



Environmental Energy Technologies Division Lawrence Berkeley National Laboratory

The Program Administrator Cost of Saved Energy for Utility Customer-Funded Energy Efficiency Programs

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**REPORT SUMMARY
Lawrence Berkeley National Laboratory
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Presentation Outline

- Project Scope and Objectives
- Approach
 - Data collection and quality control
 - Program typology and definitions
 - LBNL DSM Program Impacts Database
- Results
- Findings and Recommendations
- Next steps



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Approach and Objectives

Scope and Objectives

The program administrator cost of saved energy (CSE) has not been comprehensively documented or analyzed at the program level

Approach

- Collect & analyze EE annual program data reported by program administrators

Objectives

- Encourage more consistent reporting of EE program impacts and costs by EE program administrators using common reporting guidelines
- Enable more cost-effective EE portfolios: benchmark program implementation approaches across different markets, delivery mechanisms and design approaches

Information in this report may be used by regulators, policymakers, resource planners and program administrators in the following ways:

- Program administrators: benchmark and compare alternative types and design of efficiency programs (e.g., depth of savings per program \$\$ invested; screen)
- DSM Resource Planners and other stakeholders: Project impacts of efficiency programs on future load forecasts
- State regulators (and other stakeholders): Compare efficiency program options with other demand and supply-side resources at screening level



We cast a very wide net for our initial data collection efforts

- Attempted to collect data from program administrators in the 45 states currently running utility customer-funded EE programs
- States report a wide variety of program impact and cost data as part of their annual reporting procedures

Geographic and Program Coverage

- Includes data from over 100 program administrators in 31 states
- Electric, natural gas, and electric/gas programs
- Over 1,700 individual programs for up to 3 years (2009-2011)
- More than 4,000 data points (program years) in the dataset with multiple years for same programs

Types of Data Collected

- Net & gross savings
- Annual incremental & lifetime savings
- Budget & expenditures
 - Administrative costs
 - Incentive costs
 - Education, marketing & outreach
 - Evaluation
- Participant costs
- Measure lifetimes for programs
- Number of program participants

Key Terms and Definitions

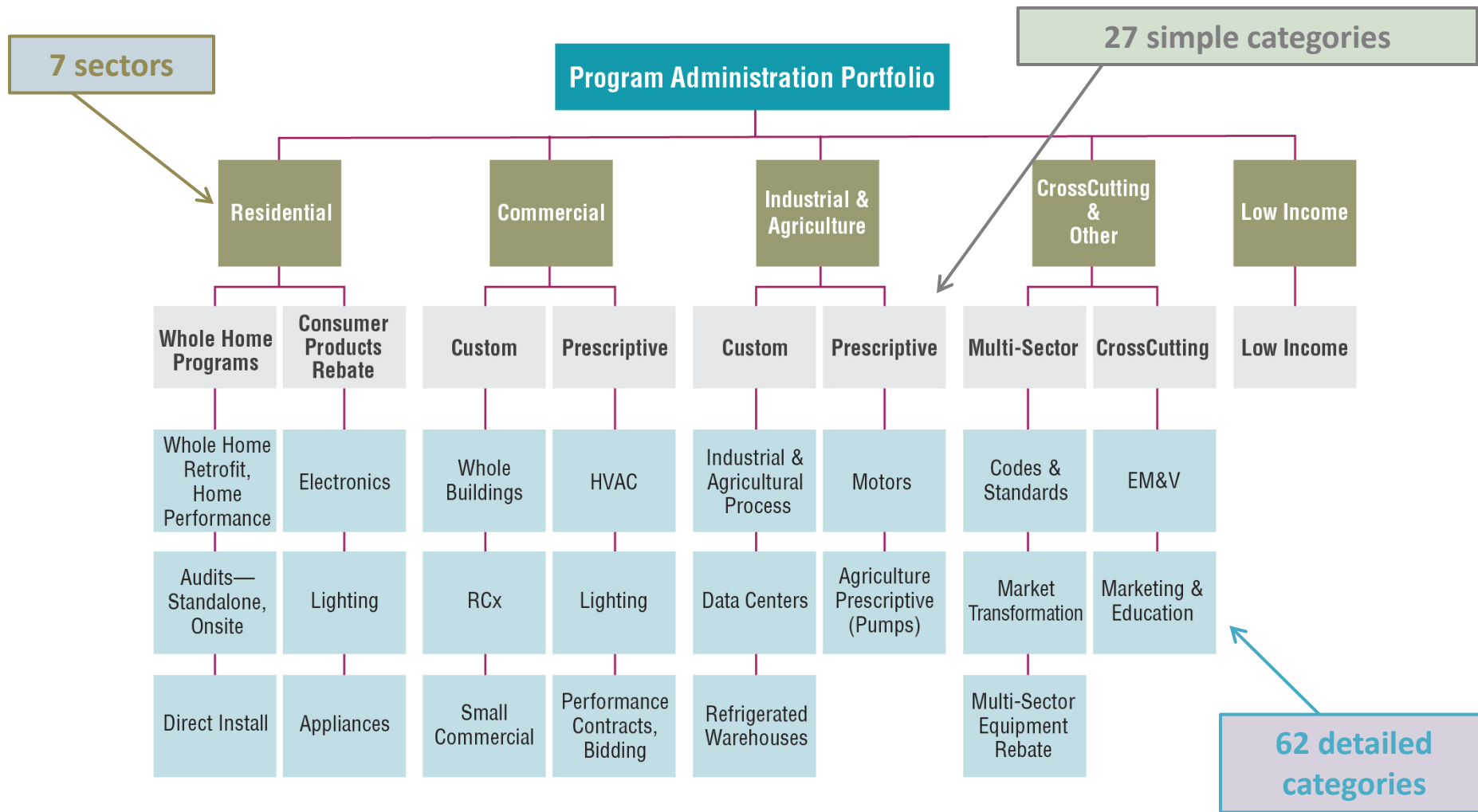
This report focuses on **gross energy savings** and the **program administrator costs**

- We collected data on net savings and participant costs where reported, although there was insufficient data & too much uncertainty for a national analysis at this time

Program Administrator Costs	Program administration costs (e.g. staff, program design costs); directing, managing and paying implementation contractors; marketing, education and outreach (ME&O); evaluation activities; incentives (e.g., rebates) paid to program participants (or end users) and to contractors.
Program Average Measure Lifetime	Weighted average economic lifetime (in years) of all measures installed in a program year, in a specified program.
Claimed Annual (First Year) Gross Savings	Gross annual incremental savings are the reported change in energy consumption resulting from program-related actions taken by program participants regardless of why they participated.
Lifetime Gross Savings	The expected gross savings over the lifetime of the measures installed under the subject program.

