Is the Second Time a Charm?

Higher Education Success Stories with ESPCs

Better Buildings Summit

May 9, 2016

3:45-5:00 PM

Agenda

- Introductions
- University of Maryland ESPC Evolution: From 1.0 – 3.0
- Right-Sizing Your ESPC: Towson University Case Study
- System-Wide Implementation: ESPC Initiative at Kentucky Community & Technical College System
- Q&A

Today’s Presenters

- Susan Corry, University of Maryland
- Steve Kolb, Towson University
- Billie Hardin, Kentucky Community & Technical College System

University of Maryland ESPC Evolution: From 1.0 – 3.0

Susan Corry

U.S. DEPARTMENT OF ENERGY

UNIVERSITY OF MARYLAND

Is the Second Time a Charm?
Higher Ed Success Stories with ESPCs

Susan Corry
Engineering & Energy
University of Maryland
Better Buildings Summit
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UMD ESCO Projects to Date

- **<u>First</u>** ESCO Project – by the numbers
  - ➢ Project development began in January 2008
  - ➢ Finalized in November 2008
    - $20M project
    - Covered 1.2M sf over 9 buildings
    - 22% energy savings across the project
    - Guaranteed annual savings of $1.9M+
  - ➢ BOR/BPW approval in Spring 2009
  - ➢ Substantial completion in Fall 2011
  - ➢ Final payout in Fall 2015
  - ➢ 13 years of M&V and limited maintenance contract valued at approximately $800k

UMD ESCO Projects to Date

- **<u>Second</u>** ESCO Project – by the numbers
  - Project development began in January 2012
  - Finalized in November 2012
    - $1.2M project
    - Covered 7 athletic facilities
    - 6% energy savings across the project
    - Guaranteed annual savings of $187k
  - BOR/BPW approval in early 2013
  - Substantial completion in November 2013
  - Final payout in Fall 2015
  - 13 years of M&V valued at approximately $211k

Compare & Contrast

- Similarities
  - Same contract vehicle

- Differences
  - Much smaller (manageable) scope
  - Less ambitious ECMs
  - Less complicated installation (scheduling)
  - Limited impact from future space changes
  - Straightforward M&V
  - No maintenance contracts

Lessons Learned

- Be aware of the limitations of the ESCO team and your in house resources to manage them (design and construction)
- Be realistic with energy savings and expectations
- Be careful with ECM selection and associated savings
- Realize you are working in occupied spaces and what that means in terms of management (communications, scheduling, etc.)
- Identify goals early to share with ESCO design team
- Limit number of ECMs & related M&V
- Review financial model carefully regarding maintenance cost savings, utility rate escalations, maintenance contracts

UMD ESCO 3.0

- Targeting 8 buildings totaling 1.3M sf
- Estimating project value of approx $12-15M
- Focusing on equipment replacement and infrastructure improvement paired with low hanging fruit such as lighting & energy recovery systems
  - AHU replacement
  - Pneumatic to DDC upgrades
  - Exhaust manifold/consolidation
- Limited M&V
- Limited number of ECMs

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Right-Sizing Your ESPC: Towson University Case Study

Steve Kolb

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A Towson University ESPC Case Study

Stephen E. Kolb
Towson University Energy Manager

150 years

TOWSON UNIVERSITY

Brief Overview of Towson University

- Part of The University System of Maryland
- Located just outside of Baltimore
- 2^{nd} Largest College Campus in Maryland
- Sitting on 328 acres
- 56 Buildings of all types/age
- Appx. 25,000 faculty, staff and students
- Annual Energy Spend of appx. $10 million

A Towson University ESPC Case Study

- Past 7 years, TU entered into 3 ESPC potential projects with 1 of 3 resulting in successful project

- Ranging in size from approximately $5 million to over $30 million

- Initially included various ECM's including HVAC, Lighting & Controls, Building Envelope, Chillers, Boilers, Water Conservation, Solar, etc.

