Small Thermal Energy Storage & Its Role in Our Clean Energy Future

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Our Mission…

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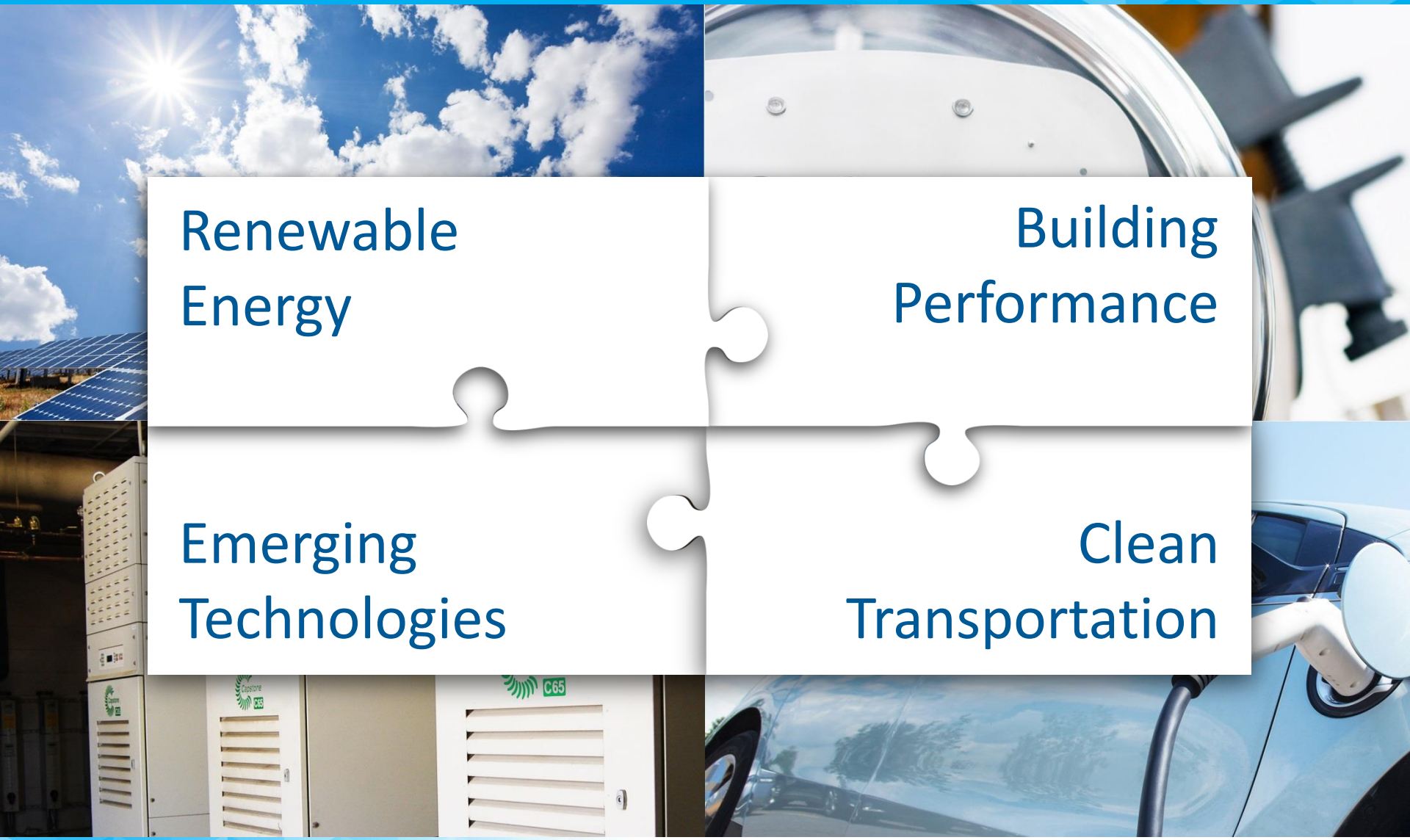
We Are Experts In…



