



## PROJECT LIGHTYEAR:

PUSHING GMP LOGISTICS AND WAREHOUSE  
FACILITIES TO INFINITY AND BEYOND

Andy Campbell  
Corporate Real Estate  
United Therapeutics

CaSA Opening Keynote  
February 15, 2022

# Agenda

- Our Mission
- Project Goals and Guidance
- The Building
- NZE Design Overview
- Battery Storage System
- Project Challenges and Wins



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## OUR MISSION

## Who We Are & What We Do



# We are in the business of saving lives. And that doesn't stop with our patients.

- The Unisphere, a 135,000 square foot site net zero energy and Platinum LEED-certified commercial building in Silver Spring, Maryland
- Two additional LEED Gold certified buildings totaling 164,000 square feet on our Silver Spring campus, providing administrative, laboratory, and manufacturing space
- An 11,000 square foot site net zero energy childcare center in Research Triangle Park, North Carolina
- A 25,000 square foot site net zero energy ex-vivo lung perfusion (EVLP) facility on the campus of the Mayo Clinic in Jacksonville, Florida
- A 10,000 square foot site net zero energy call center in Melbourne, Florida

**Going forward, we will strive to ensure all new buildings are “site net zero” to the greatest extent practicable**



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# Top-Down Commitment to Sustainability



## Leadership

Engage from all stakeholders to implement and empowerment from leadership to act



## Concept

Identify and establish project goals and objectives for sustainability



## Design

Involvement of design and construction teams from onset to align execution



## Construction

Track development of sustainable objectives; commitment to commissioning



## Life Cycle

Educate occupants, fine tune systems, refine best practices

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# **PROJECT LIGHTYEAR: GOALS AND GUIDANCE**

## Defining Our Needs

- Understanding our present
- Planning for the future
- Autonomy/control of process
- Supply chain management
- Risk management

TO INFINITY  
AND BEYOND!

-BUZZ LIGHTYEAR



# Developing Our Path Forward

- Priority 0: Meet the corporate needs
- Priority 1: Zero carbon facility
- Priority 2: Facility operational by Q2 2023
- Priority 3: Made in the USA
- Priority 4: Budget requirements
- Priority 5: Reduce embodied carbon
- Priority 6: LEED and other certifications



