



**INTEGRATING A NEW ENERGY
CENTER AT NEW JERSEY'S LARGEST
URBAN HOSPITAL**

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Introduction

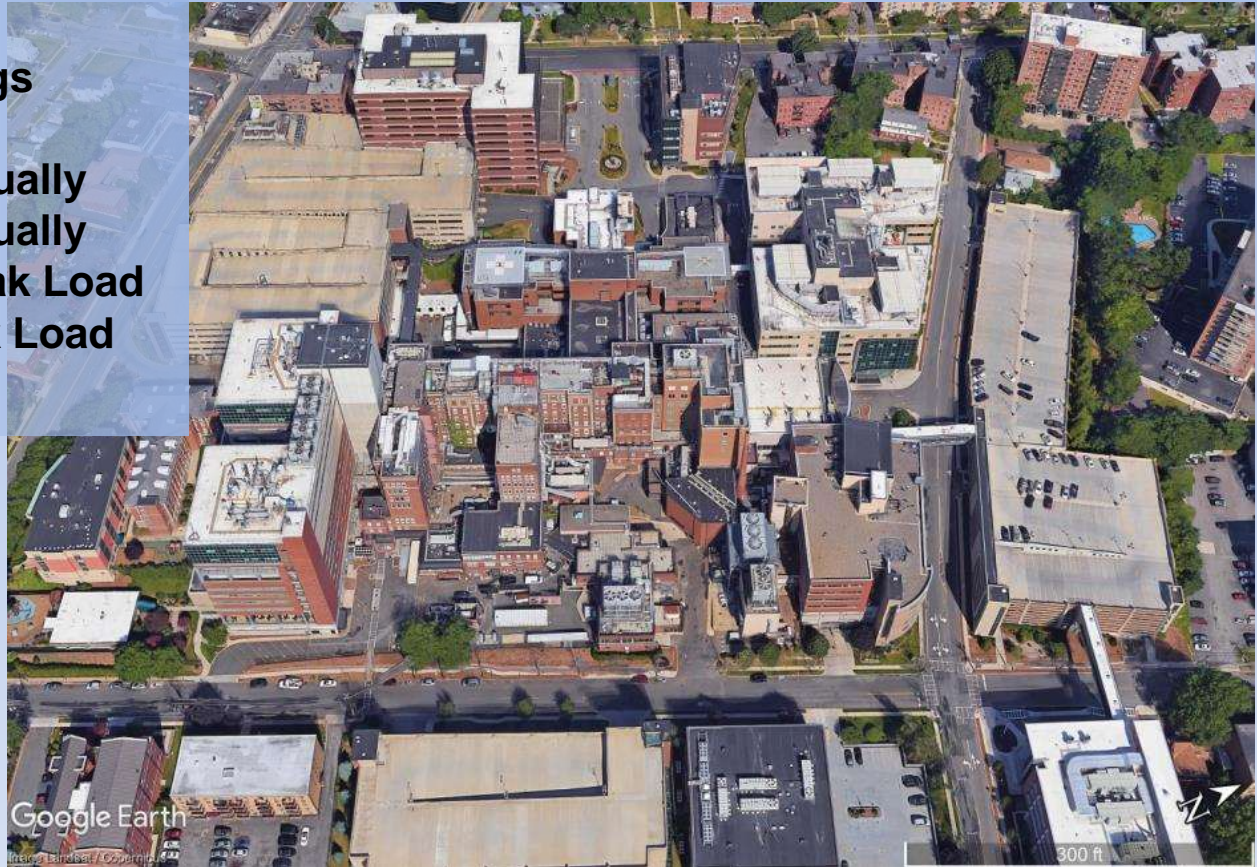
Hackensack Meridian Health - Hackensack University Medical Center

- **775-bed, nonprofit, research and teaching hospital**
- **7 miles (11 km) west of New York City - Bergen County, NJ**
- **Founded in 1888 with 12 beds**
- **Largest Provider of inpatient and outpatient services in New Jersey**
- **#1 hospital in the state, one of the busiest hospitals in the country**
- **70,000 Admissions & 30,000 Surgeries Annually**



Facility Background

- Site Covers over a full block
- ~20 Acres
- ~2.5M SF of Buildings
- 11 MW Electric Load
- 55,000,000 kwh Annually
- 300,000 dth NG Annually
- 6,000 Tons CHW Peak Load
- 65 kpph Steam Peak Load
- 120 AHUs



