

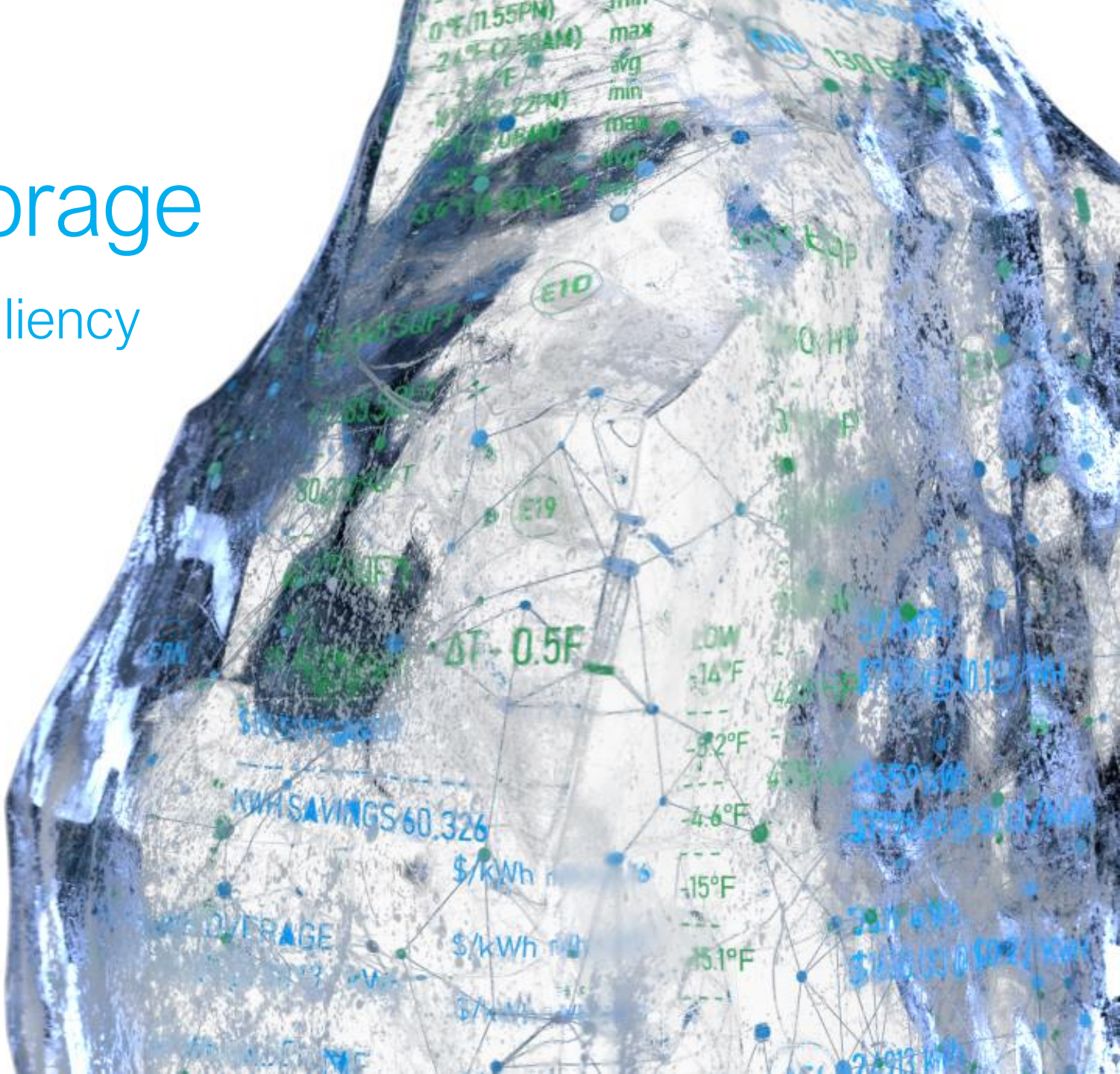
Intelligent Thermal Energy Storage

Long-Duration | Efficiency | Resiliency



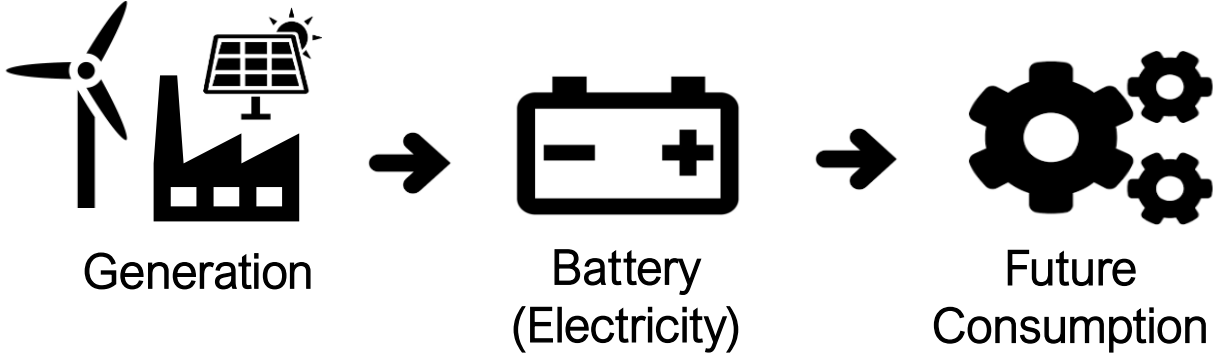
VIKING COLD™
SOLUTIONS

THERMAL ENERGY STORAGE



Energy Storage Basics for Cold Storage

Conventional
Electrical Storage



Thermal Energy Storage
(TES)



TES Levelized Cost of Energy (LCOE) < 2¢ per kWh
Round Trip Efficiency (RTE) 99% to 100%
TES improves efficiency ~25%, ensures lower GHG for any generation source

Commercial & Industrial TES Applications

Energy Usage
OF THE GLOBAL COLD CHAIN

1ST HIGHEST DEMAND
of ANY industrial category per ft³

3RD HIGHEST CONSUMING
utility category

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



Customer Freezer Applications



- ▶ 500 to 200,000+ ft²
- ▶ -20° to 32° Fahrenheit
- ▶ Run nearly 24/7
- ▶ 5 kW to 1+ MW per installation
- ▶ Thousands of facilities



TES - Permanent & Safe Thermal Mass

Phase Change Material: PCMs store and release energy as they transition between solid and liquid states



Latent Heat Absorption (vs Sensible Heat)