- We adopted the definitions for program impacts (e.g., savings) from the State Energy Efficiency Action Network (SEEAAction) *“Energy Efficiency Program Impact Evaluation Guide”*
 - Definitions also being used by the Consortium for Energy Efficiency (CEE) and the Northeast Energy Efficiency Partnerships (NEEP)
- Developed **program typology** in order to characterize and analyze similar types of efficiency programs
 - Defined by market sector and technology, design or delivery approach
 - Efficiency program categories span 7 sectors (e.g., residential, commercial, industrial/agriculture, low-income, cross-cutting) and include many types of program designs and delivery mechanisms
 - CEE is also using the program typology in their Annual Industry Survey

LBNL Efficiency Program Typology



See LBNL Policy Brief: Energy Efficiency Program Typology and Data Metrics: Enabling Multi-State Analyses Through the Use of Common Terminology – at <http://emp.lbl.gov>

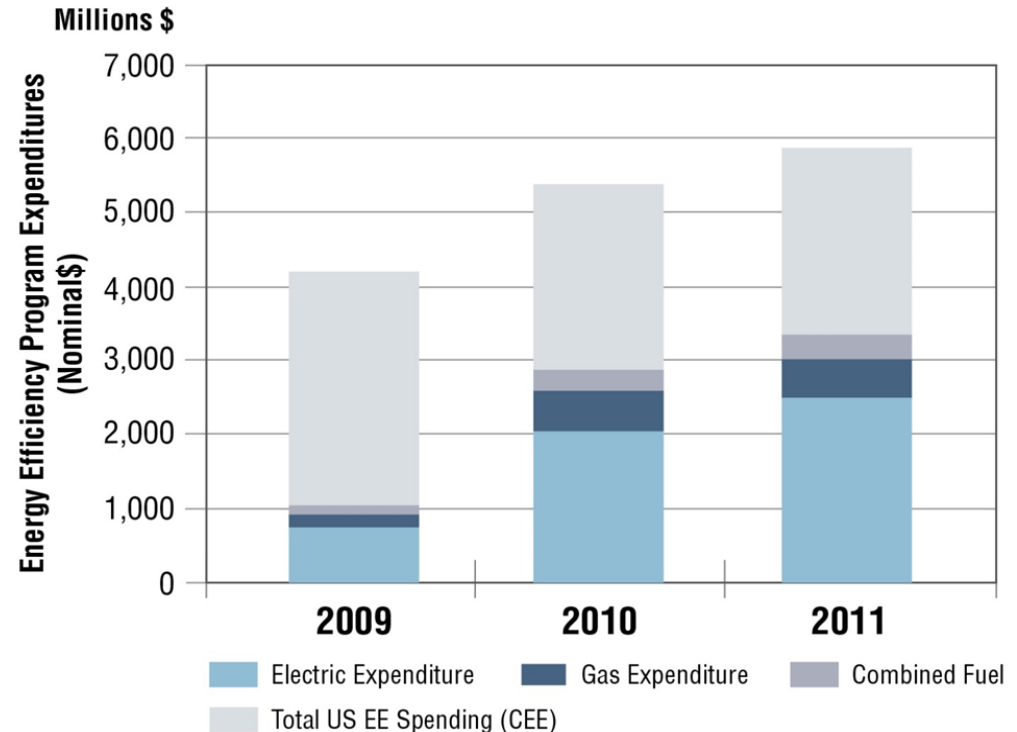
Program Type Categorization Level

■ Portfolio	■ Sector
■ Simplified	■ Detailed

What's in the Program Database?

