

BUILDINGENERGY NYC

Powering Resilience: Stony Brook University's Decarbonization Master Plan

Rachel Carpitella, Wendel Companies

Tom Lanzilotta, Stony Brook University

Robert Myrick, Wendel Companies

Curated by Grant Sheely & Jeff Perlman

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POWERING RESILIENCE

**Stony Brook University's
Decarbonization Master Plan**





Robert Myrick,
PE (NY)
WENDEL

- **Role** | Energy Engineer
- **Experience** | 9 Years
- **Expertise**
 - Energy Modeling
 - Energy Efficiency Measure Development
 - Energy Project Development
 - Energy Master Planning



Rachel Carpitella
WENDEL

- **Role** | Business Development
- **Experience** | 20 Years
- **Expertise**
 - Decarbonization Strategy
 - Energy Program Development
 - Stakeholder Engagement
 - Grant & Funding Strategy
 - Workforce & Partnerships



Grandpa Grid

Our Legacy Energy
Infrastructure

85 years

architecture, engineering, energy
efficiency, and construction
management



4

Main
practice
areas



15

Offices
Nationwide

350+

Employees, nationwide.



Stony Brook University

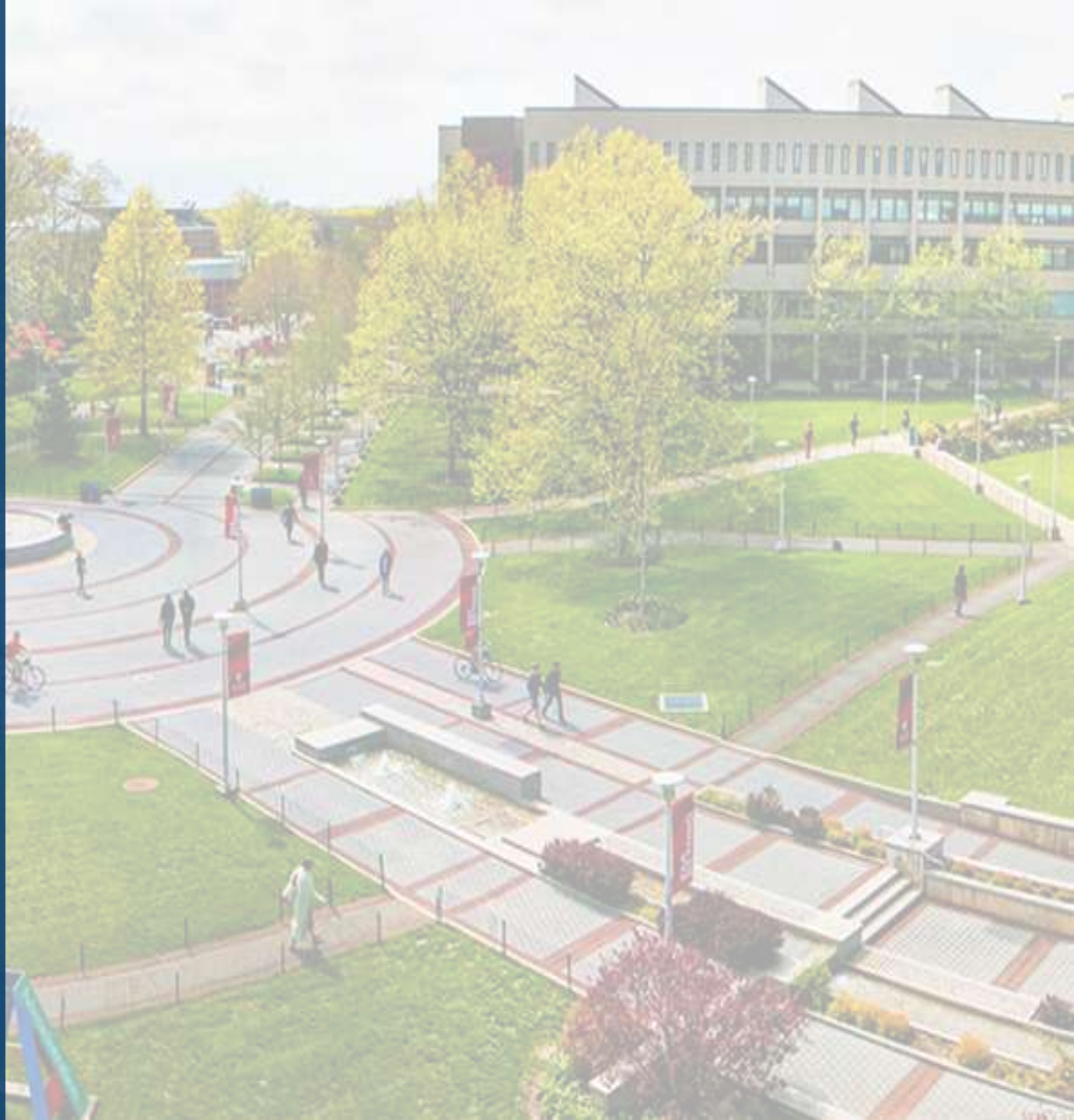
Overview
• **13** million square feet of space

- **1,452** acres of land
- **213** buildings
 - **1,466** lab spaces
 - **6** dining facilities
 - University Hospital
 - On-Site Cogeneration Plant
- **26,000+** students
- **18,000+** faculty and staff



Stony Brook / NYPA Objective

1. Identify constraints to decarbonization.
2. Provide a pathway to decarbonize campus energy systems.
3. Identify near term actionable projects that will facilitate the transition to cleaner energy infrastructure.



A tall electrical transmission tower is silhouetted against a vibrant sunset sky. The sky transitions from a deep blue at the top to a warm orange and yellow near the horizon, with wispy clouds catching the low light. The tower's complex lattice structure is clearly visible on the left side of the frame.

Today's Conversation

A case study in moving from ambitious climate goals to infrastructure decisions that protect mission-critical operations.

- Why resilience
- Campus planning
- Integrated solution
- Phased delivery
- Actionable steps

Learning Objectives

One campus. Multiple critical missions.

1. Recognize

The opportunities and challenges universities and healthcare facilities face on the path to decarbonization.

2. Understand

The unique features of Stony Brook University's campus-wide initiative.

3. Connect

Programs, incentives, and delivery mechanisms to project success.

4. Engage

Diverse stakeholders across departments to build durable momentum.

A background image showing a person from behind, wearing a yellow hard hat and a high-visibility safety vest with orange and blue stripes. They are looking out at a landscape with several large electrical transmission towers under a blue sky. The entire image has a semi-transparent blue overlay.

1

Why resilience changes the question

Decarbonization master planning is not only about reducing emissions. On a campus with healthcare, research, residential, and academic operations, the pathway must also preserve continuity, flexibility, and emergency readiness.

The Planning Challenge

1. Academic + research

Diverse schedules, specialized loads, laboratories, and constantly changing program needs.

2. Healthcare

Reliability, redundancy, simultaneous heating and cooling loads, and continuous operations.

3. Residential

Thermal comfort and service continuity across a large, occupied campus.

4. Engage

Perspectives and support from leaders across campus departments.

Existing Conditions

The existing system is both an asset and a constraint

45 MW

combined-cycle plant

Typical campus electric
use ~35 MW

Steam production capacity
up to 305 Mlb/hr
at 390 psi

What it enables

Campus-scale
generation, established
distribution, and
operational familiarity.

What it complicates

High-temperature heat
distribution, aging
infrastructure, and
tightly coupled thermal
and electric decisions.

The core planning question

How can the campus transition toward lower-carbon thermal
infrastructure while maintaining reliable service through
every phase?

