2005 LIEE Impact Evaluation Final Report

Presentation to the Low Income Oversight Board

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with

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Outline

- PY 05 Impact Evaluation Goals & Objectives
- Components of the Research Plan
- Changes from Previous Evaluations
- Results
- Conclusions and Recommendations

Program Goals and Data Collection

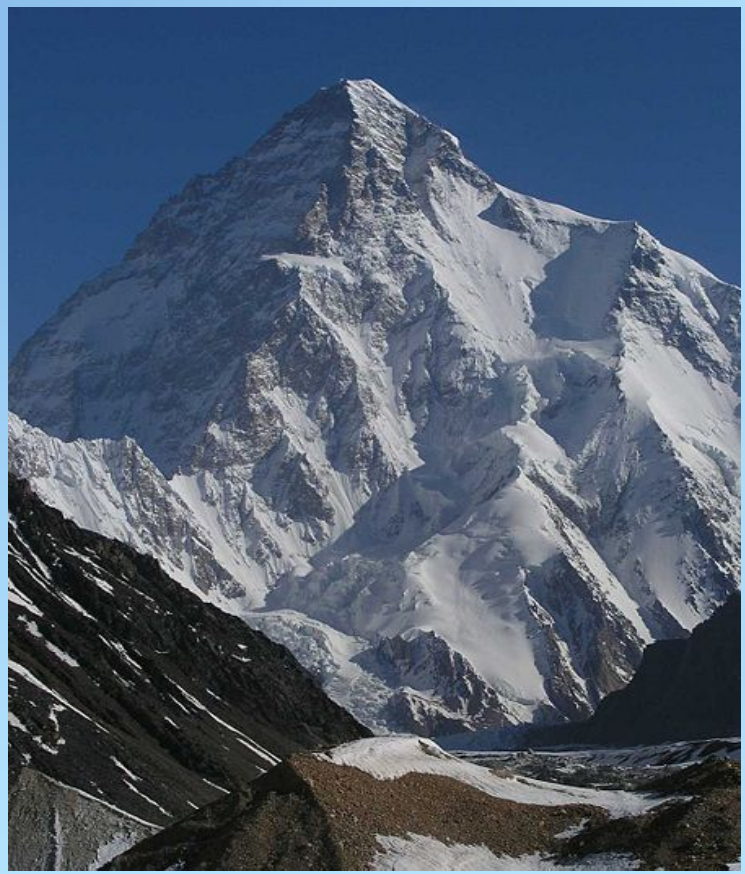
- Program goal:

  installation of all feasible measures in the homes of low income customers

- On site data collection:

  generally restricted to the presence or absence of particular measures and the quantity installed at the time of the audit

Goals & Objectives



Photograph of K2 in summer from Wikipedia Commons

Evaluation Results

- Load impact evaluation
  - First year energy savings
  - By house type, by measure
  - Coincident peak demand savings

PY05 Evaluation Objectives

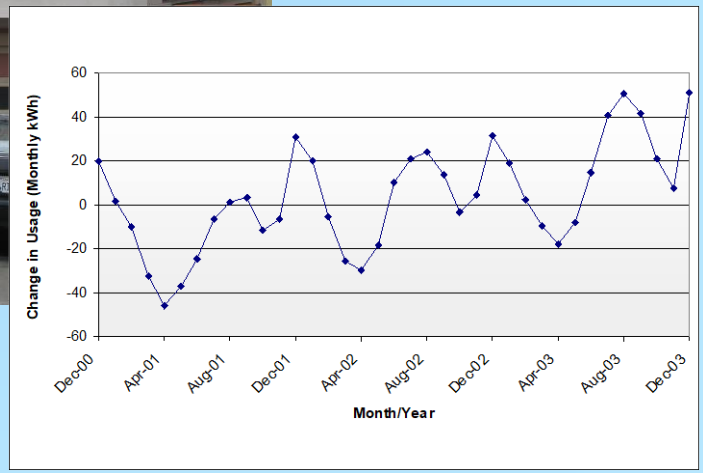
- Measure-specific focus
  - lighting, cooling and DHW low flow
- Energy education
  - qualitative assessment
- Estimate energy savings
  - Household and end use level
- Missed opportunities
  - Preliminary assessment

Challenges

- Household savings are small in comparison to usage
- Many measures, multiple housing types
- Billing data unavailable for mobile homes
- Some measures may improve efficiency, but also increase use
- Mild heating and cooling climates

PY05 Research Plan

Three Phase Approach



Phases

- Phase I
  - Ride alongs
  - Improving program data collection
  - Showerhead survey
- Phase II
  - On-site Survey
- Phase III
  - Billing analysis
  - Integration of results

