U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

FEMP Federal Energy Management Program

ISWG Panel Presentation:

Mastering Campus Sustainability Management – Tools for Success

September 22, 2016

FEMP Large Campus Innovative Change Team

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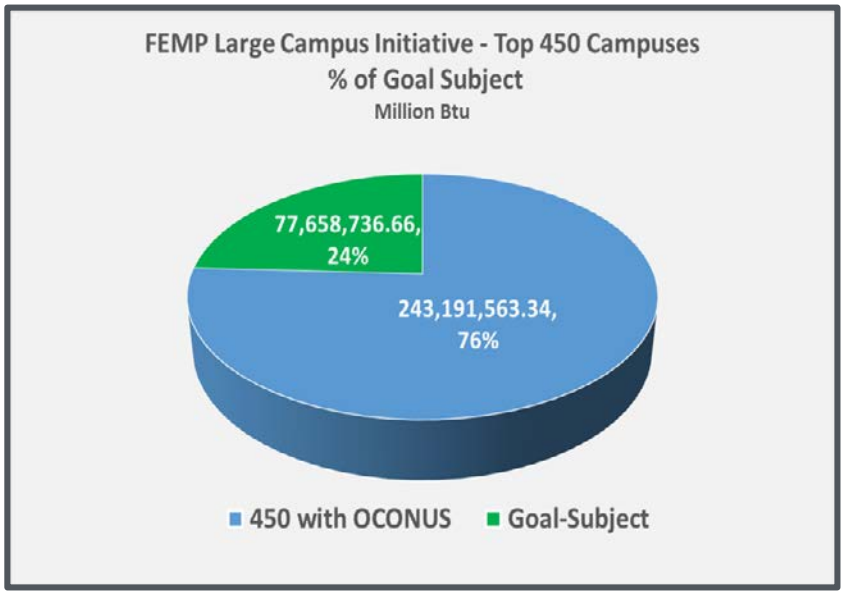
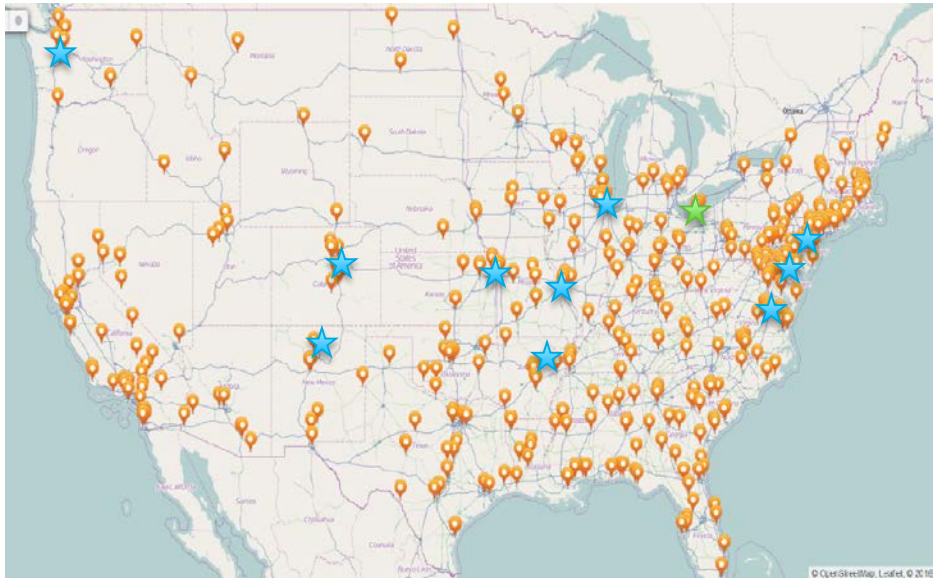
Why a “campus” approach to Sustainability?

- There is a real benefit to re-consider how facilities consume energy; despite many of the Federal mandates, such as the Guiding Principles, taking a building focus, agencies largely manage energy on a site, or campus, basis.

- The FEMP Sustainability Team, through the LCIC team, has reviewed EISA reporting data and assessed that a target group consisting of the top 450 energy consuming campuses utilizes around 75% of all Federal energy use.