Renewable Energy

Building Performance

Emerging Technologies

Clean Transportation

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Our Services…

Program Management

Technical Assistance

Workforce Training

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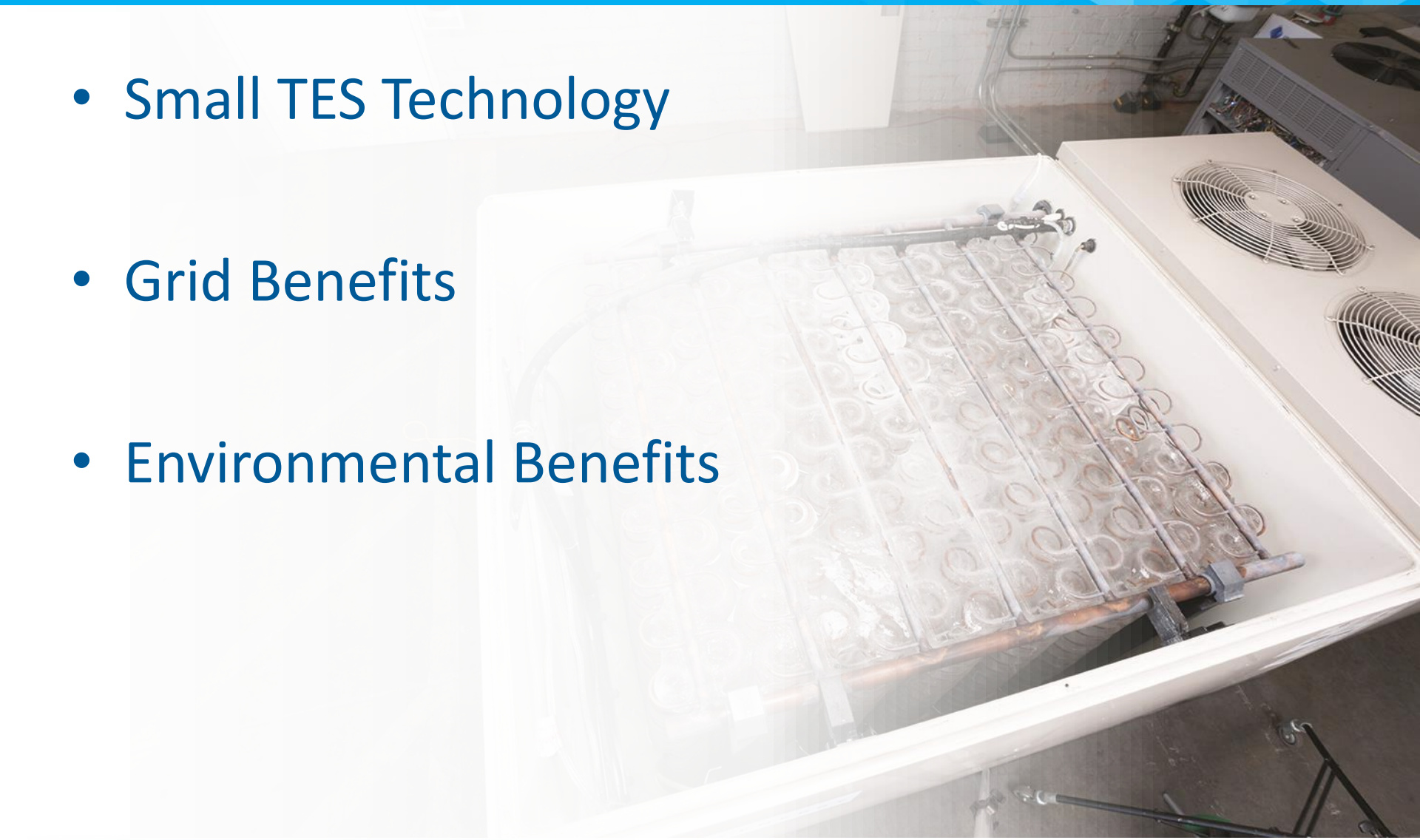
Presentation Overview

- Small TES Technology
- Grid Benefits
- Environmental Benefits



Technology Overview

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Energy Storage

- Technology capable of **absorbing energy**, **storing it** for a period of time and **discharging** the energy at a later time

- Accomplished via **chemical**, **mechanical** or **thermal** processes

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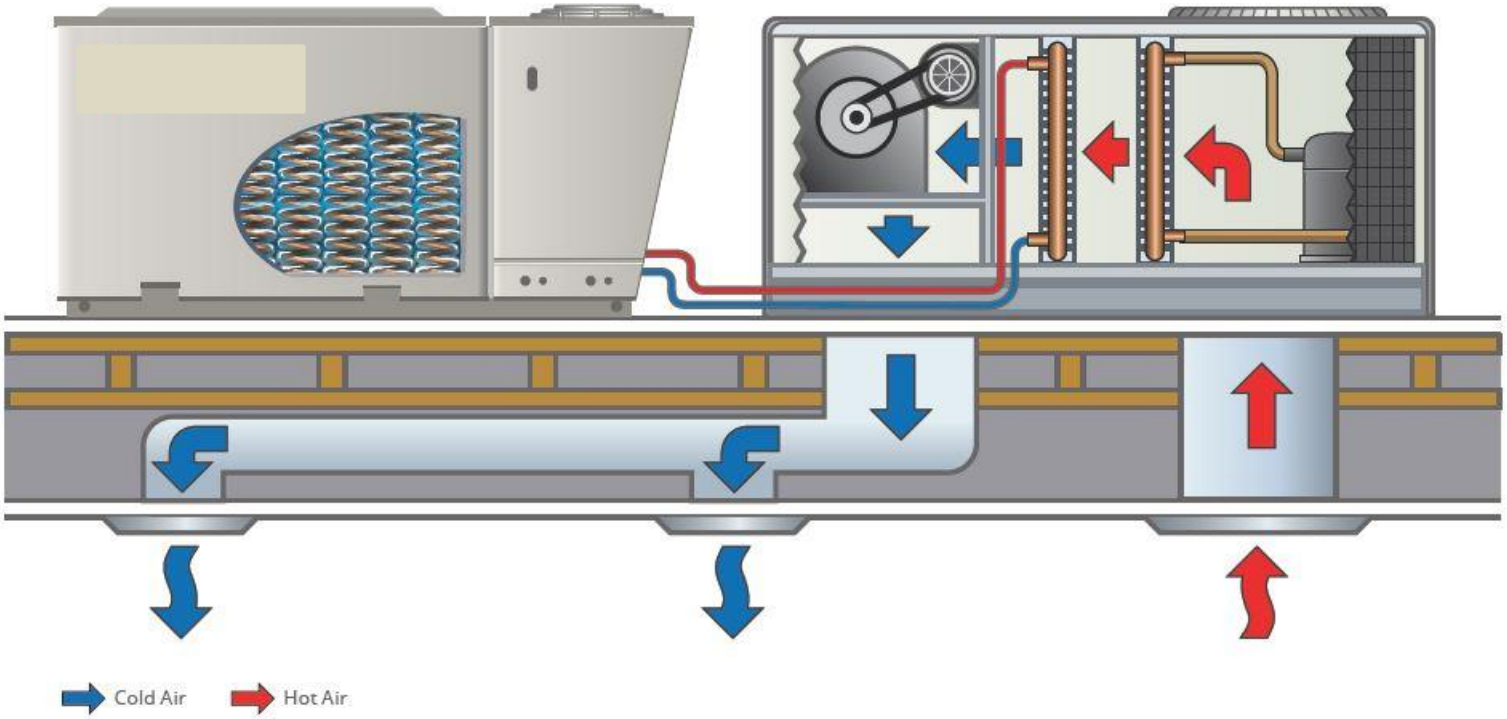
Thermal Energy Storage (TES)