Problem Statement

New Central Plant/Infrastructure Project

- **Hospital recognized need to facilitate future growth**
- **Highly developed site constrained by neighboring property**
- **Hospital has decided to consolidate aging and undersized infrastructure from the center of campus to lower value perimeter property**
- **Only space left for future development is location of previous on-site laundry, main electrical service, (3) CHW Plants and Boiler Plant**
- **Most functional location for building to connect to existing hospital is the current site for extensive existing utilities (heart of campus utilities)**
 - Main Electrical Service & Distribution
 - Boiler plant (Equipment at end of useful life, not sufficient to meet Master Plan firm capacity requirement. Master Plan building footprint creates stranded equipment)
 - Chiller plant (100% of Chiller/Cooling Tower Capacity)

Campus Master Plan

AREA IDENTIFIED FOR
FUTURE EXPANSION

Existing Infrastructure Challenges



Site Challenges

Interruption to all Major Utilities (Electricity, CHW, Steam)

- **Phased CHW Plant – (2) New Chillers Commissioned First, (4) Relocated Chillers moved over Seasonally**
- **Provisions to operate New and Existing Boiler Plants in Parallel**
- **Phased Electrical Transition from Existing to New Switchgear with ATS used for critical load switchover**

Acoustic Considerations

- **Cooling Tower on Roof – Field Erected vs. Shop Fabricated**
- **6.0 MW of Diesel Emergency Generator – Air Cooled**
- **HVAC – Louvered Openings for Ventilation Cooling**

Grade of Existing Site Changes 50'

Project Broken into Initial/Enabling Phase and CUP Phase

Existing Main Electric Service

- (2) Utility Feeders at 26 kV
- Relocation of 26kV Service Gear, (2) Service Transformers, 13.2 kV Distribution Gear
- Existing Service Transformers at 90% Load – no additional capacity
- Refeed all (12) Existing 13.2 kV Distribution Circuits
- Existing Ductbanks relocated to permit future footing location flexibility (50' Elevation Change between Second St and Prospect Ave)



Relocated Main Electric Service

- Service Transformer Size Increased for Future Load
- Refeed all (12) 13.2 kV Distribution Circuits & Redundant Feeds to New CUP



Existing Boiler Plant

- (5) Existing Dual Fuel Boilers – 15 to 55 years old
- 55 year old Water Tube Boilers stranded by new equipment
- Boilers and Fuel Oil Tanks in way of Master Plan Development
- 70,000 lb/hr Firm Capacity
- 65,000 lb/hr Peak Load
- Two Existing Steam Headers
- 9 Existing Users/Main Distribution Feeds
- Steam Header Pressure reset and Steam Trap Replacement Program in place by Hospital



Existing Chiller Plant

- 6,600 Ton Firm W/C Capacity
- (7) W/C Chillers on (4) different Cond. Water Systems
- (6) Remote A/C Chillers connected to Central Plant
- Variable Secondary CHW Pumping (Bypassed Primary Pumps)
- Building-Level Flow Meters

