



Energy Management Practices at Dallas/Fort Worth International Airport

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Presentation Outline

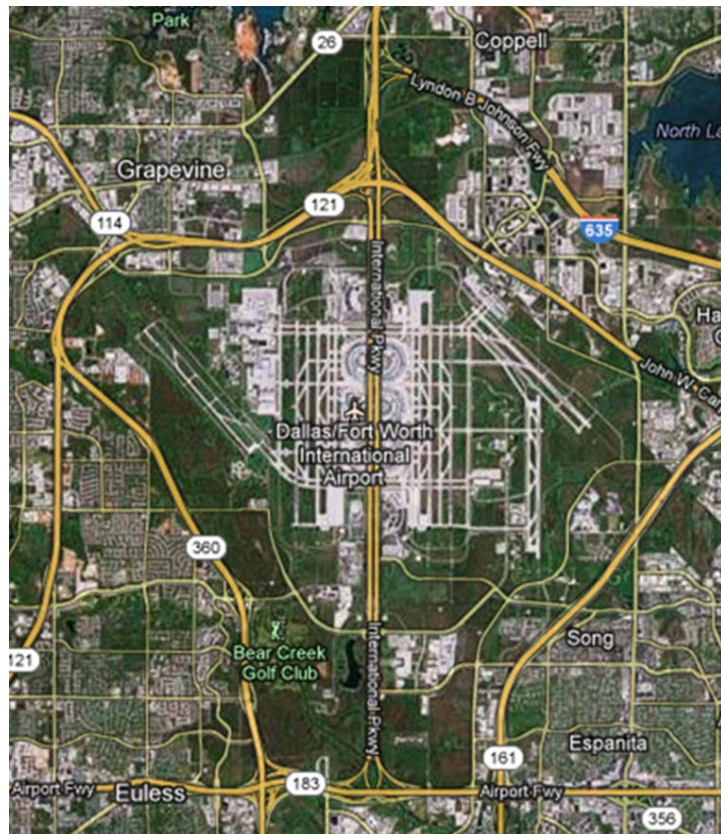
- DFW Airport Overview
- Energy Management Section
 - Structure & Mission
- Supply-Side Management
 - Reliability
 - Cost (Risk) mitigation
 - Environmental stewardship
- Demand-Side Management
 - Energy monitoring
 - Energy audits
 - Energy standards
 - Continuous Commissioning®
- Summary





DFW Airport Overview

Geography



8.1 miles

7.7 miles

- Located Between Dallas & Fort Worth
- 17,207 acres
 - 26.9 square miles
- 7 runways
 - 4 are 13,400'
- 3 control towers
- 5 terminals
 - 155 gates
- 4 aircraft can land simultaneously



DFW Airport Overview (cont.)

Operations

- 4th-busiest airport in the world in terms of operations
- 8th-busiest in terms of passengers
- 886 daily departures (646,803 total annual operations)
- 58 million passengers annually
- 653,000 tons of cargo annually





DFW Airport Overview (cont.)

Energy



- Board Managed Accounts
- ~200 electric accounts
 - 275,000,000 kWh
 - \$19 million
- ~20 natural gas accounts
 - 275,000 MMBtu
 - \$1.4 million



Energy Management

- Structure & Mission
 - Energy, Transportation, & Asset Management Department
 - Energy & Utilities Services Business Unit
 - Energy Management Section
 - Energy Manager
 - Energy Engineer
 - Energy Analyst
 - Designer (CADD and GIS Support)
 - Electrical Supervisor (27 employees)
 - SEAMS Scheduler

Mission Statement

Energy Management provides the business and technical expertise and resources necessary to meet the Airport's energy needs. Energy Management's comprehensive approach to the procurement and utilization of energy supports the reliability, sustainability, and cost management goals of the Airport Board.