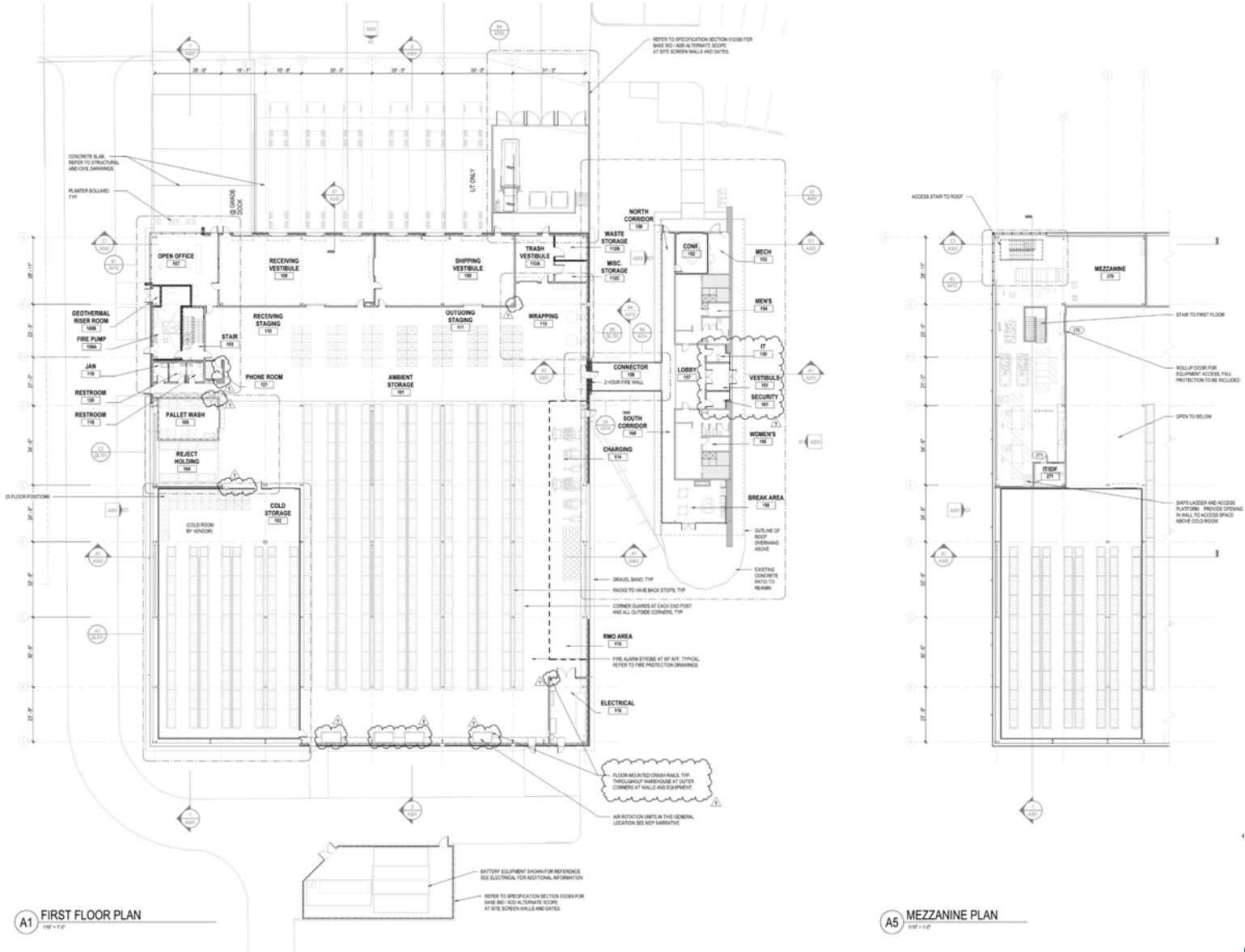
# THE BUILDING

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# Site Plan



# Floor Plan





# Renderings

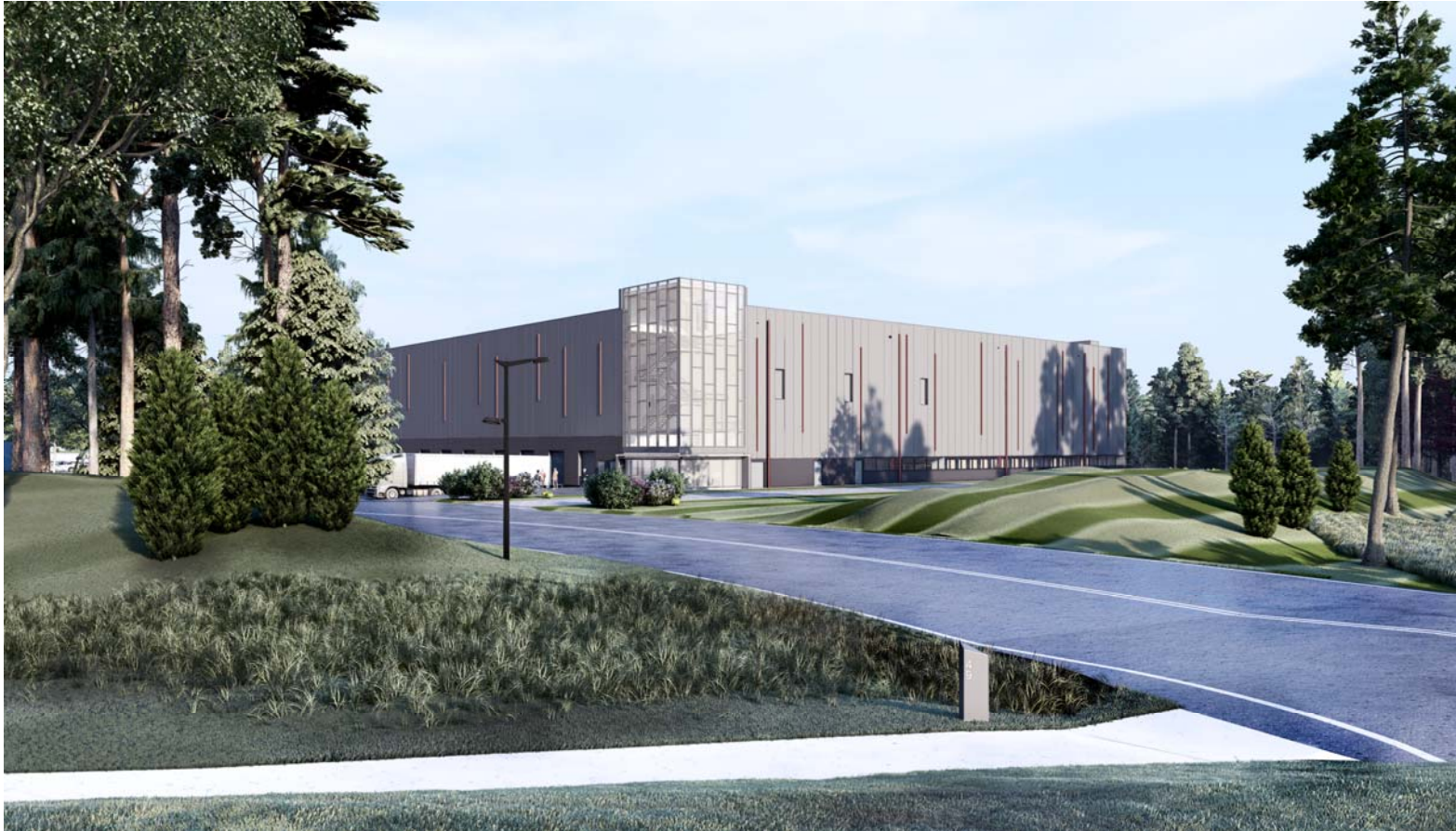


# Renderings





# Renderings



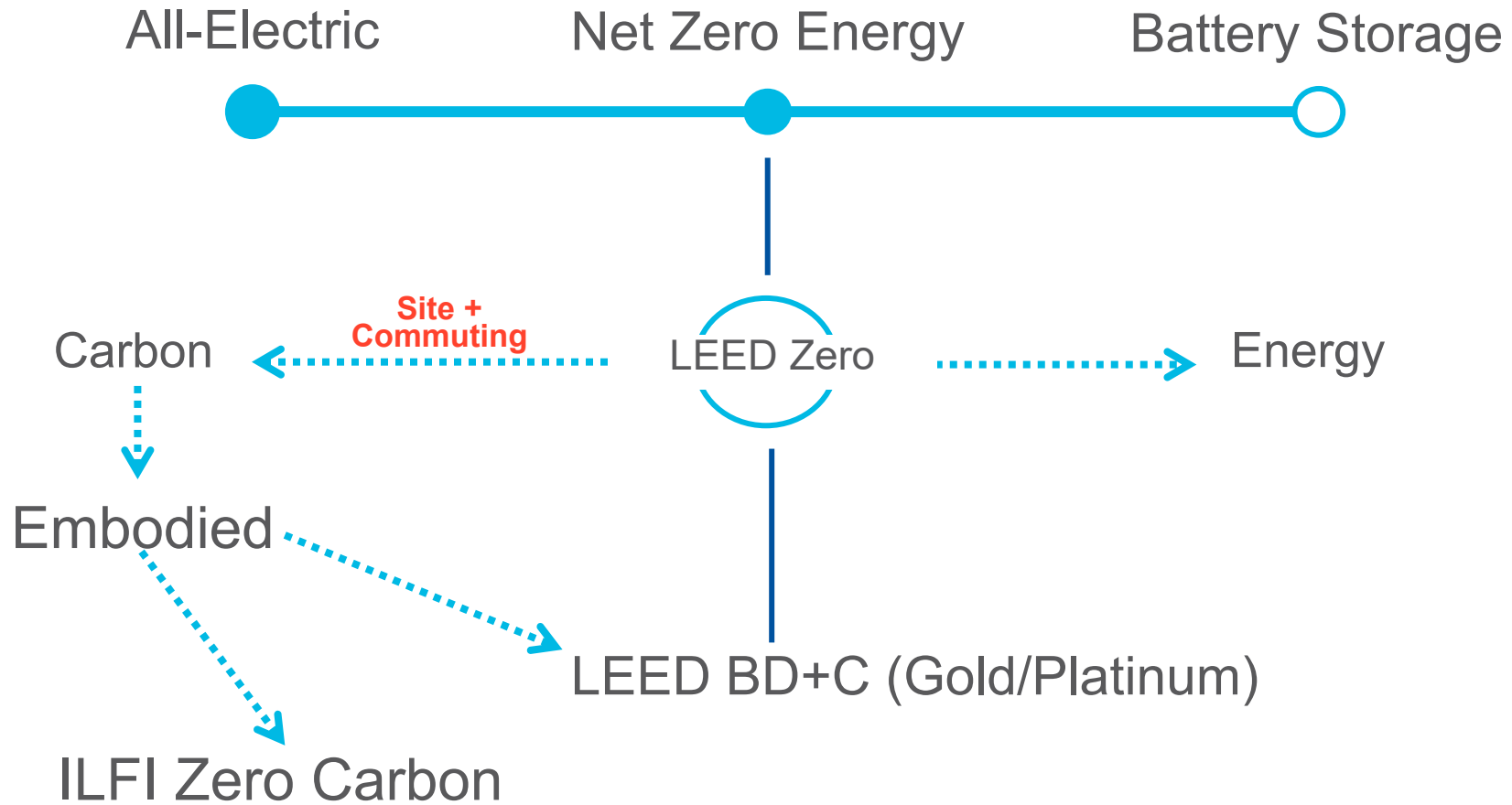
# Project Progress

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before.