LCIC 450 Focus & Active Site Engagements

Why a “campus” approach to Sustainability? – 2 Reasons

1. Interconnectivity of Federal Sustainability Requirements

Key Terms	SSPP	EMS	GPs	EO13693
GHG	X	X		X
Sustainable Buildings	X	X	X	
Clean & Renewable Energy	X	X	X	
Water Use Efficiency & Management	X	X	X	X
Fleet Management	X	X		X
Sustainable Acquisition	X	X	X	X
Pollution Prevention & Waste Reduction	X	X		X
Energy Performance Contracts	X			
Electronics Stewardship	X	X		
Data Centers	X			
Climate Change Resilience	X		X	X
Energy Efficiency	X	X	X	X
Energy Audits		X		
Metering		X	X	
Land Stewardship		X		
Integrated Design			X	
Benchmarking			X	
Indoor Environmental Quality			X	
Net Zero Energy				X

2. Interconnectivity of Federal Campus personnel, teams, and actions.

ISWG Panel Presentation – Campus Sustainability

Agenda

Section	Panel Presenter
1. Planning	**Kim Fowler** Pacific Northwest National Laboratory
2. Example Focus: Energy	**Otto VanGeet, PE** National Renewable Energy Laboratory
3. Project Financing	**Jesse Maestas** FEMP LCIC Lead - Contract Support

Ten Steps to a "Super" Energy Program – Today's Review

1. **Build a network**
2. Use data
3. Set goals
4. ***Develop plan***
5. ***Find funding***
6. **Communicate**
7. Engage your network
8. **Take action**
9. **Measure and verify progress**
10. **Recognize and reward accomplishments**

Step 1 - Build a Network

- Identify key stakeholders at your campus and broaden your internal network to include unusual suspects
  - Contracting
  - Information Technology/Cybersecurity
  - Mission
  - Human Resources
  - Building occupants
  - Management/Leadership
- Build an external network
  - Peers
  - Community members
  - Technical service providers

Step 4 - Develop Plan

- Connect energy, water, waste, and sustainability strategies whenever feasible
- Assign stakeholders to be accountable for different aspects of the plan
- Develop a clear plan of action and tasks
- Have a clear focal point and expected outcomes that can be communicated to others
- Develop schedule that includes regular progress checks with the stakeholders

Step 4 - Develop Plan: Strategy vs. Strategery

- **Strategy** is a plan of action designed to achieve a particular goal
- **Strategery** is a reactive, quickly developed 'plan' of action passed off as strategy.

http://www.bing.com/videos/search?q=SNL+strategery&view=detail&mid=EDECA9699022352A961EEDECA9699022352A961E&FORM=VIRE

- If the 'strategy' meeting you're holding was called ten minutes ago it's a strategery meeting
- If you're developing the plan at midnight on your 10th cup of strong coffee, it's probably strategery
- If three participants in the meeting are dialing in separately by phone to discuss it, it's strategery
- If the 'strategic plan' needs to be implemented at 9am tomorrow morning and completed by 10am it's a strategeric plan
- If you're writing it on a plane, train or the back of a car, it's strategery

Source: http://www.forbes.com/sites/dansimon/2012/09/11/5-differences-between-strategy-and-strategery/#63eab1b12af8

Step 5 - Find Funding

- Pursue funding from within the agency
- Use other people's money, when possible
- Look for low-/no-cost strategies that could be part of the Quick Wins
- Quantify the cost of delay if the plan is not fully implemented
- Use your extended network to look for new funding sources

Step 6 - Communicate

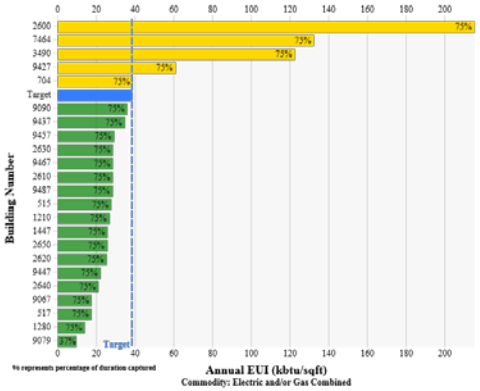
- Make senior leadership aware of the plan, and if possible get them to commit to the goals and participate
- Look at the plan and goals monthly to assess progress and help focus efforts
- Share the plan with internal and external stakeholders
- Engage campus occupants through competitions or general communications
- Track and share progress on goals

