



*Managing Metamorphosis,
Building for Change*



Session: 100205

Date: Thursday, October 2, 2014

Time: 10:00 am – 11:00 am





*Managing Metamorphosis,
Building for Change*

***Serving a New
Medical District
The Utility Plant
Challenge***

Presented by:



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Principal
Stantec**





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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



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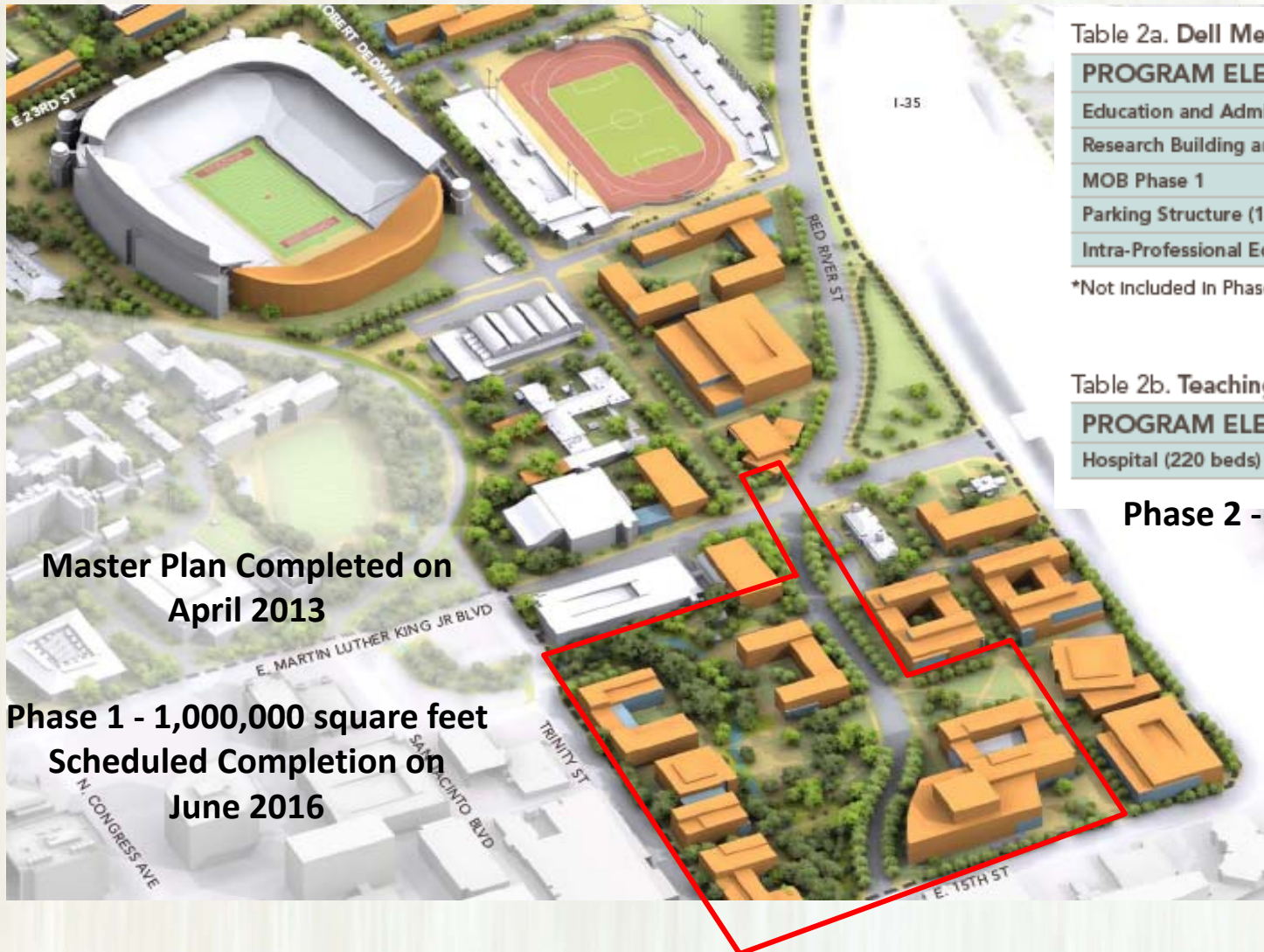
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New Campus Master Plan

5.5 million new SF Completed June 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**



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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 Building and Graduate School of Business



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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, 4 MW, 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 district
- **What is impact of other new space?**
- **Prevent power plant expansion**
- **Prevent a conflict between Peak Steam and Peak Power**



