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IAC Student Meeting – Washington DC

Higher Education Performance Contract Case Study

Eastern Kentucky University - EKU

February 5, 2010

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Agenda

- Siemens Industry Inc. - Building Technologies Division
- EKU ESPC Project Overview
- EKU Video Podcast
- Project Development Approach
- Energy Efficient Technologies
- Construction Management Approach
- Measurement & Verification
- Questions and Answers

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About Siemens Industry Inc. - Building Technologies Division

Building Technologies Division Mission:

Making buildings comfortable, safe, productive and less costly to operate.

- Building Automation
- Fire Safety
- Security Solutions
- **Energy and Environmental Solutions**

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Energy and Environmental Solutions Mission

Help our customers:

- Manage energy costs
- Improve energy reliability
- Enhance energy performance
- Have a positive impact on the environment

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Eastern Kentucky University
ESPC Project Overview

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ESPC Project Overview

- Campus-wide energy efficient facility improvements
- Funded through guaranteed energy savings
- Will address deferred maintenance needs
- Improvements include:
  - Energy efficient lighting
  - Heating, ventilation and air conditioning systems
  - Building controls
  - Energy efficient motors
  - Water conservation
  - Training

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Financial Overview

- $27 million energy savings performance contract
- Executed in August 2008
- Funded through guaranteed energy savings over a 13 year contract term
- Will not require additional taxpayer dollars
- Will reduce EKU’s $6.4 million annual utility budget by more than 40%
- Savings are guaranteed to be $2.9 million annually, or $7,900 per day
- If the guarantee is not met, Siemens will pay to cover the shortfall

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Environmental Overview

Reduced Greenhouse Gas Emissions

- 75,042,110 lbs. of carbon dioxide (CO2)
- 119,241 lbs. of nitrogen oxides (NOx)
- 374,480 lbs. of sulfur dioxide (SO2)

Equivalent Reductions

- 227 acres of forest preserved, or
- 6,229 cars removed from the road, or
- 79,159 barrels of oil burned, or
- 179 rail cars of coal burned

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EKU Video Podcast

Project Development Approach

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Involvement of Facilities Services Personnel

EKU Subject Matter Experts

- Utilities
- Mechanical
- Electrical
- Plumbing
- Structural
- Energy Management
- Housing
- Building & Grounds

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Project Development Philosophy

- Work with EKU staff in a cooperative fashion
- Provide recommendations based upon simple payback or ROI
- Observe owner preferences for equipment, consultants, and contractors
- Competitively bid scopes of work
- Clearly communicate plans for Measurement and Verification of savings

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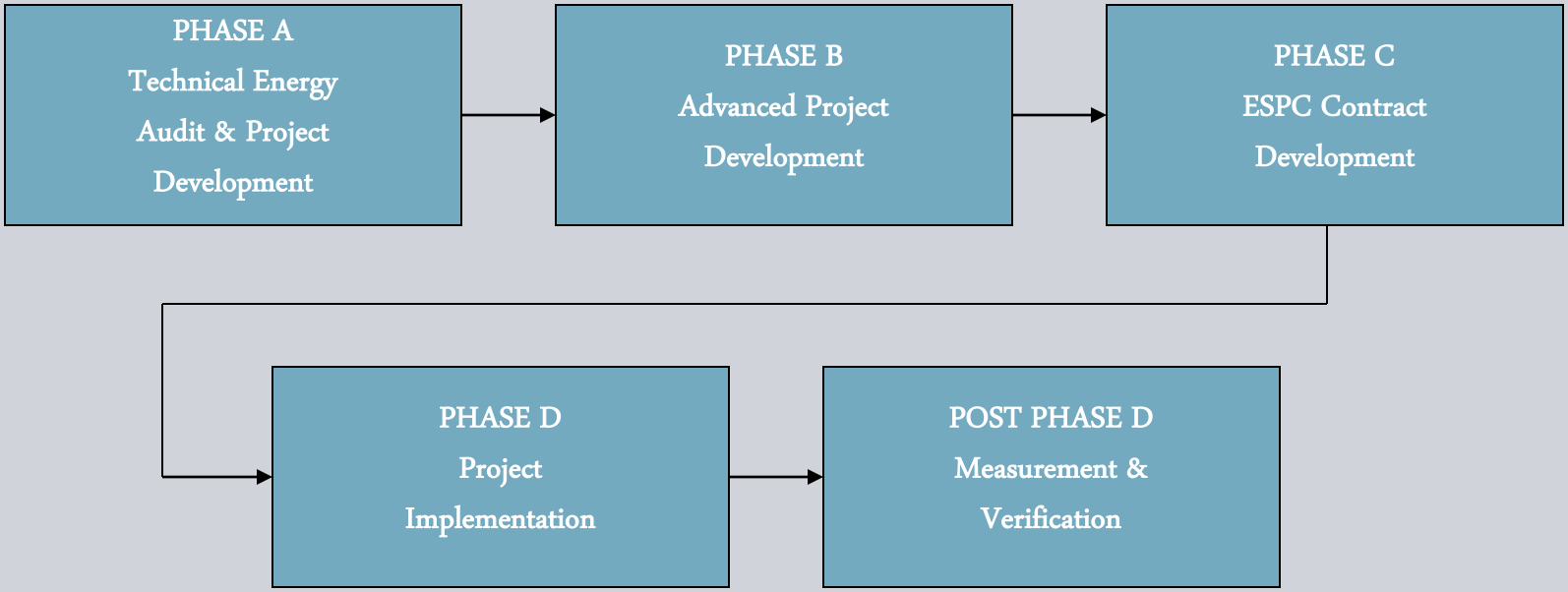
Project Development Process