- A technology that heats or cools a storage medium which is used at a later time for heating or cooling
- Focus on **ice** thermal energy storage for **behind the meter** purposes
- Residential, commercial customers

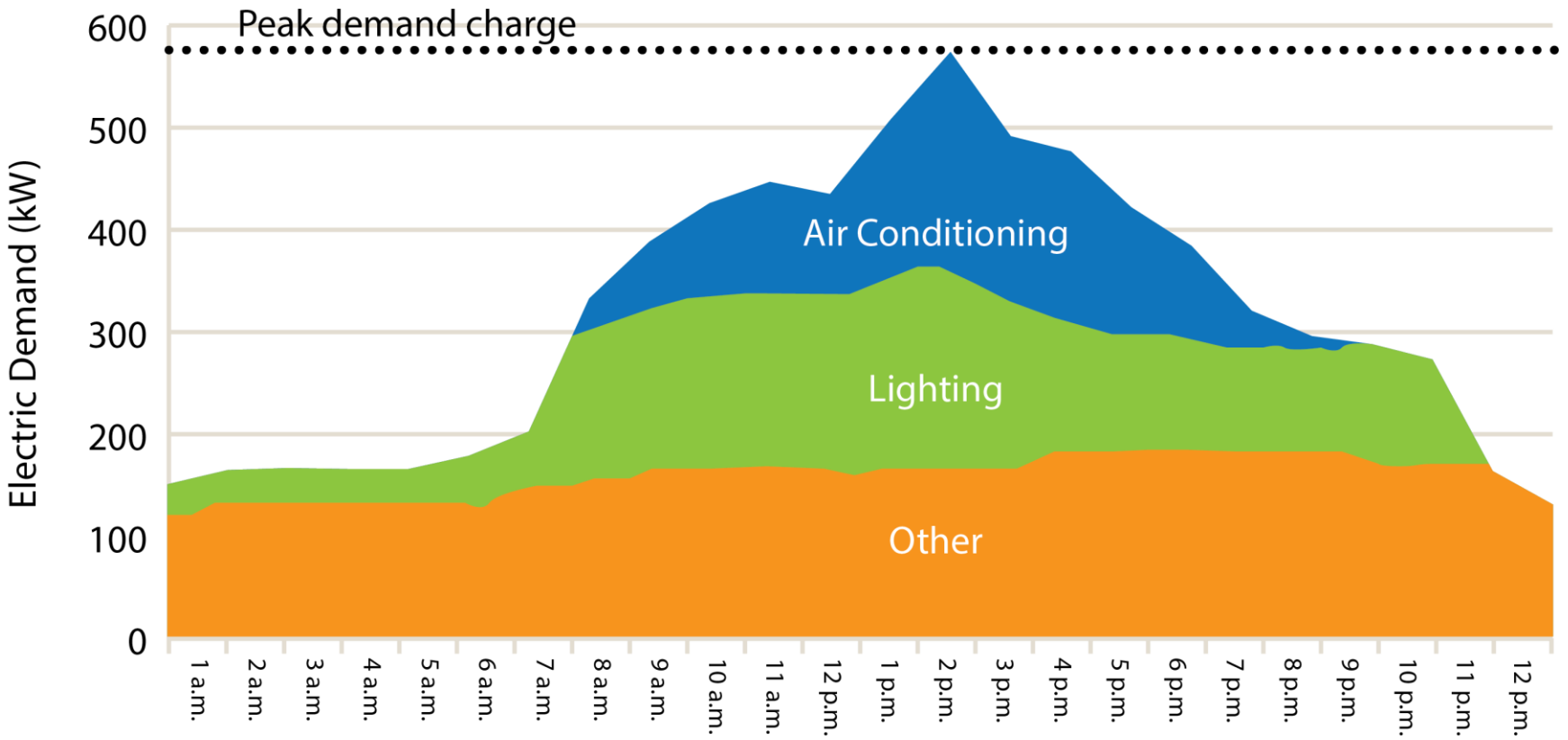
Small Thermal Energy Storage

- Stores **electricity** in the form of **ice**
- Releases **cool air** to replace the need for **air conditioning** or **refrigeration**, offsetting the need to use electricity to run HVAC and refrigeration systems