2

From data to decisions

The decarbonization plan combined energy and emissions analysis, infrastructure assessment, technology screening, stakeholder input, scenario modeling, and implementation planning.



Strategic Plan





Strategic
Plan



Energy
Efficiency



Strategic
Plan

Energy
Efficiency

Energy
Recovery

Strategic
Plan

The diagram is set against a dark blue background with a faint image of a globe and ferns. A large dashed white line forms a rounded rectangle. Inside, four boxes are arranged: 'Strategic Plan' at the top left, 'Energy Efficiency' and 'Energy Recovery' in the middle left, and 'Alternative Fuel Transportation' at the bottom left. A dotted line connects the 'Strategic Plan' box to the 'Energy Efficiency' and 'Energy Recovery' boxes. A solid white arrow points from the 'Alternative Fuel Transportation' box towards the right, passing between the 'Energy Efficiency' and 'Energy Recovery' boxes.

Energy
Efficiency

Energy
Recovery

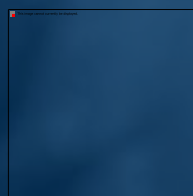
Alternative Fuel
Transportation



Strategic
Plan



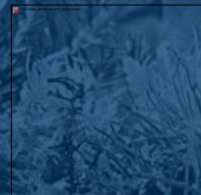
Critical
Infrastructure
Review
Remove High
Temperature
End Uses



Energy
Efficiency



Energy
Recovery



Alternative Fuel
Transportation



Complicated Infrastructure Issue Solutions: Stony Brook University

Infrastructure Issues	Potential Solutions
Multiple Campuses	Different solutions on a campus by campus basis
~150 Buildings	Building by building solutions, stress testing
High Temp Hot Water	Convert to low temp hot water
Steam generated Chilled Water	Convert to electric chilled water generation
Buried Piping	Replacement and /or GIS mapping of buried infrastructure with easier maintenance possibilities
Hospital	Battery Storage / Power Quality, isolation
Grid Power Unreliable	Use current technologies to address this: battery storage, thermal storage
High O&M Expenses	Solution should provide options for lower O&M expenses

Strategic
Plan



Critical
Infrastructure
Review
Remove Steam
End Uses



Thermal
Energy

Energy
Efficiency

Energy
Recovery

Alternative Fuel
Transportation



NYS Decarbonization Leadership Program



Strategic
Plan



Critical
Infrastructure
Review
Remove Steam
End Uses

Energy
Efficiency

Energy
Recovery



Thermal
Energy

Alternative Fuel
Transportation

Renewable
Energy
Generation



Strategic
Plan



Critical
Infrastructure
Review
Remove Steam
End Uses

Utility Grid
Capacity and
Rates

Energy
Efficiency

Energy
Recovery



Thermal
Energy

Alternative Fuel
Transportation

Renewable
Energy
Generation



Resilience Principle

Reliability cannot be added at the end

Every decarbonization decision was tested against four operational questions:

Continuity

Can critical loads remain served through an outage or equipment failure?

Redundancy

Are there alternate sources, loops, or operating modes?

Recovery

How quickly can the campus stabilize and restore normal operations?

Adaptability

Can the system evolve as grid, technology, and campus needs change?

Strategic
Plan



Critical
Infrastructure
Review
Remove Steam
End Uses

Utility Grid
Capacity and
Rates



Thermal
Energy

Energy
Efficiency

Energy
Recovery

Energy
Storage

Alternative Fuel
Transportation

Renewable
Energy
Generation

Strategic
Plan



Critical
Infrastructure
Review
Remove Steam
End Uses

Utility Grid
Capacity and
Rates



Thermal
Energy

Energy
Efficiency

Energy
Recovery

Energy
Storage

Alternative Fuel
Transportation

Renewable
Energy
Generation

Operations &
Maintenance

Strategic
Plan



Critical
Infrastructure
Review
Remove Steam
End Uses

Utility Grid
Capacity and
Rates

Emerging
Technologies

Energy
Efficiency

Energy
Recovery



Thermal
Energy

Energy
Storage

Alternative Fuel
Transportation

Renewable
Energy
Generation

Operations &
Maintenance

Strategic
Plan



Critical
Infrastructure
Review
Remove Steam
End Uses

Utility Grid
Capacity and
Rates

Emerging
Technologies

Energy
Efficiency

Energy
Recovery



Thermal
Energy

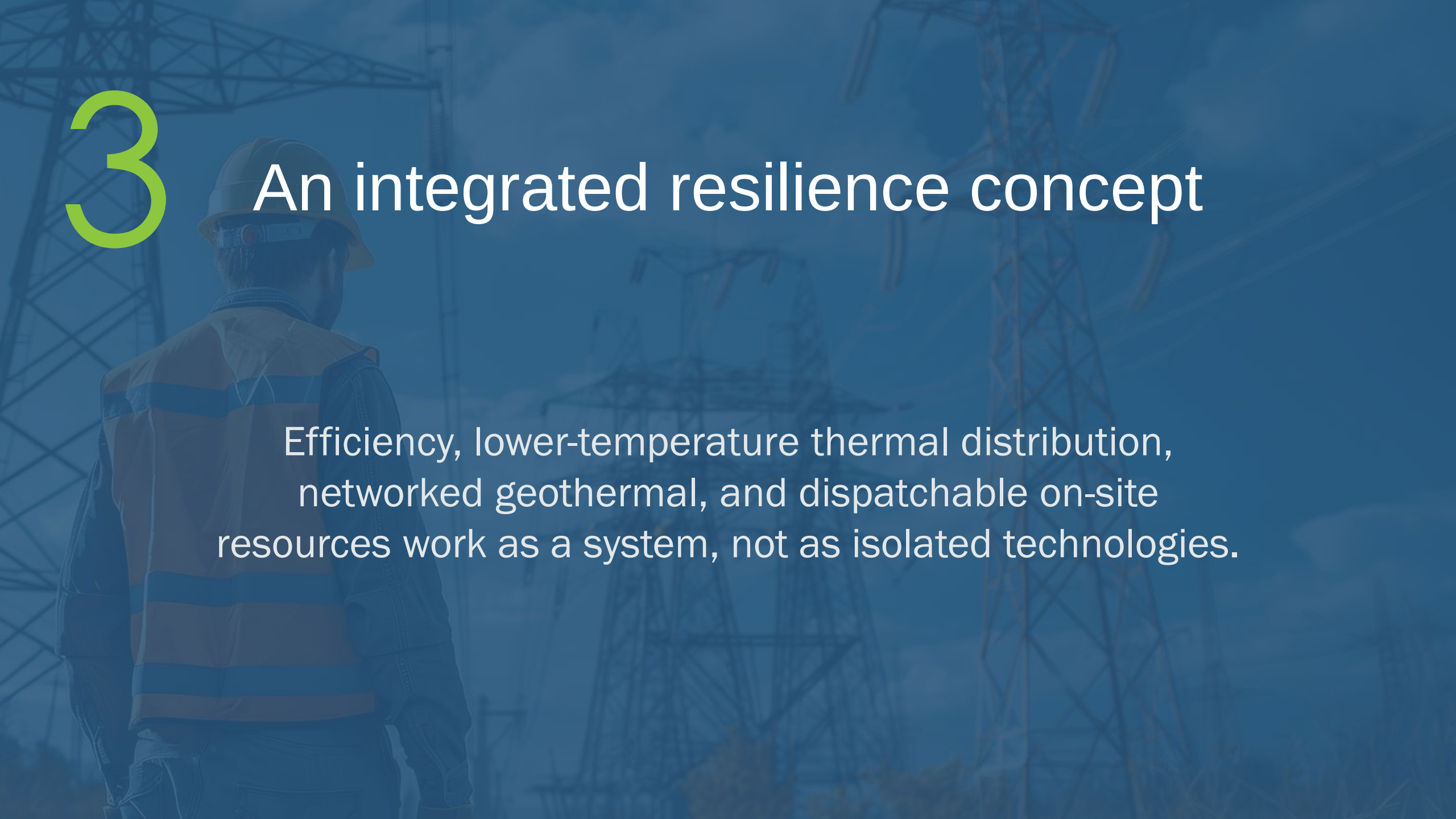
Energy
Storage

Carbon Neutral
Energy System

Alternative Fuel
Transportation

Renewable
Energy
Generation

Operations &
Maintenance

A worker in a hard hat and safety vest is seen from behind, looking out over a landscape filled with high-voltage power line towers. The scene is overlaid with a semi-transparent blue filter.

