Energy Trust of Oregon

Conservation Advisory Committee Meeting

August 12, 2009

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Evaluation Topics

- Steam Traps
- Tankless Gas Water Heater
- Overview of highlights of:
  - NBE 2006-2007 Evaluation
  - EB 2006-2007 Evaluation
  - Billing Analysis:
    - Multifamily
    - Duct Insulation and Duct Sealing

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Existing Buildings Steam Trap Site Verification Study

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Project background and site verification findings

Purpose

- Steam trap projects saw dramatic rise and fall in late 2008
  - Rapid uptake put pressure on budget
  - Interesting back-story…
- Energy Trust wanted to verify assumptions on-site to help inform any future steam trap program offerings
  - Considerable number of geographically clustered cleaners in Clark County WA (43)

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Steam trap projects in Oregon

- Oregon market appears to be saturated
  - Rapid drop off after majority of PDX dry cleaners received services

Year	Month	Projects	Incentives
2008	7	1	$ 2,000
2008	10	47	$ 69,600
2008	11	30	$ 47,400
2008	12	65	$ 111,100
2009	2	30	$ 43,600
2009	3	24	$ 40,100
2009	4	3	$ 6,600
2009	5	3	$ 3,600
2009	6	1	$ 1,700

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Verification study background

- 10 Sites visited by SEG in May 2009 to verify measure assumptions regarding installations, boiler operating hours, and customer satisfaction
- Korean Dry Cleaner Association informed members of SEG visits beforehand
  - This appears to have helped site visits go very smoothly

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Site verification findings

- Installations were high quality
- Customers expressed high levels of satisfaction with savings, equipment, and program interaction
- Consistent with savings assumptions, all traps at sites were replaced
  - Savings based on 30% failure rate
- Boilers were found to be operating at 62% of assumed hours

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Site verification findings cont.

- Majority of business owners maintain steam system themselves
- Majority indicated they saw no reason to contact same contractor who performed replacements
- Contractors indicated incentives would need to be *increased* to cost effectively replace non-metro dry cleaner traps

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Impact analysis and results

Methodology

- Conducted in-house
  - Preliminary analysis indicated savings were considerably lower than expected
  - More rigorous savings estimated using regression analysis
- Comparison group of non-project sites included

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The Data

- Analysis utilized sites accounting for over 65% of steam trap projects
- Project sites were slightly higher gas users than non-participating sites

Descriptive statistics	Participants	Comparison Group
Sites used in analysis	136	58
Avg. daily pre-period therm consumption	21.2	18.1
Avg. daily post-period therm consumption	19.8	19.0

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Findings

- Savings estimates ranged from 44-55 therms per trap, depending modeling approach
  - Current savings assumption: 139/trap
    - Yields realization rate of 32%-39%
- Despite this, the measure still has a B/C ratio over 1.0

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Conclusions & Discussion

- General feeling that Oregon market has been saturated
- ETO staff exploring options for Clark County WA
  - 43 geographically concentrated dry cleaners
- Business as usual approach could rapidly deplete first year EB budget
  - Potential for $60k in incentive payments
- Redesign of program implementation considered

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Residential Program Incentives for Tankless Gas Water Heaters

- Energy Trust offers tankless gas water heater incentives to both the existing and new home markets through the Home Energy Solutions and the Efficient New Home programs
- Tankless water heater incentives have been offered since 2007 ($200)
- Up to a $340 tax credit is also been available through the Oregon's Residential Energy Tax Credit (RETC)
- HE tanked gas water heater incentive have been offered since 2004($35 .62 EF)

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Tankless Water Heater Incentives

Year	Existing Homes	New Construction
2007	475	120
2008	872	213
Total	1,347	333

Installed cost	
2007	$2,600
2008	$2,700

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Tankless Billing Analysis Results

- Billing analysis was performed on the 2007 participants
- Four different evaluation consultant analyzed the billing data with different research plans:
  - Counterfactual simulation
  - NAC Pre and NAC Post estimation
  - NAC combined estimation
  - Panel model

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Tankless Analysis Results (cont.)