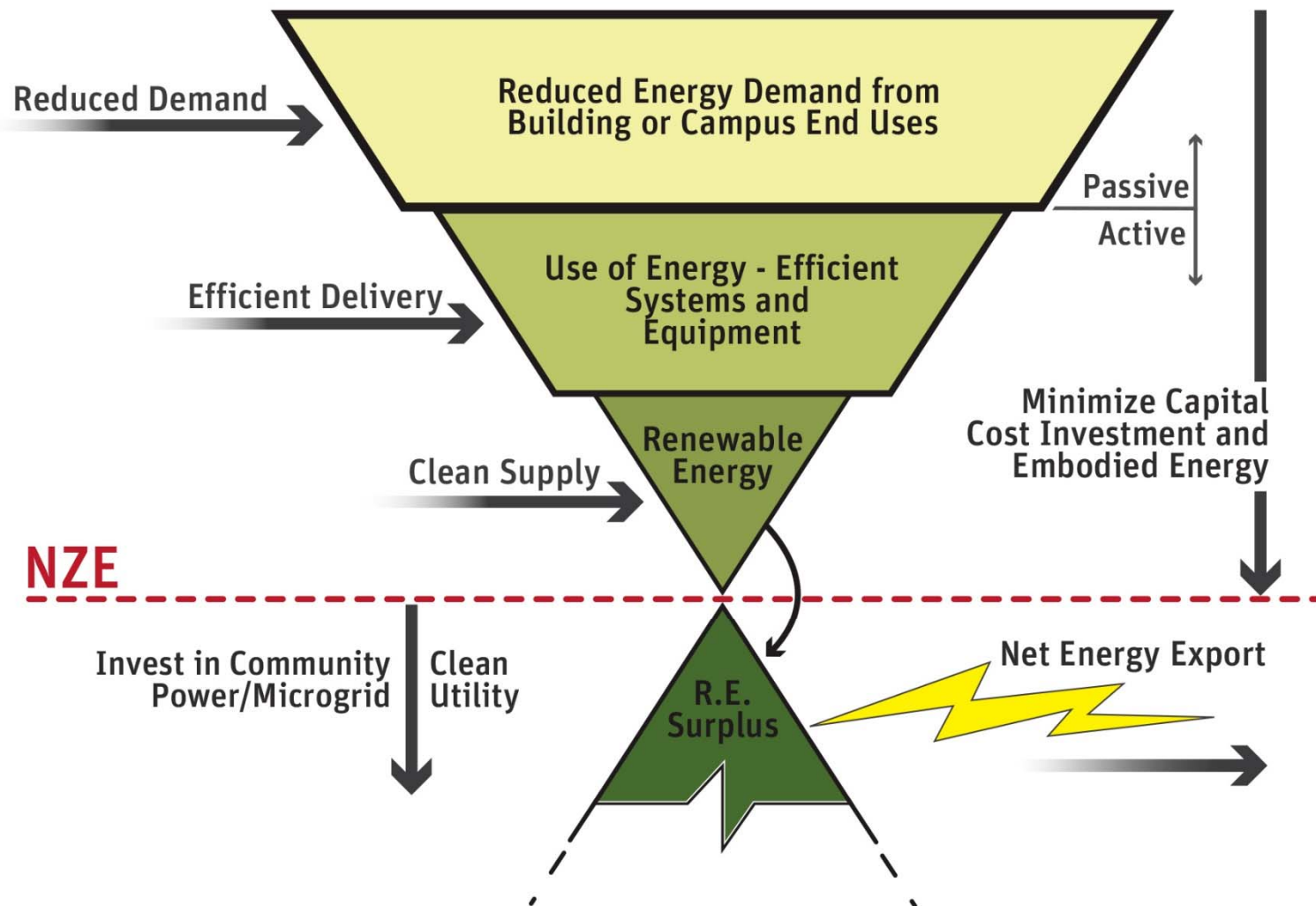


# NZE DESIGN OVERVIEW

# Sustainable Design Goals



# Zero Energy Design Overview



Illustration, copyright AEI/Affiliated Engineers, Inc.

# Passive Strategies - Siting

- Balance site features vs solar
- Optimizes PV production
- Minimizes impact to wetlands
- Minimizes impact to existing tree canopy





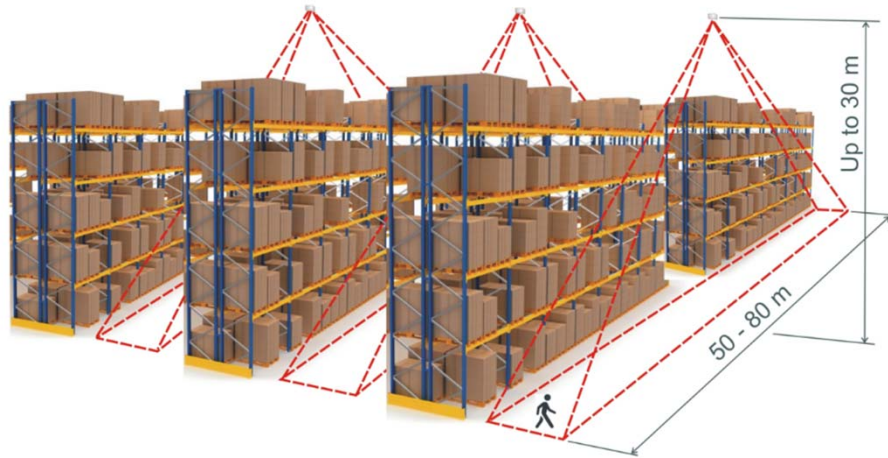
# Passive Strategies - Envelope

- Roof: R-42
- Walls: R-21
- Windows: SHGC=0.28, U-value=0.35
- Infiltration Reduction
  - Metal panel construction
  - Loading vestibules
  - Dock doors
  - Skin commissioning
- Provide daylighting while providing visual security and UV protection to product
- Translucent panels & glazing



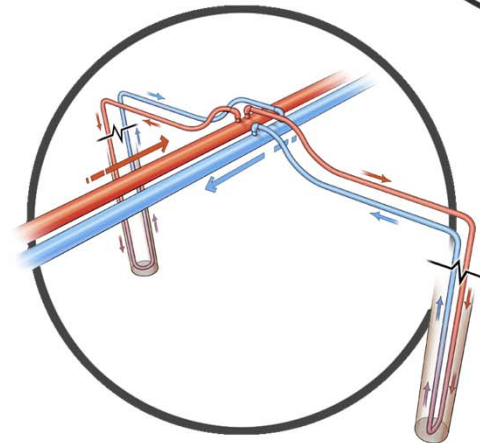
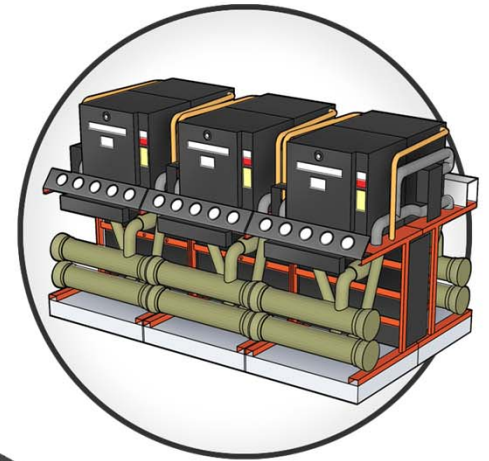
# Passive Strategies - Operational

- Lighting occupancy sensors
- Temperature setbacks in administrative spaces
- EnergyStar computer & office equipment
- Regenerative charging lift trucks

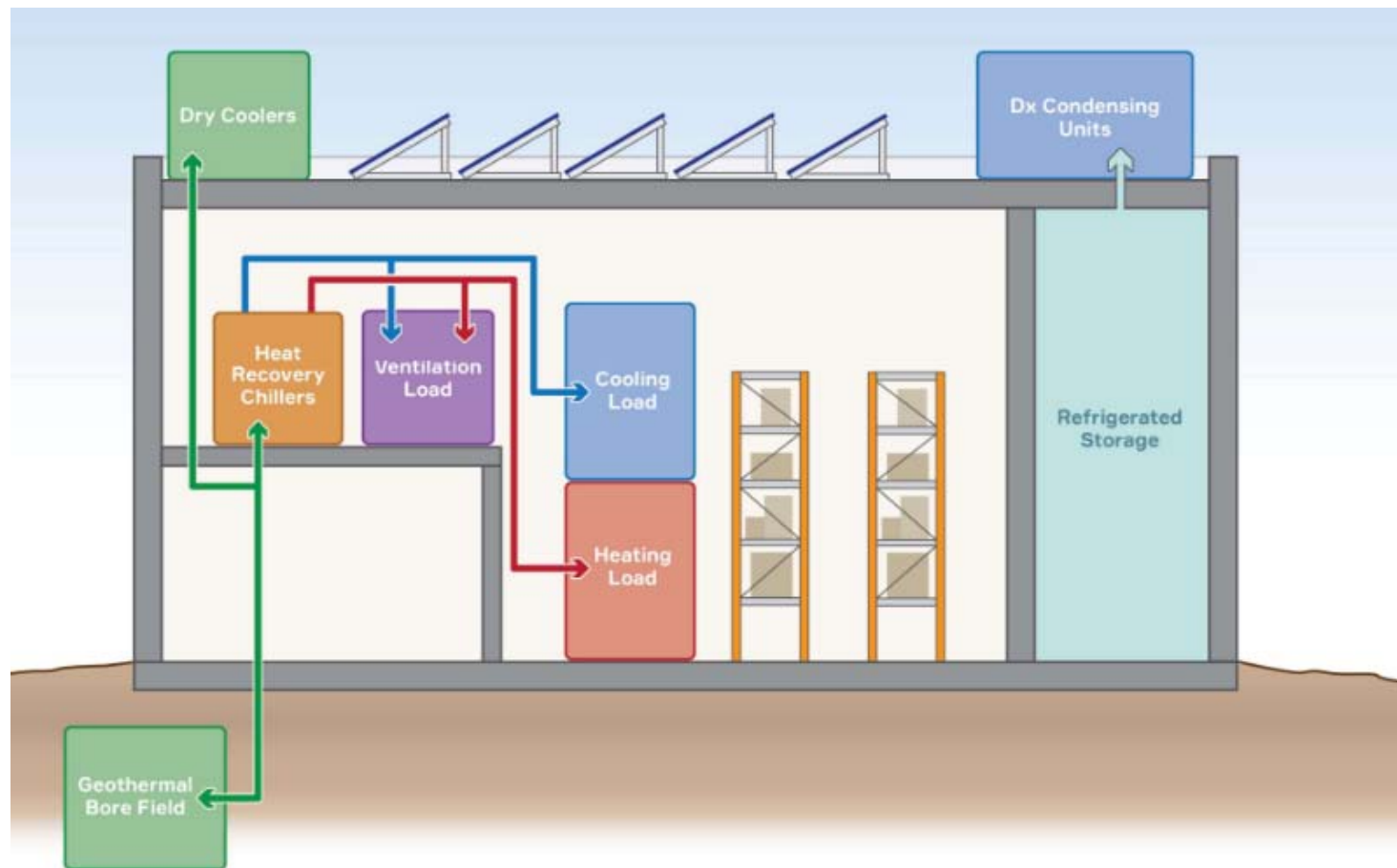


# Active Strategies - Systems

- LED lighting
- Variable speed fans and pumps
- Premium efficiency motors
- Decoupled ventilation and cooling
- Low pressure drop DOAS and distribution
- Geothermal heating & cooling
- Heat recovery chillers
- Dry cooler supplemental heat rejection
- High-efficiency cold storage equipment



