THE PATH TO A DEEP ENERGY RETROFIT

USING AN ENERGY SAVINGS PERFORMANCE CONTRACT

DEEP ENERGY RETROFITS

Seven key steps will help owners reach deeper energy savings through Energy Savings Performance Contracts (ESPCs). ESPCs are partnerships between a Federal agency and an energy service company (ESCO) that allow Federal agencies to complete energy-savings projects without upfront capital costs or special Congressional appropriations.

What is a deep energy retrofit?

Deep energy retrofits integrate a variety of energy conservation measures (ECMs) through a whole building approach to achieve superior energy savings compared to conventional retrofits, often approaching or exceeding 50% savings. They also make net-zero energy buildings more achievable by substantially reducing energy demand, which makes it easier and more cost-effective to meet remaining energy needs with renewable energy.

Why do a deep energy retrofit?

- To reduce GHG emissions and support the President's Climate Action Plan
- Maximize the value of Federal appropriations
- To replace aging infrastructure and improve a building system's reliability
- To reduce operating costs and hedge against risks such as rising energy costs
- To improve occupant satisfaction, wellness, and productivity
- To maintain access to additional cost-effective upgrades and infrastructure renewal in the future

Brought to you by GSA's Office of Federal High-Performance Green Buildings

Deep retrofits can be implemented across a wide spectrum of buildings and conditions:

What is not (necessarily) required for deep energy savings: high energy prices, high energy consumption or advanced energy conservation measures.

What is required for deep savings: buildings in need of an energy retrofit, agency support, a thorough audit process to identify measures, and an integrative design approach.

Step 1: GO DEEP AT THE RIGHT TIME AND IN THE RIGHT ORDER

Piggyback on upcoming projects and conduct the right steps in the right order.

- The following are some events that may trigger a cost-effective deep energy retrofit:
  - » Planned building renovation
  - » Major system replacement
  - » Disaster recovery
  - » Envelope replacement
  - » Code upgrades
  - » New owner/refinancing
  - » New use/occupancy type
  - » Building greening
- When a deep retrofit opportunity surfaces, have an initial conversation with GSA Headquarters or with your ESCO to do a rough scoping. If there is any access to appropriated funds, use those to buy longer payback items (such as window replacements).
- Consider expanding the scope of work beyond a single building as a stand-alone system. Instead consider the portfolio of buildings as a whole to drive greater impact.

THE RIGHT ORDER: ALWAYS REDUCE ENERGY DEMAND FIRST.

Reduce loads: Reduce the amount of energy needed to heat, cool and light the building	Identify integrative bundles of measures	Select appropriate and efficient technologies	Optimize operations	Explore renewable energy

KING–BRICKELL FEDERAL BUILDINGS

As part of GSA's National Deep Energy Retrofit (NDER) Program, the King–Brickell Federal Buildings, located in Miami, Florida, anticipate a 40% reduction in energy use and more than $200,000 in annual energy cost savings over a 15-year contract period. The ESPC process, which was led by FPL Energy Services, Inc. (FPLES), incorporated several unique characteristics that enabled this significant energy use and cost savings projection to be achieved. FPLES used an established project management process, including the engagement of a diverse group of stakeholders early and throughout the process and they analyzed and implemented a variety of ECMs to achieve the projects conservation goals. Additionally, Option C was selected for measurement and verification (M&V) to evaluate the success of the project.