Supply-Side Management

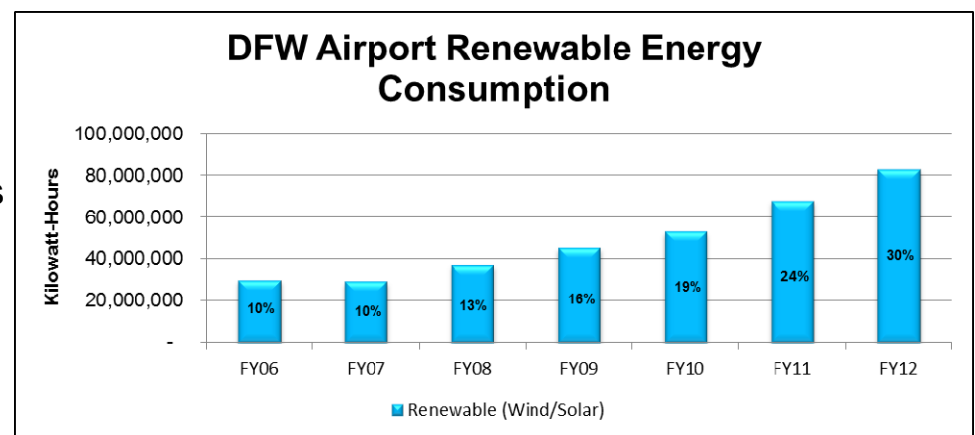
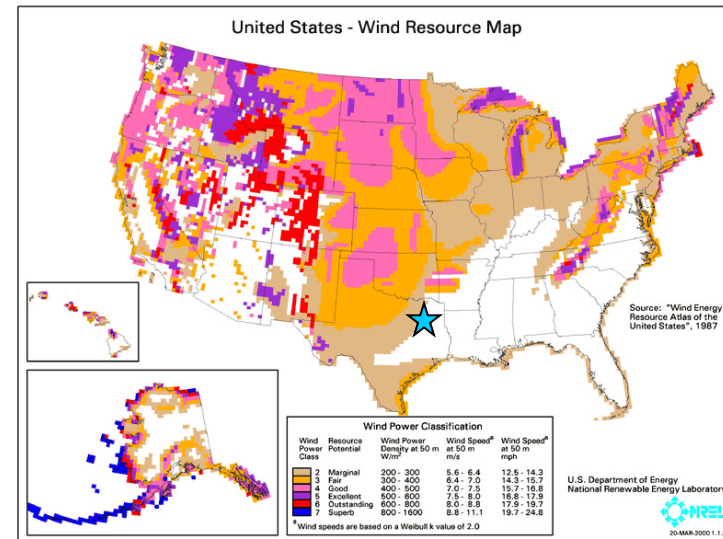
- Energy Procurement – Develop and implement an energy procurement strategy designed to insure availability and **environmental stewardship**, and mitigate cost volatility.
 - Electricity
 - Natural Gas
 - Propane
 - ~~Water / Waste Water~~
 - Vehicle Fuels
 - Compressed Natural Gas (CNG)
 - Unleaded Gasoline
 - Diesel
 - Biodiesel





Supply-Side Management (cont.)

- Environmental Stewardship
 - Electricity
 - Onsite Renewable
 - Wind – Economically, geographically and operationally not practical
 - Solar – Economically not practical unless heavily subsidized
 - Offsite Renewable
 - Wind – Practical and very affordable
 - Renewable Energy Credits (REC)
 - 1 REC = 1 MWH
 - Currently at 30%





Supply-Side Management (cont.)

- Environmental Stewardship (cont.)
 - Natural Gas
 - Landfill – Mostly spoken for
 - Vehicle Fuel
 - CNG – 2.25 million DGE annually (100% of our Bus Fleet)
 - Available, very affordable (\$1.50 DGE) (\$2.25 DGE – apples to apples)
 - Biodiesel
 - Available, affordable, mixed reviews

**Truck Fuel Filter
Biodiesel Gels in Cold
Temperatures**





Demand-Side Management

- Energy Monitoring – Track and forecast energy usage for all Board facilities. This supports:
 - Budgeting
 - State and Federal reporting requirements
 - Energy Audits
 - Life cycle and return on investment calculations