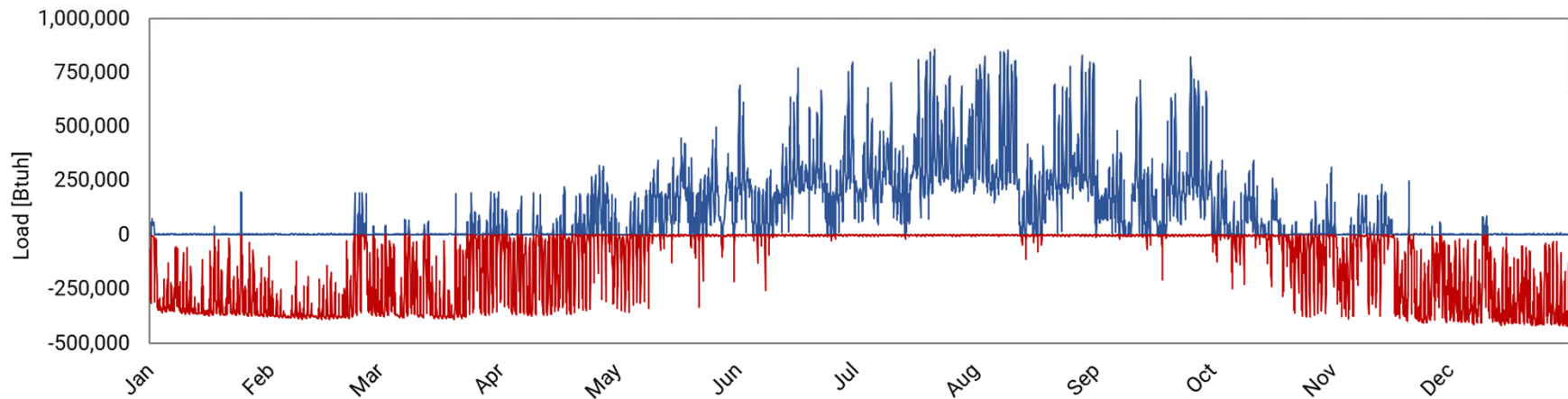
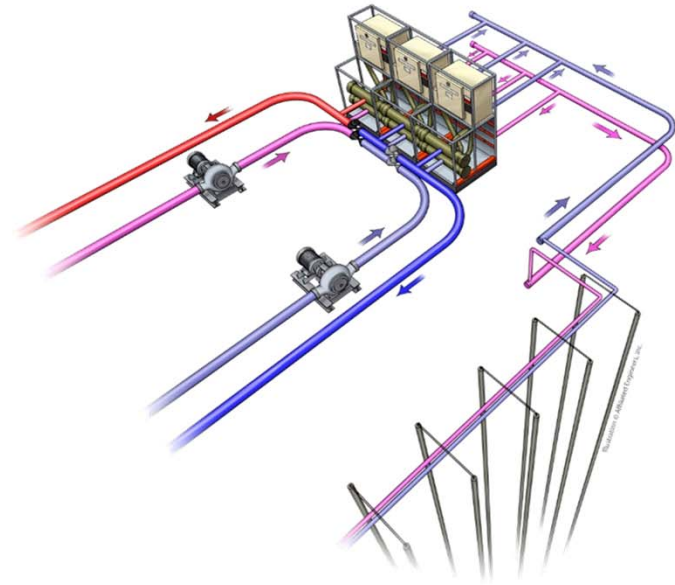
# Mechanical System Overview





# Geothermal System Overview

- Annual Cooling: 960 MBTU
- Annual Heating: 1,062 MBTU
- Peak Cooling: 857,000 Btu/hr
- Peak Heating: 420,000 Btu/hr