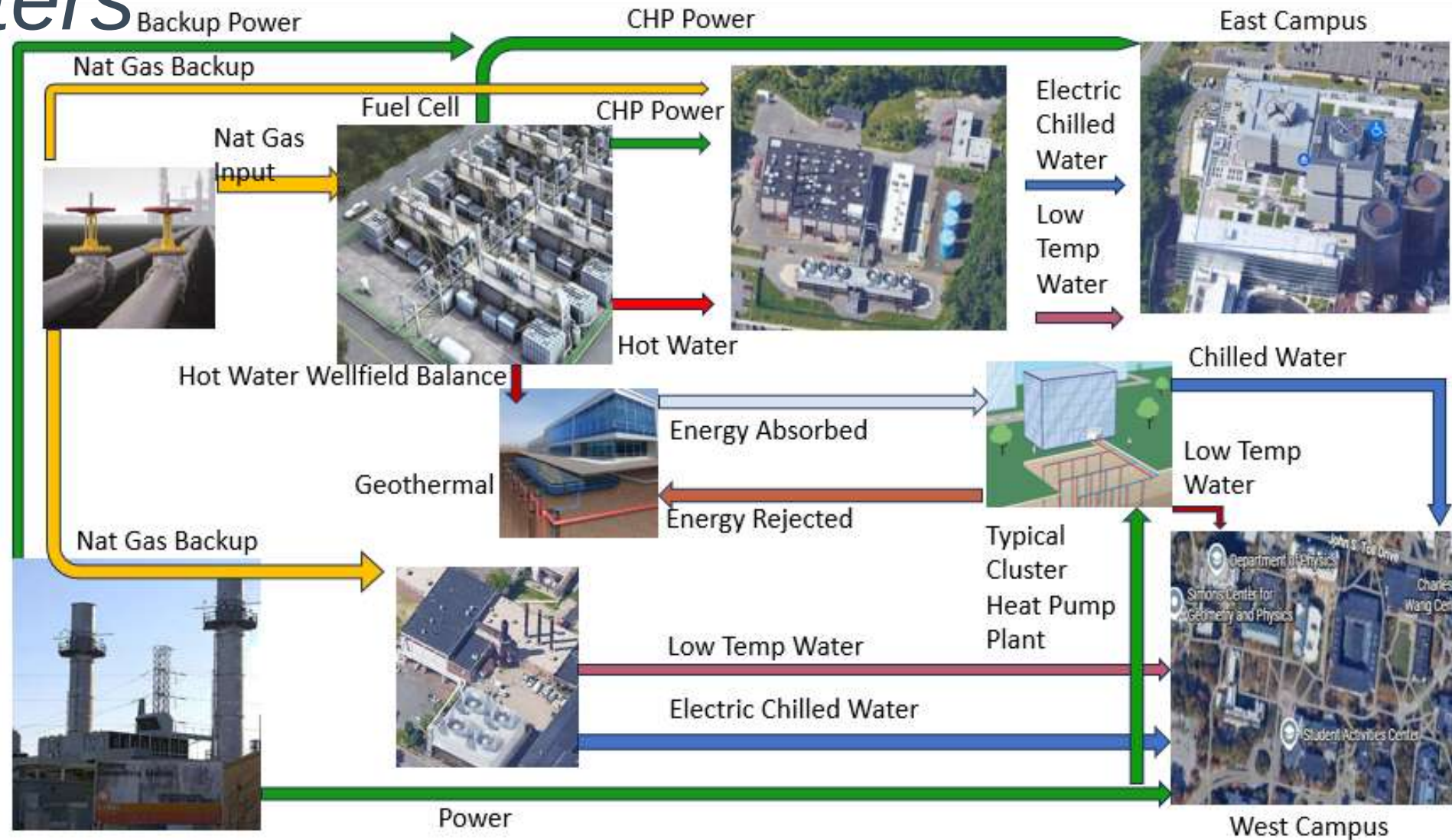
3

An integrated resilience concept

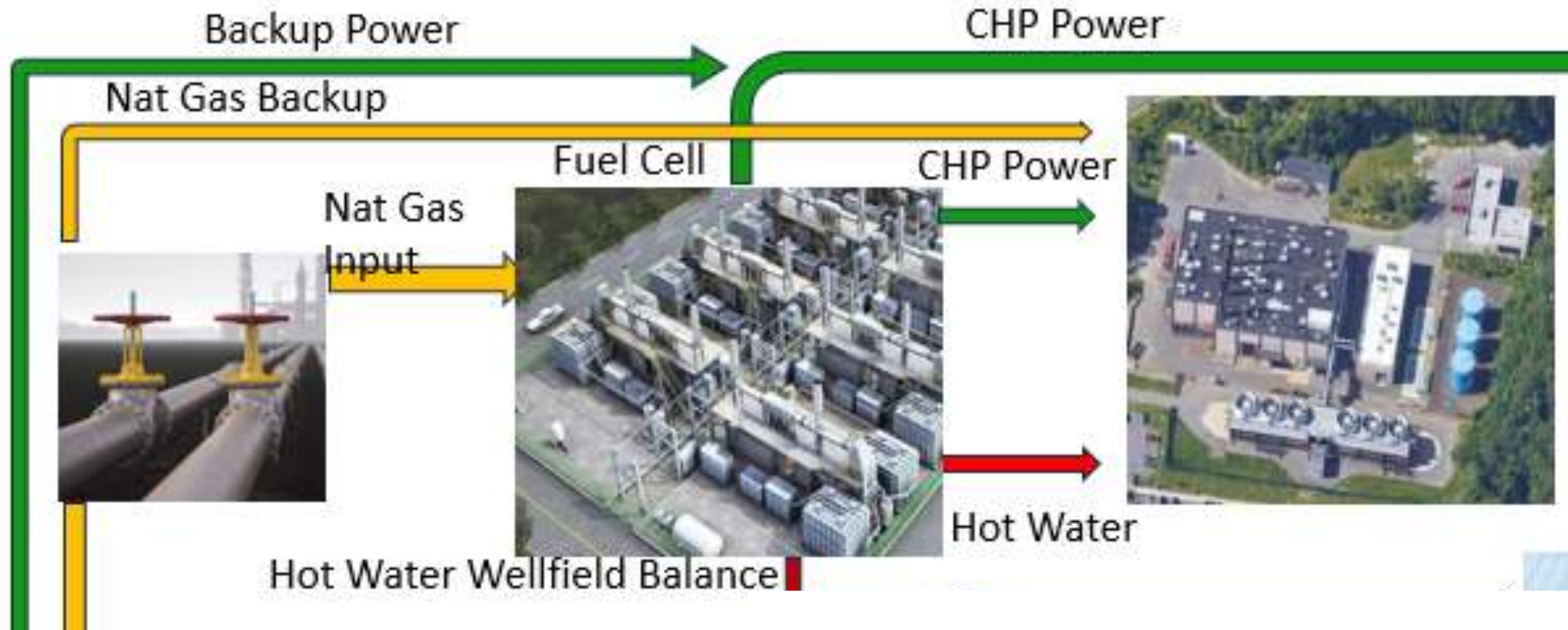
Efficiency, lower-temperature thermal distribution, networked geothermal, and dispatchable on-site resources work as a system, not as isolated technologies.