- ▶ 300x more heat capacity than frozen food
- ▶ 8x heat transfer rate of frozen food

Natural Convection

- ▶ PCM absorbs rising heat
- ▶ Releases cold that falls across the food



TES Absorbs & Consolidates Heat



Integration and Control

Temperature sensors & equipment-level energy meters feed data to TES system for optimizing the existing refrigeration energy usage and temperatures

- ▶ “De-Coupled”, Behind the meter
- ▶ Energy Data is collected and reported at refrigeration equipment level
- ▶ Does not require interconnection (inverter)



TES - Intelligent Controls, Monitoring, Notifications



Flexibility: Efficiency and Demand Management Strategies

- ▶ Consumption reduction
- ▶ Demand, time-of-use, peak avoidance
- ▶ Adapts to seasonality or rate structure changes

Easy Integration

- ▶ Subsystem of existing controls
- ▶ Control and platform agnostic
- ▶ Secure cloud connection
- ▶ API or BACnet interface

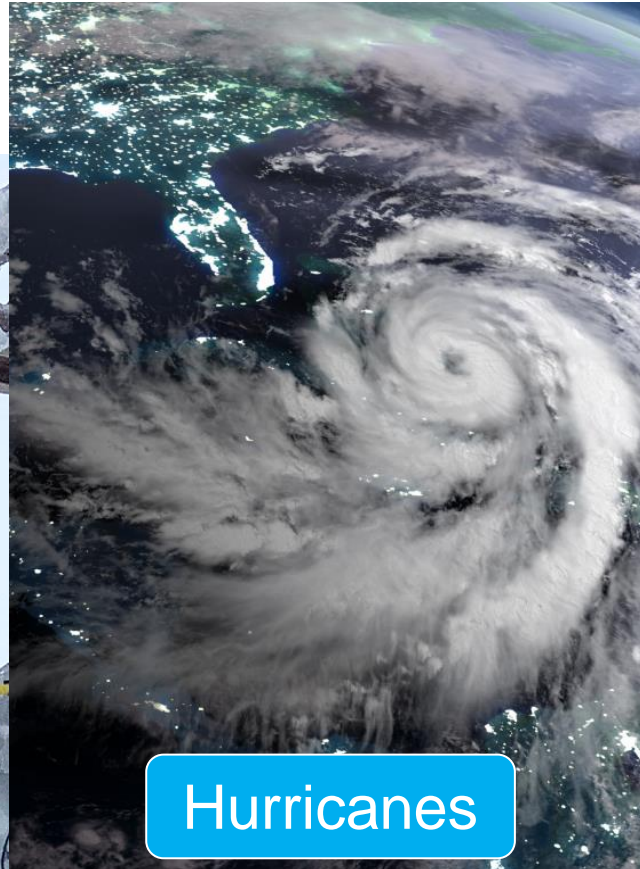
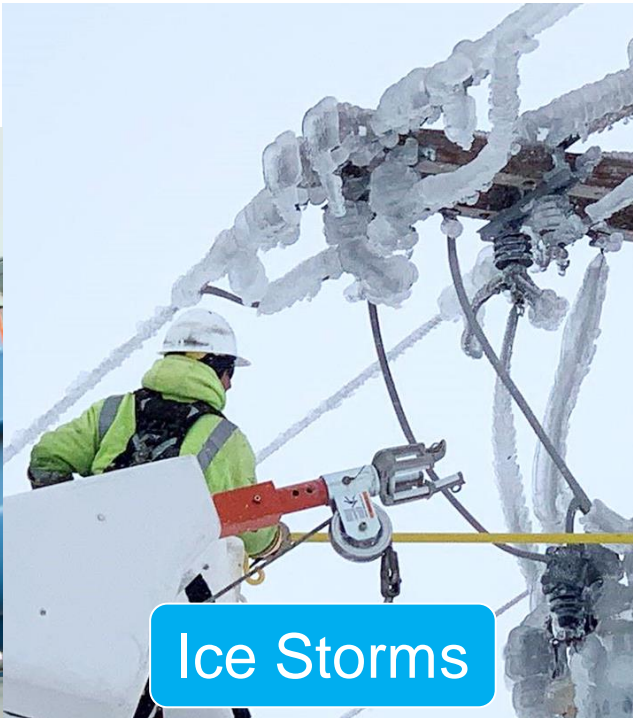
Visibility & Actionable Intelligence