Improved Data Collection

- Added critical fields to program data collection forms
  - Fuel used for space and water heating
  - Presence of working air conditioning
  - Was furnace working prior to repair or replacement?
- Implemented during the first quarter of 2005

Showerhead Survey

- Collected showerheads and aerators removed from participants' homes
  - Sent to a testing facility
  - Flow rates measures at 4 pressures
- Two-stage cluster sample
  - Selected delivery contractor
  - Set number of showerheads to be collected
- Total of 268 showerheads and 187 aerators tested

On Site Survey

- Post-installation, on site surveys
  - 399 homes visited
  - Stratified, 2-stage cluster sample
  - Checked short-term measure persistence, reviewed energy education, assessed missed opportunities, measured showerhead pressures and flow rates

Billing Analysis

- Gas and Electric
- Data from program tracking, billing records and utility weather stations
- Included all participants who passed screening criteria
  - Sufficient and usable billing history available
  - New program-level data available

Changes from Previous Evaluations

- Improved measure-level estimates
  - On-site survey provides context
- Smaller measures were combined
- Coincident peak savings were estimated

Insights from the On-Site Survey

- Provides support for measure-level savings
  - Heating savings
    - ~ half of participants have very low heating use
  - Evaporative coolers
    - At least 35% of participants do not use their evaporative coolers correctly
  - Lighting
    - Hours of use are low, retention rate is low

Combining Measures

Caulking
Weatherstripping
Outlet gaskets
Minor home repairs
Window replacement/repair
Door replacement/repair
Window glazing

→ **Air Sealing**

Low flow showerheads
Low flow aerators
Tank wraps
Pipe Insulation

→ **Hot Water Conservation**

Results: Bringing It All Together

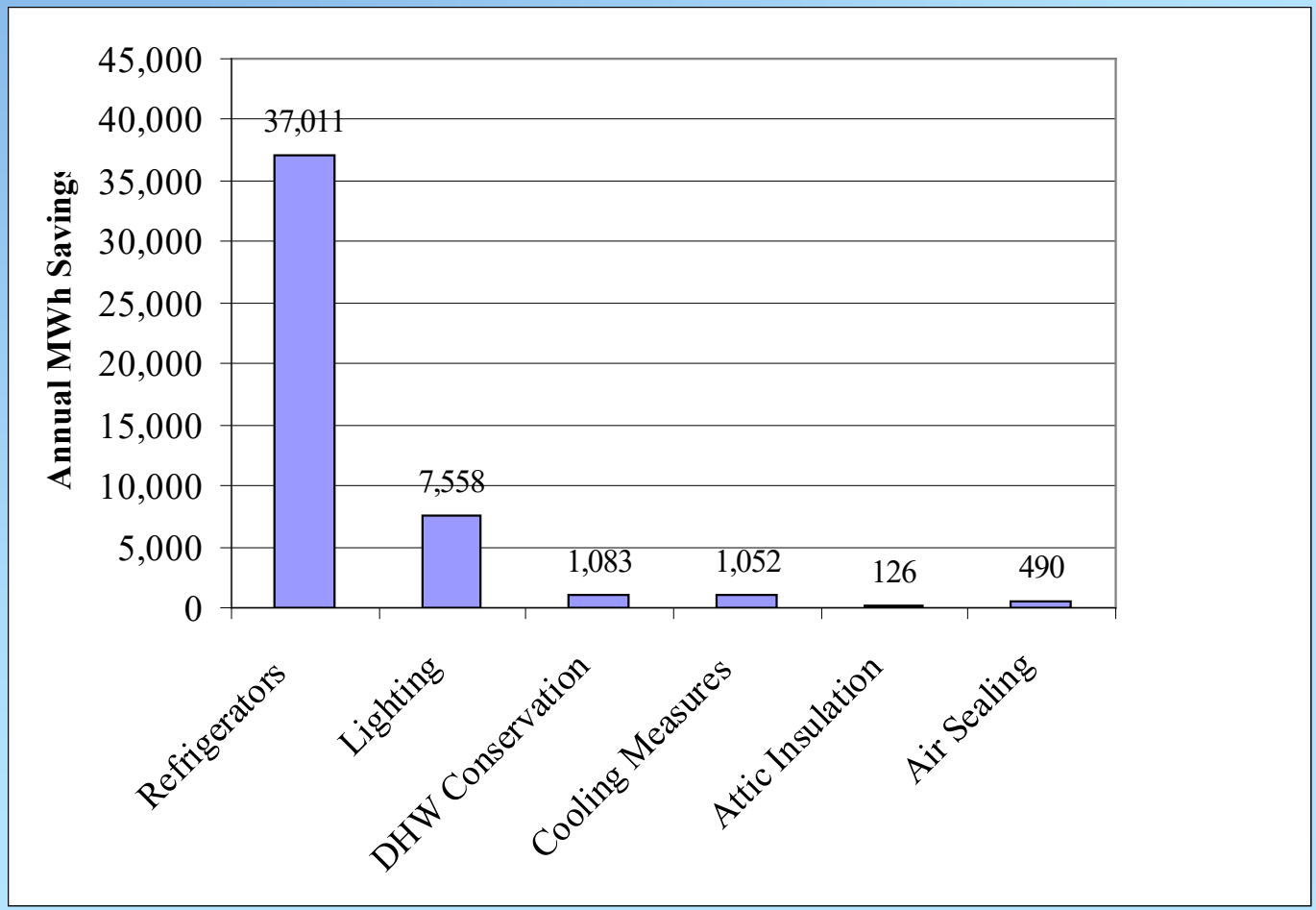
Who are the LIEE participants?