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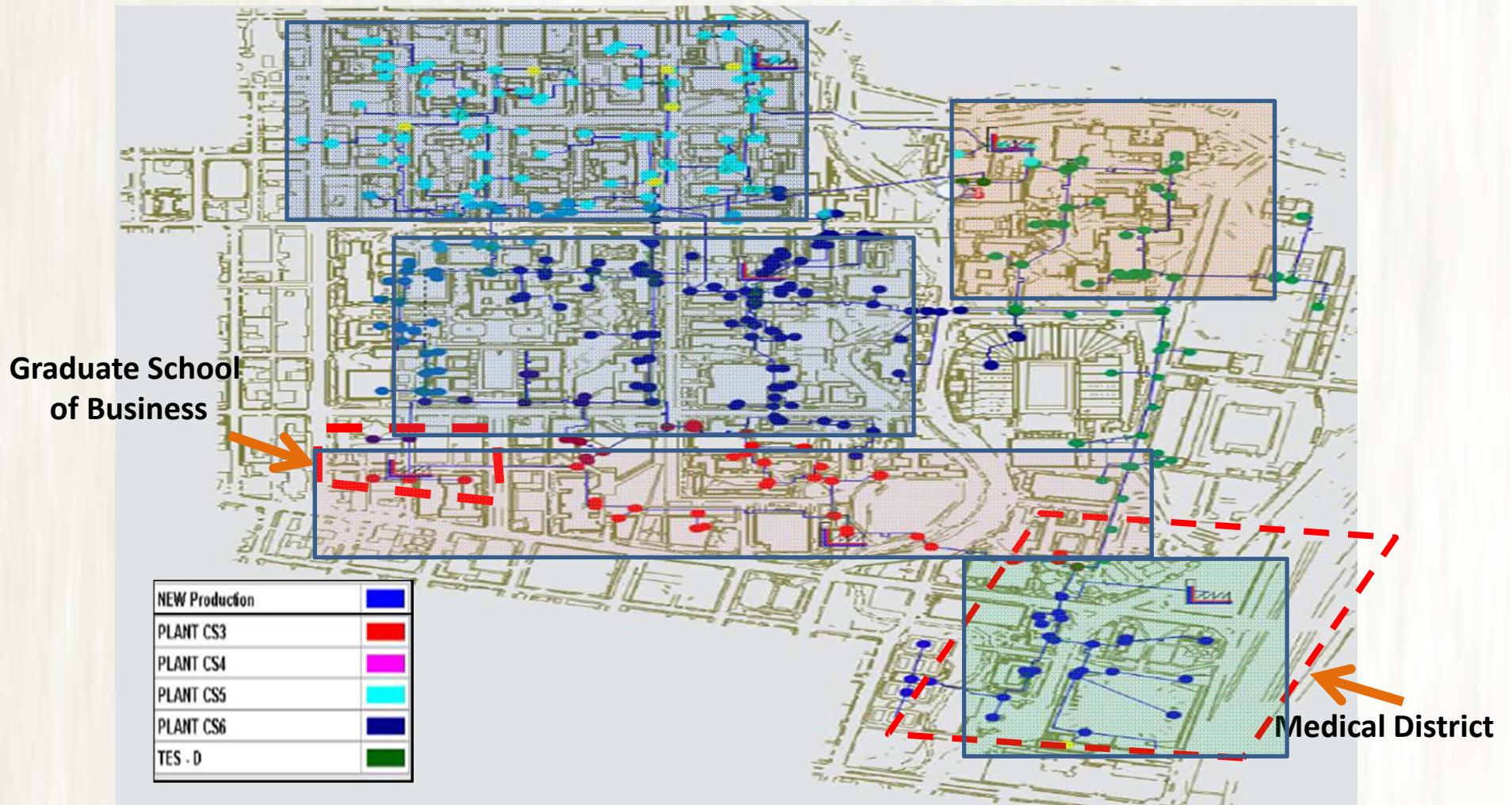


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Chilled Water Model at Peak Conditions



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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