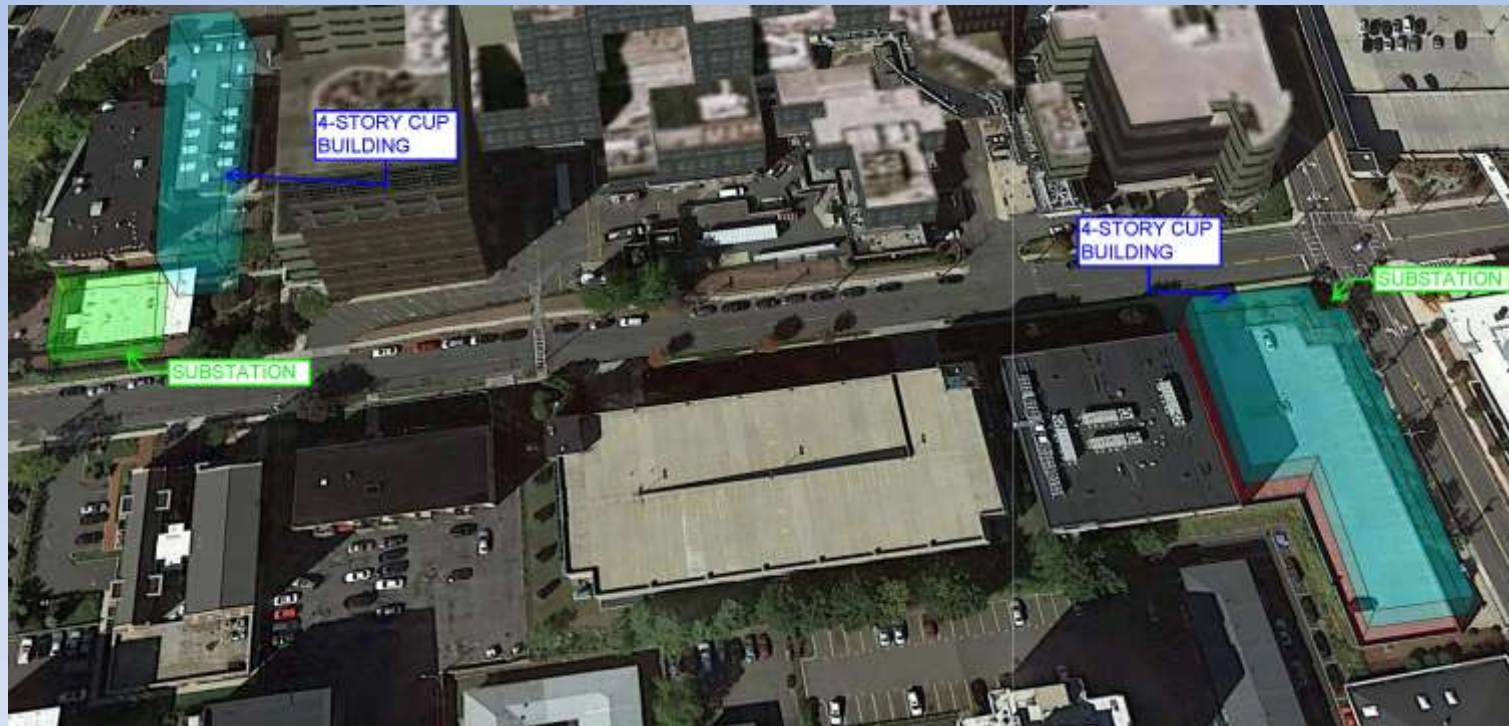


HUMC Ideal Objectives

- Capacity for current and future forecasted growth
- New industrial equipment with 20+ year lifespan
- Minimize hospital interruption
- High efficiency lowest operating cost
- Highest degree of resiliency
- Improve maintenance access and replacement
- Consolidate utilities for efficient operation
- PEER certification (target LEED Silver+ on future growth)

Future CUP – Site Evaluation

- Proximity to Existing Distribution Infrastructure – Electric and Thermal
- Least impact to Future Development/Master Plan



Future CUP – Selected Site

Location Considerations:

- Consolidation of all CHW & Steam Production
- 3 x 2 MW Emergency Generators & Provisions to connect (2) 2 MW Rental Generators
- Proximity to Existing Thermal Distribution Systems
- Sound Attenuation
- Adjacent Sloping Grade – Truck Access to both Ground Floor & First Floor



Future Central Utility Plant



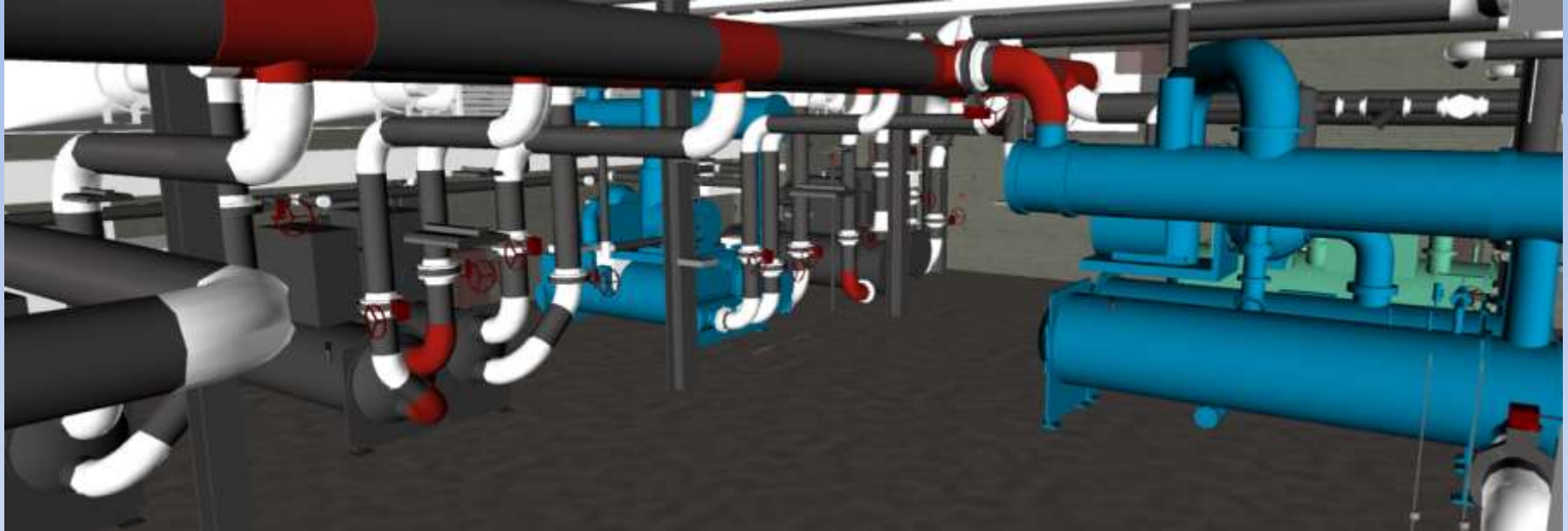
***Rendering Courtesy RSC Architects &
EYP**