Small Thermal Energy Storage



Peak Demand: Before



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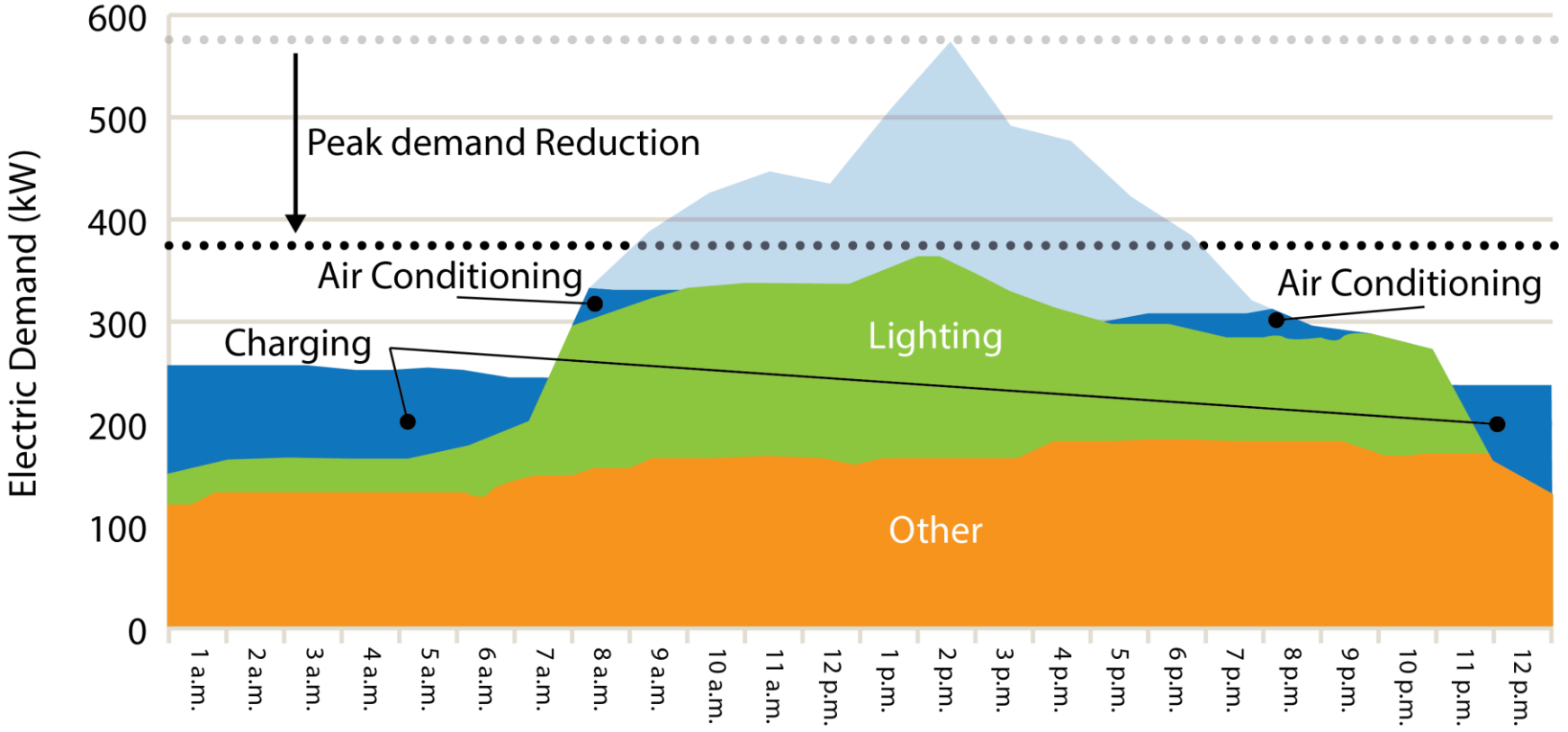
Peak Demand: After



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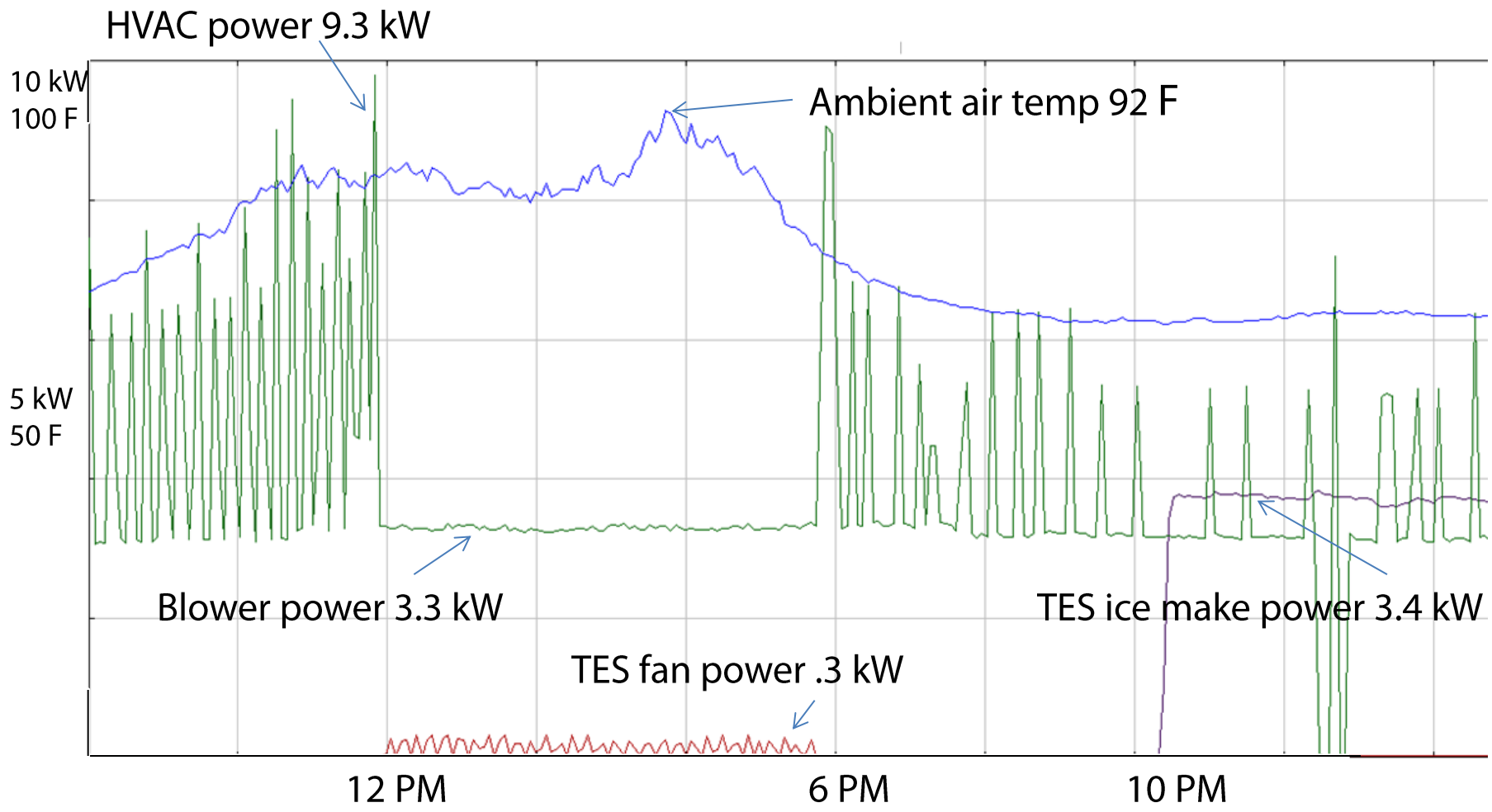
Peak Demand Data