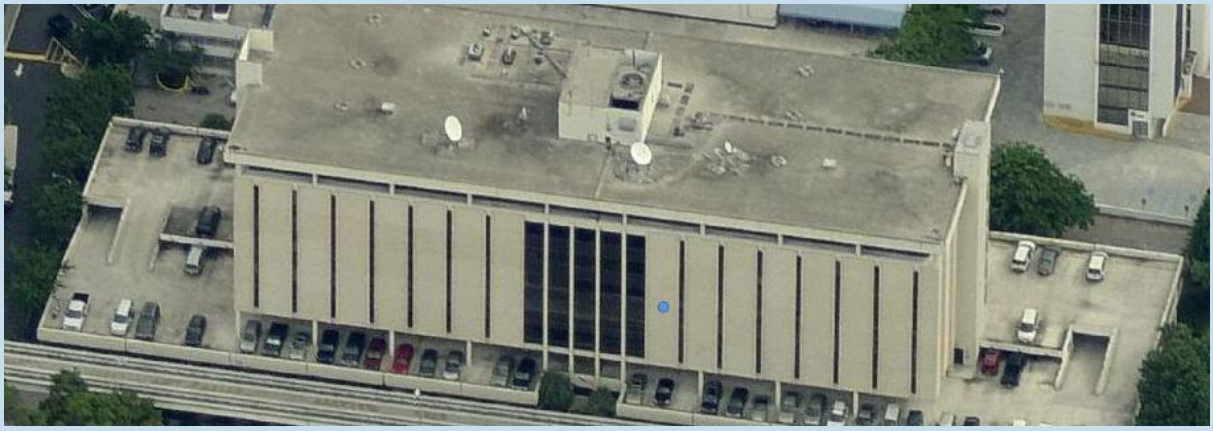


Image courtesy of FPL Energy Services, Inc. (FPLES).

Step 2: ENGAGE DIVERSE STAKEHOLDERS

Engage the entire decision-making chain early and check in throughout the process.

- Involve all stakeholders from the owner decision making team: Occupants, facility management team, legal, financial and procurement.
- Engage with those that bring different perspectives on energy savings like security, janitorial, landscaping and grounds staff, maintenance service providers, and local utility representatives.
- Make the project a priority.
- Involve a project coordinator to help oversee the ESCO and contractors.
- Engage building occupants early and often to educate, train, and foster support.
- Clarify contractor roles and liabilities at the onset. Identify contractor design responsibilities for each aspect of a project.
- See your Contracting Officer as both an advocate and an advisor. The Contracting Officer should push both the ESCO and the agency to go deeper.

KOHL'S

Kohl's acheived deeper energy savings by establishing a multi-disciplinary energy team. Kohl's previously executed several "low-hanging fruit" efficiency projects that provided cost savings but it remained difficult to get funding for more and deeper energy efficiency projects until Kohl's embedded a member of its finance department within the energy team. The results improved communication and transparency between the energy team and finance department and expedited approval processes.

Energy Team Structure

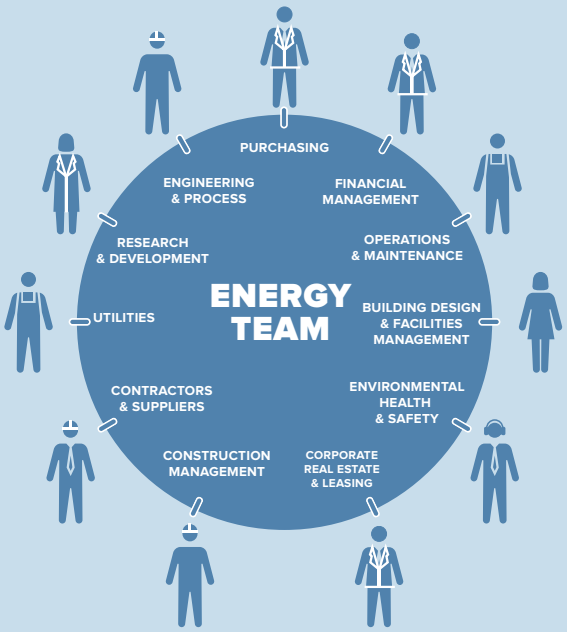


Figure courtesy of World Business Council for Sustainable Development (WBCSD).

Image courtesy of Joe Seer / Shutterstock.com.