- Low users
  - Use less electricity and gas than the average residential customer
- Fewer opportunities (electric)
  - Lower penetration of electric space and water heating and cooling equipment
- Many practice energy conservation prior to program participation

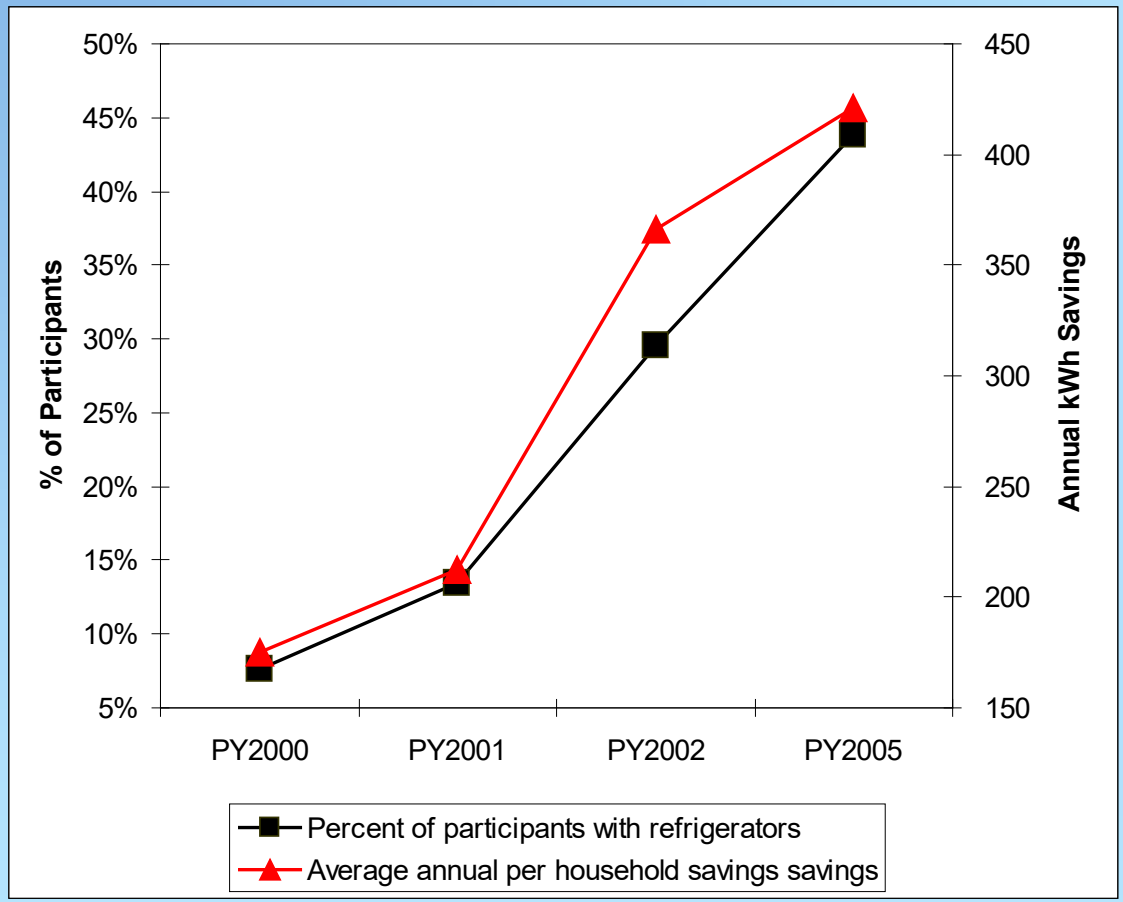
Total Program Savings

	# of Participants	Annual MWh	Coincident Peak (KW)	Annual Therms
PG&E	61,519	24,678	4,588	1,029,125
SCE	41,397	18,001	2,920	
SDG&E	13,737	4,640	800	154,498
SoCalGas	41,535			711,768
Totals	158,188	47,319	8,309	1,895,391

