Facilities Energy Conservation - The Big Picture

Tuesday, June 9, 2015 – 1:15pm-2:30pm, Harborview, 15th Floor

Presented by:
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Whether it’s a single facility, a multi-facility campus or a statewide program there is usually ample opportunity to reduce energy usage in our portfolios. Many states have written legislation or other administrative directives which establish reduction parameters. Visit with our panel of experts and discuss short and long term solutions and innovative programs. Hear why there are those times where the reduction in energy does not always lead to a reduction in costs. Come to understand what role “cost avoidance” plays in the long term equation. Discuss partnering with utilities on conservation, construction planning, program marketing, rebates and more.

ABOUT THE SPEAKERS

CRAIG CHERRY has over 25 years in the facilities industry. He has over 15 years of experience with designing, installing and programming various building automation systems. Craig has been with the State of Oklahoma for 7 years and has played a vital role in the restructuring of facility operational guidelines. Craig also holds the title of Program Director for Oklahoma Facilities Energy Conservation Program. Craig is a Certified Energy Manager & Energy Auditor.

HOPE DAVIS is the Director of Strategy and Statewide Programs at Massachusetts Division of Capital Asset Management and Maintenance (DCAMM) where she has worked on operational efficiency projects and programs for over 30 years. Her experience includes managing energy performance contracting projects for state buildings, incorporating sustainable design techniques and technologies into new construction/ major renovation projects, and designing programs to improve the maintenance of state facilities. She directed, in collaboration with the Department of Energy Resources, the Commonwealth’s Accelerated Energy Program, which will improve the energy efficiency of 700 state facilities, save over $40 million and create an estimated 4,000 jobs. Hope has served on the board of directors of the Boston Area Sustainable Energy Association, and she is a past president of NASFA.
Commonwealth's facilities portfolio:

- 80 million gross square feet of space
- Over 6300 structures on 276 campuses containing multiple buildings
- Located on over 13,000 real estate parcels

Estimated annual energy costs of $240 million
What the Energy Team Does

Initiates, studies, procures, and supports construction of energy/water projects
Supports OPDC on LEED and sustainable design
Coordinates with utility companies for incentives on behalf of agency
Tracks compliance w/ E.O. 484 (LEED, energy and water tracking)
Supports Administration and DOER on energy/sustainability issues that affect state agencies
Supports Agencies implementing projects, including training, funding, policy, and development of studies
Coordinates grant funding related to energy/water projects
Manages Clean Energy Investment Program on behalf of agencies and A&F
Manages Renewable Energy Credits, Demand Response, and Alternative Portfolio Credits on behalf of Commonwealth Agencies
Supports Integrated Facilities Management (IFM)

Energy Mandates/Directives

Executive Order 484, Clean Energy and Efficient Buildings, April 2007

EO 484 2020 Targets
- 40% ghg emission reduction
- 35% energy reduction
- 30% use of renewable power

Existing Buildings
- ESPC for buildings >100,000 sf
- Retro CX for buildings >50k sf

Mass LEED Plus New Construction standards
- Requires LEED certification
- 20% better than code
- 3rd party commissioning

Accelerated Energy Program

Upgrade 700 Sites in 700 working days

EOLWD
DOE

Commonwealth of Massachusetts
Comprehensive Retrofit

Sheriff's Department Berkshire

Berkshire County Jail and House of Corrections
Pittsfield, MA

Project Overview:
• 160,000 square foot facility dedicated in 2001
• Comprehensive energy and water retrofit may include:
  • Lighting improvements
  • Occupancy sensors
  • Metered timer controls for showers – will save an estimated 45,625 gallons/year
  • Condensing boilers
  • Solar photovoltaic array for on-site power generation
  • Solar thermal heating system for domestic hot water
• Total investment of $2.7M has a 5.4 year simple payback
• AEP Certified-Plus

Retro-commissioning

Executive Office of Labor & Workforce Development

Career Center
Taunton, MA

Project Overview:
• Heating and cooling systems currently operate simultaneously and independently.
• Recommended ECMs:
  ✓ Retro-commissioning

Financials:
• Total investment of $20,000.
• Estimated annual savings of $12,000.

Utility Vendor Program

| Total Sites | 445 sites |
| Total Invest | $24,000,000 |
| Invest per Site | < $100,000 |
| Procurement | Utility vendors and small contracts |

Buildings
 Include small to moderate size buildings, usually under 50,000 square feet, but some may be larger.