Grid Benefits

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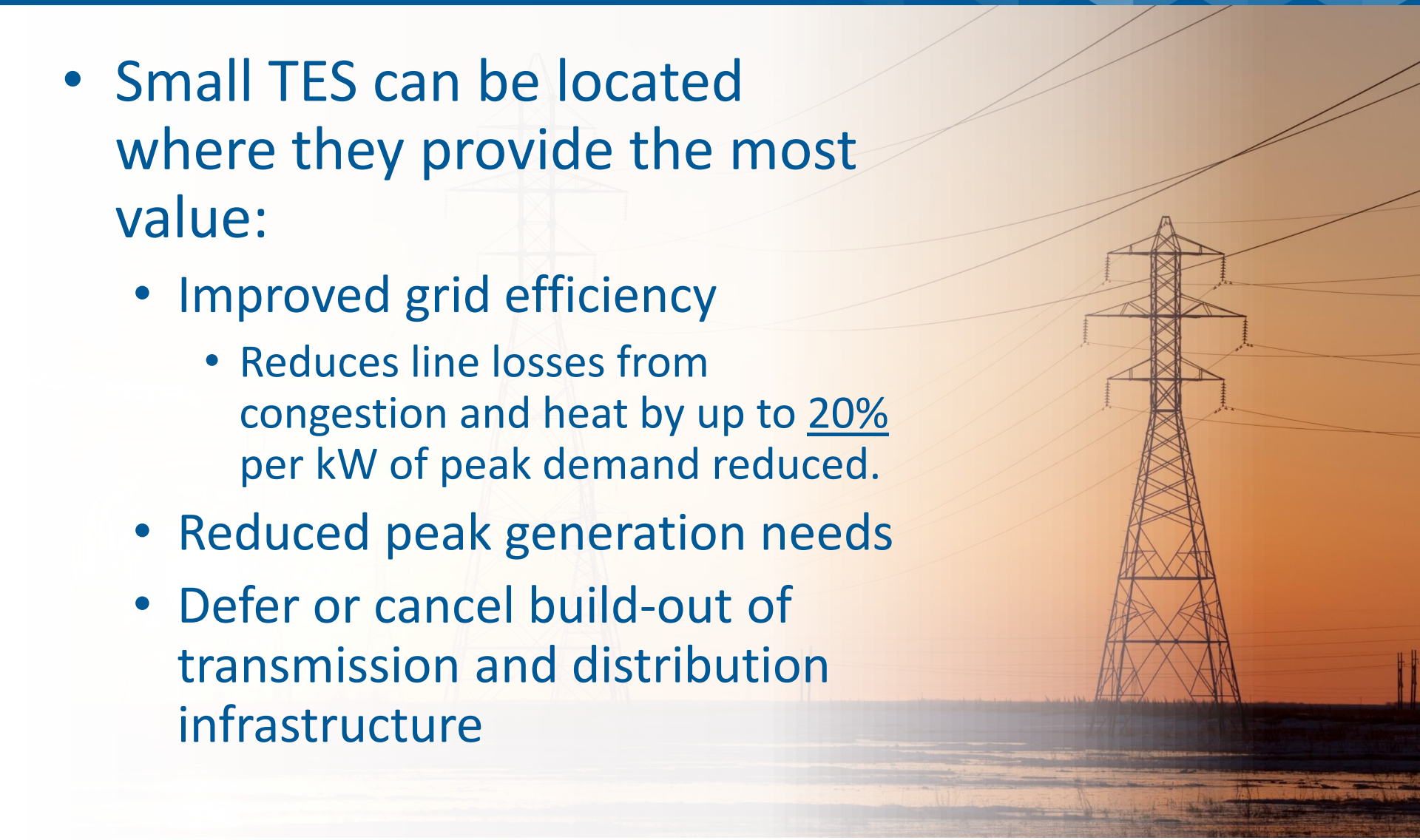
Due to the small, scalable nature…

- Small TES can be located where they provide the most value:
  - Improved grid efficiency
    - Reduces line losses from congestion and heat by up to 20% per kW of peak demand reduced.
  - Reduced peak generation needs
  - Defer or cancel build-out of transmission and distribution infrastructure



