



Achieving Higher Savings in Low-Income Weatherization

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Session Outline

- Introduction
- Maximizing Energy Savings
 - Target High Energy Users
 - Install Major Measures where Cost-Effective
 - Quality Service Delivery
- Performance Measurement
- Summary and Recommendations

Low-Income Energy Efficiency Programs



- Serve many purposes
 - ☐ Affordability
 - ☐ Comfort
 - ☐ Health and safety
 - ☐ Equity
- Many goals for the programs
- Sometimes the goals are conflicting

Potential Goals

Energy Savings

Cost-Effectiveness

Bill Reduction

Ratepayer Subsidy Reduction

Environmental Impact

Economic Impact

Vulnerable Households Served

Energy Savings

Programs Vary on Many Levels

- Administration
 - State office
 - Utility
 - Nonprofit
- Geography
- Fuels
- Measures

Common Interest Among Managers

- Importance of energy savings
- Findings from billing impact analysis

Presentation

Evaluations of many different programs



Not an in-depth analysis of one program



Common elements that relate to higher savings



Recommendations for achieving higher savings



Maximizing Energy Savings

Reaching High Usage Customers

Utility Lists

- High usage customers

Program Outreach

- Promote awareness
- Acceptance of legitimacy

Referrals

- Neighbors
- Friends and relatives

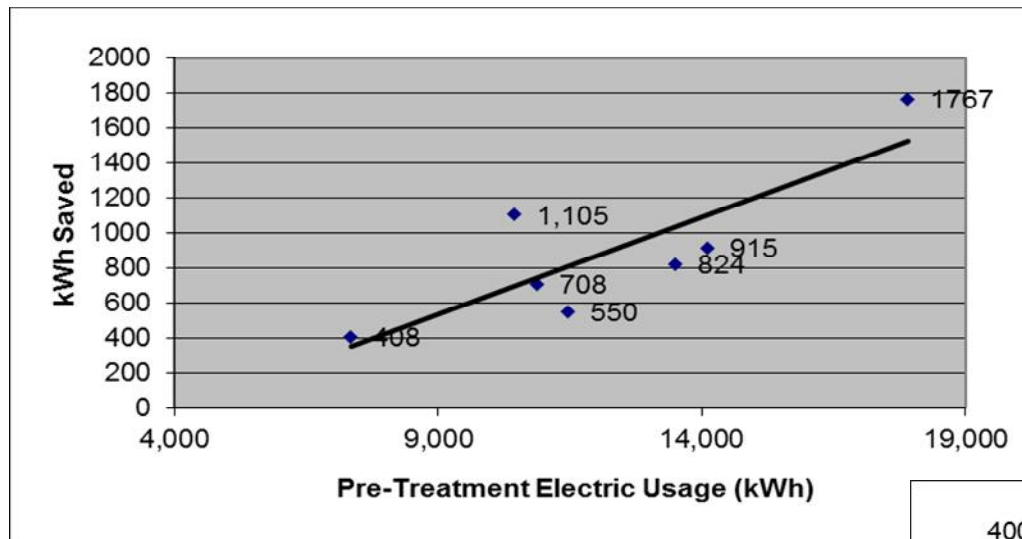
Link with Bill Payment Program

- Serves goal of reduced ratepayer subsidy

Calibrate Offerings

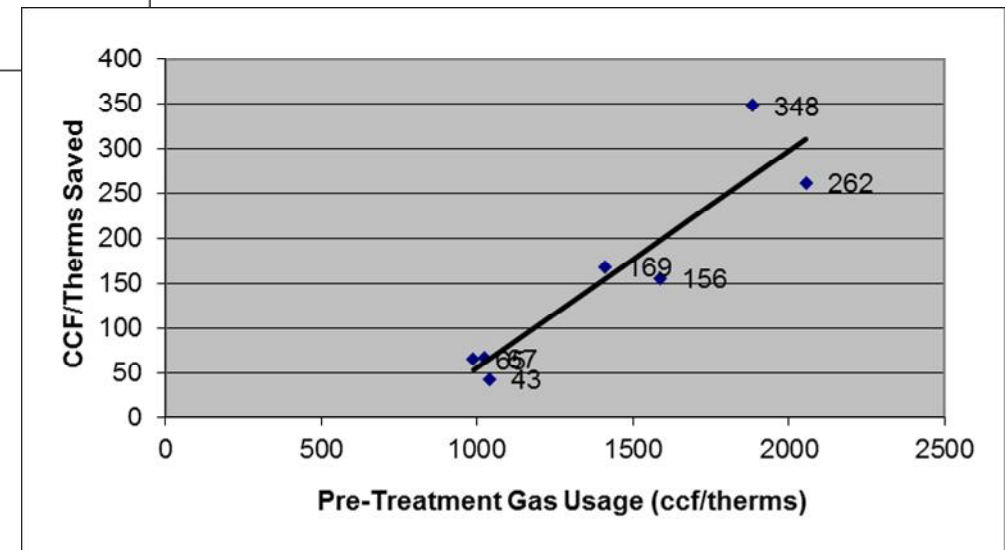
- Relative to savings opportunities

Treating High Usage Across Program Analysis



Seven low-income efficiency program evaluations over past eight years.

Seven low-income efficiency program evaluations over past four years.



Treating High Usage Within Program Analysis

Program 1 - Electric Baseload		
Pre-Treatment kWh	Savings	
	kWh	%
< 8,000	-79	-1.1%
8,000-12,000	419	4.3%
> 12,000	1,079	6.6%

Program 2 - Electric Baseload		
Pre-Treatment kWh	Savings	
	kWh	%
< 8,000	193	2.8%
8,000-12,000	522	5.3%
> 12,000	1,984	12.2%

Program 3 - Electric Heating		
Pre-Treatment kWh	Savings	
	kWh	%
≤10,000	354	4.2%
10001-16,000	693	5.4%
>16,000	1,559	8.1%

Program 4 - Electric Heating		
Pre-Treatment kWh	Savings	
	kWh	%
< 16,000	753	5.7%
16,000-26,000	1,367	6.7%
> 26,000	4,614	13.5%

Treating High Usage Within Program Analysis