Work
 Include audits and installation of simple fix measures (lighting, motors, thermostats and minor controls, weatherization, insulation, appliances, etc.)
Maximizing Savings

TZNE Retrofit Charrette
74 participants across multiple disciplines

TZNE Retrofit Report
Includes Just Do Its ("JDIs")

New Construction

Zero Net Energy Buildings

- 37 LEED certified buildings
- 2 zero net energy designed buildings constructed
- Other ZNEBS in design and construction

Division of Fisheries and Wildlife HQ
Westborough, MA

Summary of Major Accomplishments

INITIATED PROJECTS
- 44 utility vendors
- 11 T-ZNE
- 1 retro-commissioning
- 22 total reviews
- 22 sites
- 92 evaluated NA

RESULTS
- $470 M investment projected with $86 M invested thus far
- $40 M annual savings projected with $9 M achieved thus far
- 25% avg. energy use reduction projected with 20% achieved thus far
- $24 M utility incentives projected with $4.4 M received thus far
- Mapped utility accounts to 71% of sites (from 30% in 2011)

PARTNERSHIPS
- Department of Energy Resources (DOER)
- Leadership Steering Committee (multiple agencies)
- Electric and Gas Utility Companies
- Energy Contractors and Business Representatives
- Public and Private Workforce Advisors

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Program Challenges and Approach

Major Challenges

1. Engage and align a wide range of stakeholders
2. Translate goal of "greening" every facility into definable actions
3. Retrofit 445 small decentralized sites with new system
4. Complete program on-time (in 3 years)
5. Ensure quality retrofits are installed under accelerated schedule
6. Promote access & opportunity for women/minority contractors & workers
7. Reveal program goals and results to employees and public
8. Achieve ambitious energy savings goals
9. Sustain the energy and water savings gains

Challenge #1: Engage and align a wide range of stakeholders

People were the most important element

- Brought together personnel from
  - State Energy Office
  - Facility managers
  - Utility companies
  - Multiple DCAMM departments
- Invested in developing partnerships through
  - Structured committees and working groups
  - Connecting through scheduled and ad hoc meetings

Approach: Establish and Cultivate Partnerships

- Department of Energy Resources (DOER)
- Leadership Steering Committee (leaders from key agencies and utilities)
- Utility companies
- Energy contractors and business representatives
- Public and private advisors and consultants
Challenge #2: Translate goal of “greening” every facility into definable actions

**AEP Site Screening**
- 815 sites were ‘active’
- 780 sites were “in-use” (e.g., not vacant, not going to be demolished, not surplus, and not mothballed)
- 748 sites had not been retrofitted by an energy project since 2007 (in prior 5 years)
- 700 sites actually consumed energy and would potentially benefit from a retrofit

**AEP Site Certification Status**
- 156 sites completed or signed contract
- 61 sites achieved AEP Certification
- 11 sites achieved AEP Certified Plus

**Approach:**
- Identified sites to retrofit, defined “green”, and created AEP Certification levels
- Identified the sites that needed to be retrofitted.
- Segmented sites by “Large”, “Small” and “Occasional use” for targeted levels of retrofit

- Defined “green” and AEP certification levels

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Challenge #3: Retrofit 445 small and decentralized sites with new system

**Approach:**
- Created NEW procurement method
  - Created Utility Vendor Contracting program
  - Developed new DCAMM internal processes (bundling, M/WBE, change orders, close out)
  - Guided and supported new vendors (initial meetings, FAQs, follow up meetings)
  - Assigned work based on successful implementations.

**LESSON LEARNED**
- Contractors don’t always staff up for surge work
- Vendors often level-load work which takes longer to complete.
- Most vendors ended up using their existing staff which resulted in prolonging the time required to complete the surge work.
- Firms that were involved and successful on AEP were flexible and creative with staffing.
- Steps that were expected to take 254 days ended up taking 505 days.
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- Steps that were expected to take 254 days ended up taking 505 days.
- AEP team re-utilized faster firms

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Challenge #4: Complete program on-time (within 3 years)

**Approach:** Establish program controls with transparent reporting
- Prioritized work for implementation.
- Structured reporting milestones.
- Streamlined work through LEAN process improvement workshops.
- Created financial plans incorporating multiple funding sources.
- Established risk register with mitigation plans.

**Schedule:**
- Prioritized work for implementation.
- Structured reporting milestones.
- Streamlined work through LEAN process improvement workshops.
- Estimated budgets and set target milestones to predict spending functions.
- Created financial plans incorporating multiple funding sources.
- Established risk register with mitigation plans.

**Reporting:**
- Issued Monthly PMO Reports and Quarterly Leadership Steering Committee Reports.
Challenge #5: Ensure quality retrofits are installed while maintaining schedule

To retrofit 700 sites, the AEP needed a large pool of facility advisors and vendors. Many of these vendors were new to DCAMM. The AEP implemented a rigorous quality program to ensure every retrofit was done right the first time.

Approach: Implement rigorous quality management

- Standardized Processes
  - Building code checklist
  - Audit data collection templates and reports
  - Accessibility checklist
  - Vendor Statements of Work

- Quality Control (QC) Checks
  - Resident Engineer inspections on small projects
  - Technical reviews
  - Vendor pricing analysis
  - Consistent team feedback

Challenge #6: Promote access and opportunity for women / minority contractors and workers

An important objective of the AEP was to create sustainable job opportunities across the Commonwealth.