Hospital Campus

Co-Gen & Academic Campus Geothermal Clusters

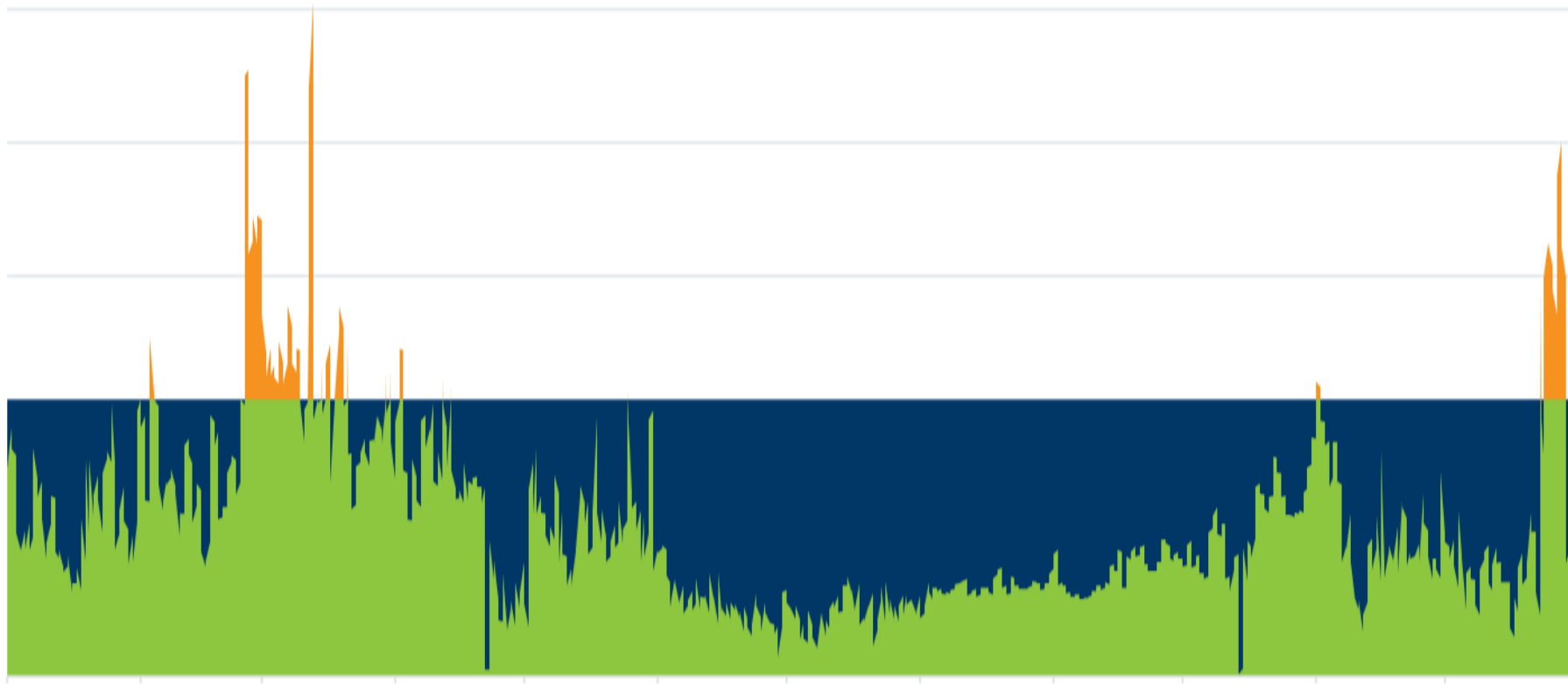


Hospital Campus Co-Gen

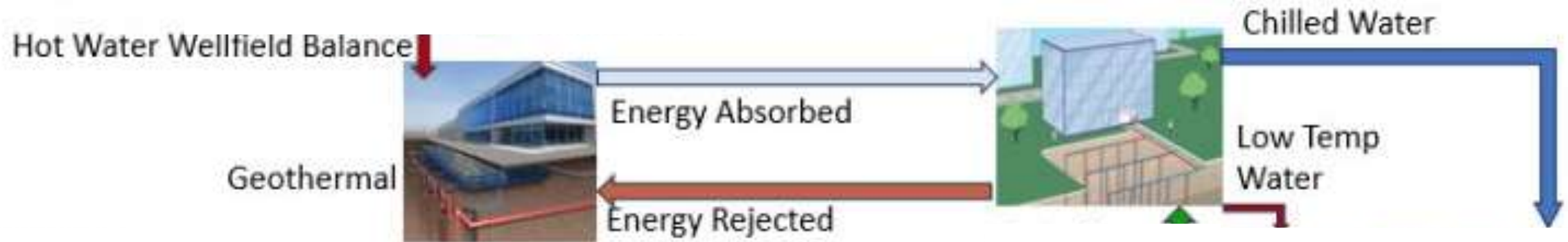


- Natural gas-powered fuel cell providing heat and electricity for the East Campus hospital.
- Excess heat is transferred to the West Campus to maintain geothermal wellfield balance.
- Backup heating is provided directly by natural gas.

Hospital Campus Baseload and Peak Strategy



Academic Campus *Geothermal Clusters*



- Geothermal (Ground Source) Heat Pumps provide low temperature hot water and chilled water to the Academic (West) Campus
- Electric energy provided directly from the grid

Thermal Transformation

Lower-temperature thermal networks create options

Today

- Centralized
- Heating, cooling, and electric loads interdependent
- Difficult to convert all at once



Transition State

Low-temperature loops
+ heat recovery
+ modular heat-pump plants

Supports phased building conversion,
shared thermal energy, geothermal
connection, and multiple operating modes.



Networked geothermal becomes infrastructure

Shared resource

A campus thermal network can move and balance heat among buildings rather than treating each building as an isolated system.

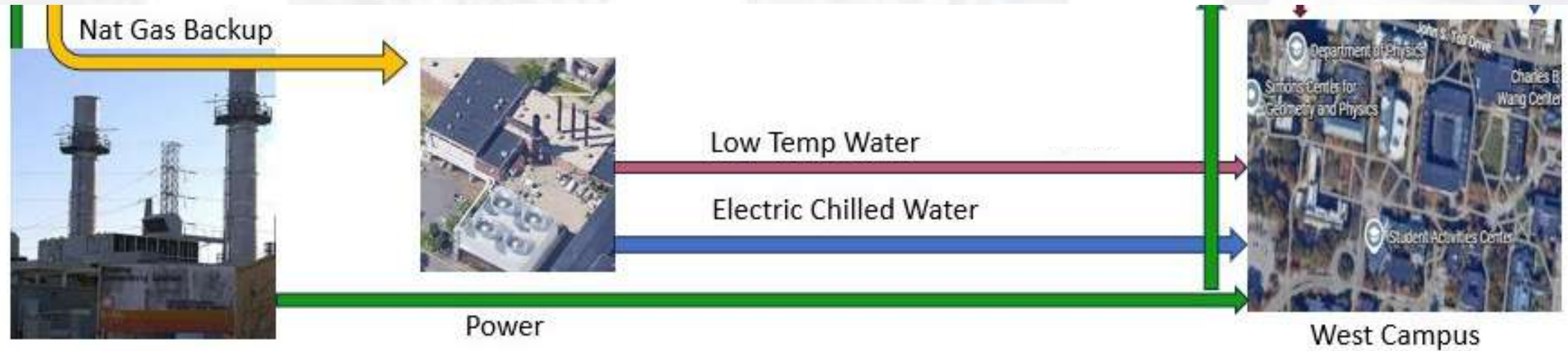
Phased connection

Clusters can be developed and connected as buildings, distribution, and capital projects become ready.

