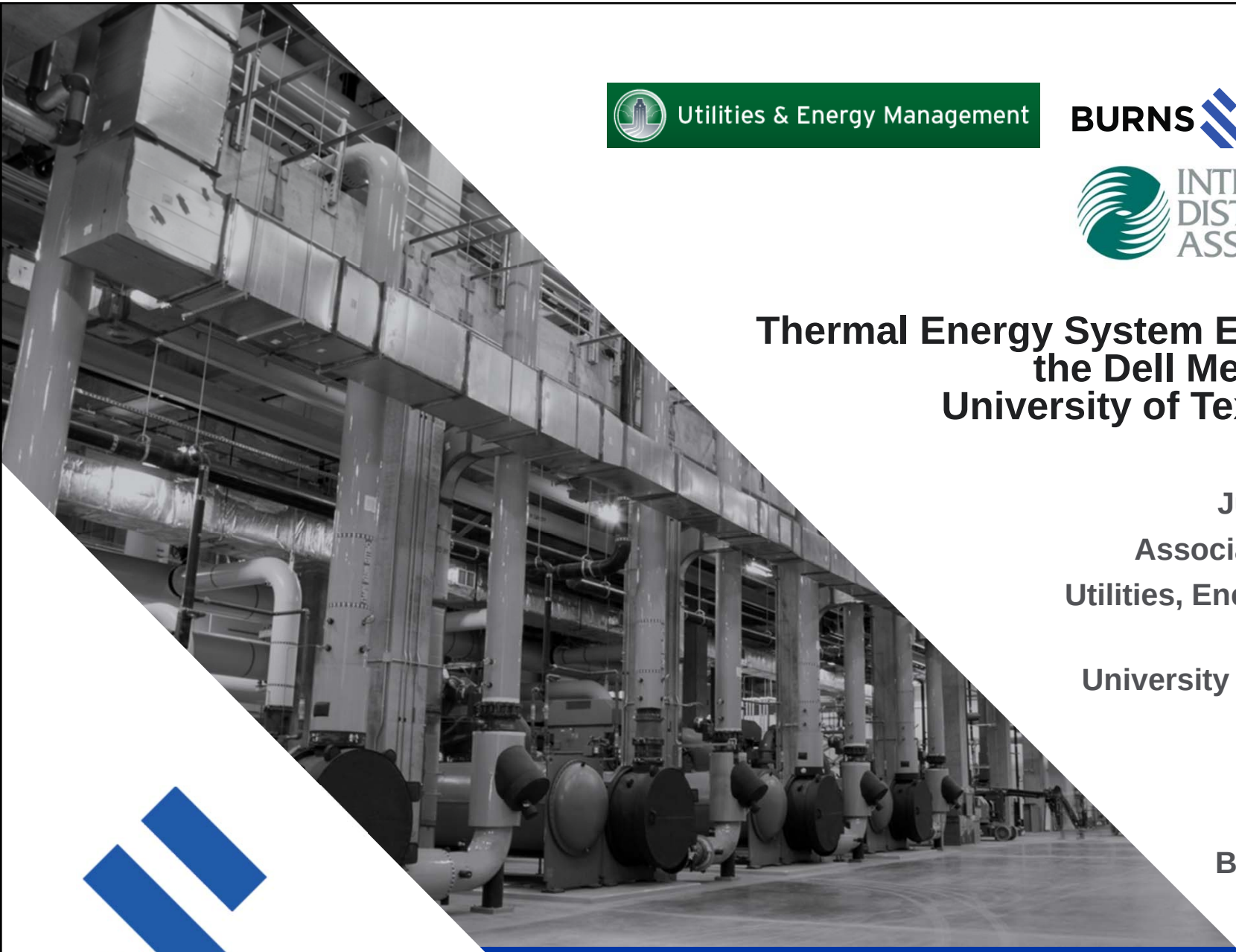

Utilities & Energy Management

BURNS McDONNELL

INTERNATIONAL DISTRICT ENERGY ASSOCIATION

Thermal Energy System Expansion for the Dell Medical District University of Texas at Austin

Juan Ontiveros, PE
Associate Vice President
Utilities, Energy and Facilities Management
University of Texas at Austin

Jeff Easton, PE
Project Manager
Burns & McDonnell

CAMPUSENERGY2015

Agenda

- UT Austin Campus and Utility System
- Dell Medical School Program
- Challenges & Approach
-
- Background / Pre-Programming
- Site / Organization
- Planning / O&M
- Design / Context
- Capacity / Distribution
- Reliability / Resiliency
- Efficiency
- Closing Remarks
- Questions

