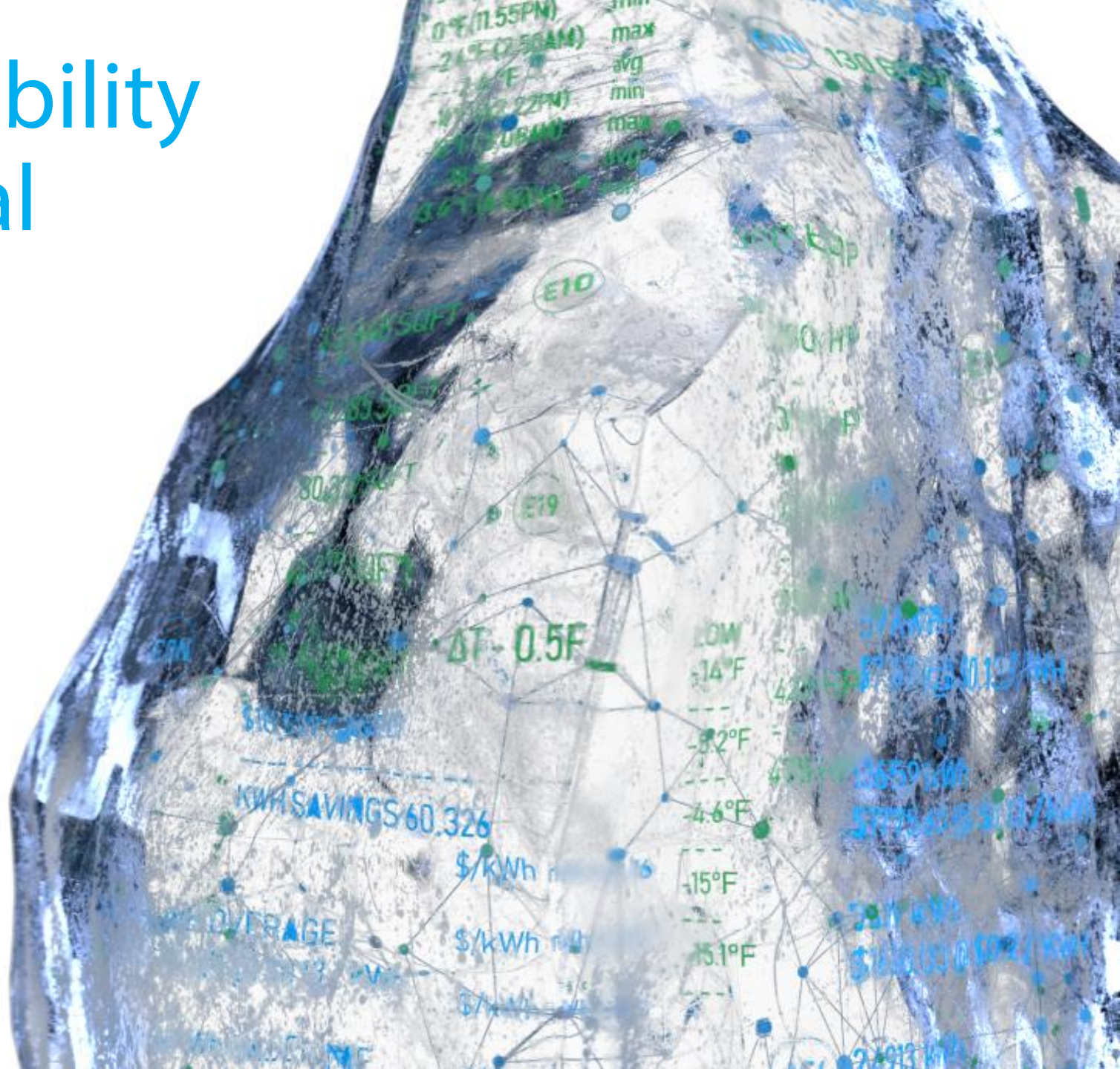
Reaching Sustainability Goals with Thermal Energy Storage

Presented by Nelly Barhemmati,

Thermal Energy Scientist

VIKING COLD™ SOLUTIONS



Introduction

Thermal Energy Storage helps decarbonize the cold chain while making the grid more resilient.

Thermal Energy Storage (TES)
Storing of excess thermal energy for future use.

