Supporting A Fast Track Mission-Critical Campus Healthcare Expansion

JUAN M. ONTIVEROS, P.E.

AVP – UTILITIES, ENERGY AND FACILITIES MANAGEMENT

INTERNATIONAL DISTRICT ENERGY ASSOCIATION

ASHRAE

EBC Energy in Buildings and Communities Programme

U.S. DEPARTMENT OF ENERGY

New Campus Master Plan

5.5 million SF Completed June 2012

New Medical School

Master Plan Completed April 2013

Phase 1
1 million square feet

Table 2a. **Dell Medical School Program**

PROGRAM ELEMENT	GSF
Education and Administration Building	75,000
Research Building and Vivarium	240,000
MOB Phase 1	200,000
Parking Structure (1,000 spaces)	325,000
Intra-Professional Education (IPE)*	+/- 50,000

*Not included in Phase 1 planning budget.

Table 2b. **Teaching Hospital and MOB Program**

PROGRAM ELEMENT	GSF
Hospital (220 beds)	480,000

Phase 2 - 1,200,000 square feet in 5 to 10 years

Methodology

Develop Utility Master Plan in 3 months

- Used building type & actual metered energy use per GSF for existing campus buildings
  - Estimate annual & peak energy& water needs
    - Determine plant total capacity & rate impact
  - Used Termis chilled water and steam model
    - Size and plan distribution system
- Include build out of 2.2 million SF for Phase 2&3
- Include 1 million more new square feet on the campus

Over Arching Objectives

- New chilling station
  - Capacity & efficiency enough to prevent negative impact to campus
  - Expandable to address subsequent phases of district
  - Continue philosophy of loops & redundant service
- What is impact of other new space?
- Avoid power plant expansion
- Avoid conflict between Peak Steam and Peak Power

Projected Loads

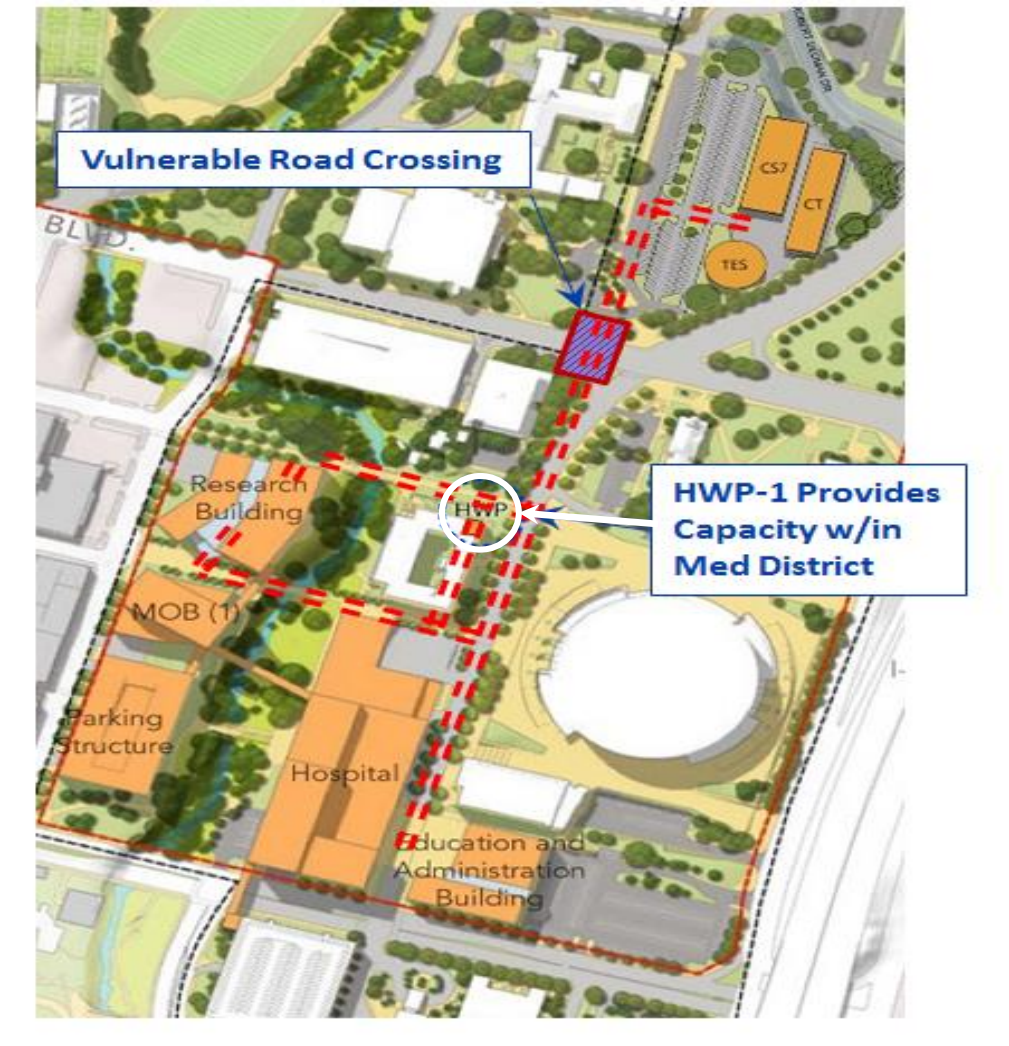
- Main Campus Load Growth
  - 6,000 Tons
- Phase I
  - Dell Medical School;
    - 7,000 Tons, 6 MW, 30,000 lbs/hr
- Hospital
  - 1,700 Tons, 30,000 lbs/hr
- Phase II- Medical School
  - 5,100 Tons, 4MW, 25,000 lbs/hr

Capacity

- Chilled Water System
  - 15,000 tons chilled water
    - 6 -2,500 ton chillers
    - 5° F approach cooling tower
    - Expandable to 20k tons
  - 5.5 million gallon TES
    - Stratified Water
    - Dedicated pumping
    - More than 5 MW load shifting capacity

Capacity

- Chilled Water
  - Proven Existing System
  - Tunnel + Direct Buried
  - Station Redundancy
- Heating Water
  - New System
  - Fuel Diversity
  - Geographic Diversity
- Single Points of Failure
  - N+1 pumps and tower cells
  - Looped Piping
  - Main tie main switchgear



Resiliency

- Multiple Water Sources
  - Recovered
  - Reclaimed
  - Irrigation
  - Domestic
- O&M Considerations
  - Bridge crane and monorails
  - Standardize components
  - Catwalks
- PLC Control Systems
  - Programming for failure

Efficiency

- Water
  - Recovered Water System
  - Heat Pump Chiller
    - 17,000,000 gal/year + Chemicals
- Gas
  - Heat Pump Chillers
    - $287,000/ year
- Electricity
  - Optimization
    - Maintain the "Sweet Spot"
    - Pumping in harmony
  - Up to 25,000,000 kWh/year savings vs. conventional plant

SUMMARY
CS7 / TES-2 BENEFITS

- Lower campus annual kW/ton
  - 4 years at .64 kW/ton annual average
  - New plant expected at .55 KW/ton
- Offset 6 MW of peak demand
  - Avoids additional CHP capacity need
- Improves campus hydraulics
- Off-loads plants in need of renewal
- Room for expansion
  - 5,000 tons more
  - 1,800 tons / 30 MMBtu with HPC's
  - 12 MMBtu via boiler