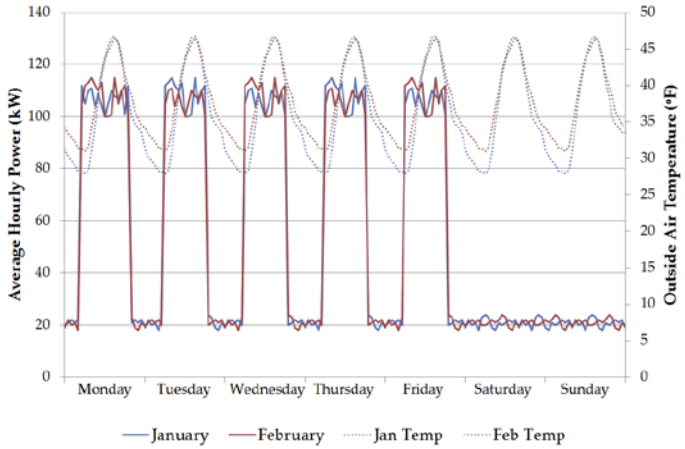
Step 8 - Take Action

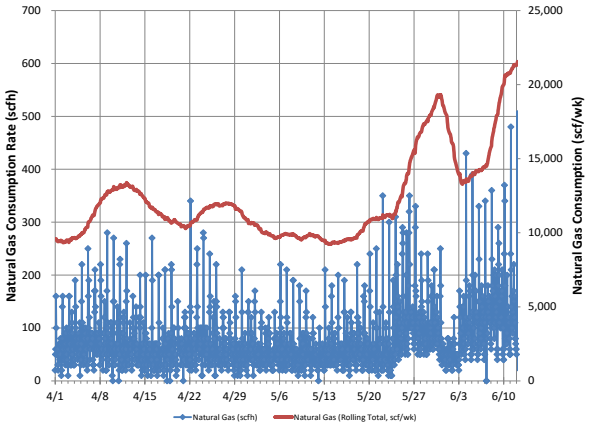
- Pick one thing to focus on
- Use technology to your advantage
- Automate where logical
- Offer training resources for all key stakeholders
- Fix the basics
- Include a focus on quality maintenance
- Hold competitions

Step 9 - Measure and Verify Progress

- Develop a measurement and verification plan that is logical for the existing level of data
- Collect and analyze available data on a regular basis
- Use the data to further improve performance and to communicate successes with key stakeholders
- Continuous monitoring and assessment is preferred, where technical and human resources are available







Energy Efficiency & Renewable Energy

Step 10 - Recognize and Reward Accomplishments

- Publicly recognize or reward stakeholders and others that are actively reducing energy, waste or waste
  - Recognition in internal newsletters
  - Small token rewards such as food, pins, bags
  - Submission into Federal awards program
  - Notes in their annual performance review

- Recognize key internal and external stakeholders whenever possible

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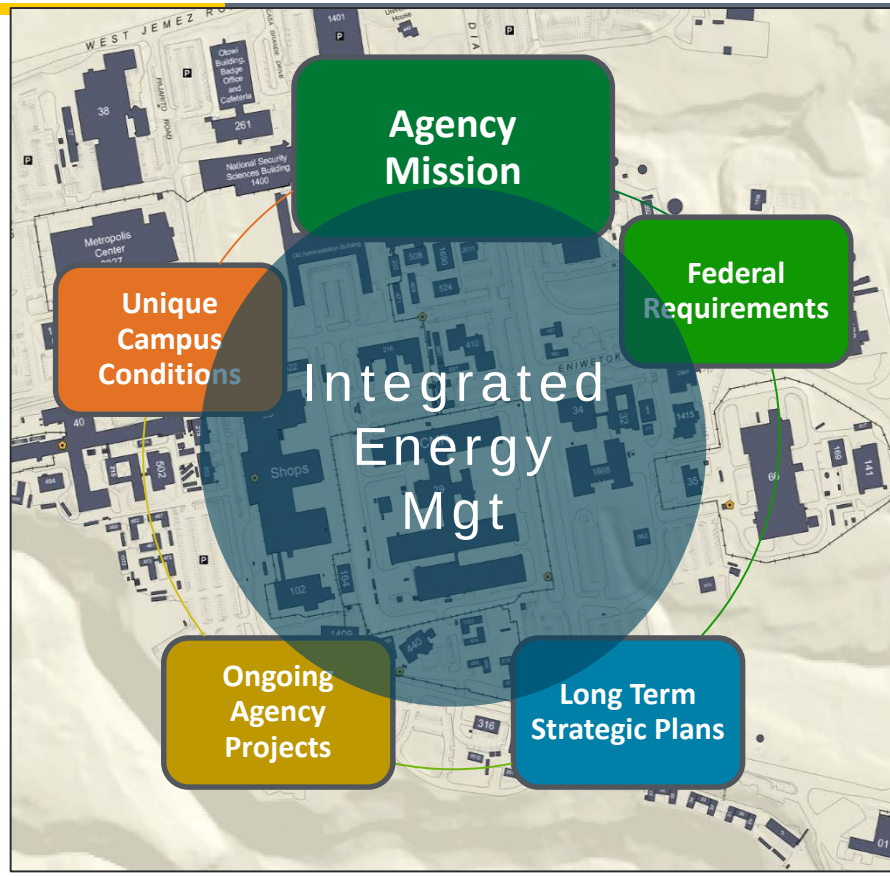
Campus Energy Management

1. Determine Federal mandates and Agency sustainability goals (EE/RE).
2. Survey agency for current and planned EE/RE projects – compare to 1 for "gap".
3. Conduct a pre-screen of RE and EE opportunities for each campus. EE opportunities depend on audit data.
4. Review findings of pre-screen with agency to refine assumptions (e.g. land availability). Optimize between EE/RE opportunities to meet goal and mission.
5. After maximizing onsite RE, develop a procurement strategy for purchase of offsite RE.
6. Consolidate EE/RE recommendations (including procurement mechanisms) into a roadmap to meet goals.



