GSA Net Zero
Renovation Challenge Charrette

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Executive Summary

The General Services Administration (GSA), Office of Federal High Performance Green Buildings (OFHPGB) and the Federal Energy Management Program (FEMP) have launched an effort to enhance and increase the usage of Energy Savings Performance Contracts (ESPCs) on GSA buildings. This effort is centered on the Net Zero Renovation Challenge (the Challenge), which will pave the way for increased energy savings working towards net zero energy projects delivered through ESPCs.

Rocky Mountain Institute (RMI) and GSA convened a workshop at RMI offices in Boulder, Colorado on October 27th and 28th, 2011. The goal of the workshop was to examine the existing ESPC structure and process, and identify improvements to unlock the possibility of deep savings and eventual net zero ESPCs. Workshop attendees included representatives from the 16 ESCOs qualified under FEMP's ESPC IDIQ contract, GSA, DOE and DOD and we examined ways to modify and expand the ESPC process to attain deeper energy savings during comprehensive retrofits of existing buildings. GSA introduced the Net Zero Renovation Challenge, and then the group brainstormed current barriers and possible solutions to achieve greater savings on ESPC projects.

GSA, DOE and DOD seek to identify ways to improve the ESPC process and expand use of ESPCs to finance installation of energy saving technologies and practices in existing buildings. The lessons learned during the charrette and through the outcomes of the challenge will help to identify structural, contractual and technical impediments and will result in change in procurement practice; in budget practice; in measurement; in fee structures. Other countries have achieved 95% savings upon 10-year terms, we believe 75% savings are achievable – with today's technology.

The Net Zero Renovation Challenge

The Net Zero Energy Renovation Challenge will use 30-35 GSA buildings across the country as demonstration projects for deep savings from ESPCs. GSA invites all of the 16 FEMP prequalified ESCOs to participate and create plans to bring the buildings to net zero energy. A team of independent experts will assess awards for the challenge based on criteria in six main categories: absolute energy savings, progress towards Energy Independence and Security Act 2007 (EISA)/GSA goals, financial creativity, technical creativity, replicability/applicability, and design process and analysis. The overall winning project teams will be considered for additional work provided by GSA (with some other awards being given for winners of individual categories). GSA launched the Challenge in early August 2011 and will announce the buildings before the end of the year. GSA will award and implement the projects over the next two years. For the Challenge, it is not anticipated that there will be any additional appropriated funding available.

The goal, simply put, is to achieve maximum savings possible with no technological limits.

Overview of the Workshop

The one-and-a-half-day workshop focused on enabling deep energy savings through ESPCs. On the first day, GSA introduced the Challenge and RMI shared expertise and case studies on achieving deep energy savings in retrofits. During a working lunch, a representative from the National Renewable Energy Laboratory (NREL) discussed the role renewable energy systems play in achieving net zero energy through case studies, tools and technologies, bundling, and potential difficulties. FEMP followed that with a presentation on underutilized energy conservation measures. During the afternoon, attendees divided into five groups and addressed barriers and potential solutions in the following topic areas: Analysis and Integrative design, Project Economics, ESPC Delivery Process and Procurement, Occupant Behavior and Workplace Culture, and Measurement and Verification (M&V). On the second and final day of the workshop, attendees discussed in depth each of the breakout groups' key conclusions. GSA concluded the day with a more detailed explanation of the Challenge and next steps.

The workshop was a collaborative and transparent environment that enabled very candid input from the ESCOs and reactions and commitment from GSA. Momentum for the Challenge was high and both the ESCOs and GSA alike are enthusiastic about the possibilities. Input indicates that ESPC projects could fairly easily and consistently double the amount of typical savings achieved from 20% to >40%.

High Priorities

Some of the most prevalent themes from the workshop are summarized below. These were identified in a session where each attendee responded to a question asking for the single most impactful thing that could improve the process to enable deeper retrofits. The opportunities were supported and expanded upon in the break out groups.

Opportunities for Deep Retrofits	Proposed Solution
Time is money. By reducing/streamlining the ESCO award process (currently 18 months on average), GSA can get to savings sooner, reduce costs to ESCOs and add 20-30% from savings to project budgets.	GSA and FEMP intend to expedite the process of ESCO selection based on the experiences of the Challenge – targeting 30 days for selection and 8 moths for award.
Shared risk between the ESCO and the agency would enable deeper savings from ESPCs	Certain risk sharing between parties and/or policy changes to encouraged reduced interest rates for available financing would lower project costs and make greater energy savings more viable. Combining appropriated funding for designated projects with ESPCs could lead to bigger savings, more robust projects and better buildings overall.
Redefine or clarify eligible savings, particularly as it relates to O&M and avoided capital costs.	Including avoided capital and maintenance costs (even over just 1-2 years in the future) can increase project financing. Clear and consistent guidance from GSA on what the ESPC can include is necessary.
ESCOs very rarely guarantee occupant behavior energy use reduction – largely because the savings from an occupant behavior program are hard to quantify and verify.	ESCOs could incorporate occupant behavior savings into bundles (through the implementation of each measure) instead of as a stand-alone measure. Solutions to share risk, or incentives for ESCOs to over-perform would encourage the inclusion of occupant behavior. These energy reductions can either be explicitly measured (as a measure or part of a bundle) or included in other relevant measures by stipulating energy savings and the implementation of occupant engagement.
For broader uptake of the ESPC process, the GSA program should support aggregated, multi-building projects.	Bundling of ESPC projects (and associated financing) could lower overhead, implementation, and financing costs and could make more measures viable.
Uncertainty with M&V stems from the operation of the building after installation.	One option is to treat operations and maintenance (O&M) as a part of a bundle (additional savings are often possible – and can improve project financials) and assign responsibility to the ESCO – to oversee the existing O&M contractor.

Next Steps

The workshop provided a good platform to understand and prioritize the challenges and solutions to make the Net Zero Renovation Challenge a success. Next steps for the Net Zero Renovation Challenge include the following:

#	Task	Timeline
1	GSA to schedule call with all ESCOs to review	The week of December 12th, 2011
2	GSA will issue the Notice of Opportunity (NOO) (including list of buildings)	January 2012
3	ESCOs respond to NOO with interest, approach and preferred buildings	February 2012
4	GSA assigns buildings to ESCOs	March 2012
5	ESCOs perform IGA	April-July 2012
6	Contracts awarded	August 2012

Summary of the GSA Net Zero Renovation Challenge

The General Services Administration (GSA), Office of Federal High Performance Green Buildings (OFHPGB) and the Public Buildings Service (PBS) seek to identify ways to improve the Energy Savings Performance Contract (ESPC) process and expand use of ESPCs to finance installation of energy saving technologies and practices in existing buildings.

The Net Zero Energy Renovation Challenge will use 30-35 GSA/PBS buildings across the country as demonstration projects for deep savings from ESPCs. GSA invites all of the 16 FEMP prequalified ESCOs to participate and create plans to bring the buildings to net zero energy. A team of independent experts will assess awards for the challenge based on criteria in six main categories: absolute energy savings, progress towards Energy Independence and Security Act 2007 (EISA)/GSA goals, financial creativity, technical creativity, replicability/applicability, and design process and analysis. The overall winning project teams will be considered for additional work provided by GSA (with some other awards being given for winners of individual categories). GSA launched the Challenge in early August 2011 and will announce the buildings before the end of the year. GSA will award and implement the projects over the next two years. For the Challenge, it is not anticipated that there will be any additional appropriated funding available.

Federal Requirements for GSA Buildings

Federal agencies are subject to numerous energy reduction requirements. Today, 97% of GSA's greenhouse gas (GHG) emissions come from energy consumption in federal buildings and leased space. The Energy Independence and Security Act of 2007 (EISA 2007) mandates all federal agencies to reduce facility energy intensity to 49 kBtu/gsf by 2020. This equates a 37.5% reduction from the FY 2003 baseline of 78 kBtu/gsf. Additionally, EISA 433 requires a fossil fuel reduction of 65% by 2015 phasing up to 100% fossil fuel use reduction by 2030[1].

More broadly, GSA is committed to achieving a Zero Environmental Footprint[2] and has put forth a Strategic Sustainability Performance Plan[3], which outlines how to meet this commitment.

ON THE APPROACH

"The government's approach to risk in ESPCs has changed dramatically. We are more willing than ever before to accept risk, because honestly we've looked at these projects, and there's not that much risk there. The choice is clear when weighed against the risk – the opportunity cost – of foregoing the use of this tool."

—Kevin Kampschroer
GSA

[1] http://www1.eere.energy.gov/femp/news/news_detail.html?news_id=11683
[2] http://www.gsa.gov/portal/content/130449
[3] http://www.gsa.gov/portal/category/100551

Approach to Net Zero

Definition of Net Zero

There are four commonly accepted industry definitions for net zero energy: site, source, cost, and carbon. For the purpose of the Challenge, net zero site energy is the preferred metric since it is comprehensive, keeps the analysis relatively straight forward, and complies with all EISA 2007 requirements[4]. Net zero site energy specifies that the site produces at least as much renewable energy as it consumes summed over a year[5]. Acceptable forms of renewable energy to meet this goal include onsite photovoltaic (PV), solar hot water, low impact hydroelectric, wind, biomass, biogass, ethanol and biodiesel[6]. The Challenge does not permit the use of renewable energy credits (RECs) to offset site energy use.

While the ultimate objective of the Challenge is to accelerate the realization of net zero energy in all GSA buildings, net zero energy is not a strict requirement for winning the Challenge. Projects should maximize energy savings in a cost-effective manner, and include the creation of a roadmap for attaining net zero as part of their implementation plan.

The pathway to Net Zero starts with efficiency

Existing buildings are full of energy efficiency opportunities waiting to be realized. While some such opportunities are obvious and easily attainable, talented design teams can often achieve much deeper savings by rethinking the project and producing reductions in capital cost. RMI defines deep energy retrofits as those that achieve much larger savings—over 50% reduction in energy use—than those of conventional, shallow retrofits. However, deep retrofits are more characterized by their process than by their results (i.e. there could be a deep retrofit that only achieves a 35% energy savings but took all the right steps in the right order).

Buildings are composed of numerous systems and integrative, whole-building strategies recognize how individual efficiency measures can affect other building systems and attributes. Improvements to the building envelope, for example, can reduce mechanical system loads and equipment, which in turn may increase usable floor area and reduce operating costs. RMI promotes an integrative, whole-system approach to achieve profitable and innovative deep retrofits. This approach is a highly collaborative and iterative design process in which design teams employ whole-systems thinking to create multiple benefits from single expenditures, often justifying energy savings greater than 50%. By simply recognizing how systems are interrelated, ESCOs can cause small improvements to cascade into substantially larger benefits.

[4] Executive Order 13514 (10/2009) which clarifies EISA 2007, defines a zero-net-energy commercial building a high-performance commercial building that is designed, constructed, and operated to require a greatly reduced quantity of energy to operate; to meet the balance of energy needs from sources of energy that do not produce greenhouse gases; in a manner that will result in no net emissions of greenhouse gases; and to be economically viable.

[5] Calculated as net energy – not accounting for source generation (carbon intensity) or transmission losses.

[6] This definition is consistent with the NZE definitions put forth by NREL (http://www.nrel.gov/docs/fy06osti/39833.pdf) and generally accepted in the industry EXCEPT for the inclusion of RECs.

Right Steps in the Right Order

In the deep energy retrofit process, it is important to identify the right steps to take, and equally important to perform these steps in the right order. Following this process will enable project teams to realize the most cost-effective energy reductions:

1. **Define the specific end-user needs**
   What are the needs and services required by the building occupants? Understand this first, rather than jumping right to the equipment needed to provide the service.
2. **Understand the existing building structure and systems**
   Understand and assess the current state of the building. What needs are not being met? Why not?
3. **Understand the scope and costs of planned or needed renovations**
   What systems or components require replacement or renovation for non-energy reasons (and are there any other available funding sources)? What are the costs or interruptions to service or occupancy? Identify these planned renovations early, as it may be possible to combine this with a desired energy efficiency retrofit to optimize the overall return on investment.
4. **Reduce loads**
   Select measures to reduce loads:
   a. First, through passive means (such as increased insulation)
   b. Then, by specifying the most efficient non-HVAC equipment and fixtures
5. **Select appropriate and efficient HVAC systems**
   After reducing loads as much as possible, consider what HVAC system types and sizes are most appropriate to handle the drastically reduced loads.
6. **Find synergies between systems and measures**
   Seek synergies across disciplines and find opportunities to recover and reuse waste streams. Through this exercise, you can often realize multiple benefits from a single design decision.
7. **Optimize controls**
   After the most appropriate and efficient technologies have been selected, the focus should shift to optimizing the control strategies.
8. **Incorporate renewables**
   Once the energy consumption has been drastically reduced, it is appropriate to investigate and size renewable energy options that are well suited to the climate and site.
9. **Realize the intended design**
   Tune the owner's project requirements (OPR), implement measurement and verification (M&V) and continuous commissioning to ensure full realization of the intended design.

Goal Setting – Striving Towards the Theoretical Minimum

The purpose of developing the theoretical minimum is to set the bar for what is technically possible for building performance. Then, as constraints arise (e.g. LED lighting everywhere in the building is not cost-effective or raising the temperature setpoint to 80°F conflicts with existing tenant lease requirements) and the targeted level of savings starts to drift away from the technical potential, the team learns why that is and what conditions would need to exist to make that measure feasible. It changes the retrofit paradigm from 'We can't because…' to 'We could if…'.

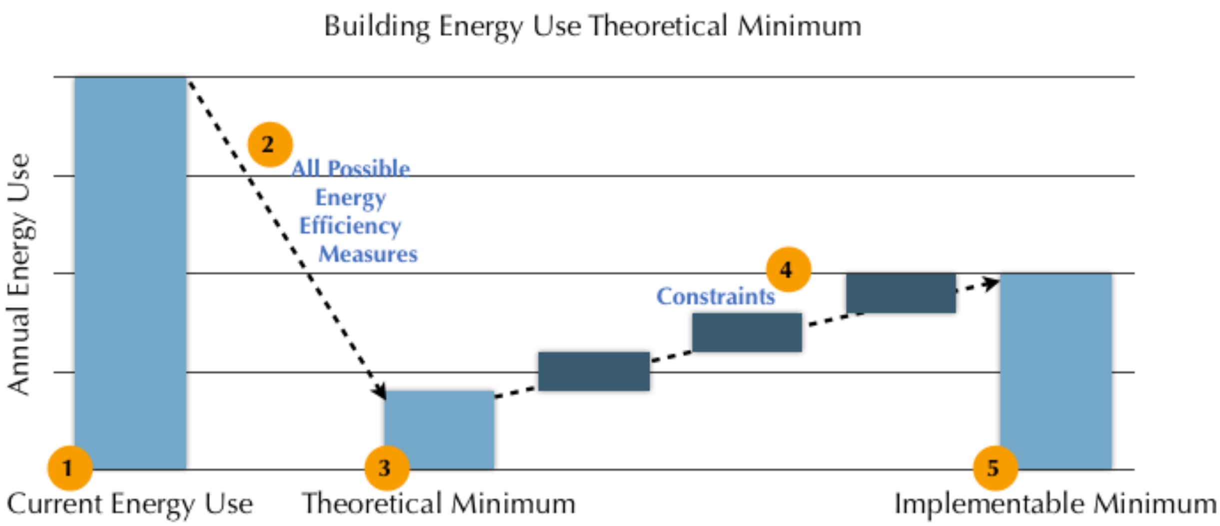


Figure 1: Theoretical Minimum process diagram

The Theoretical Minimum energy use estimate is the highest amount of efficiency available for consideration as part of an ESPC, or conversely, the minimum amount of renewable energy needed to attain net zero.

Integrative Design and Analysis

In the conventional approach of an ESPC, design teams are typically required to evaluate measures in isolation and based on simple payback period (SPP). A simple payback approach underestimates the value of an ECM because it only accounts for annual energy cost savings and capital cost. It ignores other significant costs and benefits (rebates, maintenance savings, avoided immediate and future capital investments, etc.) as well as savings that accrue beyond the timeframe of the simple payback period. Because the inclusion of additional cash flows or the impact on long-term operating costs can significantly alter the decision to include or exclude a particular measure, a simple payback metric is not ideal. In sharp contrast, a comprehensive LCCA (Life Cycle-Cost Analysis) gives decision-makers the full financial implications of various design decisions to make better decisions about bundles of measures and the project as a whole.

On The Challenge

"We have been looking at each of the elements on their own, but they have to be considered integratively. We haven't been using that in the ESPC evaluation."

—Kevin Kampschroer
GSA

Collaboration Among Stakeholders

A deep retrofit process also involves all the stakeholders in a building throughout the entire analysis and design process. Stakeholders include ownership, facilities management, design engineers, occupants, energy modelers, finance, vendors, and the utility. Some of the most insightful and effective ideas often come from sources typically not integrated into the design process. In existing buildings, the maintenance and facilities managers often possess much of the institutional knowledge of the building and can make valuable contributions to the deep retrofit.

Tenant/Occupant Engagement

Occupants are the ultimate end users of buildings and consumers of energy. In GSA buildings, occupants may have strict and varied tenant-space requirements depending on their work activities. However, their contributions to a successful ESPC are viable, and can make or break a deep retrofit project. Occupant impact on energy use derives from a combination of tenant interior fit-out and occupant behavior. Occupants engaged during the design phase, typically through workshops, offer benefits to the overall design. A comprehensive discussion with the occupants on the goals, measures, and options of the ESPC will ease the transition and improve occupant engagement. Upcoming tenant guidelines (based on the Byron G. Rogers Federal Courthouse retrofit project) will assist in integrating occupants into an energy retrofit.

Right Timing the Retrofit

To fully achieve the effects of a deep retrofit, those implementing the program should piggyback efficiency improvements on already planned (and budgeted) capital improvements and breaks in occupancy, apply integrative design principles, take advantage of advanced energy modeling, auditing, and life cycle cost analysis methods, and commit to ongoing metering and commissioning in order to verify savings while illuminating opportunities for continuous improvement. The resulting deep retrofit process improves the economics of efficiency, while incurring myriad other benefits to building owners, occupants, and society as a whole.

Balancing Efficiency with Renewable energy

Renewable energy systems are necessary for any net zero project, and ESPCs have often included the installation of renewable energy. Renewable energy should typically be explored when all cost effective efficiency measures have been assessed. Cost effectiveness for efficiency in a net zero project is slightly different from a more traditional project since it occurs when the cost of efficiency is less than the cost of renewable generation. For instance, on the new net zero NREL Research Support Facility in Golden, Colorado, the project team used a value of $5.23/watt, the all-included cost of PV, and the cost effectiveness limit of efficiency. For each watt they saved in demand reduction and efficiency, they avoided $5.23/watt for PV to offset that load. Any efficiency measure that cost less than $5.23 for each watt it saved was implemented.

Renewable energy systems such as solar, wind, and hydro are also variable, and could benefit from additional systems (dispatchable renewable energy, storage, or tracking) to optimize their generation. Bundling renewable energy and efficiency, with a possible microgrid offers additional savings, and could greatly increase the size of the ESPC.

Technologies to Achieve Deep Energy Savings

The technology to achieve net zero and EISA 433 goals exists – but may not always be self-funding (specifically large solar arrays and biomass or biogas combined heat and power (CHP)). Financially sound net zero projects begin by reducing heating and cooling loads and minimizing plugloads (lighting, appliances, and controls). And despite the integrative effects available from bundled measures, ESPCs have typically revolved around lighting, controls, heating, and cooling ECMs. A deep retrofit solution will require a holistic approach to the building energy and waste flows and careful energy modeling and sizing – coupled with an awareness of efficient technologies.

The FEMP Technology Deployment Matrix offers a tool for ESCOs and agencies to identify and assess underutilized technologies for ESPC projects. The tool currently ranks 49 technologies by impact, each of which are regularly evaluated and updated to facilitate the ECM selection process. FEMP also supports technology deployment specifically for ESCOs – targeting a 25% increase in utilization of selected technologies. FEMP staff will create best practice guidance papers and case studies of successful deployment examples. Some examples of this program include the demonstration of cool roofs and variable refrigerant volume air conditioning in a US Coast Guard base in Puerto Rico. The Coast Guard Base project used a Power Purchase Agreement (PPA). Power purchase agreements allow Federal agencies to fund onsite renewable energy projects with no upfront capital costs incurred. With a PPA, a developer installs a renewable energy system on agency property under an agreement that the agency will purchase the power generated by the system. The agency pays for the system through these power payments over the life of the contract. After installation, the developer owns, operates, and maintains the system for the life of the contract. FEMP also supports the GSA Green Proving Ground Project, which evaluates 16 new technologies (including ground source heat pumps, smart windows, highly insulated windows, daylighting, PV joined with solar hot water, net metering, and plugload/behavioral change).