1st TU ESPC Project (ESPC Project)

- Project scope grew to over $30 million –began to make TU administration nervous. ROI was increasing.
- Scope was being developed by an “Energy Committee” made up various TU employees from various departments. The committee began spinning its wheels due to inability to agree on ECM’s.
- Some committee members began adding solar PV, geothermal, rain gardens, etc.
- Facilities AVP finally dissolved Energy Committee and assigned ESPC Project to new Energy Manager and new Director of Energy
- ESPC Project was pared down to manageable size. All ECM’s were studied for feasibility/economics. Many ECM’s were removed to get to acceptable ROI (down to ~5 years)

2nd TU ESPC Project (ESPC Project)

- University decided to spend up to $8 million on ESPC Project if ROI was acceptable. (~5 years or less)

- To get ROI down to 5 years, scope was changed to Lighting and Controls for this phase. Cost was ~$8 million with $2.5 million in utility rebates. Energy savings approximately $1 million year

- Project was a significant success for TU. All proposed savings were realized. Approximately 10% reduction in energy was measured in all buildings 1 to 2 years following completion of project. (Lighting energy reduction was 30% to 50% across campus.)


READ
READ
REFERENCE

Successes Of TU ESPC Project

- Manpower—ESPC is able to provide maximum resources with little notice to complete larges projects in short periods of time
  Examples:
  - ESPC completed room by room, fixture by fixture lighting audit of majority of campus (38 buildings) in 4 months
  - ESPC was able to complete lighting replacement/retrofit of entire buildings during evening hours in several weeks each—sometimes deploying as many as 30 workers in an active building
  - ESPC was able to complete 38 buildings, approximately 30,000 fixtures and 10,000 sensors, in approximately 16 months

- Engineering & Design Resources—ESPC is able to provide maximum resources and pull from several sources to ensure proper expertise is utilized

- Documentation—ESPC is able to quickly provide detailed project design and construction documentation

- Project Management—ESPC can provide PM necessary to facilitate all aspects of the project from design through commissioning

Challenges of TU ESPC Project

- Costs—Required constant and exhaustive negotiating to get costs to an acceptable ROI. Due to multiple layers of project management, and project/product markups, ESPC costs quickly escalated.

- ESPC loaded up fees at front end of project making ROI out of reach initially

- Engineering & Design—Required significant input from TU to get design where we wanted it. We had to define scope and provide exact product specifications on all materials. (<u>Do not leave it up to ESPC to define scope or product/material specifications.)</u>

- Project Management—Required very tight project management from TU. Found that ESPC PM role was floating and often changing from one person to another or was off-site most of time. Be sure to specify project management expectations during the design phase. Expect owner project management through all phases of project.