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Energy Efficient Technologies

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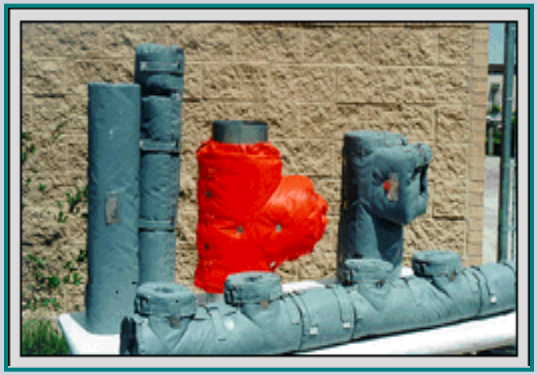
Energy Efficient Technologies

Heating System Improvements:

- Boiler plant process controls upgrade
- Coal ultrafeed stoker upgrades
- Campus wide steam trap and condensate system improvements
- Removable steam valve insulation jackets



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Energy Efficient Technologies

Lighting / Water / Sewer System Improvements:

- Retrofit T12 and T8 Lighting with 2nd Generation T8 Lighting
- Lighting controls
- Low-flow toilets, urinals, aerators
- Submeter cooling towers and irrigation systems

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Alumni Coliseum Lighting

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Energy Efficient Technologies

Cooling System Improvements:

- VFD control of chilled water / condenser water / cooling towers
- Chemical-free cooling tower treatment
- Closed loop chemical treatment and filtering

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Energy Efficient Technologies

Ventilation System Improvements:

- Demand control ventilation strategies
- Coil cleaning and improved air filtration
- Synchronous belts
- Energy efficient motors

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Construction Management Approach

