Overview

β Pentagon Basics
  • Renovation

β Pentagon Energy Management
  • Where We Have Been
  • What We are Doing
  • Program Goals

β Commissioning

β Summary
Pentagon at a Glance

- Currently classified as the largest low-rise office building in the world
- National Historic Landmark
- 6.5 million Sq. Ft
  - 34 acre footprint
- Annual electric bill of $6.5 million
- 150 miles of ductwork
- 280,000 HVAC control points – over 500,000 by end of Renovation
The Pentagon - A Small City

The Pentagon was completed in 1943 and the first major renovation did not start until 1991.

3 Empire State Bldgs.
7,748 windows
17.5 miles of corridors
25,000 personnel
1,000,000 calls each day
Police force
Metro Train/Bus Hub
Health Facilities
Post Office
Mini-mall
Heliport
The Need for Renovation

Major building systems beyond repair, non-compliant with modern building codes and ADA, hazardous materials present throughout, poor energy efficiency
All Building Systems Need Replacement: *Plumbing*
Building Code Violations:
Electrical, Fire, Life Safety, ADA and Others
Presence of Hazardous Materials
Asbestos, Lead Paint, Mercury, PCBs
THE SOLUTION:  
A COMPLETE RENOVATION  
“Ceiling to Slab”

- Replace all building systems
- Remove or encapsulate all hazardous materials
- Improve energy efficiency
- Bring building up to code compliance
- Improve vertical mobility, comply w/ ADA
- Enhance security
- Improve pedestrian & vehicular traffic flow
- Preserve/Restore Historical Features
• Security Improvement
• Monitoring & Control Systems
• Building Operations Command Center
• Replacement of Exterior High Pressure Water Lines
• Fire Sprinklers
• Automatic Fire Doors
• Fire/Life Safety Codes
• ADA Compliance
Pentagon Energy Management

Where We Have Been

• Assessing Performance
  • Per EPAct 2005, Baseline Year Changed From 1985 to 2003
    • Allows Greater Accuracy in Baseline Determination
    • New Baseline Determined in October 2006
      • FY2003 Baseline – 163kBtu/SF per Year
  • Energy Accounting
    • Developed Utility Forecasting Tool
      • Accounting Process to Track Costs
      • Forecasts Future Costs
  • Wedge Level Sub-metering in Wedge 2 – 212 Meters
    • Detailed Sub-metering
      • Chilled Water, Steam, Natural Gas, Electric Energy
Pentagon Energy Management

What we are doing

• EPA “Energy Star” Products
  • Computers – 70% Less Electricity
  • Monitors – Shut Off After 20 Minutes of no Activity
• Alternative Fuels at Pentagon Fueling Station (1st in US!)
  • Bio Diesel
  • Ethanol – 85 (E-85)
  • Natural Gas
• Mass Transit Subsidies
  • 34,000 Total Participants and $35.9 Million per Year in Disbursements
  • Includes Approximately 11,000 Pentagon Participants and $13.3 Million per Year in Disbursements
Pentagon Energy Management

What we are doing (cont.)

• Incorporated Energy Conservation Measures into all contracts
  ☑ Initiate recycling program that diverts 50% of waste stream from landfills.
  ☑ Integration of EPP products into all contracts (custodial, O&M, construction)
  ☑ Integrated Sustainable Design
  ☑ Energy Budgets
  ☑ Life cycle cost analysis
  ☑ Construction Energy Plan
  ☑ Building Commissioning

• ESPC with Honeywell and Currently Looking at:
  • Install Boilers at FOB2
  • Chiller Improvement – Water Side Economizer
# Pentagon Energy Management Program Goals

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<th>OBJECTIVE</th>
<th>ACTIONS</th>
<th>TARGET DATE</th>
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<td>Data Collection</td>
<td>Develop Energy End-Use Profile for Pentagon</td>
<td>Aug-07</td>
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<td>Guides Energy Management Team to Identify Best Energy Efficient Opportunities</td>
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<td>Accountability for Energy Reduction Goals.</td>
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<td>Verify Savings from Energy Conservation Measures (ECM's)</td>
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<td>Cost Allocation for Tenants</td>
<td>Identify High Energy Users</td>
<td>Oct-07</td>
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<td>Monthly Reports (Creates Awareness)</td>
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<td>Operational Analysis</td>
<td>Identify Inefficient Operations</td>
<td>Mar-08</td>
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<td>Internal Review</td>
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<td>Control Systems to Optimize Energy Conservation</td>
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<td>Building Tune-ups</td>
<td>Implementation of Continuous Commissioning Principles</td>
<td>Mar-08 and Beyond</td>
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<td>Data Mining</td>
<td>Detect and Diagnose Energy Degradation Prior to Failure</td>
<td>Mar-08 and Beyond</td>
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Continuous Commissioning

- Develop Performance Monitoring
- Indoor environmental parameters, building and systems performance
- Establish Operating Procedures - Include Corrective Actions for Troubleshooting
- Control Strategies - to Improve Indoor Environmental Quality and Efficiencies
- Comprehensive Measurement and Verification Plan
- Comprehensive Best Practices and Reliability Centered Maintenance
- Cross-Functional Training Program