Barriers to Deep Retrofits and Proposed Solutions

Charrette participants divided into 5 breakout groups to discuss the barriers to deep energy ESPCs and brainstorm possible solutions. Half way through the brainstorm, participants switched groups so each attendee was able to contribute to two breakout groups. Participants were assigned so each ESCO provided input to 4 different topics.

The 5 breakout group topics included:

Topic	Description
Analysis and Integrative Design	Integrative, whole building analysis and measures are not commonly included in ESPCs for a variety of reasons including time constraints, risk, confidence in results and unfamiliarity with the process.
Project Economics	Deep energy retrofits may need a different angle on funding ESPC projects that takes into account blending appropriated funds with ESPC funding, long term contracting, bundles of ECM's and aggregated delivery.
ESPC Delivery Process and Procurement	The current ESPC delivery process is too long and lacks consistency among project managers in different agencies.
Occupant Behavior	Energy savings strategies that rely on occupant behavior modifications are rarely part of the ESPC process, and this potential savings is unrealized.
Measurement and Verification	M&V strategies may need to be modified to determine savings from interactive energy conservation measures.

The objectives of each breakout group were to:

1. Identify the common barriers experienced in current practices as they relate to deeper energy savings
2. Brainstorm potential solutions to those barriers
3. Prioritize key solutions that should be addressed urgently

Summaries from each breakout group are provided below. There were many overlapping topics from the breakout groups, but they were approached from different angles.

The individual barriers and solutions will be used to structure the Challenge and to inform the program GSA intends to create to facilitate more ESPC projects, as described in the Next Steps section of this report.

Analysis and Integrative Design

Integrative analysis is essential to cost-effectively achieve deep energy savings; however, it is typically not part of the ESPC process. The Analysis and Integrative Design breakout group discussed the typical ESPC analysis process and how and when whole building energy modeling and LCCA are employed. The group also discussed engaging innovative technologies in this process and integrating disparate ECMs to achieve bundled, whole buiding benefits and energy savings.

The group discussed the barriers and potential solutions and identified the following as the most important:

Analysis and Integrative Design

Key Barriers	Possible Solutions
Deep savings may not be cost effective over contract term ▪ **Key factor: there is no funding available from agencies**	▪ Identify any preapproved funds available through coordination between energy managers, master planning and capital improvement ▪ Find solutions to channel saved space into funding for deep retrofits ▪ Employ bulk purchasing program ▪ Phase implementation of ECMs to capitalize on post cost savings with other planned renovations
There is a lack of information on the existing buildings (e.g., metering, utility data)	GSA can further improve the process by storing and categorizing reports/data into a centralized and searchable database
The typical ESPC process evaluates individual ECMs	The ESPC process needs to change to better evaluate bundles of integrated measures
The law tells you to save energy, but the ESPC process is structured around cost savings (or certain energy related cost savings)	GSA and other agencies must reconcile this disconnect
There is a high risk to guarantee deep savings ▪ **Key factor: it is difficult to accurately model new and innovative technologies**	▪ ESCO engineers have the experience and judgment to guarantee savings. This could be accomplished through education and training, or by ESCOs hiring a dedicated specialist to fulfill this role ▪ The energy simulation tools keep up with new and innovative technologies
There is no way to take credit for other savings (e.g., increased productivity, avoided capital costs, etc.)	GSA needs to develop a standard way to assign value for non-energy benefits

Please refer to the Appendix for additional barriers and solutions.

Project Economics

Deep energy savings through standard ESPCs historically only appear profitable either with extremely high utility rates (Hawaii, Guam) or on extremely inefficient buildings. Installation of comprehensive energy saving technologies would require a substantial contribution of appropriated funds, which may not be available. However, the final result of a guaranteed ESPC can be modified through a variety of levers beyond appropriations funding. Finding synergies between agencies, financiers, and customers to redefine project scope and reduce project costs would help enable deep retrofit ESPCs.

This breakout group discussed current financing for ESPCs, the ways to use standard process for financing through ESPCs, the biggest hurdles for deep energy retrofits in the way ESPCs are currently financed, and the methods to overcome these hurdles. At the end of the discussion, the breakout group prioritized the following major barriers and solutions:

Financing Net Zero Energy Projects

Key Barriers	Possible Solutions
It is hard to overcome high financing costs	▪ Create a centralized effort (perhaps driven by GSA?) to get more preferable interest rates - as close as possible to fed discount rate (.75%) or like term treasury bond. ▪ Create a case for gathering support (appeal to broader issues, jobs, small business requirements, etc.) NOTE: This effort should be aligned with Skye Schell's (FEMP) ongoing efforts to lower ESPC interest rates

There is no integration with planned improvement projects	▪ Agency/building manager should provide improvement information ahead of time (through RFP or data sharing) to ESCO ▪ ESCO could fold pre-planned improvement into a larger contract, possibly involving the current O&M provider
There is no inclusion of avoided future (greater than 1-2 years) costs in ESPC including capital and maintenance	▪ Agencies allow avoided future costs for utility energy service contracts (UESCs) and can authorize for ESCOs ▪ Clear guidance from central office through to contracting officers is needed
Contract duration limits longer payback measures	▪ Include the life cycle-costs analysis (LCCA) costs (avoided) as net present value (NPV) ▪ Treat each energy conservation measure (ECM) differently depending on life cycle or assess based on bundled measures

Please refer to the Appendix for additional barriers and solutions.

ESPC Delivery Process and Procurement

This breakout group identified the biggest hurdles for deep energy retrofits in the way ESPCs are currently processed and managed by the GSA, FEMP and participating ESCOs, including the processes for ESCO selection, implementing the IGA, and scoping and implementing the performance contract.

The group identified the following major considerations to address process improvements at a high level:

- Agencies and sites need to be fully bought into deep retrofits
- Should the process be structured to be largely centralized or regionalized? Which best ensures a skilled team? Should the team perform a quick *and* effective deep retrofit and/or create a replicable model?
- Retrofits of portfolios of buildings provide increased flexibility and opportunity for cost-effective deep savings (simplified analysis, bundling for financing, etc.). How would the process be structured for portfolios?
- This Challenge will include around 32 buildings. Will GSA (or other agencies) replicate this large-scale ESPC process? Consider how the process is set up in terms of scaling and speed.
- How should (if at all) the process support the GSA objective of diverse ESCO participation?

More specifically, the following 3 barriers were discussed at length.

ESPC Delivery Process and Procurement

Key Barriers	Possible Solutions
Major confusion/disagreement on what can be counted as eligible savings	▪ Clearly define eligible sources of payment; consider O&M, utility rebates, PPA, leasability, and absenteeism ▪ Define how to demonstrate post-retrofit differential for these savings categories ▪ Clarify how to address elevated baselines (how much it would have cost had the project invested in proper replacements, maintenance, etc.)
The current ESCO selection process takes too long	▪ Create a streamlined process to select all 32 project ESCOs in 90 days ▪ Consider a 3-step process: 1. One notification letter to all 16 ESCOS, with project grid including building data status and team experience level. ESCOs mark those projects in which they are interested 2. GSA team (region/central?) chooses top 3 ESCOs for each job 3. GSA completes final selection through oral interview

Significant project delays occur because regions/sites are not always incentivized to adhere to aggressive schedules	▪ Establish a midterm review in IGA, with clear evaluation criteria and protocol for follow-up ▪ Create urgency by enforcing GSA rebates/incentives tied to meeting deadlines

Please refer to the Appendix for additional barriers and solutions.

Occupant Behavior Change

Occupant behavior significantly affects the energy saving strategies; therefore it should be seriously taken into consideration, especially in deep retrofits. However, energy savings strategies that rely on occupant behavior modifications are rarely part of the ESPC process, and this potential savings is often unrealized.

At the end of the discussion, the breakout group prioritized the following major barriers and solutions:

Occupant Behavior Change

Key Barriers	Possible Solutions
It is difficult to quantify energy/cost savings	▪ Find opportunities for agencies to share risk with the ESCO ▪ Create incentive to over-perform ▪ Stipulate a conservative savings estimate ▪ Allow occupant behavior savings to be bundled with other measures
There are not many good examples of "Behavior ECMs"	▪ Create case studies and get the word out ▪ Start with low risk process-based solutions (e.g., daytime cleaning)
It is hard to incentivize all occupants of varying cultures, generations, and characteristics	▪ Be more inclusive during design ▪ Identify obsolete processes used by tenants that are inhibiting energy savings ▪ Tie savings to issues "bigger than the individual," such as climate change, resource scarcity, or economic duress. ▪ Create alternative metrics (e.g., jobs preserved)
ESCOs have no control over occupants and engaging occupants is challenging	• Provide well-structured educational programs and trainings to respond to the needs of different audience Create strategies to let individuals see the big picture yet increase local control for direct correlation of actions to savings.

Please refer to the Appendix for additional barriers and solutions.

Measurement and Verification

Measurement and Verification (M&V) is critical to increase the success of the energy conservation measure (ECM). During this session, the groups discussed the biggest constraints to deliver deep retrofits through current M&V methods and protocol, the ways to modify current M&V methods to better support deep energy retrofits and the strategies to expand the use of M&V to provide ongoing performance optimization and to educate occupants and maintenance staff.

The breakout groups prioritized several barriers and potential solutions to shorten the time and complexity associated with M&V:

Measurement and Verification

Key Barriers	Possible Solutions
There is uncertainty/variability of how building is operated on an ongoing basis after installation	▪ Treat O&M as ECM and have ESCO provide that service ▪ Have O&M contractor address it specifically ▪ Clearly specify all performance vs. operation responsibilities
The cost, level of effort, and complexity for whole building M&V (including keeping track of adjustment factors, performing sub-metering, client understanding of M&V) is critical	▪ Perform robust M&V for first year ▪ Have Option A or Option B for following years. ▪ Pull M&V out of agencies' control and have FEMP oversee
There is lack of consistency across GSA offices, agencies and regions	▪ Apply better standardization throughout ▪ Have common, more specific M&V methodology across similar projects ▪ Create a center of competence for M&V (e.g. move to FEMP)
There is poor, absent or incorrect baseline performance data	▪ Improve baseline efforts ▪ Have FEMP approve baseline; allow ESCO to submit before price proposal

Please refer to the Appendix for additional barriers and solutions.

Action Items and Next Steps

The workshop provided a good platform to understand and prioritize the challenges and solutions to make the Net Zero Renovation Challenge a success. There are two different levels of next steps, one that relates directly to the next steps for the challenge and another that relates to the larger vision of improving the ESPC process, both within GSA and more broadly within FEMP.

Next steps for the Net Zero Renovation Challenge:

#	Task	Timeline
1	GSA to schedule call with all ESCOs to review	The week of December 12th, 2011
2	GSA will issue the Notice of Opportunity (NOO) (including list of buildings)	January 2012
3	ESCOs respond to NOO with interest, approach and preferred buildings	February 2012
4	GSA assigns buildings to ESCO's	March 2012
5	ESCOs perform IGA	April-July 2012
6	Contracts awarded	August 2012

Based on the key barriers identified, the following next steps have been identified:

Opportunities for Deep Retrofits	Proposed Solutions	Action item
Time is money. By reducing/streamlining the ESCO award process (currently 18 months on average), GSA can get to savings sooner, reduce costs to ESCOs and add 20-30% from savings to project budgets.	GSA and FEMP intend to expedite the process of ESCO selection based on the experiences of the Challenge – targeting 30 days for selection and 5 months for award.	GSA to work with FEMP to enable concurrent reviews, rather than staggered reviews. GSA to develop acquisition strategy, including GSA Central Office to support the expedited process.
Shared risk between the ESCO and the agency would enable deeper savings from ESPCs	Certain risk sharing between parties and/or policy changes to encouraged reduced interest rates for available financing would lower project costs and make greater energy savings more viable. Combining appropriated funding for designated projects with ESPCs could lead to bigger savings, more robust projects and better buildings overall.[7]	GSA encourages blended appropriated funds with performance contracting through individual project team negotiation. Although it is unlikely that appropriated funding will be available for Challenge projects, this methodology will be raised with GSA regions and encouraged as part of the larger ESPC delivery process.
Redefine or clarify eligible savings, particularly as it relates to O&M and avoided capital costs.	Including avoided capital and maintenance costs (even over just 1-2 years in the future) can increase project financing. Clear and consistent guidance from GSA on what the ESPC can include is necessary.	GSA will promote and work with FEMP to develop training across GSA Regions and develop standardized list of acceptable savings.
ESCOs very rarely guarantee occupant behavior energy use reduction – largely because the savings from an occupant	ESCOs could incorporate occupant behavior savings into bundles (through the implementation of each measure) instead	GSA encourages Challenge participants to submit measures related to occupant behavior savings.

[7] It should be noted that for the Challenge, it is not anticipated that there will be any appropriated funding available.

behavior program are hard to quantify and verify.	of as a stand-alone measure. Solutions to share risk, or incentives for ESCOs to over-perform would encourage the inclusion of occupant behavior. These energy reductions can either be explicitly measured (as a measure or part of a bundle) or included in other relevant measures by stipulating energy savings and the implementation of occupant engagement.	Concurrently, GSA will work with FEMP to put together some methodology about acceptable practices to account for and verify these savings. GSA will work with the building tenants to asses areas of opportunity.
For broader uptake of the ESPC process, the GSA program should support aggregated, multi-building projects.	Bundling of ESPC projects (and associated financing) could lower overhead, implementation, and financing costs and could make more measures viable.	GSA will evaluate their portfolio and identify clusters of buildings for future solicitation. Any ESCO or Region engaged at this scale should continue to challenge financial institutions to reduce cost of financing.
Uncertainty with M&V stems from the operation of the building after installation.	One option is to treat operations and maintenance (O&M) as a part of a bundle (additional savings are often possible – and can improve project financials) and assign responsibility to the ESCO – to oversee the existing O&M contractor.	GSA encourages the integration with buildings operations, not just at the hand-off, but for years following. Challenge participants are encouraged to include an approach to providing this service for consideration.

Appendices:

Appendix A: Attendee Feedback: “What one change would you make?”

The workshop was designed to encourage the ambitious and audacious improvement of the ESPC process. To facilitate this type of thinking, RMI asked attendees to set aside incremental solutions and answer: “What single change in the ESPC process would be most impactful for achieving deep savings?” Each attendee wrote down their own proposed procedural change, and then went around the room and read out their idea.

The “word cloud” below shows the words that appeared in the various topics, with the size of the words in proportion to the number of times they were mentioned.

Key Themes from Attendee Input:

1. Rethinking the funding model (potentially to include a blend of ESPC and appropriations)
2. Redistribution of risk (modifying guaranteed savings approach, government take on some risk)
3. Streamlining the process (speeding up approvals and ESCO selection from 18 month to around a year, or 4 months as Kevin Kampschroer intends)
4. Bundling and integrating measures (including behavior/including tenants)
5. Discussion of the innovative elements of the process (radical new process/way of thinking)
6. Redefining avoided costs (including O&M savings and non-energy related projects)

Appendix B: Additional Barriers and Solutions for Achieving Net Zero Renovations

The following tables show additional barriers and solutions that were brainstormed in the breakout groups.

Analysis and Integrative Design

Barriers	Proposed Solutions
Customer doesn't trust modeling results	▪ Employ dedicated staff to review/contribute to process (Army does this) ▪ Establish constant communication
Typical ESPC process does not include "true" LCCA; ESCOs can't use MILCON funds. SRM funds requires timing	▪ Timing of funds needs to support this process ▪ Process and regulatory change needed
Some ESCOs are not organized for integrative design	ESCOs would be incentivized to set up integrated project teams
There is lack of collaboration between ESCO, architect and customer	Early involvement of all stakeholders through design charrettes
ESCOs propose O&M and it is perceived as expensive because current O&M funding does not support proper maintenance	Government need to budget for proper maintenance
There is no business case for new technology such as microgrids	GSA needs to assign value to energy security
ESCOs don't follow integrative design	▪ ESCOs need more experience and case studies in order to trust the outcomes of the integrative design process ▪ GSA needs to roll in extra development costs

Project Economics

Barriers	Proposed Solutions
All GSA regions are on different pages and have different processes, which increases time and costs	Standardize ESPC delivery, evaluation criteria and procurement approach
There is confusion and lack of clear guidance on how to handle RECs in terms of ownership and value of REC over time	Allow sale of RECs to enlarge projects and make more suitable projects for ESPC
Longer payback periods are resisted	▪ GSA supports ESPC's and the Challenge on all levels. Need greater oversight of regional teams. Needs to be a standardized way to do it so a single person can't block. Need centralized support ▪ GSA to buy out existing ESPCs, purchasing the equipment, paying off the project loan, and use ongoing cash streams for new deep retrofit projects. (assuming excess cash flow is available). This will be detrimental to the financier – but not to the ESCO
Incorporating O&M costs and avoided upgrade costs (and others) into ESPC is important but hard because buildings already have O&M contractors and would need to move scope to the ESPC	▪ Provide accurate baseline costs ▪ ESCOs should take over, joint venture, oversee small business (serve as a mentor) ▪ Savings from right sizing of M&V for integrated projects (not many historically)

Blending ESPC with appropriations funded projects and bundling of ECMs often not done because of high costs of envelope measures	Savings from better interest rates (closer to the fed discount rate or like term treasury bond) and others can allow longer payback measures to form part of the bundle. Better incorporation of avoided costs will also help
Bundling project across geographic region does not work since financing drives costs higher for the IGA (and cost savings are hard to find here)	Standardized DOE enabled program (3 ECMs) across geographic regions for GSA buildings (leveraging economies of scale on suppliers and financing) - This can work for simple measures – lighting, controls, water. Not for deep projects

ESPC Delivery Process

Barriers	Proposed Solutions
There is lack of available building data, and agency understanding/ proficiency around data/design needs	Provide agency/site training to regather data
There is lack of experience in agencies/sites	▪ Provide complementary training ▪ Select right people to participate
There is lack of standard GSA regional process	Develop a centralized resource including technical review, contracting, etc. with the caveat that there is agreement from the agencies with the centralized approach that's used
There is a significant cost/risk to the additional analysis required for successful deep retrofits	
Regions may not be onboard with deep retrofit	

Occupant Behavior Change

Barriers	Proposed Solutions
Isolating measures makes it difficult to identify benefits	Need contracting solution
There are constant changes in occupant density and other characteristics	Need training and education programs that endure
ESCOs perceive they need control over occupant behavior	ESCOs need accountability
Maintenance personnel often encounter false perceptions, misaligned incentives	▪ Provide education and training ▪ Need ESCO controlled O&M (outsourced)
Organizational leaders are not leading by example	Empower leaders to create incentives and cheerlead

M&V

Barriers	Proposed Solutions
Current methods do not account for existing equipment	Capture savings associated with O&M improvements that happen as part of new installation
Guarantee is based on equipment O&M being done effectively, but if ESCO doesn't have control over O&M it might be at risk	Have ESCO be responsible for O&M
ESCO needs to verify performance of integrated measures that might be difficult to accurately model and estimate savings	▪ Provide documentation of energy modeling assumptions, inputs, outputs for FEMP to review/accept for reasonableness

Appendix C: Glossary of Terms and Acronyms

TERM	DEFINITION
Avoided Cost	The cost a local distribution company would otherwise incur to generate power to buy the same amount of power if it did not purchase from a qualifying facility.
Baseline Demand	The calculated energy demand of a piece of equipment or a site prior to the implementation of the ECMs. Baseline physical conditions, such as equipment counts, nameplate data, and control strategies will typically be determined through building occupancy, energy end-use survey and plug load surveys of the Facilities.
Baseline Usage	The calculated energy usage of the Facilities prior to the implementation of the ECMs.
British Thermal Unit (BTU)	The amount of heat energy required raising one pound of water by one degree Fahrenheit at sea level. It is used as the basic unit of energy measurement.
Delivery Charge	The charge on your utility bill representing the cost of moving power from the generation source to your home or business. This portion of your electric bill is not open to competition, but is regulated by your state's PUC.
Demand (or Load)	The amount of electricity that must be generated to meet the needs of all customers at a certain point in time.
Demand Charge	A charge for the maximum rate at which energy is used during peak hours of a billing period. That part of a power provider service charged for on the basis of the possible demand as distinguished from the energy actually consumed.
Demand Response	Ability of end user to cut back on power use when called by a Load Serving Entity.
Demand Side Management (DSM)	The planning, executing and monitoring of utility activities designed to help customers use electricity more efficiently.
Department of Energy (DOE)	The federal government agency engaged in establishing policies and programs relating to national energy matters.
Distributed Generation	Small, modular, decentralized, grid-connected or off-grid energy systems located in or near where energy is used.
Distribution	The delivery of electricity to an end-user through low-voltage lines or natural gas through pipeline systems.
Emission Factor	A measure of the average amount of a specified pollutant or material emitted for a specific type of fuel or process.
Energy Audit	An energy audit is an inspection, survey and analysis of energy consumption for purposes of conservation in a building, process or system to reduce the amount of energy input into the system without negatively affecting the output(s). Service providers may provide these services as part of their offerings.
Energy Conservation Measure (ECM)	The installation of equipment or systems, or modification of equipment or systems.
Energy Efficiency	Refers to products or systems using less energy to do the same or better job than conventional products or systems. Energy efficiency saves energy, saves money on utility bills, and helps protect the environment by reducing the demand for electricity.
Energy Service Company (ESCO)	A non-utility business that provides gas or electric commodity or that installs energy efficient and other demand side management measures in facilities.
Energy Savings Performance Contract (ESPC)	Agreement with an energy service company (ESCO). The ESCO will identify and evaluate energy-saving opportunities and then recommend a package of improvements to be paid for through savings. The ESCO will guarantee that savings meet or exceed annual payments to cover all project costs—usually over a contract term. If savings don't materialize, the ESCO pays the difference, not you. To ensure savings, the ESCO offers staff training and long-term maintenance services.
Excess Verified Savings	The amount of Verified Savings minus Guaranteed Savings in a Guaranty Period.

