Dallas/Fort Worth International Airport District Energy Plant Upgrades Project – Making More with Less

Sustainable Communities Conference
Dallas, TX

March 10, 2009
Agenda

- DFW Capital Development Program
- District Energy Plant Upgrades Project
- Project Strategies
- Thermal Energy Storage System
- Boiler Emission Reductions
- Continuous Commissioning® Program
- Green Industry Leadership
DFW Capital Development Program

- Five year, $2.7 B program
- 2.1 million square foot international passenger terminal (July 2005)
- Integrated 300-room Grand Hyatt Hotel
- 8,100-space, 8-level parking garage
- New Automated People Mover System (May 2005)
District Energy Plant Upgrade Project

- Major facility expansion/renovation driven by Capital Development Program
- Major goals of the Upgrades project:
  - Increase thermal energy production capacity
  - Renew infrastructure
  - Deregulation planning/positioning
  - Reduce environmental footprint
- Need to remain on-line during construction
  - Phasing plan required
District Energy Plant Upgrade Project - Strategies

- **Chiller Repowering**
  - Remove existing steam driven equipment (22,000 tons)
  - Install 6 - 5,500 ton electric drive centrifugal chillers (33,000 tons)

- **Boiler Replacement**
  - Remove existing equipment - 405,000 lbs/hr (~100 PPM NOx)
  - Install 5 new boilers - 222,000 lbs/hr @ 125 psig (~9 PPM NOx)

- **Thermal Energy Storage Tank**
  - 6 million gallons, 90,000 ton-hours, ability to shift up to 15 MW off-peak

- **Centralized Pre-Conditioned Air System**
  - 12,000 tons Cooling
  - 51 MMBtu Heating

- **Energy efficient design and technology features will produce a projected avoided future energy use of 25 million MMBTUs over the useful life of the facilities.**
District Energy Plant Equipment

- Six steam boilers (total 260,300 pph)
- Six 5,500-ton centrifugal chillers
  - six 150-HP constant speed primary pumps
  - four 450-HP VFD secondary pumps
- One 90,000 ton-hr Thermal Energy Storage (TES) tank
- Eight cooling towers each with one 150-HP two speed fan
- Five 1,350-ton two-stage centrifugal glycol chillers
  - four 250-HP VFD primary pumps
  - four 450-HP VFD secondary pumps
- Six 1,130-ton plate and frame heat exchangers (HX’s)
Energy Plaza
Chilled Water/Thermal Energy Storage System Configuration
Energy Plaza
Thermal Energy Storage charge/discharge schedule
Energy Plaza
Thermal Energy Storage system performance

Energy Plaza Load Profile

Saturday, June 10, 2006

335,161 kWh Consumed

85% Reduction in On-Peak Demand

100°F

77°F

3,094 kW

20,477 kW
Energy Plaza
Thermal Energy Storage system performance

- **Summer Operation**
- **Winter Operation**
Boiler Emissions Reductions
District energy plant boilers were replaced with smaller, medium pressure boilers using ultra-low NOx burner technology.
Continuous Commissioning® Program in Terminal D & Energy Plaza

- A process developed at Texas A&M University’s Energy Systems Laboratory (ESL) that:
  - optimizes energy use based on actual building conditions and requirements
  - Routinely achieves 10 – 25% whole building energy cost reductions

- **CC® measures employed at Energy Plaza**
  - Fine-tune boiler steam pressure set point
  - Optimize glycol system hot water pumping control
  - Implement ChW supply temperature reset schedule
  - Optimize chiller staging & TES tank control
  - Optimize glycol temperature reset schedule including improved PCA system switch mode operation
  - Improve CW pumping control
  - Optimize ChW secondary system control
  - Improve cooling tower fan staging control
Steam Pressure Reset

Relationship Between NG Consumption and Steam Production under Different Boiler Pressure Set Points

Plant Total Steam Production (MMBtu/hr)

Plant Total NG Consumption from 1DR meter (MMBtu/hr)
Continuous Commissioning® Program in Terminal D & Energy Plaza

- Phase I (FY 08) complete
- Phase II (FY 09) on schedule
- Terminal D
  - Electricity consumption decreased by 5% (2.4MWh)
  - Chilled water consumption decreased by 16.37% (32,221 MMBtu)
  - Hot water consumption decreased by 8.99% (5,576 MMBtu).
- Energy Plaza
  - Electricity consumption decreased by 9% (5.657MWh)
  - Natural gas consumption decreased by 24% (31,420 MMBtu)
  - Peak electrical demand decreased by 3MW
- Total project savings
  - $1,101,428 (FY 08), exceeds forecast by 120%
Passenger Terminal Energy Utilization

![Graph showing energy utilization for different terminals over months]

- **Terminal A '08**
- **Terminal B '08**
- **Terminal C '08**
- **Terminal D '08**
- **Terminal E '08**
Continuous Commissioning® Program Results

Accumulative Savings
All Airport CC® Projects Performed To Date

Savings determined in accordance with the International Measurement & Verification Protocol
Green Industry Leadership
DFW’s environmental success recently earned the Airport’s participation in EPA’s National Environmental Performance Track Program, and TCEQ’s Clean Texas Platinum Award.

Recognizes top businesses and organizations that excel at environmental leadership and performance

Note: Federal Aviation Administration has unilateral jurisdictional authority over Airports and additional requirements
Thank you for your kind attention

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