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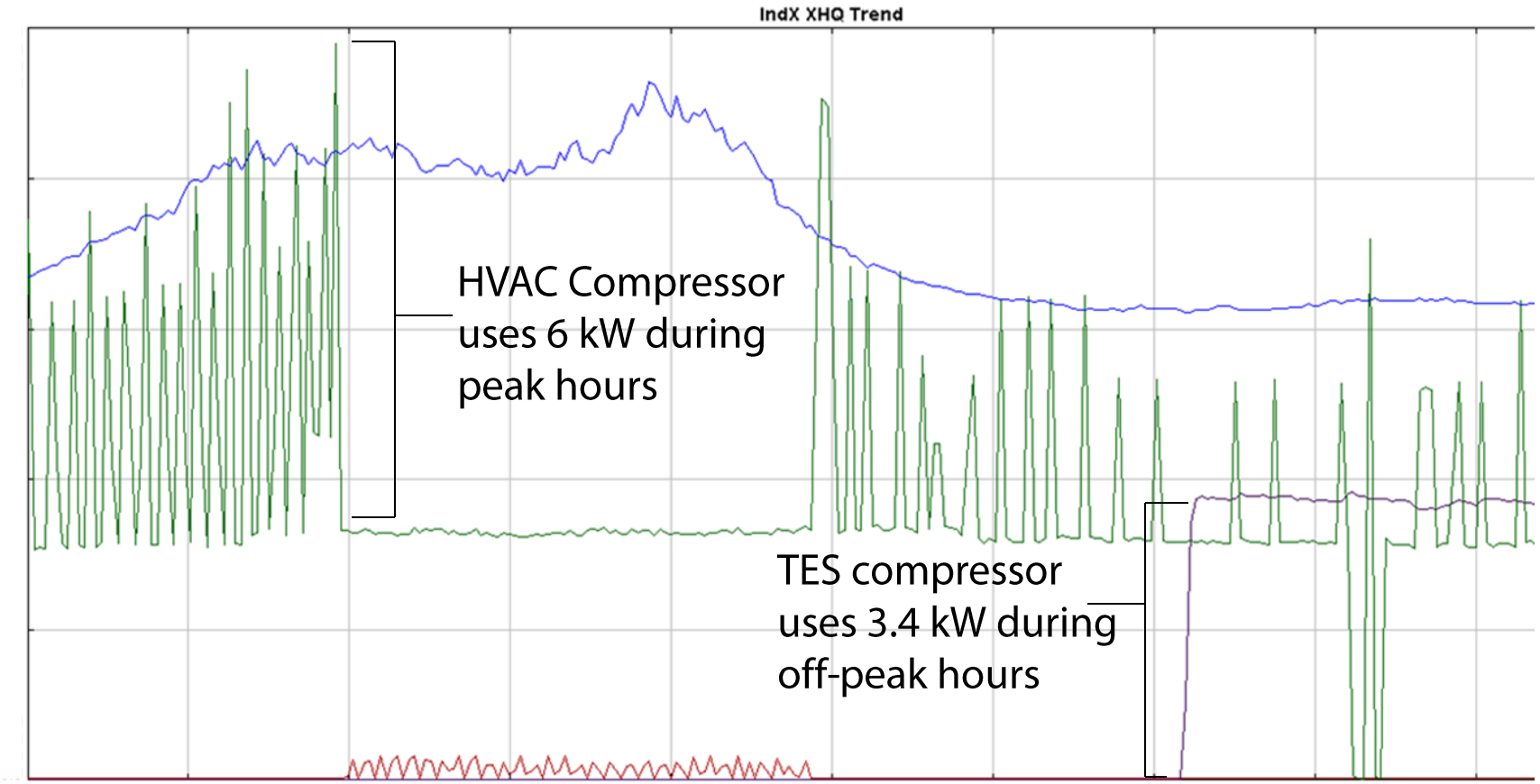
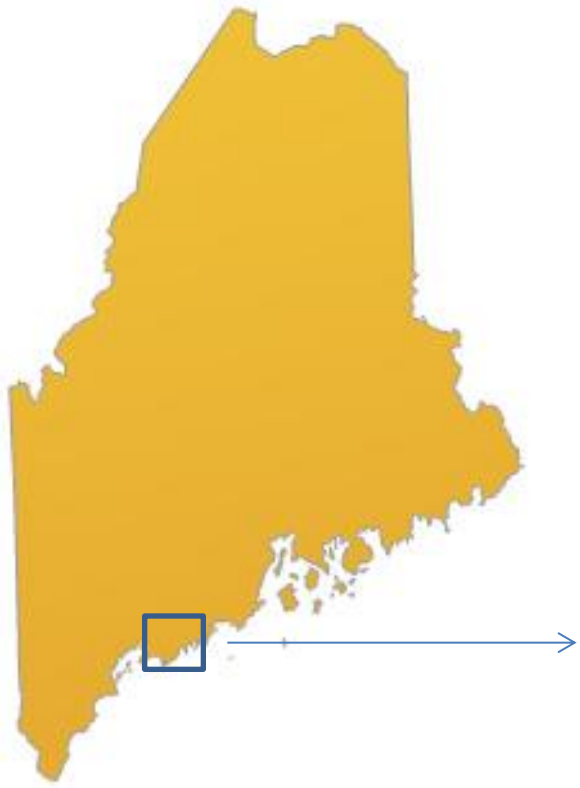
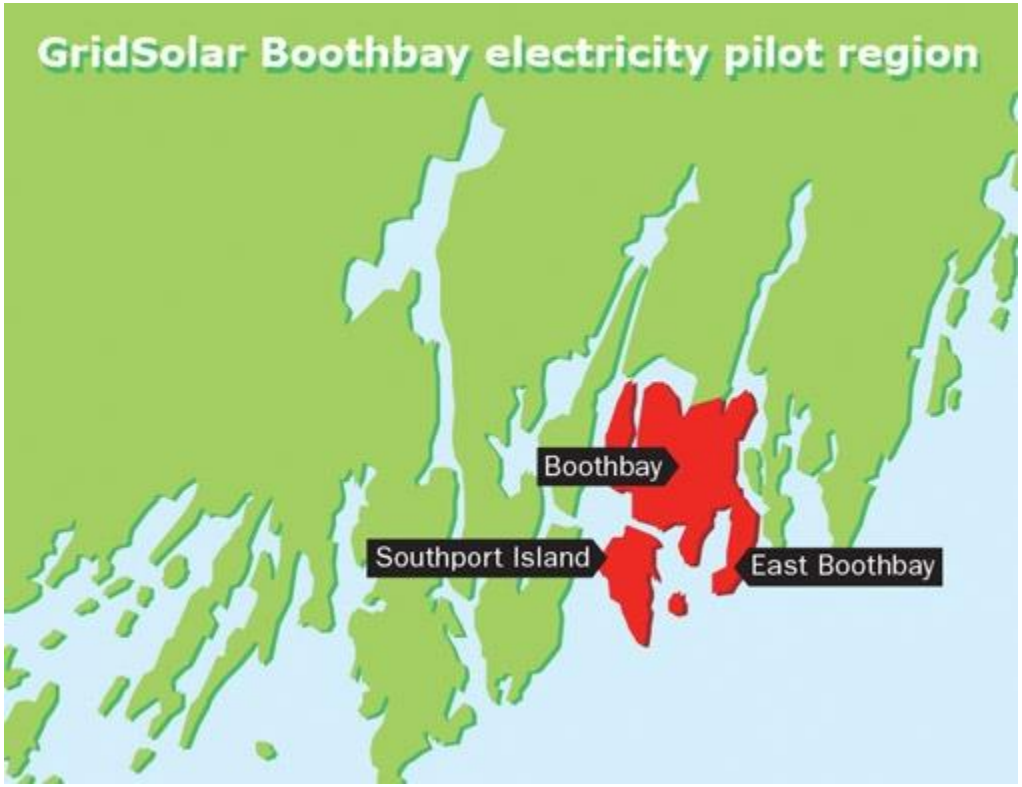
Efficiency Gains