| | (From Electric Invoices) | | | (Calculated - Renewable/Fossil Fuel Split) | | | | (From Natural Gas Invoices) | | |
|-------------|--------------------------|--------------------|-----------------|--|-------------------|------------------|--------------------|-----------------------------|----------------|-----------------|
| | | Electricity | | Percent | Renewable/Grid | Renewable/ADE-PV | Fossil Fuel | | Nat Gas | |
| | \$ | KWH | \$/KWH | Renewable | KWH | KWH | KWH | \$ | MMBtu | \$/MMBtu |
| 10/1/2011 | \$1,512,572 | 21,107,139 | \$0.0717 | 30.0% | 6,332,142 | - | 14,774,997 | \$79,647 | 15,879 | \$5.0160 |
| 11/1/2011 | \$1,467,740 | 20,263,710 | \$0.0724 | 30.0% | 6,079,113 | - | 14,184,597 | \$140,395 | 29,068 | \$4.8299 |
| 12/1/2011 | \$1,626,163 | 22,831,656 | \$0.0712 | 30.0% | 6,849,497 | - | 15,982,159 | \$248,797 | 48,822 | \$5.0960 |
| 1/1/2012 | \$1,417,752 | 19,178,779 | \$0.0739 | 30.0% | 5,753,634 | 17,373 | 13,425,145 | \$251,697 | 43,667 | \$5.7641 |
| 2/1/2012 | \$1,442,504 | 19,565,766 | \$0.0737 | 30.0% | 5,869,730 | 15,775 | 13,696,036 | \$215,094 | 38,654 | \$5.5646 |
| 3/1/2012 | \$1,420,020 | 19,318,768 | \$0.0735 | 30.0% | 5,795,630 | 17,718 | 13,523,138 | \$157,552 | 25,647 | \$6.1432 |
| 4/1/2012 | \$1,537,378 | 21,600,918 | \$0.0712 | 30.0% | 6,480,275 | 25,320 | 15,120,642 | \$94,070 | 16,385 | \$5.7412 |
| 5/1/2012 | \$1,599,439 | 22,715,549 | \$0.0704 | 30.0% | 6,814,665 | 26,070 | 15,900,884 | \$59,611 | 11,751 | \$5.0727 |
| 6/1/2012 | \$1,867,286 | 27,291,838 | \$0.0684 | 30.0% | 8,187,551 | 28,803 | 19,104,287 | \$44,246 | 9,738 | \$4.5434 |
| 7/1/2012 | \$1,912,252 | 28,252,662 | \$0.0677 | 30.0% | 8,475,799 | 29,309 | 19,776,863 | \$44,058 | 9,593 | \$4.5929 |
| 8/1/2012 | \$1,856,890 | 26,668,818 | \$0.0696 | 30.0% | 8,000,645 | 20,373 | 18,668,173 | \$46,383 | 9,331 | \$4.9709 |
| 9/1/2012 | \$1,819,366 | 26,669,662 | \$0.0682 | 30.0% | 8,000,899 | 27,942 | 18,668,763 | \$49,224 | 10,632 | \$4.6296 |
| FY12 | \$19,479,362 | 275,465,264 | \$0.0707 | 30.0% | 82,639,579 | 208,681 | 192,825,685 | \$1,430,773 | 269,167 | \$5.3156 |



Demand-Side Management (cont.)

- Energy Audits – A technical evaluation of a facility’s energy, typically resulting in the identification of energy savings opportunities.
 - Walk-through Audit – Identifies preliminary energy savings opportunities without detailed cost or savings estimates.
 - Scoping Audit – Identifies energy savings opportunities that appear likely to have a 5 year ROI.
 - Investment Grade Audit – A detailed engineering analysis intended to provide sufficient information to support informed choices for capital energy investments.




Demand-Side Management (cont.)

- Energy Standards
 - Conduct research into new energy saving technologies.
 - Fanwall AHU
 - Lighting and controls
 - Geothermal heatpumps

Proposed Street Light for Southgate

Quadro HO LED



selux

Project: DFW Airport

Type: _____ Qty: _____

QHOL - - 1 - -

Series Optics Mounting Light Engine CCT Finish Voltage

Options Pole Series Height Finish Options

| Series | Optics | Mounting | Light Engine | CCT | Finish | Voltage | Options |
|---------------|-------------|----------|-------------------------------|----------|--------------------------|---------|---------------------------------|
| QHOL | R1 Type I | 1 Single | 6TL350 ¹ 350mA/60w | 30 3000K | WH White | 120 | HS House Side Shield |
| Quadro HO LED | R2 Type II | | 6TL500 500mA/87w | 45 4500K | BK Black | 208 | PCT Photocell Tenon |
| | R3 Type III | | | | BZ Bronze | 277 | DM ¹ Dimming (0-10v) |
| | R4 Type IV | | | | SV Silver | 347 | HL ² Hi-Lo Switching |
| | R5 Type V | | | | SP Specify Premium Color | 480 | |

¹No dimming at 300mA ²120V, 277V only



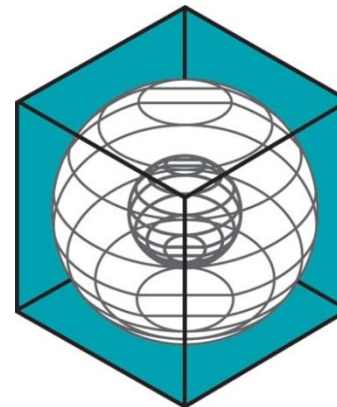
Fanwall AHU (TRIP)

- Assist in the development and adoption of the Airport's energy conservation building codes and standards.



Demand-Side Management (cont.)

- Continuous Commissioning®
 - Optimizes energy use based on actual building conditions and current requirements
 - Routinely achieves 10 – 25% whole building energy cost reductions
 - Maintain and/or improve comfort
 - Calibrate and repair sensors and malfunctioning devices
 - Modify control sequences and implement reset schedules
- Increase heating and cooling deadbands and implement uniform space temperature setpoints
- Training (transfer of knowledge)



**Energy
Systems
Laboratory**



Demand-Side Management (cont.)