Step 3: REQUEST A DEEP RETROFIT IN YOUR SOLICITATION

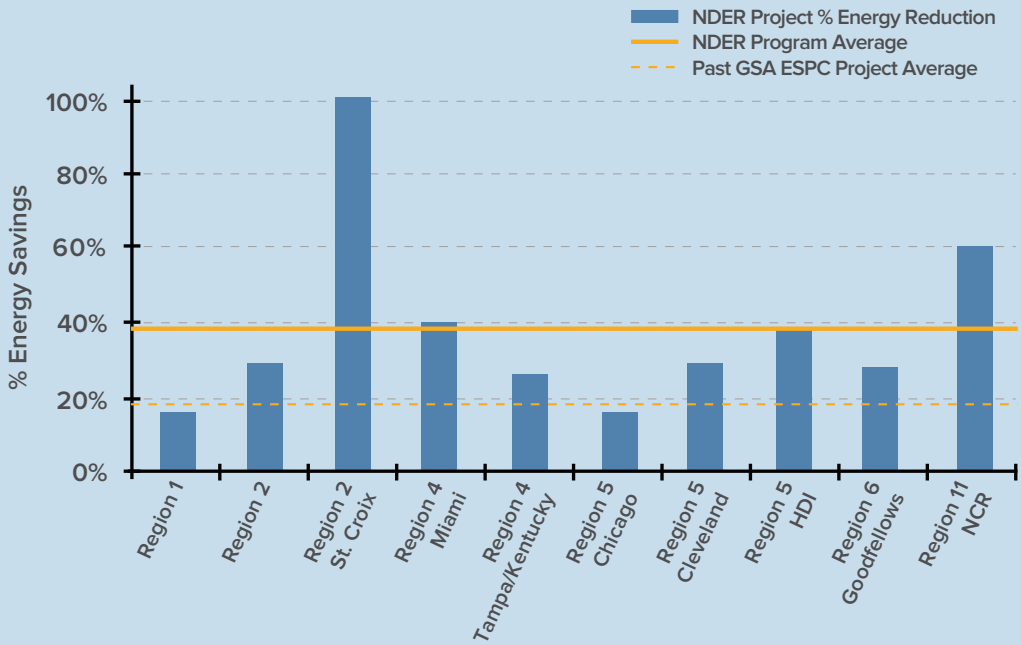
Ask for a deep retrofit, know what you're getting and how to make the most of it.

- In your request for proposals or notice of opportunity, state your intent to achieve deep levels of savings. Be prepared for what you are asking for, as it should entail a more rigorous audit process and a broader set of ECMs than a conventional retrofit. Continue to push for out of the box ideas over the course of the project.
- Consider adding capital to buy-down the project cost. Apply capital to the longer payback measures and ensure they are analyzed as part of the bundle of ECMs and implemented at the same time.
- Wherever possible, include operations and maintenance (O&M) in the contract. It could yield additional savings since the ESCO is more involved on a day-to-day basis and form a seamless integration between O&M and measurement and verification (M&V).
- Work with your ESCO, GSA, Contracting Officer, and occupants to incorporate occupant behavior savings into ECM bundles.

GSA'S NATIONAL DEEP ENERGY RETROFIT (NDER) PROGRAM

The GSA awarded ten ESPC projects under the NDER Program to demonstrate the use of innovative and renewable energy technologies and to move Federal buildings toward net-zero energy. The NDER projects have doubled energy savings from past GSA ESPC projects—boosting average energy savings from 18% to 38%—by emphasizing the need for deeper energy savings and by establishing a central Project Management Office (PMO) that provides authoritative contracting, technical, and pricing assistance.