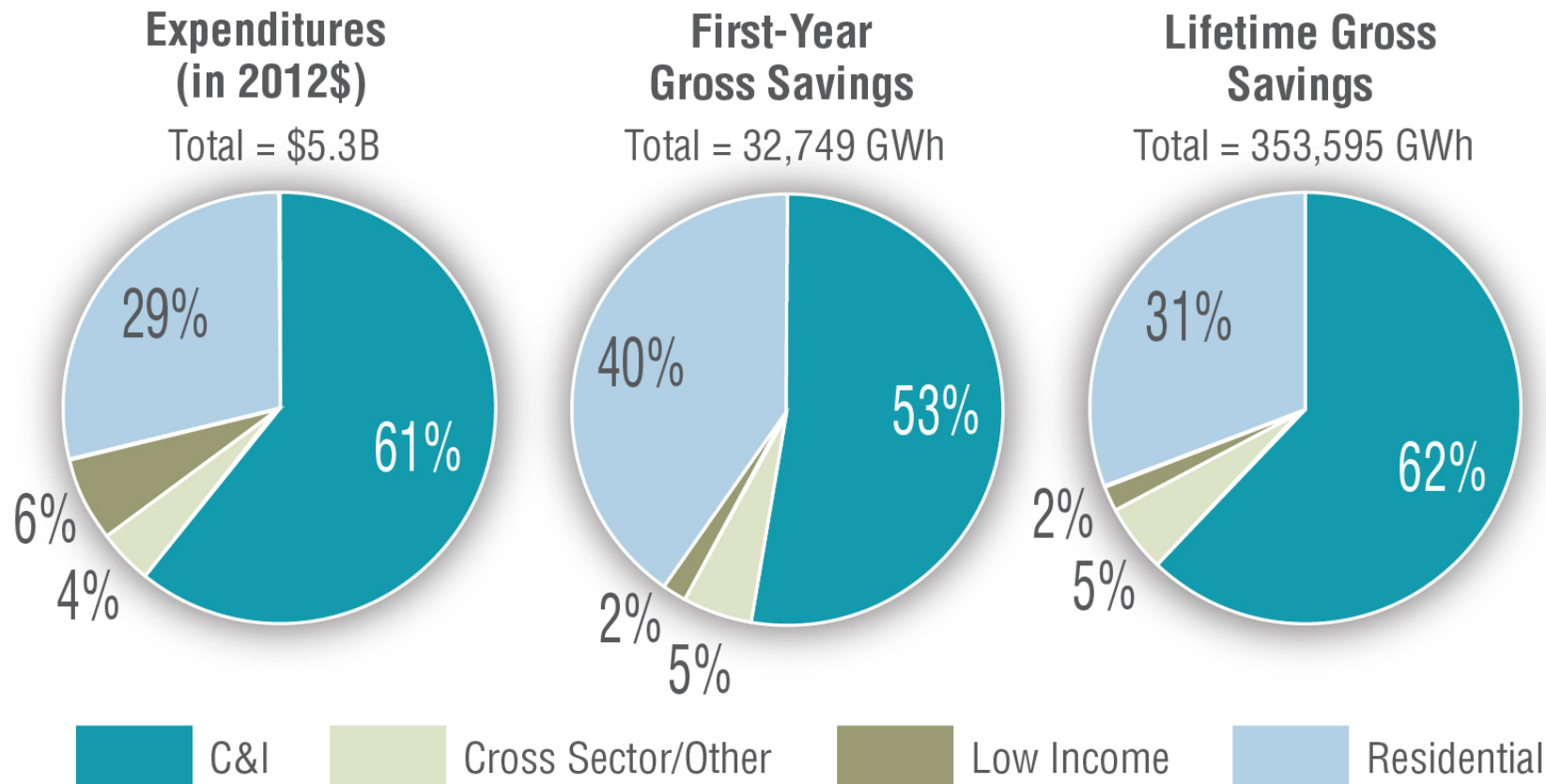
- Slides 10-14 provide high-level summary of programs included in the LBNL DSM Program Impacts Database, which are analyzed in the report
- Expenditures are reported in 2012\$
- First year and lifetime savings are gross savings

LBNL Dataset Compared to National Spending (CEE)