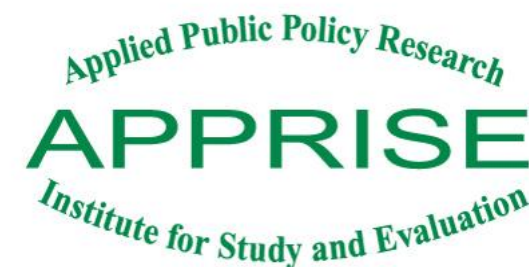
Program 1		
Pre-Treatment ccf	Savings	
	ccf	%
≤800	10	1.5%
801-1,200	46	4.7%
>1,200	79	4.9%

Program 2		
Pre-Treatment ccf	Savings	
	ccf	%
< 800	23	3.5%
800 – 1,400	76	7.3%
> 1,400	144	8.3%

Program 3		
Pre-Treatment ccf	Savings	
	ccf	%
<1,400	146	11.7%
1,400-1,600	184	12.3%
>1,600	129	6.5%

Program 4		
Pre-Treatment ccf	Savings	
	ccf	%
750-1,000	123	14.0%
1,000-1,250	182	16.4%
1,250-1,500	217	15.9%
>1,500	365	20.0%

Penetration of Major Measures



Electric Savings by Number of Major Measures Installed in Electric Heating Jobs

Number of Major Measures	Air Sealing, Attic Insulation, Other Insulation, HVAC Replacement, Duct Sealing, Refrigerator Replacement		
	Obs.	Savings	
		kWh	%
None	72	3	<0.1%
1	90	427	3.3%
2	87	1,172	8.8%
3	63	1,429	9.4%
4-5	22	2,293	14.1%

Penetration of Major Measures

Natural Gas Savings by Number of Major Measures Installed

Number of Major Measures	Air Sealing, Attic, Floor, Sidewall, Wall/Perimeter Insulation, HVAC Replacement, Duct Sealing		
	Obs.	Savings	
		ccf	%
0	938	8	0.8%
1	678	15	1.6%
2	838	25	2.5%
3	506	111	9.9%
4	168	170	13.5%
5-6	32	237	17.3%

Number of Major Measures	Air leakage reduction and/or air sealing (one measure), Attic, Wall, Header Insulation, Unspecified Insulation		
	Obs	Savings	
		ccf	%
0	58	167	10.6%
1	198	80	5.1%
2	254	162	10.5%
3	167	226	14.2%
4 or more	53	271	16.8%

Quality Service Delivery Evaluation Method



Develop check lists and rating scales



Train experts to implement
consistently



Quantify findings across all
observations and inspections



Enrich data with descriptive
information



Recommendations for program based
on prevalent issues

Quality Service Delivery Weaknesses Identified

Insufficient use of
diagnostic testing
results

- To inform measure selection
- To determine installation specifications

Lack of focus on the
highest priority areas

- Example - air sealing at the top of the envelope not prioritized

Failure to use
appropriate testing

- Blower door – guide air sealing work
- Zonal Pressure testing – affirm appropriate pressure boundary

Duct sealing -
incorrect focus and
failure to test

- Ducts outside conditioned spaces
- Pressure pan testing to ensure effective work

Quality Service Delivery Weaknesses Identified

Missed opportunities for insulation.