Federal Energy Management Program (FEMP)	A program of the U.S. Department of Energy (DOE) that implements energy legislation and presidential directives. FEMP provides project financing, technical guidance and assistance, coordination and reporting, and new initiatives for the federal government. It also helps federal agencies identify the best technologies and technology demonstrations for their use.
Fossil Fuels	Fuels that are derived from decayed plant and animal matter, that over millions of years, under pressure and heat, have become petroleum, coal, natural gas, etc.. There is a finite amount of such resources, and therefore they are called non-renewable fuels.
Generation	A process that produces electricity.
Generation Charge	The fee charged to the consumer for the generation of electricity.
Geothermal Heat Pump	A type of heat pump that uses the ground, ground water, or ponds as a heat source and heat sink, rather than outside air. Ground or water temperatures are more constant and are warmer in winter and cooler in summer than air temperatures. Geothermal heat pumps operate more efficiently than "conventional" or "air source" heat pumps.
Green Power	Energy produced from renewable or non-polluting and non-hazardous technologies.
Grid	A system of power lines and generators that are coordinated to deliver electricity to customers at various points.
Guaranty Period	Defined as the First Guaranty Period and each of the successive periods commencing on the anniversary of the commencement of the First Guaranty Period throughout the Term of the Agreement.
Guaranteed Savings	The amount of avoided Energy Costs and Operations and Maintenance Costs guaranteed to the Customer in each Guaranty Period.
HVAC	Heating, Ventilation, Air Conditioning - the technology of indoor or environmental comfort.
Indoor Air Quality (IAQ)	Term referring to the air quality within and around buildings and structures, especially as it relates to the health and comfort of building occupants.
International Performance Measurement and Verification Protocol (IPMVP)	The IPMVP guidelines classify measurement & verification approaches as Option A, Option B, Option C, and Option D.
Kilowatt (kW)	1000 watts.
Kilowatt Hour (kWh)	The amount of kilowatts used over a one hour span to power lights, appliances, etc... It is used as the basic unit of measure for residential and commercial electric accounts.
Leadership in Energy & Environmental Design (LEED)	An internationally recognized green building certification system, providing third-party verification that a building or community was designed and built using strategies aimed at improving performance across all the metrics that matter most: energy savings, water efficiency, CO2 emissions reduction, improved indoor environmental quality, and stewardship of resources and sensitivity to their impacts.
Life Cycle Cost Analysis	The investigation and valuation of the environmental impacts of a given product or service caused or necessitated by its existence or energy life-cycle cost analysis (ELCCA) is a decision-making tool for building owners and designers. It provides a means of comparing the present values of two or more design alternatives.
Load	The demand for or use of electricity.
Load Profile	Data collected over a period of time that approximates when and how much a customer, or class of customers, uses electricity. It is usually broken down hourly over a one-day period.
Marginal Cost	The cost that it takes to produce an additional energy unit, or the cost saved by not producing such unit.
Measurement and Verification (M&V) Plan	Details how the Guaranteed Savings will be verified.
Mega Mega British Thermal Unit (MMBTU)	Represents one million British Thermal Units.

Megawatt (mW)	1 million watts or 1000 kilowatts. Used as the wholesale unit of measure.
National Association of Energy Service Companies (NAESCO)	The premier trade association for ESCOs.
Off-peak	A period of time when there is a low demand for electricity on a utility's generation system.
On-peak	A period of time when there is a high demand for electricity on a utility's generation system.
Operations and Maintenance (O&M) Costs	Includes the cost of operating and maintaining facilities.
Peak Demand/Load	Maximum energy demand or load in a specified time period.
Peak Power	Power generated that operates at a very low capacity factor; typically used to meet short-lived, variable high demand periods.
Performance Contracting	The process to implement energy efficiency improvements with minimal up-front cost. It uses savings resulting from the efficiency project to pay for the work over a period of time.
Photovoltaic (Solar) Module or Panel	A solar photovoltaic product that generally consists of groups of PV cells electrically connected together to produce a specified power output under standard test conditions, mounted on a substrate, sealed with an encapsulant, and covered with a protective glazing.
Photovoltaic (Solar) System	A complete PV power system composed of the module (or array), and balance-of-system (BOS) components including the array supports, electrical conductors/wiring, fuses, safety disconnects, and grounds, charge controllers, inverters, battery storage, and the like.
Renewable Energy	Derived from resources that are naturally regenerative or are practically inexhaustible (ex. biomass, geothermal, solar, hydro, wind).
Renewable Energy Certificate (RECs)	Renewable energy certificates (referred to as RECs, and also known as renewable energy credits) represent the environmental and other non-power attributes of renewable electricity generation and are part of most renewable electricity products. RECs are measured in 1 mega-watt-hour (MWh) increments of power generated from renewable sources like wind, solar, hydro and biomass. They can be traded separately from the actual electricity produced by renewable facilities.
Renewable Portfolio (or Power) Standard (RPS)	State regulatory requirement that, by a defined date, a defined percentage of generation must be supplied by renewable energy sources, such as hydroelectric, solar, wind, geothermal, or biogas.
Request for Qualification (RFQ)	Interested ESCO's submit their corporate resumes, business profiles, experience, and initial plan. A request for qualifications (RFQ) is a document often distributed before initiation of the RFP process. It is used to gather vendor information from multiple companies to generate a pool of prospects. This eases the RFP review process by preemptively short-listing candidates which meet the desired qualifications.
Request for Proposal (RFP)	A detailed explanation and outline of a project for response. This document contains all cost savings measures, products, M&V plans, and the performance contract.
Request for Information (RFI)	A proposal requested from a potential seller or a service provider to determine what products and services are potentially available in the marketplace to meet a buyer's needs and to know the capability of a seller in terms of offerings and strengths of the seller. RFIs are commonly used on major procurements, where a requirement could potentially be met through several alternate means.
Retro-Commissioning	The Commissioning Process applied to an existing facility that was not previously commissioned.
Retrofit	The improving of existing buildings with energy efficiency equipment
Therm	100,000 Btu, 97 cubic feet, or 29.3 kilowatt hours (kWh) of energy; unit of heat.
Turnkey Service	Promotes a full installation or retrofit package including audit, design, replacement, rebate assistance, financing, and commissioning of lighting or other energy optimization package.

Utility	A regulated entity that exhibits the characteristics of a natural monopoly (also referred to as a power provider). For the purposes of electric industry restructuring, "utility" refers to the regulated, vertically integrated electric company. "Transmission utility" refers to the regulated owner/operator of the transmission system only. "Distribution utility" refers to the regulated owner/operator of the distribution system that serves retail customers.
Verified Savings	It is defined as the summation of the avoided Energy Costs and Operations and Maintenance Costs as determined by the Measurement and Verification Plan for the Facilities in each Guaranty Period as a result of the ECMs.
Watt (W)	The rate of work represented by a current of one ampere under a pressure of one volt; the equivalent of 1 / 746 horsepower. It is the smallest unit of measure in the electricity industry.

Appendix D: Presentations from Charrette (attached in a separate file)

Appendix E: Pre-Read which includes Charrette Overview, Agenda, Attendees, Case Studies, Press Release and Expedited ESPC Delivery timeline (attached in a separate file)

Net Zero Energy Concepts and Case Studies

Robert 'Hutch' Hutchinson
Cara Carmichael
Kendra Tupper

Rocky Mountain Institute

Rocky Mountain Institute

Deep Energy Retrofits and Achieving Net Zero

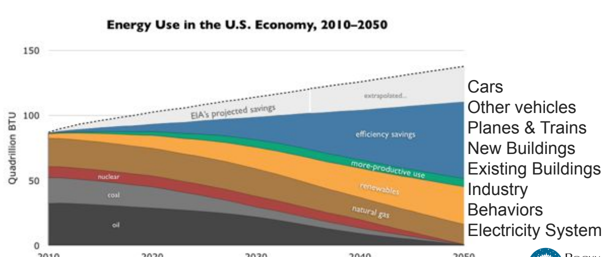
October 27, 2011

Robert 'Hutch' Hutchinson
Cara Carmichael

Rocky Mountain Institute

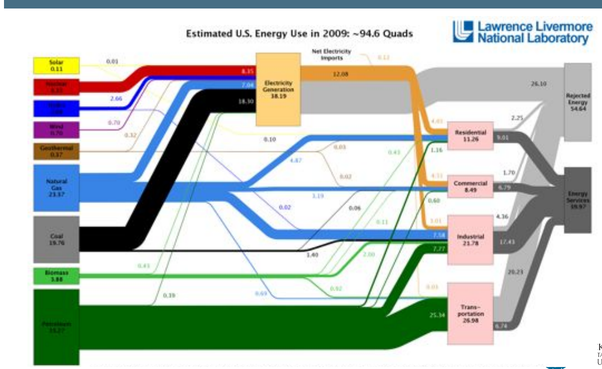
Reinventing Fire

Efficiency is a fundamental component of the coming energy transition – much of it driven by high performing buildings.



Rocky Mountain Institute

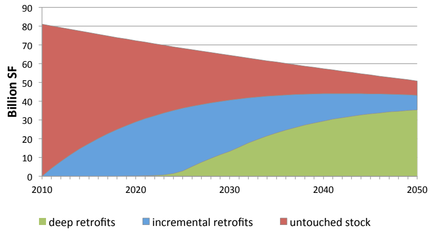
Where does the efficiency come from?



Deep retrofits are one key

Deep = fundamental → large savings, increased value; Financeable project economics

Retrofit adoption



% change

Eroding performance 5-20%, must repeat

30-60%+ no repeat

Electricity system a key ally

Building efficiency benefits the electricity system, especially at peak times. In return, utilities will offer more creative and substantial incentives, multi-building programs, integration of efficiency, storage and renewables offers, and more.

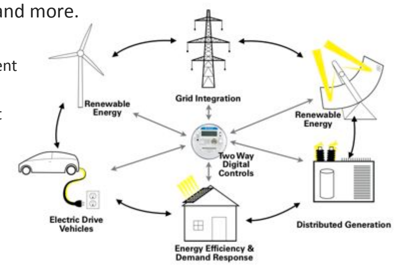
Avoided generation investment

Avoided or different grid cost

Lower system losses

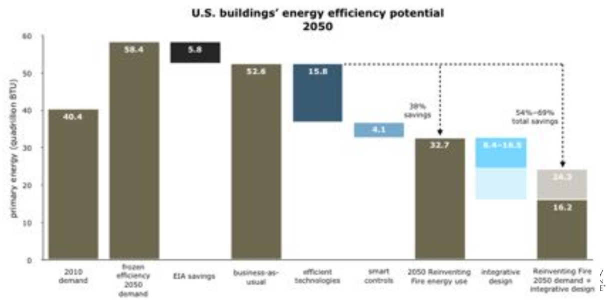
System recapitalization

Lower risk



Building savings potential

Efficient technologies and smart controls = 38%
Beyond that = integrative design



Net Zero is the new Black

- Fortune 500, leading international clients asking for it
- Part of 2030 Challenge, which has been widely adopted
- Federal Gov't committed
  - EO 13514
  - EISA 2007

What is Net Zero?

Net Zero Energy Definitions

Net-Zero Site Energy

Net-Zero Source Energy

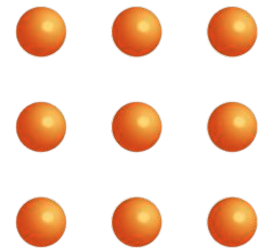
Net-Zero Energy Costs

Net-Zero Energy Emissions

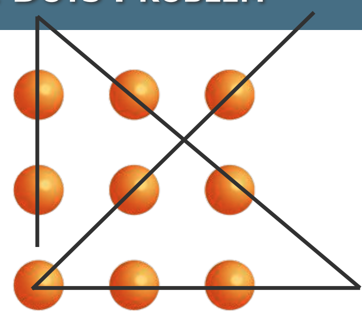
- No RECs allowed for the Challenge
- the Challenge heavily weights efficiency over renewables

Elastic thinking

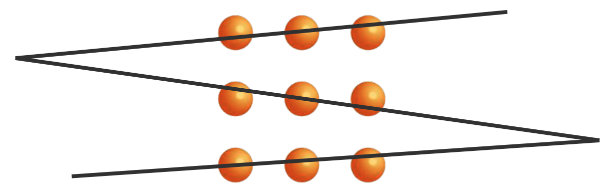
The Nine Dots Problem



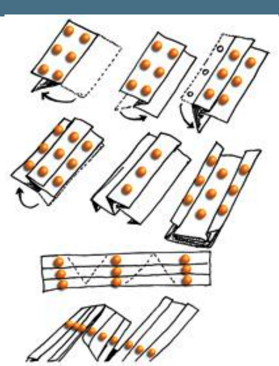
The Nine Dots Problem



The Nine Dots Problem



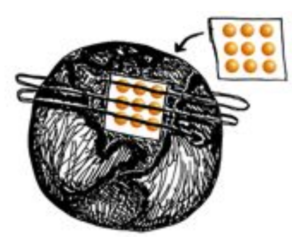
The Nine Dots Problem



origami solution

The Nine Dots Problem

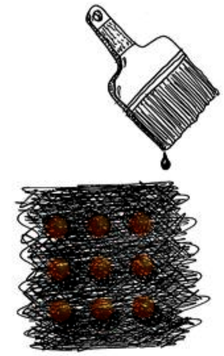
geographer's solution



The Nine Dots Problem

mechanical engineer' s solution

The Nine Dots Problem



A painters solution

Reorienting perspectives

Ameya Preserve

Deep Energy Retrofits

The Pathway to Net Zero

What is a "Deep Energy" Retrofit?

Process Differentiators:

- Broader conversations with owners
- Integrative design
- Advanced auditing, modeling and LCCA
- Ongoing M&V, proof of success
- Occupant engagement

Results:

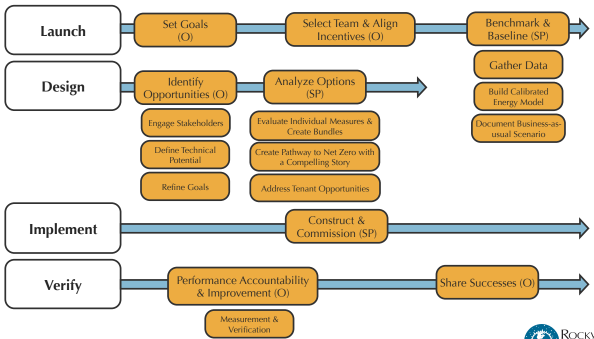
- Large energy savings
- Improved project economics

Timing is Key to Profitable Deep Retrofits

Top 'Ripeness' Indicators

1. Planned capital improvement
2. Major occupancy change
3. Major system replacement
4. Upgrades to meet code
5. Fixing an 'energy hog'

Deep Retrofit Process



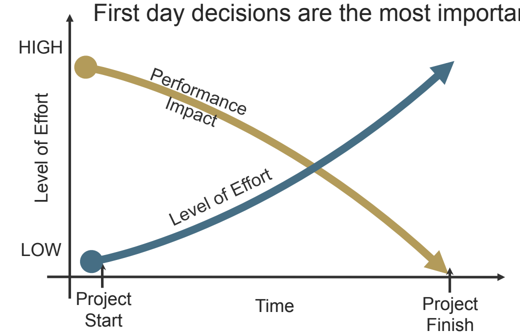
www.RetrofitDepot.org

The Playbook - Key NZE concepts

1. The right steps in the right order
2. Integrative design and analysis
   a. Whole systems thinking
   b. Designing bundles
3. Collaboration among stakeholders
4. Goal setting – Striving towards the theoretical minimum
5. Tenant / occupant engagement

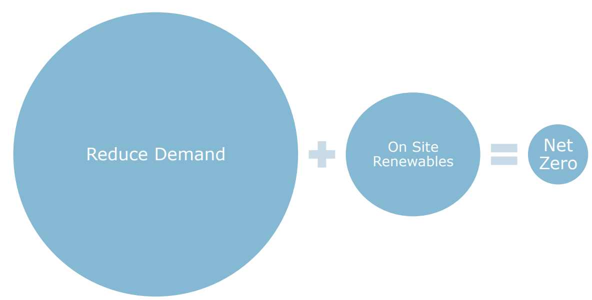
1. The Right Steps in the Right Order

Early Intervention



Approach to Net Zero
Typical Approach

Approach to Net Zero
Recommended Approach



Approach to Net Zero
The Right Steps in the Right Order

(1) Define Needs & Set Goals
(2) Understand the Existing Building
(3) Understand the Scope of Planned Renovations
(4) Reduce Loads
(5) Select Appropriate & Efficient Technology
(6) Seek Synergies
(7) Optimize Controls
(8) Integrate Renewables
(9) Realize the Intended Design

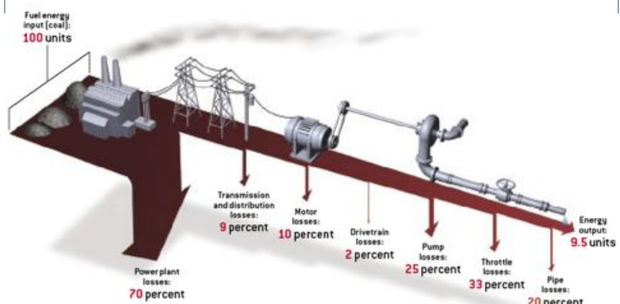
Most people start here… → (5)

Then jump here! → (8)

2. Integrative Design and Analysis

Whole systems thinking
Bundles

Whole Systems Perspective



Savings *downstream* results in 10x energy saved at the power plant.
Also makes upstream equipment smaller, simpler and cheaper.

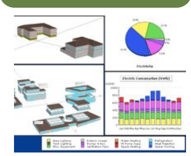
Guiding Principles
Deep Retrofits and Integrative Design

Optimize the WHOLE, not the parts

Early Intervention → Goal Setting → Determine the Technical Potential → Pursue the Right Steps in the Right Order → Iterative Energy Modeling and LCCA → Multiple Benefits from a Single Expenditure → Tunnel through the Cost Barrier

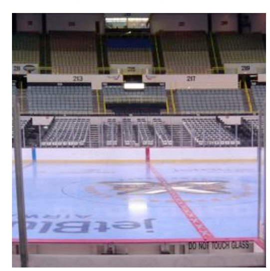
Iterative Analysis Procedure

Optimize Load Reduction Strategies → (Re)size and select Equipment → Compare Metrics to Benchmarks and Goals → Use LCCA to Evaluate Options



Multiple Benefits from Single Expenditures

Dis-integrated design occurs when each component performs just one function.



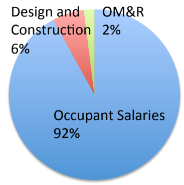
Vortex Ice / Water Technology:

1. The ice is clear,
   * Rink lines are visible.
   * Advertising income.
2. The ice is harder.
3. The ice is faster.
4. $1000 / month maintenance savings.
5. $900 / month energy savings.