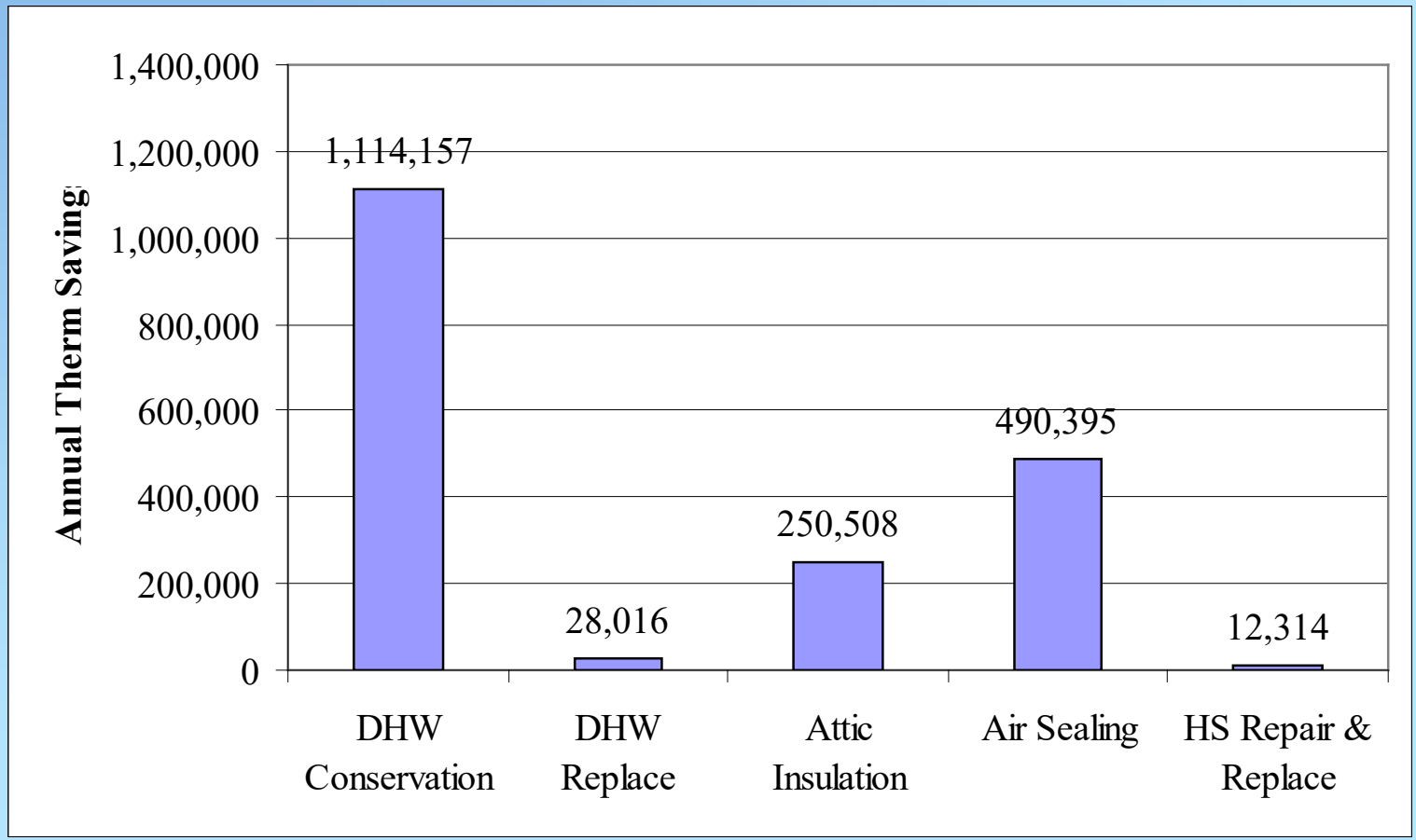
Energy Savings by End Use (Electric)



Electric Savings & Refrigerator Penetration



Program Savings by End Use (Gas)



How do these Estimates Compare?

PG&E	Unit Electric Savings (kWh)		Unit Gas Savings (Therms)	
	PY2005	PY2001	PY2005	PY2001
Refrigerators	757	736		
Lighting (CFL's)	16	20		
DHW Conservation	277	228	12.7	18.8
Evaporative Cooler Install	247	254		
Attic Insulation/Cooling	101	281	60.4	40.5
Attic Insulation/Heating	254	205		
Furnace Repair/Replace			***3.4***	***43.2***

Considerations for Future Evaluations

- How often are impact evaluations needed?
- What are issues influencing cost-effectiveness?
  - Should LIEE services be targeted to specific groups?
- How will changes in measure specification affect program savings?

