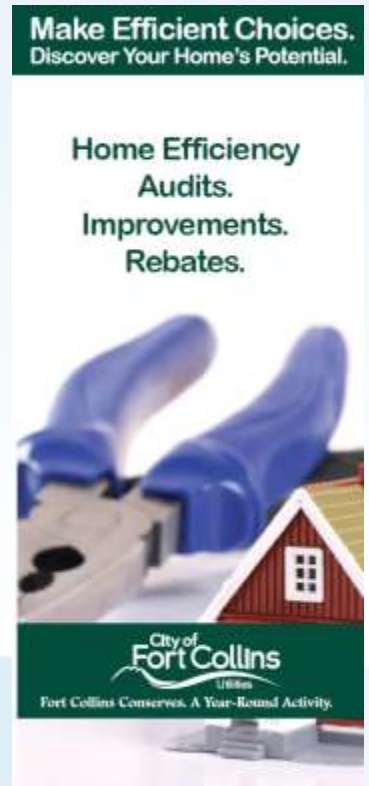


# Look at the Numbers

## Home Efficiency, High Standards and Results

John Phelan, PE, Energy Services Manager  
Kim DeVoe, Energy Services Engineer  
Fort Collins Utilities

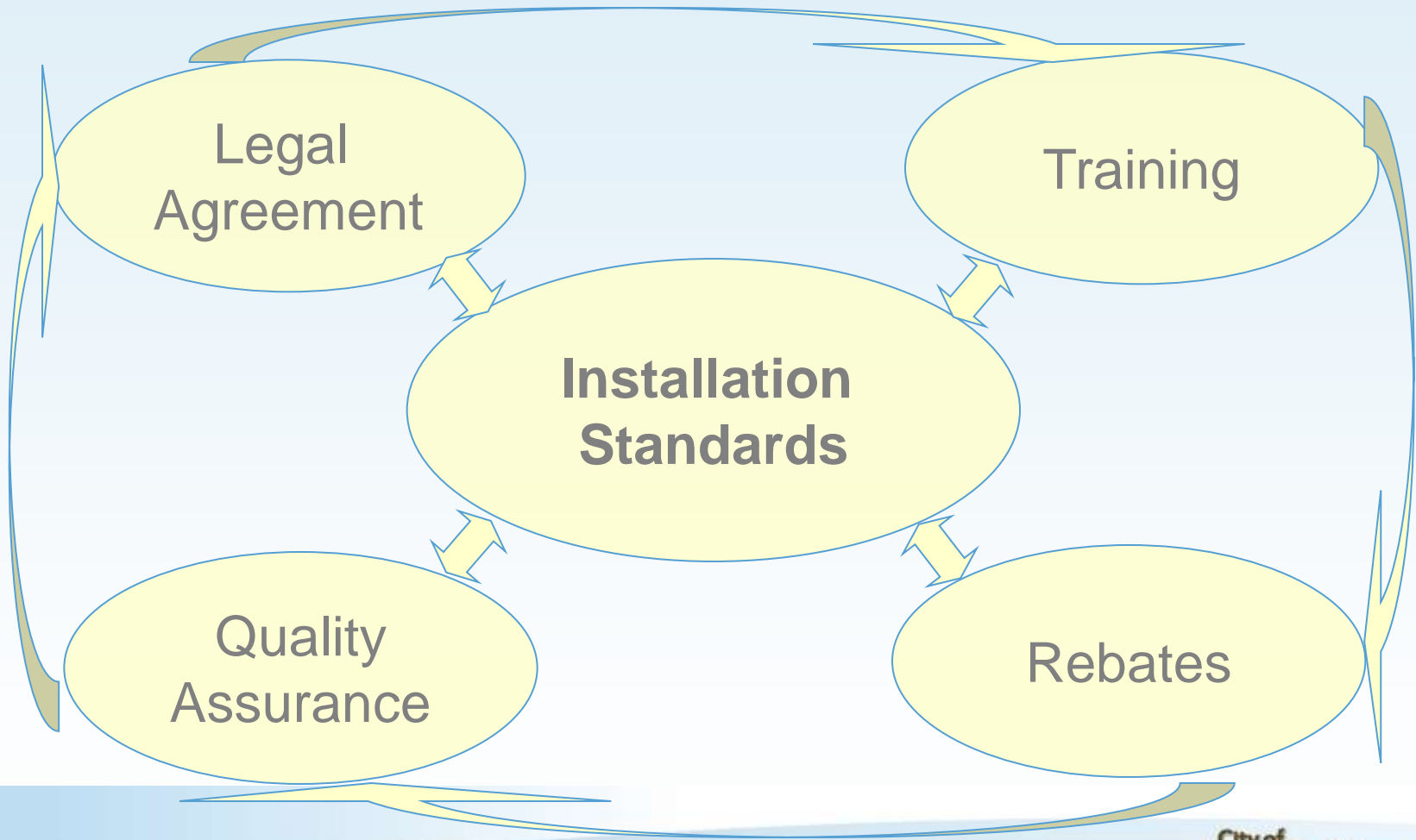


# Agenda

- Home Efficiency Program after four years
- Savings evaluation methodology
- Measured results for project savings
  - Electricity
    - Audits and projects
  - Electricity and natural gas
    - Insulation and air sealing projects
    - High efficiency furnace projects
  - Calculated results for air conditioning
  - Customer satisfaction



# Standards Driven Everything



# Program Principles

- Building science / house-as-a-system/ best practice
- Very comprehensive installation standards
  - Details on existing conditions, materials, testing
- Contractor training
  - Building science and installation standards
- QA / QC
  - HVAC right-sizing/ performance testing
  - Mentoring / inspections

Efficiency Measure	Existing Conditions	Installation Standards	Post-installation Tests
Attic Knee Wall	<ul style="list-style-type: none"> <li>• Uninsulated or insulated to R-11 or less</li> </ul>	<ul style="list-style-type: none"> <li>• If uninsulated, add a minimum R-19 spray foam, foam board or vinyl faced fiberglass blanket:               <ul style="list-style-type: none"> <li>- Seal all edges and seams of insulation</li> </ul> </li> <li>• If already insulated, add a minimum R-11 spray foam, foam board or vinyl faced fiberglass blanket over