Agenda

• Our Mission
• Project Goals and Guidance
• The Building
• NZE Design Overview
• Battery Storage System
• Project Challenges and Wins
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
Top-Down Commitment to Sustainability

Concept
- Identify and establish project goals and objectives for sustainability

Design
- Involvement of design and construction teams
- Align execution

Construction
- Track progress
- Commissioning

Life Cycle
- Educate occupants
- Fine tune systems
- Refine best practices
PROJECT LIGHTYEAR:
GOALS AND GUIDANCE
Defining Our Needs

- Understanding our present
- Planning for the future
- Autonomy/control of process
- Supply chain management
- Risk management
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
Site Plan
Floor Plan
Renderings
Renderings
Project Progress

To be inserted day before.
Sustainable Design Goals

- All-Electric
- Net Zero Energy
- Battery Storage

- Carbon
- Embodied
- ILFI Zero Carbon
- LEED Zero
- LEED BD+C (Gold/Platinum)
- Energy
- Site + Commuting

Connecting Pharmaceutical Knowledge
Zero Energy Design Overview

- Reduced Demand
- Efficient Delivery
- Clean Supply
- Renewable Energy
- R.E. Surplus
- Net Energy Export
- Minimize Capital Cost Investment and Embodied Energy
- NZE
- Invest in Community Power/Microgrid
- Clean Utility
- Passive
- Active
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

- CBECS Refrigerated Warehouse: 84 EUI [kBtu/ft²-yr]
- CBECS Non-Refrigerated Warehouse: 23 EUI [kBtu/ft²-yr]
- 90.1-2013 Baseline: 65 EUI [kBtu/ft²-yr]
- Project Lightyear: 45 EUI [kBtu/ft²-yr]
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
BATTERY STORAGE SYSTEM
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
Average Summer Day (100% PV)
Microgrid

Solar on Warehouse Roof – Net Metering Agreement with Duke Energy with Control connection to Duke Energy

Building Electrical Distribution Sys.

Battery System & Microgrid Controller

Microgrid Switchboard

Emergency Lighting Inverter
Project Certifications

2019 LEED Zero

May 25, 2021
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
Thank You!