Frequency of Impact Evaluations

- Currently scheduled every two years
  - PY2004 postponed to PY2005 to improve program data collection
- Household savings reasonably stable
- May not need to maintain two-year cycle, unless there are substantial changes to the program

Program Cost-Effectiveness

- Opportunities for savings are lower
  - LIEE participants use less and conserve.
- Refrigerators are a huge contributor to electric savings.
  - Changing standards affect per home savings.
- Higher use = higher savings
- More extreme climates = higher savings for heating and cooling measures
- Energy savings are not the only benefit from this program.

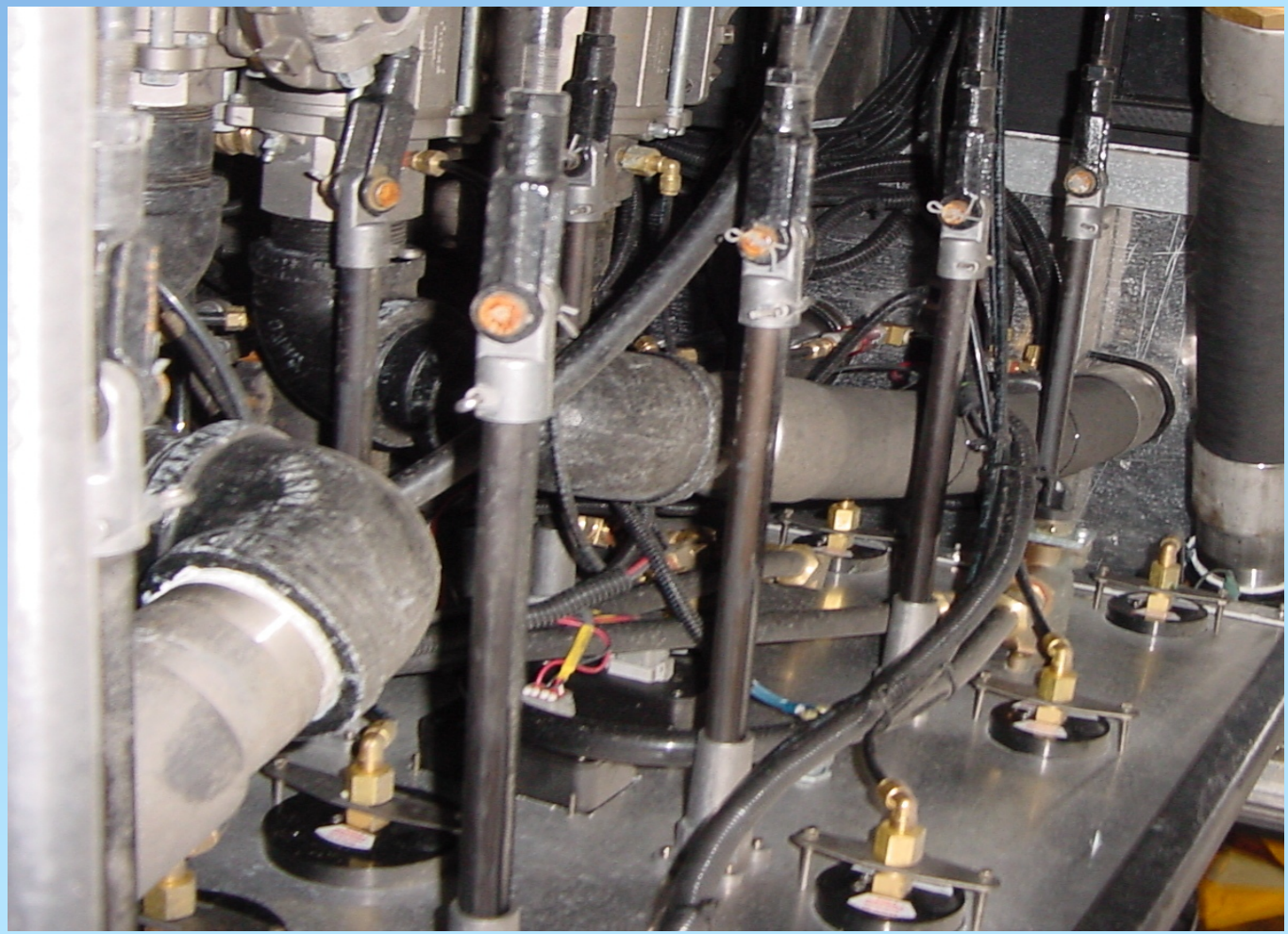
Non-Energy Benefits

- Health and Safety
  - Heating systems are not working in 45% of homes with heating system repair or replacements
- Comfort
  - Very low users show an increase in use after program participation
    - Suggests that “savings” are being taken in the form of improved comfort
- Improved ability to pay bills

