Gas Weatherization Impact Analysis for 2008 Existing Homes Program

Conservation Advisory Committee

March 9, 2011

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Background

- 2008 analysis follows in-house work on 2006-2007 program years
- Findings are consistent, with a few exceptions
- Air sealing continues to demonstrate challenges

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Key Findings

Comparison of Savings Estimates by Year and Measure

Measure	2006 only	2007 only	2008
Air sealing	15	-25	52
Duct sealing	32**	37**	5.6
Gas furnace	75***	78***	68***
Windows† (per sqft)	47 (0.19***)	9 (0.034)	50 (0.2***)
Ceiling insulation (per sqft)	75 (0.06***)	59 (0.047***)	65 (0.052***)
Floor insulation (per sqft)	43 (0.04***)	47 (0.041***)	59 (0.051***)
Wall insulation (per sqft)	54 (0.05***)	61 (0.061***)	62 (0.06***)
Duct insulation (per sqft)	8 (0.04)	33 (0.16**)	28 (0.14***)

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

†Deemed windows savings are based on 'incremental' savings, impact estimates in this table represent 'replacement' savings and are not de-rated to account for baseline assumptions.

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Key Findings cont.

- Savings averaged 62 therms, or 8% of household load per site
- Expected air sealing and duct seal savings were not found
  - One high volume contractor performed over 50% of projects involving these measures
  - Pre-2008 duct sealers demonstrated measureable savings in 2008

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Background & Methods

Sample Selection

- Participants in 2008 with a full year of pre and post utility readings (to facilitate weather normalization) and no program participation in other years

- Two comparison groups made up of future participants: December 2009 and 2010 participants

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Weather Normalization and NAC Screening

- Energy Trust uses a technique similar to the PRInceton Score-keeping Method
- Data screens:
  - Excessive consumption changes (delta of 65% or more)
  - Model $R^2 < 0.7$
  - Adequate weather variation present
  - Consumption above(below) 99th(1st) percentile Comparison group consumption was bounded by participant consumption
  - Sites with less than 9 pre or post observations

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Sample Attrition

- Attrition led to a final sample comprising 48% (5,859 of 12,289 sites) of total 2008 participants
- 32% of attrition stemming from inability to locate utility bills
- Actual analysis sample uses a smaller sample due to the removal of infrequent or minimal expected energy saving measures

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Saving Estimation Techniques

Two approaches:

1. Difference in difference estimation
   - Uses comparison group to ‘control’ for non-program trends

2. Multiple variable modeling
   - All measures entered as dummy or scale variables

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Findings

Difference in Differences Estimation: All Sites

2008 Average Annualized Therm Savings for Program Participants and Comparison Group

Cohort	N	Average pre-period therm usage	Average therm savings	Average savings net of comparison group	95% confidence interval
2008 participant	4823	751	82	62	±7
2008 comparison group	910	748	20		

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Difference in Differences Estimation Cont.

Therm Savings Estimates Net of Comparison by Frequently Combined Measures

Measure category	Part N	Savings net of comparison group	95% confidence interval
Air sealing	81	24	±28
Ceiling insulation	282	78	±16
Ceiling and floor insulation	70	105	±32
Ceiling and wall insulation	36	126	±38
Ceiling insulation and windows	29	88	±50
Duct and floor insulation	29	76	±38
Duct sealing	98	18	±24
Duct and air sealing	371	18	±10
Duct sealing and gas furnace	29	130	±71
Floor insulation	80	74	±26
Gas furnace	1,983	80	±12
Wall insulation	90	93	±23

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Multiple Variable Measure Level Savings Estimates

Variables	Regression Parameters
Duct sealing	5.559
Air sealing	5.193
Gas furnace	68.20***
Ceiling insulation (per Sqft.)	0.0515***
Floor insulation (per Sqft.)	0.0508***
Wall insulation (per Sqft.)	0.0623***
Duct insulation (per Lft.)	0.137***
Windows (per Sqft.)	0.195***
Constant	21.62***
Observations	4,689
R-squared	0.115

*** p<0.01, ** p<0.05, * p<0.1

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Multiple Variable Estimates with Contractor Level Effects

Variables	Regression Parameters
Duct sealing	-0.00457
Air sealing	6.998
Ceiling insulation	60.33***
Duct insulation	21.88**
Floor insulation	52.05***
Gas furnace	66.71***
Wall insulation	51.32***
Windows	36.56***
Duct sealing Contractor before 2008	**32.32****
Constant	23.95***
Observations	4,823
R-squared	0.112

*** p<0.01, ** p<0.05, * p<0.1

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Concluding Remarks

- Gas savings appear to be stable over program years (with some exceptions)
- Consistent modeling techniques yield comparable results across program years
- No measureable air and duct sealing savings
  - Issues with one former contractor may be clouding duct sealing results
  - Air sealing results most problematic

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Looking forward and backward

- Air and duct sealing incentives changed in 2009
- Air sealing documentation requirements changed in 2009
- 2009 billing analysis later this year
- Considering additional changes to air and duct sealing
  - Prescriptive, with checklist (ACH50 v.s CFM50)?
  - Increased TA standards/certification?
  - Included in insulation installation spec?
  - Changes in QC process

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