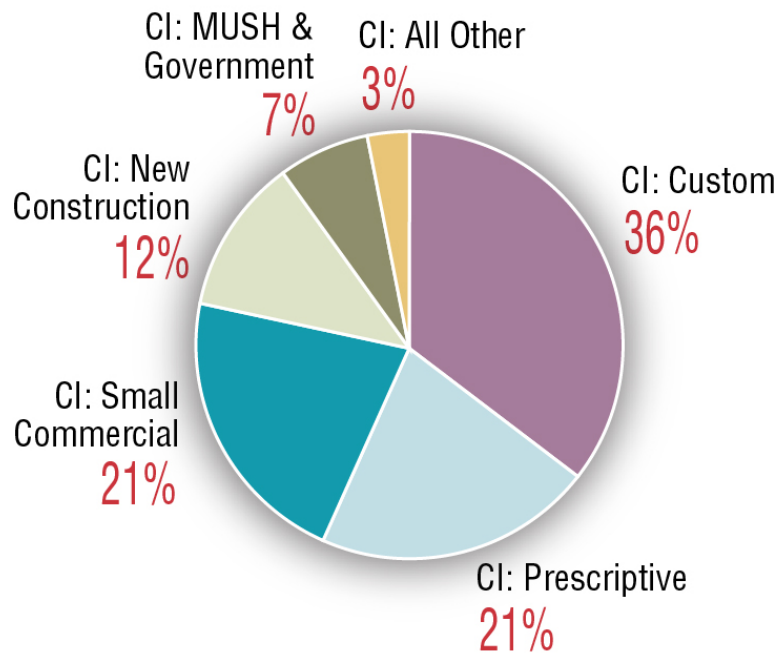


* Numbers cited in this figure are from the LBNL Program Impacts Database

Program Administrator Expenditures and Savings

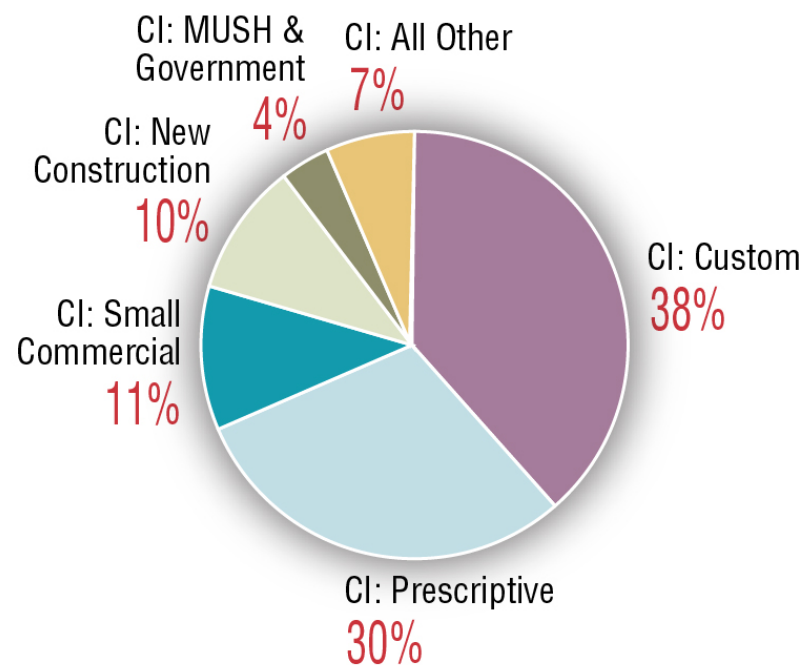


Program Administrator Expenditures and Savings



Expenditures

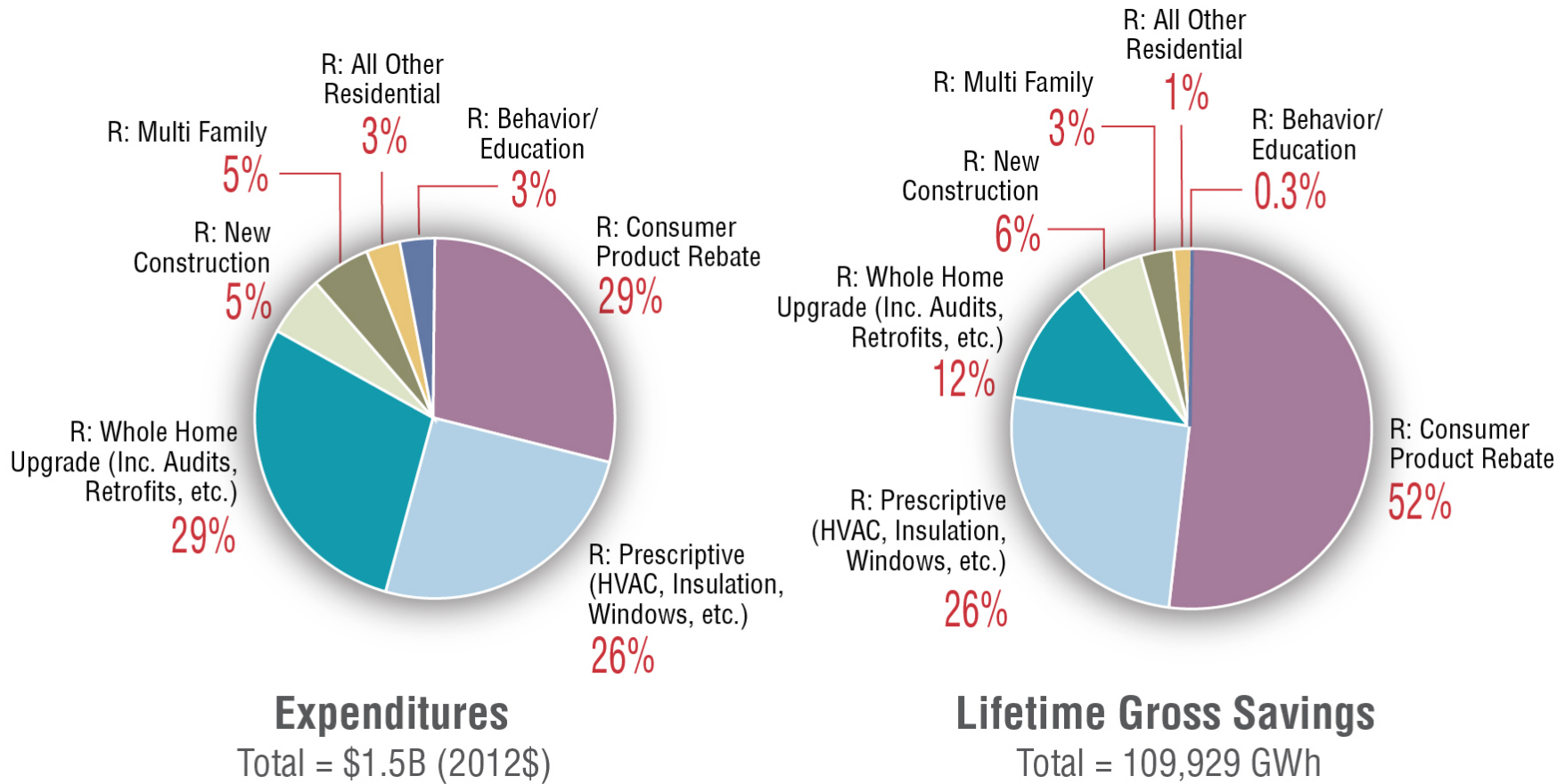
Total = \$3.214 B (2012\$)