existing insulation:               <ul style="list-style-type: none"> <li>- Seal all edges and seams of insulation</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Complete Post-Installation Combustion Safety Test procedures and record results on Rebate Application Form.</li> <li>• Blower door test for post improvement house tightness (see air sealing section).</li> </ul>

# Activity Results

- 2108 audits completed thru Sept 2013
- 849 homes improved, 40%
- 1878 measures, 2.2 per home
  - 1134 insulation/air sealing
    - Attics, crawl spaces, ext walls, etc.
  - 682 HVAC
    - Furnaces, AC, water heaters, etc.
  - 62 windows
- Total incentives paid to date, \$499,256
- Average rebate, \$582
- Average project cost, ~ \$6,000



# Savings Methodology

- ICF Strategic Information Management System
  - Weather normalized pre and post billing data
  - Project “population” analysis
    - Average, median, std dev, percent, absolute
- Types
  - Electricity only (audits and projects)
  - Electricity and natural gas
    - Insulation and air sealing projects
    - High efficiency furnace projects

# AC Savings Methodology

- Replacement AC energy and demand savings
  - Annual savings = original AC energy minus new AC use, same for demand
- New AC energy and demand savings
  - Same with federal minimum efficiency baseline
- Accounts for increased efficiency & decreased size
- Assumptions
  - 400 run hours / cooling season (PRPA/Nexant)
  - Baseline SEER 8 for replacement
  - Baseline SEER 13 for new