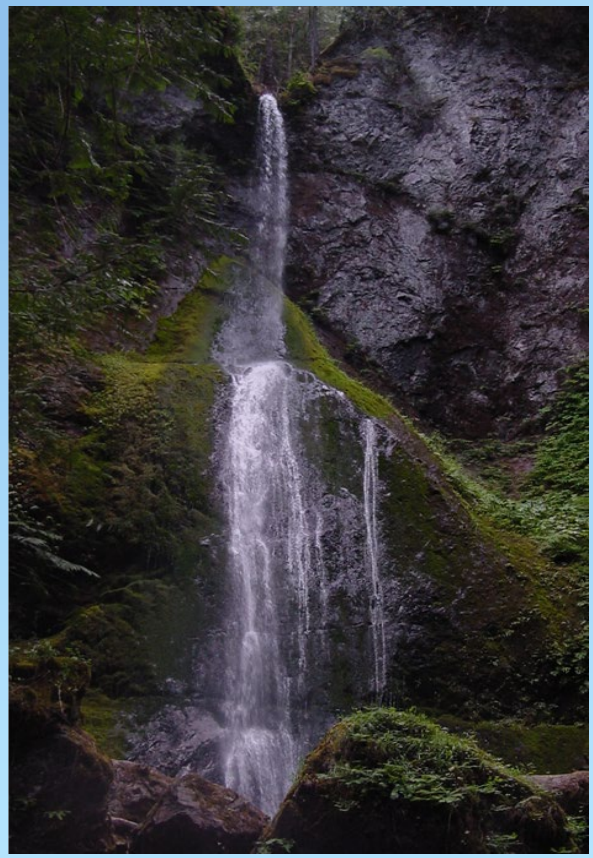
Concluding Thoughts

- Impact goals should be consistent with the objectives of the program.
  - Non-energy benefits may be worth exploring.
- Exercise caution in considering whether to eliminate a measure or change measure specifications.
  - Measure may have important non-energy benefits.
  - Changing eligibility requirements is likely to affect *both* the ***number of homes*** with the measure and the ***savings per home***.

Questions?



Appendices



How reliable are these estimates?

