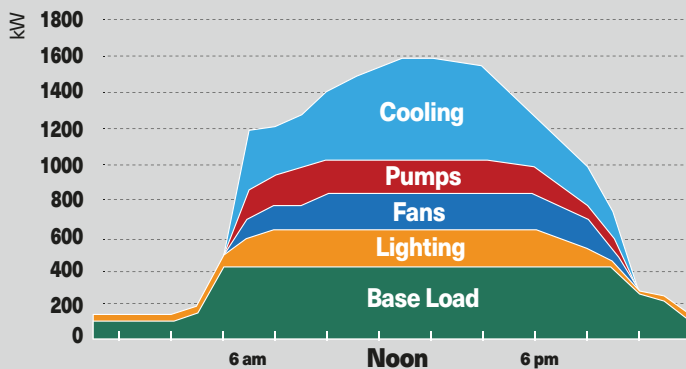


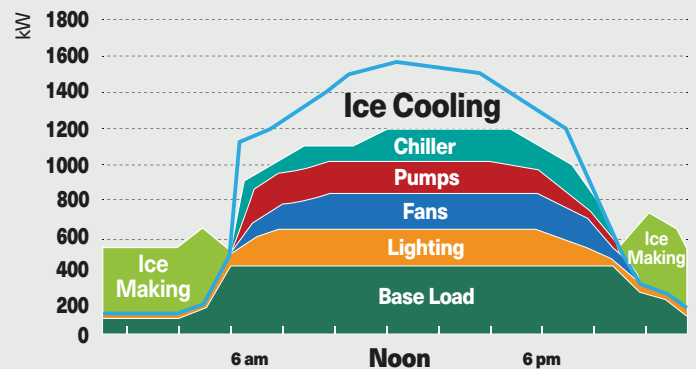
Thermal Energy Storage: Proven, Safe and Cost Effective



Building Electric Load Profile...



...with Thermal Energy Storage



Buildings have thermal and electrical loads. Heating ventilation air conditioning (HVAC) accounts for 40% of energy usage in commercial buildings.¹ Leveraging energy storage technologies helps lower operating costs and reduce pressure on the utility grid. Using off-peak electricity for on-peak cooling enables building owners to lower their cooling costs by as much as 40% with thermal energy storage. Thermal energy storage creates ice during off-peak periods when electricity prices are low so that building owners can avoid running air conditioners during on-peak periods, when prices are much higher.

Trane has over 100 years of buildings and energy experience, cutting edge technology and services. Our dedicated people help leverage buildings as a financial and operational resource for the grid by offering grid operators results: energy controls that uniquely address local grid conditions, increased capacity management, dispatchable assets, non-wire solutions, and reduced greenhouse gas emissions.

(1) EIA, 2016

CALMAC® US Projects Histogram



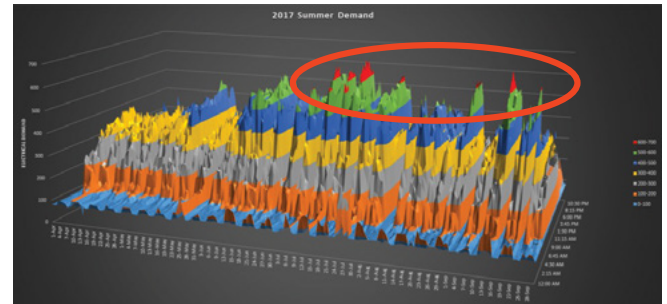
CALMAC has installed 530 MW/3,422 MWH of Thermal Battery™ cooling systems in the US.

Installed base where grid ISO's are active

Case Study: How Thermal Energy Storage Drives Savings from Reduced Peak Demand

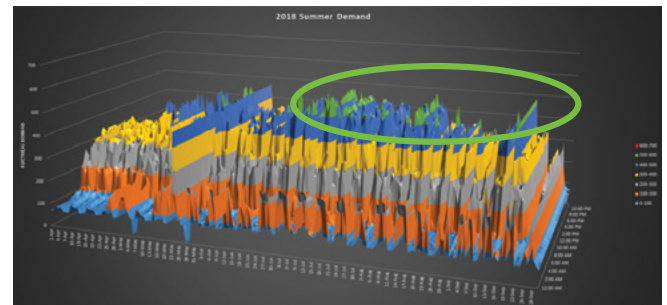
Before Thermal Energy Storage:

- Peak building demand was close to 700kW in 2017
- Decided to use Thermal Storage using ice tanks
- Shifting our usage to night hours



After Thermal Energy Storage:

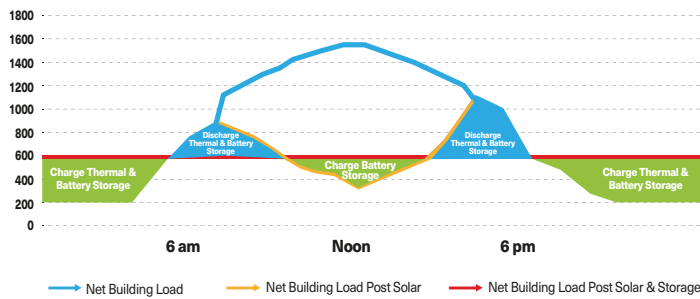
- Thermal Energy Storage reduced the 2018 peak by 100 KW (a reduction of more than 15%)
- Summer monthly bill savings of \$1,000



Thermal and Battery Energy Storage

Leveraging thermal and battery energy storage together optimizes renewable energy usage. Energy storage increases the use of renewables up to 50%.² Combining ice and a battery energy storage to address peak demand can reduce the installed energy storage equipment cost by as much as 75% compared to a battery alone.³

Building Electric Load Profile with Thermal and Battery Energy Storage



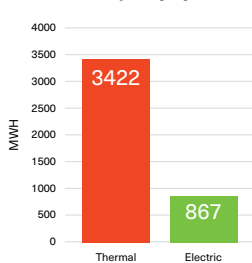
Thermal Energy Storage is One-Third the Cost of Chemical Battery Systems for C&I Uses

Cost advantages

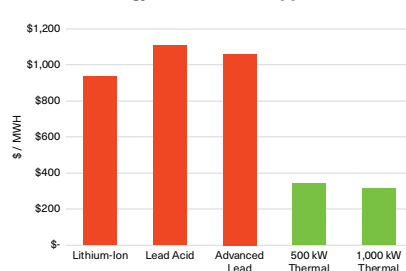
- 30-year useful life
- No balance of system, interconnection costs
- No degradation

Lower capital costs mean lower financing costs

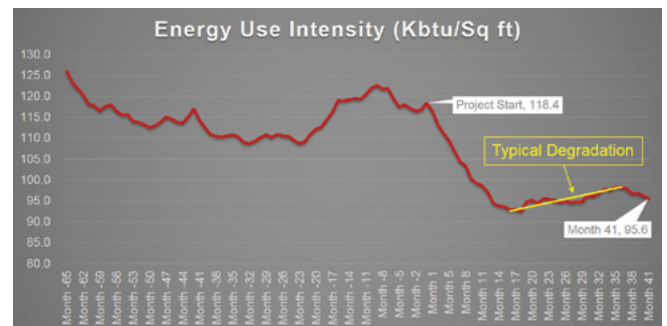
Installed Capacity by 2018⁴



Technology Cost for BTM Applications^{5,6}



Results



(2) ASHRAE Research Paper: Design and Utilization of Thermal Energy Storage to Increase the Ability of Power Systems to Support Renewable Energy Resources, 2017 (3) Commercial Building Example is based on CALMAC analysis as published in Distributed Energy Magazine, January, 2018 (4) Energy Information Administration. <https://www.eia.gov/analysis/studies/electricity/batterystorage/> (5) Costs represent average range of pulled from LCOS 3.0 for battery technologies (Source: Ingersoll Rand) (6) Conservative case that includes full cost of chiller (Source: Ingersoll Rand)



Trane – by Trane Technologies (NYSE: TT), a global climate innovator – creates comfortable, energy efficient indoor environments through a broad portfolio of heating, ventilating and air conditioning systems and controls, services, parts and supply. For more information, please visit trane.com or tranetechnologies.com.

All trademarks referenced in this document are the trademarks of their respective owners.

© 2020 Trane. All Rights Reserved.

ENGY-SLB027-EN
07/24/2020