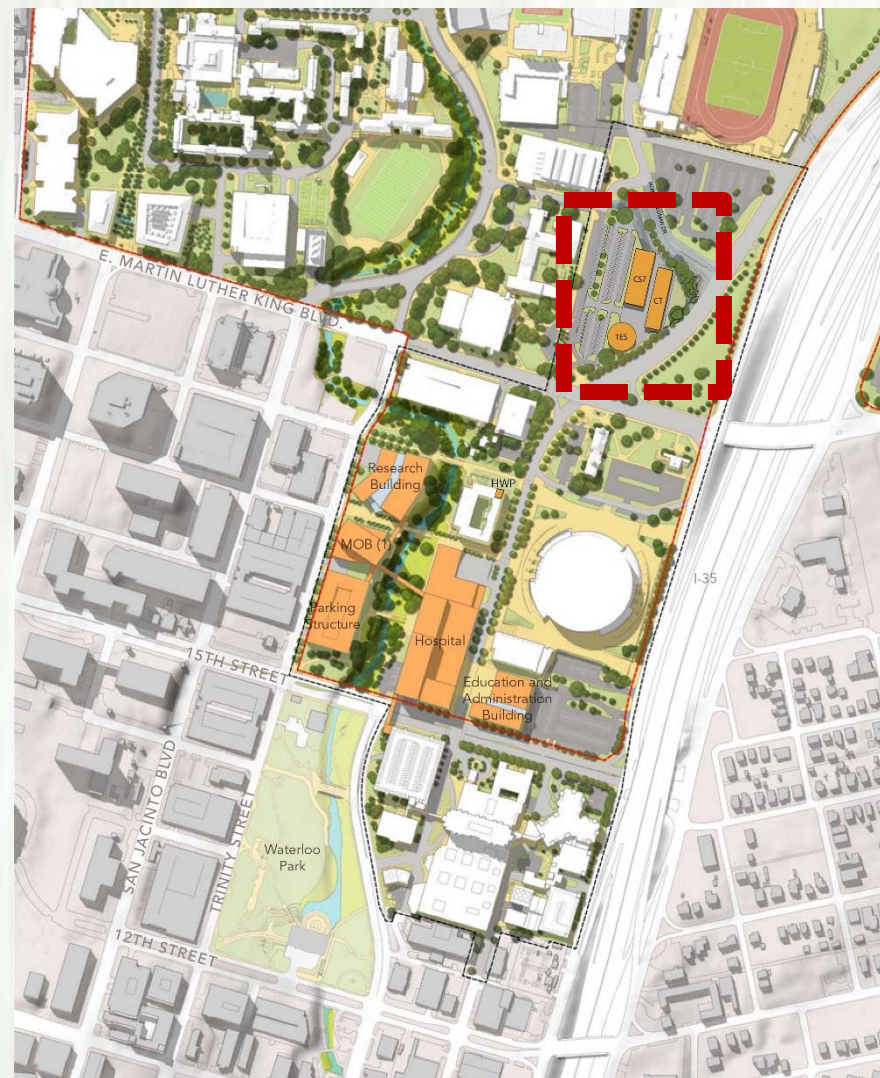
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Site / Context



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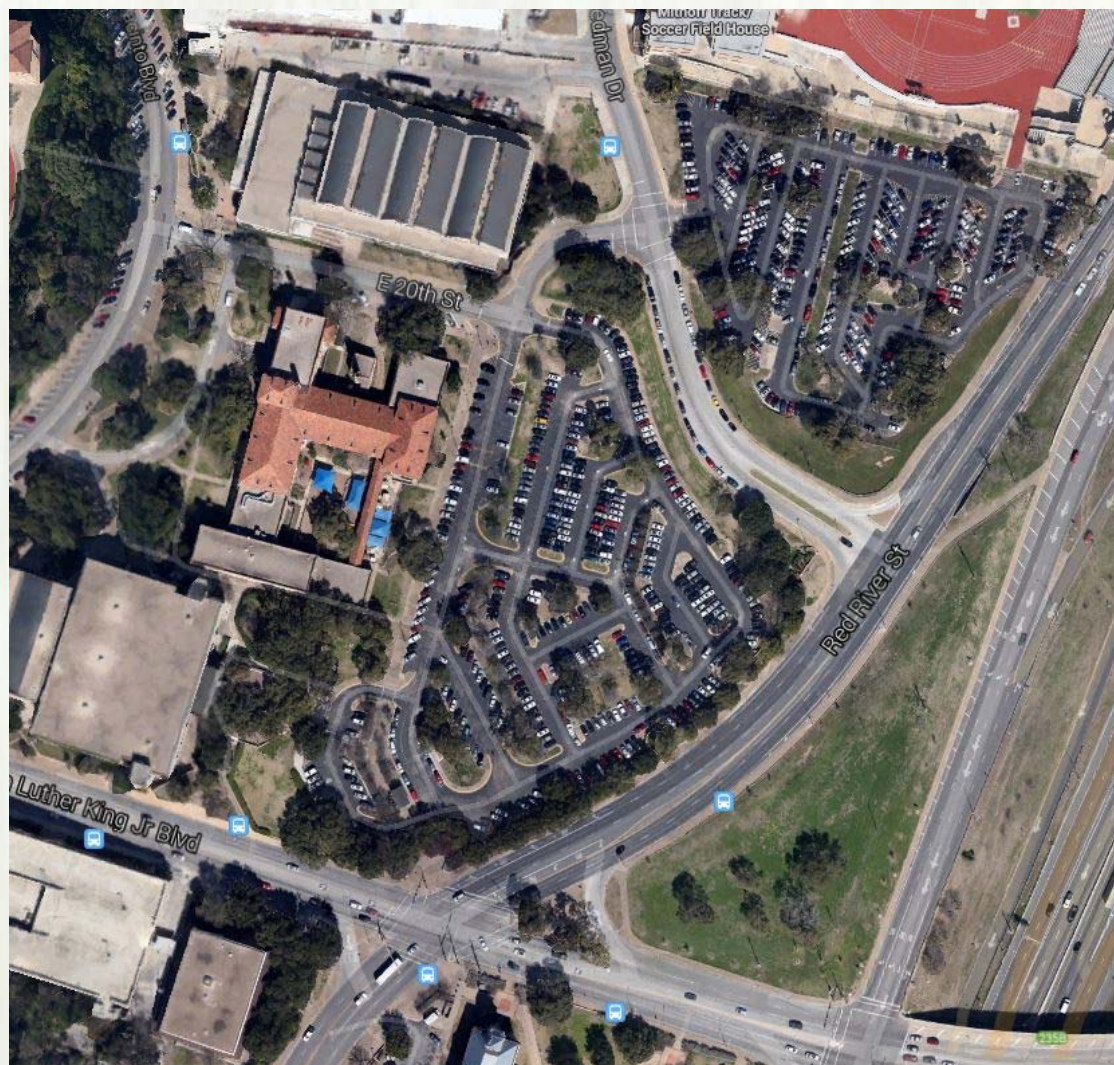
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Site / Context