Learnings in Working With ESPC

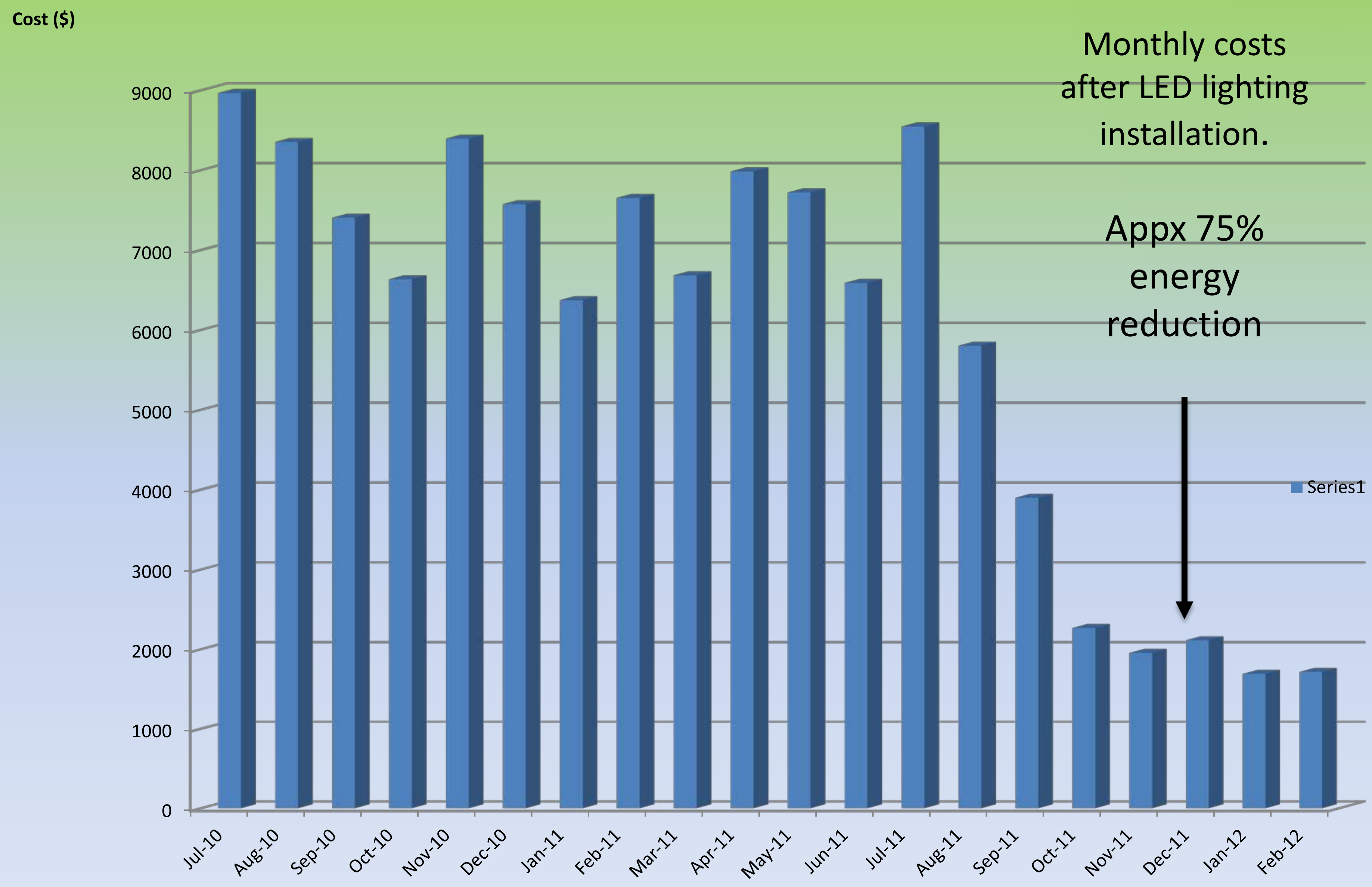
- If your organization has the cash, do the work yourself. This way the savings comes back to the organization instead of to the ESPC. If your organization does not have cash but desperately needs equipment replaced, using an ESPC is a viable alternative. Example: project could result in 20% savings with 18% going to ESPC and 2% going to owner.

- If you need it done quickly and there is not a lot of complexity in the construction and M&V, an ESPC could be a viable solution.

- If you are installing a complex system such as CHP or a new Chiller/Controls systems, using an ESPC could add some challenges and might not be the best solution.

- Be prepared to spend a great deal of back and forth negotiating fees/costs and scope/products. Be mindful of multiple layers of added costs.