NDER Program ESPC Project Energy Savings



Step 4: BUNDLE ENERGY CONSERVATION MEASURES

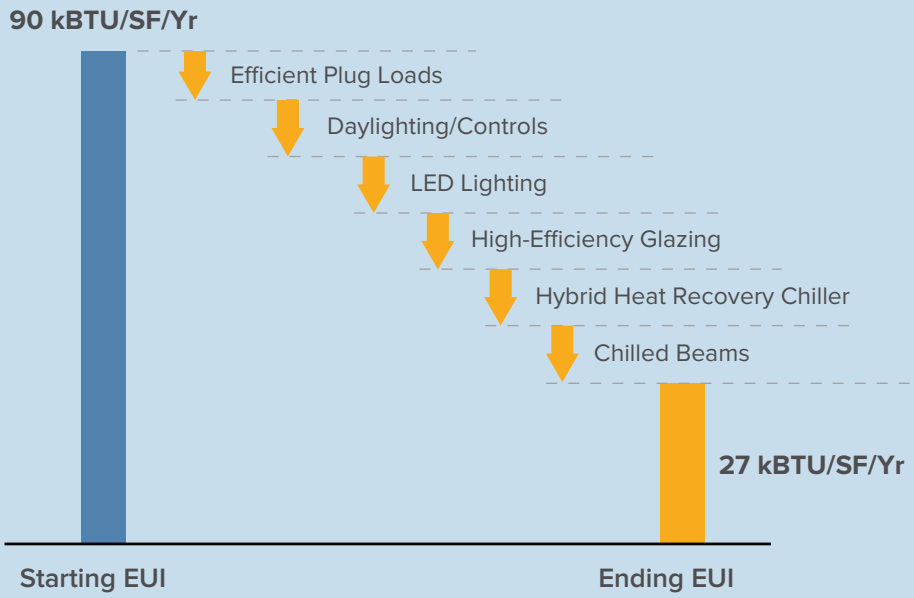
Reinforce the importance of bundling energy conservation measures. Bundling—or grouping measures to consider the total savings rather than the individual savings from each measure—provides interactive effects across different systems. For instance, highly insulating windows may reduce heating and cooling energy use and lead to downsized heating and cooling systems. This is not apparent unless you consider the bundle as a whole.

- Bundling measures combines long payback measures with short payback measures, creating an acceptable return and much higher value.
- Combining several buildings into a single ESPC contract (and associated financing) may reduce overhead, implementation, and financing costs.
- When reviewing the proposed measures in audit reports, keep the bundles intact and resist removing individual measures. Bundles of ECMs create greater value for owners than the sum of the individual measures.

BYRON G. ROGERS FEDERAL OFFICE BUILDING

GSA's 494,156 square-foot Byron G. Rogers Federal Office Building in Denver, Colorado—home to eleven federal agencies—underwent a deep energy retrofit to make it one of the most energy-efficient buildings in the U.S. The retrofit is expected to reduce energy use by 60–70% and lower Energy Use Intensity (EUI) to 28–38 kBtu/sf-year. Bundling ECMs was the driving force behind the significant energy performance improvements to the building. Updates to daylighting, controls, lighting, glazing, and plug loads significantly reduced energy loads. Active chilled beams were integrated with a heat recovery and thermal storage system to meet the loads more efficiently.

Bundle ECMs to maximize energy performance



Step 5: PRESENT THE FULL SUITE OF BENEFITS

Communicate all the potential benefits of a deep energy retrofit to stakeholders.

- Build a stronger case for deep energy retrofits by considering their value beyond energy cost savings and how different stakeholders benefit.

POTENTIAL VALUE BEYOND ENERGY COST SAVINGS

Maintenance Costs Pacific Northwest National Laboratory (2008); Leonardo Academy (2008); Aberdeen Group (2010)	↓ 9.0-14%
Occupant Satisfaction GSA (2011)	↑ 27-76%
Rental Premium Eicholtz, Kok & Quigley (2010); Wiley et al. (2010); Fuerst & McAllister (2011); Eicholtz, Kok, et al. (2011); Newell, Kok, et al. (2011); Miller, Morris & Kok (2011); Pogue et al. (2011); McGraw Hill/Siemens (2012)	↑ 2.1-17%
Occupancy Premium Wiley et al. (2010); Pogue et al. (2011); McGraw Hill/ Siemens (2012)	↑ 3.14-18%
Property Sale Price Premium Eicholtz, Kok & Quigley (2010); Fuerst & McAllister (2011); Eicholtz, Kok, et al. (2011); Newell, Kok, et al. (2011)	↑ 11.1-26%
Employee Productivity Lawrence Berkeley National Laboratory	↑ 1.0-10%
Employee Sick Days Miller, Pogue, Gough & Davis (2009); Cushman & Wakefield et al. (2009); Dunckley (2007); City of Seattle (2005); Romm & Browning (1995)	↓ 0-40%

* Information courtesy of Rocky Mountain Institute's Deep Retrofit Value Practice Guide.