Lifetime Gross Savings

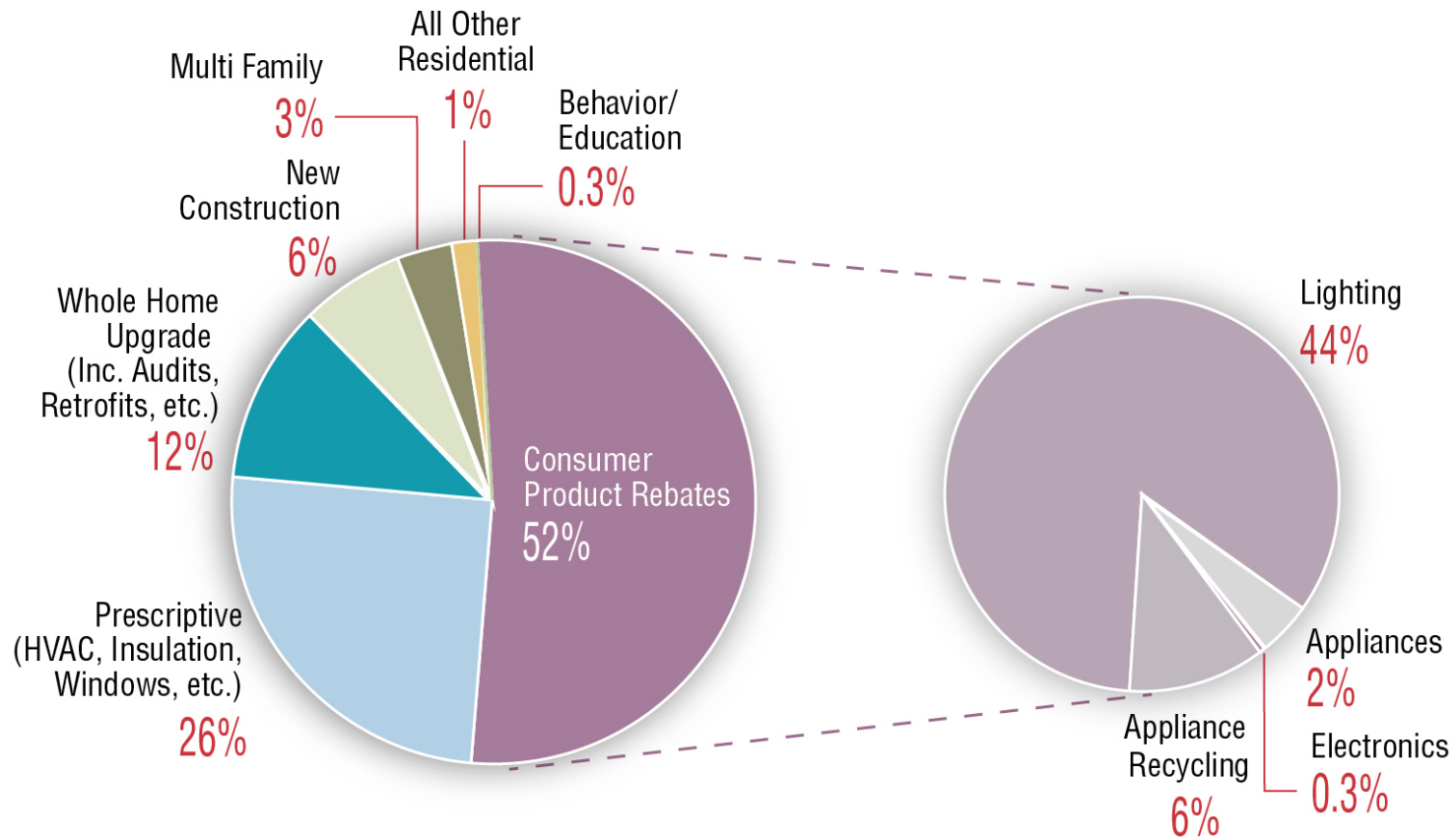
Total = 219,476 GWh

Program Administrator Expenditures and Savings



* Numbers cited in this figure are from the LBNL Program Impacts Database

Detailed Program Typology Example



Consumer Product Rebates (Lifetime Gross Savings)

* Numbers cited in this figure are from the LBNL Program Impacts Database



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Results: Cost of Saved Energy

Defining the Cost of Saved Energy

Cost of First-Year Energy Savings (First-Year CSE)	The cost of acquiring a single year of annualized incremental energy savings through actions taken through a program, sector or portfolio.
Cost of Lifetime Energy Savings (Lifetime CSE)	The cost of acquiring energy savings that accrue over the economic lifetime of the actions taken through a program/sector/portfolio.
Levelized Cost of Lifetime Energy Savings (Levelized CSE)	The cost of acquiring energy savings that accrue over the economic lifetime of the actions taken through a program/sector/portfolio, discounted back to the year in which the costs are paid and the actions are taken.

Defining Levelized Cost of Saved Energy

$$\begin{aligned} \text{Levelized CSE} & \left(\text{in } \frac{\$}{\text{unit}} \text{ energy, e. g., kWh, therm, Btu} \right) \\ & = \frac{C \times (\text{Capital Recovery Factor})}{D} \end{aligned}$$

$$\text{Capital Recovery Factor} = [A * (1 + A)^B] / [(1 + A)^B - 1]$$

Where:

A = Discount rate (LBNL uses 6% in this analysis)

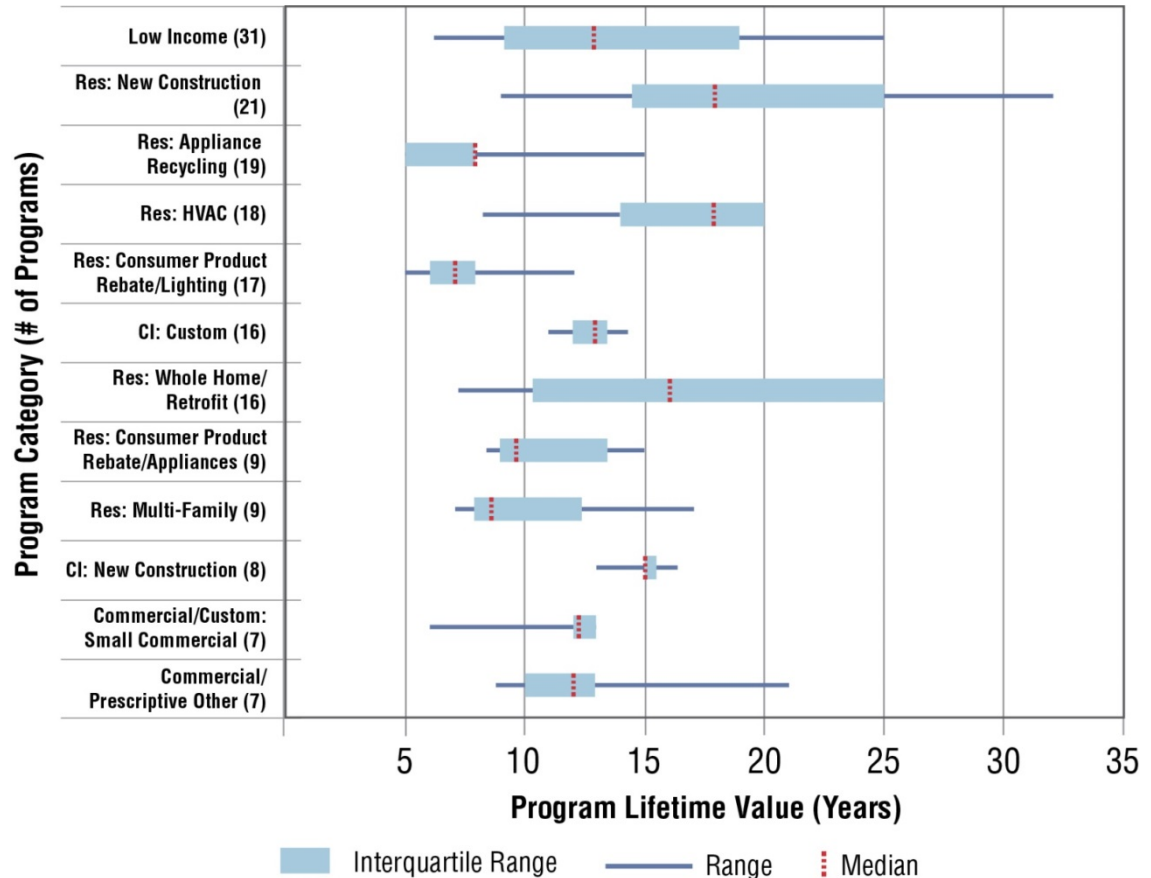
B = Estimated program savings life in years