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Site Planning / Organization



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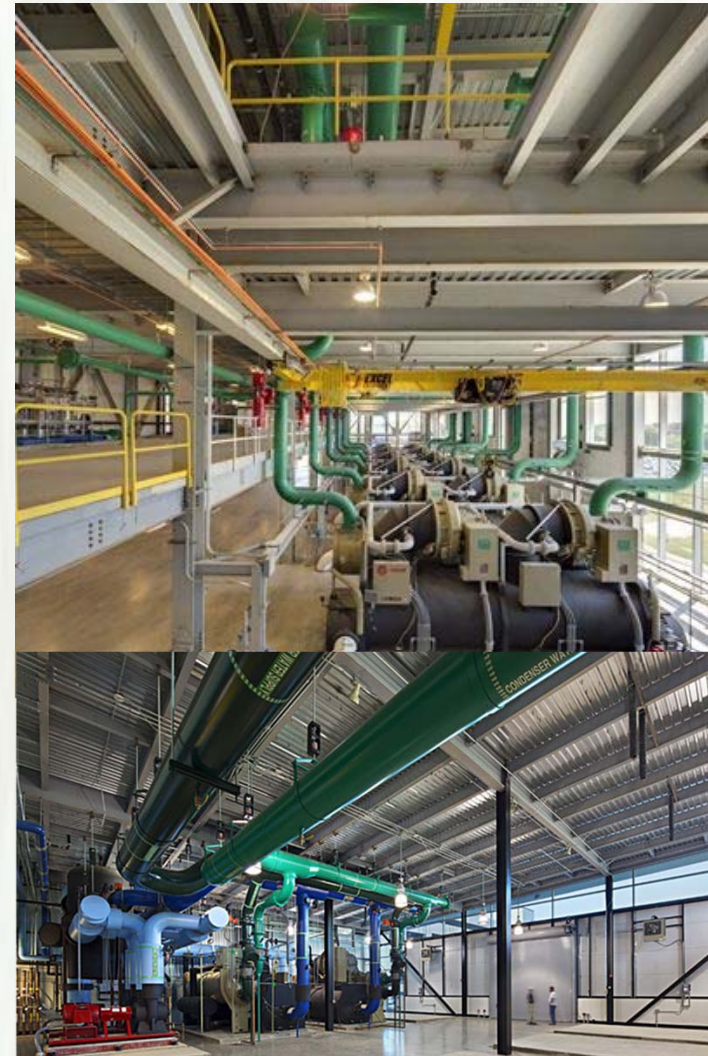
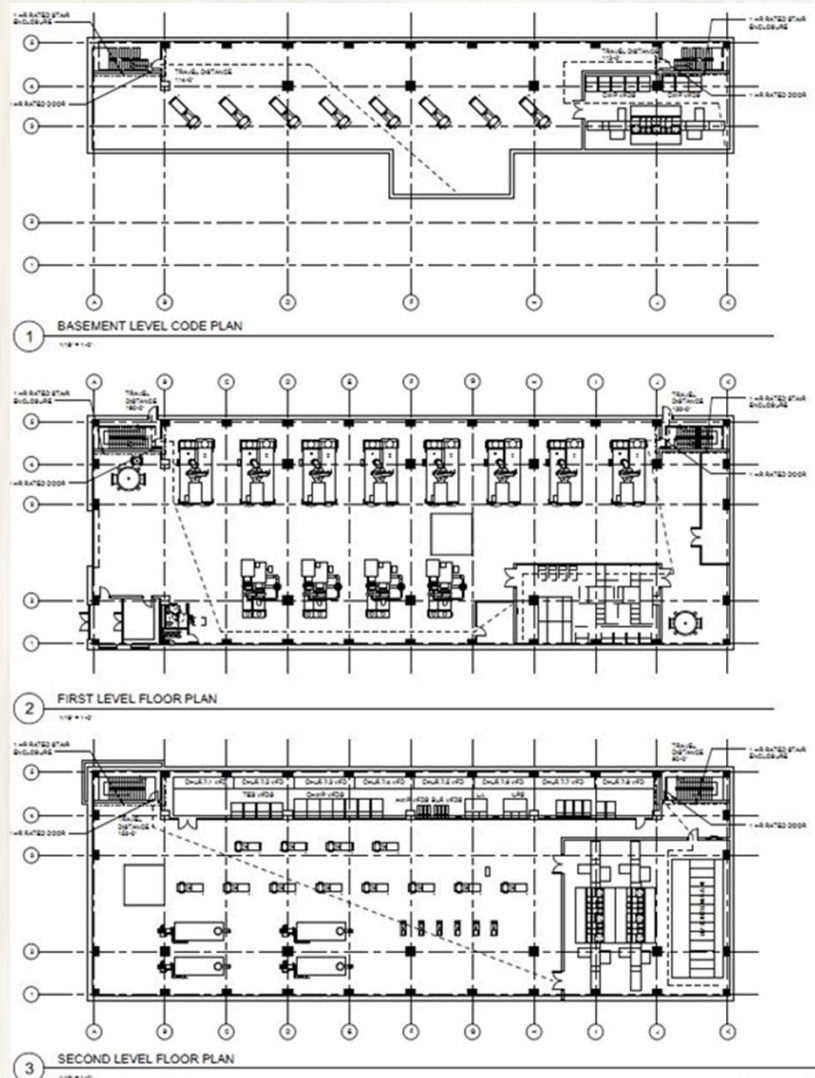
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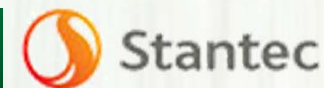
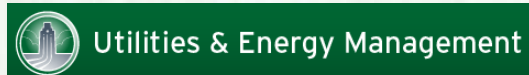
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Planning / O&M