AT&T

AT&T is integrating the multiple benefits of energy efficiency into decision-making. At&T builds support for its energy management program by engaging stakeholders across different departments—including human resources, operations, and maintanence—about how energy efficiency investments would benefit each of them. The effective communication of these benefits to stakeholders established broad internal support for AT&T to make large investments in its energy management program. These investments provided $191 million in annual energy cost savings between 2010 and 2013.

Step 6: MEASURE AND VERIFY FOR SUCCESS

Measurement and Verification (M&V) is essential for evaluating and improving a building's energy performance.

- Consider using International Performance Measurement and Verification Protocol (IPMVP) Option C—which provides a whole building approach—during the first year or two and then transition to measuring only key parameters of retrofits in isolation later.
- Share project successes and lessons learned through case studies.
- Build a long-term energy management plan for the building. Note the age of equipment and envelope components and plan ahead for when they will need replacement.
- Continually engage occupants and facility staff to maximize benefits and minimize future maintenance.

Image courtesy of Schneider Electric.

GSA'S ALMERIC CHRISTIAN FEDERAL BUILDING

Through its participation in GSA's National Deep Energy Retrofit (NDER) Program, the Almeric Christian Federal Building in St. Croix, U.S. Virgin Islands anticipates 100% energy use reductions—thereby achieving net-zero energy status—and nearly $510,000 in annual energy cost savings over a 19-year contract. Schneider Electric is overseeing the ESPC process. Best practices included the following: doing the right steps in the right order by reducing loads before adding on-site solar energy, engaging a diverse group of stakeholders early and throughout the process, combining ECMs into bundles and taking a whole building approach to measurement and verification of savings by using Option C.

Step 7: ACHIEVE NET-ZERO ENERGY

When pursuing net-zero energy, the decision-making paradigm changes from asking 'what measures are cost effective within a given timeframe?' to 'what measures are more cost effective than purchasing renewable energy?'.

- Deep energy retrofits are critical for making net-zero energy buildings a practical, cost-effective option.
- The path to a net-zero energy building demands that the right steps are pursued in the right order. Reduce the building energy load first optimize equipment and controls (building and grid/micro-grid), and then supply the remaining energy needs with renewable energy.

GSA WAYNE ASPINALL FEDERAL BUILDING AND COURTHOUSE

Built in 1918 and the home of nine federal agencies, GSA's Wayne Aspinall Federal Building and Courthouse in Grand Junction, Colorado is the first net-zero energy building on the National Register of Historic Places. Designed to achieve LEED Platinum, the deep retrofit of this 41,562 sf building used many best practices to become 67% more energy-efficient than comparable code-compliant buildings. With 123 KW of rooftop photovoltaic (PV) system, the building is a net producer of energy on an annual basis while still preserving the building's historic character.

Image couresy of GSA.

RESOURCES

Deep Energy Retrofits:

- Rocky Mountain Institute (RMI): Deep Retrofit Value Practice Guide and Retrofit Depot
- ASHRAE: Advanced Energy Retrofit Guides
- GSA: Energy Savings from GSA's National Deep Energy Retrofit Program and Deep Energy Retrofits in GSA Buildings
- New Buildings Institute (NBI): Deep Energy Savings in Existing Buildings

Net-Zero Energy Buildings:

- GSA: Sustainable Facilities Tool (SFTool)
- Whole Building Design Guide (WBDG): Net Zero Energy Buildings
- New Buildings Institute (NBI): Zero Net Energy
- International Living Future Institute: Net Zero Energy Building Certification

Energy Savings Performance Contracting:

- Department of Energy, Federal Energy Management Program (FEMP) ESPCs
- Energy Service Coalition
- National Association of Energy Service Companies

Acknowledgements:
We would like to thank the following individuals for their input: Sharon Conger, Hillary Dobos, Don Gilligan, Kinga Porst, John Shonder, Linda Smith, Derek Supple, Kevin Vaughn, and Bill Treadway.