Resilience value

Distributed wells, loops, and plants can reduce reliance on a single thermal source while creating alternate operating modes.

Academic Campus Backup Heating System



- Backup heating is provided directly by natural gas

Grid Electric Constraints and Solutions

Constraints

- Limited capacity from the grid
- Power sags at hospital
- Cost of increased demand

Solutions

- Load shifting
 - Battery Energy Storage Systems (BESS)
 - Thermal Storage (Ice Storage)

4

From decarbonization plan to implementation

Implementation pairs long-term infrastructure direction with funding strategies, enabling work, and near-term projects. Multistakeholder engagement builds campuswide support for delivery.

Multistakeholder Engagement

Implementation needs campuswide support



Pathways, Not a Single Leap

NEAR-TERM PATHWAY

PRIMARY ADVANTAGE

KEY CHALLENGE

Continue main cogeneration
+ geothermal clusters

Lower disruption in early
phases

Long-term fuel and emissions
exposure

LONG-TERM PATHWAY

PRIMARY ADVANTAGE

KEY CHALLENGE

East Campus cogeneration +
West Campus geothermal

Balances reliability and
thermal transformation

Requires careful interface
and phasing

Lot 40 Solar PV Canopy, Battery Storage, and EV Charging



Geothermal Network Expansion (West Campus & Southampton)

Department

Campus Planning, Design & Construction (CPDC)

Overview

Stony Brook University will design and construct two geothermal thermal energy network projects as part of New York State's \$1 billion Sustainable Future Program. Supported by a \$22 million investment from New York State, the projects will expand geothermal infrastructure at Stony Brook Southampton and establish a new thermal energy network on the West Campus, supporting cleaner, more efficient heating and cooling systems across multiple buildings.

Key Highlights

- \$22 million investment through New York State's Sustainable Future Program
- Expansion of the existing geothermal system at the Stony Brook Southampton campus library to serve additional buildings
- Development of a new geothermal network on West Campus connecting the Multidisciplinary Engineering and Neuro-AI buildings with the existing Engineering complex
- Use of thermal energy networks that distribute heating and cooling through shared underground piping systems
- Supports New York State's climate leadership goals and SUNY's commitment to achieving net-zero greenhouse gas emissions

Implementation Roadmap

A phased pathway reduces risk

1. Act Now

Efficiency, controls, metering, critical repairs, test bores, and design standards

2. Enable

Electrical capacity, building conversions, low-temperature distribution, and heat recovery

3. Scale

Geothermal clusters, heat-pump plants, microgrids, and resilient generation

4. Optimize

Commissioning, analytics, training, and continuous reinvestment

Implementation Roadmap

An adaptable phased pathway leads to implementation

1. Act Now

Expected 5 MW of growth threatens to exceed the capacity of the existing plant.

Energy storage systems.

2. Enable

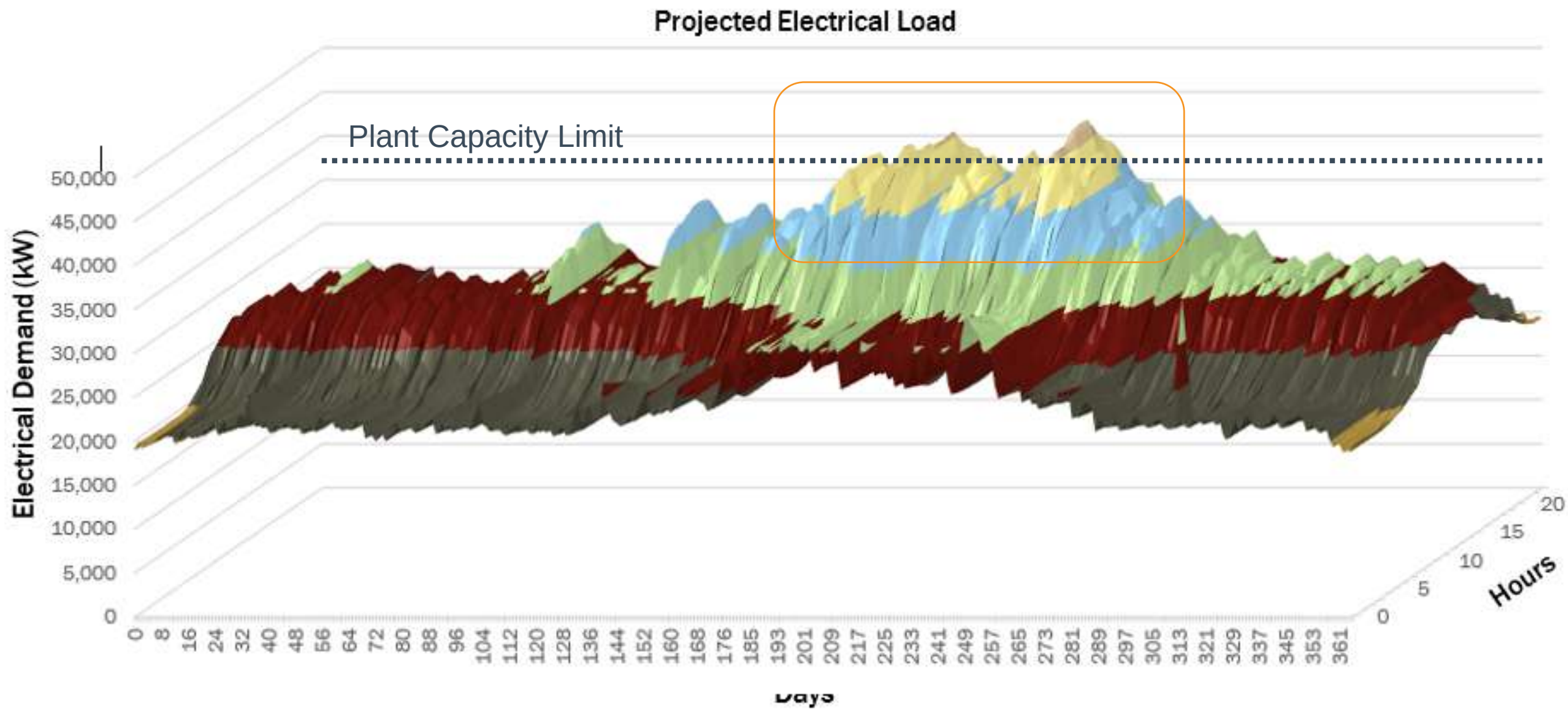
Electrical capacity, building conversions, low-temperature distribution, and heat recovery.

3. Scale

Geothermal clusters, heat-pump plants, microgrid controls, and resilient generation.

4. Optimize

Commissioning, dispatch, analytics, training, and continuous reinvestment.





The Solutions Option 1

WHAT TECHNOLOGY COULD BE USED?

Basis of Design: Tesla Megapack

The Tesla Megapack is a utility scale battery which is capable of providing reliable storage and grid stability. The system has a multilayer approach to safety including 24/7 monitoring software and non-occupiable enclosures designed to minimize risk to the facility and others.