Parking Garage Monthly Cost Savings After ESPC Lighting Retrofit to LED



LINE ITEM	LOCATION				EXISTING						PROPOSED	
	BUILDING	FLOOR	MAP ID	ROOM DESCRIPTION	PRE QTY	WATTS	PRE CODE	PRE FIXTURE DESCRIPTION	PRE ANNUAL HOURS OF OPERATION	WATTS	Original Post Code	Original Retrofit Description
1	Burdick Hall	1	1000	Lab 111	36	114	A44T8N/PC	2'x4' Recessed Troffer w/ (4) F32T8 Lamps & (1) Normal Power Electronic Ballast w/ Paracube Lens	5317	114	A42RT5	Install New Lithonia 2RT5 2'x4' Recessed Fixture w/ (2) SYL FP28T5/841 Lamps & (1) SYL QTP 2x28 T5 Program Rapid Start Electronic .95 Normal-Power Ballast; Include IDEAL Power Plug Disconnect
2	Burdick Hall	1	1000	Lab 111	6	60	I1X60	Fixture w/ (1) 60w Incandescent Lamp	5317	60	CF1X13SI	Relamp w/ (1) Sylvania 13w Compact Fluorescent Lamp
3	Burdick Hall	1	1001	Room 100A	2	89	A43T8N/PARA	2'x4' Recessed Troffer w/ (3) F32T8 Lamps & (2) Normal Power Electronic Ballasts w/ Parabolic Lens	2600	89	A42RT5	Install New Lithonia 2RT5 2'x4' Recessed Fixture w/ (2) SYL FP28T5/841 Lamps & (1) SYL QTP 2x28 T5 Program Rapid Start Electronic .95 Normal-Power Ballast; Include IDEAL Power Plug Disconnect
4	Burdick Hall	1	1001	Room 100B	2	89	A43T8N/PARA	2'x4' Recessed Troffer w/ (3) F32T8 Lamps & (2) Normal Power Electronic Ballasts w/ Parabolic Lens	2600	89	A42RT5	Install New Lithonia 2RT5 2'x4' Recessed Fixture w/ (2) SYL FP28T5/841 Lamps & (1) SYL QTP 2x28 T5 Program Rapid Start Electronic .95 Normal-Power Ballast; Include IDEAL Power Plug Disconnect
5	Burdick Hall	1	1001	Room 100C	4	89	A43T8N/PARA	2'x4' Recessed Troffer w/ (3) F32T8 Lamps & (2) Normal Power Electronic Ballasts w/ Parabolic Lens	2600	89	A42RT5	Install New Lithonia 2RT5 2'x4' Recessed Fixture w/ (2) SYL FP28T5/841 Lamps & (1) SYL QTP 2x28 T5 Program Rapid Start Electronic .95 Normal-Power Ballast; Include IDEAL Power Plug Disconnect
6	Burdick Hall	1	1001	Room 100D	4	89	A43T8N/PARA	2'x4' Recessed Troffer w/ (3) F32T8 Lamps & (2) Normal Power Electronic Ballasts w/ Parabolic Lens	2600	89	A42RT5	Install New Lithonia 2RT5 2'x4' Recessed Fixture w/ (2) SYL FP28T5/841 Lamps & (1) SYL QTP 2x28 T5 Program Rapid Start Electronic .95 Normal-Power Ballast; Include IDEAL Power Plug Disconnect
7	Burdick Hall	1	1001	Room 100E	4	89	A43T8N/PARA	2'x4' Recessed Troffer w/ (3) F32T8 Lamps & (2) Normal Power Electronic Ballasts w/ Parabolic Lens	2600	89	A42RT5	Install New Lithonia 2RT5 2'x4' Recessed Fixture w/ (2) SYL FP28T5/841 Lamps & (1) SYL QTP 2x28 T5 Program Rapid Start Electronic .95 Normal-Power Ballast; Include IDEAL Power Plug Disconnect
8	Burdick Hall	1	1001	Closet 100F	4	89	A43T8N/PARA	2'x4' Recessed Troffer w/ (3) F32T8 Lamps & (2) Normal Power Electronic Ballasts w/ Parabolic Lens	2600	89	A42L	Install New Lithonia SP8 2'x4' Prismatic Recessed Troffer w/ (2) SYL FO32/28w/841XP Lamps & (1) SYL QTP PSX 2x32 Electronic Low-Power Ballast; Include IDEAL Power Plug Disconnect
9	Burdick Hall	1	1001	Room 100G	4	89	A43T8N/PARA	2'x4' Recessed Troffer w/ (3) F32T8 Lamps & (2) Normal Power Electronic Ballasts w/ Parabolic Lens	2600	89	A42RT5	Install New Lithonia 2RT5 2'x4' Recessed Fixture w/ (2) SYL FP28T5/841 Lamps & (1) SYL QTP 2x28 T5 Program Rapid Start Electronic .95 Normal-Power Ballast; Include IDEAL Power Plug Disconnect
10	Burdick Hall	1	1001	Room 100H	4	89	A43T8N/PARA	2'x4' Recessed Troffer w/ (3) F32T8 Lamps & (2) Normal Power Electronic Ballasts w/ Parabolic Lens	2600	89	A42RT5	Install New Lithonia 2RT5 2'x4' Recessed Fixture w/ (2) SYL FP28T5/841 Lamps & (1) SYL QTP 2x28 T5 Program Rapid Start Electronic .95 Normal-Power Ballast; Include IDEAL Power Plug Disconnect
11	Burdick Hall	1	1001	Room 100J	4	89	A43T8N/PARA	2'x4' Recessed Troffer w/ (3) F32T8 Lamps & (2) Normal Power Electronic Ballasts w/ Parabolic Lens	2600	89	A42RT5	Install New Lithonia 2RT5 2'x4' Recessed Fixture w/ (2) SYL FP28T5/841 Lamps & (1) SYL QTP 2x28 T5 Program Rapid Start Electronic .95 Normal-Power Ballast; Include IDEAL Power Plug Disconnect
12	Burdick Hall	1	1001	Room 100K	2	89	A43T8N/PARA	2'x4' Recessed Troffer w/ (3) F32T8 Lamps & (2) Normal Power Electronic Ballasts w/ Parabolic Lens	2600	89	A42RT5	Install New Lithonia 2RT5 2'x4' Recessed Fixture w/ (2) SYL FP28T5/841 Lamps & (1) SYL QTP 2x28 T5 Program Rapid Start Electronic .95 Normal-Power Ballast; Include IDEAL Power Plug Disconnect