Energy Efficiency, then Renewable Energy (EERE)

- All new buildings should be as efficient as possible with the goal of net zero annual energy.
- Determine the energy use and energy cost of existing buildings and infrastructure.
- Reduce energy use by behavior, installing EE lighting, HVAC and controls and reducing plug loads.
- Install RE (Solar, Wind, Biofuels) to meet remaining energy needs.
- Consider District Energy solutions
- Monitor all site buildings (use FDD) energy performance and energy sources

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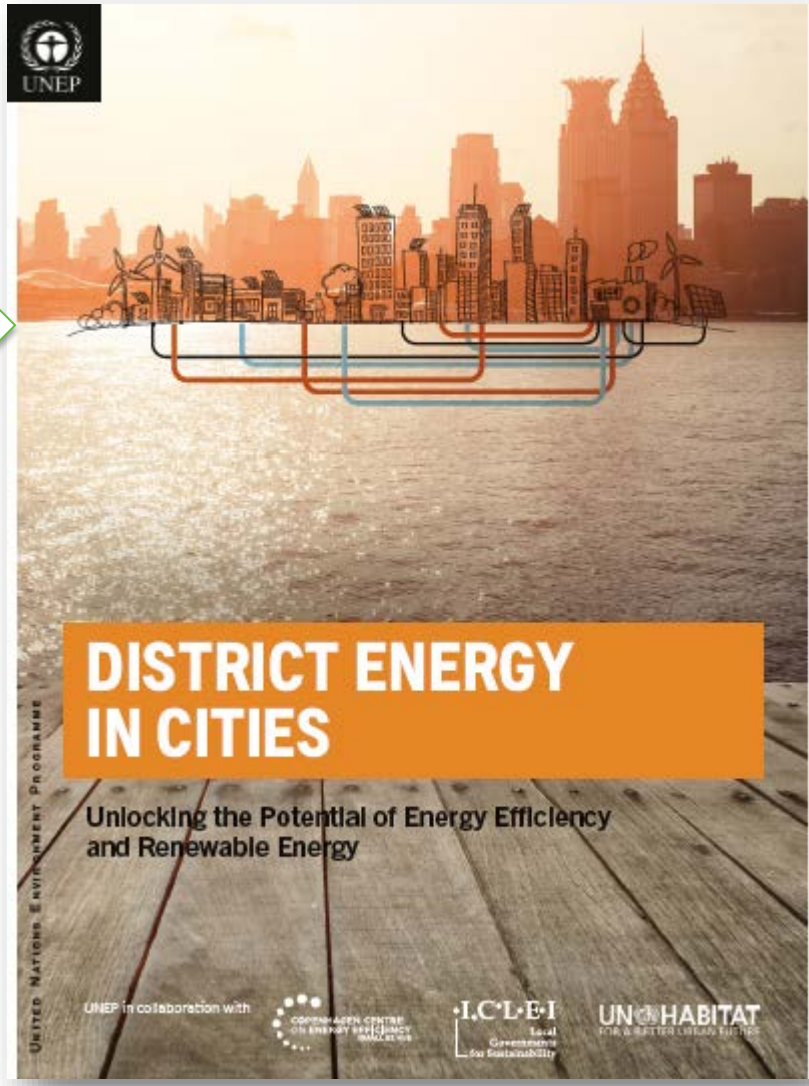
Moving from Net Zero Energy Buildings to Net Zero Energy Districts

Net Zero Energy Buildings

- EO – all buildings (5000+ SQ FT) beginning planning in FY2020 must be designed to achieve NZ by 2030

- % (DOE = 1%) Existing building NZ energy, water or waste by 2025



Net Zero Energy Districts

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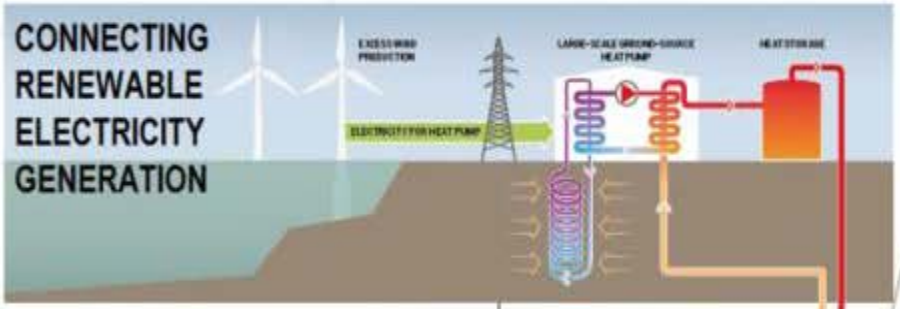
Net Zero Districts