- Wall insulation seen infrequently

Refrigerators and freezers

- Failure to assess all refrigerators and freezers.
- Missed opportunities for two-for-one swaps.

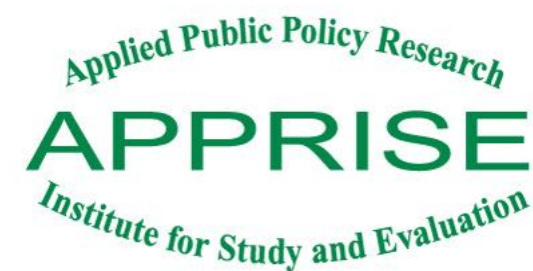
Work orders

- Do not provide appropriate guidance
- Example –detail on air sealing priorities

Customer education

- How to use energy and maintain measures
- Lost opportunities for customer actions

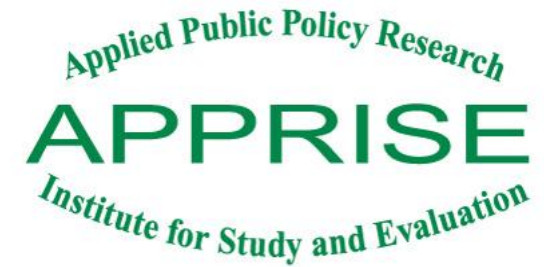
Quality Service Delivery



Audit Observation Findings: Air Leakage and Insulation Diagnostics

	Program 1			Program 2		
	Applicable Obs.	Action Taken		Applicable Obs.	Action Taken	
		#	%		#	%
Measured surfaces	100	94	94%	75	57	76%
Inspected all accessible attics	78	69	88%	62	61	98%
Created access to inaccessible attics	33	3	10%	23	0	0%
Inspected for all typical bypasses	100	62	62%	75	67	89%
Visual inspection for air sealing opportunities	100	83	83%	76	71	93%
Used blower door while inspecting for leaks	96	64	67%	51	32	63%

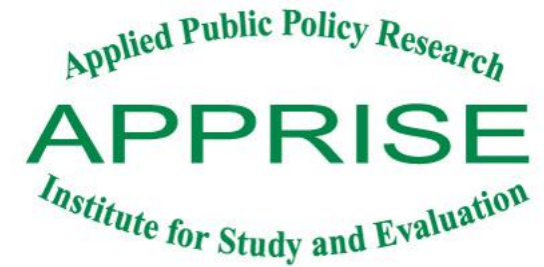
Quality Service Delivery



Measure Installation Findings: Air Sealing Work

	Program 1			Program 2		
	Applicable Obs.	Action Taken		Applicable Obs.	Action Taken	
		#	%		#	%
Blower door used to guide air sealing	83	18	22%	26	2	8%
Zone pressure testing done	80	9	11%	23	12	52%
Sealing at top and bottom prioritized	82	63	77%	21	13	62%
All major opportunities sealed	83	47	57%	25	12	48%