The Value of LCCA

- Encourages longer term facilities perspective
- Incorporates:
  - OM&R costs
  - Energy escalation costs, cost of CO2
- Value productivity, health benefits
- Bounds the opportunity

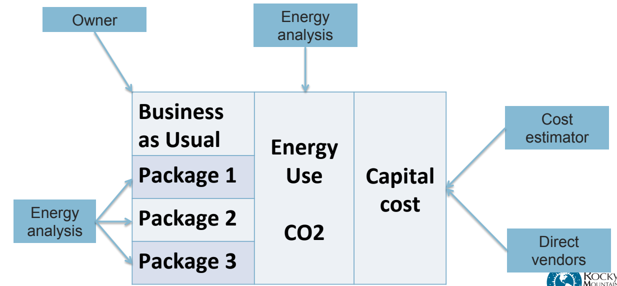
Lifecycle costs of a building



Source: www.wbdg.org

Life Cycle Cost Analysis

An iterative process among several data sets



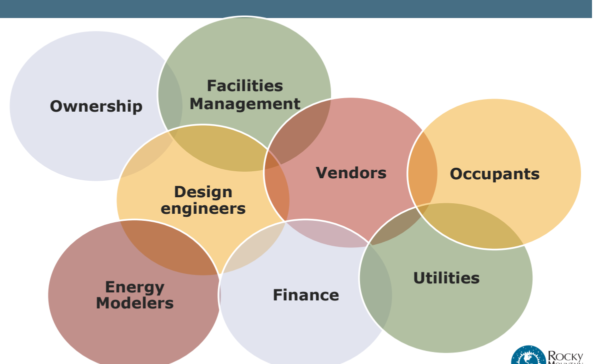
NZE - Efficiency vs. renewables

Cost savings from efficiency should be weighed against the avoided cost for renewables that would be needed to off set that load.

vs

3. Collaboration

Key players



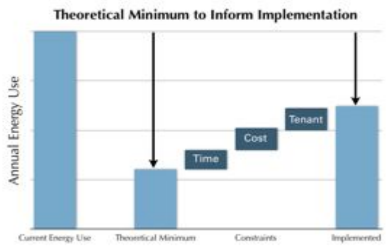
4. Goal setting

Theoretical Minimum

Theoretical Minimum

What is it?

- Maximum level of savings possible given today's technology



WHY DO WE CARE?

- Challenges conventional thinking
- Not limited by industry benchmarks/norms
- Leads to more aggressive design targets
- Explicitly determines where ground has been lost

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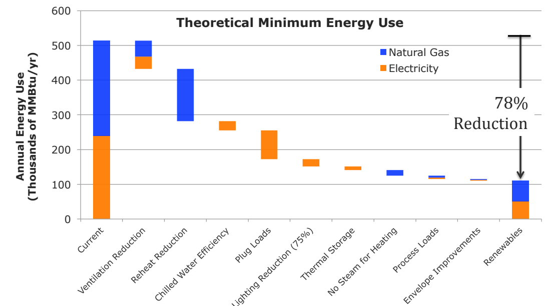
Technical Potential Exercise



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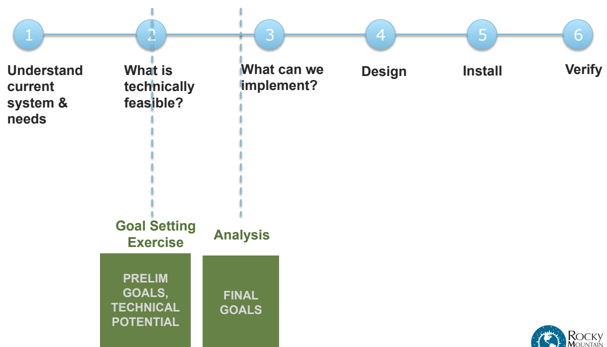
Goal Setting
Where does it fit in the Project Process?



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Goal Setting
Different Types Goals

Overall Target Values
- EISA 2007
- EUI < 35 kBtu/sf/yr
- Net Zero site energy
- Demand < 3 W/sf

Comparative
- 55% reduction from current energy use
- 30% cost energy reduction from ASHRAE 90.1-2007

Certifications
- LEED Platinum
- Energy Star score

End-Use Specific
- 80% reduction in lighting energy from natural daylight
- 100% of heating from waste heat and solar thermal

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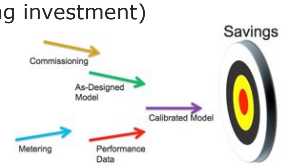
Approach to Net Zero
Realization of Intended Design

- Translate M&V into a more helpful form of information – for <u>everyone's</u> benefit
  - O&M improvements
  - Tenants/occupants (to inform behavior)
  - Financing (to inform risk)
  - Owners (to inform on the success of retrofit, ongoing investment)



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5. Tenant / Occupant Engagement

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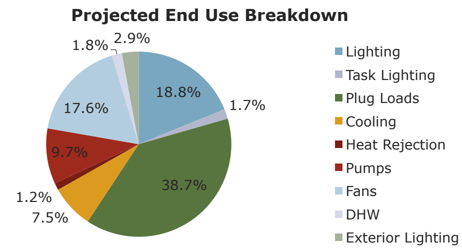
Tenants can't be ignored



Occupant Engagement

- Occupant energy use feedback (and billing)
  - Dashboards
- Occupant workshops during design and operation
  - To review project goals
  - Review tenant guidelines
  - To review functionality
  - To ID what they can do
- Guideline development
- Sample spaces with layouts and finishes

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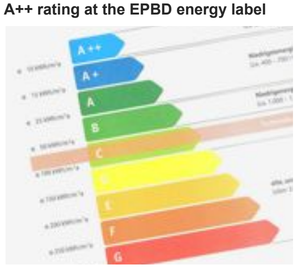
WWF Headquarters, The Netherlands

WWF Headquarters

- retrofit of a 1950's agricultural laboratory
- A++ rating at the EPBD energy label

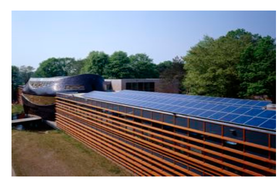


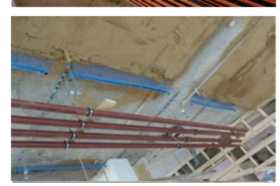
- The first Carbon Neutral Building in the country

Location	: Zeist, Netherlands
Size	: 40,900 ft^2
Completed	: 2006
Type	: Office Building
Cost	: $5.4 million

Photo credit: RAU Architects

WWF Headquarters





LOAD REDUCTION STRATEGIES

- Triple glazed windows w/ south louvers
- Ground water for cooling (and flushing toilets!)
- Natural ventilation
- Increased roof, wall and slab insulation

HIGH PERFORMANCE ENERGY SYSTEMS

- Mud ceiling with capillary heating and cooling system
- 16-well geothermal system
- Backup biomass system
- 40 kW PV System
- Solar hot water

Photo credit: RAU Architects

WWF Headquarters

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IDeAs Z Squared Design Facility

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IDEAS Z SQUARED DESIGN FACILITY

- Retrofit of a 60's era tilt-up concrete structure
- First commercial office building in the US to achieve a"Z²" energy efficiency goal: net zero energy, zero carbon emissions

Location	: San Jose, CA
Size	: 7200 ft² (669 m2)
Completed	: 2007
Type	: Office Building
NZE Premium	: 6.3%

Photo credit: IDeAs

Rocky Mountain Institute

IDEAS Z SQUARED DESIGN FACILITY

LOAD REDUCTION STRATEGIES

- Natural daylight (skylights)
- Occupancy sensors
- High efficiency office equipment and innovative automatic controls
- Increased roof, wall, and slab insulation
- High performance window glazing (electrochromic glass)

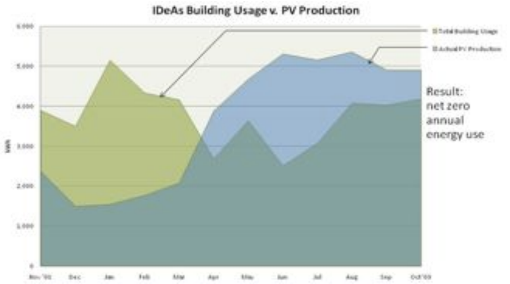
HIGH PERFORMANCE ENERGY SYSTEMS

- Ground-source heat pump
- 28 kW PV system
- Natural ventilation supplemented by radiant heating and cooling

Photo credit: IDeAs

Rocky Mountain Institute

IDEAS Z SQUARED DESIGN FACILITY



- IDeAs Office Building consumes 60% less energy than ASHRAE 90.1.2004 levels
- The energy efficiency for the HVAC system and building envelope is 40% below 2005 California Title 24 energy requirements

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Byron Rogers Federal Office Building

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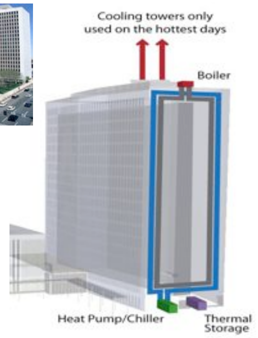
Byron Rogers Federal Office Building

- 500,000 SF
- Built in 1964 (Historic)
- 11 different Federal tenants
- Retrofit complete: 2013



A few design concepts…

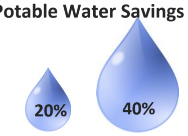
- Hybrid heat pump system-with heat reclaim and TES
- Chilled beams
- 100% LED lighting, Task/ambient systems

Beyond the Requirements

LEED

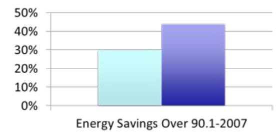
Requirement Target

Potable Water Savings



Requirement Target

Energy Savings



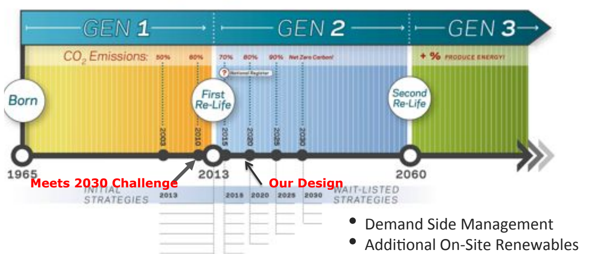
Solar Thermal

Requirement: 30% of hot water demand met

Target: 100% of hot water demand met

Life Cycle Continuum

- EISA 2007 Requirement: < 40.2 kBtu/sf/yr by 2015
- Design Team Target: < 35 kBtu/sf/yr by 2013



- Demand Side Management
- Additional On-Site Renewables
- Drastic Reduction in Plug Load Use
- Implement New Technologies

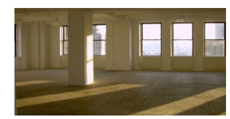
Challenge: Split Incentives

Necessary administrative changes

- GSA currently bills based on square footage
- Where does the change need to occur?

Push-back from tenants

- Sometimes design directives come from central agencies
- Perimeter offices!



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Lunch time Inspirational Keynote

Andy Walker

National Renewable Energy Laboratory

Renewable Energy in Net Zero Energy Renovation Challenge

U.S. Department of Energy | Energy Efficiency & Renewable Energy

FEMP Federal Energy Management Program

Net Zero Energy Renovation Challenge Charrette
Rocky Mountain Institute, Boulder CO
10/27/2011

Andy Walker
National Renewable Energy Laboratory
Andy.walker@nrel.gov

Recent Trends in ESPC & Renewables

- Several Examples of RE bundled in ESPC
- Performance guarantee- easy to measure RE delivery (IPMVP vol. III)
- Excess electricity/thermal energy sale allowed (new EISA provision)
- FEMP conducts renewable screening for every new ESPC project
  http://www1.eere.energy.gov/femp/financing/espcs_techplanning.html
- Energy Services Agreement (ESA) – PPA within ESPC
  - Private ownership for tax incentive eligibility
  - ESPC has a 25 year contract authority
  - ESCO/partner retain ownership and take advantage of tax benefits
  - Fixed payment to match guaranteed production

RE in ESPC Example

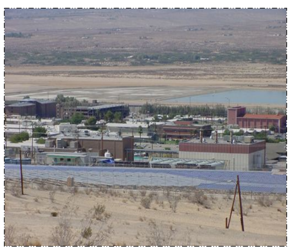
Naval Base Coronado Photovoltaic Project

- 750kW Parking Lot Photovoltaic System
  - Shaded parking for 444 vehicles
  - Provides 3% of peak summer demand
- $7.7M installed cost, $3.6M CA. incentives
- $228k annual savings, 9.9 yr SPB w/incentives
- M&V: Option A using PVWatts analysis for savings; electric meter installed to monitor performance

http://apps1.eere.energy.gov/news/news_detail.cfm/news_id=6152

RE in ESPC Example

29 Palms Photovoltaic Project



- 1.3 MW
- Completed September 2003
- Implementation cost = $6.5M
- Incentives = $4.5M
- Estimated annual savings over $500k
- Additional 1 MW project in progress

RE in ESPC Example

USCG Baltimore, Maryland Landfill Gas

- Boiler Conversion to LFG Cogeneration Plant
  - 4 MW Electricity
  - 8,000 lb/hr Steam
- 15 year contract length
- Project Investment : $15.0 million
- Annual Savings: $2.5 million
- Offsets 18,000,000 kWh/yr and 71,000 decatherms/yr of Natural Gas
- Operational: April 2009

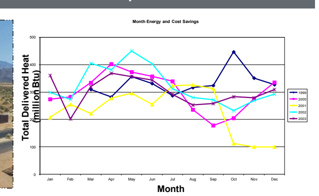
RE in ESPC Example

DOE Savannah River Site

- New 20 MW wood waste cogeneration plant and two biomass heating plants with local fuel source
- 19 year contract
- Includes performance guarantee and O&M
- Annual Savings of $34 M project cost of $183 M
- Task order signed 5/15/09
- Construction started September 2009, completion expected December 2011
- Important project to meet federal renewable goal/DOE Order 230.2b

RE in ESPC Example

Concentrating Solar Thermal (Industrial Process Heat) Federal Correctional Institution - Phoenix, AZ



- 17,040 square feet of parabolic trough collectors
- 23,000 gallon storage tank
- Installed cost of $650,000
- Delivered 1,161,803 kWh in 1999 (87.1% of the water heating load).
- Saved $77,805 in 1999 Utility Costs

RE in ESPC Example

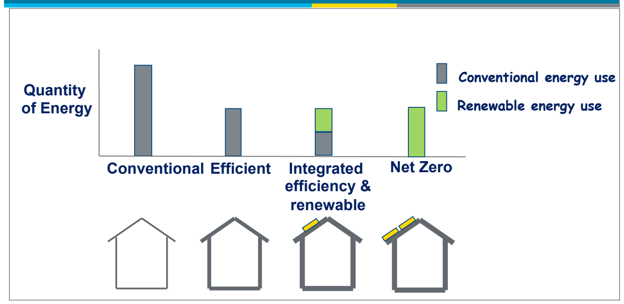
BOP Federal Correctional Institution - Victorville, CA

- Awarded 09/03
- Initial capital investment $5.4M, 19 year term with NORESCO
- Scope includes HVAC controls upgrade, 750KW wind turbine, and 74.5KW PV Carport
- First ESPC financed wind turbine
- SCE provided RE generation financial incentive $4/W
- Escrow account for wind turbine maintenance

The New Math

- Net Zero = EE+RE
- Nix the “Net”
- Zero > Net Zero
- Zero = EE + RE + Microgrid

Net Zero = EE + RE



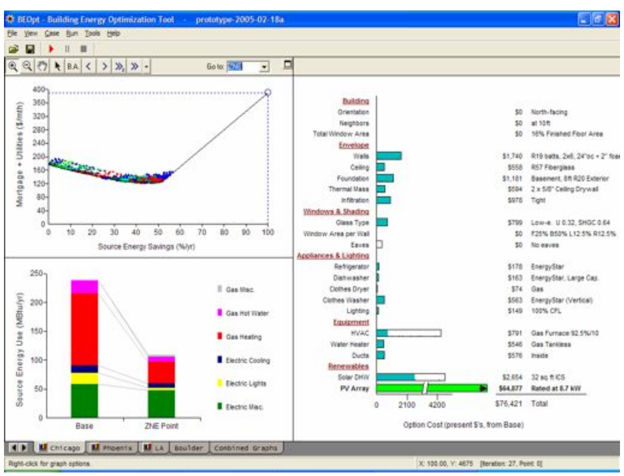
Strive for 40-70% energy reduction

$1 spent on EE lighting = $6 of PV (an NPS project)
$1 spent on EE refrigeration = $2 of PV (an NPS project)
$1 spent on EE = $2 spent on RE (EIA Press Release Aug 2011)

Energy Efficiency

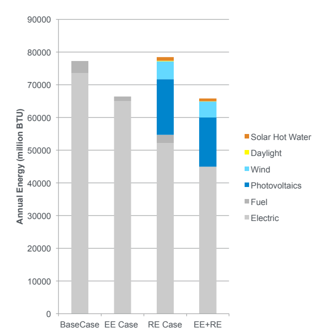
Renewable Energy

Any questions?



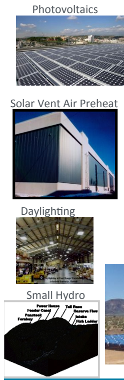
EE+RE Example: Camp Smith HI

ARRA/FEMP Assessment
PNNL evaluated EE measures
NREL evaluated RE measures



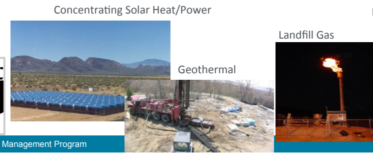
Renewable Energy Solutions

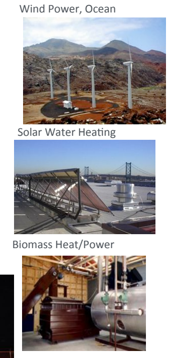
U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy



"*Now GSA is challenging the private sector to partner with us to go above and beyond what has been done before in federal building renovations. We want the private sector to provide us with their most innovative, cost effective solutions to maximize energy and cost savings,*"

GSA Administrator Martha Johnson, Press Release October 20, 2011





Net Zero in Renewable Energy Optimization (REO)

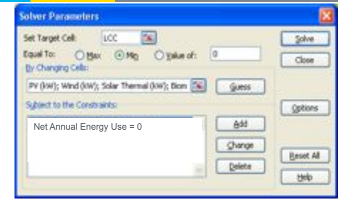
U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

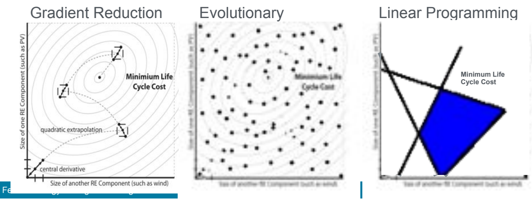
Objective: Minimize Life Cycle Cost ($)

Variables: Size of Each Measure (kW PV, kW wind, kW biomass, etc.)

Constraints: examples:
- Net Zero (100% energy from renewables)
- Rate of Return > ESPC rate 7%
- Finance Term < ESPC 25 years

The optimum is often along a constraint.





Example: Frito Lay North America

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

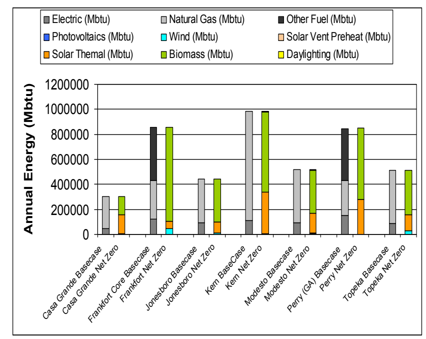
Minimum Life Cycle Cost (Net Zero constraint)

	Photovoltaics Size (kW)	Wind Capacity (kW)	Solar Vent Preheat Area (ft2)	Solar Thermal Area (ft2)	Biomass Boiler Size (M Btu/h)	Biomass Cogeneration Size (kW)	Daylighting Office Utility Skylight/Floor Area Ratio	Daylighting Warehouse Skylight/Floor Area Ratio
Plant #1	200	491	5456	509196	19	1669	2.2%	2.1%
Plant #2	0	6187	8953	391987	87	3097	3.8%	2.0%
Plant #3	0	3107	13098	469621	44	3180	4.9%	3.6%
Plant #4	1011	1000	10213	1360535	78	4108	3.4%	1.8%
Plant #5	1003	998	10327	704140	44	3327	6.1%	3.4%
Plant #6	0	0	10322	1529609	74	6020	err	err
Plant #7	0	3699	10802	673761	43	2193	3.3%	3.7%

Example: Frito Lay North America

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

Minimum Life Cycle Cost (Net Zero constraint)



Example: Frito Lay North America

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

REO Financial Results for Seven Net Zero Frito Lay Plants

Name	Total Initial Cost ($)	Annual Gas Cost ($/year)	Annual Electric Cost ($/year)	Annual O&M Cost ($/year)	Net Zero Plant Life Cycle Cost ($)	Basecase Life Cycle Cost ($)	Net Plant Energy Use (Mbtu/year)
Casa Grande Plant	$29,228,816	$0	$87,364	$348,653	$50,679,571	$47,556,454	1
Frankfort Core Plar	$77,048,078	$62	$288,503	$795,785	$130,531,140	$108,861,469	5
Jonesboro Plant	$44,291,995	$0	$289,989	$466,294	$72,136,790	$68,144,389	0
Kern Plant	$92,813,837	$0	$426,891	$1,036,368	$194,825,458	$181,057,153	0
Modesto Plant	$56,778,062	$0	$259,207	$561,925	$90,551,986	$86,014,963	0
Perry (GA) Plant	$81,422,621	$0	$442,687	$926,686	$143,798,174	$134,966,886	-971
Topeka Plant	$52,504,595	$0	$169,804	$519,792	$92,619,259	$82,995,450	0

"All the News That's Fit to Print"

The New York Times

VOL. CLVII . . . No. 54,129 + ©2007 The New York Times THURSDAY, NOVEMBER 15, 2007

In Eco-Friendly Factory, Low-Guilt Potato Chips

Frito-Lay's Venture Joins the Rush to Be Green

By ANDREW MARTIN

CASA GRANDE, Ariz. — At Frito-Lay's factory here, more than 500,000 pounds of potatoes arrive every day from New Mexico to be washed, sliced, fried, seasoned and portioned into bags of Lay's and Ruffles chips. The process devours enormous amounts of energy, and creates vast amounts of wastewater, starch and potato peelings.