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Building Image



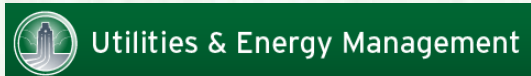
The Ohio State University East Regional Chilled Water Plant, Columbus, OH



Princeton University Chilled Water Plant, Princeton, NJ



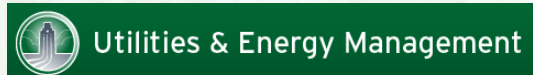
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Context



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Context



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Conceptual Design



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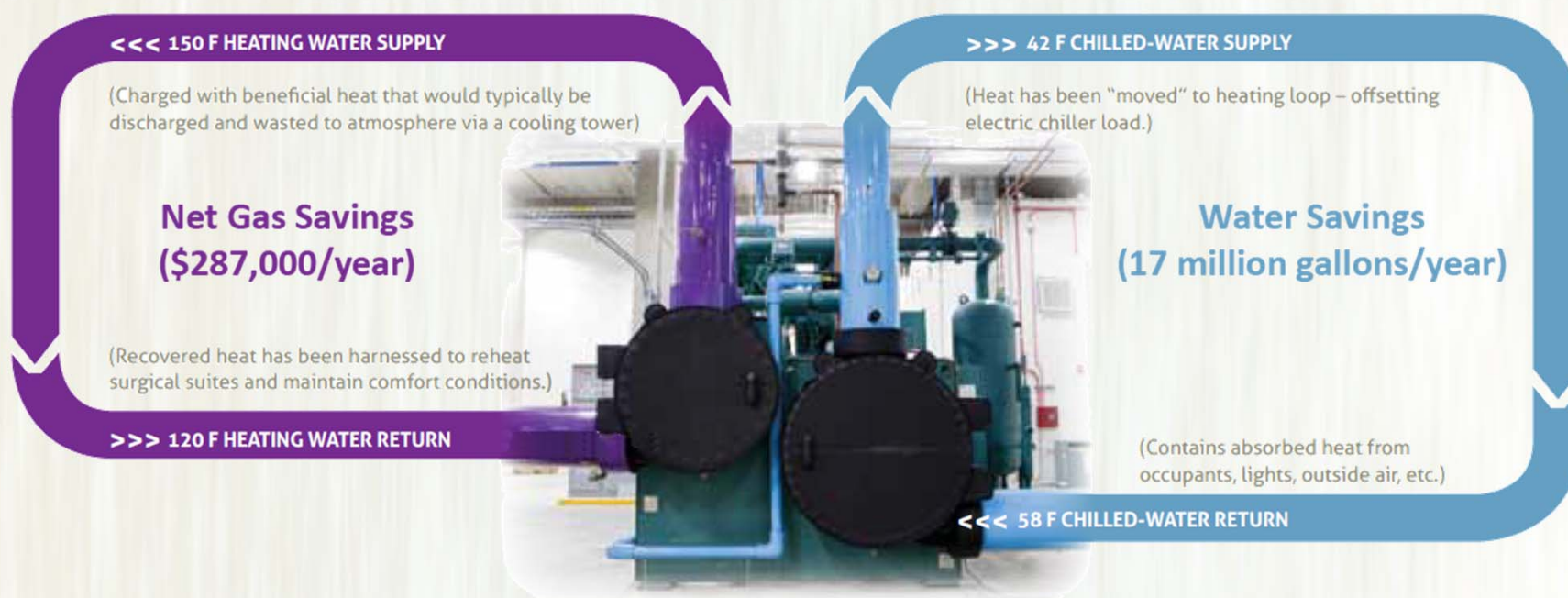
Capacity