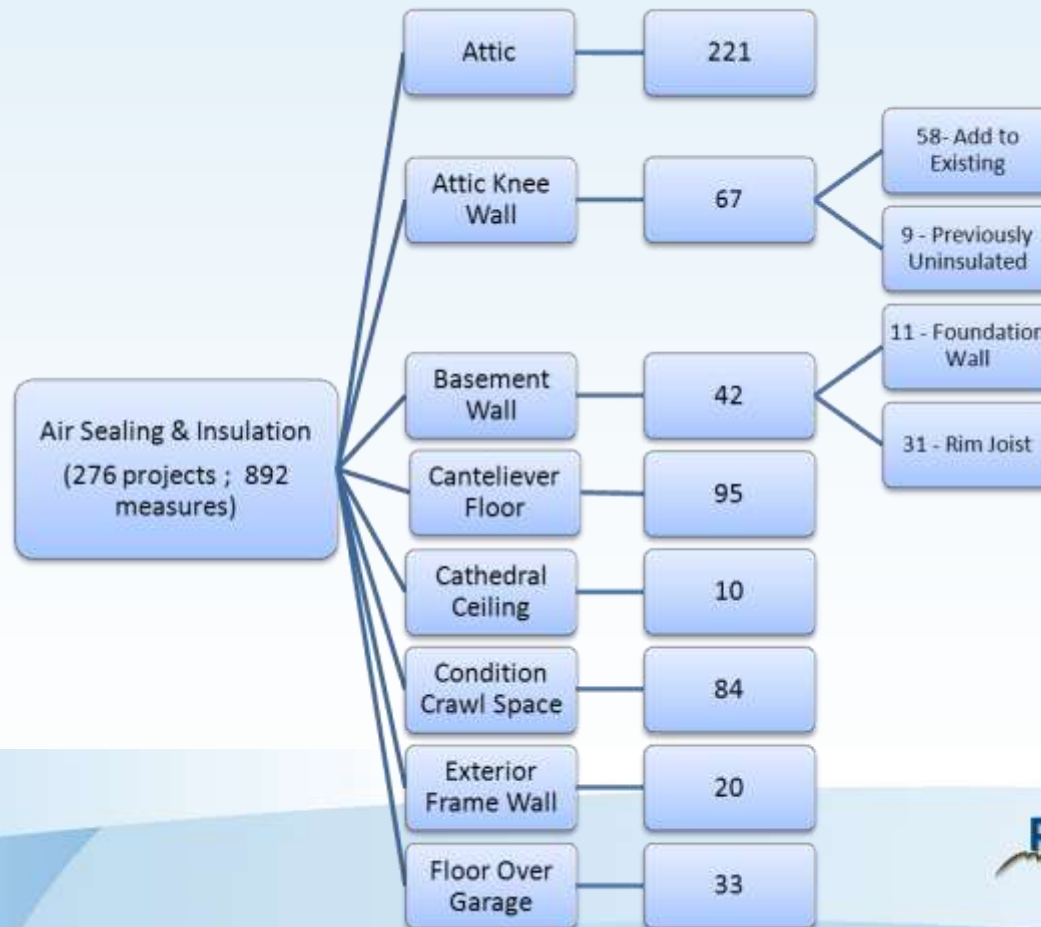
# Gas Data

- All Fort Collins residential customers are also Xcel customers
- Customer provides pre-audit data to Energy Logic
- Post retrofit data requested from customers
  - Up to two years available from web site
- Challenges with format, responsiveness, completeness
- Have pre-post data from ~ 80 projects
- New bulk data process possible from Xcel
  - Unacceptable gas data release form



# Project Type Breakdown (example)

- Challenge of isolating measure specific results
- Inexorable logic of percentages