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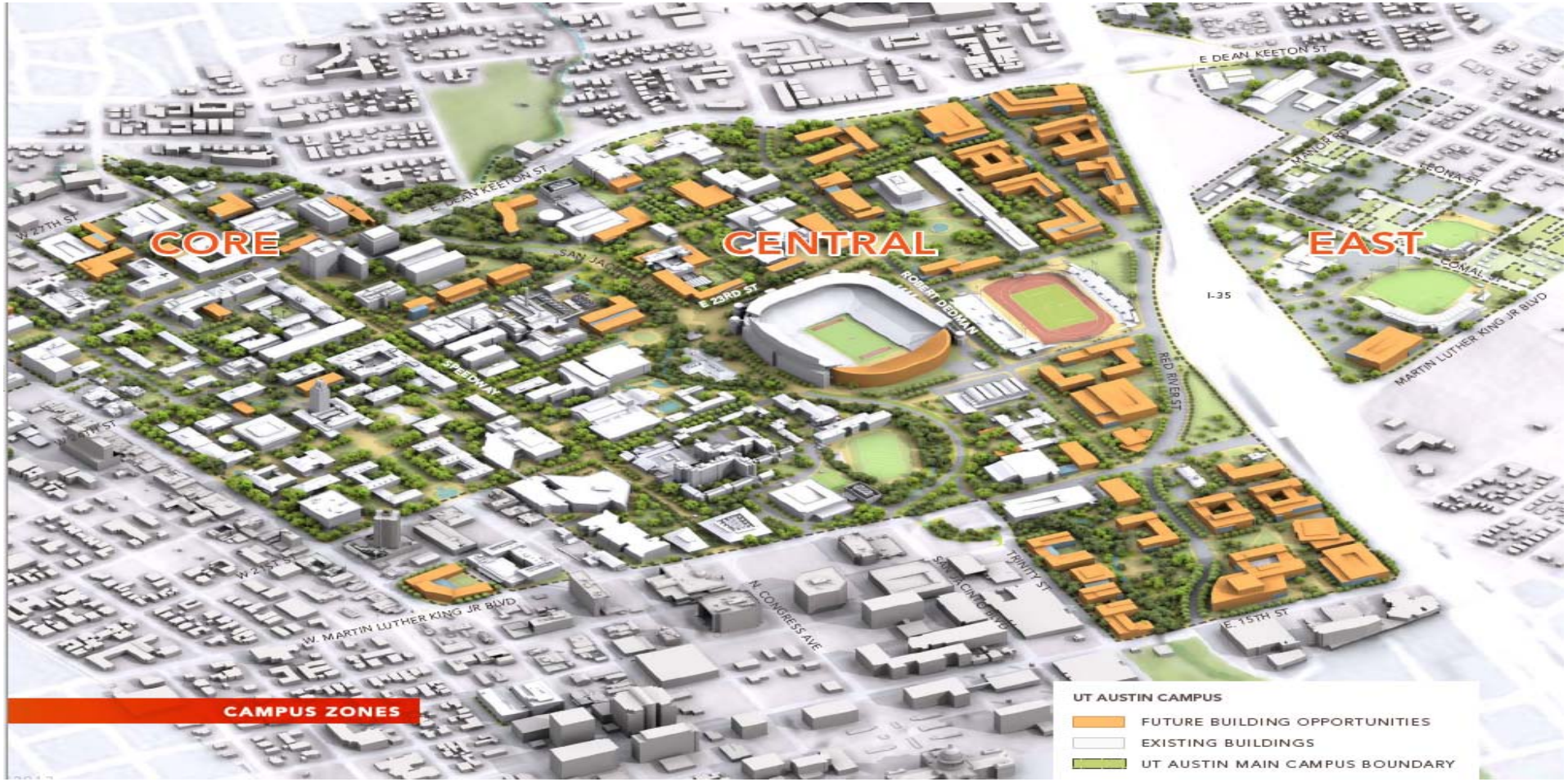
Background

To Describe How UT:

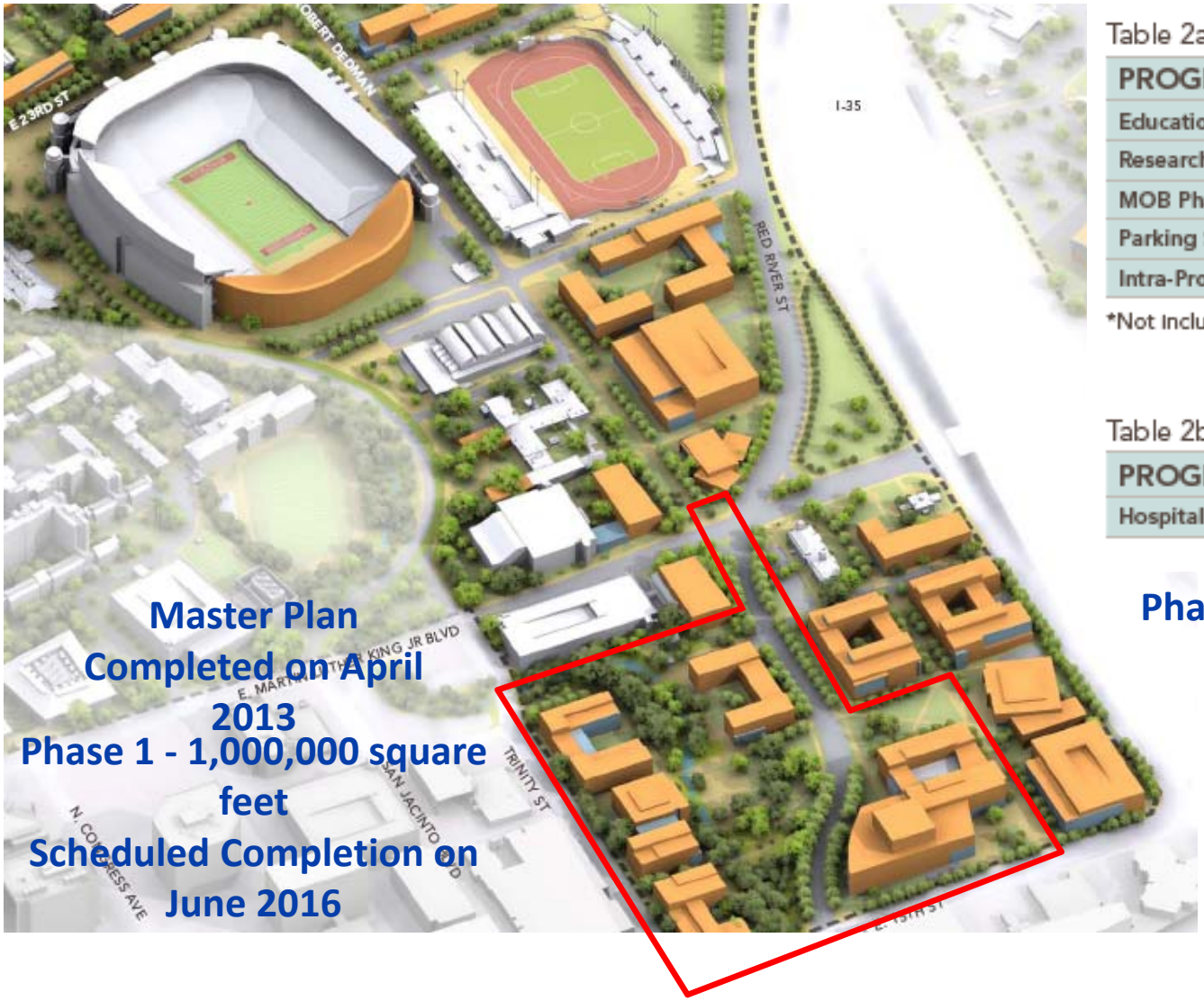
- "Fast-Tracked" a Utility Master Plan
- Used "Real Time" modeling to plan

New Campus Master Plan

- 5.5 million SF Completed Jun 2012



New Medical School



Master Plan Completed on April 2013

Phase 1 - 1,000,000 square feet

Scheduled Completion on June 2016

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 for new space
  - Using projected building type & actual energy use/GSF for existing campus buildings.
    - Estimate peak electrical, steam and chilled water needs
  - Factor in eventual build out of 2.2 million SF for Phase 2&3
  - Factor in additional 1 million new square feet in new Engineering Build and Graduate School of Business.