Case Study: Maine

Boothbay Sub-Region Smart Grid Reliability Pilot





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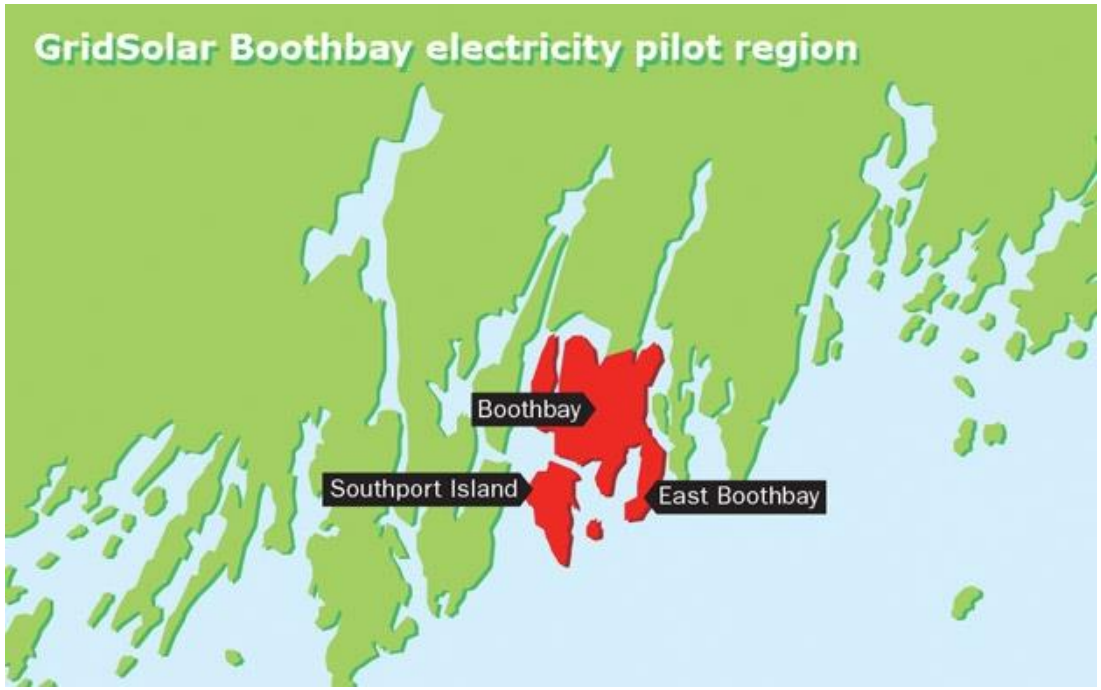
Case Study: Maine

- The electric line serving Boothbay needed to be rebuilt at a cost of $18 million to meet growing peak demand



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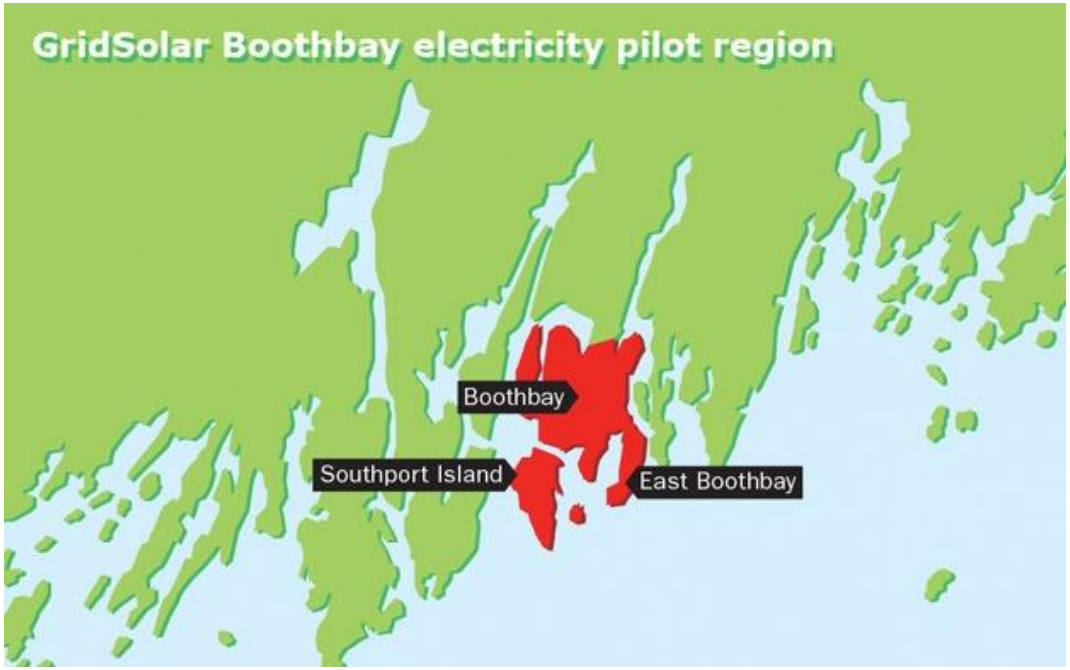
Case Study: Maine