Internal Validation

- Compare models
- Compare billing analysis to alternative estimates

External Validation

- Compare to previous LIEE evaluations
- Compare to external studies

Reliable Savings Estimates

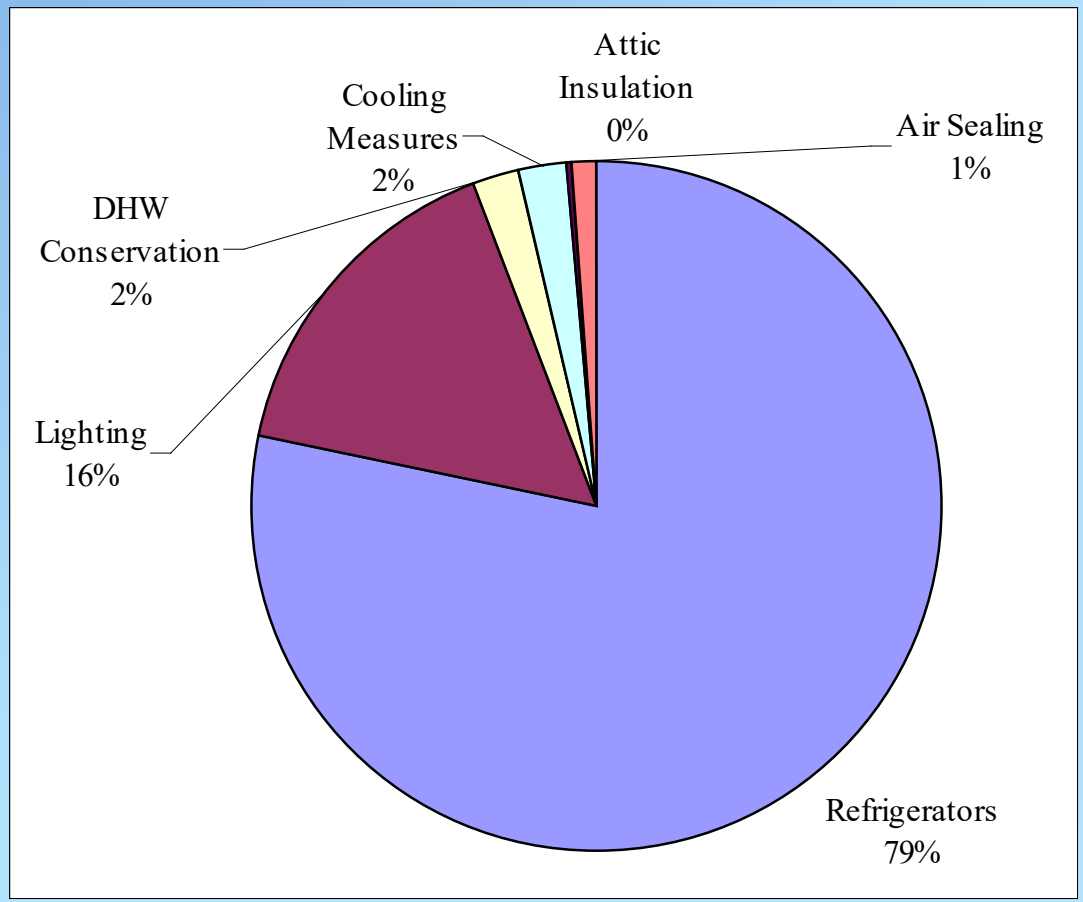
Comparison of Household Savings

		Average Savings per Home			
	Average Energy Use PY05	PY05	PY02	PY01	PY00
Avg. Energy Use and Savings Trends (kWh)	5,431	423	366	213	175
Avg. Gas Use and Savings Trends (Therms)	421	18	8	18	24