Thank You Very Much!

Questions?

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System-Wide Implementation: ESPC Initiative at Kentucky Community & Technical College System

Billie Hardin

U.S. DEPARTMENT OF ENERGY

KENTUCKY COMMUNITY AND TECHNICAL COLLEGE SYSTEM ESPC INITIATIVE

Better Buildings Summit

May 2016

Presented by:
Billie Hardin
KCTCS Sustainability Project Manager

KCTCS GREEN INITIATIVE

KCTCS PROFILE

- Created in 1997
- 16 colleges; 73 campuses/locations
- KY's largest provider of postsecondary education
  - 700+ credit program options
  - 127,211 credit-seeking students attended KCTCS in academic year 2013-14
  - 87,027 credit-seeking students fall 2014, an approximate increase of more than 68.5%
    - 10,480 dual enrollment
    - 37,170 online students
    - Part-time students: 59%
    - Full-time students: 41%

KCTCS PHYSICAL PLANT

KCTCS infrastructure totals 8.7 million gross square feet:

- KCTCS-owned space
  - Totals approximately 7.7 million gross square feet
  - Education and program space owned comprises approximately 7.5 million square feet in 358 buildings
- KCTCS free or leased space
  - Totals approximately 1.0 million gross square feet in 298 buildings
  - Education and program space free or leased comprises approximately 0.5 million square feet

KCTCS PHYSICAL PLANT

Since inception in 1997, authorization received for 45 new state funded construction projects or major renovation projects, totaling approximately $500 million

- 33 projects completed between 1998 and 2008, having approximate total scope of $276 million
- 11 projects completed during the 2008-10 biennium, having approximate total scope of $200 million
- 1 project completed in the 2012-14 biennium