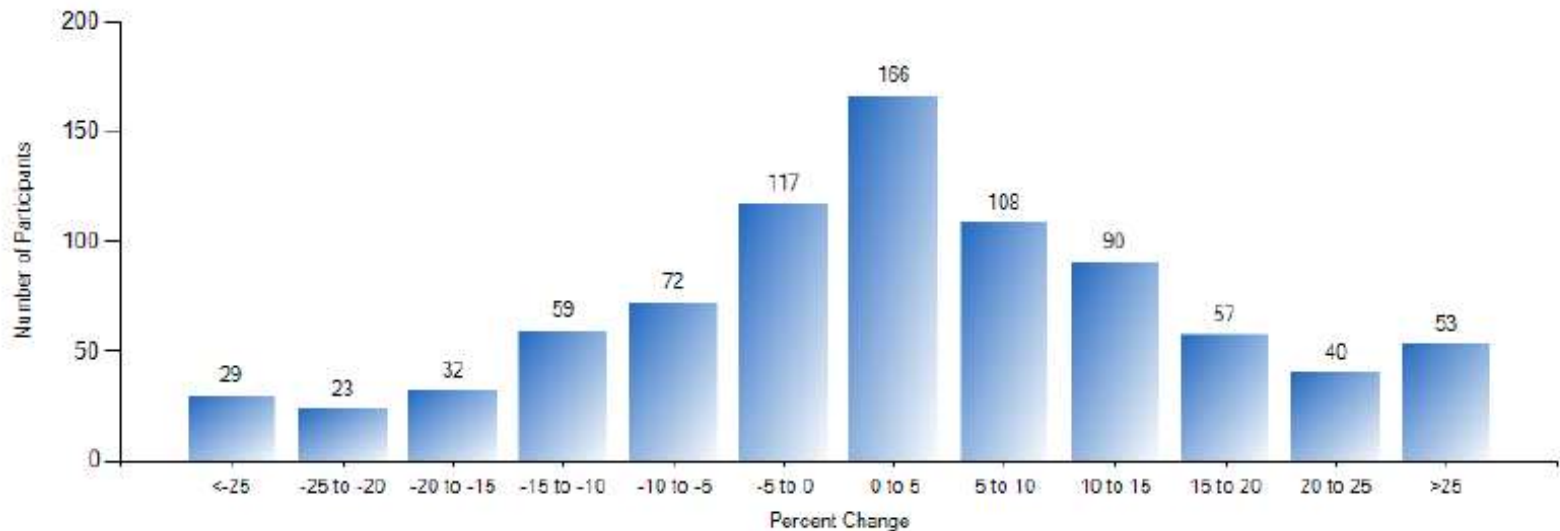


# Results – Electricity (audits)

## Relative Savings Summary

		Annual Savings per Program Participant		Confidence Interval for Average Savings <sup>1</sup>		
Program	Number of Meters	Median (%)	Average (%)	Absolute (+/- %)	Relative (+/- %) <sup>2</sup>	Standard Deviation (%)
HEP - Services	846	2.8	2.5	1.1	43.7	16.1