- **Chilled Water System**
 - 15,000 tons chilled water
 - 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

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



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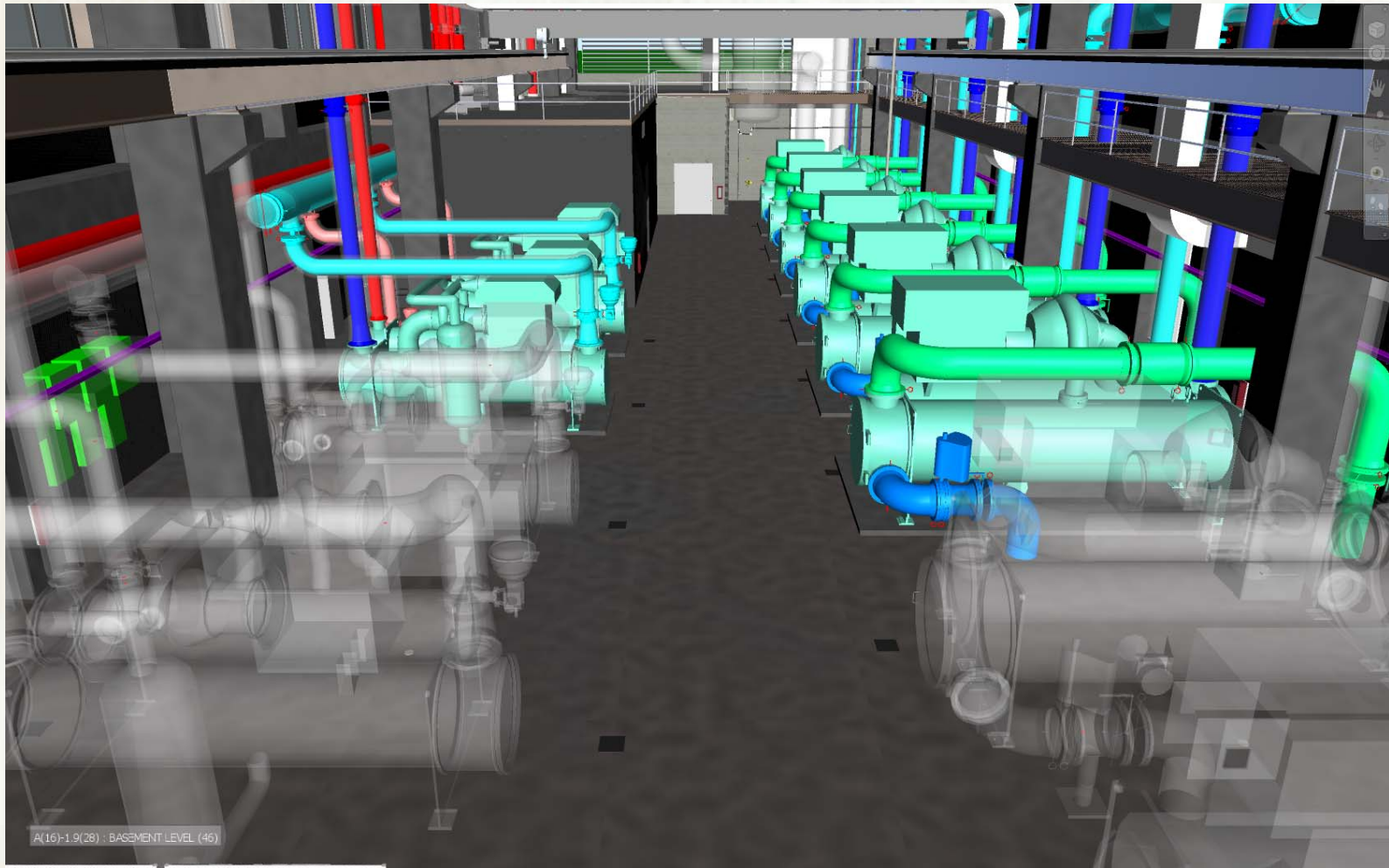