- Counterfactual approach did not provide results ended up being estimated as a Panel model
- NAC analysis revealed issues with fuel switching
- NAC also indicated that avg. DHW gas consumption lower than generally assumed (<200 therms)
- Participant and Comparison sample selection were different for each consultant
- Results clustered around 59 to 71 therms
- Furnace savings were estimate in two of the research designs with differing results (77 and 22 therms)

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NBE 2006 -2007 Impact and Process Evaluation

- Impact Study Period:
  - January 2006- December 2007
- Site Visits and Customer Surveys:
  - Q4 2007-Q2 2008

- Evaluation Contractor: ADM Associates, Inc.

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New Building Market

Year	SQFT Million	NBE Share %
2005	12.0	41%
2006	31.6	23%
2007	~23.2	39%

Major building types :

Offices/Banks
Hospitals and other health
Schools and Colleges

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Impact Evaluation Methods

	2006	2007
• Participant site visits:	63	60
• Short-term metering:	18	24
• Participant survey:	52	30
• Billing calibrated building simulation	29	36

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Realization rates

Year	*Realization Rates*	
	kWh Savings	*Therm Savings*
2004	**108%**	**101%**
2005	**104%**	**42%**
2006	**102%**	**105%**
2007	**92%**	**111%**

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Trends in Realization Rates

Year	*Realization Rates*	
	Overall kWh Savings	*Lighting kWh Savings*
2004	**108.4%**	**127.6%**
2005	**103.6%**	**102.9%**
2006	**101.9%**	**94.4%**
2007	**92.3%**	**93.1%**

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EUI Comparison

NEEA Building Type	*EUI 2002-2004*
Assembly	13.3
College	12.7
Education (Schools)	9.6
Grocery	46.6
Health Services	14.3
Hospital	25.3
Institution	15.4
Office	17.8
Other	18.3
Residential/Lodging	10.6
Restaurant/Bar	86.2
Retail	21.6
Warehouse	15.1

Building Type	*Number of Buildings*	*Code EUI*	*As-Built EUI*	*Percentage Savings*
Education / Lab	1	54.21	38.83	28.4%
Food Store	10	47.51	43.61	8.2%
Hospital / Clinic	8	27.01	21.10	21.9%
Hotel	4	23.21	19.07	17.8%
Multifamily	5	10.43	8.70	16.6%
Office	4	23.96	15.19	36.6%
Retail	16	25.46	22.62	11.2%
School	6	14.46	12.41	14.2%
Special	4	4.95	3.24	34.6%
Warehouse	1	8.13	7.55	7.0%
Other	6	89.11	72.97	18.1%
All buildings	65	21.84	18.23	16.5%

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Free Rider Trends

Year	*Free Rider Rates*	
	Electric Measures	Gas Measures
2004	33%	33%
2005	31%	31%
2006	35%	33%
2007	35%	32%

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Process Evaluation Findings 1

- Program has been very good at making needed program changes and adapting to the market
- High level of program satisfaction from interviews mirrors that found in participant surveys
- Paperwork is the major complaint though changes in that area have been noticed and some market actors have taken up the paperwork for others
- Four separate program tracks are important for administration but clients not aware of differences

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Process Evaluation Findings 2

- Consider merging LEED and Energy Star into custom track
- Some clients preferred standard track due to its simplicity and cost of documentation
- Incentives are not driving factors in every customer's decision and in some subsectors the incentive's immediate importance is more pronounced (e.g. government)
- Smaller customers have greater risk aversion and prefer simple reliable technologies

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Process Evaluation Findings 3

- In the area of national chains Energy Trust needs to work with others to engage chains at the national level.
- National engagement needs to focus both on engineering as well as the chain's mission, in the case of retail merchandizing

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EB 2006 and 2007 Impact and Process Evaluation

- Impact Study Period:
  - January 2006- December 2007
- Site Visits and Customer Surveys:
  - Q4 2007-Q3 2008

- Evaluation Contractor: Research Into Action, Inc.

