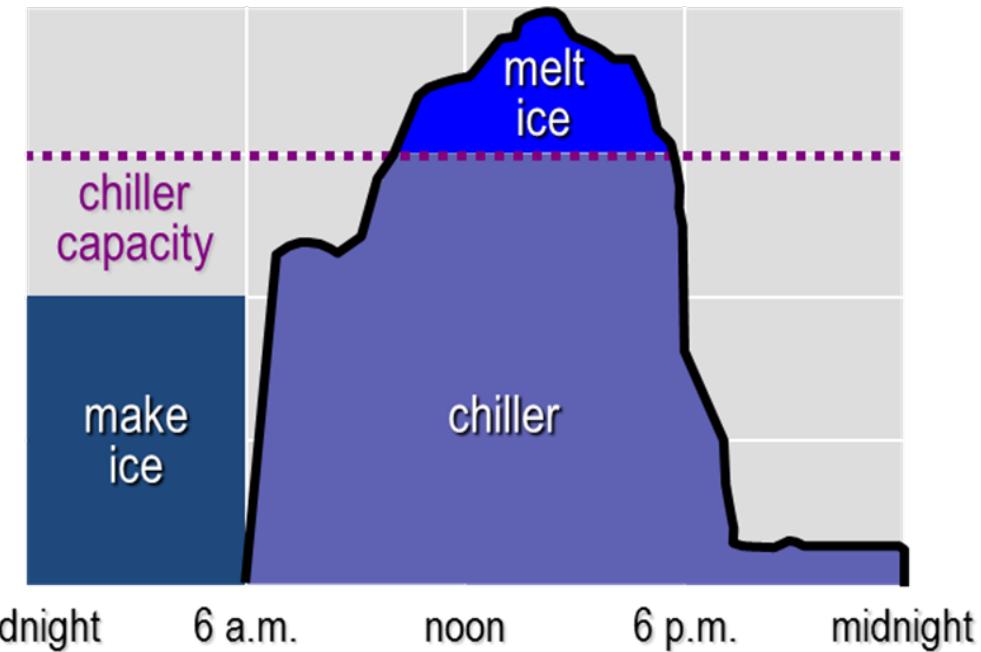


World-Class Talent in Every Market
More than **40,000 employees** globally



Global Footprint and Ingersoll Rand Locations
We have a total of **867 facilities** around the world,
including **51 manufacturing facilities** worldwide.

What is Thermal Ice Storage?



Very efficient type of energy storage because it stores energy in the form it will be used.

Ice Storage Benefits



- Lowest installed cost
- Stores energy in form it will be used – Cooling or BTUh
- No cycle degradation over lifetime
- Ice storage system life is 25 + years
- Sustainable form of energy storage – Made of mostly recyclable materials with no end of life material disposal issues.
- Technology has been in use for decades.

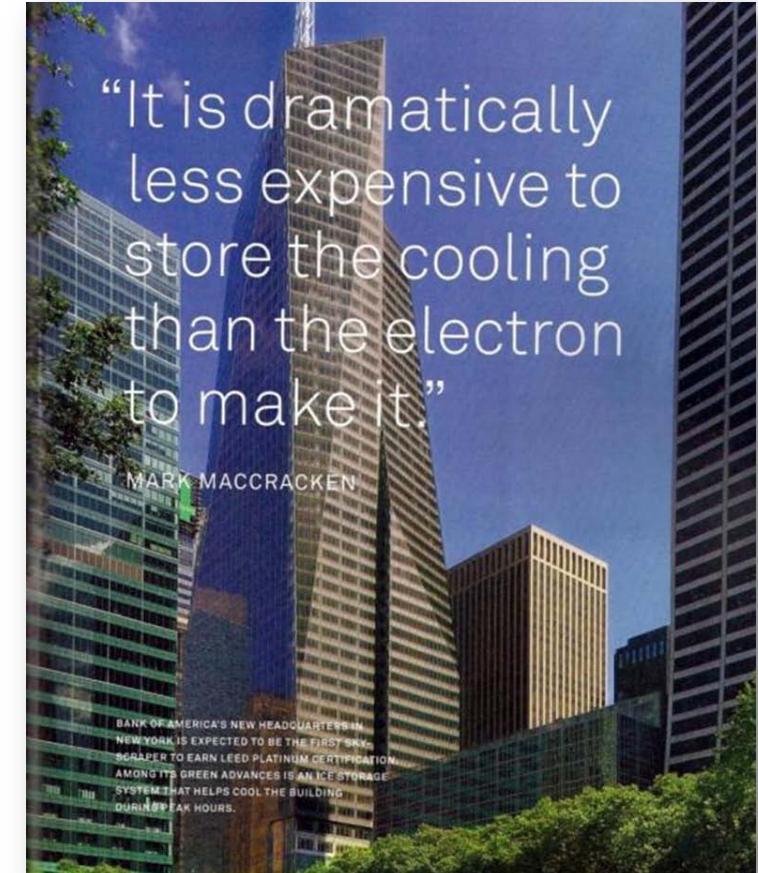
Model 1190 Ice Tank	Discharging over 6 hrs.	30 kW Cooling	192 kWh / day	\$22,000 / tank	\$733 / kW	\$ 115 / kWh
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St. Lucie County School District



Typical Large Ice Storage Project

- 13 schools upgraded
- Chiller plants with ice storage
- 3.8 MW at peak, storing the equivalent of 22.8 MWh
- Reduced annual energy costs by 30-40% (\$5M)
- Full- and partial-load shifting helps manage peak electrical demand and avoid costly substation upgrades.
- Project benefited from sufficient demand charges and first cost incentives



**Reducing annual energy costs by more than \$5M
by shifting 3.8 MW at peak**

Baltimore Convention Center



- Large Scale District Chilled Water Plant
- Original Installation in 1996
- 75,000 Ton-hours of ice storage capacity in 4 connected plants
- Build Ice at night when demand & Cost is down, melt ice during the day
- Serves more than 11.5 million sf of conditioned space.



Using Ice Storage Across MD



- Time of Day Utility Rates facilitate peak demand shifting technologies
- Including Prescriptive Utility incentives for technologies such as thermal storage to the EmPOWER MD peak reduction programs can drive success (similar to NY, NJ, CA)
- Ideal applications for ice storage
 - Large buildings (40,000 sf +)
 - Lower cooling loads at night
 - ✓ K-12 Education
 - ✓ Higher Education
 - ✓ Healthcare
 - ✓ Office Space
 - ✓ Arenas