C = Total program cost in 2012\$ dollars

D = Annual kWh saved that year by the energy efficiency program

Range in Program Average Measure Lifetime

- Need either lifetime savings or the average lifetime for the mix of measures installed by the program to calculate the CSE
 - ~50% of the program administrators reported either program lifetime values or lifetime savings
- Huge range in reported program lifetime value for some types of efficiency programs
 - Example: Residential New Construction programs range from 8 to 34 years
- LBNL calculated and applied the average program lifetime value for those programs that did not report this information



* Numbers cited in this figure are from the LBNL Program Impacts Database

- Focus on **program administrator costs** (not total resource costs):
 - at state and regional levels
 - by market sector (e.g., commercial, industrial and residential)
 - by program type (e.g., residential whole house programs, commercial retro-commissioning, and industrial custom programs)
- CSE values are calculated in two ways:
 - **Savings-weighted average CSE**: Calculated using all savings and expenditures at the level of analysis: national, sector, program category
 - Median values for **program-specific CSE** and inter-quartile range:
 - Based on calculations for each individual program type
 - Gives equal weighting to all programs irrespective of their relative size (either in terms of savings or costs)

National Results:

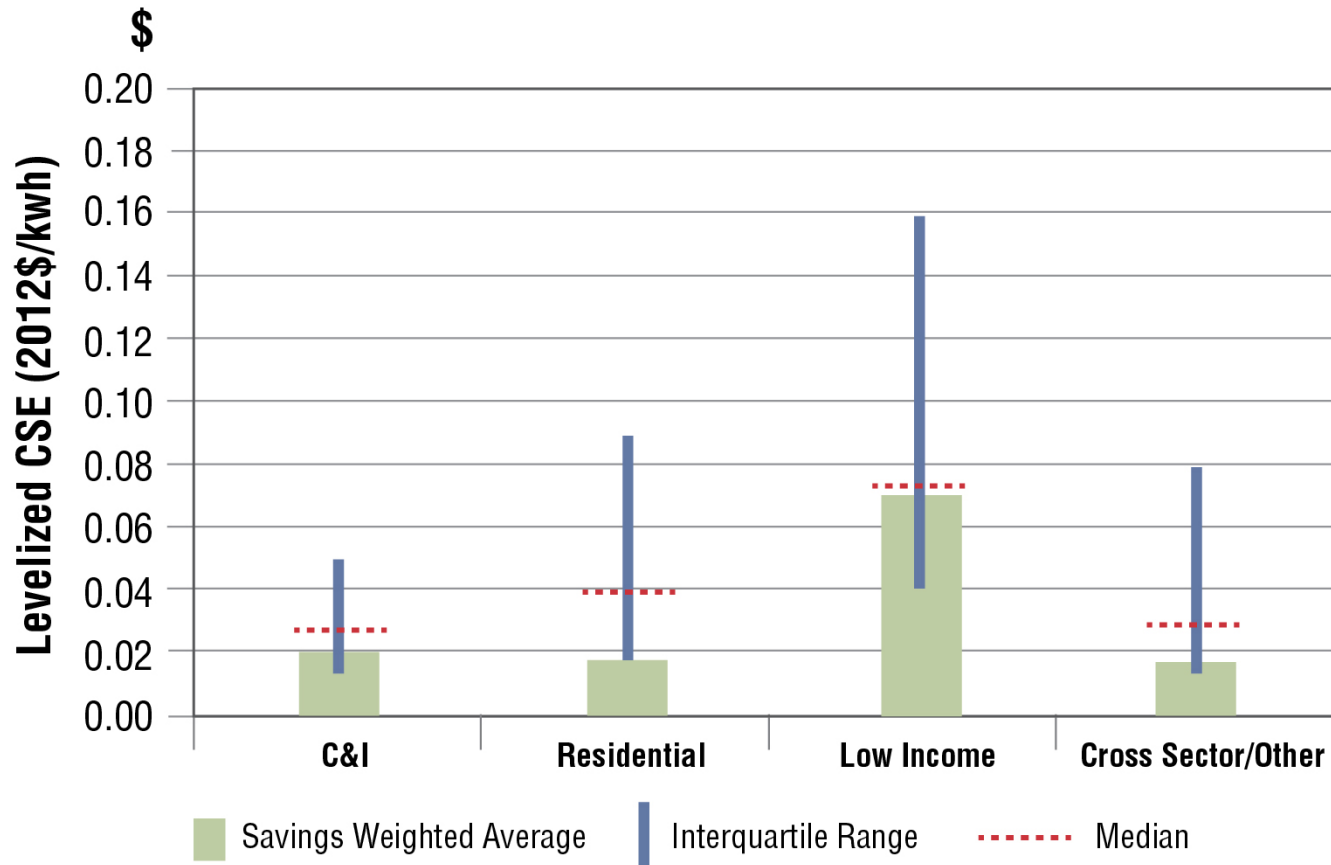
- The U.S. average levelized CSE is slightly more than two cents per kilowatt-hour
- Gross savings and spending are aggregated at the national level and the CSE is weighted by savings
- Discussion of results can be found in Chapter 3 of the LBNL report

