

As seen in [Building E2 News, Summer 2010 Issue](#)—a quarterly newsletter produced by the U.S. Department of Energy’s Building Technologies Program

Saving Energy—and Money—in Existing Commercial Buildings

The challenge to reducing energy use during commercial building retrofits is rarely technical or financial. More often, it’s practical. In spite of all the information available on “greening” buildings, it can be difficult to know where to turn for guidance on a specific project.

Commercial Building Partnerships

Through its [Commercial Building Initiative](#), the U.S. Department of Energy (DOE) works with industry to bridge this information gap. In [Commercial Building Partnerships](#) (CBP), for example, building owners and operators (partners) team with DOE representatives, national laboratory staff, and private-sector technical experts to explore energy-saving ideas and strategies.

CURRENT COMMERCIAL BUILDING PARTNERS

Working with Pacific Northwest National Laboratory:

Bank of America
Hines
InterContinental Hotels Group
JC Penney
PNC Bank
Regency Centers
Westfield

Working with National Renewable Energy Laboratory:

Best Buy
CB Richard Ellis/Fitzmartin Consulting
Forest City
John Deere
Kohl’s
ProLogis
Ryan Companies
SUPERVALU
Target
Whole Foods

CBP is in the second year of a five-year effort. The two retrofit case studies that follow demonstrate how focusing participants’ attention on energy efficiency from the beginning of a project can result in practical, deployable, cost-effective energy solutions.

Collaborating for Energy Efficiency

CB Richard Ellis (CBRE) is the world’s largest commercial property management firm, with 2.5 billion square feet under management. Fitzmartin Consulting is a project management consultant to CBRE.

The Fitzmartin Consulting CBP retrofit involves the renovation of a 20,000-square-foot upper floor in the Wells Fargo Center, a 1980s vintage downtown Denver high-rise office building. The tenant, Holme, Roberts & Owen LLP (HRO), an international law firm, occupies a total of nearly 110,000 square feet on five floors in the building.

The HRO job requires coordinating—for starters—the building owner, the tenant, the architect, the engineer, and the builder. In addition—because this is a CBP retrofit—there are National Renewable Energy Laboratory (NREL) researchers and private-sector subcontractors involved. The person responsible for synchronizing all these talents and resources is the project manager, Don Fitzmartin of Fitzmartin Consulting.

“In the projects I manage, I introduce the benefits of reducing energy consumption early in the process,” says Fitzmartin. “Although each situation is different, examples of similar projects that improved energy efficiency without busting the budget help sell the concept. CBP provides those examples.”

CBP makes the technical expertise of national laboratory personnel and private-sector experts available to partners. In the Fitzmartin Consulting CBP project, NREL researchers and subcontractors installed submetering equipment, and used the data to perform whole building [energy modeling](#). They explored various options by adding each proposed energy efficiency measure (EEM) to a baseline model and assessing its energy use impacts. Finally,

they investigated promising configurations of EEMs and compared them to baseline energy use. The results, detailed in the table below, indicate that the identified strategies will result in energy savings of approximately 37% compared to existing energy use.

Fitzmartin Consulting Retrofit Project	
Energy Saving Measures	Approximate Energy Savings
Increase thermostat deadband from $\pm 1^{\circ}\text{F}$ to $\pm 3^{\circ}\text{F}$	3%
Install variable speed fans on air handling units combined with supply air temperature reset	9%
Rightsize corridor lighting	5%
Install occupancy sensors (also addresses nighttime lighting)	9%
Upgrade downlighting from incandescent to fluorescent	7%
Reduce nighttime plug loads from 50% to 20%	4%
Estimated Total Energy Savings Compared with Existing Energy Use	37%

In addition to saving energy, the EEMs have to make business sense.

“We modeled new variable air volume air handling units and daylight harvesting in detail, and both strategies would have saved energy,” says Greg Stark, NREL Project Lead. “But we couldn’t justify the cost of these EEMs based on the client’s business model, so we eliminated them from consideration.”

The EEMs that the team agreed upon are relatively inexpensive and are replicable in a large number of high-rise office buildings throughout the United States. The impacts of widespread deployment would be impressive. If the identified EEMs were applied throughout this building alone, the energy and carbon savings per year would be almost 7 million kWh of electricity and 9 million pounds of carbon. NREL will publish its methods and analysis for all to use.

Keeping It Simple

Sometimes the simplest solutions are the most elegant.

