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Executive Director of Utilities and Energy Management
University of Texas at Austin
Background

- Total Budget of $2.076 billion
- Contracts and Grants of $511 million
  - Federal Contracts and Grants of $281 million
- 17 million square feet served
- Student enrollment of 50,000
- Staff of 20,000
Background

• 100% power, heating and cooling requirements for 16 million sf and 150+ buildings

• Power Plant (by 2010)
  • 137MW of on-site Combined Heat and Power (65 MW Peak)
  • 1.2 million lb/hr of steam generation (200K Peak)

• Chilled Water (BY 2010)
  • 48,000 tons capacity in 4 plants (32K Peak)
  • 4 Million Gallon/39,000 ton–hr TES Tank

• 6 miles of distribution tunnels
• 99.9998% reliability over last 35 Years
System Schematic - 2010

University of Texas at Austin
Combined Heat and Power Plant

Campus Facilities

- Eight Electric Chillers 30,000 Tons
- Three Electric Chillers 15,000 Tons
- Four Chilling Stations
- Two Heat Recovery Steam Generators
- Four Steam Turbines 57 MW
- Two Gas Turbines 75 MW
- Four Boilers

Inlet Air Cooling
Air
Natural Gas
Exhaust Gas
1000 F
High Pressure Steam
Four Steam Turbine Driven Chillers 10,800 Tons
Three Electric Chillers 15,000 Tons

Standby Power
Air
Natural Gas

Electric Power

Heating and Hot Water
9,000 tons 39,000 Ton-hrs

Underground Duct Banks

Tunnels
## Major Plant Improvements

<table>
<thead>
<tr>
<th>Project Description</th>
<th>Resulting Gas Savings (MMBTU/Year)</th>
<th>Resulting Emissions Reduction (Tons/CO₂/Year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steam Turbine #9</td>
<td>200,000</td>
<td>11,000</td>
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<tr>
<td>Cooling Tower #1</td>
<td>50,000</td>
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<tr>
<td>Boiler FGR/NOx Retrofit</td>
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<td>11,000</td>
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<td>Steam/Feed Water By-Pass</td>
<td>500,000</td>
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<td>Chilling Station 6</td>
<td>130,000</td>
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<td>Inlet Air Chilling</td>
<td>120,000</td>
<td>6,600</td>
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<td>Thermal Energy Storage</td>
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<td>2,200</td>
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<td>Chilling Station Modernization</td>
<td>20,000</td>
<td>1,100</td>
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<tr>
<td>Gas Turbine # 10</td>
<td>399,400</td>
<td>21,967</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td>1,659,400</td>
<td>91,267</td>
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</tbody>
</table>

Plus Use of Proven Technology such as Digital Controls, Plant Optimization Software & Plant and Distribution System Modeling
8 Years of Projects to Address Campus Energy Growth & Fuel Needs

- ST9
- FW Bypass
- CS6
- GT10
- 90% Efficiency

- Plant Fuel Usage
- Boiler Retrofit
Efficiency Gain

- Replacing three 1950’s vintage steam-turbine driven chillers
- Drastically reduces cooling energy requirements
UT Austin Distributed Chilling System
Jan, 2010 – 0.329 kW per Ton
Effects of Utility Improvements on Carbon Emissions

Annual CO2 Emissions (Tons)

400,000
350,000
300,000
250,000
200,000
150,000
100,000
50,000

Return to 1977 Carbon Emission & Fuel Levels

9 million sf vs. 17 million sf
184 million kWh vs 372 million kWh
Paradigm Shift for Supporting Communities

Change the business plan

- From house owner buys electricity from utility to buying thermal energy from development
  - Developer supporting long term thermal energy needs via purchased power (green & conventional)
  - Home owner does not replace AC/furnace only fans and coils – development is responsible for capital replacement of large equipment funded from rates
  - Home electrical and natural gas loads are less (construction and operational value/savings)
  - Construct house using green principles
    - Solar heat/power
  - Live in a green development – higher value for homeowners
Supporting Communities

- Shift to a more sustainable model
  - Home owner buys chilled and hot water from a central plant
    - Produce cooling with .5 kw/ton vs 1.1 kw/ton
      - Use chilled water storage for reliability and less refrigerants
    - Boiler efficiency will be about the same
      - Use hot water storage for heating system reliability
  - Development teams with Thermal Plant Operator
  - Leverage carbon credits
  - Proven concept from Europe
Partner with the Utilities

- Use thermal storage to shift electrical purchases to off-peak (negotiate cheaper rates)
  - Can phase-in development load growth
- Improves utility efficiency through increased off-peak loads
- Helps manage utility load growth
- Should be considered demand side load control
- Lowers thermal energy rates
- Federal Grants?