Sector	Levelized CSE (6% Discount) (\$/kWh)	First Year CSE (\$/kWh)
Commercial & Industrial (C&I)	\$ 0.021	\$ 0.19
Residential	\$ 0.018	\$ 0.12
Low Income	\$ 0.070	\$ 0.57
Cross Sectoral/Other	\$ 0.017	\$ 0.12
National CSE	\$ 0.021	\$ 0.16

CSE for Electricity Efficiency Programs

National Results by Sector

- Residential programs have the lowest savings weighted CSE (\$0.018/kWh) followed by C&I programs (\$0.021/kWh)

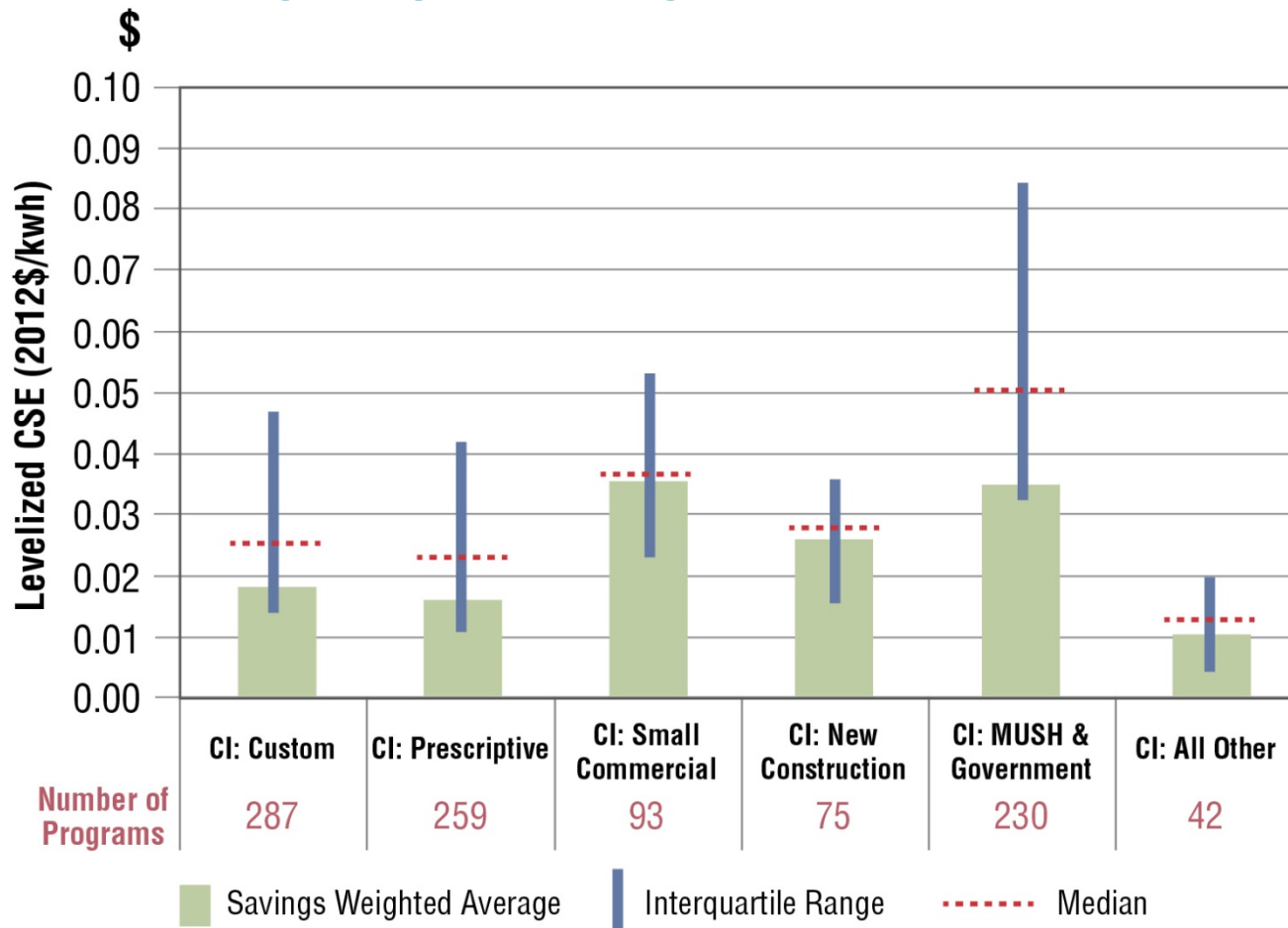


Values in this figure are based on the 2009-2011 data in the LBNL DSM Program Impacts Database. CSE values are for program administrator costs and based on gross savings. Savings are levelized at a 6% real discount rate. The savings-weighted average CSE is calculated using all savings and expenditures at the level of analysis. The inter-quartile range and median CSE values are calculated for each program type.

CSE for Electricity Efficiency Programs

Commercial & Industrial Programs

- C&I Custom (287) and Prescriptive (259) programs are the most common; both with savings weighted average CSE below \$0.02/kWh