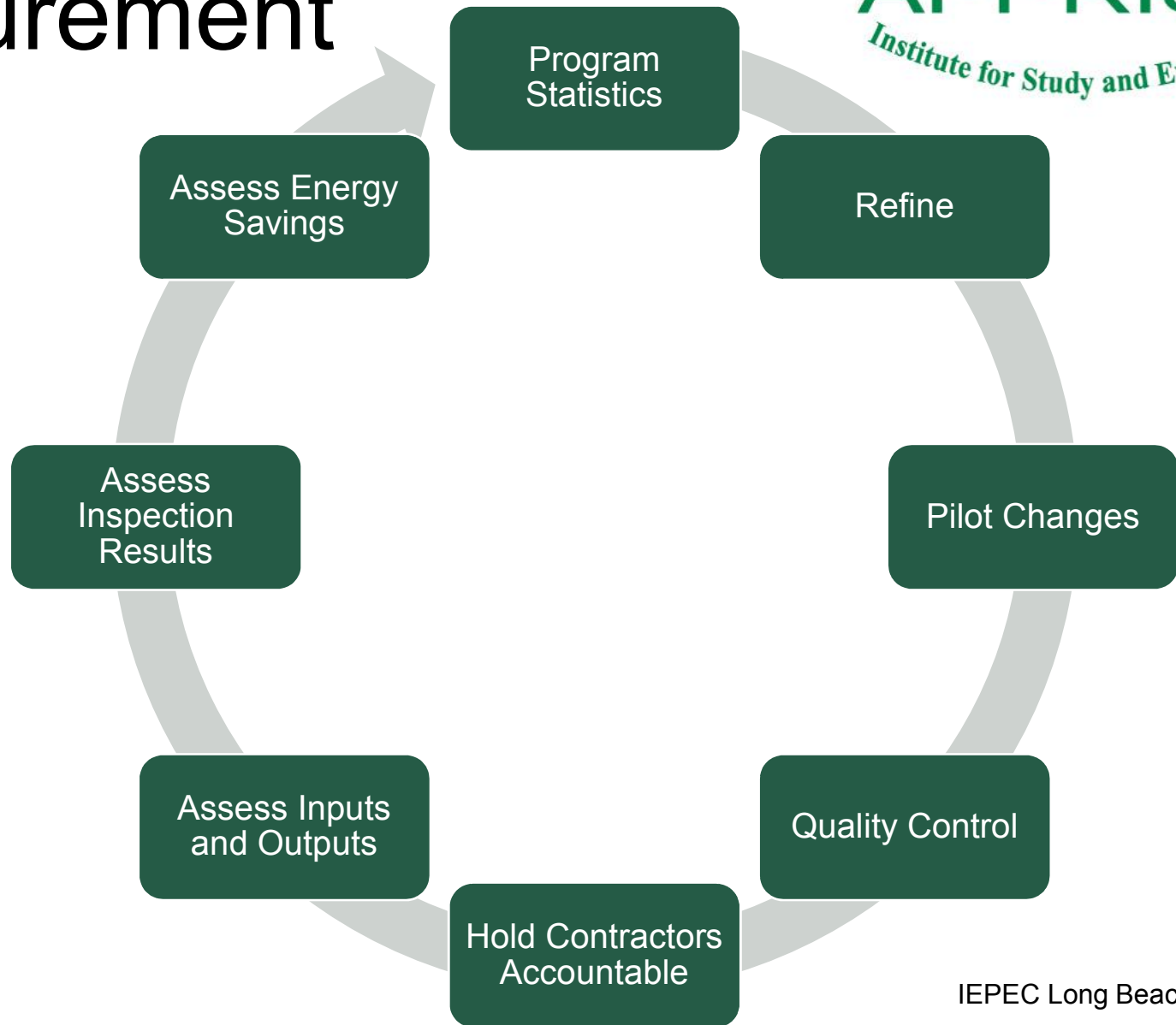
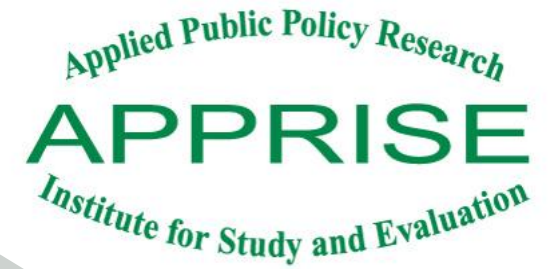
Quality Service Delivery Recommendations



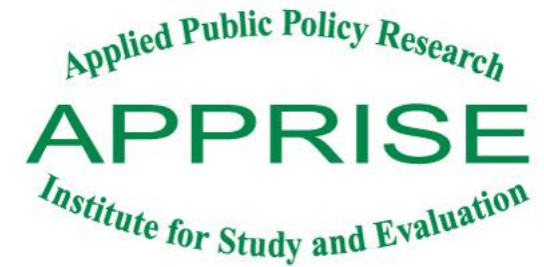
- Program Manual
 - ☐ Clarify measure selection and installation
 - ☐ Reflect best practices in home performance
- Spending Guidelines
 - ☐ Relate to savings opportunities
 - ☐ Allow flexibility
- Work Orders
 - ☐ Clear and specific
- Training
- Quality Control
- Performance Measurement

Performance Measurement

Performance Measurement



Performance Measurement



1. Develop Baseline Statistics

- ☐ Pre-treatment usage, measure installation rates, energy savings measured through billing analysis