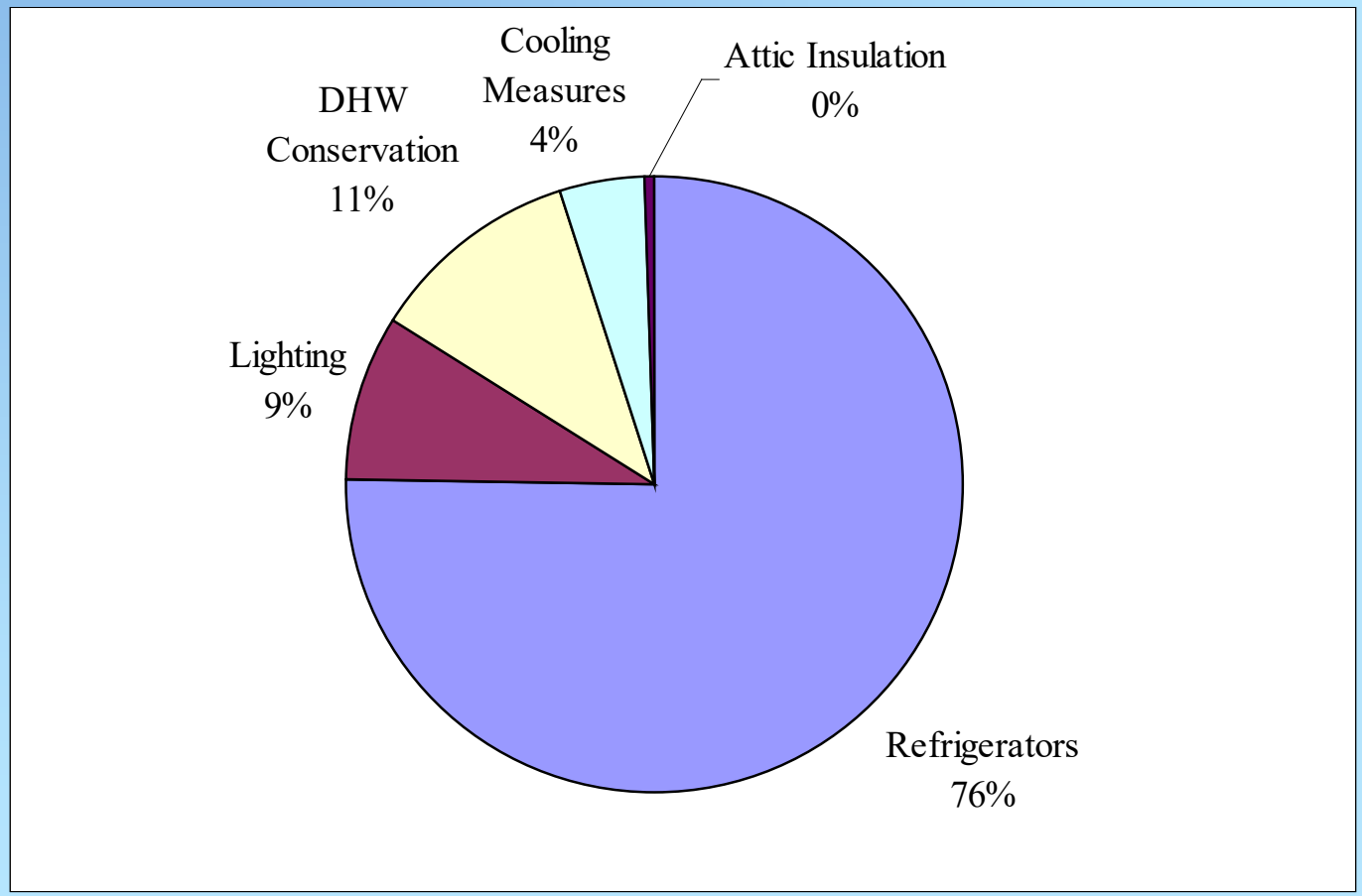
Electric Savings by Measure Group

	# of Households	Savings per home (kWh)	Program Savings (MWh)
Refrigerators	49,042	755	37,011
Lighting	95,391	79	7,558
DHW Conservation	3,959	274	1,083
Cooling Measures	5,330	197	1,052
Attic Insulation			
Heating	175	253	44
Cooling	812	100	81
Air Sealing/Envelope	7,484	65	490

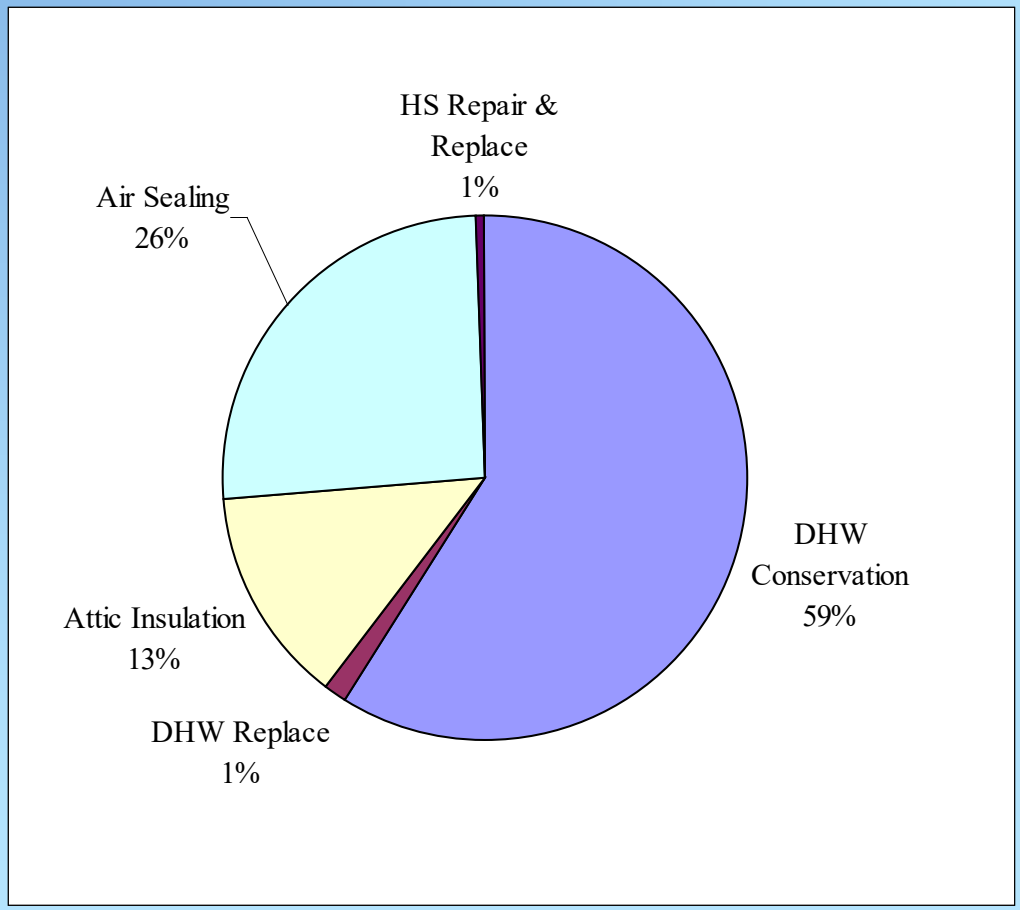
Energy Savings by End Use (Electric)



Coincident Peak Savings by End Use



Gas Savings by Measure Group

	# of Households	Savings per home (Therms)	Program Savings (Therms)
DHW			
Conservation	91,120	12.2	1,114,157
Repair/Replace	2,325	12.1	28,016
Heating Measures			
Attic Insulation	4,981	50.3	250,508
Air Sealing/Envelope	83,896	5.8	490,395
Repair/Replace	4,911	2.5	12,314

Program Savings by End Use (Gas)