Approach: Make labor and workforce connections

- Created and met with Labor & Workforce Advisors
- Developed workforce strategy
- Hosted four vendor outreach events
- Implemented changes to project solicitations
- Conducted contractor surveys

LESSON LEARNED

Workforce Development Takes Time

- A long-term effort requiring the active involvement of multiple stakeholders.
- The participation of women in many important trades and occupations is very low.
- The process of occupational selection and progress is a complex mix of cultural, personal, and economic factors.
- DCAMM and other state agencies do have "some" leverage, and can make use of this in coordination with others in the larger workforce development system.

Challenge #7: Reveal program goals and results to employees and public

Partnership with Facility Managers

To achieve the goals of the AEP, a partnership was established with facility managers.

- Facility managers were instrumental
  - Selecting ECMs
  - Coordinating implementation of ECMs and renewable energy systems at each site
  - Collaboration with energy auditors and designers

Approach: Establish an "InReach" program for facility managers

- Conducted survey to solicit needs of facility managers
- Provided AEP posters and certification plaques
- Supported broader communication of program including regional press events
- Developed training and ongoing M&V ideas

AEP Certification Plaques & Posters
Challenge #8: Achieve ambitious energy savings goals

Goal to reduce energy consumption by 25% over 700 state sites.
At half-way point, current efforts were projected to only produce a 22% reduction.
Higher targets for deeper savings were needed to achieve AEP and Massachusetts goals.

Approach: Innovation and TZNE
- Innovation
  o Published Innovative technology online web intake form
  o Piloted innovative technologies
  o Participated in MassCEC First Customer Expo
- Towards Zero Net Energy (TZNE)
  o Held TZNE charrette
  o Piloted 9 TZNE projects
  o Pushed all large sites to higher savings targets

Lesson Learned: Energy Analytics Can Help Sustain Gains
- Real-time facility energy usage data (EEMS) is available at 470 state buildings across 25 million SQFT.
  - At UMass Lowell, used EEMS to identify measures to implement to reduce annual energy costs.
  - For example, energy usage at Tsongas Center was 32% higher year over year.
  - Identified and fixed problem with control system.

Challenge #9: Sustain the energy and water savings gains

AEP collaborated with facility managers.
Developed new methods and ways of sustaining these impressive energy savings gains.

Approach: Enhance Facility Energy Management Capabilities
- Mapped facility utility accounts to online energy reporting
- Developed site- or facility-based data management system
- Expanded training and new measurement and verification (M&V) approaches.
- Increase participation in demand response programs.

Lesson Learned: Facilities Energy Conservation - The Big Picture
- NOAA Coastal Flood Exposure Map – Critical Assets

Going Forward – AEP 2.0
# AEP 2.0 – Future Plans

## IMPLEMENT ONGOING PROJECTS
- 69 Large comprehensive and retro-commissioning projects
- 267 utility ‘simple fix’ projects
- Increase continuous commissioning
- Enhance communication and feedback
- Re-examine previously retrofitted sites to find areas for more improvement

## SUSTAIN GAINS
- Increase use of measuring and testing
- Train facility managers & occupants
- Implement continuous commissioning
- Enhance communication and feedback
- Re-examine previously retrofitted sites to find areas for more improvement

## ADVANCE PERFORMANCE
- Develop additional project opportunities
- Deliver towards Zero Net Energy Buildings
- Incorporate resiliency
- Offer more creative financing
- Model total cost of ownership into economics

## OKLAHOMA FACILITIES ENERGY CONSERVATION PROGRAM (aka: 20x2020 Program)
- Benchmark state facilities energy usage
- Reduce state energy expenditures 20% by 2020 compared to FY2012 baseline
- Fully fund the program with existing state agency budgets through savings generated by reducing energy expenditures
- Implement a formalized organizational behavior-based or performance-based energy conservation program
- The selected behavior-based or performance-based vendor shall provide an initial "fee-free" period of not less than (12) months
- Utilize a commercially available energy accounting software program that adheres to IPMVP (International Performance Measurement and Verification Protocol) standards

## BEHAVIOR CONSULTANT REQUEST FOR PROPOSAL CHALLENGES
- State’s utility expenditures were unknown
- Over 100 different state organizations own, manage and/or operate facilities
- Legislation mandates organizations participation in the program, yet had no penalties for non-participation or delayed participation
- All state expenses to begin program would come out of existing budgets
- Software acquisition had not been completed when Behavior Consultant RFP began
PROGRAM CHALLENGES

- Legislation called for a 20% reduction in facility energy expenditures not a reduction in usage
- Over the next several years projected energy cost increases will outpace the projected energy usage savings
- State owned/managed facilities are not done through a single organization
- 71 different organizations
- Most organizations did not have money in current budget to hire an Energy Manager or pay an employee for entering the historical utility data
- No startup budget for program costs (Program Director, Software, Software Administrator, etc.)
- Historically electricity costs in Oklahoma are low
  - Oklahoma $0.0717 kWH
  - United States $0.1062 kWH
- 310 different utility vendors

LESSONS LEARNED

- Performance and energy conservation programs have the best chance of success if managed by the organization that pays the bills for facility maintenance and operations
- Benchmark utility expenditures first
  - This will help find the low hanging fruit
  - Much easier to find billing errors
  - You cannot manage what you do not know!