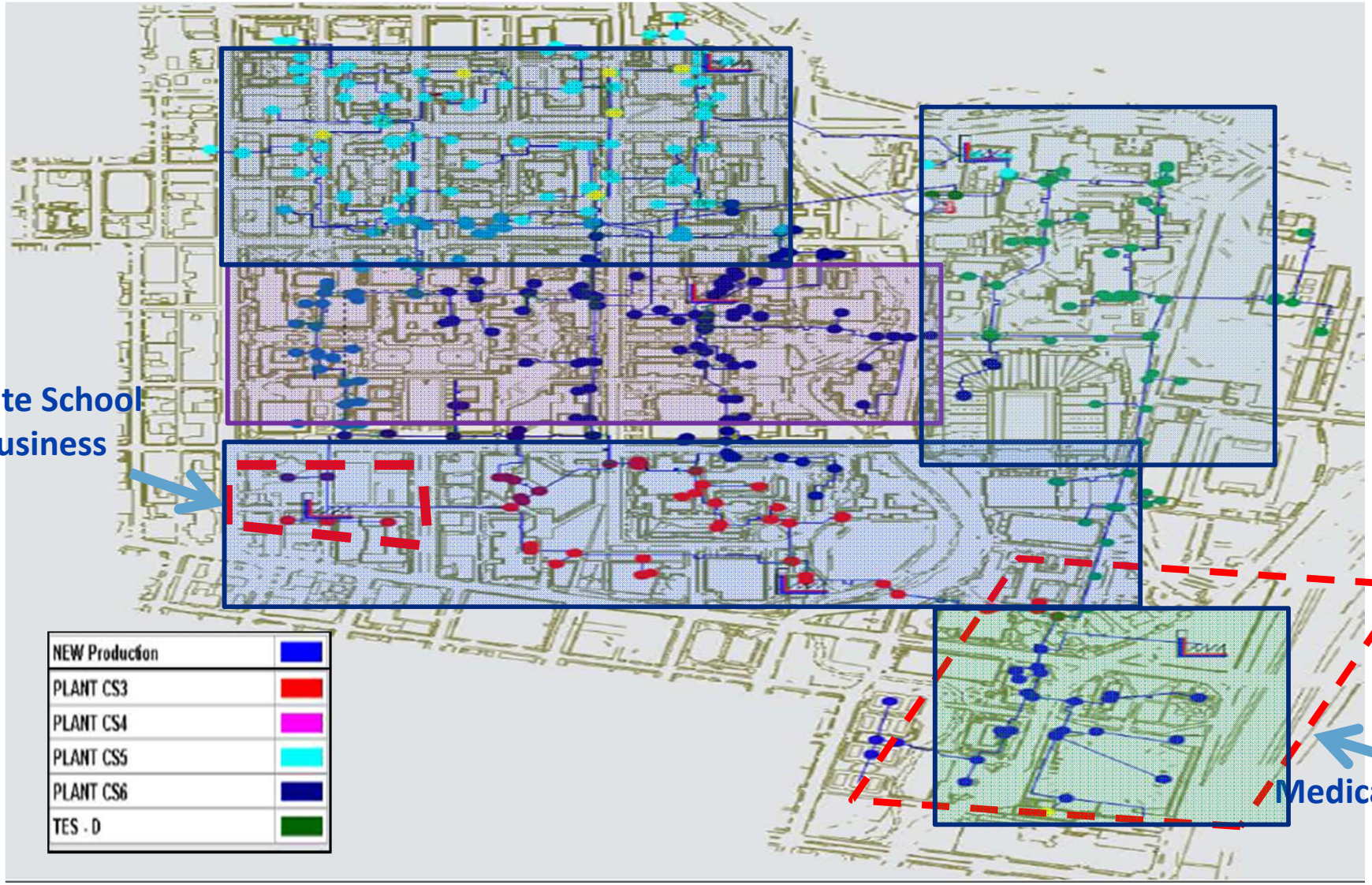
Projected Loads

- 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

Over Arching Objectives

- New chilling station
  - Capacity & efficiency enough to prevent negative impact to campus
  - Expandable to address subsequent phases of distract
- What is impact of other new space?
- Prevent power plant expansion
- Prevent a conflict between Peak Steam and Peak Power

Chilled Water Model at Peak Conditions



Final Steps

- Develop estimates of cost for plants, TES and distribution piping
- Stand –Alone vs Centralized Analysis

Stand-Alone vs Centralized

	New GSF	District Cooling	Decentralized Air-Cooled	Decentralized Water-Cooled
UT Research	280,000	$4,986,942	$4,980,756	$5,397,709
MOB	235,500	$4,194,374	$4,189,172	$4,539,859
Parking Garage	0	$0	$0	$0
Hospital	515,000	$9,172,410	$9,161,033	$9,927,929
School of Medicine	191,700	$3,414,274	$3,410,039	$3,695,503
Total	1,222,200	**$21,768,000**	**$21,741,000**	**$23,561,000**
NPV (30 Yrs)		**$40,259,000**	**$55,770,000**	**$51,764,000**