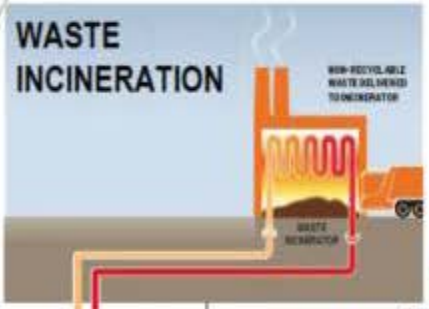
- High-Performance Buildings
  - Rooftop PV/Electric Vehicles, Battery Storage
  - Building Automation, Connected campus
- District Energy
  - Solar gardens, district geothermal and ambient loop heat pumps, industrial waste heat capture, CHP
  - Thermal and stationary battery storage

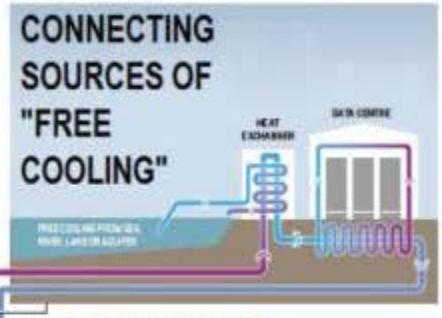
DISTRICT ENERGY IN CITIES

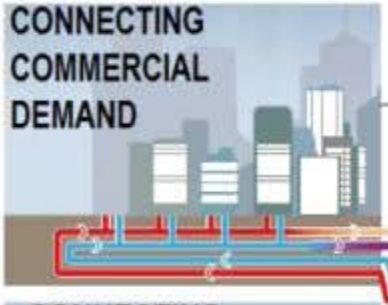
WHAT IS DISTRICT ENERGY?

