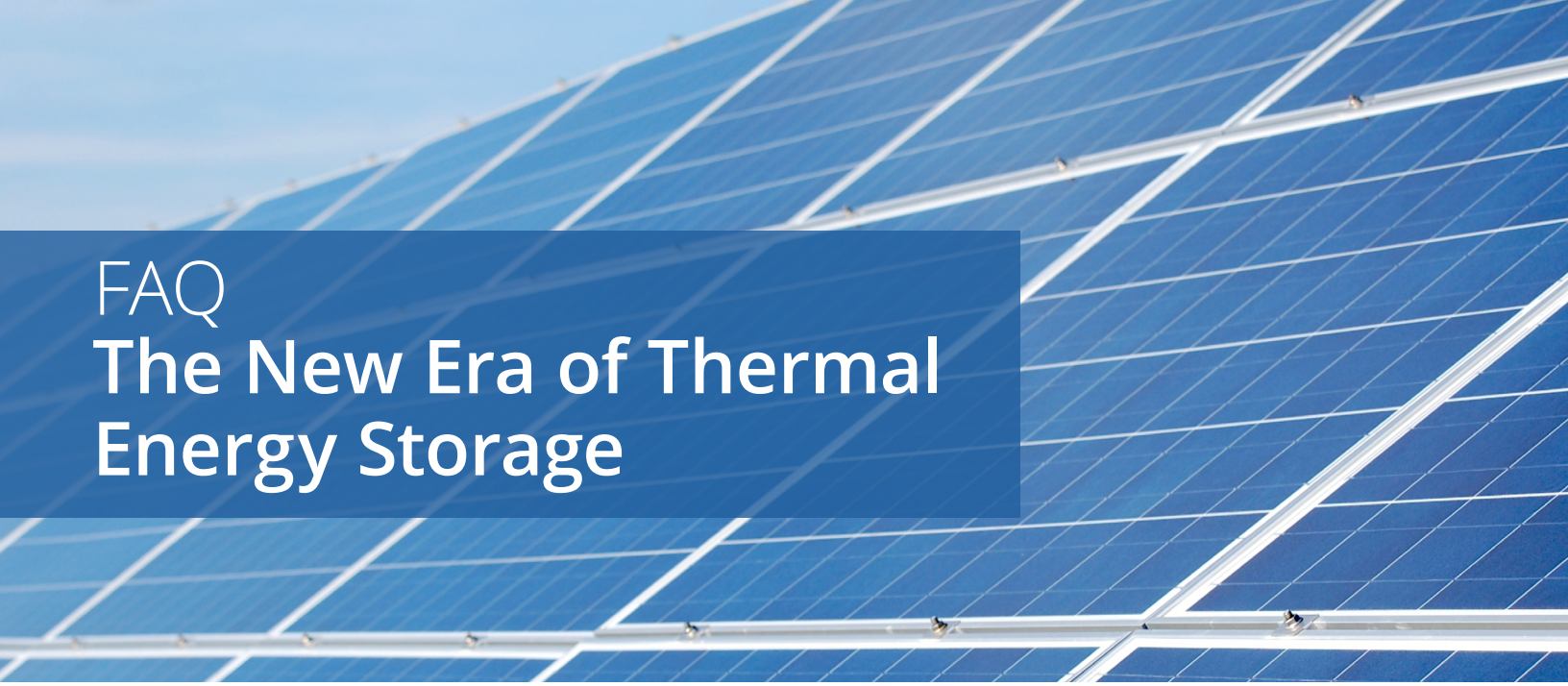

FAQ
The New Era of Thermal Energy Storage

Transitioning to a low carbon future relies on all forms of energy storage. For buildings, this means addressing thermal loads with thermal energy storage and electrical loads with electrical storage.

Today, Trane has installed over 530MW / 3,422 MWH of thermal energy storage in the United States. Advancements in controls and digital/intelligent services have made thermal energy storage systems more efficient and are installed and serviced by highly trained technicians.

As renewables increase, these systems are even more critical to decarbonization efforts. Unlike systems of the past, they can provide more than just cooling. They also can store and dispatch heating as "thermal batteries" for an HVAC system.

Q1: Why isn't thermal energy storage applied more?

A: There is a lack of awareness around the true value of thermal energy storage to reduce energy costs and reduce carbon emissions.

1) Many people do not understand the significant variations throughout the day for local electricity costs and carbon emissions. The flexibility that thermal energy storage adds enables buildings to be active consumers of energy, actively participating in daily grid operations by shifting when energy is consumed from one time of day to another. This allows building operators to take advantage of less expensive energy when cleaner power is abundant on the grid.

2) Energy savings beyond the meter is overlooked. While, efficiency is an important indicator of energy savings, site energy savings—the amount of heat and electricity consumed by a building—may or may not occur with thermal energy storage. On the other hand, source energy savings—the total amount of on and off-site energy required to operate the facility—nearly always happens.

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Q2: How does thermal energy storage help customers meet their financial goals?

A: Thermal energy storage systems change the hours of chiller operation to help lower energy, water and maintenance costs. Buildings that can modify when they need electricity help utilities manage resources; incentives and various utility pricing structures encourage thermal energy storage systems that provide that energy-use flexibility.

Building owners who install thermal energy storage systems may see up to a 30% savings in operating costs (Trane. Thermal Storage Systems - Remarkable Resilience from a Sustainable Footprint. March 1, 2018).

Q3: How do you see thermal energy storage adapting to the clean energy grid?

A: Today, electricity mainly comes from coal and gas, which are forms of stored energy. Renewable energy is variable; the sun doesn't always shine and the wind doesn't always blow. As more wind and solar are generated, we will need to move toward technologies that can store and dispatch renewable energy for later use.

Thermal energy storage is one such technology. According to ASHRAE Research Paper 1607, thermal energy storage can increase the usage of renewable energy by up to 50%.

The move toward sustainability and renewable resources will completely change the potential value of thermal energy storage in buildings. (Plumbing Systems & Design. Making Buildings More Efficient with Hybrid Cooling. September 2010).

Q4: What is the most important thing customers should consider when they're looking to implement a new cooling and heating design?

A: Electrification of heat is coming, so a building that can shift its electric consumption to leverage the supply will be very important. The advantage of an electrified building is, that as the grid gets cleaner, the building's carbon emissions will go down proportionally. If the building burns fossil fuels, the associated emission stays the same.

Understanding heat pumps, and thermal energy storage's relationship to them, will be critical. (ASHRAE Journal. Electrification, Heat Pumps and Thermal Energy Storage. July 2020).

With the increasing demand for warm thermal energy storage, scientists at Lawrence Berkeley National Laboratory are looking at developing next-generation materials and systems to be used as heating or cooling mediums. They are also creating a framework to analyze costs as well as a tool to compare cost savings. (Berkeley Lab. Turning Up the Heat: Thermal Energy Storage Could Play Major Role in Decarbonizing Building. November 18, 2021).

Q5: What are some of the latest advancements for thermal energy storage, and why are they important?

A: Advances in intelligent services enable building operators to see how their system is operating and trends that may impact future performance as conditions on the grid change. Connected chillers and building automation systems have made thermal energy storage systems smarter and easier to monitor and control. Built-in control algorithms allow building operators to optimize for cost savings, emissions, or both. Design aid tools provide a repeatable approach with simple schematics and sequences to help reduce time and risk.

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