Site / Context

Site / Context

Site Planning / Organization

Context

Context

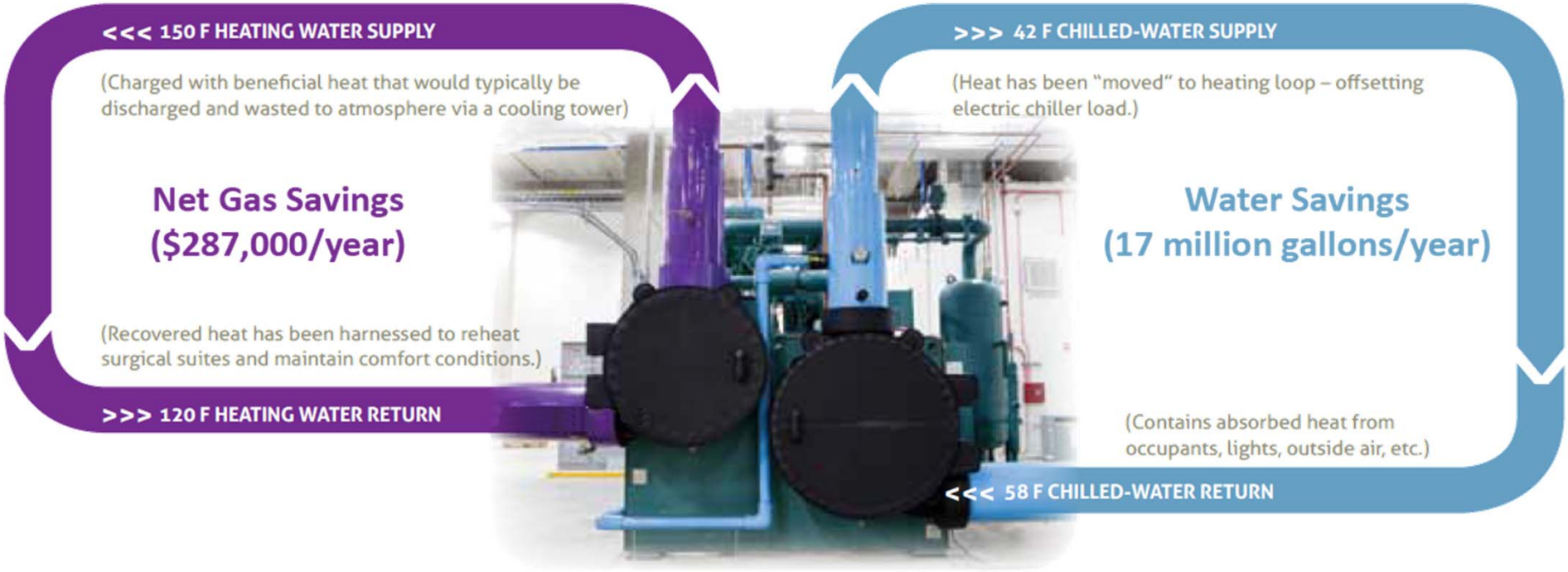
Conceptual Design

Capacity

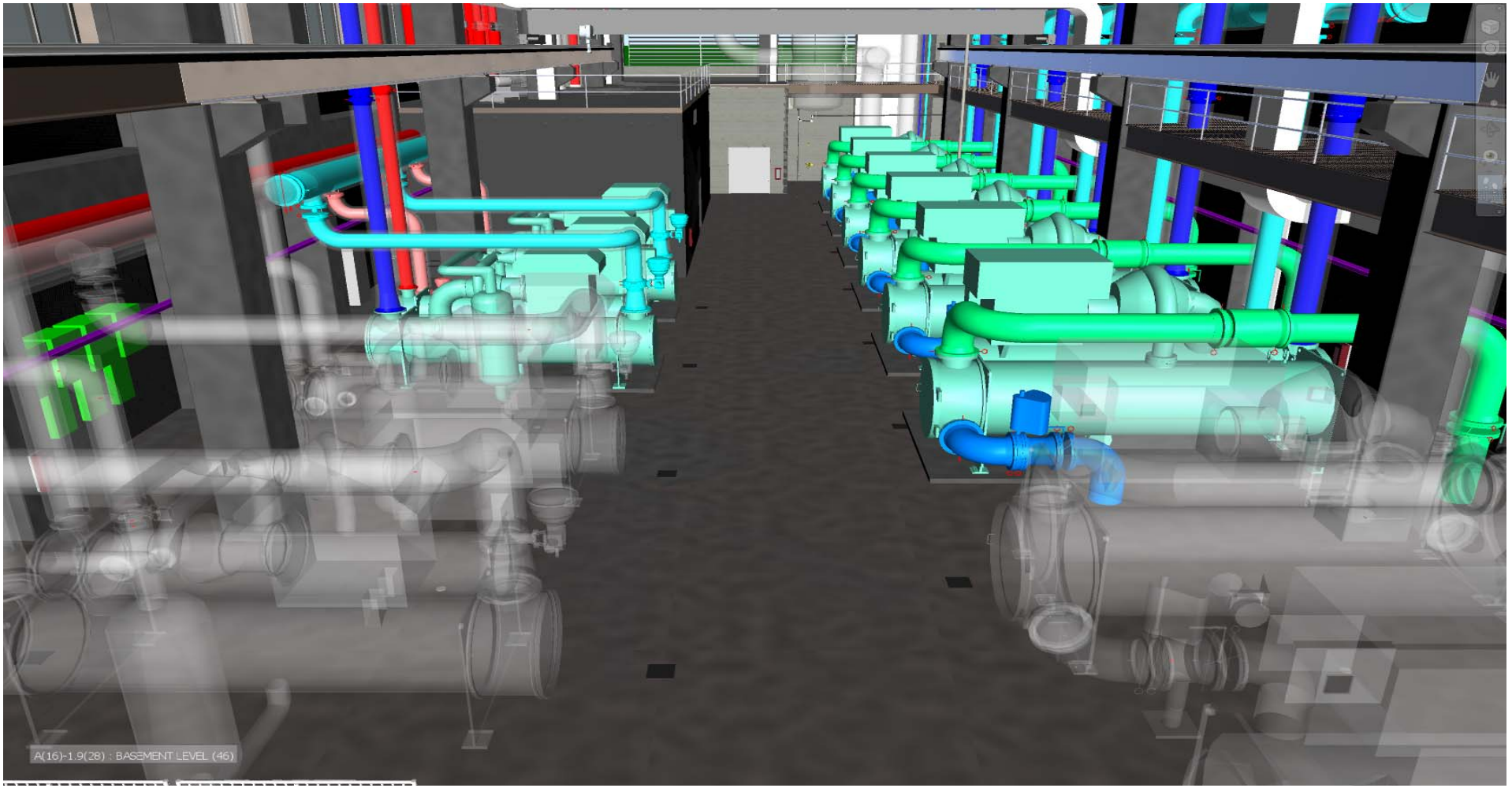
- Chilled Water System
  - 15,000 tons chilled water
    - 2,500 ton chiller
    - 5 F approach cooling tower
    - Expandable to 20k tons
  - 5.5 million gallon TES
    - Stratified Water
    - Dedicated pumping
    - More than 5 MW load shifting capacity