Another CBP partner, ProLogis, is a global provider of distribution facilities, with more than 475 million square feet of industrial space in North America, Europe, and Asia. The ProLogis CBP retrofit project is a lighting upgrade at an 800,000-square-foot unconditioned warehouse leased by retailer Sears in Olive Branch, a town in northern Mississippi. The lights—which are on 24 hours a day, 7 days a week—represented the best opportunity for energy savings.

NREL’s lighting research group used lighting power density calculations to determine energy savings. The results, shown in the table below, demonstrate that a lighting retrofit alone would result in a substantial reduction in energy consumption.



The Fitzmartin Consulting retrofit project involves renovating one floor of the five-floor HRO law offices in the Wells Fargo Center in downtown Denver, Colorado. *Photo courtesy of Downtown Denver Partnership*

ProLogis Lighting Retrofit	
Energy Saving Measures	Approximate Energy Savings
Reduce lighting power throughout the warehouse while maintaining illumination levels	30.4%
Estimated Total Energy Savings Compared with Existing Energy Use	30.4%
Estimated Total Energy Savings Compared with ASHRAE Standard 90.1-2004	51.3%

To achieve these savings, all the metal halide fixtures in this Sears warehouse would be replaced with fluorescent fixtures. "This lighting retrofit not only saves energy, but it is also very cost-effective, with a payback period of less than two years," says NREL's Stark.

As often happens when companies start to explore the benefits of energy efficiency, Sears is expanding the scope of the lighting upgrade. They decided to install motion sensors so that lights are only on when and where they are needed, which will further increase the facility's energy savings. The switch to fluorescent fixtures opened the door to using occupancy sensors.

Projects such as this are easily replicable in warehouses throughout the United States. In this building alone—based on the original NREL analysis—the energy and carbon savings per year will be almost 1.2 million kWh of electricity and more than 1.5 million pounds of carbon.

Although they were very motivated, ProLogis searched long and hard to find a partner for its CBP retrofit project. This was in part because the ProLogis business model presents challenges to widespread energy upgrades.

ProLogis doesn't pay the utility bills in their facilities—the customers do. As a result, the benefits of reduced energy consumption accrue to the customers, which can be a disincentive for building owners to invest in energy efficiency.

"In the case of the Sears warehouse in Mississippi, ProLogis and Sears will share the cost of the lighting upgrade," says Sarah Martinez, vice president, corporate responsibility for ProLogis. "We are providing the financial incentive as part of a larger negotiation and in the interest of maintaining a good relationship with the customer."



The ProLogis Commercial Building Partnerships retrofit—a simple lighting retrofit on this 800,000 square foot Sears warehouse in northern Mississippi—will save about 30% of the energy the building previously used.
Photo courtesy of ProLogis

This "split-incentive" situation is not unique to ProLogis—it is common among distribution facility providers and real estate services companies that control billions of square feet of commercial facilities. Developing strategies to overcome the obstacles that arise in these situations could encourage owners and tenants of large leased commercial buildings to reduce energy consumption in their facilities.

Transforming the Market

Building professionals need to be convinced that the improvements not only save energy, but also are cost-effective and won't interfere with project schedules and other business priorities. By identifying and supporting energy efficiency champions at companies with large building portfolios, DOE and its national labs have improved the odds of reducing energy consumption across the commercial building sector.

"I'm on a mission to transform the commercial building marketplace one project at a time, and having DOE and the national labs on my team has been a huge asset," says Fitzmartin. "It's like having continual access to the Google of energy efficiency."

About Commercial Building Partnerships

Commercial Building Partnerships (CBP) is a public/private cost-shared activity of the U.S. Department of Energy's Building Technologies Program. CBP teams building energy researchers (currently from the National Renewable Energy Laboratory and the Pacific Northwest National Laboratory) and private sector consultants with commercial building owners and operators to work on specific new construction and retrofit projects. CBP requires careful documentation of these projects, and the dissemination of this information will accelerate the understanding and deployment of cost-effective energy efficiency strategies throughout the commercial building sector.

For More Information

- Learn more about DOE's [Commercial Building Partnerships](#) and [Commercial Building Energy Alliances](#)
- View a list of [partnership opportunities](#) under the [Commercial Building Initiative](#)
- Read about [PNNL's Buildings Program](#)
- See the status of [NREL's Commercial Building Partners](#) at NREL's Web site