Future Boiler Plant

- **(3) New Dual Fuel Water Tube Boilers: 120,000 lb/hr Firm Capacity**
- **Phasing – Operation of New Boiler Plant with Existing in Parallel**
- **Header Pressure Reset and Variable Speed Feedwater Pumps**



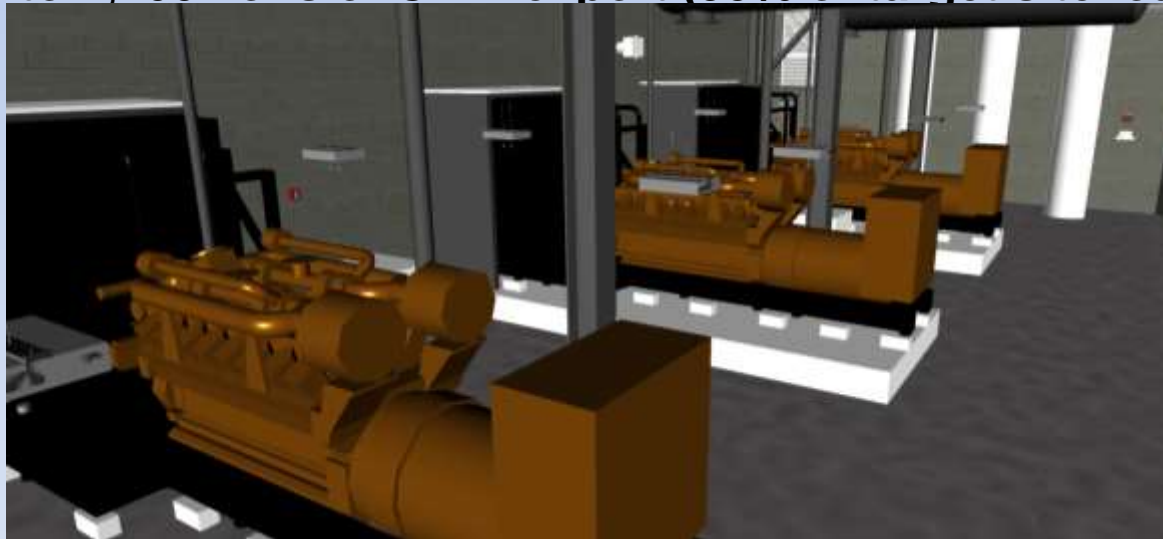
Future Chiller Plant



- **(6) Water Cooled Chillers: 8,800 Ton Firm Capacity**
- **Phasing – Relocated Steam Chiller and (2) New Chillers Installed First**
- **(3) Relocated 1500 Ton Electric/VFD Chillers Installed Subsequently**
- **Variable Primary with Key Variable Secondary Pumps for Remote/High dP Loads**
- **Adaptive Non-Proprietary Optimization Algorithms**

Emergency Generators

- **N+1 Future Growth and CUP Critical Loads**
 - Nominal Plant Steam Output & 4,400 Tons of Steam Turbine Driven Chiller
 - Backup 1500 Ton electric chiller within IEEE limits
 - High percentage of non-essential loads on backup power between permanent & rental gensets
- **Redundant Emergency Feed provisions for Future Growth**
- **Includes Temporary connections for rental generators (4 MW Capacity)**
- **Allows up to 7,400 Tons of CHW export (93% of target site load)**



Lessons Learned & Key Features

Integration of Program Manager, Construction Management and Engineer Early

- **Pull Planning/IPD in Parallel with Conceptual Engineering**
- **Initial OPCC was within 4% of IFC Document Cost Estimate**
- **Owner involved in several Charrettes to develop goals and key features**
 - **Rental Gensets**
 - **Hybrid CHW Plant**
- **Equipment Early Purchase**
- **Provisions for Equipment PLC Screens Read/Write Access from Control Room**
- **\$100M in construction within 18 months**
- **40% of project value was Enabling Phases to prepare the site for location of future use**
- **Initial PEER Screening for certification in collaboration with USGBC/Peer staff for new certification. Plant attributes offer a high degree of resiliency during a utility outage**

QUESTIONS?



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