Capacity

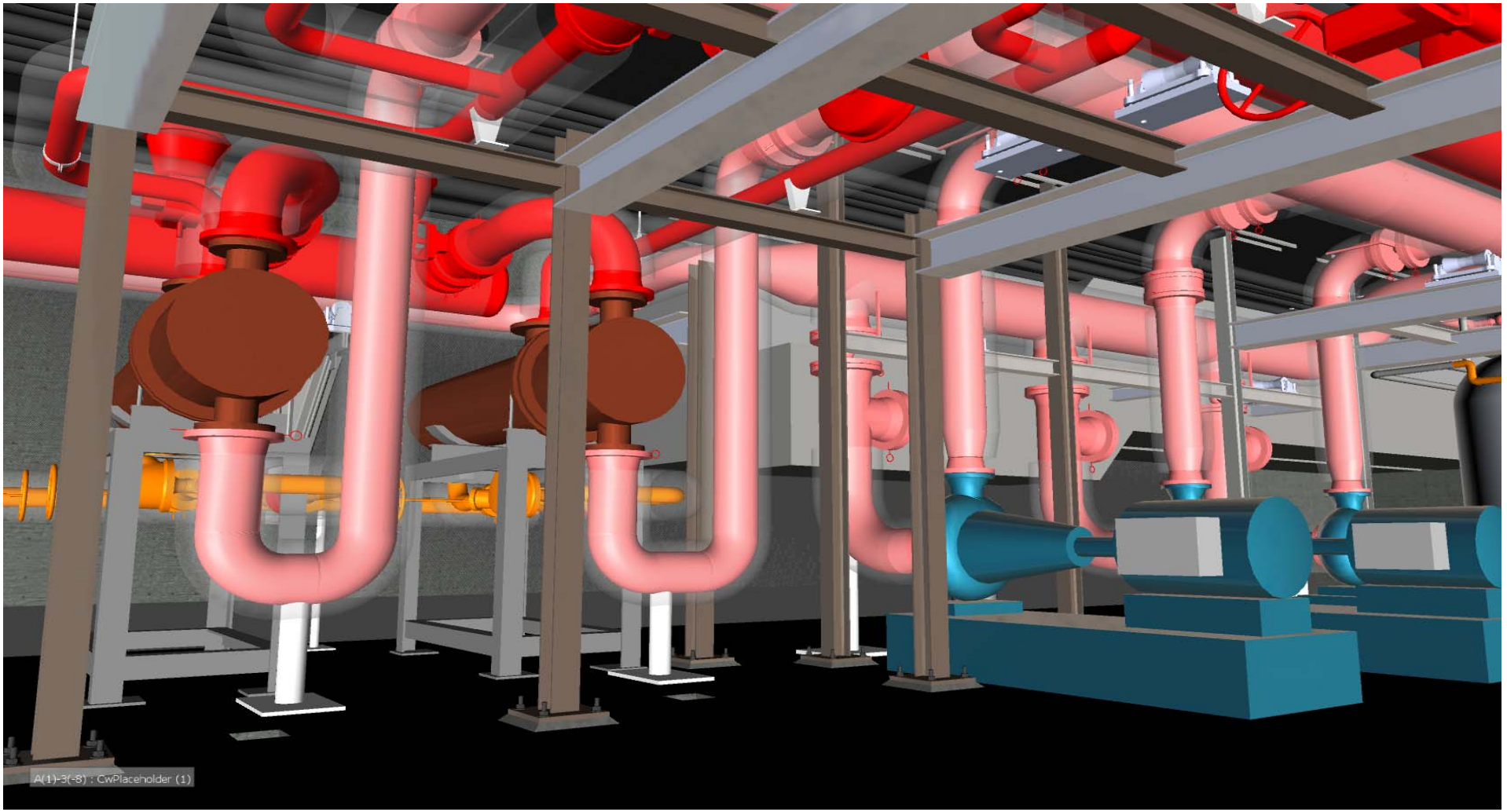
- Heating Hot Water Systems
  - CS-7: 53,000 MBH
    - Heat pump chillers
    - Watertube boilers
  - HWP-1: 40,000 MBH
    - Steam to hot water exchangers