Option 1:

Battery Storage System: Tesla Mega Pack
Configuration: 6 Hour
of Batteries: 15
Nameplate Energy: 60MWh
Usable Energy: 54MWh
Estimated Labor & Material Cost: \$38,308,211

Option 2:

Battery Storage System: Tesla Mega Pack
Configuration: 6 Hour
of Batteries: 7
Nameplate Energy: 28MWh
Usable Energy: 25.2MWh
Estimated Labor & Material Cost: \$19,296,003



ADDED VALUE

Provides power conditioning for hospital electrical loads.

- PERMIT-LEVEL ASSUMPTIONS:
- Tesla Megapack 2 XL ≈ 29' × 9' footprint
 - 3 ft inter-unit separation (UL 9540A-supported)
 - 8 ft inter-row fire / maintenance aisle
 - 15 ft perimeter clearance (no transformers shown)
 - Layout suitable for IFC 2024 / NFPA 855 review; final approval subject to AHJ.



Projected Electrical Load

Plant Capacity Limit

Electrical Demand (kW)

45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0

0 9 18 27 36 45 54 63 72 81 90 99 108 117 126 135 144 153 162 171 180 190 199 208 217 226 235 244 253 262 271 280 289 298 307 316 325 334 343 352 361

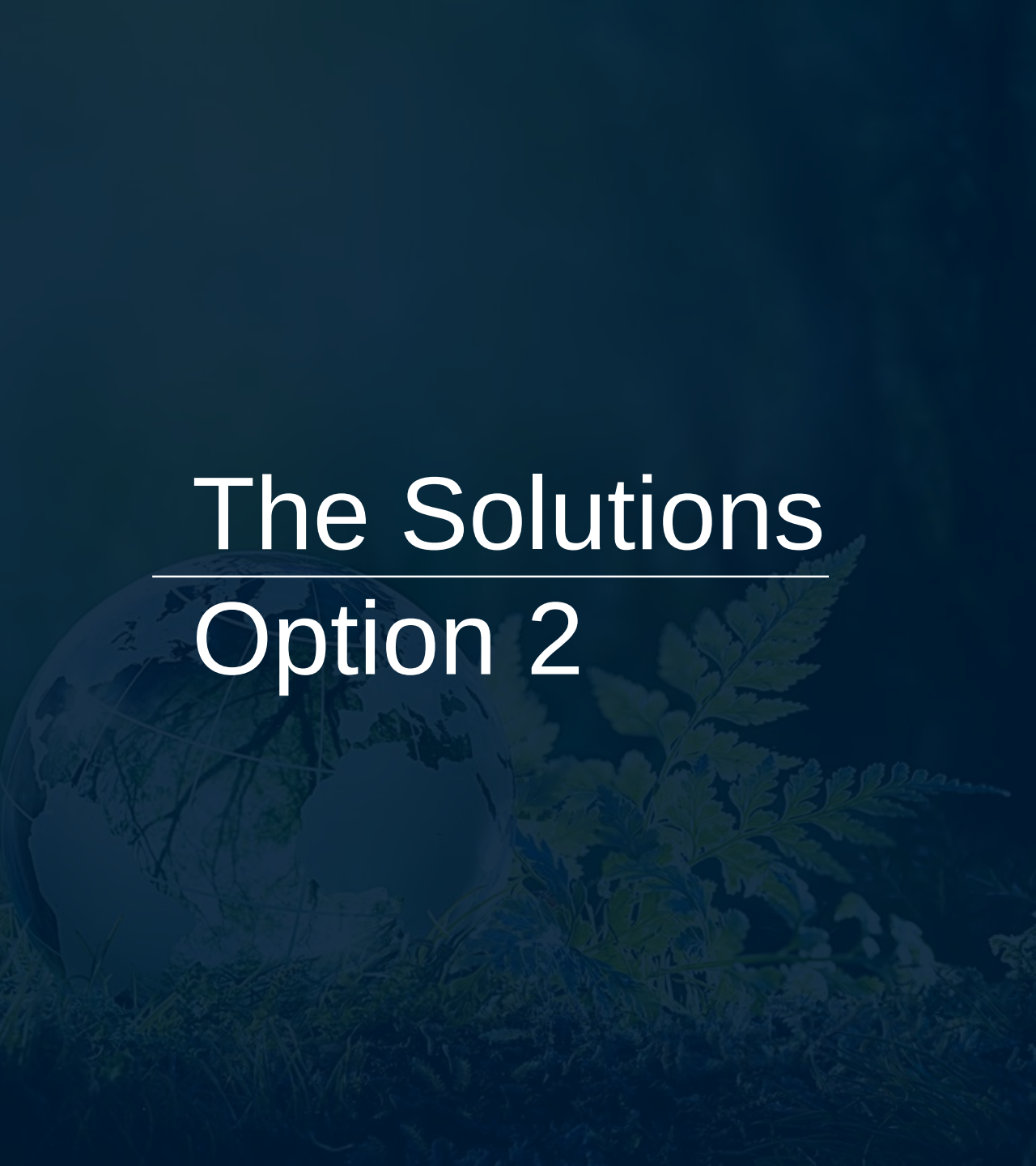
Days

2 4 6 8 10 12 14 16 18 20 22
Hours





The Solutions Option 2



WHAT TECHNOLOGY COULD BE USED?

Basis of Design: Tesla Megapack

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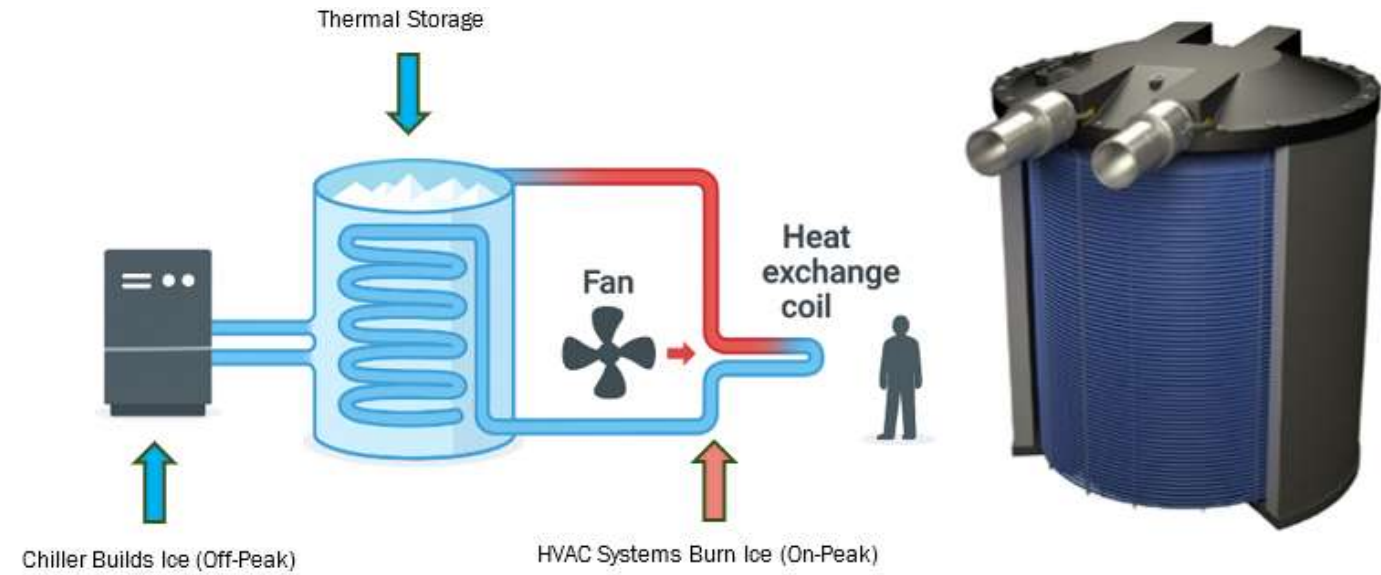
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WHAT TECHNOLOGY COULD BE USED?