## Distribution of Relative Savings by Participant

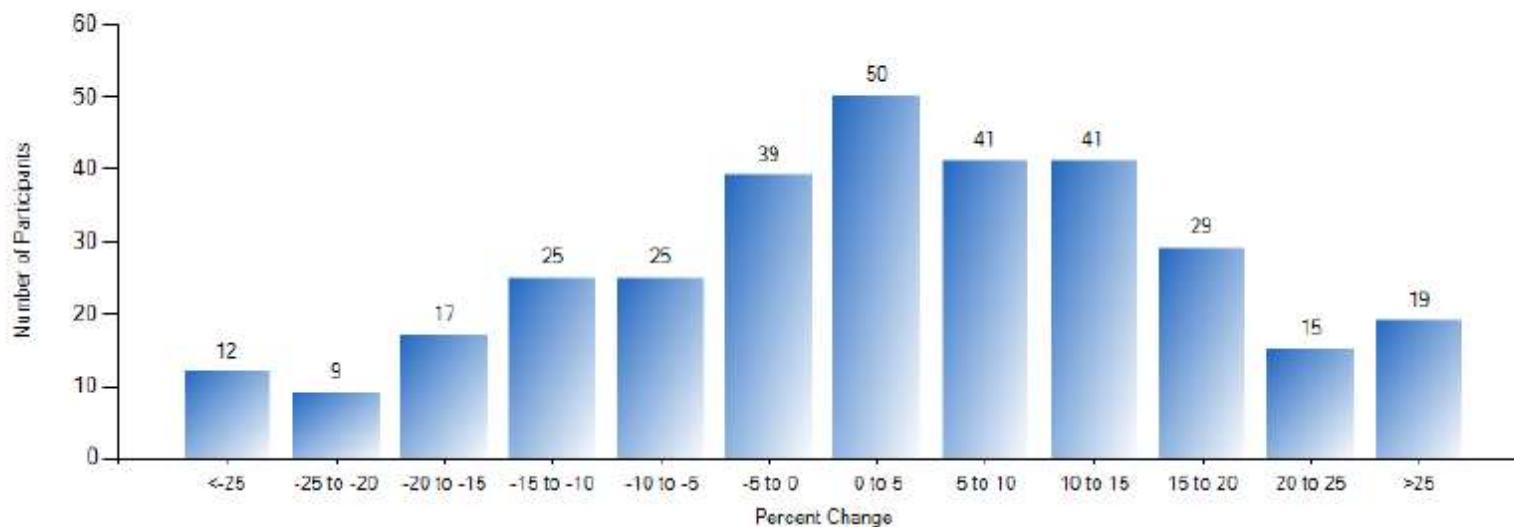


# Results – Electricity (all projects)

## Relative Savings Summary

		Annual Savings per Program Participant		Confidence Interval for Average Savings <sup>1</sup>		
Program	Number of Meters	Median (%)	Average (%)	Absolute (+/- %)	Relative (+/- %) <sup>2</sup>	Standard Deviation (%)
HEP - Incentives	322	2.7	2.4	1.8	73.2	16.3

## Distribution of Relative Savings by Participant

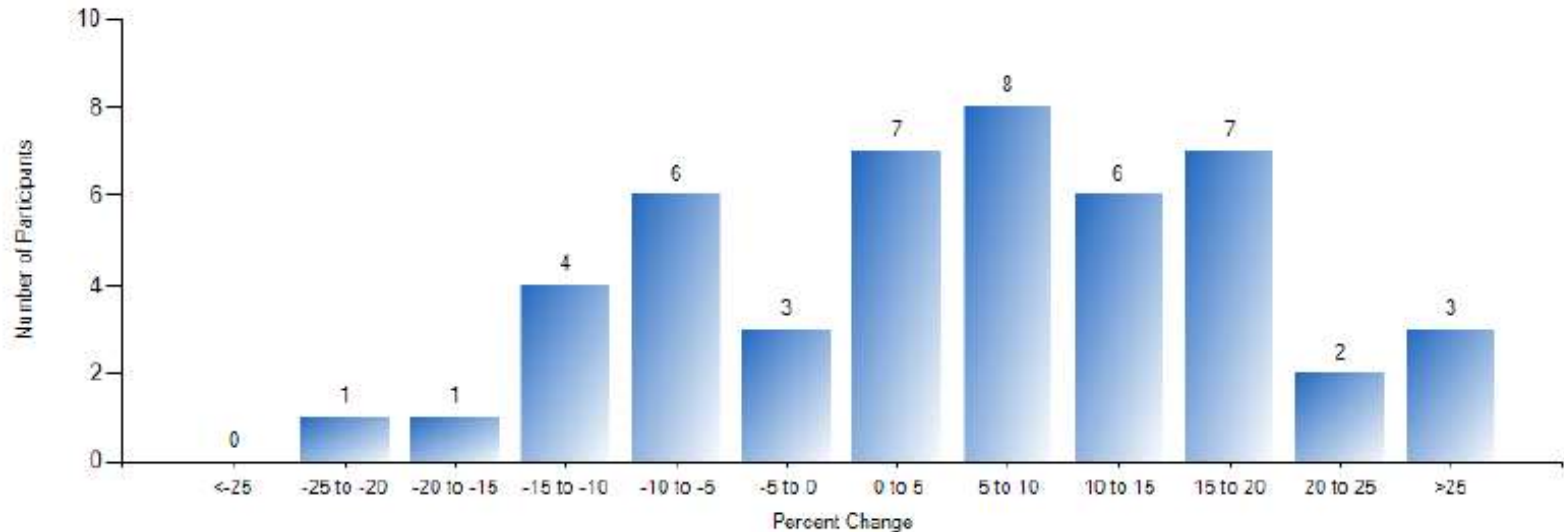


# Results – Electricity (Ins & AS)

## Relative Savings Summary

Program	Number of Meters	Annual Savings per Program Participant		Confidence Interval for Average Savings <sup>1</sup>		Standard Deviation (%)
		Median (%)	Average (%)	Absolute (+/- %)	Relative (+/- %) <sup>2</sup>	
Insulate & Seal - E	48	6.3	5.4	3.9	70.9	13.6