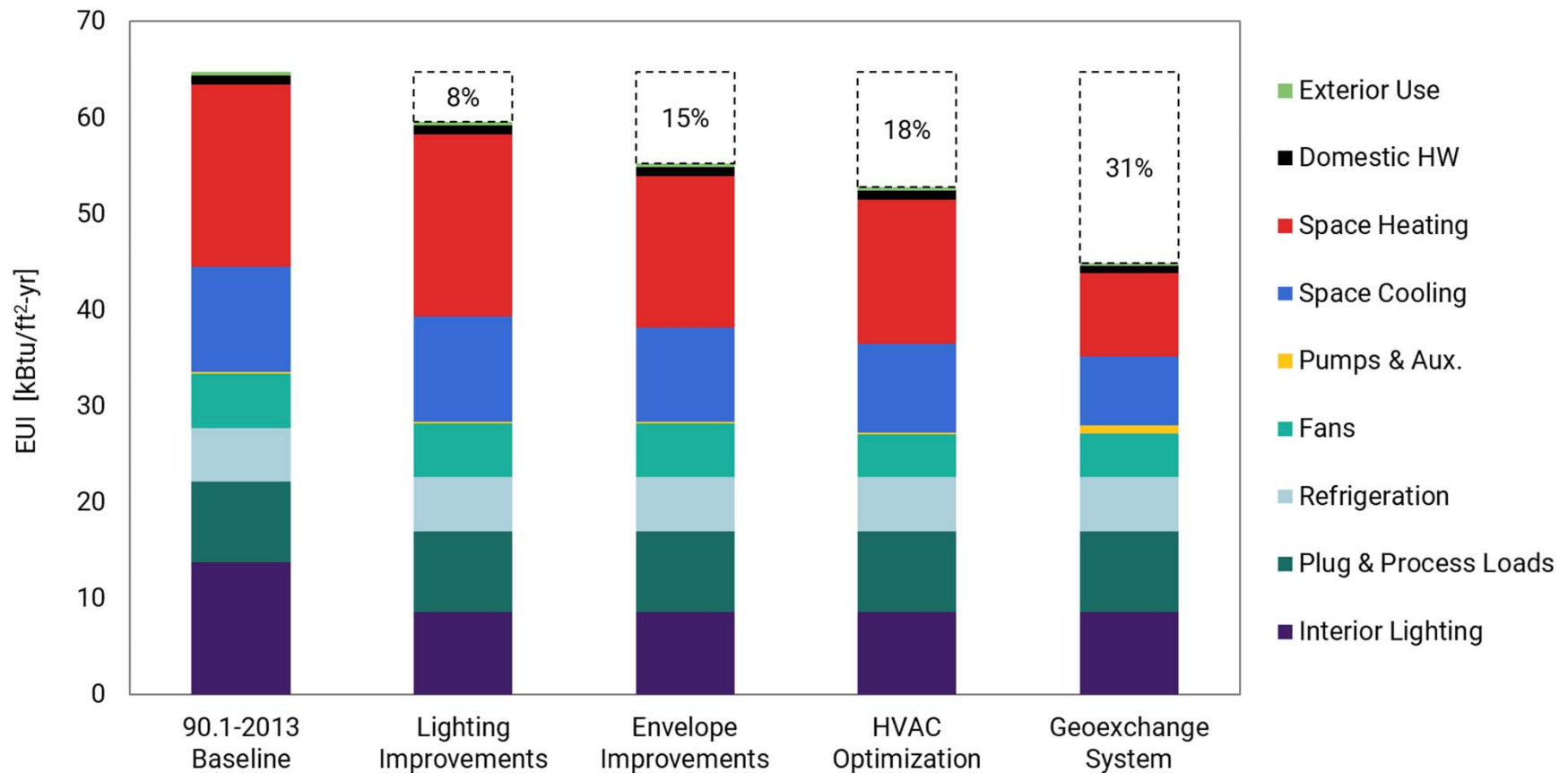


# Geothermal System

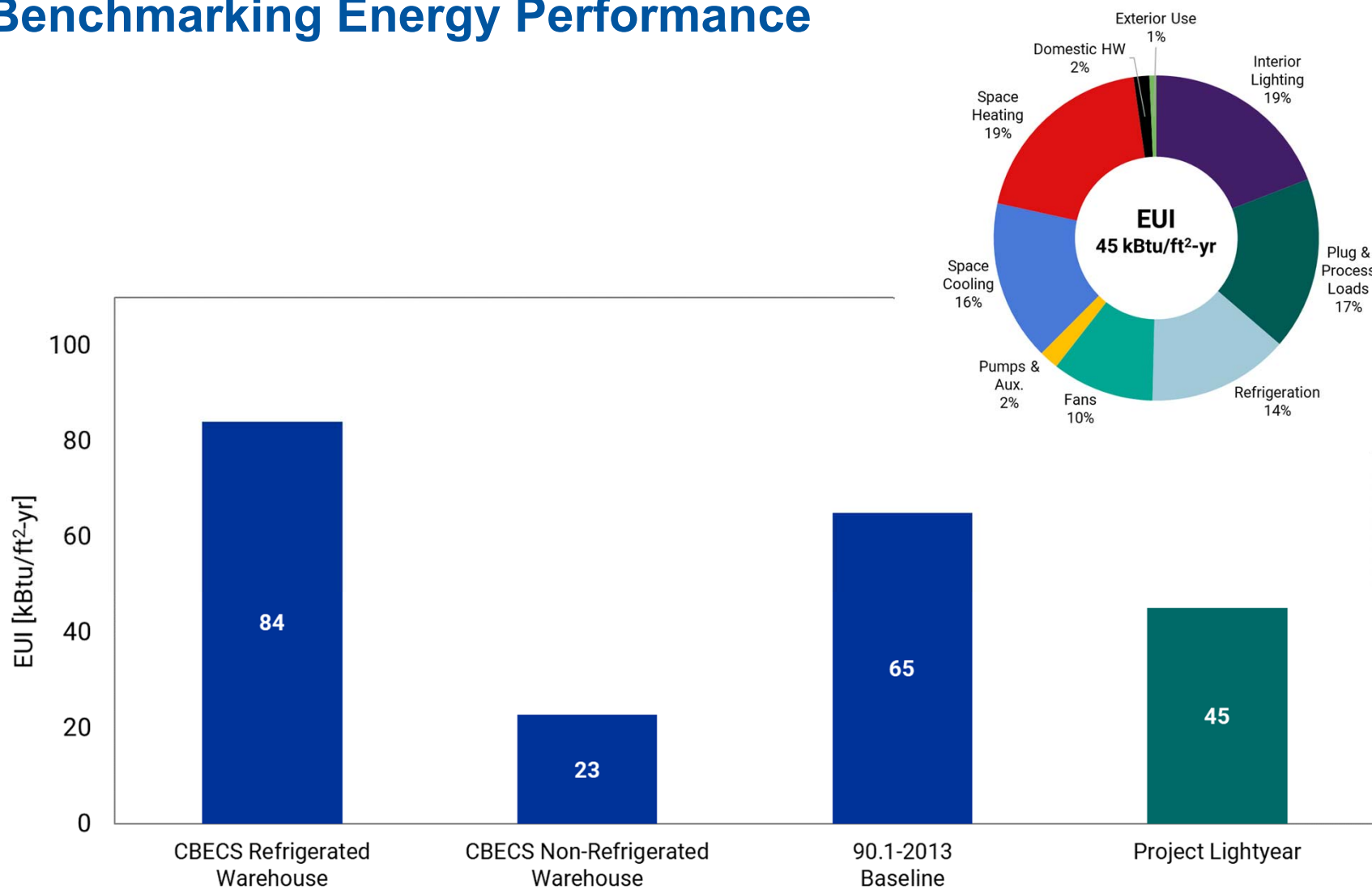
- 40 bores 25' o.c. at 500' deep
  - ~2.5 tons/bore\*
- 6-pipe HRC configuration
  - ~5.4 COP Cooling
  - ~3.9 COP Heating
  - ~6.5 COP Simultaneous
- 20-ton supplemental heat rejection



# Energy Modeling – Energy Savings



# Benchmarking Energy Performance



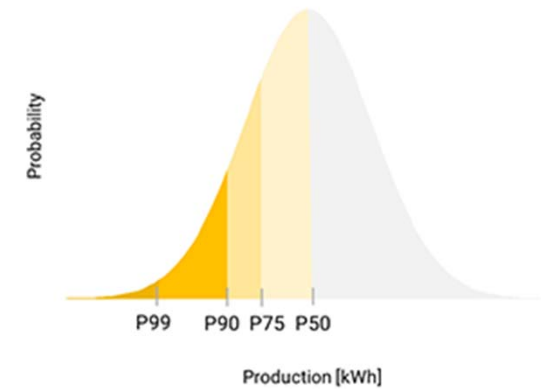
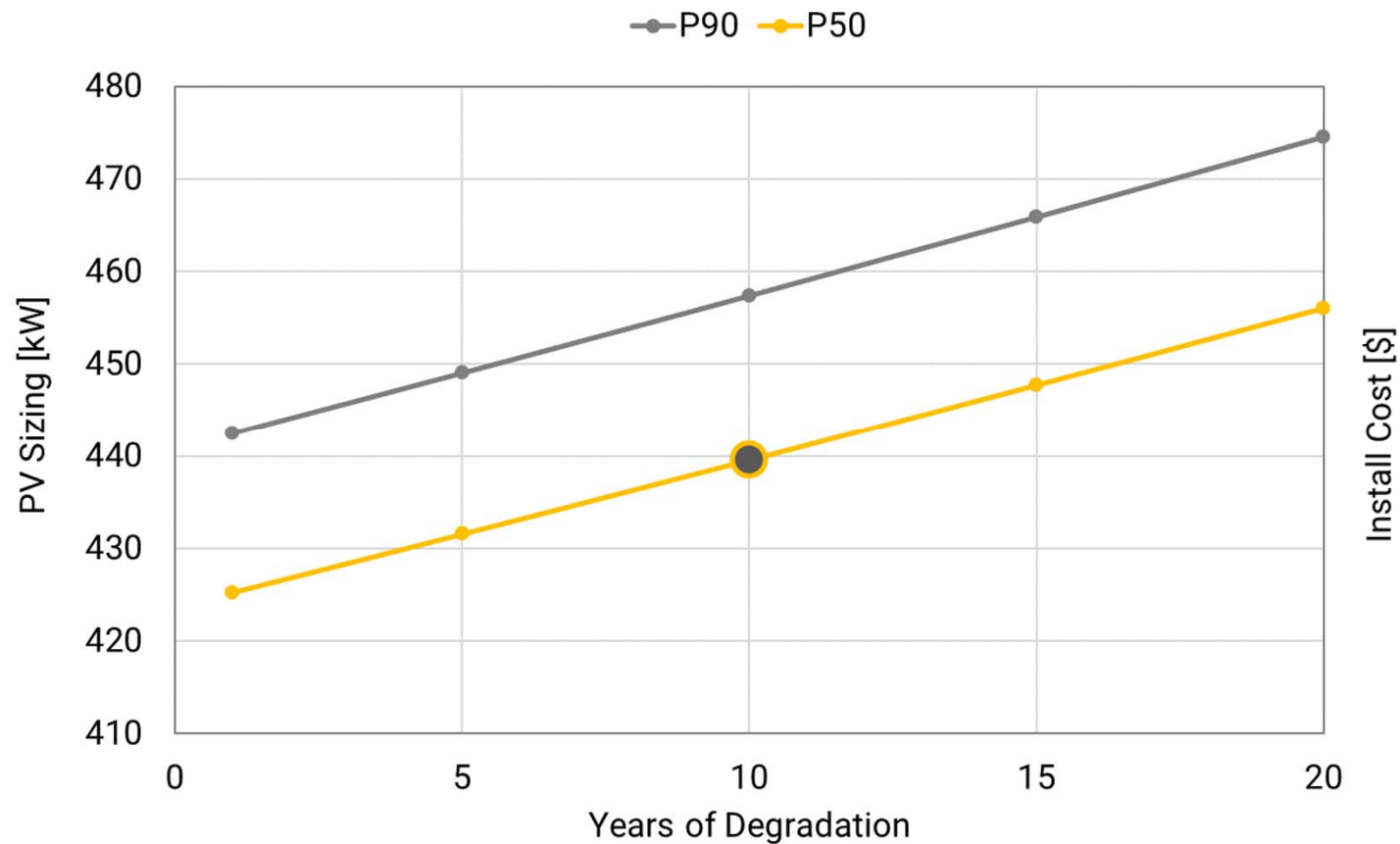
# PV System Design