Basis of Design: Calmac Ice Bank– Model 1500C
The Calmac Ice Bank Model 1500C thermal storage tanks allow facilities to generate and store thermal energy during off-peak hours for use during on-peak periods of operation. Additional benefits include increased redundancy and resiliency.

Water-Cooled Electric Chiller: One (1) 4,500-ton Nominal Cap.
Ice Storage System: 1500C Thermal Tanks 486 ton-hr
Configuration: Sixty-two (62) 1500C Thermal Storage Tanks
Nameplate Capacity: 30,132 ton-hrs
Usable Capacity: 24,106 ton-hrs
Estimated Labor & Material Cost: \$27,461,677



Existing Cooling Equipment			
Plant	Equipment Tag	Type	Capacity
East	CH-1	Steam	4,850
East	CH-2	Steam	4,850
East	CH-3	Steam	4,850
East	CH-4	Electric	2,500
East	CH-5	Electric	2,500
East	CH-6	Electric	2,500

Thermal storage can be used to offset peak demand of existing electric chillers.



HOW DOES A PHOTOVOLTAIC SYSTEM WORK?

When the sun shines onto a solar panel, energy from the sunlight is absorbed by the PV cells in the panel. This energy creates electrical charges that move in response to an internal electrical field in the cell, causing electricity to flow.

DC power that is produced by the solar panels can be stored in batteries. It is then converted from DC power to AC power via an inverter. AC power is either supplied to the utility grid through a net metering system, directed to electrical loads within a building, or fed to an EV charger or other connected system.

In New York, end-users are able to connect a single array up to 5MW of solar to the utility grid via New York’s net metering law.

SUMMARY

- PV System Array: 5.98 MW DC
- PV System Inverters: 5.00 MW AC
- Annual Production: 7.87 GWh
- Utility Connection: Direct to the electrical utility.
- Estimated Labor & Material Cost: \$49,464,437

MOUNTING CONFIGURATIONS

Parking Lot Canopy Solar PV

Parking lot canopy solar PV installations are elevated structures built above parking areas that generate electricity while also providing shade and weather protection for parked vehicles. By utilizing existing paved surfaces, they make efficient use of space without requiring additional land, and they can improve the comfort of vehicles by reducing heat buildup and exposure to snow, rain, or hail. These systems can be designed as single-row canopies, multi-bay structures, or even full-lot coverage, with panel orientation and tilt optimized for solar production. However, their design requires careful attention to structural integrity, snow and wind loads, drainage, and clearance for vehicle and pedestrian access. Electrical interconnection must also be planned with respect to nearby infrastructure, transformer capacity, and utility requirements. Beyond energy production, canopy projects can enhance the aesthetics and functionality of parking lots, but they often come with higher upfront costs compared to ground-mount systems due to steel, foundation, and construction complexity. Successful implementation depends on evaluating site space, energy demand, budget, available incentives, and long-term project goals.



Stony Brook - LIVE Stony Brook Solar, 1449 Stony Brook Rd, Stony Brook University, NY 11790

Report

Project Name	Stony Brook Solar
Project Address	1449 Stony Brook Rd, Stony Brook University, NY 11790
Prepared By	Brad Hanagan bhanagan@wendelcompanies.com

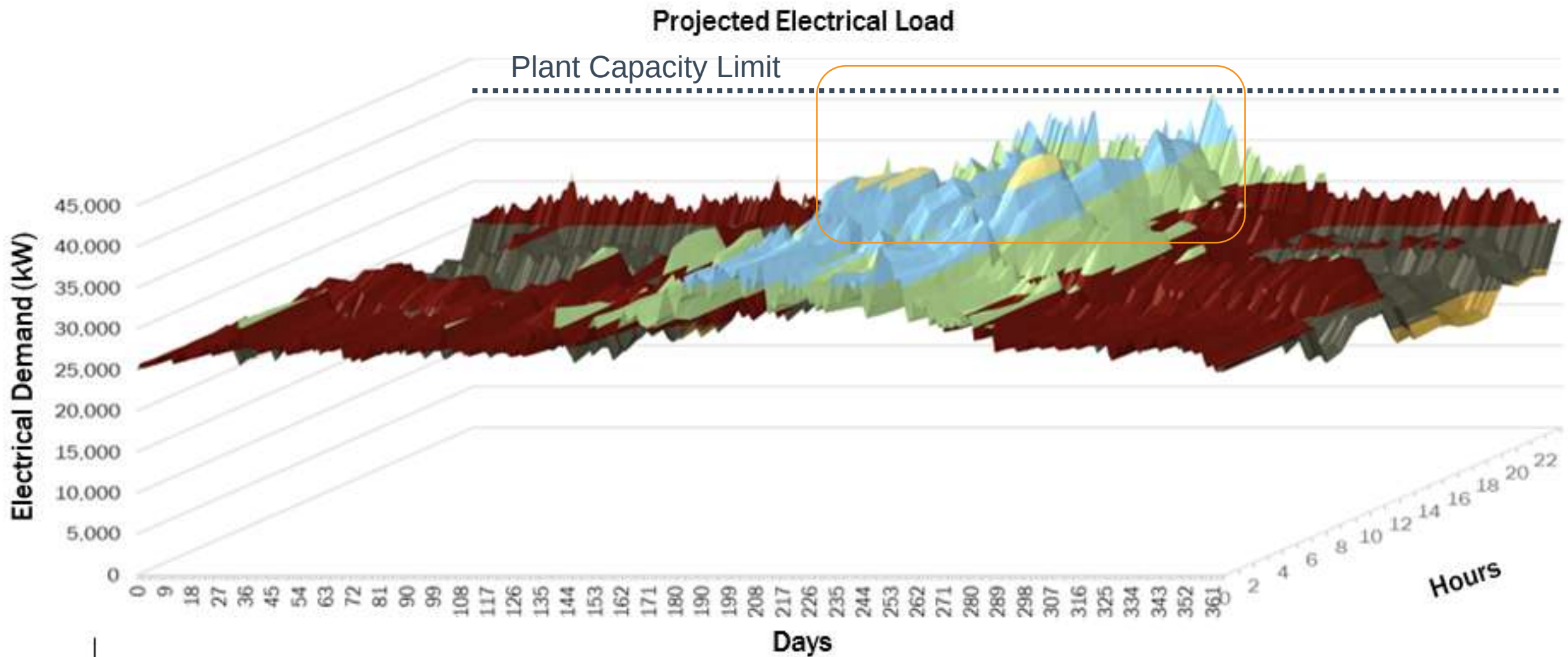
System Metrics

Design	Stony Brook - LIVE
Module DC Nameplate	5.98 MW
Inverter AC Nameplate	5.00 MW
Load Ratio	1.20
Annual Production	7.867 GWh
Performance Ratio	85.5%
kWh/kWp	1,314.7
Weather Dataset	TMY, 10km grid (40.85,-73.15), NREL (prospector)
Simulation Version	bc926eb1a1-e1595462b-c68e24bc92-41503a9340