DEFINITION

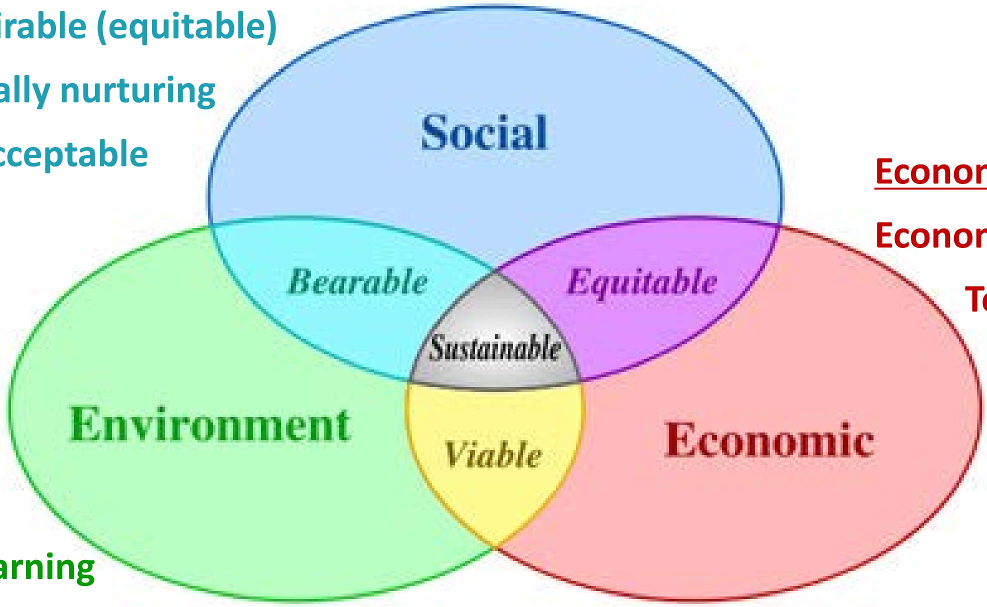
"Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

Social Criteria:

Socially desirable (equitable)

Psychologically nurturing

Culturally acceptable



Economic Criteria

Economically sustainable

Technologically feasible

Operationally viable

Environmental Criteria

Environmentally robust

Generationally sensitive

Capable of continuous learning

Definition Source: Our Common Future: Report of the World Commission on Environment and Development also known as the Brundtland Report), United Nations, 1987.
Graphic Source: Johann Dréo and translated by User:Pro_bug_catcher, March 2006/ Translated January 2007 and Accessed October 21, 2010, at http://en.wikipedia.org/wiki/File:Sustainable_development.svg#file

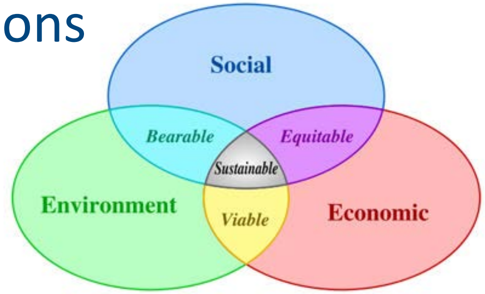
KCTCS GREEN+ SUSTAINABILITY OBJECTIVES

- Promote sustainable communities inside and outside of KCTCS, using an all-encompassing, no-silo, collaborative approach, through adoption of sustainable development goals
- Provide transformative education and training, equipping individuals with knowledge and tools to live and work in a global, green, knowledge-based economy
- Facilitate cultural change to balance the social, environmental, and economic criteria of the sustainability triple bottom line across KCTCS
- Enhance the efficiency and effectiveness of KCTCS
- Protect Kentucky's natural resources and environment
- Embrace and practice social justice across KCTCS
- Benchmark progress toward sustainability using nationally recognized sustainability metrics

KCTCS GREEN+ INITIATIVE

DRIVING FORCES

- **Economics**
  - Sustainable economic development – **Green Jobs**
  - Budget
- **Environment**
  - Indoor
    - Air quality
    - Learning environment
    - Productive work environment
  - Outdoor
    - Pollution
    - Landfill capacity
    - Ecological stewardship
    - Resource management
- **Energy**
  - Electric utilities (rate structures)
  - Limitation of nonrenewable energy
  - Global energy demand
- **Stakeholders**
  - Customers
  - Vendors
  - Government
  - Future generations