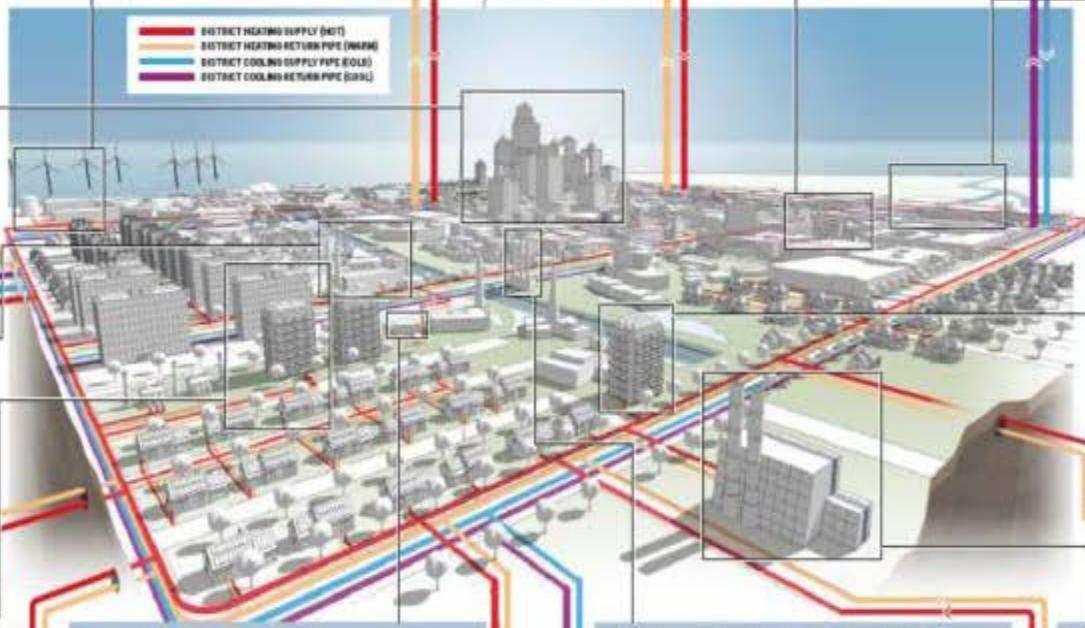
UNEP

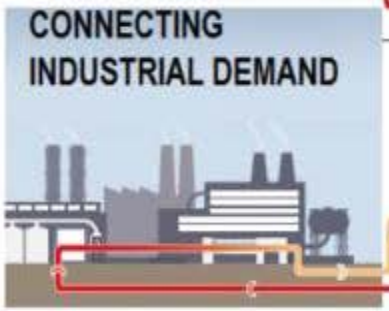


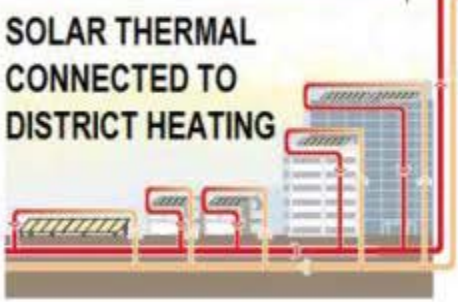


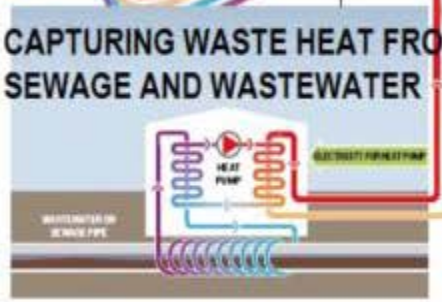


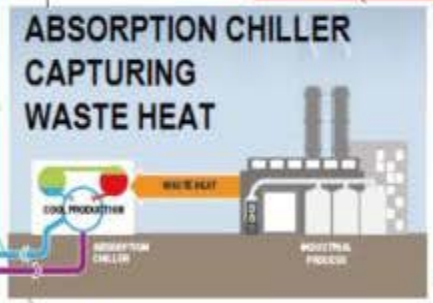


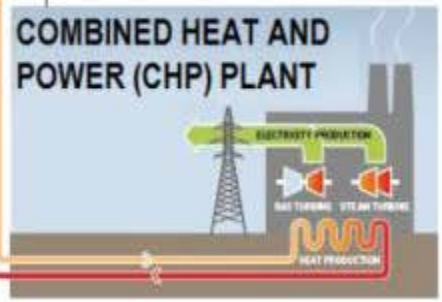












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Better Buildings Accelerator: Zero Energy Districts Accelerator

Zero Energy Districts are an important pathway toward optimizing energy efficiency in new construction because of the cost savings and environmental and economic benefits they can provide. Specifically, Zero Energy Districts are designed and built to maximize energy efficiency and use renewable energy at a district scale. Zero Energy District Accelerator partners will work together and with DOE to demonstrate and document the practicality of taking action to cost effectively meet