- Sizing & design considerations
- Helioscope analysis
- Current roof layout

EUI to offset  
Building massing & orientation  
Panel, inverter & racking systems  
Panel degradation  
Solar year variability  
Future capacity needs

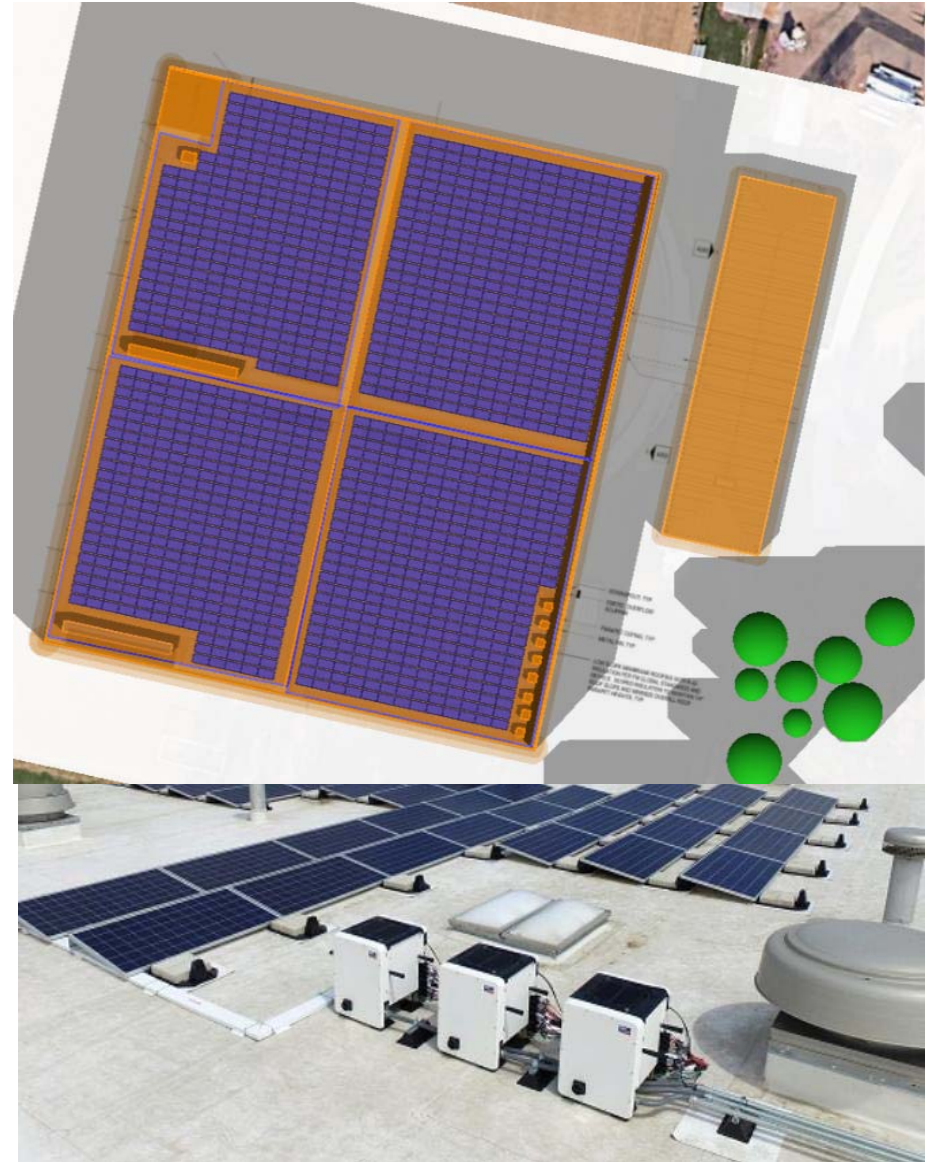


# PV System Sizing

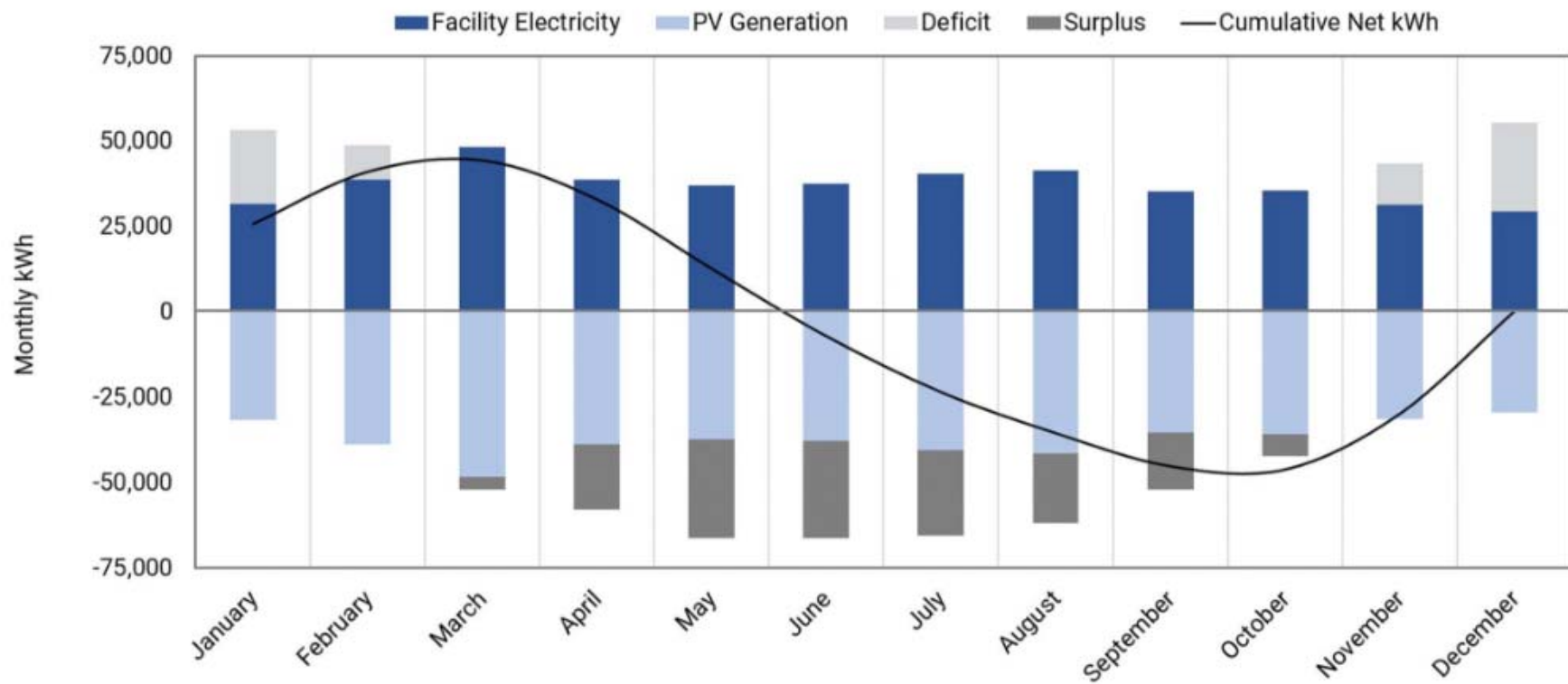


# PV System

- 193° azimuth
- 5° tilt, 6" intrarow spacing
- SunPower Performance3 UPP 475W
- SMA Sunny Tripower Core1 62-US
- PanelClaw clawFR
- 560 kW planned/max available coverage