- ▶ 24/7 Real-time intelligence
- ▶ Performance tracking and trends
- ▶ Notifications via text, email, or call
- ▶ Identifies issues prior to becoming costly problems



TES Also Adds Resiliency

- ▶ No power required
- ▶ Holds temperatures 3X longer
 - ▶ Power outages & other grid challenges
 - ▶ Natural disasters
 - ▶ Mechanical failures



Frozen Food Warehouse

TES allows customer to avoid all additional energy costs from a 13-hour peak period Monday through Saturday:

NET CONSUMPTION (kWh)

43%

29%

PEAK DEMAND (kW)

TEMPERATURE STABILITY

50%

766
MT

GHG REDUCTION (per year)



Successful Utility Supported TES Projects

- ▶ California Energy Commission Energy Storage Program: Self Generation Incentive Program (SGIP)



- ▶ SCE
- ▶ SDG&E
- ▶ PG&E



- ▶ 8 installations targeting ICAP hours **EVERSOURCE**

- ▶ Custom Incentive Programs **Xcel Energy**

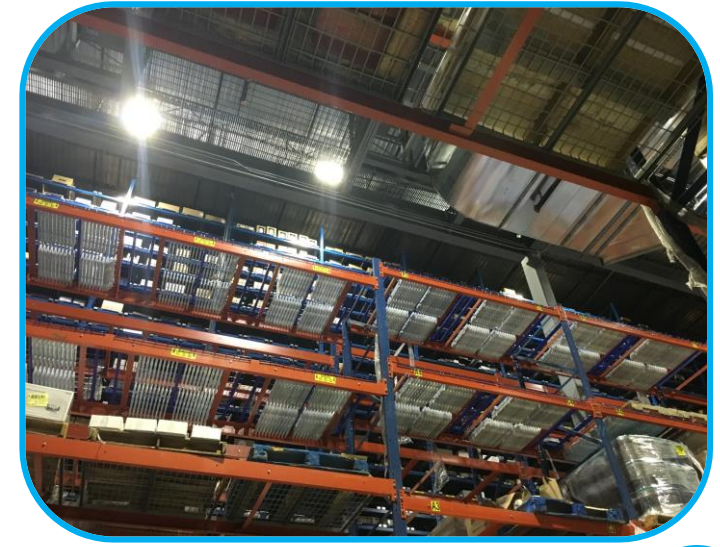
- ▶ VCS provides M&V data within the service offering

- ▶ Deemed/Prescriptive Programs



Utility-Sponsored TES Cold Storage Program

- ▶ 8 Customer installations
 - Largest foodservice distributor (Sysco)
 - Largest cold storage 3PL (Americold)
 - Food processors
 - Greater Boston Food Bank
- ▶ Average facility ~50,000 ft²
- ▶ Largest Facility 157,000 ft²
- ▶ 1.3 MW of Curtailment
- ▶ Average install period: 127 days from agreement to commissioning