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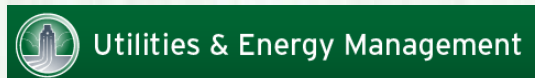
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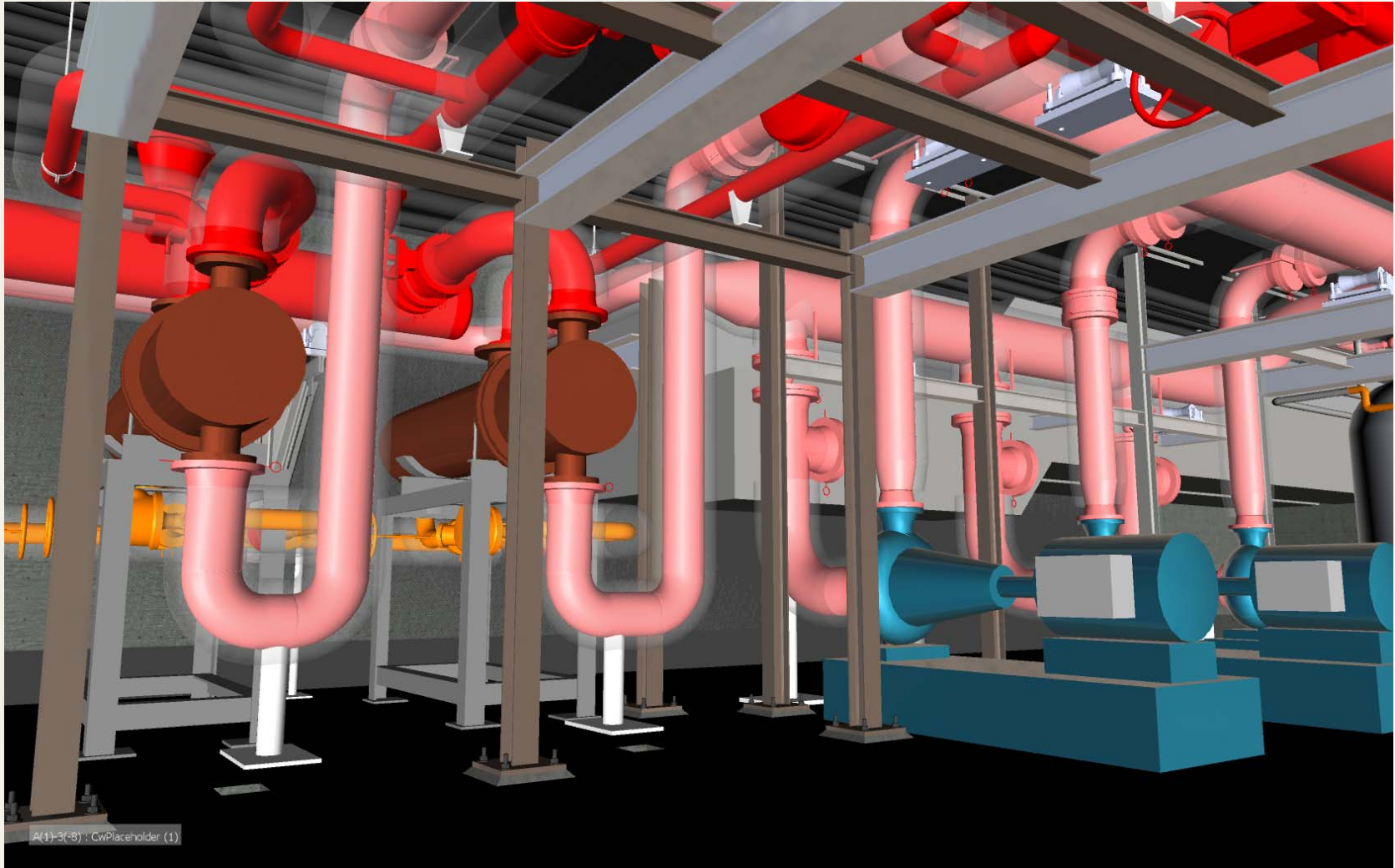
Capacity



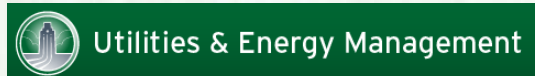
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Capacity