Now, Frito-Lay is embarking on an ambitious plan to change the way this factory operates, and in the process, create a new type of snack: the environmentally benign chip.

Its goal is to take the Casa Grande plant off the power grid, or nearly so, and run it almost entirely on renewable fuels and recycled water. Net zero, as the concept is called, has the backing of the highest levels of corporate executives at PepsiCo, the parent of Frito-Lay.

There are benefits besides the potential energy savings. Like many other large corporations, PepsiCo is striving to establish its green credentials as consumers become more focused on climate change. There are marketing opportunities, too. The company, for example, intends to advertise that its popular SunChips snacks are made using solar energy.

"We don't know what the complete payoff for net zero is going to be," said Indra K. Nooyi, PepsiCo's chairman and chief executive. "If this works even to 50 or 60 percent of its potential, that is fantastic, and it's so much better than what we already have."

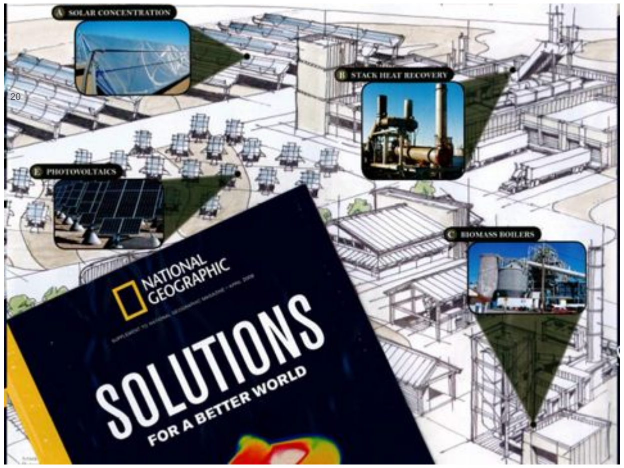
From coast to coast, more companies are thinking about how much fossil fuel they use and ways to conserve energy. Venture capital money is also pouring into fledgling green technology.

Only a few years ago, Andy Walker, a government engineer, pleaded with companies to tackle the problems but got blank stares. "Now, my phone is ringing off the hook," said Mr. Walker, who works at the National Renewable Energy Laboratory of the Department of Energy in Colorado.

But advocacy groups contend that for all the interest in saving energy, many companies also exaggerate small improvements for marketing purposes.

"Now I think there's a transi-

Continued on Page A22



Example: Frito Lay North America

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

Casa Grande Arizona
Near Net Zero
Announcement
October 5, 2011

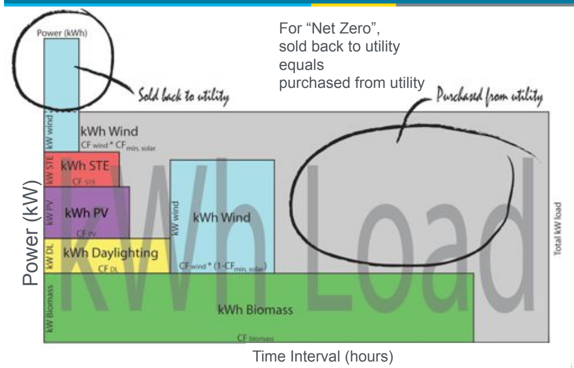
"Frito-Lay set out to create an environmental learning lab in our Casa Grande plant that would try to make the plant 'near net zero'. Our approach to significantly reduce the use of natural resources and the environmental impact of a manufacturing site has been cutting edge and today marks a major milestone for Frito-Lay and PepsiCo."

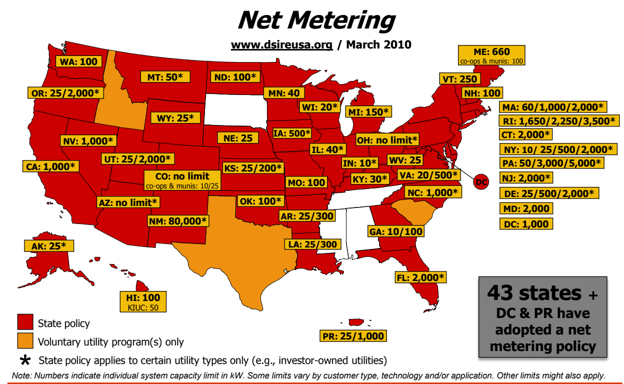
October 5, 2011 Al Halvorsen, Senior Director of Environmental Sustainability, Frito-Lay North America.

The "Net" in "Net Zero"

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

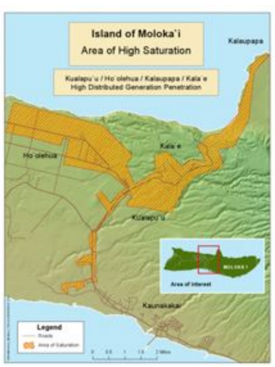
For "Net Zero",
sold back to utility
equals
purchased from utility





Problems with "Net" Metering

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



- Pros:
  - Incentive for RE
  - Saves Some Fuel (up to a limit)
- Cons:
  - Limits to Fuel Savings
  - Doesn't save any other utility operating costs
  - RE may be curtailed; limits on installations (eg 15% in HI)
  - Socio-economic problem: foists utility costs on those least able to afford it.
- Utility Cost Recovery
  - Retail/buy-back spread (c/kWh)
  - Stand-by Charges ($/kW/month)

Why these problems with "Net" Zero?

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

Thermodynamics
Energy Out=Energy In
(kWh and Btu)

Transport Phenomena
Instantaneous
(Volts and Amps)

Net Zero Solution

Zero = EE+RE+Microgrid

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

- Strategies for "Zero" rather than "Net Zero"
  - Tracking Solar
  - Solar on different orientations (East-South-West)
  - Diversity of RE Measures (Solar, Wind, Etc)
  - Dispatchable RE (biomass, hydro, geothermal, landfill gas)
  - Flexible Grid Layout (circuits) to route power around
  - Isolate Critical Circuits: exercise Demand Control
  - Energy Storage (short and long term, electric and thermal)
  - Micro-grid controls
    - Control requirement: maintain required frequency and voltage levels
    - Grid disconnect and seamless resynchronization
    - Micro-grid start-up ("black start")
    - Load control (interfaces with SCADA and EMCS)
    - Supply control (optimized operation of DERs)

Tracking the Sun

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Zero = EE+RE+Microgrid

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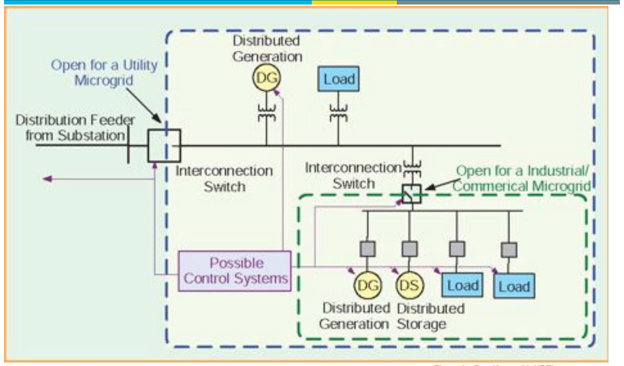

Figure by Ben Kroposki, NREL

Bundling of EE+RE+Microgrid

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

- "Bundling" is not a bad word.
- Win-Win-Win-Win-Win
  - Win for agency:
    - gets infrastructure improvements
    - Redundancy, reliability, diversity, security, cost savings
  - Win for ESCO:
    - sells more product (twice as much?)
    - Enhance economic value of RE with Microgrid
  - Win for Treasury:
    - deeper savings,
    - control energy costs
  - Win for the environment
    - Carbon emissions
  - Win for community
    - Economic development and jobs

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Thank You!

Andy Walker
Andy.walker@nrel.gov

Nearly Net Zero Home:
Well insulated
Efficient Appliances
Programmable Controls
Passive Solar
2.7 kW PV: $10,300
30 sf Solar Water Heater: $2,500
Wood Fireplace: $1,500

Energy Conservation Measures

John Shonder

Oak Ridge National Laboratory

Energy Conservation Measures to Achieve Deep Energy Savings

John Shonder
Oak Ridge National Laboratory

Federal agencies are subject to numerous requirements

- Comprehensive energy and water evaluations of 25% of covered facilities each year, so that an evaluation of each facility is completed at least once every four years (EISA 432)
- Metering of electricity, natural gas and steam (EISA 434, NECPA)
- 30% reduction in energy use intensity compared with 2003 (EISA 431)

But EISA 433 sets the most stringent goals

In addition to goal of reducing energy use in all federal buildings by 30% by 2015, all major renovations of existing federal buildings must meet the following targets for reduction in use of fossil fuel

Fiscal Year	Fossil Fuel Reduction Target
2010	55%
2015	65%
2020	80%
2025	90%
2030	100%

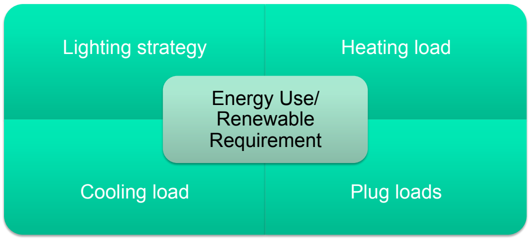
Technology exists to meet EISA 433 goals and reduce fossil fuel use by 100%

- Large solar arrays
- Biomass-fueled CHP
- Biogas-fueled CHP
- Even nuclear energy would work
- But in isolation, these are very expensive solutions for retrofits of single buildings or building clusters

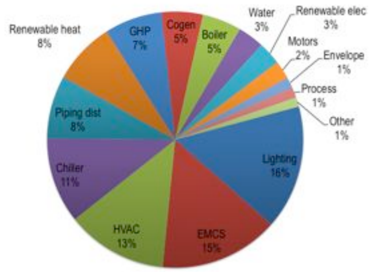
Key is to reduce loads

- Minimize heating and cooling loads
- Minimize plug loads
  - Efficient lighting strategies
  - Efficient appliances
  - Controls
- Minimizing the energy requirements of the building reduces the size and cost of the renewable energy system

Synergies / interactions



Conservation measures implemented in ESPC, by investment



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Deep retrofits require

- Holistic approach considering all energy uses/flows/waste streams in building
- Simulation, careful design and sizing
- Awareness of efficient technologies

U.S. Department of Energy
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FEMP's Technology Deployment Program

- Focus is on new and underutilized technologies applicable to existing buildings, developed beyond bench-test status, commercially available through a private-sector partner, or already in the commercial market but with minimal market penetration in the federal building sector.

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FEMP supports the deployment of emerging and underutilized technologies in a number of ways

- Technology deployment matrix
- Technology Deployment In ESPC Working Group
- Interagency Technology Deployment Working Group
- FEMP Designated and Energy Star Products
- Support to GSA's Green Proving Ground
- Support to Army Policy for New Technologies and Spec Updates
- Support to Tri-Services and the GSA– Technology Screening and Evaluation Portal
- Training to Ensure Success

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FEMP Technology Deployment Matrix

- Tool to assist agencies and ESCOs identify newer and underused energy saving technologies to help meet energy reduction goals.
- Identifies 49 top ranked underused technologies for Federal ESPC/UESC projects.
- Ranked to maximize energy savings impact.
- Provides easy access to application, climate information, resources, case studies, assessments, websites, tools and points of contact to help evaluate applicability in energy improvement projects
- Currently being evaluated and updated and on a regular basis
- Saves research time and provides better direction in making Energy Conservation Measure (ECM) decisions
- Available at http://www1.eere.energy.gov/femp/technologies/m/newtechnologies_matrix.html
- Working to make if more visible via a link on NAESCO web page.

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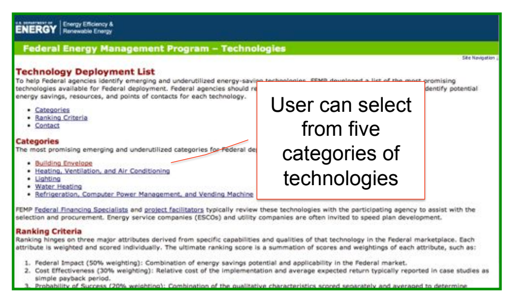
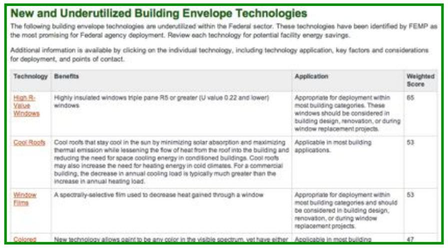
Technology Deployment Matrix



“Building Envelope” page



New and Underutilized Building Envelope Technologies

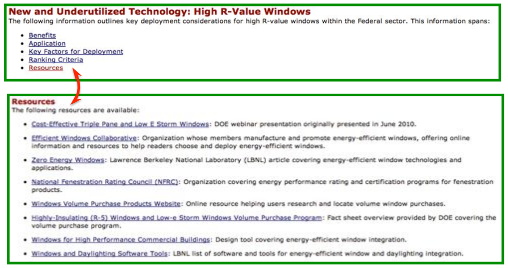
The following building envelope technologies are underutilized within the Federal sector. These technologies have been identified by FEMP as the most promising for Federal agency deployment. Review each technology for potential facility energy savings.

Additional information is available by clicking on the individual technology, including technology application, key factors and considerations for deployment, and points of contact.

Technology	Benefits	Application	Weighted Score
High R-Value Windows	Highly insulated windows triple pane R5 or greater (U value 0.22 and lower) windows.	Appropriate for deployment within most building categories. These windows should be considered in building design, renovation, or during window replacement projects.	65
Cool Roofs	Cool roofs that stay cool in the sun by minimizing solar absorption and maximizing thermal emission while lessening the flow of heat from the roof into the building and reducing the need for space cooling energy in conditioned buildings. Cool roofs may also increase the need for heating energy in cold climates. For a commercial building, the decrease in annual cooling load is typically much greater than the increase in annual heating load.	Applicable in most building applications.	53
Window Films	A spectrally-selective film used to decrease heat gained through a window	Appropriate for deployment within most building categories and should be considered in building design, renovation, or during window replacement projects.	53
Colored	New technology allows paint to be any color in the visible spectrum, yet have either	Applicable in most building	47

- Seven total technologies including colored paint for heat reflection, green roofs, aerogel insulation, and smart windows
- Similar variety of ideas when other categories selected

- Each link takes the user to other useful areas
- “Resources” provides a plethora of non-FEMP information



New and Underutilized Technology: High R-Value Windows

The following information outlines key deployment considerations for high R-value windows within the Federal sector. This information spans:

- Benefits
- Application
- Key Factors for Deployment
- Ranking Criteria
- Resources

Resources

The following resources are available:

- Cost-Effective Triple Pane and Low E Storm Windows: DOE webinar presentation originally presented in June 2010.
- Efficient Windows Collaborative: Organization whose members manufacture and promote energy-efficient windows, offering online information and resources to help readers choose and deploy energy-efficient windows.
- Zero Energy Windows: Lawrence Berkeley National Laboratory (LBNL) article covering energy-efficient window technologies and applications.
- National Fenestration Rating Council (NFRC): Organization covering energy performance rating and certification programs for fenestration products.
- Windows Volume Purchase Products Website: Online resource helping users research and locate volume window purchases.
- Highly-Insulating (R-5) Windows and Low-e Storm Windows Volume Purchase Program: Fact sheet overview provided by DOE covering the volume purchase program.
- Windows for High Performance Commercial Buildings: Design tool covering energy-efficient window integration.
- Windows and Daylighting Software Tools: LBNL list of software and tools for energy-efficient window and daylighting integration.

Tech Deployment in ESPC Working Group

- Authorized at the Federal ESPC steering committee meeting in November 2010
- Objectives include:
  - Increase the utilization of FEMP Designated Product Specifications (top 25% in efficiency) for selected technologies in ESPC
  - Accelerate deployment of new technologies through ESPC with particular emphasis on use of the FEMP Technology Deployment Matrix
- Expected results include:
  - best-practice guidance papers that address techniques of enhancing technology deployment in ESPCs, and case studies of successful deployment examples
- Contact Shawn Herrera (202-586-1511), shawn.herrera@ee.doe.gov or Mike Holda (209-835-8150, maholda@lbl.gov) for more information

Technology Deployment in ESPC Working Group - Initiatives

- Periodic “technology” conference calls to increase awareness and educate agency technical POCs, ESCOs, Core team, FFS and PFs on the latest and best available technologies for ECMs
- Support for appropriate opportunities to incorporate demonstrations of EERE technologies in ESPCs
- Risk sharing through the R,R&P matrix and M&V
- Use of the Technology Deployment in ESPC WG as a user community to identify parameters/characteristics in technology testing that would accelerate market acceptance in ESPCs
- Other means as jointly identified by the Working Group

Interagency Technology Deployment Working Group

- Part of the Feds-only Interagency Energy Management Task Force
- Purpose of the working group is to
  - understand federal agencies technology deployment needs
  - inform ESCOs, technology developers and vendors of potential market opportunities

Objectives of the Interagency Tech Deployment WG

- Learn what technologies the agencies are interested in and what policies are in place or need to be in place, which will help FEMP understand the market.
- Gather information to inform the technology vendors and developers of potential market opportunities.
- Work with Agencies to develop policies, strategies, and tools to accelerate deployment.
- Focus on identifying technologies that meet requirements for broad Federal acquisition methods, including through UESC and ESPC vehicles
- Communicate results to ESCOs and other stakeholders

Interagency Tech Deployment Working Group

- Next meeting is December 7, 2011 from 10 a.m. to 12:00 p.m., at the DOE Headquarters building
- If you would like to attend in person or remotely, or for more information, please contact Shawn Herrera at: shawn.herrera@ee.doe.gov

FEMP Designated and Energy Star Products

- Federal agencies are required to procure energy-efficient products
- FEMP produces energy efficiency requirements and resources to help Federal buyers comply with Federal requirements while saving energy and costs
- http://www1.eere.energy.gov/femp/technologies/procuring_eeproducts.html

Examples of Deployment of New and Emerging Technologies in ESPC

USCG Puerto Rico

Investment Grade Audit scope included the demonstration of:

- cool roofs
- variable refrigerant volume (VRV) air-conditioning
- Baseline and post-retrofit conditions were measured before award (for each ECM)
- USCG is funded demonstrations directly
- Helps reduce price, installation and performance risk

San Diego VA- Ultra Low NOx Turbine Cogen System

Ft. Irwin –HID to T-5 Hi- bay Lighting: Pre-Retrofit

Ft. Irwin –HID to T-5 Hi- bay Lighting: Post-Retrofit

GSA Region 7

Three concurrent ESPC projects with three separate ESCOs leveraged with ARRA $

- LED Lighting
- Induction lighting
- Turbocor chillers
- Roof Integrated PV and cool roofs
- Wind
- Data center efficiency measures

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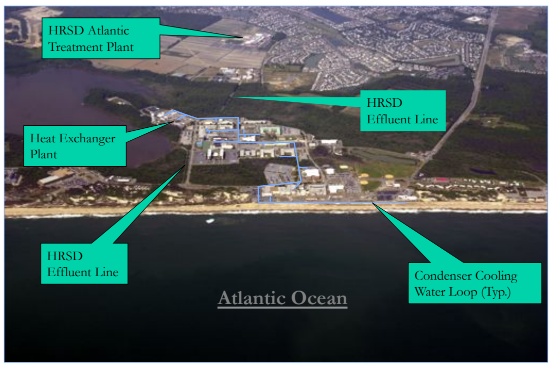
Dam Neck Annex GSHP Project



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Heating, Ventilation and Air Conditioning Energy Conservation Measures

- HVAC Improvements in 14 Buildings (1,624,269 SF)
- Condenser Cooling Water Loop (Cooled by HRSD effluent) provided to 15 Buildings (1,530,155 SF)
- 2,142 Tons of New-Installed HVAC on Condenser Cooling Water Loop
- 1,400+ Tons of Existing HVAC on Condenser Cooling Water Loop
- 10 miles of Condenser Distribution Loop Piping in Sizes from 2" to 36" diameter
- 0.5 miles of HRSD/Heat Exchange Plant Piping, 36" diameter

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FEMP Support For GSA Green Proving Ground Project

- Green Proving Ground is GSA's program to deploy and test sixteen new or underutilized technologies in their facilities.
- After thorough objective evaluation of each technology, reports will be written and findings widely distributed so that these technologies can be best matched with facilities whose needs match their capabilities.
- Successful technologies will be included in the P-100, Performanced Based Specifications
- 140 different sites were evaluated to determine which would be the best test cases.
- Evaluation and selection was supported by DOE national labs.