Capacity

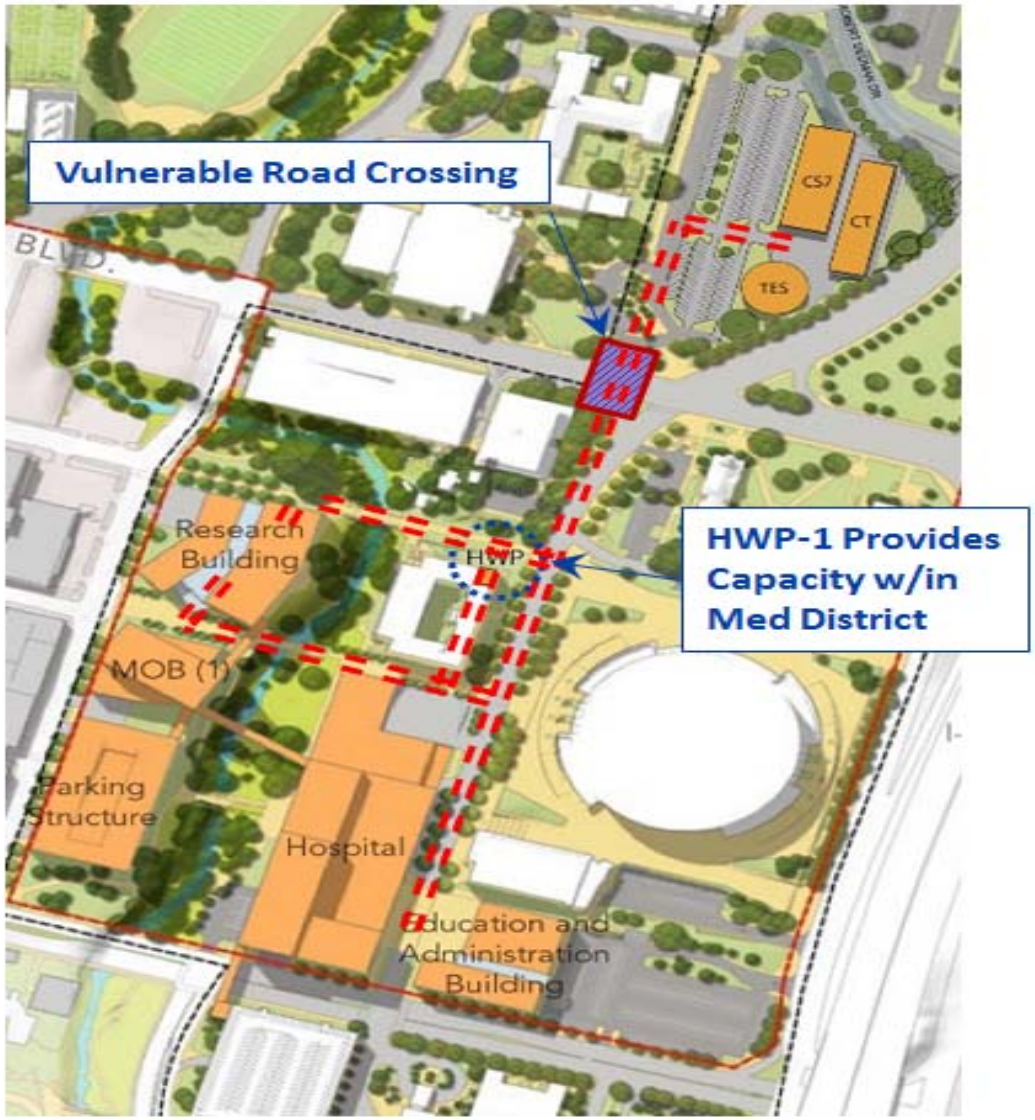


Capacity



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



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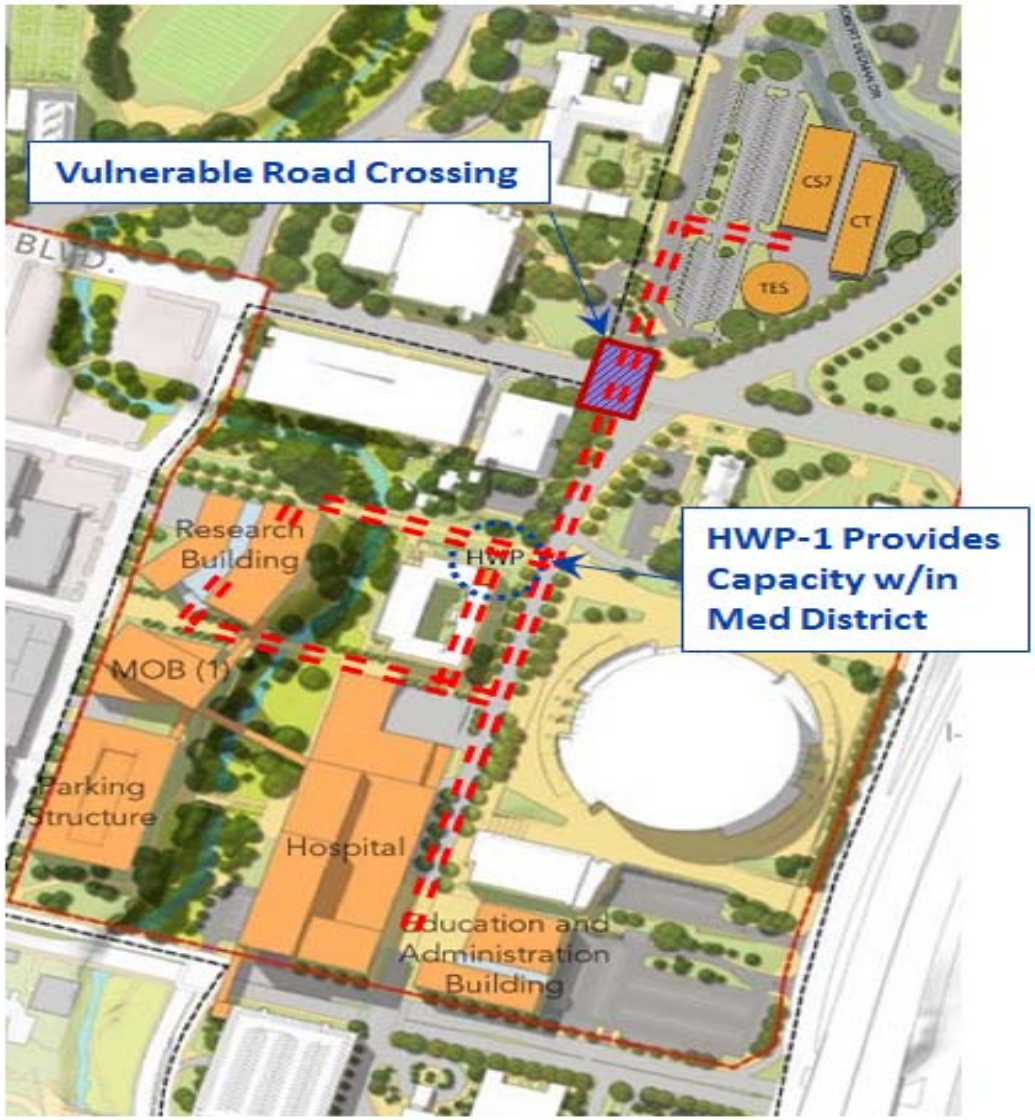
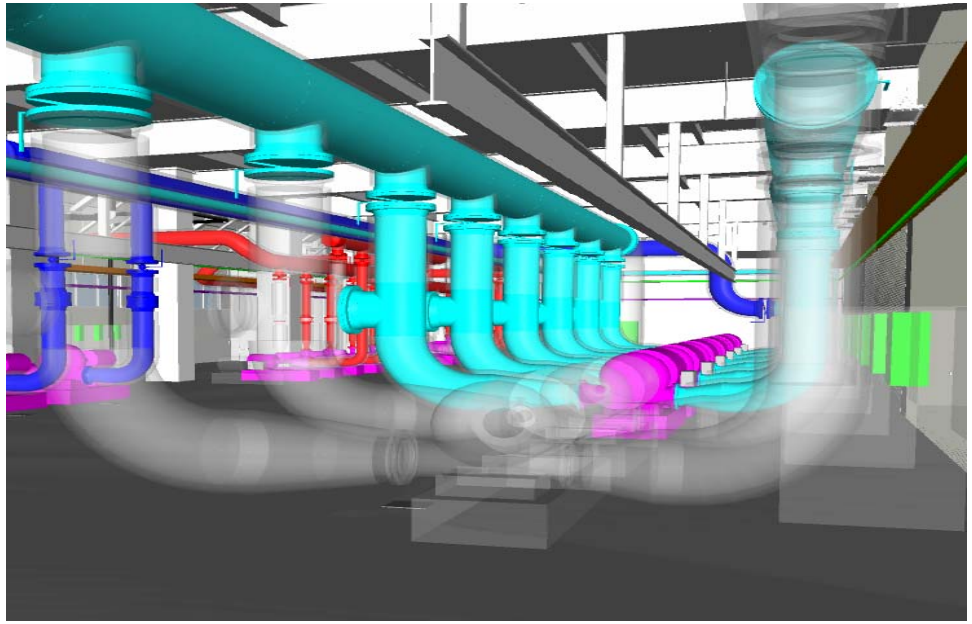
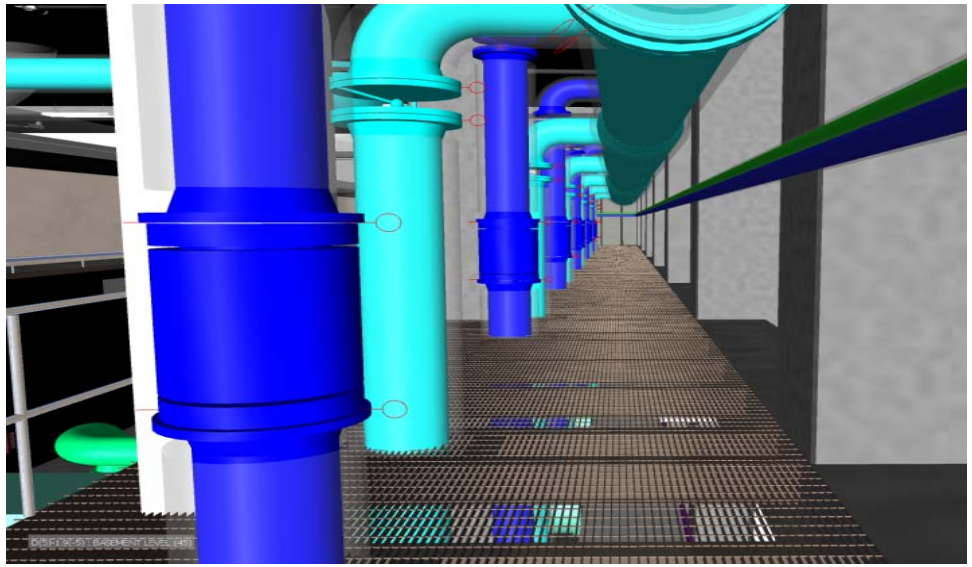


Resiliency

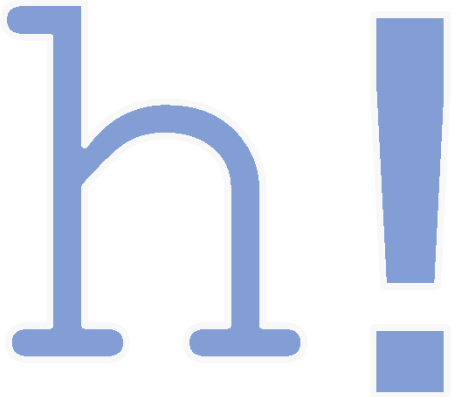
- Multiple Water Sources
  - Recovered
  - Reclaimed
  - Irrigation
  - Domestic
- O&M Considerations
  - Bridge crane and monorails
  - Commonality of components
  - Catwalks
- PLC Control Systems
  - Programming for failure





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



Current Status & Next Steps

- Construction started:

  12/01/2014

- HW service for dry-in:

  June 2015

- Anticipated Completion:

  May 2016

Questions?

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