2. Refine Procedures

- ☐ Documentation, contractor training

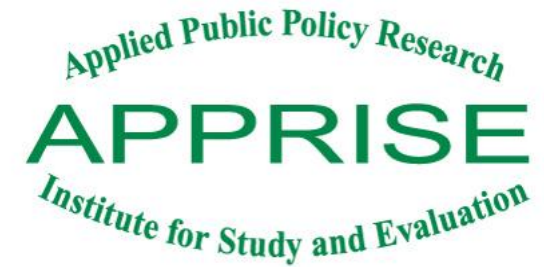
3. Pilot Program Changes

- ☐ Innovative strategies implemented on small scale
- ☐ Examples: treating low usage, high baseload, health and safety issues, homes previously treated

4. Conduct Quality Control

- ☐ Observe, inspect, quantify findings, agree on specifications

Performance Measurement



5. Require Contractor Accountability

- ☐ Require remediation, set goals for performance, additional QC, remove contractors if they do not improve

6. Assess Inputs and Outputs

- ☐ Improving enough to lead to better results?

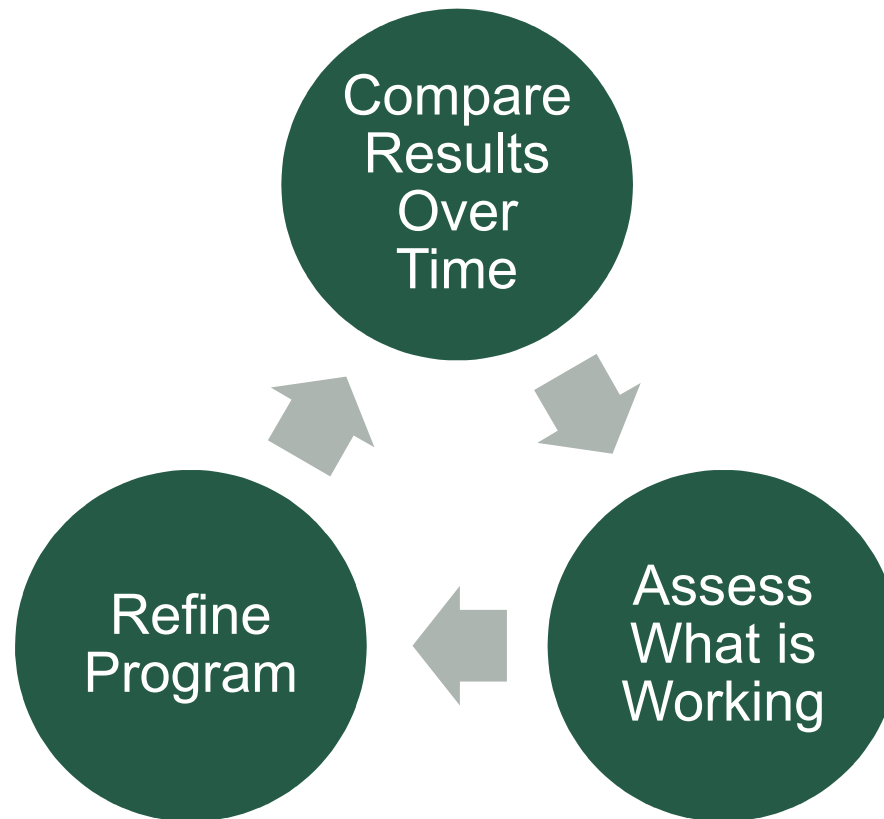
7. Assess Inspection Results

- ☐ Comprehensive installations, missed opportunities, poor quality work
- ☐ Early indication of savings expectations

8. Assess Energy Savings

- ☐ Billing analysis on an annual basis

Performance Measurement

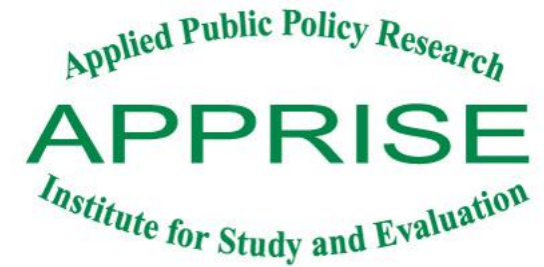


Summary and Recommendations

Lessons Learned

- It is challenging to meet savings expectations
- Target high usage customers
- Ensure major measures are installed where opportunities exist
- Maximize use of proven home performance techniques
- Conduct performance measurement

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