## Distribution of Relative Savings by Participant

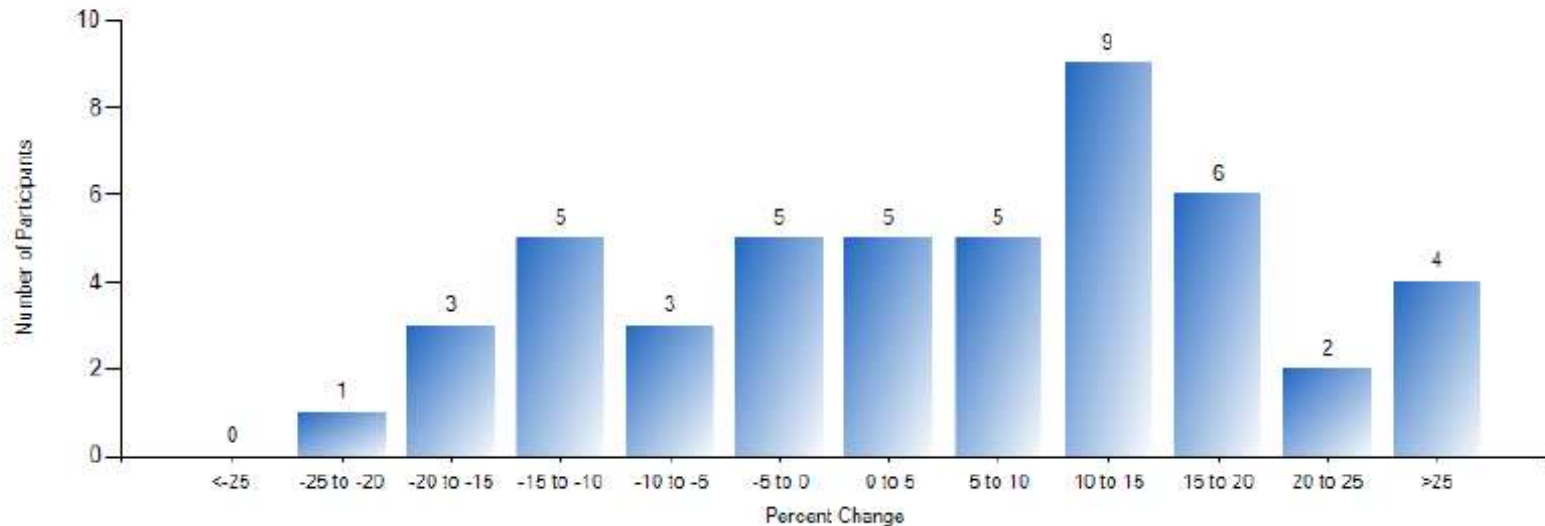


# Results – Electricity (furnaces)

## Relative Savings Summary

		Annual Savings per Program Participant		Confidence Interval for Average Savings <sup>1</sup>		
Program	Number of Meters	Median (%)	Average (%)	Absolute (+/- %)	Relative (+/- %) <sup>2</sup>	Standard Deviation (%)
Furnace_ONLY - E	48	6.5	5.8	4.0	68.7	14.1