zero energy goals and commitments. By completing a detailed energy master plan, governance and business case model, and development pathway for a Zero Energy District, partners will identify the best practice approaches of considering well-defined energy performance goals and incentives for the entire building and district lifecycle, including planning, design, construction, and operation.

Featured Solutions

Zero Energy Buildings - Tales from Those Who Have Built Them 2016 Better Buildings Summit

The ZEBs just keep coming! Learn how a bank, an elementary school and a manufacturing complex are using the zero energy design process of integrating energy and architecture to become leaders in their industry.

Net Zero Campus

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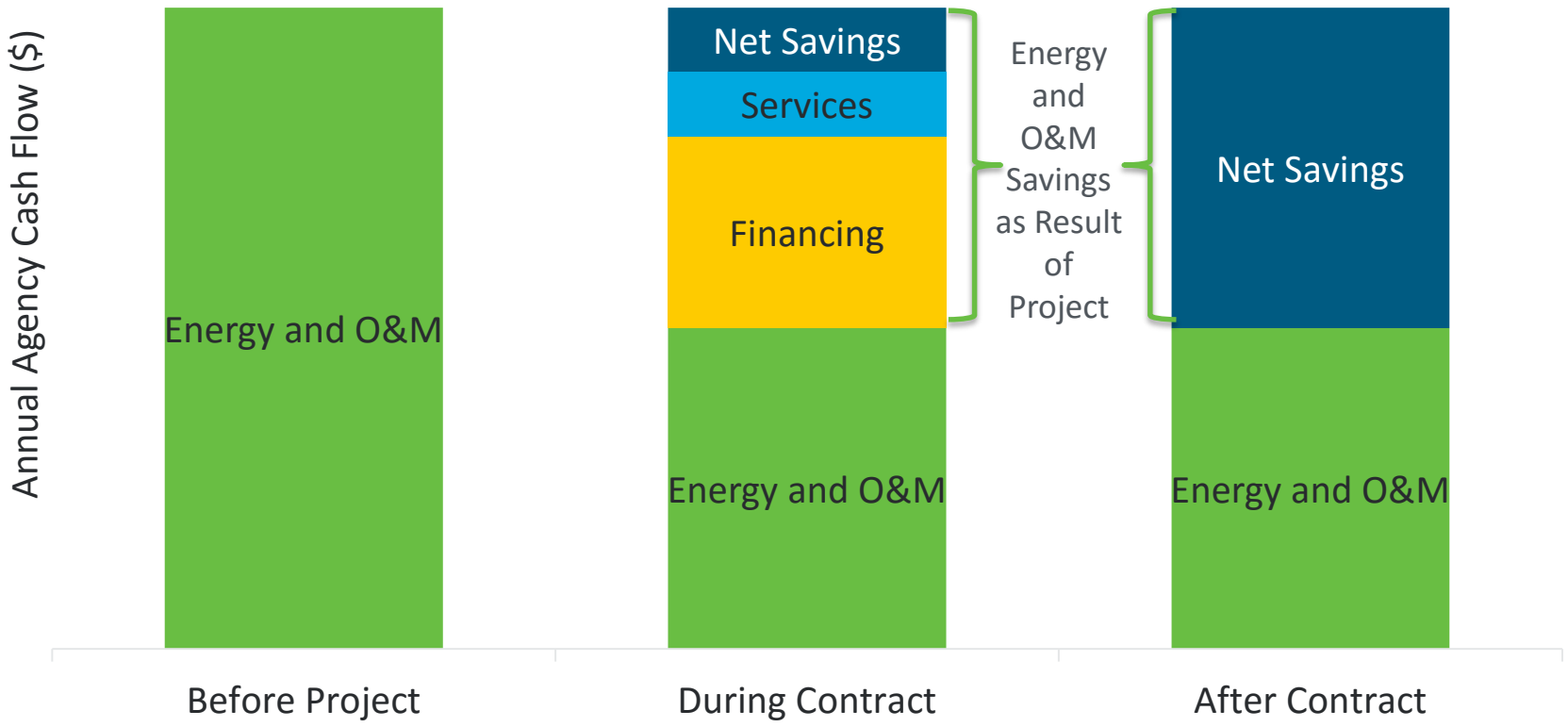
Major Types of Alternatively Financed Projects