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EB Expected Savings

Year	KWH (Millions)	Therms (Thousands)
2003	12	8
2004	38	85
2005	56	443
2006	31	1,016
2007	26	507
2008 (YTD)	35	785

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EB Participating Sites

Year	#Sites
• 2003	210
• 2004	466
• 2005	801
• 2006	1,581
• 2007	1,388

- 2006-2007 participants ~12-14% of market

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Process and Impact Evaluation Methods

Surveys and Interviews:

• Energy Trust and PMC Staff	9
• ATACs	13
• Active Trade Allies	20
• Least Active Trade Allies	34
• Nonparticipant Vendors	59
• Participants	212
• Nonparticipants	130

Participant site visits:

2007	81
2008	98
Billing Analysis	Participant Population

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Realization Rates 2006 and 2007

	2006	2006	2007	2007
Group	**Electric Measures**	**Gas Measures**	**Electric Measures**	**Gas Measures**
Engineering Analysis Savings	99%	95%	98%	102%
Billing Analysis	79%	102%	92%	104%
Total Savings	90%	98.%	94%	103%

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Billing Analysis

- Spray valve savings are based on homogenous sample of coffee shops with gas water heat
- Need to reconcile lighting billing analysis with site visit RR
  - Review of files and site visits of subset of buildings
  - Consider increased data collection to identify:
    - Buildings with significant changes in use and hours
    - Alternatives to billing analysis

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Program Free Rider Rates

	Electric	Gas
• 2004	14%	35%
• 2005	20%	5%
• 2006	40%	37%
• 2007	44%	40%

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Market Effects: Spillover

- Spillover for both participants and nonparticipants is modest with :
  - 3% of nonparticipants reported installing EE equipment with high program influence.
  - ~2% of participants reported installing EE equipment with no incentives with high program influence.
- Some indication of market transformation:
  - 93% of participants' non-EB equipment was EE
  - 94% of nonparticipants' equipment was EE
  - 40% participants report EE equipment standard
  - >40% of all vendors include EE equipment inn all of their bids (over 55% in 80% or more of their bids)
  - During 2 year study period worked with about 12%-14% of nonresidential building stock

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Market Effects Implications

- High free rider rates indicate the need for program redesign:
  - Change incentives
  - Change EE of qualifying measures
  - Target niche markets
  - Develop market transformation strategy
- High free rider rate impacts program cost-effectiveness :
  - More buildings will be needed to meet goals and/or,
  - More savings per building need to be achieved

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Participant Highlights

- Surveyed participants represented wide range of building types with offices (23%) institution and other (both 11%) making up the largest groupings
- 72% owned their building
- ½ operated more than one site with 8% of the participants operating in 20 or more locations
- >90% were aware of energy Trust and 67% had been aware for 2 or more years
- Vendor influenced participation for 34% of customers

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Participant Highlights (cont.)

- Most common reasons for installing EE equipment were:
  - Energy savings (Most important 43%)
  - Reliability
  - Incentive (most important 15%)
- Program Influence
  - The technical study is rated a 4 or 5 (5 point scale) by >50% and the incentive gets a 4 or 5 from 70%
  - 30% state the project would probably or definitely not have occurred without program facilitation
  - Past program participation cited as being influential in participation by overwhelming majority

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Participant Highlights (cont.)

- 30% of Energy Trust technical studies led to a project with a typical lag of just over a year.
  - Should review what the outcomes of the other studies are to capture study spillover
  - Research how other third party studies are influencing participant decisions
- Generally, repeat participation is associated with larger projects.

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Participant Highlights (cont.)

- A surprising number of participants have a formal Energy Policy (61%) , a staff member responsible for energy (42%), a written energy management plan (14%) and numerical goals (12%).
- 2/3s were mostly or completely convinced of Global Warming and 28% reported that their operations were being affected by GW
- Belief in global warming was not correlated with adoption of corporate policies
- 2/3s applied for the BETC and BETC was of equal, (45%) or more important (4%) than the program incentive (48% cite EB incentive as having more influence)

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Participant Highlights (cont.)

- 67% Participants felt that program contact very knowledgeable
- 90% reported they would contact the program again to discuss new equipment purchases and over 1/3 had already done so
- Overall program satisfaction was high with >95% giving a 4 or 5 rating. In all other areas the program also received favorable ratings (even application with 81% giving a 4 or 5)
- Customers experienced no (77%) or minor (17%) confusion with the program

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Nonparticipant Highlights (cont.)