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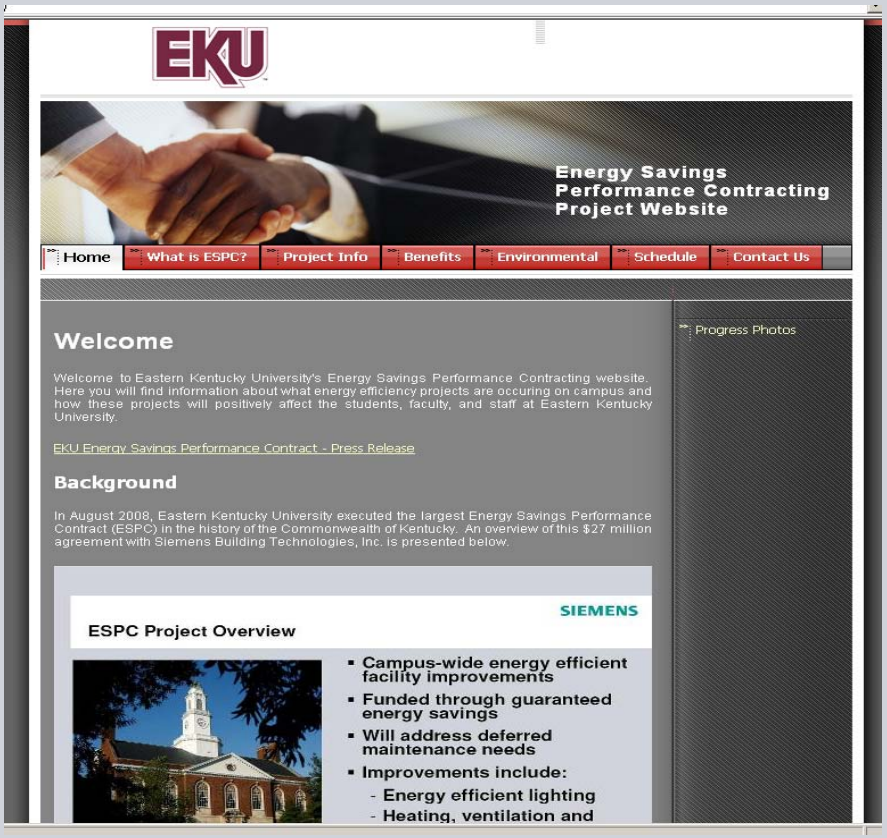
Construction Management Approach

Construction Project Website – Communication Tool



- Scheduling of Work in Occupied Buildings
- Owner Interaction
- Campus Awareness and Communications
- Contractor Management
- Comfort complaints
- Installation, Commissioning and Start-up

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Measurement and Verification Planning

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Measurement & Verification Planning

- International Performance Measurement & Verification Protocol (IPMVP)
- Comparison of measured energy consumption both before and after the facility improvement
- Options range from partial measurements to on-going measurements to computer modeling
- Costs very by complexity, but can be tailored to meet specific needs
- IPMVP provides direction on how to adjust for changes in weather, occupancy, facility operation, etc.

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Sample Measurement and Verification Methodology

Recommendation	Siemens Responsibility	Customer Responsibility	Engineering Assumptions
Lighting & Motor Improvements	KW Pre and Post Measurements	Run Hours	None
Equipment Scheduling	Motor KW, Fan CFM, OA%	Pre & Post Fan Hours	30 Year Bin Weather Data
VSDs	Pre Motor KW, Post On-Going Motor KW Trending, OA Temperature	Pump Run Hours	30 Year Bin Weather Data
Water Conservation	Pre and Post Fixture Water Consumption	Occupancy, Usage per Occupant	None
Destratification Fans	Pre and Post Ceiling Temperatures, Ceiling Area, Building Volume	Building Hours, Temperature Set points	30 Year Weather Data, Building Insulation Values, Infiltration Rates, Heating Equipment Efficiencies
Setback Thermostats	Pre and Post Temperature Logging	Building Hours, Temperature Set points	30 Year Weather Data, Building Insulation Values, Infiltration Rates, Heating & Cooling Equipment Efficiencies
Window Retrofit	Window Area, Crack Lengths	Building Hours, Temperature Set points	30 Year Weather Data, Rated R-Value Before, Rated R-Value After, Rated Infiltration Value After, Heating & Cooling Equipment Efficiencies
Infiltration Improvements	Crack Area Before and After	Building Hours, Temperature Set points	30 Year Weather Data, Building Infiltration Calculations
Vending Machines	KW Before / Equipment Logging After	Building Occupancy	None
Steam Traps	Trap Size, Trap Survey	Steam System Operation	30 Year Bin Weather Data, Steam Loss Engineering Calculation based on Trap orifice
Cooling System Upgrades	KW per Ton Before, KW per Ton After	Building Operation	30 Year Weather Data, Building Cooling Load Model and Electric Bill
Heating System Upgrades	Boiler Efficiency Before, Boiler Efficiency After	Building Operation	30 Year Weather Data, Building Heating Load Model and Gas Bill

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Questions and Answers