- Alternatively, 1.7 MW of behind-the-meter resources, including 250 kW of small TES, were used to reduce peak demand



Case Study: Maine

Results:

- The project cost less than $6 million
- Less than 3 year payback and $12 million in savings
- Small TES has met or exceeded performance expectations since the project began in 2012

Case Studies: Massachusetts and New York

- Massachusetts - proposal to use 2.5 MW of small TES to defer transmission upgrades.
- Save $2.8 million over next 7 years

- New York – proposal to install 1.5 MW of small TES to defer grid upgrades

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Environmental Benefits

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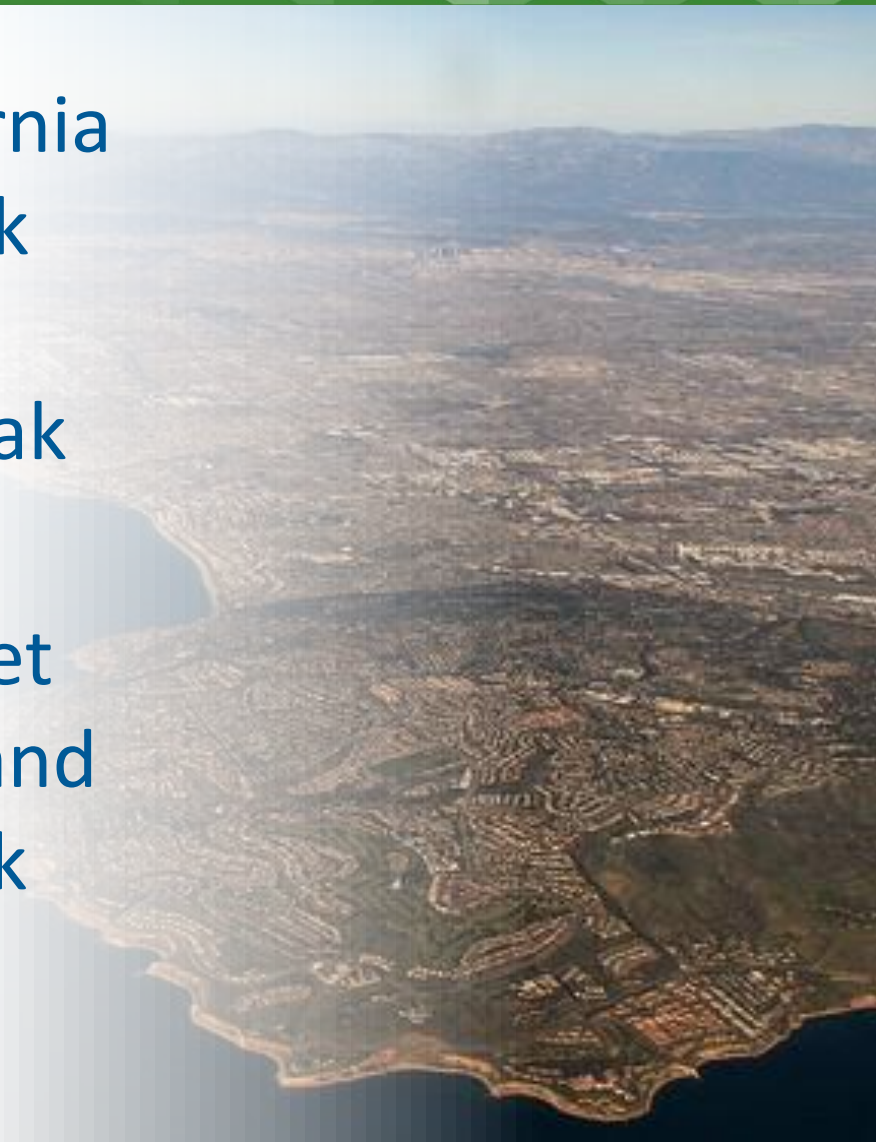
Case Study: LA Basin

- In 2015, Southern California Edison called critical peak pricing events on the 12 days with the highest peak demand
- An aggregated 1 MW fleet of small TES responded and reduced load during peak hours of these days



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Case Study: LA Basin

Results:

- Reduced peak generation 32 MWh
- Reduced CO2 emissions by 19 tons and nitrous oxide emissions by 2 pounds
- Equivalent of taking 112 cars off the road each day

Environmental Benefits

- Non-Toxic storage medium (tap water)
- 100% recyclable materials
- Little system degradation – long lifespan

Small Thermal Energy Storage can…

Greatly improve the efficiency of the grid – up to 20%

Save utilities and ratepayers money through greater efficiency and grid upgrade deferrals – Maine utility saved $12 million

Reduce GHG emissions and criteria air pollutants

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Thank You!

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We work nationally in the clean energy industry and are always open to exploring partnership opportunities.

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