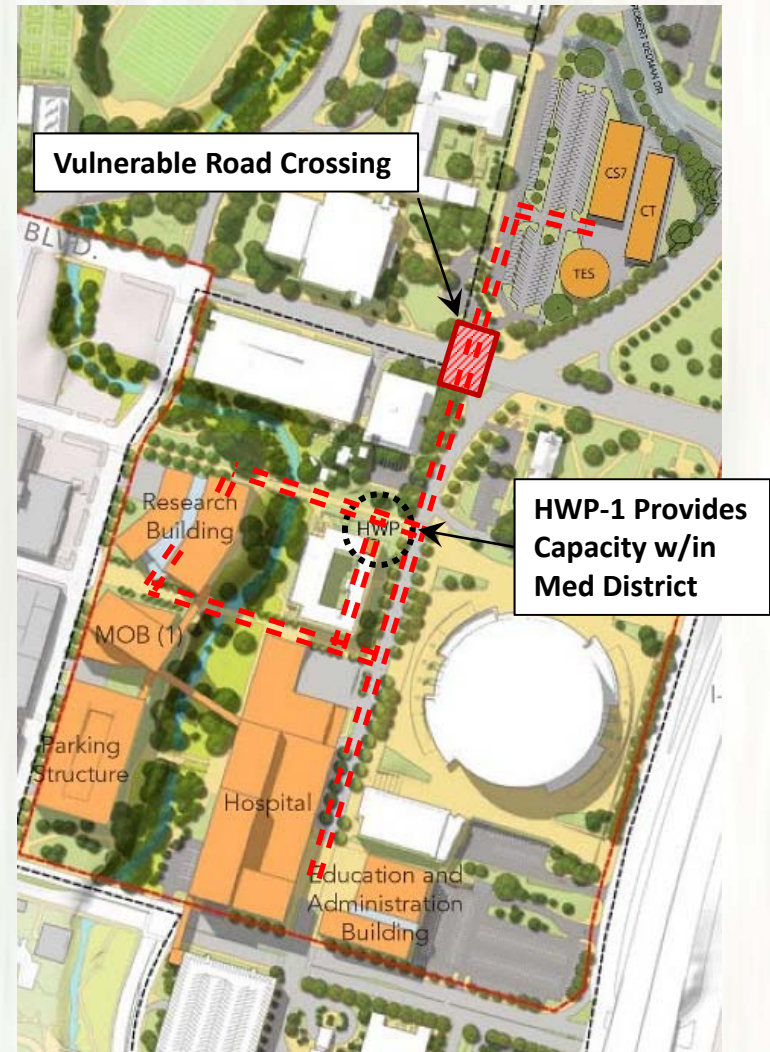


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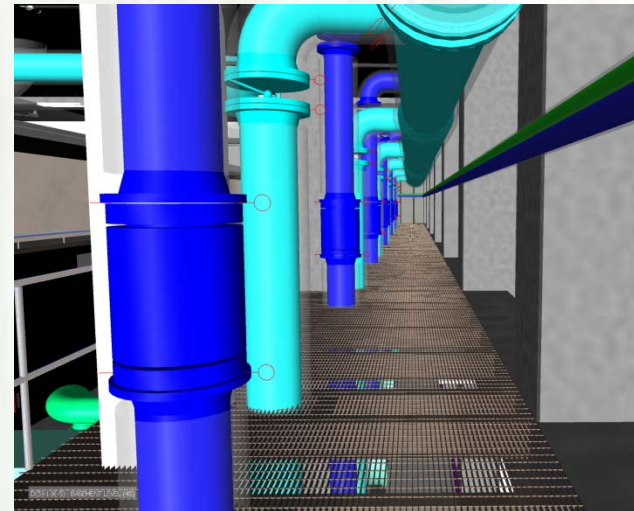
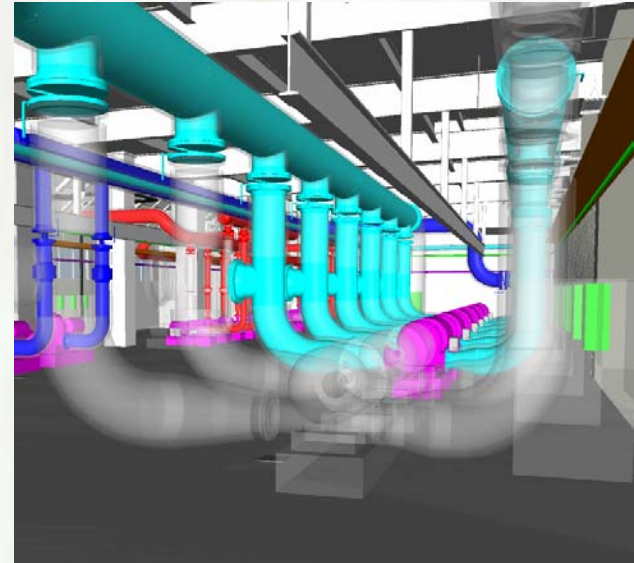
Reliability

- 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**
 1. Recovered
 2. Reclaimed
 3. Irrigation
 4. Domestic
- **O&M Considerations**
 - Bridge crane and monorails
 - Commonality of components
 - Catwalks
- **PLC Control System**
 - Programming for failure



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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

η !



Current Status & Next Steps

- **Construction begins:**
12/1/2014
- **HW service for dry-in:**
June 2015
- **Anticipated Completion:**
May 2016



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Seminar Evaluation

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Thank you!