## Distribution of Relative Savings by Participant

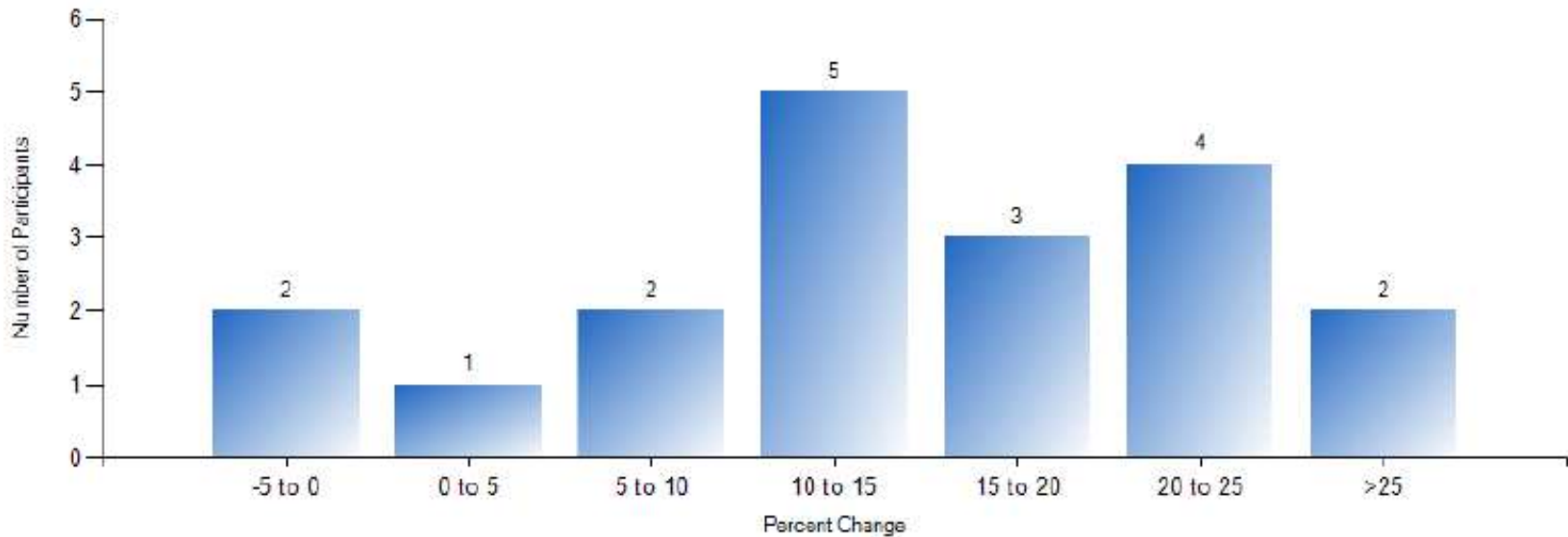


# Results – Gas (Ins & AS or furnace)

Relative Savings Summary

Program	Number of Meters	Annual Savings per Program Participant		Confidence Interval for Average Savings <sup>1</sup>		Standard Deviation (%)
		Median (%)	Average (%)	Absolute (+/- %)	Relative (+/- %) <sup>2</sup>	
HEP_Insulate or Furnace - G	19	14.7	14.6	4.1	27.8	9.1

Distribution of Relative Savings by Participant

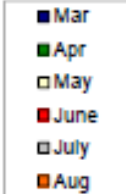
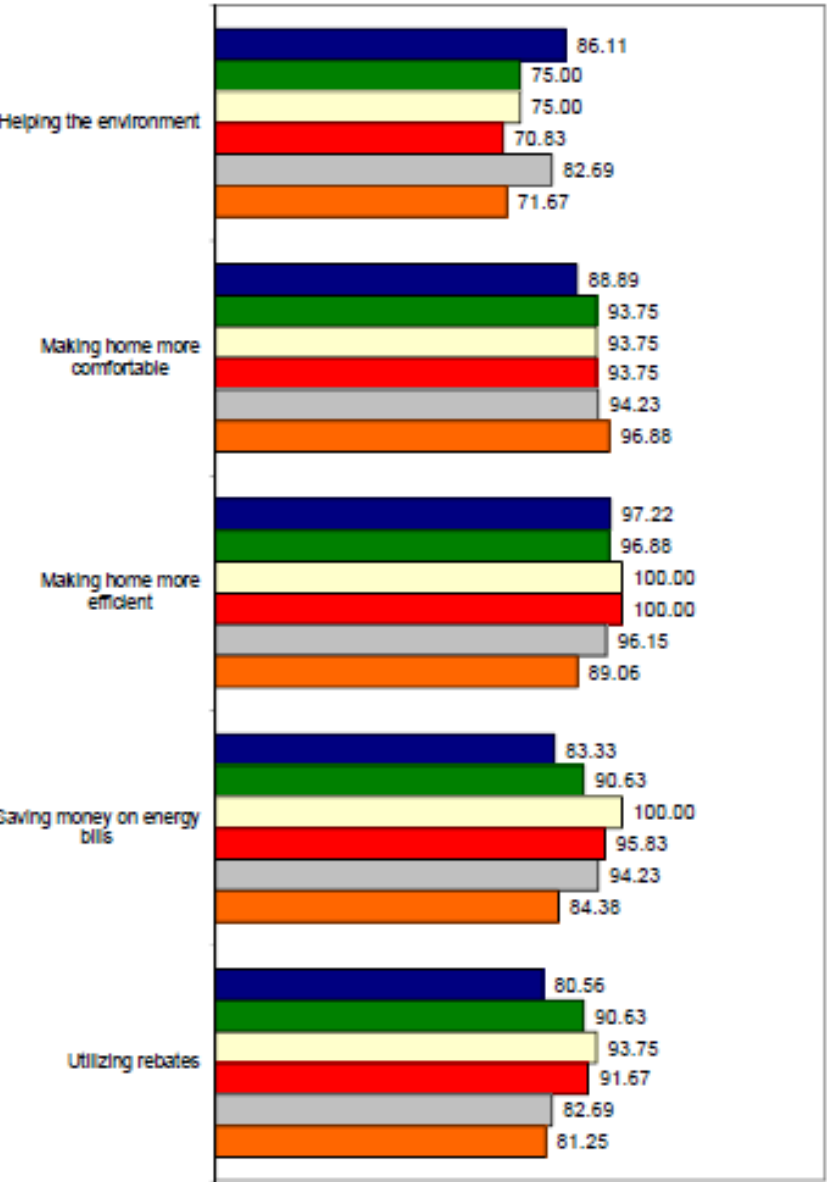