RELATED STATE STATUTES – SELECT EXAMPLES

Area	Kentucky Revised Statute
Energy Efficiency	KRS 56.770, KRS 56.777, KRS 56.782, KRS 164A.580, KRS 56.775, KRS 45A.615, KRS 45A.351, KRS 45A.352
Energy	KRS 42.580 to KRS 42.588 and KRS 152.710 to 152.720
Green Purchasing	KRS 45A.645, KRS 45A.500 to KRS 45A.540
Pollution	KRS 224.46-305, KRS 224.46-310, KRS 224.46-315, KRS 224.46-320, KRS 224.46-325, KRS 224.46-330, KRS 224.46-335, KRS 224.46-510, KRS 224.46-520
Recycling	KRS 224.10-650, KRS 224.10-660, KRS 224.10-620, KRS 45A.520, KRS 160.294, KRS 141.390
Education	KRS 157.900, KRS 157.905, KRS 157.910, KRS 157.915

KCTCS ENERGY SAVINGS PERFORMANCE CONTRACTING

- Legislative authority
- KCTCS – Commonwealth of Kentucky partnership
- Second Kentucky postsecondary institution to engage ESPC initiatives (2004)

KCTCS ENERGY SAVINGS PERFORMANCE CONTRACTING

Round 1: Five contracts, three energy savings companies

Contract	ESPC Contract Groupings	Award Year	Payback Period or Contract Length	TOTAL Guaranteed Energy Savings over Payback Period
1	Jefferson Madisonville	2004	13 years	$2.7 million
2	Bluegrass Elizabethtown Owensboro	2008	12 years	$3.5 million
3	Bowling Green Henderson Hopkinsville West KY [C]	2008	13 years	$6.4 million
4	Hazard Somerset Southeast KY	2010	14 years	$9.2 million
5	Ashland Big Sandy Gateway Maysville	2011	13 years	$6.3 million
			Totals	$28.1 million

KCTCS ENERGY SAVINGS PERFORMANCE CONTRACTING

Round 2: Two contracts to date, two energy savings companies

Contract	ESPC Contract Groupings	Award Year	Payback Period or Contract Length	TOTAL Guaranteed Energy Savings over Payback Period
1	Madisonville Owensboro West Kentucky	2015	14 years	$11.8 million
2	Ashland Bluegrass	2016	14 years	$9.9 million
			Totals	$21.7 million

KCTCS ENERGY SAVINGS PERFORMANCE CONTRACTING

- Emphasis shift
  - Round 1
    - Low hanging fruit, e.g., lighting
    - $28M guaranteed savings
    - Payback achieved early
  - Round 2
    - Deferred maintenance, high-ticket items
      - Commonwealth Energy Management Control System (CEMCS)
    - Payback target 14 years
    - $21.7M guaranteed savings

Round 1

- Incorporated Leadership in Energy and Environmental Design (LEED) standards into building and design