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Technologies being evaluated by GSA in the Green Proving Ground Program

- Ground source heat pumps
- Smart windows
- Highly insulated windows
- Daylighting
- PV with solar water heating
- Net metering
- Plug load and behavioral change

Augmenting Building Upgrade Projects with ESPC

- Many agencies dedicate funding to building modernization
  - DOD's Facilities Sustainment, Restoration and Modernization Program (SRM)
  - Army's Barracks Upgrade Program
  - Building modernization in GSA, VA and other agencies
- Energy efficiency is not usually the primary focus, but if coupled with efficiency upgrades, these projects could dramatically improve the economics of doing deep retrofits

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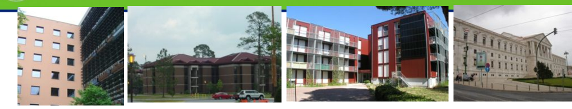
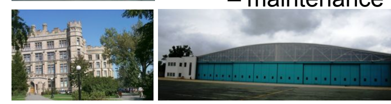


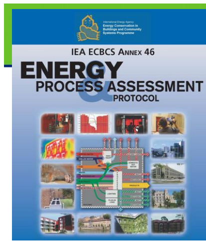
Government/Public non-residential buildings, e.g.:
- office/administrative buildings,
- dormitories/barracks
- one storey production and
- maintenance facilities

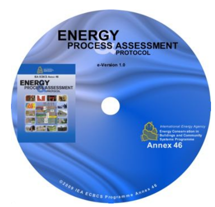


Four Subtasks Addressing

A Energy Assessment Protocol (Canada, Finland, France, Germany, USA)
B Technology Database (Canada, Denmark, Finland, France, Germany, Italy, USA)
C Best Practice Guidelines for EPCs (Canada, Denmark, Finland, Germany, USA)
D Energy Concept Adviser Toolkit "EnERGo" (Canada, Denmark, Finland, France, Germany, Italy, USA)

OA	**Alexander Zhivov (USACE, USA)**
Subtask A:	**Jorma Pietilainen (VTT, Finland)**
Subtask B:	**Cyrus Naseri (DOE FEMP, USA)**
Subtask C:	**John Shonder (Oak Ridge National Laboratory, USA)**
Subtask D:	**Hans Erhorn (Fraunhofer Institute of Building Physics, Germany)**





Protocol Content

Preface
Introduction

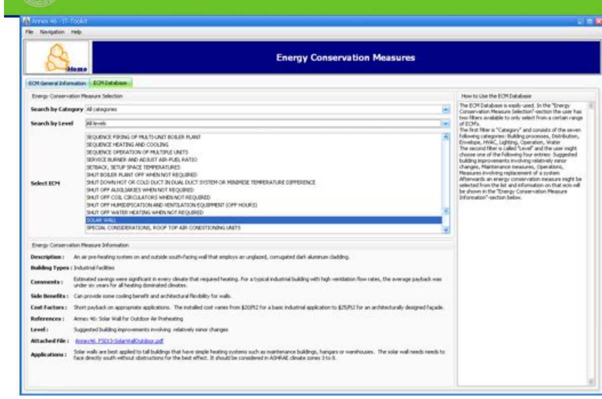
Part I: Energy Assessment Procedure
Energy assessment as part of energy management
Organizing energy assessment
Energy assessment as a means of continuous improvement
Key players in an energy assessment
Assessment procedure
After the energy assessment
Continuous commissioning

Part II: Energy-saving opportunities
Special features of industrial sites
Special features of non-industrial sites
Typical areas to look for improvement
Glossary
References

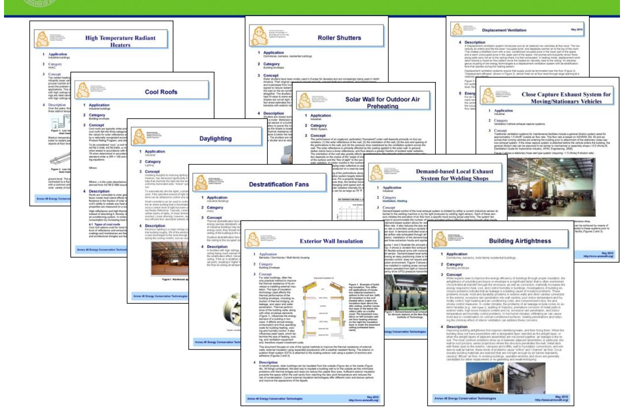
APPENDIXES A-O
Total: 380 pp

Published by the ASHRAE,
Distributed more than 600 copies
Referenced in the ASHRAE Std. 100 "Energy Conservation in Existing Buildings"

ECM Database



Examples of ECM Fact-sheets



Best Practices Guide for ESPC

International Energy Agency
Energy Conservation in Buildings and Community Systems Programme

IEA ECBCS Annex 46

Best Practice Guidelines for Using Energy Perfomance Contracts To Improve Government Buildings

John Shonder, Oak Ridge National Laboratory
Ed Morofsky, Public Works and Government Services Canada
Fritz Schmidt, Ennovatis
Ove Morck, Cenergia
Mervi Himanen, VTT

May 2010

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- Definition Of Energy Performance Contract
- Motivations For Using EPCs for Government Facilities
- Most Common Energy Conservation Measures (ECMs)
- Implementation Process
- EPC Best Practices
  - Policy and Legal Framework
  - Pre-negotiated/Model Contracts
  - Training and Assistance
  - Competition
  - Measurement and Verification
  - Quality Assurance During Project Performance Period
- Continuous Program Improvement
- Conclusions

Where to find Annex 46 results

- Annex46.org
- http://www.annex46.de/impress_e.html

Representative SRM project

- Cluster of five barracks (29,000 sq. ft. each) and dining hall (12,000 sq. ft.), served by central plant providing hot water and chilled water
- Total annual energy use of 3.1 million kWh electricity and 11,476 MMBtu propane
- Typical upgrades using Building Upgrade Program funds cost $29.4 million, result in $27k savings (8% electricity, 7% heating fuel)
- This is a missed opportunity to incorporate energy efficiency upgrades during the renovation process
- How much incremental funding required, and what could be saved?

ECMs included in expanded scope

- Improved building envelope insulation
- Cool roofs
- Reduced air infiltration
- Efficient lighting/day-lighting
- Triple-pane, low E windows
- Insulated doors
- Reduced plug loads, efficient appliances
- With deep (50%-70%) energy reductions achieved, renewable power sources become an affordable option
  - Solar PV
  - Biomass/biogas fired CHP
  - Central solar water heating

Incremental funding can allow buildings to meet EISA fossil fuel reduction targets

- Additional investment of ~$2M for deep savings upgrades + ~$1M for biomass-fueled CHP plant
- Potential annual energy savings = ~$300k plus additional O&M savings
- Simple payback <10 years for the incremental funding
- Alternative financing becomes an attractive option for the incremental portion

Source: Zhivov et al., Net Zero Building Cluster Energy Systems Analysis for US Army Installations ASHRAE Transactions (in press)

Conclusions

- Technology already exists to achieve deep reductions in building energy use
- Key is to consider the building and its energy supply as a whole, and develop an integrated approach
- FEMP has several resources available to support the use of the technologies required to achieve deep energy retrofits

U.S. Department of Energy
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Contacts

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- John Shonder
  Oak Ridge National Laboratory
  shonderja@ornl.gov

Report Out Slides from Breakout Groups

Presenters varied

Occupant Behavior and Workplace Culture

Rocky Mountain Institute

OCCUPANT BEHAVIOR CHANGE SOLUTIONS

Barrier	Solution
It is difficult to quantify energy / cost savings	Agency shares risk; Create incentive to overperform; Stipulate conservative number; Do we need to explicitly measure (i.e. bundle)?
Not many good examples of "Behavior ECMs"	Create case studies and get the word out; start with low risk process-based solutions (e.g. daytime cleaning)
Hard to incentivize all occupants of varying cultures, generations, and characteristics	Be more inclusive during design; identify obsolete processes used by tenants that are inhibiting energy savings; tie savings what is "bigger than the individual"; alternative metrics (e.g. jobs preserved)

Analysis and Integrative Design

Rocky Mountain Institute

ANALYSIS AND INTEGRATIVE DESIGN SOLUTIONS

Barriers	Votes	Solution
Deep savings may not be cost effective over contract term (No $ is available from agencies)	12	▪ Identify funds available through coordination between energy managers, master planning and capital improvement ▪ Find solutions to channel saved space into funding for Deep Retrofits ▪ Bulk purchasing ▪ Phased implementation of ECMs
Lack of info on existing buildings (metered/utility data)	9	GSA needs to store and categorize reports/data into centralized searchable database
Typical ESPC process looks at individual ECMs	5	Process needs to value bundles of integrated measures

Rocky Mountain Institute

ANALYSIS AND INTEGRATIVE DESIGN
SOLUTIONS

Barriers	Votes	Solution
Laws tell you to save energy, ESPC process demands $ savings	**4**	Disconnect must be reconciled
High risk to guarantee deep savings (ability to model new technologies)	**4**	▪ ESCO engineers have experience and judgment needed ▪ The tools keep up with new technologies
No way to take credit for other savings (O&M, increased productivity, etc.)	**3**	GSA needs to develop a standard way o assign value for these things

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PROJECT ECONOMICS

ROCKY MOUNTAIN INSTITUTE

Project Economics
KEY BARRIERS & SOLUTIONS

Barriers	Solutions
1. High Financing Costs (Interest rates)	• Get as close as possible to fed discount rate (.75%) • Create case for gathering support (appeal to broader issues, i.e. jobs, small biz requirements, etc.) • **Need to align with Skye's prior efforts**
2. No integration w/planned improvement projects	• Provide the information ahead of time (RFP or data sharing) • ESCO could fold pre-planned improvement into a larger contract

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Project Economics
KEY BARRIERS & SOLUTIONS

Barriers	Solutions
3. No inclusion of avoided future (>1-2yrs) costs in ESPC (including capital and maintenance)	• Allowed for UESCs • Need clear guidance from central office through to contracting officers
4. LCCA costs do not match contract duration	• Include the LCCA costs (avoided) as NPV • Treat each ECM differently depending on life cycle
5. 1% interest rate difference between UESCs and ESPCs due to guarantee	• Set up insurance fund

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M&V

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MEASUREMENT & VERIFICATION
KEY BARRIERS AND POSSIBLE SOLUTIONS

BARRIER	SOLUTION
1. Uncertainty/variability of how building is operated on an on-going basis after installation	• Treat O&M as ECM and have ESCO handle it • Have O&M contractor handle it • Need to clearly specify all performance vs. operation responsibilities
2. Cost/level of effort/complexity for whole-building M&V (keeping track of adjustment factors, performing sub-metering, client understanding of M&V)	• Perform robust M&V for 1st year • Have option A, B for following years • Pull M&V out of agencies and put it in FEMP
3. Lack of consistency across GSA offices/agencies/regions	• Apply standardization • Have common M&V methodology across similar projects • Get center of competence for M&V (e.g. move to FEMP)

MEASUREMENT & VERIFICATION
KEY BARRIERS AND POSSIBLE SOLUTIONS

BARRIER	SOLUTION
4. Poor, absent or incorrect baseline performance data	• Improve baseline efforts • Have FEMP approve baseline; allow ESCO to submit before price proposal
5. Current methods do not account for existing equipment not working well in making baseline adjustments	• Need to be able to capture savings associated with O&M improvements that happen as part of new installation
6. Guarantee is based on equipment O&M being done effectively but if ESCO doesn't own O&M, they might be at risk	• Have ESCO be responsible for O&M
7. Must verify performance of integrated measures that might be difficult to accurately model/estimate savings	• Provide documentation of energy modeling assumptions, inputs, outputs for FEMP to review/ accept for reasonableness • Do not guarantee full estimated savings - degrade

DELIVERY PROCESS

Process
KEY BARRIERS

- **Project requirements**: Clear project requirements and proficient region/site teams are not established early enough ****
- **Eligible savings**: Is there a threshold for the amount of savings required to justify a deep retrofit? Major confusion/disagreement on what can be counted as eligible savings *****
- **ESCO Selection**: ESCO selection process takes too long
- **Agency building data**: Lack of available building data, and agency understanding/proficiency around data/design needs
- **Additional risk**: There is a significant cost/risk to the additional analysis required for successful deep retrofits
- **Significant project delays:** Regions/sites are not always incentivized to adhere to aggressive schedules.

Process
KEY CONSIDERATIONS

Moving forward….

Are regions fully onboard with deep retrofits?

Should processes be Centralized vs. Regionalized?

Proceed in replicable batches of 30?

Process
SOLUTIONS

Solution	Solution
Clarify eligible savings	• Define eligible sources of payment: O&M, utility rebates, PPA, leasibility (tenant satisfaction surveys), absenteeism • Define how to demonstrate differential • Clarify how to address elevated baselines How much it woulda cost if they woulda done it)

Process
SOLUTIONS

Solution	Solution
ESCO selection	• Get all 32 project ESCOs selected in 90 days • Three step process 1. One letter of notification to all 16 ESCOS, with project grid including project data (has as-built drawings, experience level of region, etc.). ESCOs mark those projects that they are interested in. 2. Then team (region/central?) chooses top 3 ESCOs for each job 3. Final selection through oral interview ** Guarantees fair opportunity, but should/does this process support GSA objective of diverse ESCO participation?

Process
SOLUTIONS

Solution	Solution
Reduce project delays	• Midterm review in IGA, with clear criteria + follow up • Create urgency to adhere to aggressive timeframes through GSA rebate/incentives

Rocky Mountain Institute

ESPC Net Zero Energy Challenge Overview

Kevin Kampschroer
Kinga Porst

GSA

GSA Challenge Goals

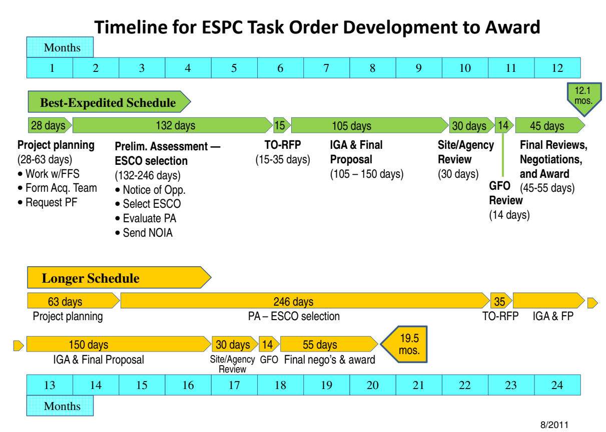
- Demonstrate best practices for maximizing overall ESPC project energy savings;
- Advance progress toward EISA goals
- Accelerate deployment of underutilized and renewable technologies.
- Further expose GSA regions to new DOE ESPC IDIQ contract process and resulting improvements in ESCO selection
- Identify and understand processes necessary to get to net zero energy
- Identify structural, contractual and technical impediments

GSA Challenge Framework

- Site Selection: GSA selected 30-35 buildings for competition across multiple regions
- Award Process: Buildings to be awarded with DOE's streamlined competition process
- Recognition: Projects to be evaluated by a panel of independent experts to identify and recognize exceptional performance in a number of technical categories
  1. absolute energy savings of pre-retrofit energy use
  2. progress towards Federal Government goals for energy, water, fossil fuel, renewable energy, and sustainability
  3. financial and technical creativity
  4. ability to extend best practices to other Federal buildings.

And More What's Next?

- Change in Procurement Practice
- Change in Budget Practice
- Change in Measurement
- Criteria for Selecting Vendors
- Performance Contracting by Team Negotiation
- Change in Fee Structures
- Integration with Buildings Operations, Not Just at the Hand-Off, but for Years

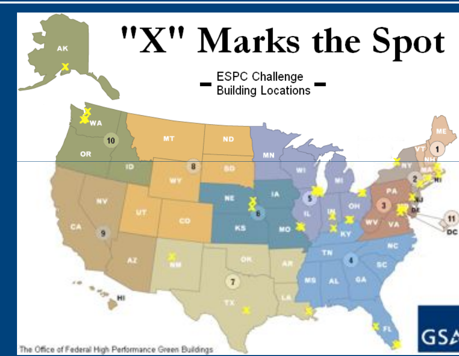


ESPC Challenge

- 30-35 Buildings
- 17 mio sqft
- 100,000 – 800,000 sqft
- $150 mio potential project size

Where the Buildings Are

Boston, MA
New Bedford, MA
Hartford, CT
Buffalo, NY
New York, NY
Newark, NJ
Philadelphia, PA
Miami, FL
Tampa FL
Louisville, KY
Indianapolis, IN
Cleveland OH
Cincinnati, OH
Chicago, IL
Overland, MO
Lincoln, NE
Omaha, NE
St. Louis , MO
Austin, TX
New Orleans, LA
Albuquerque, N.M.
Oklahoma City, OK
Auburn, WA
Tacoma, WA
Bothell, WA
Anchorage, AK
Washington, DC
Silver Spring, MD
Lanham, MD



GSA Net Zero Energy Retrofit Challenge Charrette
Pre-read

Issued October 24th, 2011

The General Services Administration, Office of Federal High Performance Green Buildings (OFHPGB), Rocky Mountain Institute (RMI) and the Federal Energy Management Program (FEMP) have begun to identify ways to modify and expand the Energy Savings Performance Contract (ESPC) process to attain deeper energy savings on retrofits of existing buildings. In this effort, GSA, RMI, and FEMP will hold a workshop with Super ESCO teams to introduce the Net Zero Energy Retrofit Challenge and to identify current barriers and solutions to achieving greater savings on all ESPC projects.

"Buildings that deliver more comfort and productivity with less energy and stronger economics are the way of the future. In fact, I live in one. At Rocky Mountain Institute, we see great market potential to infuse net zero energy buildings with energy service performance contracting through the Net Zero Renovation Challenge," said Amory B. Lovins, who is RMI's cofounder, Chairman, and Chief Scientist.

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Overview of Charrette:

GSA, RMI, and FEMP will convene a meeting of Federal contract negotiation and contract management personnel with selected Energy Services Company (ESCO) providers to improve the ESPC process and expand the use of ESCOs to finance installation of energy saving technologies and practices in existing buildings. The charrette will provide an open, collaborative and non-competitive environment for engineers, project managers and contracting experts from government and the 16 ESCOs that have been awarded contracts under the Department of Energy's IDIQ to identify barriers and solutions to raising the bar on the minimum level of savings an ESPC provides to government agencies.