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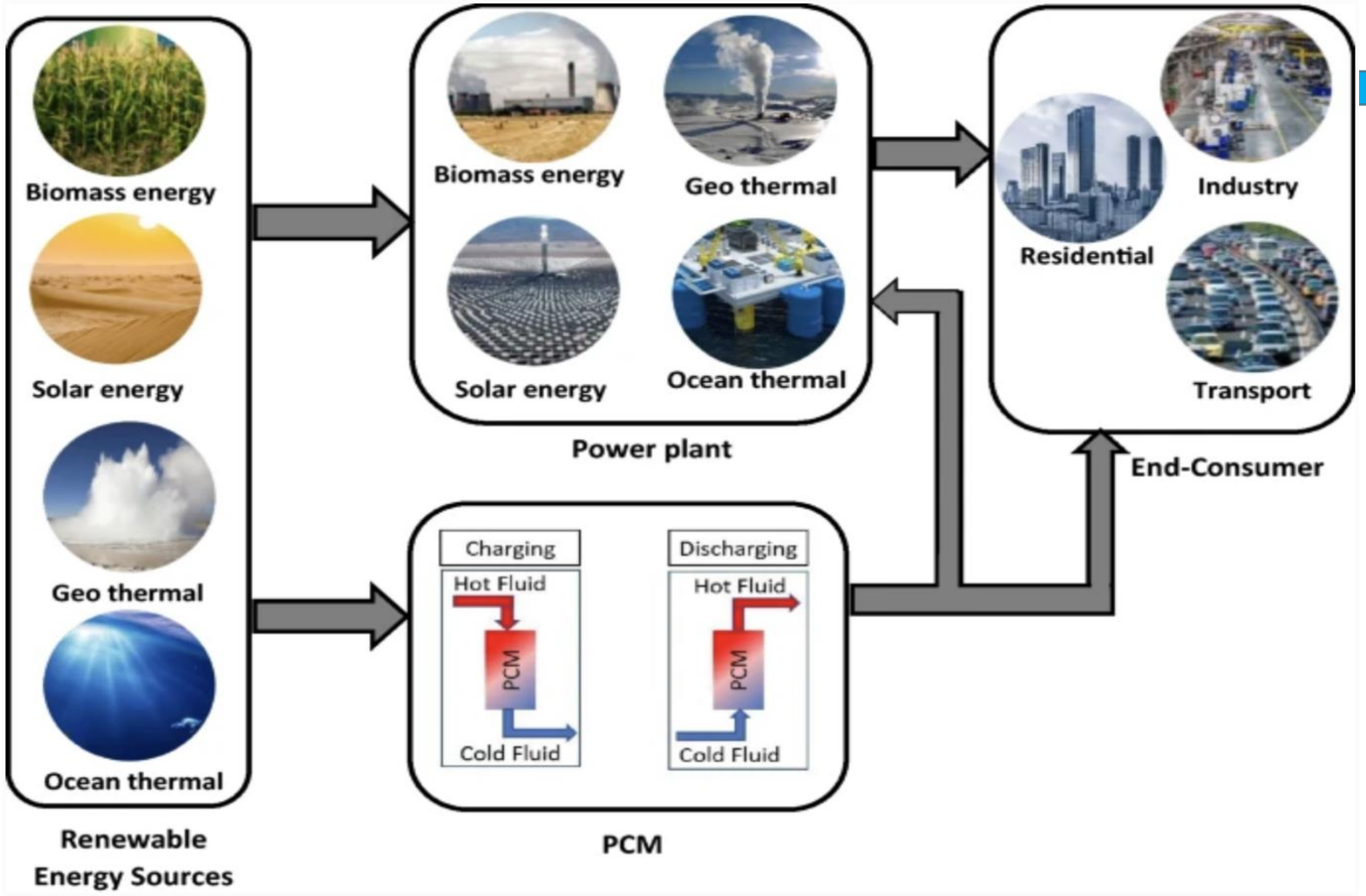
Thermal Storage Technologies



Source: https://doi.org/10.1007/s10098-020-01997-7

TES Applications in the Cold Chain

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- 4,200+ U.S. cold storage warehouses
- 5,000 to 200,000+ ft^2 freezers

- 40,000+ U.S. supermarkets
- 100 to 1,200+ ft^2 freezers

- 620,000+ U.S. restaurants
- 25 to 100+ ft^2 freezers

Energy Usage of the Global Cold Chain

- 1st HIGHEST DEMAND of ANY industrial category per ft^3
- 3rd HIGHEST CONSUMING utility category

Temperature controlled food costs over $40B in energy annually.