KCTCS ESPC CEMCS MAJOR COMPONENTS

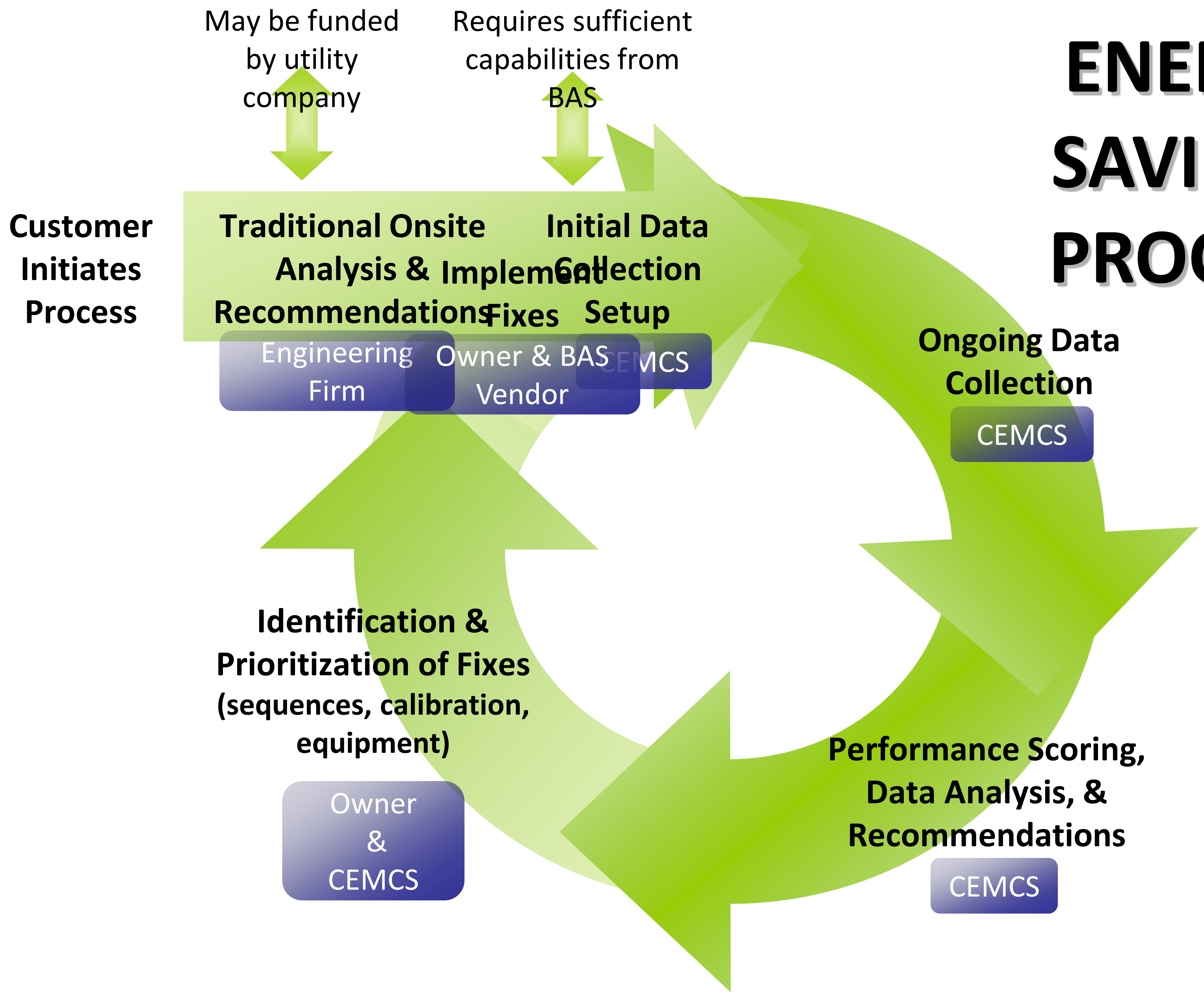
Four Major Components

- Utility Monitoring and Analysis
  - Monthly bill analysis, interval data, rate structure verification
- Building Automation Integration and Diagnostics
  - BAS output data in Sequel will be analyzed for sequence of operations
- Automated Utility Bill Paying (Centralized?)
  - Electronic Data Interchange (EDI) will be developed by Utility providers and fed into CEMCS for usage and payment
- Work Order Generation and Tracking
  - Each agency may have different CMMS
  - CEMCS attempts to notify designated contacts of issues that need attention

BUILDING AUTOMATION INTEGRATION AND DIAGNOSTICS

- Integrates building heating, ventilation, air conditioning (HVAC) and lighting controls into a agency preferred operator interface that can be accessed from any web based browser
- Allows facility managers to make informed decisions about HVAC and lighting operations, including the ability to turn off systems when appropriate (unoccupied)
- Has built in diagnostics, to assist facility managers with troubleshooting all major energy users

ENERGY SAVINGS PROCESS



http://kyenergydashboard.ky.gov/

OPPORTUNITIES AND LESSONS LEARNED

"Our chief usefulness to humanity rests on our combining power with high purpose."
(Teddy Roosevelt)

KCTCS GREEN+ INITIATIVE

Discussion

U.S. DEPARTMENT OF ENERGY

Thank you!

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