# Achieving Net Zero Energy



May 25, 2021

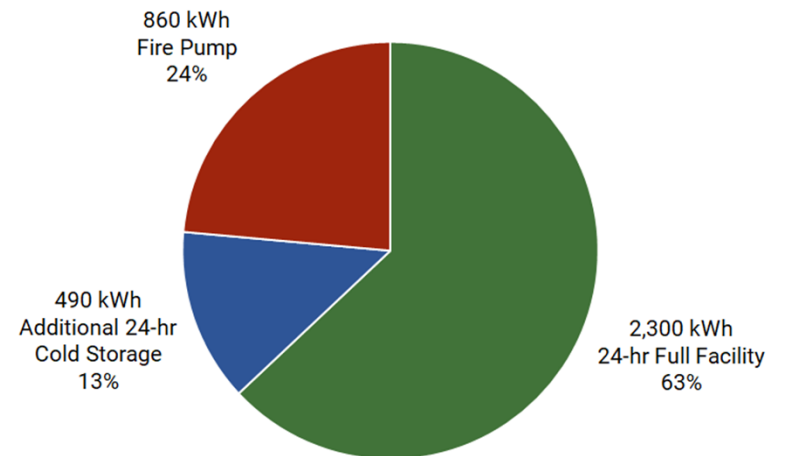
# BATTERY STORAGE SYSTEM

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# The Challenge

- **No on-site fossil fuel generation**
- **Critical Resiliency**
  - Assume Zero Solar Production/Worst Case Scenario
  - Full Facility – 24 Hour Backup
  - Cold Storage – Additional 24-Hour Backup
  - Fire Pump – 8 Hour Runtime
  - 3,650 kWh minimum size system



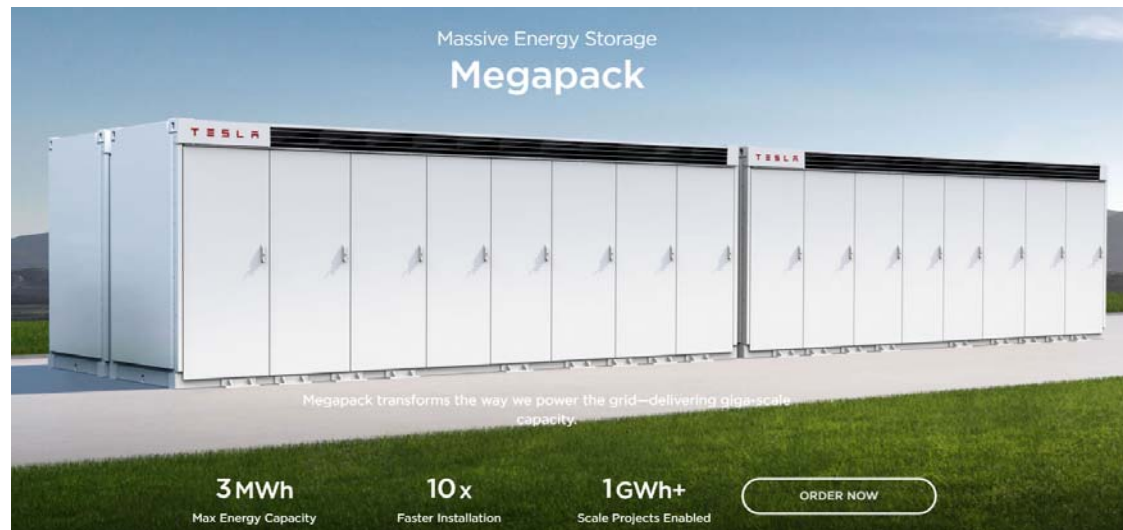
# The Direction – Tesla Megapack

## PROS

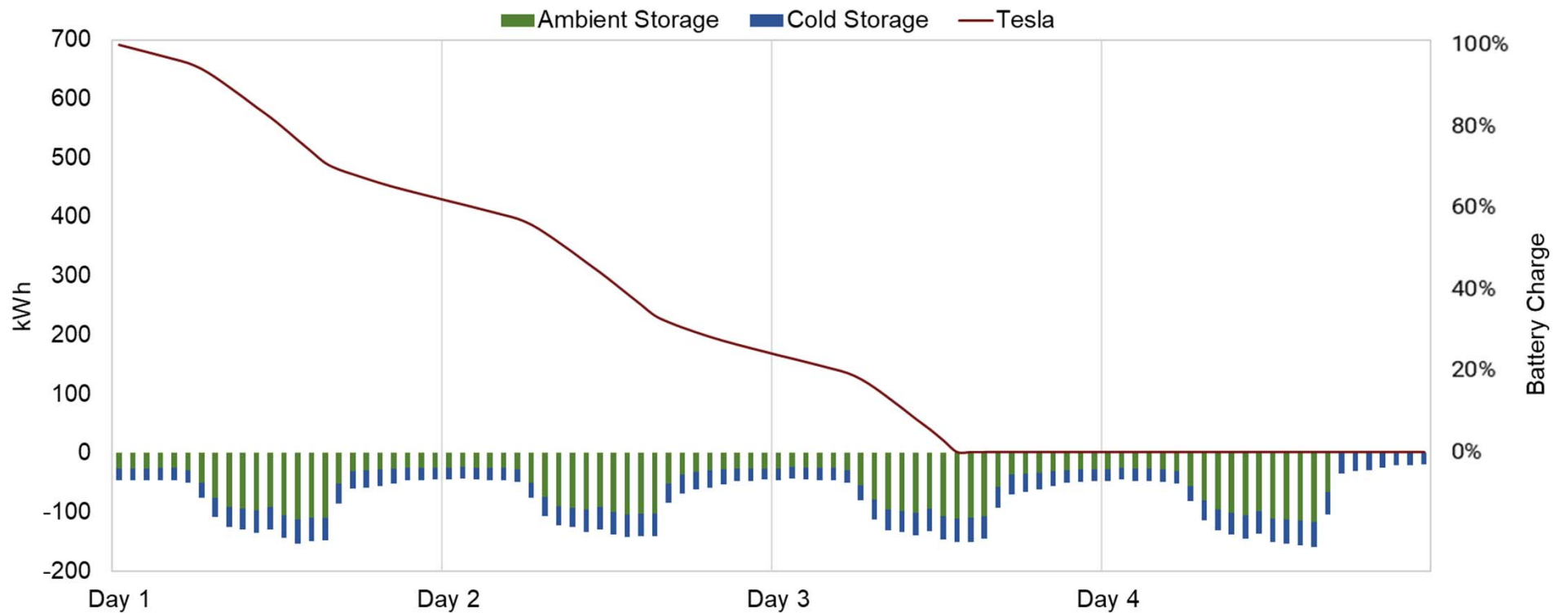
- More storage
- Significant budget savings
- Simplicity in implementation
- Built-in flexibility and redundancy

## CONS

- Significant product demand
- Cutting edge technology/concern from insurance provider
- Global supply chain issues