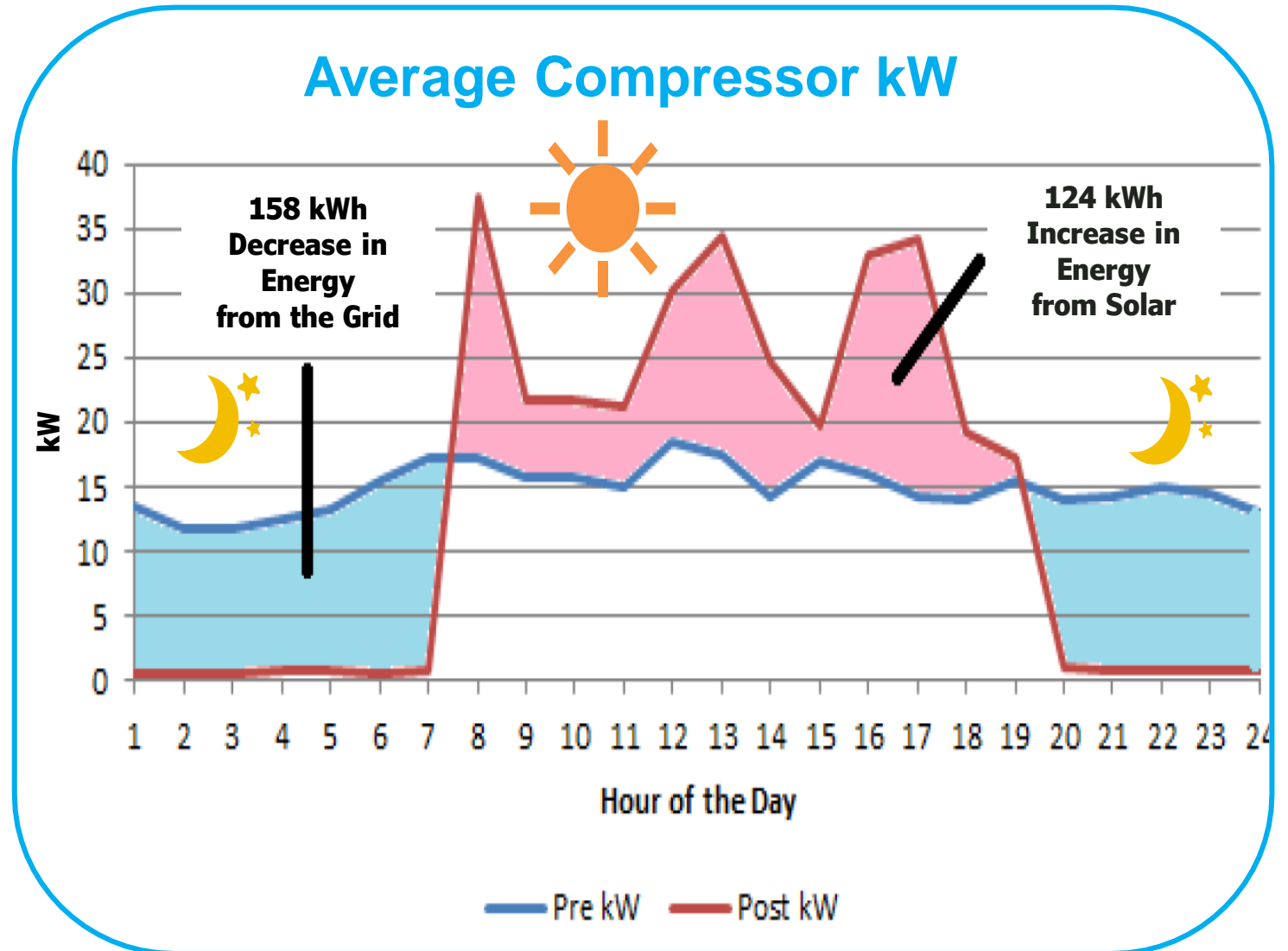


Utility Sponsored Solar + Storage Program

- ▶ Third-Party M&V Study
- ▶ 6,000 ft²
- ▶ Existing PV system
- ▶ TES stores excess solar energy
- ▶ Discharges stored solar energy at night

39% Annualized
Energy Savings

95% Overnight
Grid Energy Reduction



Levelized Cost Of Energy < 2¢ per kWh

Operational & Maintenance: \$0

- ▶ No mechanical components
- ▶ Uses existing refrigeration system
- ▶ Software updated via the cloud

20-year or longer system life,
with no capacity degradation

Round trip efficiency: 100%

Discharge depth: 80%

Discharge length: 2 to 13 hours



Requires no additional real estate

Improves average efficiency ~25%

End-of-Life Recyclability: 100%



Energy Industry Recognition of TES in 2019



Technology Pioneer



Platinum Project of the Year



Top Green Provider



Energy Institute
Technology Innovation Award



Behind-the-Meter
Technology Finalist



Best Large-Scale Solar
Storage Product 2019



Top Software &
Technology Provider



Energy Storage + Efficiency

No additional real estate

No roundtrip energy loss

Long-Duration: 13-Hour Discharge

LCOE < 2¢ per kWh

Zero maintenance

Improved temperature stability

20+ year system life

No additional energy required

Easy retrofit installation

Back-Up Resiliency

High C&I participation rate

Questions?

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