New Buildings 2010 Program Impact Evaluation

Conservation Advisory Council

November 28, 2012

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Background and purpose

- Evaluation contractor: The Cadmus Group
- Site visits and analysis took place March through August of this year
- First year of a two-year impact evaluation cycle
- Purpose is to true-up the savings estimates for 2010 projects based on analysis of operating conditions and calculation methods

Methodology

- All tracks and major measure categories represented in the sample
  - 26 largest saving projects of 2010
  - 15 smaller projects that included building and measure types of interest
  - 2 buildings did not respond to requests for evaluation, leaving 39 projects in the final sample
- Sample represents 56% of electric and 62% of gas savings for 2010
- Good confidence/precision levels

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Sample

Measure Category	Total Number of Measures	Total Electricity Savings (kWh)	Total Gas Savings (therms)
Standard Food Service	37	803,433	2,915
Standard HVAC	35	58,793	81,426
Standard Lighting	73	652,971	0
Standard Motors	29	89,333	0
Standard Water Heating	11	26,553	6,485
Custom	14	1,534,719	121,004
Custom Food Service	22	1,350,245	32,103
ENERGY STAR	1	1,041,218	4,687
LEED	17	8,987,449	501,137
Total 2010 Sample	239	14,544,714	749,757

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Methodology, continued

- Document review included electronic versions of most calculation workbooks
- Review of energy simulation models
  - Easier than in previous years, but still a few issues
- Site visits checked operating conditions
- Engineering analysis
  - Reviewed inputs and calculations
  - Simulation modeling for eligible projects
  - Calibrated with actual usage data

Results

2010 Results

Measure Category	Total Number of Measures	Reported Electricity Savings (kWh)	Reported Gas Savings (therms)	Evaluated Electricity Savings (kWh)	Evaluated Gas Savings (therms)	Electricity Savings Realization Rate	Gas Savings Realization Rate
Standard Food Service	97	1,136,661	9,803	1,196,648	9,803	105%	100%
Standard HVAC	249	1,115,482	152,015	1,185,284	121,962	106%	80%
Standard Lighting	595	6,152,260	0	7,190,608	0	121%	N/A
Standard Motors	79	291,191	0	290,467	0	100%	N/A
Standard Water Heating	80	145,225	136,602	145,225	85,900	100%	63%
Custom	71	3,320,331	166,251	3,247,121	233,685	98%	141%
Custom Food Service	23	1,565,119	32,103	1,644,268	31,934	105%	99%
ENERGY STAR	1	1,041,218	4,687	1,248,104	7,913	120%	169%
LEED	50	11,276,835	633,091	8,487,972	622,094	75%	98%
Total 2010 Sample	1,245	26,044,322	1,134,551	24,635,698	1,113,291	95%	98%

Standard measures

- **Food service:** with the exception of one night cover project in grocery, all reasonable
- **HVAC:** boiler measures varied considerably, based on their usage; new DCV calculator is better predicting savings than in 2008-09
- **Lighting:** higher than assumed operating hours resulted in high realization rate

Standard measures, continued

- **Motors:** only one operating in an application where efficiency was required by code (this was a bigger problem in previous years)
- **Water heating:** instance of a couple units being back-up only (school project); in grocery, heat-reclaim system lowered savings from efficient water heaters

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Custom projects

- **Food service:** realization rates at or above 100%
- **Custom gas and HVAC:** higher than expected realization rate after calibrating with EMS and billing data
- **Custom lighting and shell measures:** generally reasonable

ENERGY STAR and LEED

- Only one ES project; had a high realization rate after double checking model inputs
- LEED: Overall RR of 75% electric, 98% gas
- Significant variation in project-level realization rates
  - Partially a result of the way LEED works
  - Program staff does site visits for all large projects and a sample of small one to verify installations, but does not rerun the model unless there are obvious discrepancies
  - No big themes identified for savings variation

Recommendations and Response

Recommendations

- Calculate lighting savings though LPD
  - Done for projects under 2010 code
- Apply more appropriate savings to back-up boilers and water heaters
  - This is done for custom measures, but not currently done for prescriptive measures
- Account for interaction with heat recovery
  - Changed in late 2010 for custom measures; challenging for prescriptive

Recommendations (continued)

- Obtain energy simulation models during program year
  - Done in late 2010, based 2008 impact report
- Maintain consistent documentation on simulation model files
  - New labeling system already adopted
- Ensure simulation models match approved savings for LEED projects
- Provide more detail on exceptional calculations

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Energy Trust take

- 2010 overall realization rates are very close to 100% and comparable to 2009
- Many recommendations were implemented in 2009 or 2010
  - 2011 should confirm this
- Other recommendations around LEED projects and modeling are being considered