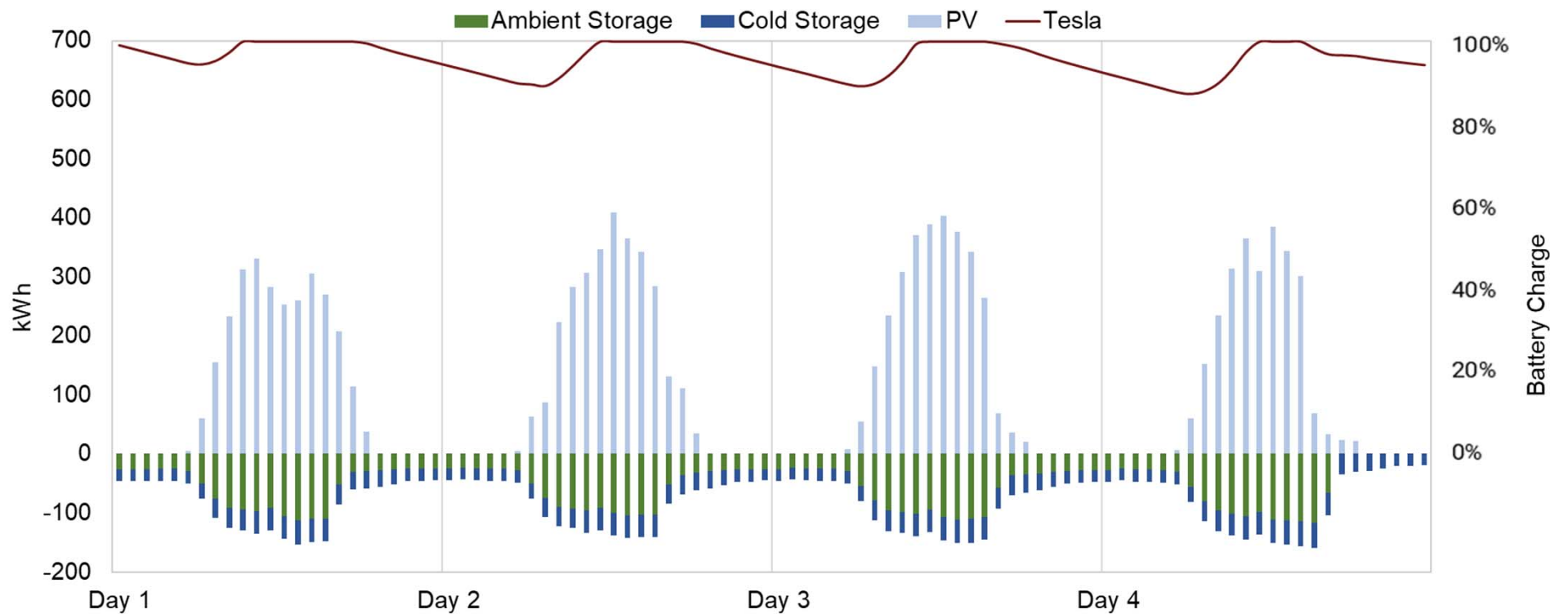


## Worst Case – No PV Recharge



Aug 05, 2021 36

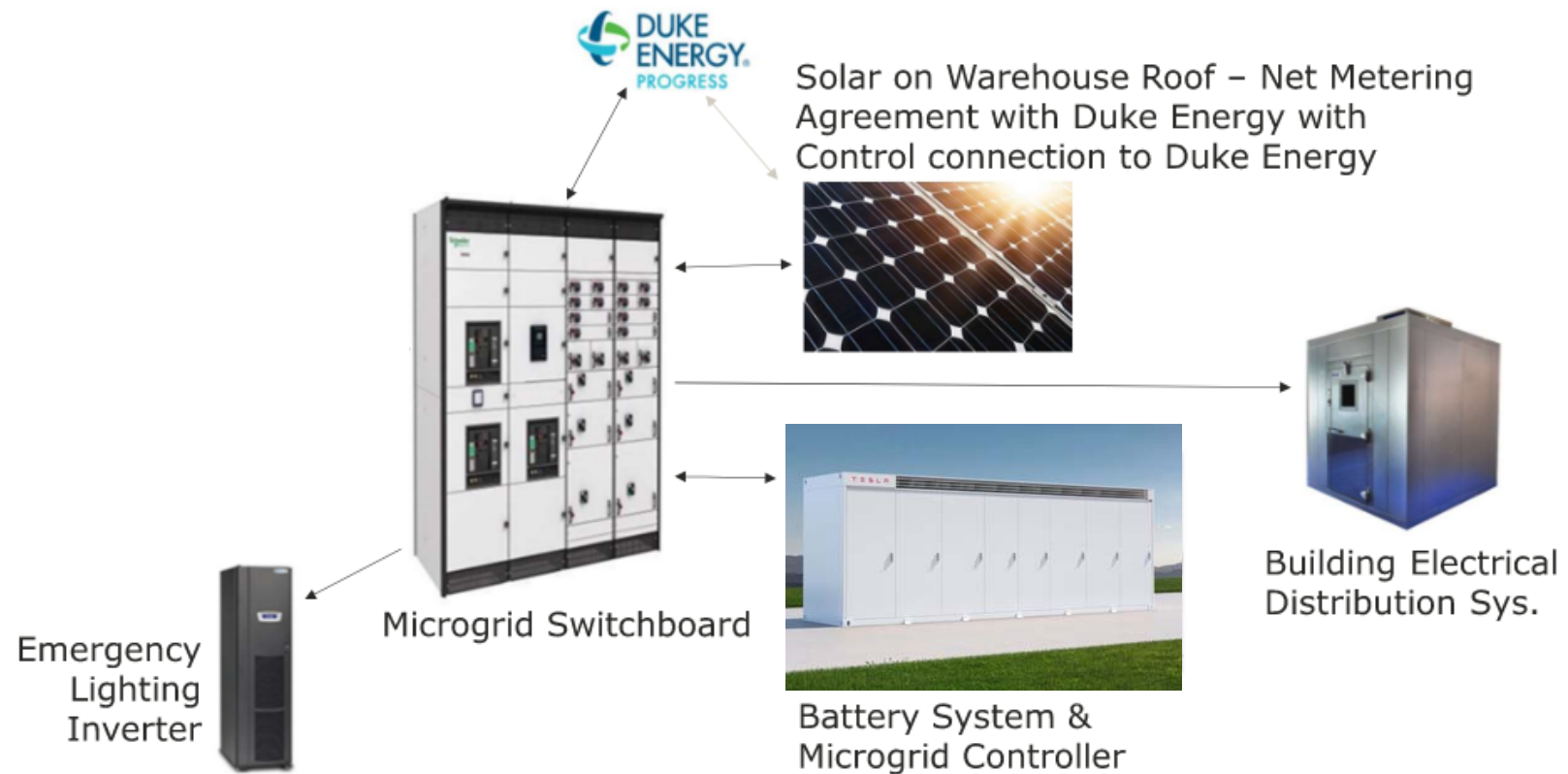
## Average Summer Day (100% PV)



Aug 05, 2021 37

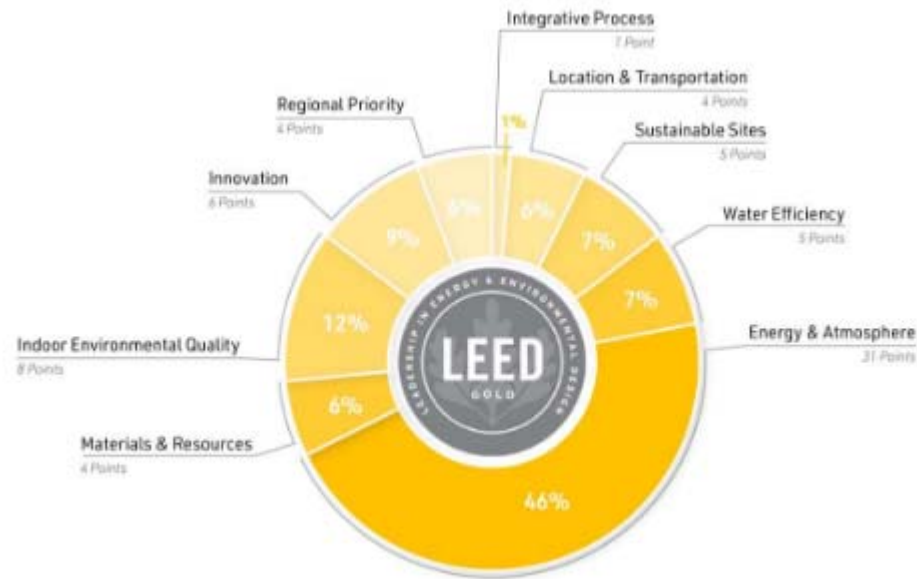


# Microgrid



May 25, 2021

# Project Certifications



May 25, 2021

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# **PROJECT CHALLENGES AND WINS**

# Where We've Been & Where We're Going

- Bleeding Edge Design and Integration
- Battery Storage Fabrication and Schedule
- Booming life science construction market in RTP
- COVID related cost escalations and availability
- Cold storage lead times
- Durham County, FM Global, and Duke Energy approval of battery backup system



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Thank You!



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