TES Values for Facilities

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Increase Sustainability

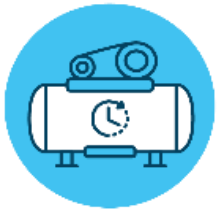
- Safely reduces Scope 1, 2, 3 GHG emissions
- Efficiently stores renewable energy (wind, solar, other)

Increase Refrigeration Efficiencies by ~25%

- Run compressors fully loaded
- Shift more run time to night
- TES transfers stored heat faster and easier

Protect Food & Minimize Waste

- TES absorbs up to 85% of heat infiltration rather than food
- 3x longer temperature resiliency in case of mechanical failure, natural disaster, power outages, or other grid challenges



Extend Refrigeration Equipment Life

- Reduce mechanical run time and maintenance costs
- 24/7 monitoring & notification of equipment status

Thermal Storage in the Community

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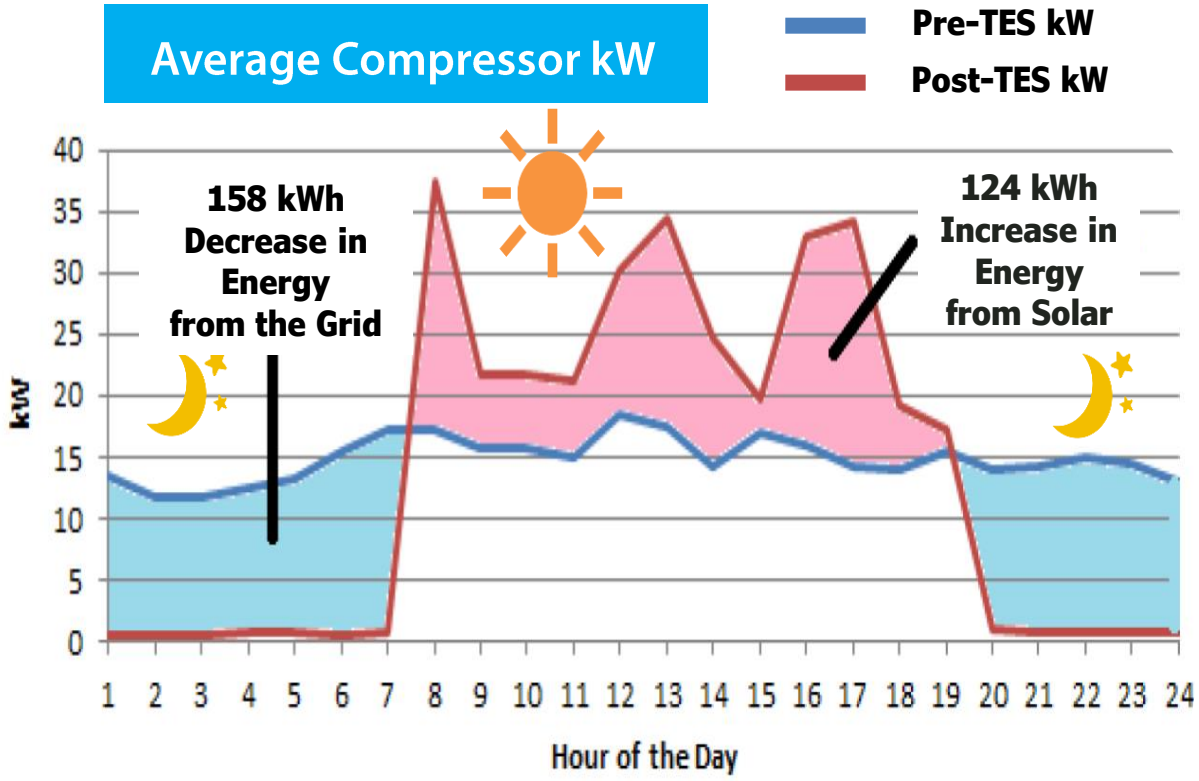
San Diego Food Bank System

- Sponsor: California Energy Commission
- Utility Partner: SDG&E
- 6,000 ft^2 facility with existing PV system
- Third-party M&V study
- TES stores excess solar energy and discharges stored solar energy every night for 12 hours

Results

- 95% Overnight Grid Energy Reduction
- 39% Annualized Energy Savings



TES Adds Value Through Resiliency

- Thermal Energy Storage works automatically
- Holds temperatures 3 times longer during:
  - Power outages and other grid challenges
  - Natural disasters
  - Mechanical failures

Questions About TES?

Energy Storage + Efficiency

- Automates refrigeration energy management
- Long-Duration: up to 13-Hour discharge
- High C&I participation rate
- Improved temperature stability
- Easy retrofit installation
- Zero maintenance
- Back-Up resiliency
- No roundtrip energy loss
- 20+ year system life
- LCOE < 2¢ per kWh

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