



Building America Case Study Technology Solutions for Existing Homes

Pilot Demonstration of Phased Energy Efficiency Retrofits: Shallow Retrofit Results

Central and South Florida

PROJECT INFORMATION

Building America Partnership for
Improved Residential Construction
(BA-PIRC) www.ba-pirc.org

Partners: Florida Power & Light (FPL)

Location: Brevard, Broward, Collier, Lee,
and Volusia Counties, Florida

Application: Retrofit, Single-family

Number of Homes: 56

Age Range: 1942 – 2006

Average Living Area: 1,777 Square Feet

Applicable Climate Zone: Hot-humid

Year Tested: 2012-2013

www.infomonitors.com/pdr/

PERFORMANCE DATA

Cost of Energy-Efficiency Measure
(including labor): \$374

Average Energy Savings:
1,530 kWh/yr (9%)

Average Energy Cost Savings: \$184

Simple Payback: 2 Years

The Florida Solar Energy Center (FSEC), in collaboration with Florida Power & Light (FPL), is pursuing a phased residential energy-efficiency retrofit program in Florida. Researchers are looking to establish the impacts of technologies of two retrofit packages—shallow and deep—on annual energy and peak energy reductions. Sixty homes have been instrumented to record total house power and detailed energy end-use data on all appliances as well as household interior temperature and relative humidity conditions. Shallow retrofit energy-reduction measures were chosen based on ease of installation and targeted:

- Lighting (CFLs and LED bulbs)
- Domestic hot water (wraps and showerheads)
- Refrigeration (cleaning of coils).

A few homes also received pool pump timer reductions and “smart plugs” for their entertainment centers. Weather-adjusted average savings for the 56 retrofit sites were 4.2 kWh/day, or 9% from pre-retrofit. The shallow retrofits were complete in four hours, on average, for a total average labor cost of \$121 (at \$30/hour). Material costs averaged \$250/site, yielding an average total retrofit cost of \$374. With \$184 annual average savings, simple payback is two years. Individually, each measure generated savings and a simple payback of five years or less. Overall, cost-effective savings were achieved.

Pre-retrofit, lighting and other plug loads made up 19% of whole-house energy use. Most homes already had some energy efficient lighting, thus the lighting measure depth varied. On average, 56% of bulbs were replaced. The lighting retrofit produced the most reliably large savings. Average lighting energy savings over pre-retrofit was 1.2 kWh/day (17%). The percent saved from the lighting retrofit is undoubtedly even higher than reported here, given the data monitoring also included energy of ceiling fans and other plug loads unaffected by the retrofit. The pool pump timer reduction yielded the largest immediate savings at 2.7 kWh/day (16%) over the pre-retrofit condition. However, a subsequent evaluation showed these savings did not persist. Pump timers were likely moved back to pre-retrofit settings in many cases. Hot water retrofit savings were small once adjusted for weather.

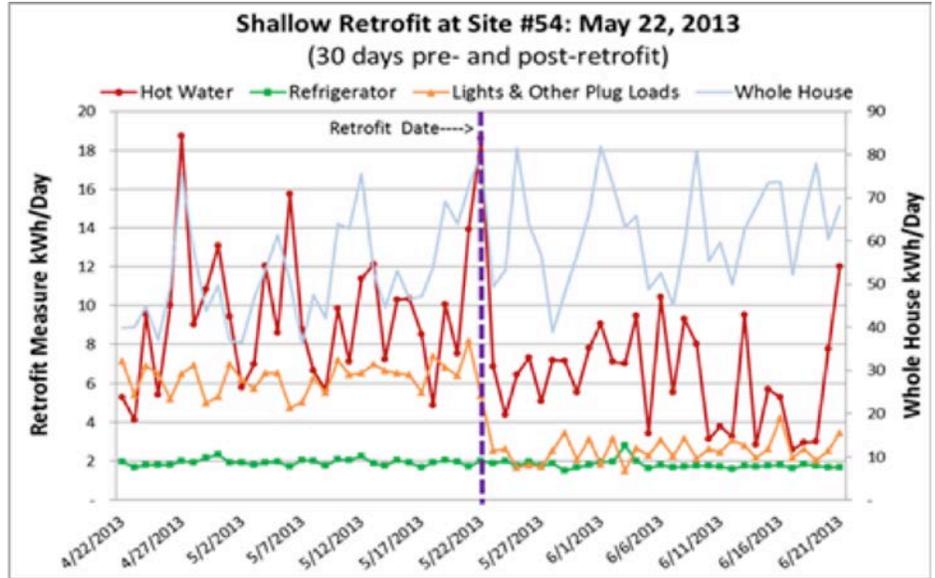


Vacuumed refrigerator coils (top: pre-retrofit; bottom: post-retrofit).



Hot water tanks and pipes were insulated (left: pre-retrofit; right: post-retrofit).

The plot below shows daily end-use power for lighting, water heating, and refrigeration at one site during a 30-day pre- and 30-day post-retrofit period. The vertical, dashed, purple line indicates the retrofit date. The graph clearly shows savings from the lighting and hot water energy use reduction measures. However, some of the post-retrofit water heating demand reduction is due to warmer weather during the post-retrofit period.



Lessons Learned

- Overall, shallow retrofit savings averaged 4.2 kWh/day or 9% of pre-retrofit monthly consumption, with an attractive two-year payback.
- The lighting retrofit measure is effective—the analysis presents an average savings of 1.2 kWh/day.
- Potential savings from reducing pool pumping hours appears large; however, may be difficult in practice to sustain.
- Savings from refrigerator coil cleaning and hot water reduction measures were small in this analysis. Additional examination will require a longer timeframe.
- Overall, reductions are small in magnitude and customers may not see their impact when comparing month-to-month billing data.

Looking Ahead

The savings evaluation for the shallow retrofits will benefit from more evaluation time. While a savings evaluation on the full sample of study homes (56) was conducted, the evaluation period was limited to 60 days. A longer-term analysis will allow for more finely tuned projections on expected savings and payback.

For more Information, go to: www.ba-pirc.org, or access the report: https://www1.eere.energy.gov/buildings/publications/pdfs/building_america/65327.pdf.

To access the monitored data, visit the project at: www.infomonitors.com/pdr/

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