Case Study:
TAMU West Campus Housing
Public/Private Partnership (P3) Project
Local Building Cooling/Heating vs Central District Energy
<table>
<thead>
<tr>
<th><strong>ENERGY SERVICES CONTINUUM</strong></th>
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<tr>
<td><strong>PROCUREMENT</strong></td>
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<tr>
<td>Calculate and nominate campus electricity &amp; NG requirements</td>
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<tr>
<td>Specify annual and monthly consumption quantities</td>
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<td>Review and recommend payment of invoices</td>
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<td>Serve on TAMU energy procurement and risk management committee</td>
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**DIVERGENT ENERGY CHART**

- **Total Campus GSF**
- **Total Campus Energy Consumption**

**Campus Square Footage**
- Significant growth in campus square footage

**Campus Energy Consumption**
- Energy consumption per GSF reduced by 45 percent over 11 year period (FY02 - FY13) $162 million cost avoidance

**Projected**
- Continuous optimization and improved efficiency

**Actual**
- 4.0 trillion Btu

**Total Campus Size (million GSF)**
- 12.0 to 26.0 million GSF

**Total Campus Energy Consumption (trillion Btu)**
- 6.0 to 10.0 trillion Btu

**Fiscal Year**
- 02 to 15
SCOPE OF PROJECT

P3 Phase I

- Three 5-story apartment buildings
- 413 apartments with 1,274 private bedrooms
- 533,000 gross square feet
- Each unit includes full kitchen, washer & dryer
- Wood and steel construction w/brick and stucco exterior

- Commence construction - June 2014
- Completion and move-in - August 2015
PROJECT SCOPE

P3 Phase II

- Three 5-story residence halls
- 477 dorm rooms with 1,226 beds
- 365,000 gross square feet
- Amenities include study, lounge and laundry areas
- Steel construction with brick and stucco exterior
- Commence construction - October 2015
- Completion and move-in - August 2016

Supporting Facilities (separate projects)

- Commons Building (50-70k GSF) with admin offices, study/computer labs, recreational, dining and retail space
- Parking Garage - 4 or 5-story with 1,600 spaces
- Completion with Phase II by August 2016
PROJECT SITE LOCATION MAP

Project Location

Raymond Stotzer PW

Provisioned West Campus Community

Horticulture St

John Kimbrough Blvd

Discovery Dr

Wellborn Rd

Northside Housing Community

Corps Housing

Southside Housing

University Apartments

Reed Arena

Kyle Field
ROADWAY CIRCULATION
UTILITY SCHEMATIC
LOCAL VS. CENTRAL DISTRICT ENERGY OPTIONS CONSIDERED

HVAC Options Considered
1) Variable Refrigerant Flow (VRF) Cooling/Heating System
2) Centrally-supplied Chilled Water with Electric Strip Heat
3) Centrally-supplied Chilled Water and Heating Hot Water*

*Option 3 selected due to lowest maintenance and life cycle cost

Domestic Hot Water
Large On-site Electric Heaters with Building DHW Distribution
Utility Service to Complex

- Electrical duct bank with redundant 12.47 kV feeds
- 24 inch CHW supply/return lines
- 12 inch HHW supply/return lines
- 12 inch and 16 inch looped domestic water lines
- 14 inch sanitary sewer mains
- 48 inch and 60 inch storm drain mains

Additional Peak Utility Loads

- 5 megawatt electrical power
- 2,500 ton (30 million Btu/hr) cooling
- 500 BHP (17 million Btu/hr) heating
- 250 GPM domestic water
PIPING SYSTEMS

Underground Distribution Piping
- Extra High Molecular Weight Plus (EHMW Plus) High Density Polyethylene (HDPE) (manufactured with PE4710 resin)

Chilled Water and Domestic Water
- Minimum of SDR 17 required
- CHW piping insulated 12 inch and below

Heating Water and Domestic Hot Water
- Minimum of SDR 11 required
- All HHW piping insulated

Sanitary Sewer and Storm Drainage
- Minimum of SDR 26 required (SDR 17 under roadways)

Building Interior Hydronic Piping (CHW and HHW)
- Insulated Copper or Cross-linked Polyethylene (PEX-a) – 2 inch and below
- Insulated Carbon Steel – sizes larger than 2 inch
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