- Energy Savings Performance Contract (ESPC)
  - Legislation: 42 USC 8287 and 10 CFR 436
  - Alt Finance Project with an ESCO under IDIQ/MATOC
- ESPC ENABLE
  - Legislation: 42 USC 8287 and 10 CFR 436
  - Alt Finance Project with an ESCO on the GSA Schedule 84, SIN 246-53
- Utility Energy Service Contract (UESC)
  - Legislation: 42 USC 8256 and 10 USC 2913-2866
  - Alt Finance Project with a servicing electric, natural gas or water utility
- Power Purchase Agreement (PPA)
  - Legislation: 40 USC 501 FAR Part 41 10 USC 2922a & others
  - Power generation project various potential providers

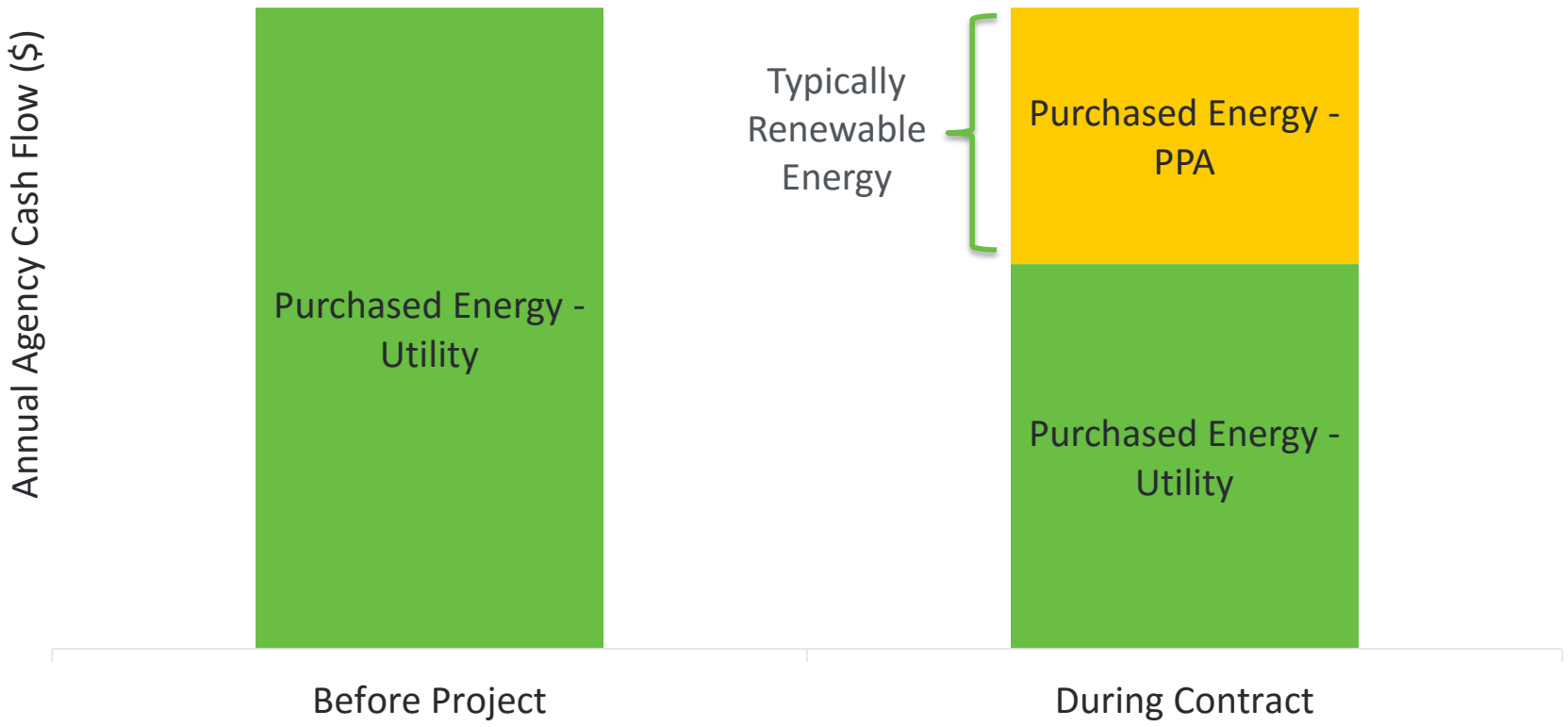
Basic Cash Flow of ESPCs and UESCs

- Reallocation of Government's Utility Bill



Basic Cash Flow of PPAs

- May or may not result in cost reduction



Making Use of Alternatively Financed Projects at a Campus

- Address multiple ECMs to leverage savings
- Integrate with Capital Improvement Plans
- Incorporate new or non-standard ECMs
- Include multiple buildings and/or sites

Leveraging ECM Savings

- Combining high and low payback ECMs
- Facilitating the execution of long payback ECMs within a reasonable financing period
- Balancing the term with budget expectations allows for the largest, most successful project
- Being creative to incorporate unique ECMs can enhance the project financials

Capital Improvement Plans

- Alignment with Capital Improvement Plans can:
  - Bring appropriations to reduce financed amount
  - Execute work that would otherwise be unfunded
  - Avoid executing ECMs in facilities to be demolished or repurposed
  - Improve operations and minimize required maintenance

Inclusion of new or non-standard ECMs

- A variety of building types allow for additional ECMs
  - Laboratory Space
  - Data Center Measures
  - Warehouses and Hangars
  - Streetlights/Runways Lighting

- Additional space can create additional opportunities
  - Central Plant Expansions
  - Large Scale Renewable Energy Systems
  - Power Generation
  - Energy Distribution Improvements

Example 1: Northeast Boiler Conversion Summary

- Campus in the Northeast with an energy budget of $10M/yr
- Campus includes 2 warehouses, 4 barracks/dorms, and a large data center
- Heated by fuel oil boiler which
  - Requires fuel tanks and related environmental concerns
  - Requires large recapitalization in the next 10 years
- Parking lots, roofs and two lots allow for PV
- Housing is to be reduced by 25% in next 5 years
- Facility Engineers have executed many projects, but ECM potential is:
  - Interior and exterior lighting
  - Boiler conversion to natural gas
  - PV system
  - Motor upgrades
  - Envelope upgrades
  - CHP upgrade

Example 1: Northeast Boiler Conversion Results

- Balancing low and high payback allows to include PV
- Removal of fuel oil reduces environmental burden
- Proper planning targets only housing that will remain in 5 years
- Due to high base demand, CHP is a practical upgrade
- LED replacements in warehouses, street lighting, and security lighting reduces maintenance burden

ECM Description	Savings	Cost	Payback
LED Lighting Retrofit	$233,333	$700,000	3
Boiler Conversion	$500,000	$4,000,000	8
Motor Upgrades	$20,833	$125,000	6
PV System	$41,667	$1,000,000	24
CHP Upgrade	$111,111	$1,000,000	9
Barrack/Dorm Envelope	$50,000	$700,000	14
Total Project	$956,944	$7,525,000	**7.9**

Example 2: Mixed Building Potential Project Summary

- 5 distinct buildings in the same region
- All buildings have had energy projects deployed or were built in the last 10 years
- All buildings are in the same utility territory
- Facility Engineers have executed many projects, but ECM potential is:
  - Interior lighting at building 1, 2, 3, & 4
  - PV parking lot cover in building 5
  - Central plant upgrade in building 4
  - HVAC Upgrades in buildings 1, 2, 3

Example 2: Mixed Building Potential Project Results

- Leveraging 5 buildings instead of one allows for a better project
- ECM mix allows the installation of PV that would not be possible otherwise
- The building mix can be viewed as a campus
- Since buildings use same utility, a UESC is also an option

	Building Included?							
ECM Description	**1**	**2**	**3**	**4**	**5**	**Savings**	**Cost**	**Payback**
LED Lighting Retrofit	X	X	X	X		$180,000	$900,000	5
Central Plant Upgrade				X		$250,000	$2,000,000	8
HVAC upgrades	X	X	X			$20,833	$125,000	6
PV System					X	$37,037	$1,000,000	27
Total Project						$487,870	$4,025,000	**8.3**

Lessons Learned

- Larger ‘campuses’ allow for a wider ECM mix of both technology and payback
- Creativity in technology and financing is important to maximize project success
- Coordination with different levels of planning and execution will help avoid project problems in the performance period
- Balance is the most important thing in the project

ISWG Panel Questions / Discussion / Contact Info

Questions?

Panel Presenter	Contact Information
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