# Results – Electric (AC)

- Early replacement
  - 10% sizing reduction (20% std dev)
  - 50% AC energy savings
  - 53% AC demand savings
- Federal minimum baseline
  - 40% AC energy savings
  - 16% AC demand savings
- Quality installation / commissioning is essential



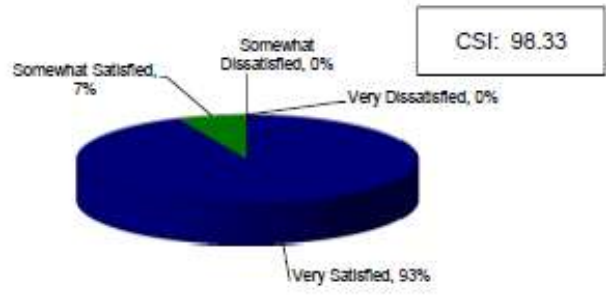
Q5 - How influential each item was in your decision to move forward with your efficiency improvements...?  
6 Month CII Comparison



# Customer Satisfaction Results

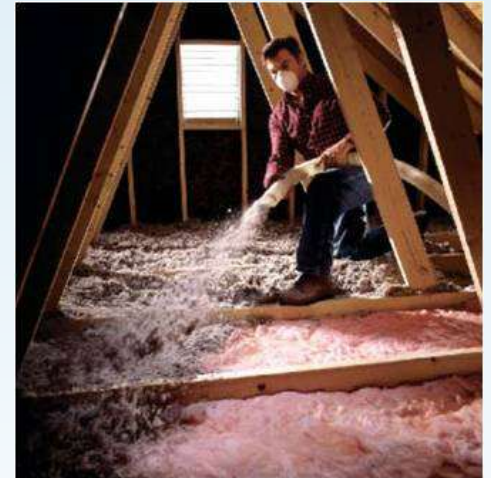
Q4 - ...rate your overall satisfaction with the efficiency improvements and rebates phase...?  
Monthly Findings and 6 Month CSI Tracking Month: August

Monthly Findings:



# What we've learned

- Total bill savings
  - Electric 5-6%
  - Gas 10-16%
- Program cost effectiveness
  - Electric CCE 6.4 cents per kWh
  - Gas CCE 44 cents per therm
- Gas data challenges (for us)
- Long time horizons to measure bill savings results
- Customers are very satisfied



# What we've learned

- Details matter
  - Standards
  - Training
  - Mentoring
  - QA/QC
- You get what you inspect, not what you expect



# Discussion

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