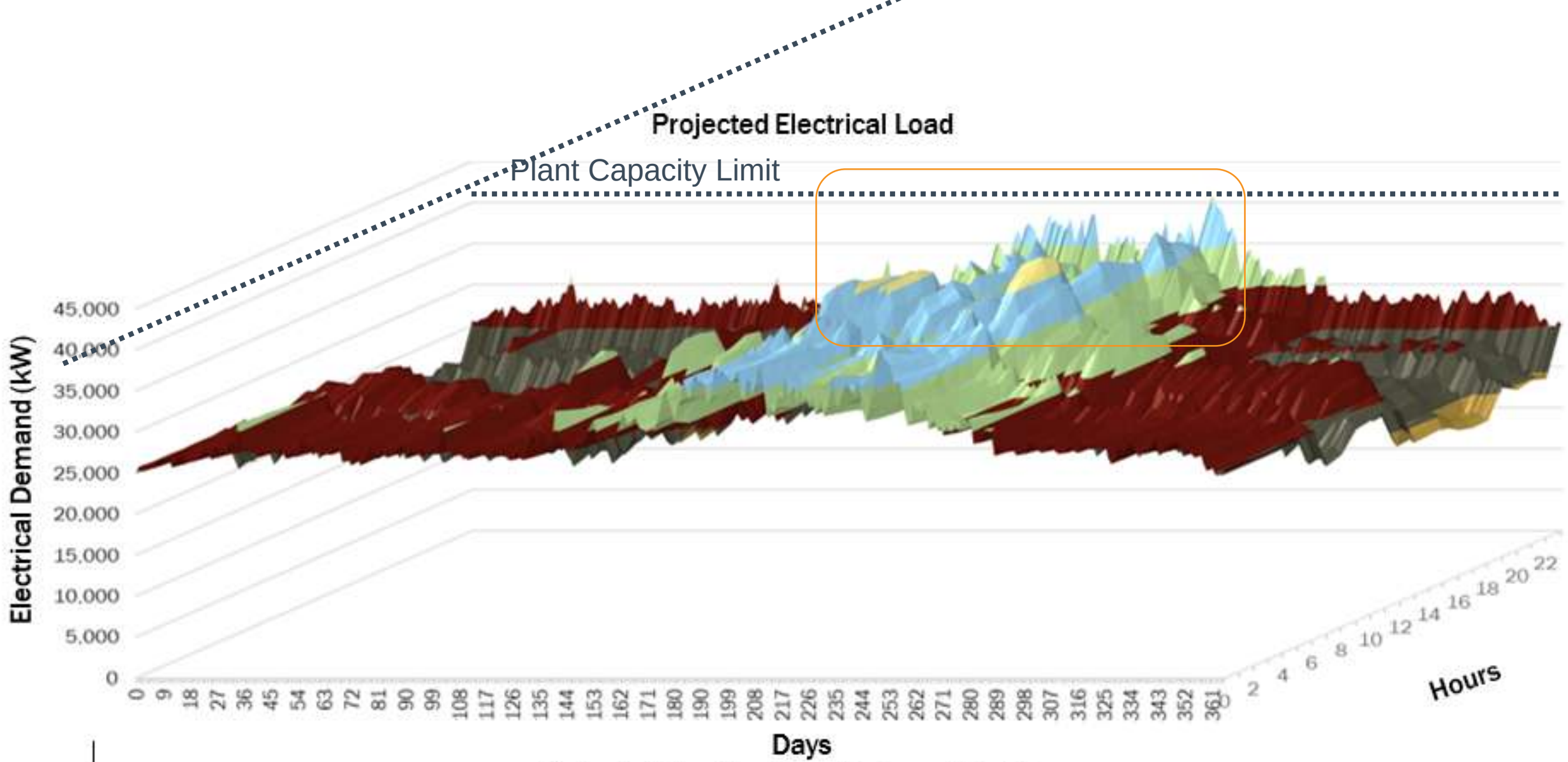
Project Location

Monthly Production

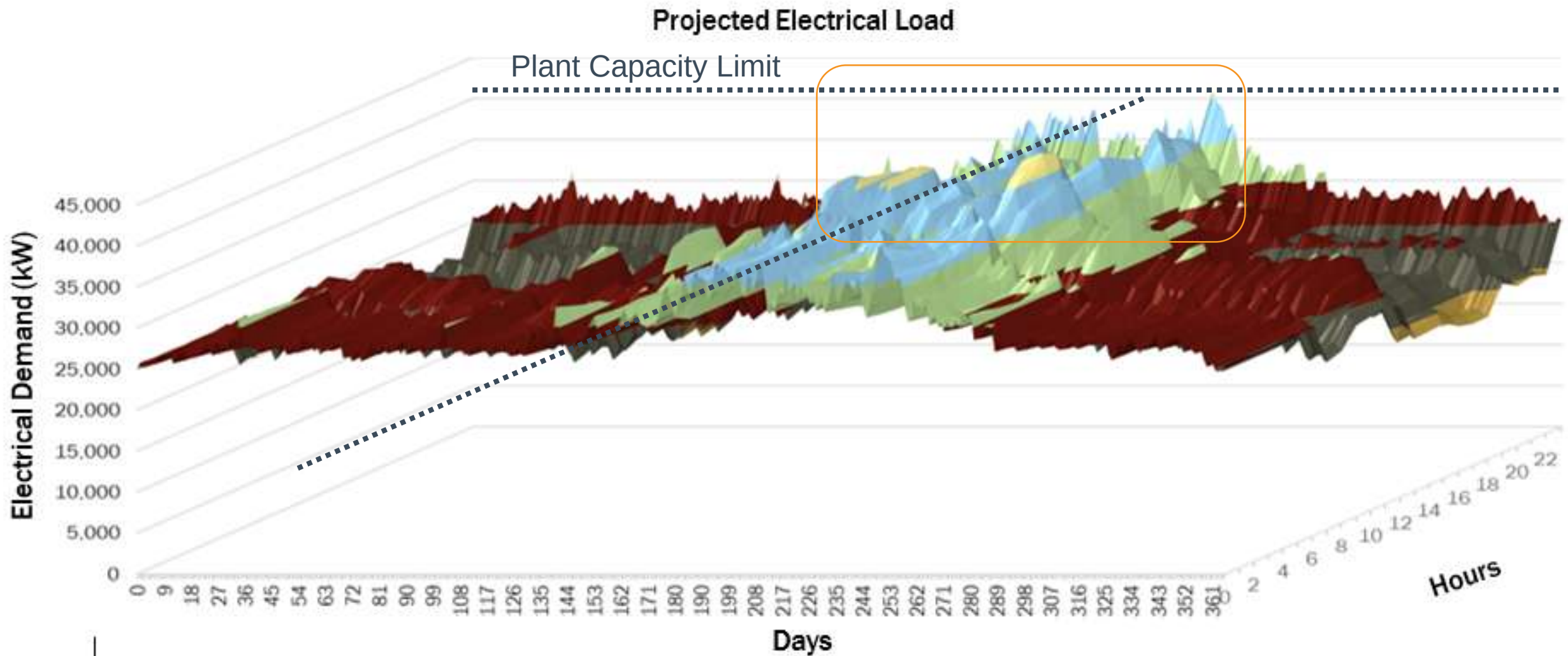
Sources of System Loss



Projected Electrical Load | Annual Profile



Projected Electrical Load | Annual Profile



Projected Electrical Load | Annual Profile

Programs + Delivery

Funding works best as a capital stack

Public programs + incentives

Use planning, technical assistance, demonstration, and implementation resources to reduce early-stage barriers.

Capital planning

Align decarbonization enabling work with renewal, deferred maintenance, and already-planned campus projects.

Performance contracting

Apply guaranteed savings and cost certainty where efficiency and enabling measures can support financing.

STACK FUNDING AROUND THE PHASE, RISK, AND ASSET LIFE



TRANSFERABLE TAKEAWAYS

Five lessons other campuses can use

1. Enhance mission critical services via decarbonization.
2. Always plan for growth.
3. Treat load imbalance as a strategic asset.
4. Flexibility is essential; a decarbonization plan is a framework not a boundary.
5. Pair the long-term vision with near-term need.

Questions?



architecture | engineering | energy efficiency | construction management



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