- Nonparticipants represented a wide range of sectors :
  - 41 tenants, (24 small 17 large)
  - 68 owner occupied (32 small 17 large)
  - 21 absentee owner (8 small 13 large)
- 61% had multiple locations with ½ having >10 locations
- Major building types represented were offices (46%) retail (20%) and other (26%)
- Building types not represented were groceries, lodging, universities and hospitals.

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Nonparticipant Highlights (cont.)

- 2/3 are aware of Energy Trust and BETC
- Fewer were aware that BETC also covered renewables and gas
- Over half the respondents feel that there are opportunities for reducing electricity consumption though less so for gas (4 in 10)
- Nearly 80% had high or very high concerns about energy costs
- Nearly 70% were actively engaged in controlling energy costs and 30% had a staff member responsible for energy and EE

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Energy Trust Take

- Need to look at specific markets:
  - Lighting and HVAC to determine FR rates and spillover
- Look at what NEEA is doing to determine if their studies can be used to determine market spillover
- Evaluation can only provide broad overview of program markets and supply chain. Should consider more detailed studies:
  - Lighting network review: network currently spans PE EB and NB and will provide insight into developing mechanical vendor network
  - Separate studies of tenants, owner occupied buildings, government/institutional, buildings managed by management firms/ REITs/absentee landlords

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Energy Trust Take

- Nonparticipant market has large potential but consists of many markets, owner occupied, absentee owner, tenants, large, small and different building types, all of which might require different strategies
- Participant market potentially untapped
  - Repeat participants do larger projects
  - Large number of multisite participants
  - Need measure installation analysis

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Billing Analysis

- Multifamily
- Duct Sealing and Duct Insulation

Multi-family average units

Program has served 33,262 unique units

2004-2008 Gas Savings

Insulation	Water measures	Windows	Total therm savings
42%	**10%**	**39%**	**333,990**

2003-2008 KWH Savings

Insulation	Lighting	Windows	Water measures	Total kWh savings
18%	**33%**	**43%**	**5%**	**75,421,830**

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Multifamily Billing Analysis Results

- Billing analysis was performed on the 2003-2007 participants
- Five different research plans were proposed :
  - Counterfactual simulation
  - NAC Pre/Post estimation
  - NAC Pre/Post estimation
  - Panel model (unit and account level fixed effects)
  - Panel model (unit level fixed effects)
- Four models were estimated

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Multifamily Results (cont.)

Realization rates

	Electric	Gas
• Model 1	8%	54%
• Model 2	41%-49%	0%
• Model 3	18%-32%	35%
• Model 4	No stable models	

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Multifamily Analysis Results (cont.)

- Participant sample selection was different for each model
- Significant differences between models possibly due to differing sample sizes
- Significant issues with multifamily data
  - Missing units and missing common areas
  - Turnover and vacancies
  - Possible issues with building upgrades
  - Possible issue with savings simulation

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Multifamily Analysis Next Steps

- New evaluation methods:
  - Billing simulation
  - Site visits
- Enhance savings analysis and data collection:
  - Identification of ALL accounts and addresses
  - Building upgrades
  - More detailed savings analysis
- Review of savings simulation models:
  - Consider billing simulation model (e.g EZSim)

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Duct Sealing and Insulation Billing Analysis Results

- Billing analysis was performed on the 2003-2007 participants
- Three different research plans were proposed :
  - NAC Pre and NAC Post estimation
  - NAC Pre/Post estimation
  - Panel model
- Two models were estimated

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Duct sealing and insulation

- Savings in 2005 and 2006 no difference
- Analysis at sites receiving duct sealing/insulation Evaluation realized savings

	Model 1	Model 2
– Gas	73 therms	99 Therms
– Electric	2,308 kWh	~625 kWh

- Differences in sample size and comparison group

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Duct Sealing and Insulation Analysis Results (cont.)

- Savings estimated but for a bundle of measures as duct insulation and sealing usually installed with insulation
- Homes with only duct sealing and insulation had savings similar to deemed savings
- Homes with estimated high leakage had higher savings
- Electric savings at gas heated homes

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Duct Sealing Next Steps

- Contract billing analysis on 2006/2007/2008 homes that had only duct insulation or only duct sealing

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