ESCO Industry snapshot:

GSA's vision is to achieve a Zero Environmental Footprint. GSA will eliminate its impact on the natural environment and use its government wide influence to reduce the environmental impact of the federal government. ESPC projects at GSA sites have not historically achieved true deep energy retrofits (greater than 50% energy savings from current operations). There is evidence that deep energy retrofits improve the economics of efficiency, and achieve bigger energy savings and other benefits at equal or lower cost, while producing much larger energy savings (more than 50%) than conventional, shallow retrofits.[1]

Lighting improvements and Building Automation upgrades were implemented in over 200 projects (>75%) whereas renewable energy systems were only implemented in 71 projects (26%) and building envelope improvements in 37 buildings (14%). (*Source: FEMP* http://www1.eere.energy.gov/femp/pdfs/do_awardedcontracts.pdf)

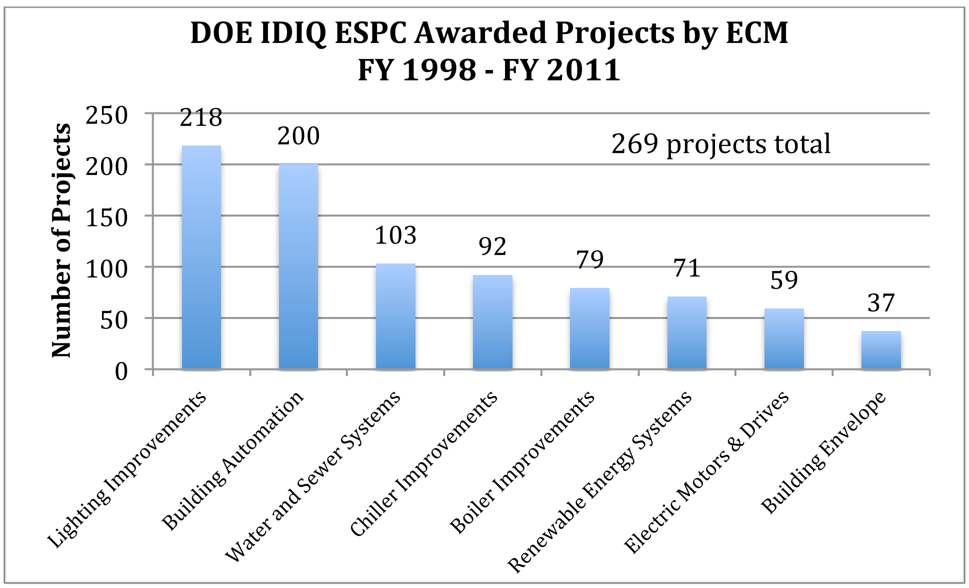

Figure 1: DOE IDIQ ESPC Awarded Projects by ECM (FY 1998 – FY 2011)

Aside from lighting improvements, ESPC's are not directly targeting reducing building loads. By reducing heating and cooling loads, envelope measures could reduce the size of the HVAC equipment required, resulting in larger energy savings than are typically seen.

[1] Rocky Mountain Institute, RetroFit Depot™, Retrofit Industry Needs Assessment Study, Public White Paper

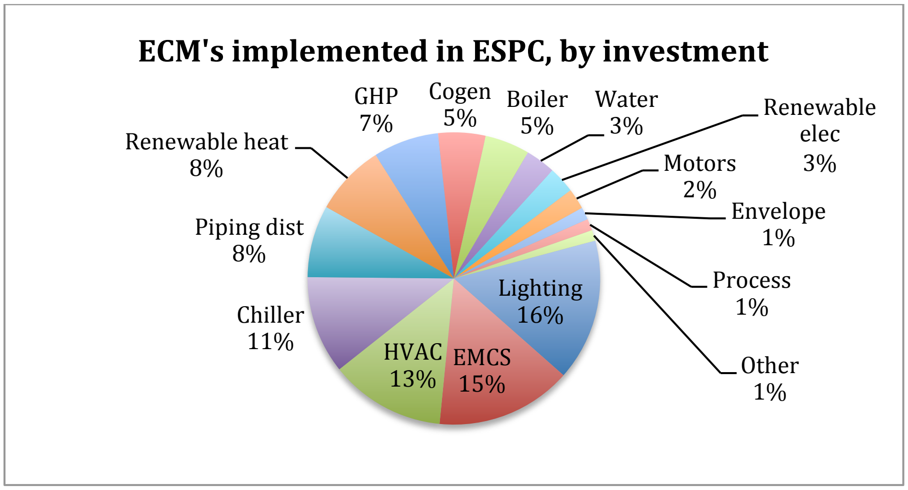

Figure 2: ECM's included in ESPC's by investment (*Source: John Shonder, Oak Ridge National Laboratory, 2011)*

Federal Requirements for GSA Buildings

The Energy Independence and Security Act of 2007 (EISA 2007) established energy management goals and requirements. Today, 97% of GSA's greenhouse gas (GHG) emissions come from energy consumption in Federal buildings and leased space. GSA will increase its investment in energy and water conservation projects across its inventory of owned Federal buildings in order to reduce facility energy intensity to 48,926 BTU/GSF by FY 2020. This amounts to a 37.5% reduction from the FY 2003 baseline of 78,282 BTU/GSF.

SCOPE 1 & 2 GHG TARGET	FY 10	FY 11	FY 12	FY 13	FY 14	FY 15	FY 16	....	FY 20
EISA Mandated Energy Reduction Goals (BTU/SF reduced from FY 2003 base year)	**15%**	**18%**	**21%**	**24%**	**27%**	**30%**	**hold**	**...**	**hold**
GSA Planned Energy Intensity Reduction (BTU/SF reduced from FY 2003 base year)	15%	18%	21%	24%	27%	30%	31.5%	...	37.5%
Mandated Renewable Electricity Goals (Percent of electricity from renewable sources)	**5%**	**5%**	**5%**	**7.5%**	**hold**	**hold**	**hold**	**hold**	**hold**
GSA Planned Renewable Electricity Use (Percent of electricity from renewable sources)	10%	12%	14%	16%	18%	20%	22%	...	30%
GSA Scope 1 & 2 Reduction Target (Reduced from FY 2008 base year)	7%	10%	13%	17%	20%	21.3%	22.8%	...	28.7%

Figure 3: Comparison of EISA mandated energy reduction goals and GSA planned energy intensity reduction. Also, a comparison of mandated renewable electricity goals and GSA planned renewable electricity use. (*Source:* http://www.gsa.gov/portal/content/185129*)*

Furthermore, E.O. 13514 reduction targets do not allow for adjustments to accommodate increases in the GSA inventory of covered buildings. E.O. 13514 Scope 1 & 2 emissions reduction targets measure tons of carbon emissions against a fixed baseline. The energy consumption of any new workspace must be offset by additional energy reductions elsewhere.

Typical ESPC procurement process

The typical ESPC procurement process is provided in two documents in the appendix. During the workshop, we will be asking for thoughts and recommendations on how to streamline the process.

Definition of Net Zero Energy

For the purpose of this competition, Net Zero Energy will be defined as a building that produces (and exports) at least as much renewable energy as it uses in a year, when accounted for at the site. This does not take into account source generation factors. Acceptable forms of renewable energy used to meet this goal include onsite PV, solar hot water, low impact hydroelectric, wind, biomass, ethanol, biodiesel.[2] Renewable Energy Credits (RECs) are not acceptable to meet net zero energy for the sake of the Challenge. Efficiency is heavily weighted as a solution above renewable generation.

Description of Net Zero Approach:

In the deep energy retrofit process, it is important to identify the right steps to take, and equally important to perform these steps in the right order. Following this process will enable project teams to realize the most cost effective energy reductions:

1. **Define the specific end-user needs**
   What are the needs and services required by the building occupants? Understand this first, rather than jumping right to the equipment needed to provide the service.
2. **Understand the existing building structure and systems**
   Understand and assess the current state of the building. What needs are not being met? Why not?
3. **Understand the scope and costs of planned or needed renovations**
   What systems or components require replacement or renovation for non-energy reasons? What are the costs or interruptions to service or occupancy? Identify these planned renovations early, as it may be possible to combine this with a desired energy efficiency retrofit to optimize the overall return on investment.
4. **Reduce loads**
   Select measures to reduce loads: First, through passive means (such as increased insulation). Then, by specifying the most efficient non-HVAC equipment and fixtures
5. **Select appropriate and efficient HVAC systems**
   After reducing loads as much as possible, consider what HVAC system types and sizes are most appropriate to handle the drastically reduced loads.
6. **Find synergies between systems and measures**
   Seek synergies across disciplines and find opportunities to recover and reuse waste streams. Through this exercise, you can often realize multiple benefits from a single design decision.
7. **Optimize controls**
   After the most appropriate and efficient technologies have been selected, the focus should shift to optimizing the control strategies.
8. **Incorporate Renewables**
   Once the energy consumption has been drastically reduced, it is appropriate to investigate and size renewable energy options that are well suited to the climate and site.
9. **Realize the intended design**
   Tune the owner's project requirements (OPR), implement measurement and verification (M&V) and continuous commissioning to ensure full realization of the intended design.

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[2] This definition is consistent with the NZE definitions put forth by NREL (http://www.nrel.gov/docs/fy06osti/39833.pdf) and generally accepted in the industry EXCEPT for the inclusion of RECs.

GSA ESPC Net Zero Renovation Challenge

GSA is committed to using the ESPC process to achieve deep energy use reductions in their buildings. Accordingly, GSA has selected 30-35 buildings across the US for improvements as part of the GSA ESPC Net Zero Renovation Challenge. Using the standard award process for the Department of Energy's ESPC IDIQ contract, GSA intends to award multiple Task Orders for energy efficiency projects in these buildings. The intent is to award Task Orders to as many ESCOs as possible.

In order to encourage ESCOs to go beyond the energy savings seen in typical ESPC projects, the challenge will provide nominal prizes and awards to the most innovative projects. An overall award will be given to the ESCO with the most cumulative points and will be awarded additional projects through GSA. ESCO's will also be awarded for the highest achievement in each category.
GSA reserves the right to use past performance as a criteria for any new Task Order awards. The criteria that will be used to evaluate the Task Orders for the purposes of the separate competition are as follows:

1. Absolute energy savings
2. Progress towards EISA/GSA goals
3. Financial creativity
4. Technical creativity
5. Replicability/Applicability
6. Design process and analysis

Barriers to deep energy retrofits in ESPC's:

These barriers coupled with opportunities or solutions will be discussed more during the breakout group sessions of the charrette.

1. Analysis and Integrative Design

- Lack of time to perform energy analysis that takes into account integrative design.
- Some risk for the ESCO to take on this level of analysis before contract is awarded.
- Agency personnel may lack confidence in savings predictions derived from simulation models.
- Agencies are sometimes resistant to new technologies or approaches.

2. Financing

- Achieving deep energy savings often requires a substantial contribution of appropriated funds, which may not be available.
- Agencies are sometimes reluctant to sign the long-term contracts (>20 years) necessary to achieve deep savings.
- Agencies sometimes question individual conservation measures with very long payback periods, despite the fact that these are bundled together with other, shorter-payback ECMs into an integrated project
- Financiers prefer Option A M&V, which may not be the customer's preference in a project with interactive ECMs.

3. Delivery process

- Agency uncertainty over how to develop and manage hybrid projects that integrate building upgrade projects and ESPC.
- Agency reluctance to go "outside the box".

4. Behavioral change

- Has great potential, but can be difficult to quantify benefits.
- Agencies are often skeptical of the benefits.
- Can be difficult to measure savings.

5. Long term and affordable Measurement and Verification

- Uncertainty over how to measure the performance of projects with interactive ECMs.
- Potential for increased risk.

Deep Energy Retrofit Case Studies:

Retrofit Projects with Net Zero Energy Target

WWF Headquarters, Netherlands

World Wide Fund for Nature (WWF) renovated a former 1950's agricultural laboratory as its headquarters. It is a Carbon Neutral Building, it is (almost entirely) self-sufficient and achieves an A++ rating at the Energy Performance of Buildings Directive (EPBD) energy label due to the use of triple glazed windows with louvers on the south elevation that ensure efficient isolation and heat resistance. Extensive use of renewable energy sources such as building integrated photovoltaic panels, solar thermal collectors, 6-well geothermal system and a backup biomass system allows building to go net zero. The organic blob at the center has a mud ceiling laced with a capillary system of tubes that channel water to regulate heating and cooling. The building uses only natural ventilation, and cool ground water is used for cooling the building before flushing toilets.

General Information

Location : Zeist, the Netherlands

Size : 40,900 ft2 (3,800 m2)

Completed : 2008

Type : Office Building

Renovation Cost: $5.4 million (€ 4 million)

Photo credit: RAU Architects

IDeAs Z-Squared Design Facility

IDeAs (Integrated Design Associates) has transformed a commonplace building - a 60's era concrete, windowless bank - into its new headquarters to build one of the first commercial buildings in the United States to be designed to a "Z^2" energy efficiency goal; that is, net zero energy, zero carbon emissions. Energy efficiency strategies such as skylights in the ceiling, occupancy sensors to turn off lights in unoccupied spaces, high efficiency office equipment and innovative automatic controls to minimize plug loads, natural ventilation supplemented by radiant heating and cooling in the floors, insulation with high R-values, high performance window glazing with high visible light transmittance (with super low-emissivity, and electro-chromic glass that is tied to a photo-sensor) helps to reduce the energy demand. A ground-source heat pump and a 28 kW solar PV system in the building are enough to offset peak demand load.

General Information

Location : San Jose, California

Size : 7200 ft2 (669 m2)

Completed : 2007

Type : Office Building

Renovation Cost : $4,100,000

Premium for NZE : 6.3% of the total cost

Photo credit: IDeAs

Wayne Aspinall Federal Building Modernization

92 year-old Wayne Aspinall Federal Building and U.S. Courthouse is planned by GSA to be the country's first Net Zero site energy historic building. Building will feature energy efficient strategies such as florescent lighting with wireless controls and storm windows with a solar film covering that will reduce the demand on heating and cooling. A geothermal heating and cooling system, a 115 kW roof and canopy mounted photovoltaic, DC micro-grids and variable refrigerant flow systems are proposed in the plans. The project aims to achieve a LEED Platinum certification and GSA expects to save roughly $16,000 in annual energy costs after the renovation is completed, as well as reduce peak energy demand by 125 kilowatts.

General Information

Location : Grand Junction, Colorado

Size : 41,562 ft2 (3,800 m2)

Completion Date: January 2013

Type : Federal Office Building

Renovation Cost : $7,000,000 - $12,000,000

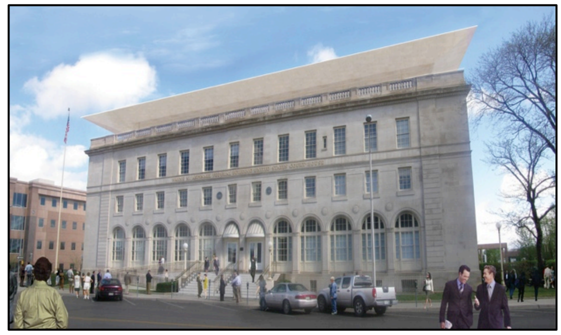


Photo credit: LAWRL Design, LLP.

Retrofit Projects with Low Energy Target

Byron Rogers Federal Office Building

A GSA building located in Denver is amidst a comprehensive retrofit that is projected to save over 60% from existing energy operating costs. The project will comply with historic preservation and asbestos abatement while improving the building envelope, window performance, and access to daylight. The project will optimize heating and cooling processes with a unique chilled beam and heat recovery approach that transfers heat around the building to capitalize on the thermal differential caused by its solar orientation. This project will meet EISA 2007, EO 13423, and EPAct 2005 requirements.

General Information

Location : Denver, Colorado

Size : 494,156 ft2, 18 stories

Completion Date : 2013

Type : High-rise Office Building

Renovation Cost : TBD

EUI : 90 kBtu/sf pre-retrofit,
< 35 kBtu/sf projected

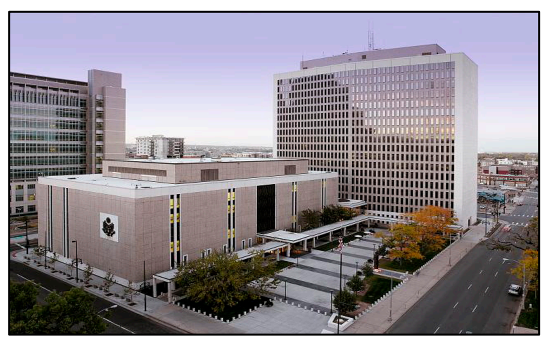


Photo credit: HOK

Indianapolis City-County Building (CCB)

This city owned building recently completed a retrofit to save 46% energy cost savings using an ESPC. Steam use will be reduced by over 93%. The project included a geothermal heat exchange system, heat recovery for the central plant, data center, and exhaust air, modified air handlers, as well as solar thermal and solar PV systems.

General Information

Location : Indianapolis, IN

Size : 731,119 ft2 (Gross), 28 stories

Completion Date : 2011

Type : High-rise Office Building

ROI : 9.3%

EUI : 113 kBtu/sf pre-retrofit (2008), < 60 kBtu/sf projected

Photo credit: C. Resources Inc.

Edith Green-Wendell Wyatt Federal Office Building

In 2009, the GSA began a deep energy retrofit to save 30% of energy use, with 30% solar thermal generation - leading to a 55% fossil fuel reduction. The project is pursuing LEED Platinum certification. 255kW PV array on roof provides 10% of building's energy and provides a canopy for rainwater collection and reuse. The distinctive façade will include transparent aluminum and a vegetated wall shading the first three floors and incorporating rainwater harvesting. The project includes green leases for tenants, a variety of tenant requirements and regulated tenant improvements.

General Information

Location : Portland, OR

Size : 517,000 ft2, 17 stories

Completion Date : 2013

Type : Federal Office Building

Renovation Cost : $135 million

EUI : Reduction from 80 kBtu/sf to 33-38 kBtu/sf (estimated)

Photo credit: PAE Engineers Inc.

Charrette Agenda
Net Zero Energy Retrofit Challenge

Location:
The charrette will be conducted at RMI offices at 1820 Folsom St., Boulder CO, 80302. (303) 245-1003

Workshop objectives:
To increase the minimum level of savings that an ESPC can provide to government agencies.

To achieve this objective, the workshop agenda has been structured to:

- Identify barriers and solutions to improving the Energy Savings Performance Contract (ESPC) process
- Expand the use of ESPCs
- To discuss criteria for the net zero energy challenge, identify and understand processes necessary to get to net zero energy and highlight key strategies such as cutting-edge energy saving technologies, best practice measurement and verification (M&V) efforts.

Agenda:
Thursday, October 27th, 2011

8:30am	**Introductions and welcome (RMI)**
9:00am	**Net Zero Energy Retrofit Challenge (GSA)** Goals, Rules, Logistics, Requirements, and Evaluation Criteria
9:45am	**Initial input from attendees (RMI to moderate)** • *Describe your company's experience with deep retrofits*
10:30am	**Break**
10:45am	**Net Zero Energy Concepts (RMI)** High-level concepts to get to net zero. Industry requirements and context. Definition of net zero.
11:30am	**Example Retrofit Project (RMI)** 2-3 case studies that have achieved 60%-70% energy savings. Description of project, ECM's, process and economics.
12:00pm	**Lunch & Inspirational Keynote (Andy Walker, NREL)** Lunch will be provided.
1:00pm	**Energy Conservation Measures (FEMP)** Cutting edge energy conservation measures and underutilized technology necessary to achieve net zero energy and discussion of the interactive effect of the measures. Next steps for FEMP.
2:00pm	**Barriers and Solutions Breakout groups (Moderated by RMI)** Introduction to the breakout groups Barriers and solutions to deep energy retrofits and net zero projects. Switch groups mid way through (3:45pm). 1. Analysis and Integrative Design 2. Financing 3. Occupant behavior and workplace cultural 4. Long term and affordable Measurement and Verification 5. Delivery process (including FEMP procedures, contracting)
5:30pm	**Adjourn**
6:30pm	**No host dinner:** The Mediterranean Restaurant, 1002 Walnut Street, Boulder CO 80302, (303) 444-5335

Friday, October 28th 2011

8:30am	**Welcome and reconvene (Moderated by RMI)**
8:45am	**Report out from breakout groups** 20 minutes per group, including comments, thoughts and Q&A from the larger group.
10:15am	**Continue discussion on streamlining the process** Stemming from the delivery process breakout group findings.
11:15am	**Recap of the ESCO Challenge, next steps and timeline (GSA)** Roles and expectations
11:45pm	**Wrap up, closing remarks (GSA)**
12:00pm	**Adjourn**

1:30pm	**Optional tour of NREL-RSF Net Zero Energy facility** Golden, Colorado

Attendees:

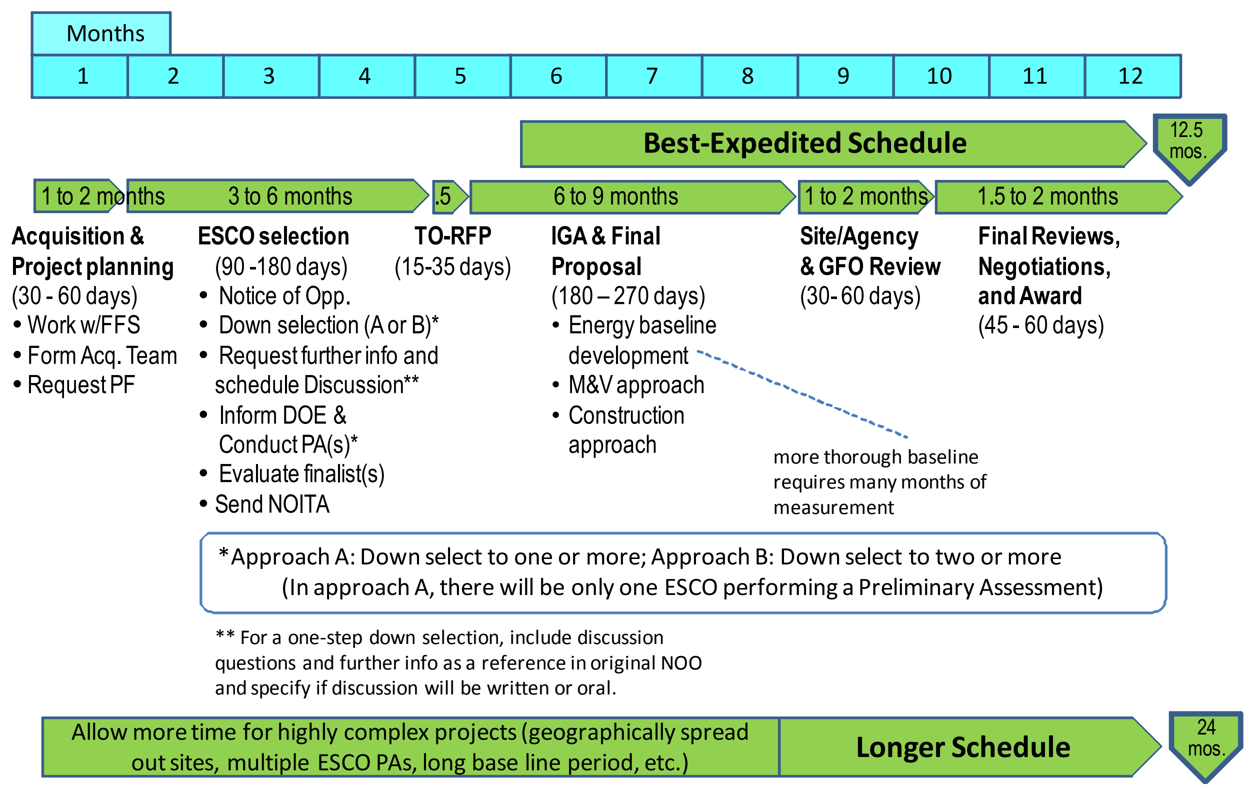
	Name	Firm	Position
1	Kevin Kampschroer	GSA	Director, GSA Office of Federal High Performance Green Buildings
2	Kinga Porst	GSA	Sustainability Advisor, GSA Office of Federal High Performance Green Buildings
3	John Simpson	GSA	Program Manager, GSA Office of Federal High Performance Green Buildings
4	Kevin Myles	GSA Region 7	Energy Manager, GSA R7
5	Mark Ewing	GSA	Director, GSA Energy Division
6	Beth Lemanski	GSA	Director, Portfolio Analysis, Office of Portfolio Management
7	Susan Damour	GSA Region 8	Regional Administrator, GSA R8
8	Scott Conner	GSA Region 8	Program Management Officer, GSA R8 PBS/Office of the Regional Commissioner
9	Tim Unruh	DOE/FEMP	Program Manager for the DOE FEMP
10	Cyrus Nasseri	DOE/FEMP	DOE FEMP
11	Skye Schell	DOE/FEMP	Supervisor, DOE FEMP
12	Deborah Kephart	DOE/Golden Field Office	Contracting Officer, DOE Golden Field Office
13	Randy Jones	DOE/Golden Field Office	ESPC/Technical Assistance Project Officer, DOE Golden Field Office
14	Michael Norton	Army	Branch Chief, U.S. Army Corps of Engineers
15	Will Irby	Army	ESPC Project Manager, U.S. Army Corps of Engineers
16	Barbara Osterkamp	Army	U.S. Army Corps of Engineers
17	Margaret P. Simmons	U.S. Army Engineering & Support Center	Counsel, U.S. Army Corps of Engineers
18	Robert ‘Hutch’ Hutchinson	RMI	Managing Director, Research and Collaboration
19	Victor Olgyay	RMI	Principal, Buildings Team
20	Cara Carmichael	RMI	Senior Consultant, Buildings Team, ESCO lead
21	Kendra Tupper	RMI	Senior Consultant, Buildings Team
22	Roy Torbert	RMI	Analyst, Buildings Team

23	Andy Walker	NREL	Senior Engineer
24	John Shonder	ORNL	Senior Mechanical Engineer
25	Don Gilligan	NAESCO	President
26	Nicole A Bulgarino	Ameresco	Federal Program Director
27	Jason Vass	Ameresco	Sr Project Development Engineer
28	Jim Edwards	Chevron Energy Solutions	Senior Mechanical Engineer
29	Bryon Krug	Clark Energy Group	Cofounder and managing director
30	Morgan Blackwood	Clark Energy Group	Development Executive
31	Eric B. Lawton	ConEdison	National Director, Program and Client Development
32	Christopher Abbuehl	Constellation	Director of Public Sector Energy Efficiency and Renewable Energy Projects
33	Rodney Frazier	Constellation	Senior Devlopment Engineer
34	Raquel Steffes	FPL Energy Services	National Sales Manager
35	David Russell	FPL Energy Services	Lead engineer
36	Steve Craig	Honeywell	General Manager, Federal
37	James Kiriazes	Honeywell	Engineering Manager
38	Andrew Morton	JCI	Manager, Business Development
39	Steven W. Spanbauer	JCI	Director, Federal Sales and Engineering
40	Bobbie L. Griffin	Lockheed Martin	Senior Program Manager
41	John Rizzo	Lockheed Martin	President, ADI Energy, Chief Engineer
42	Pat Clark	McKinstry	Senior Energy Engineer
43	Roger Huggins	McKinstry	Director of Federal Energy Program
44	Marilyn Fine	Noresco	Manager of Business Development
45	John Saams	Noresco	Account Manager,
46	John Martin	Pepco Energy Services	Federal Business Development Manager
47	Alicia, DeCesaris	Pepco Energy Services	Manager, Project Development Engineering
48	Roger Jenkins	SAIC	Vice President and manager
49	Bill Steen	SAIC	Senior Program Manager
50	Kevin Vaughn	Schneider Electric	Federal Energy Solutions, Program Director
51	Jeff Coles	Schneider Electric	Senior Manager, Project Development and Design
52	Richard Wolfert	Siemens	National Operations Manager - Federal Energy Division
53	Art Thomspon	Siemens	Business Development Manager Federal Agencies
54	David Hayden	Trane	Federal Vertical Market Leader
55	Jody Wilkens	Trane	Federal Contracting Solutions Leader
56	Nate Maniktala	ME Group	Principal
57	Pete Jefferson	ME Group	Principal-in-Charge

02 FEMP SUGGESTED ESPC MILESTONE PLAN

Energy Savings Performance Contract (ESPC) procurement requires planning and management, and delays in ESPC awards result in forgone energy savings. Savings from DOE Indefinite delivery/indefinite quantity (IDIQ) ESPC projects can be accumulated sooner through a timely award process. The DOE IDIQ provides two approaches to energy service company (ESCO) selection, depending on project requirements: Approach A allows a multi-step down selection based on qualifications (SBQ) prior to a Preliminary Assessment (PA) by one ESCO. Approach B requires a Preliminary Assessment from two or more interested ESCOs after evaluation and down selection of all interested ESCOs based on qualifications and further consideration. A longer schedule may be required for Energy Savings Agreements (ESAs) or other more technically complex projects.

Milestones for ESPC Task Order Development to Award Process



APPROXIMATE STAFFING NEEDS FOR AN ESPC PROCUREMENT PROJECT

1. To award task order:
    a. Energy/facility manager: 2–5 full-time employee (FTE) months
    b. Contracting office: 1-3 FTE months
2. Construction, commissioning, and post-installation M&V and throughout life of contract:
    a. Mostly energy/facility manager
       Time needed varies widely based on project complexity and site requirements
    b. Utilize typical agency construction/acceptance process

3. Contract administration through first-year M&V
    a. Approximately 1 FTE month

THE DOE DETAILED PROCUREMENT MILESTONE TOOL

A sample DOE detailed procurement milestone tool is found on the next page, followed by instructions for using the tool and a completed sample of the tool.

SAMPLE DOE DETAILED PROCUREMENT MILESTONE TOOL

Right-click the figure below and select "Worksheet Object, Open" to work with this schedule in Microsoft Excel. Save the file as an Excel spreadsheet in an appropriate network folder.

ENTER START DATE HERE------>:

Activity	Timeline		Completion Dates		Cumulative	
	Min	Max	Earliest	Latest	Low	High
Please read comment						
Phase 1 - Project Planning						
Site requests PF through FFS	0		0	0	0	0
FFS initiates renewable screening with Core Team	0	0	1/0/1900	1/0/1900	0	0
Golden Field Office (GFO) assigns a PF	7	14	1/7/1900	1/14/1900	7	14
GFO assigned PF works with site/facility to establish a Acquisition Team (AT)	15	38	1/22/1900	2/21/1900	22	51
AT establishes ESCO NOO & preliminary selection criteria	5	10	1/27/1900	3/2/1900	27	62
Phase 2 - Selecting the ESCO - preliminary	0	0	1/27/1900	3/2/1900	27	62
CO issues NOO to all 16 ESCOs (and includes post-down select info that will be required)	1	3	1/28/1900	3/5/1900	28	65
ESCOs submit responses to NOO	20	30	2/17/1900	4/4/1900	47	94
AT ESCO first downselection	20	30	3/8/1900	5/4/1900	68	124
ESCO downselection notification & notice to proceed with finalists	1	3	3/9/1900	5/7/1900	69	127
Phase 2 - Selecting final ESCO	0	0	3/9/1900	5/7/1900	69	127
ESCOs submit further info and/or respond to oral interviews (approach A)	5	30	3/14/1900	6/6/1900	74	156
AT reviews further information and down selects to one ESCO for PA (approach A)	10	30	3/24/1900	7/6/1900	84	186
ESCO downselection notice to unsuccessful offerers	1	3	3/25/1900	7/9/1900	85	189
Site issues Preliminary Assessment (PA) solicitation to ESCO finalist (approach A)	1	3	3/25/1900	7/9/1900	85	189
ESCO notifies GFO of intent to proceed to PA	1	3	3/26/1900	7/12/1900	86	192
Contractor(s) conduct site visits to identify any ECMs in addition to those provided in solicitation	5	30	3/31/1900	8/11/1900	91	221
GFO receives questions from contractors	5	30	3/31/1900	8/11/1900	91	221
Site receives PA	5	15	4/5/1900	8/26/1900	95	236
AT convenes and reviews PA results (approach A)	10	30	4/15/1900	9/25/1900	105	265
CO issues NOITA & Draft TO RFP	10	35	4/15/1900	9/30/1900	105	270
Phase 3 - Negotiation & Award	0	0	4/15/1900	9/30/1900	105	270
ESCO begins IGA	15	30	4/30/1900	10/30/1900	120	300
ESCO completes IGA and prepare Final Proposal	165	240	10/12/1900	6/27/1901	282	537
AT / CO obtains executive or board approval for final proposal	30	30	11/11/1900	7/27/1901	311	567
GFO Review of Final Proposal	14	14	11/25/1900	8/10/1901	325	580
Final Proposal meeting with contractor	5	10	11/30/1900	8/20/1901	330	590
Formal negotiation period	20	50	12/20/1900	10/9/1901	350	639
Finalize task order (includes all reviews and approvals)	10	15	12/30/1900	10/24/1901	360	654
Sign Task Order	1	1	12/31/1900	10/25/1901	361	655
	Total Weeks				51.6	93.6
	Total Months				12.0	21.8

Note #1: Core Team function is to provide renewable/advanced efficiency technology and financial reviews

Note #2: CoGen should be treated like a renewable and be exempt from 18-month limit. The 18-month limit should have a formal case-by-case exemption process. If not, people will try to meet the timeline even if ill-advised.

PF -Project Facilitator
FFS - Federal Fiance Specialist
GFO -Golden Field Office

BLANK DETAILED MILESTONE INSTRUCTIONS

1. Right click the Microsoft Excel Object on the next page and select "Open."
2. Once in Excel, save the file as an Excel worksheet in an appropriate network location.
3. Close the file and reopen in Excel from the network location where you just saved it.
4. Enter the start date of the project in cell D1 (colored in green); this date should be the same day you will request a Project Facilitator from your Federal Financing Specialist.
5. Do NOT edit the dates below row 3; they are automatically calculated based on the "min" and "max" timeframe you will enter into columns B and C (these cells are locked so that you cannot accidentally change them).
6. Worksheet cells with a small red marker in the upper right corner indicate helpful comments—hover over the red marker to see the comment.
7. Change the project steps text in column A (Activity) as needed to tailor the sheet to your project.
8. If you need to delete steps, delete the entire row so all formulas will still work correctly.
9. If you need to add steps:
    a. Add an entire new row.
    b. Select/highlight the row above as well as the new row and use the "Fill, down" command to copy the date formulas to the new row. Alternatively, you can copy the cells from the row above to the new row you have inserted.
    c. Change the non-date cells as needed.
10. To change the calendar day duration of the minimum or maximum calendar days to complete an activity, edit the number in column B and/or C (Min or Max). This will automatically change the end date for the task.
11. The responsibility matrix for the activities is found in columns I through O. Edit this as necessary if it will help you communicate roles to the team members.

The worksheet is protected so that you will not accidentally edit calculated cells. If you would like to edit these cells then unprotect the sheet using the "Review" tab and selecting "unprotect". There is no password required.

ENTER START DATE HERE------>: 7/1/2011

Activity	Timeline		Completion Dates		Cumulative	
	Min	Max	Earliest	Latest	Low	High
Please read comment						
Phase 1 - Project Planning						
Site requests PF through FFS	0		7/1/2011	7/1/2011	0	0
FFS initiates renewable screening with Core Team	0	0	7/1/2011	7/1/2011	0	0
Golden Field Office (GFO) assigns a PF	7	14	7/8/2011	7/15/2011	7	14
GFO assigned PF works with site/facility to establish a Acquisition Team (AT)	15	38	7/23/2011	8/22/2011	22	51
AT establishes ESCO NOO & preliminary selection criteria	5	10	7/28/2011	9/1/2011	27	60
Phase 2 - Selecting the ESCO - preliminary	0	0	7/28/2011	9/1/2011	27	60
CO issues NOO to all 16 ESCOs (and includes post-down select info that will be required)	1	3	7/29/2011	9/4/2011	28	63
ESCOs submit responses to NOO	20	30	8/18/2011	10/4/2011	47	93
AT ESCO first downselection	20	30	9/7/2011	11/3/2011	66	122
ESCO downselection notification & notice to proceed with finalists	1	3	9/8/2011	11/6/2011	67	125
Phase 2 - Selecting final ESCO	0	0	9/8/2011	11/6/2011	67	125
ESCOs submit further info and/or respond to oral interviews (approach A)	5	30	9/13/2011	12/6/2011	72	155
AT reviews further information and down selects to one ESCO for PA (approach A)	10	30	9/23/2011	1/5/2012	82	184
ESCO downselection notice to unsuccessful offerers	1	3	9/24/2011	1/8/2012	83	187
Site issues Preliminary Assessment (PA) solicitation to ESCO finalist (approach A)	1	3	9/24/2011	1/8/2012	83	187
ESCO notifies GFO of intent to proceed to PA	1	3	9/25/2011	1/11/2012	84	190
Contractor(s) conduct site visits to identify any ECMs in addition to those provided in solicitation	5	30	9/30/2011	2/10/2012	89	219
GFO receives questions from contractors	5	30	9/30/2011	2/10/2012	89	219
Site receives PA	5	15	10/5/2011	2/25/2012	94	234
AT convenes and reviews PA results (approach A)	10	30	10/15/2011	3/26/2012	104	265
CO issues NOITA & Draft TO RFP	10	35	10/15/2011	3/31/2012	104	270
Phase 3 - Negotiation & Award	0	0	10/15/2011	3/31/2012	104	270
ESCO begins IGA	15	30	10/30/2011	4/30/2012	119	299
ESCO completes IGA and prepare Final Proposal	165	240	4/12/2012	12/26/2012	281	535
AT / CO obtains executive or board approval for final proposal	30	30	5/12/2012	1/25/2013	311	564
GFO Review of Final Proposal	14	14	5/26/2012	2/8/2013	325	577
Final Proposal meeting with contractor	5	10	5/31/2012	2/18/2013	330	587
Formal negotiation period	20	50	6/20/2012	4/9/2013	349	638
Finalize task order (includes all reviews and approvals)	10	15	6/30/2012	4/24/2013	359	653
Sign Task Order	1	1	7/1/2012	4/25/2013	360	654
	Total Weeks				51.4	93.4
	Total Months				12.0	21.8
Note #1: Core Team function is to provide renewable/advanced efficiency technology and financial reviews						
Note #2: CoGen should be treated like a renewable and be exempt from 18-month limit. The 18-month limit should have a formal case-by-case exemption process. If not, people will try to meet the timeline even if ill-advised.						
PF -Project Facilitator						
FFS - Federal Fiance Specialist						
GFO -Golden Field Office						

The ESPC Process in Five Phases

Phase 1: Acquisition Planning

- **Talk with your FEMP Federal Financing Specialist**
- **Assemble agency/site acquisition team**
- **Consider project motivations and site needs**

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Phase 2: Energy Service Company (ESCO) Selection and Preliminary Assessment

- Send "Notice of Opportunity" to all 16 Super ESPC ESCOs
- Review qualifications of ESCOs
- Review ESCO responses and down-select / choose one ESCO to submit Preliminary Assessment
- Review Preliminary Assessment
- Issue Notice of Intent to Award

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Phase 3: Audit, Negotiation, and Award

Agency specifies requirements in Task Order RFP
↓
Investment-Grade Audit
↓
Final Proposal
↓
Final Negotiations
↓
Task Order Award

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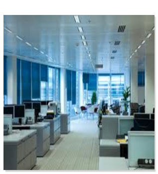
Phase 4: Construction



Review of Design and Construction Package
↓
Construction
↓
Inspections
↓
Commissioning
↓
Acceptance of Completed Project

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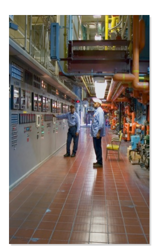
Phase 5: Performance Period



- **Operations and Maintenance per Task Order**
- **Measurement and Verification**
- **Invoice and Payments**
- **Closeout**

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GSA U.S. General Services Administration

GSA Challenges Private Sector to Reduce Energy Use at Federal Buildings

October 20, 2011
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WASHINGTON – Today, U.S. General Services Administrator Martha Johnson announced GSA's Net Zero Renovation Challenge. The new initiative challenges the private sector to improve the energy performance of federal buildings through the use of Energy Service Performance Contracts (ESPCs), aiming for net-zero energy use. ESPCs are a way to leverage private funding for building retrofits.

"In Executive Order 13514, the President challenged government to lead by example in environmental, energy and economic performance. Now GSA is challenging the private sector to partner with us to go above and beyond what has been done before in federal building renovations. We want the private sector to provide us with their most innovative, cost effective solutions to maximize energy and cost savings," said GSA Administrator Martha Johnson.

Under an ESPC, a private-sector energy services company develops and installs energy improvements such as energy efficient lighting, heating, ventilation and air conditioning systems, and more efficient roofs, walls, doors and windows. The building owner then repays the energy company for the capital expenditure over a maximum 25-year period from the resulting energy savings. After the capital expenditure is repaid, the building's owner then realizes the energy savings for the life of the building.

"Federal buildings are built to last. ESPCs provide the federal government with decades of lower utility bills without an upfront investment. The approach just makes good sense, especially when budgets are tight," said Johnson.

In the challenge unveiled today, 16 energy services companies who already provide ESPCs to federal agencies will now present the best retrofit plans for approximately 30 Federal buildings across the country. These projects will be evaluated by a panel of independent experts based on energy savings, financial and technical innovation and applicability to other federal buildings. The winning entries will be awarded the ESPCs, as well as additional ESPCs in the future.

President Obama's Executive Order 13514 on Leadership in Environmental, Energy, and Economic Performance requires agencies to meet a number of energy, water, and waste reduction targets in existing federal buildings. The Executive Order also directs that the design of all planned new federal buildings beginning in 2020 achieve net-zero energy use by 2030.

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As the federal government's workplace solutions provider, the U.S. General Services Administration works to foster an effective, sustainable and transparent government for the American people. GSA's expertise in government workplace solutions include:
• Effective management of government assets including more than 9,600 government-owned or leased buildings and 215,000 vehicles in the federal fleet, and preservation of historic federal properties;
• Leveraging the government's buying power through responsible acquisition of products and services making up approximately 14 percent of the government's total procurement dollars;
• Providing innovative technology solutions to enhance government efficiency and increase citizen engagement; and,
• Promoting responsible use of federal resources through development of governmentwide policies ranging from federal travel to property and management practices.