U.S. Department of Energy's Commercial Building Partnerships

THINKING LIKE A WHOLE BUILDING:

Whole Foods Market

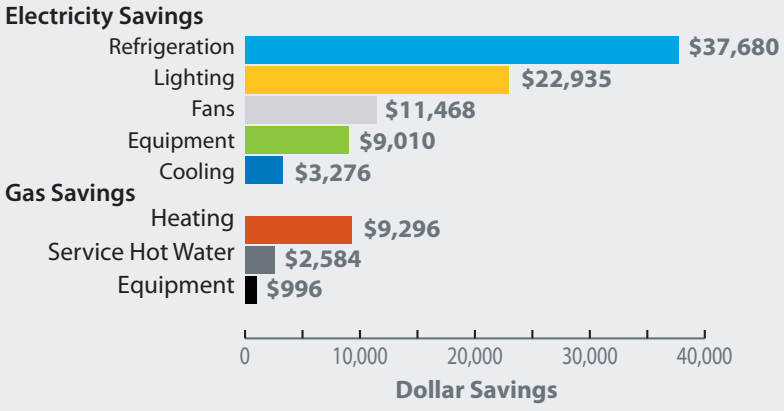
New Construction Project Summary

NREL engineers Michael Deru (left) and Ian Doebber examine night curtains, a proven energy efficiency strategy, at a Whole Foods Market store.

Photo courtesy of Patrick Corkery, NREL/PIX 17307.

ANNUAL SAVINGS BY END-USE

TOTAL DOLLAR SAVINGS **$97,245**



ANNUAL AVOIDED CARBON DIOXIDE EMISSIONS* **~2.6 million pounds per year**

* Based on 1.67 lb CO_2e/kWh of electricity and 14.5 lb CO_2e/therm of natural gas. Assumes 1 kBtu=0.974 ft^3 and combustion in a furnace and hot water heater. Other combustion devices would have different conversion factors. CO_2e is carbon dioxide equivalent, which combines all of the global warming emissions into one number using the global warming potential (GWP) for each emission relative to CO_2.

The U.S. Department of Energy's (DOE) Commercial Building Partnerships (CBP) identify, deploy, and verify the performance of cost-effective energy efficiency measures (EEMs) with the goal of dramatically cutting energy use in commercial buildings. Whole Foods Market is working with the National Renewable Energy Laboratory (NREL) on a retrofit and a new construction CBP project. The new construction project, a standalone store in Raleigh, North Carolina, will open in spring 2011.

Whole Foods Market and NREL examined the building systems that influence energy use and the interactions among those systems in the design for the new Raleigh store. Based on this collaboration and energy modeling, they identified cost-effective EEMs that can be readily deployed in existing Whole Foods Market stores and other U.S. supermarkets.

If the actual savings in the Raleigh store match the modeling results, **each year this store will save nearly $100,000 in operating costs** and **avoid about 2.6 million pounds of carbon dioxide emissions**, based on $0.06/kWh for electricity and $0.83/therm for natural gas. Raleigh has low utility rates, and the same energy savings would mean greater cost savings in a location with high rates (Boston, for example) or even national average rates:

	ELECTRICITY	NATURAL GAS	TOTAL
Raleigh			
Energy Savings	1,406,156 kWh	15,513 therms	
Rates	$0.06/kWh	$0.83/therm	
Annual $ Savings	$84,369	$12,876	**$97,245**
Boston			
Rates	$0.15/kWh	$1.00/therm	
Annual $ Savings	$210,923	$15,513	**$226,437**
National Average			
Rates	$0.098/kWh	$0.98/therm	
Annual $ Savings	$137,803	$15,203	**$153,006**

To calculate the dollar savings in your area:
www.eia.gov/cneaf/electricity/esr/esr_sum.html
www.eia.gov/dnav/ng/ng_pri_sum_a_EPG0_PCS_DMcf_a.htm

NREL
NATIONAL RENEWABLE ENERGY LABORATORY

FOOD RETAILER CHECKLIST

Based on the preliminary results from Whole Foods Market's new construction CBP project, food retailers can benefit the most from their investments in energy efficiency by implementing the following measures. The EEMs with plus signs are likely to be the most cost-effective strategies in existing buildings.

REFRIGERATION

- ✔+ Add doors to medium-temperature cases where appropriate, and night curtains to remaining open medium-temperature cases.
- ✔+ Replace light fixtures in refrigerated cases and walk-in coolers with light-emitting diodes (LEDs).
- ✔+ Replace permanent-split capacitor and shaded pole motors with high-efficiency, electrically commutated motors for evaporator fans.
- ✔+ Reduce electricity use for anti-sweat door heaters by aggressively controlling them in response to the store humidity levels.
- ✔+ Use variable-speed fans for the condensers.
- ✔ Install electronic expansion valves for the low-temperature system and reduce the minimum saturated condensing temperature from 75°F to 55°F for both the medium- and low-temperature systems.
- ✔ Capture waste heat for air and service water heating.

LIGHTING

- ✔+ Reduce total installed lighting load (not including refrigerated case lighting) to 1.0 W/ft^2.
- ✔+ Reduce lighting levels during after-hours stocking and cleaning.
- ✔ Consider using LEDs for display applications throughout the store.
- ✔ Install skylights and control lights in response to available daylight.

HVAC

- ✔+ Decrease total airflow rate to about 0.6 cfm/ft^2 in the dry goods and grocery sections.
- ✔+ Optimize the main air-handling unit by independently controlling humidity and temperature.

KITCHEN EXHAUST

- ✔+ Install side panels on exhaust hoods to achieve a lower exhaust flow rate and capture all exhaust fumes.
- ✔ Install demand ventilation sensors and controls to reduce exhaust flow (and the required make-up air) when there is no cooking.

ENVELOPE

- ✔ Add a vestibule to store entrances and exits and offset the doors to reduce the airflow into the building when both sets of doors are open.
- ✔ Reduce total glazing area and use more efficient glazing.

MORE GOOD IDEAS

Reduce refrigerant charge AND save energy. Design refrigeration systems to minimize greenhouse gas emissions, considering both refrigerant leaks and the emissions from the electricity generated to run the system.

Expect more of manufacturers. Set performance goals and place the responsibility for meeting those goals on HVAC manufacturers and other vendors.

Use equipment only as needed. Save energy and money by using equipment to provide the function required as needed rather than running it constantly at full power.

Use efficient kitchen equipment. Select ENERGY STAR® qualified equipment when possible, maintain it properly, and turn it off when not in use.

Reduce plug loads. Use power savings settings on computers and point of sale equipment, consolidate personal office equipment with a multifunction device, and use load management devices on refrigerated vending machines.

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This summary is based on "Thinking Like a Whole Building: A Whole Foods Market New Construction Case Study," which is available at www.nrel.gov/docs/fy11osti/50056.pdf.