Terminal D

- Continuous Commissioning®
 - Opened in 2005
 - 2 million sq.ft. international terminal
 - 27 aviation gates
 - 60 retail spaces
 - 99 ticket positions
 - 91 elevators, 59 escalators, 34 moving sidewalks
 - 6 miles of baggage belts
 - 55 million kWh annually

CC Results:

- Electric – 9% reduction
- Chilled Water – 27% reduction
- Hot Water – 50% reduction
- Cost Savings - \$5 million



Demand-Side Management (cont.)

- Continuous Commissioning®
 - Originally opened in 1973
 - Upgraded in 2005
 - 6 – 5,500 ton chillers
 - 6 million gallon TES
 - 4 boilers – 33,000 lbs/hr steam
 - 1 boiler – 83,000 lbs/hr steam
 - Pre-conditioned Air (PCA)
 - 12,000 tons cooling
 - 51 MMBtu heating
 - Provides heating and cooling services to 6.6 million sq.ft. of condition space
 - 77 million kWh annually
 - 400,000 MMBtu annually

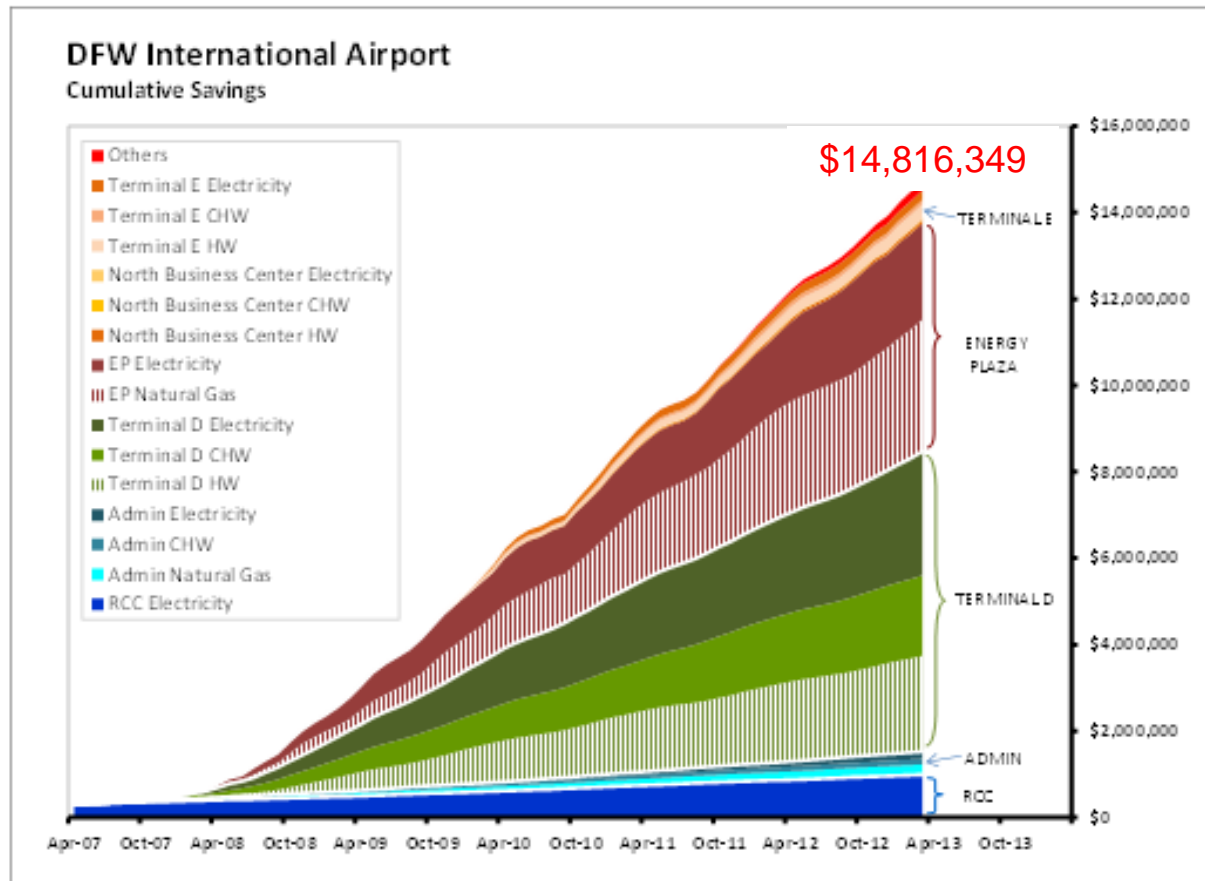
Energy
Plaza



CC Results: Electric – 6% reduction
 Natural Gas – 30% reduction
 Cost Savings - \$4 million



Demand-Side Management (cont.)



Continuous Commissioning Savings Summary



Summary