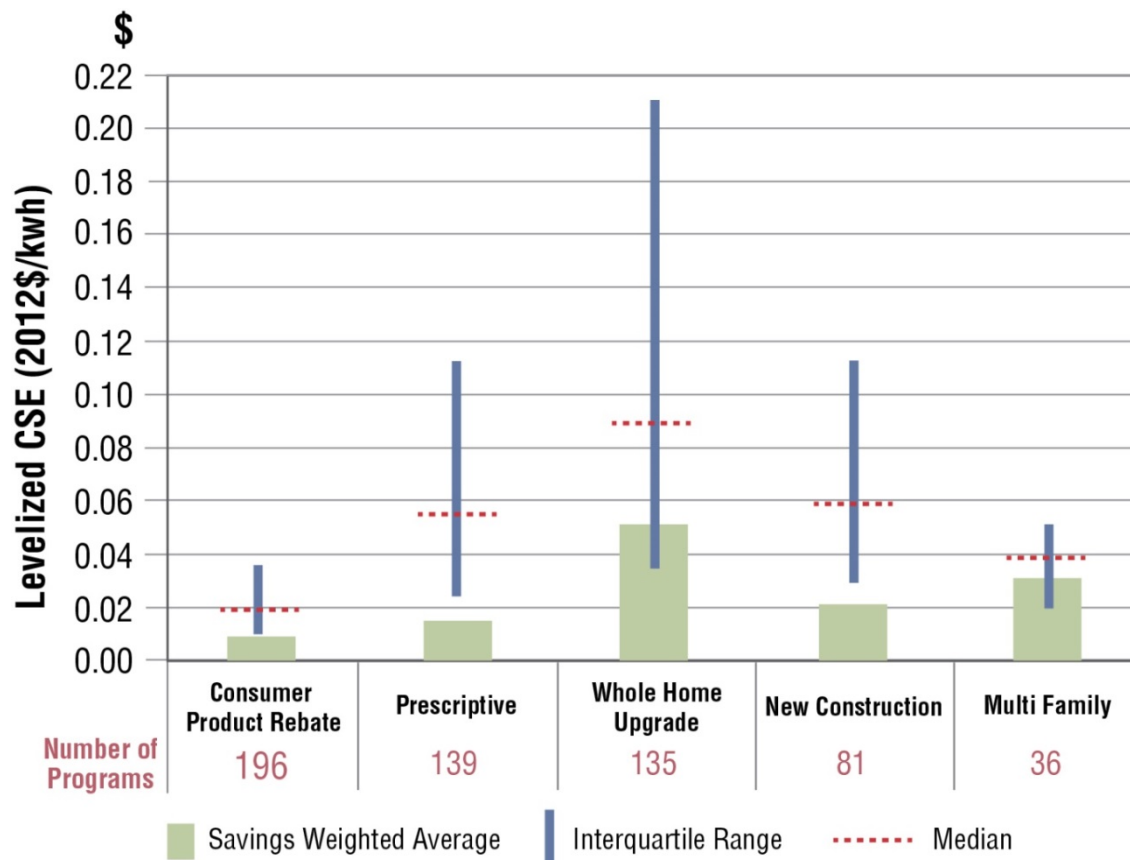


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CSE for Electricity Efficiency Programs

Residential Programs

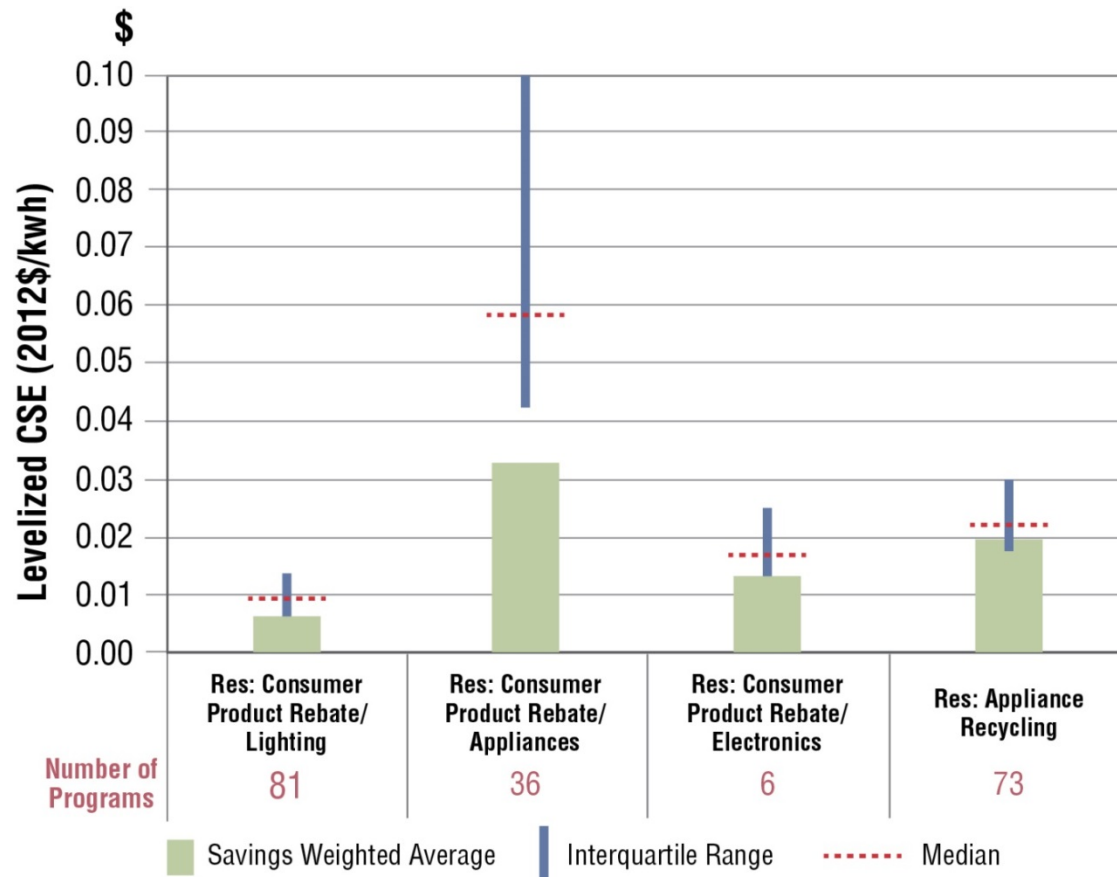
- Consumer Product Rebate and Prescriptive (HVAC, insulation, generic rebates) programs have a savings-weighted average CSE of \$0.009/kWh and \$0.016/kWh respectively



Values in this figure are based on the 2009-2011 data in the LBNL DSM Program Impacts Database. CSE values are for program administrator costs and based on gross savings. Savings are levelized at a 6% real discount rate. The savings-weighted average CSE is calculated using all savings and expenditures at the level of analysis. The inter-quartile range and median CSE values are calculated for each program type.

Residential Consumer Product Rebate Programs

- Over 44% of Residential electricity savings comes from Lighting programs, which have a savings-weighted average CSE of \$0.007/kWh

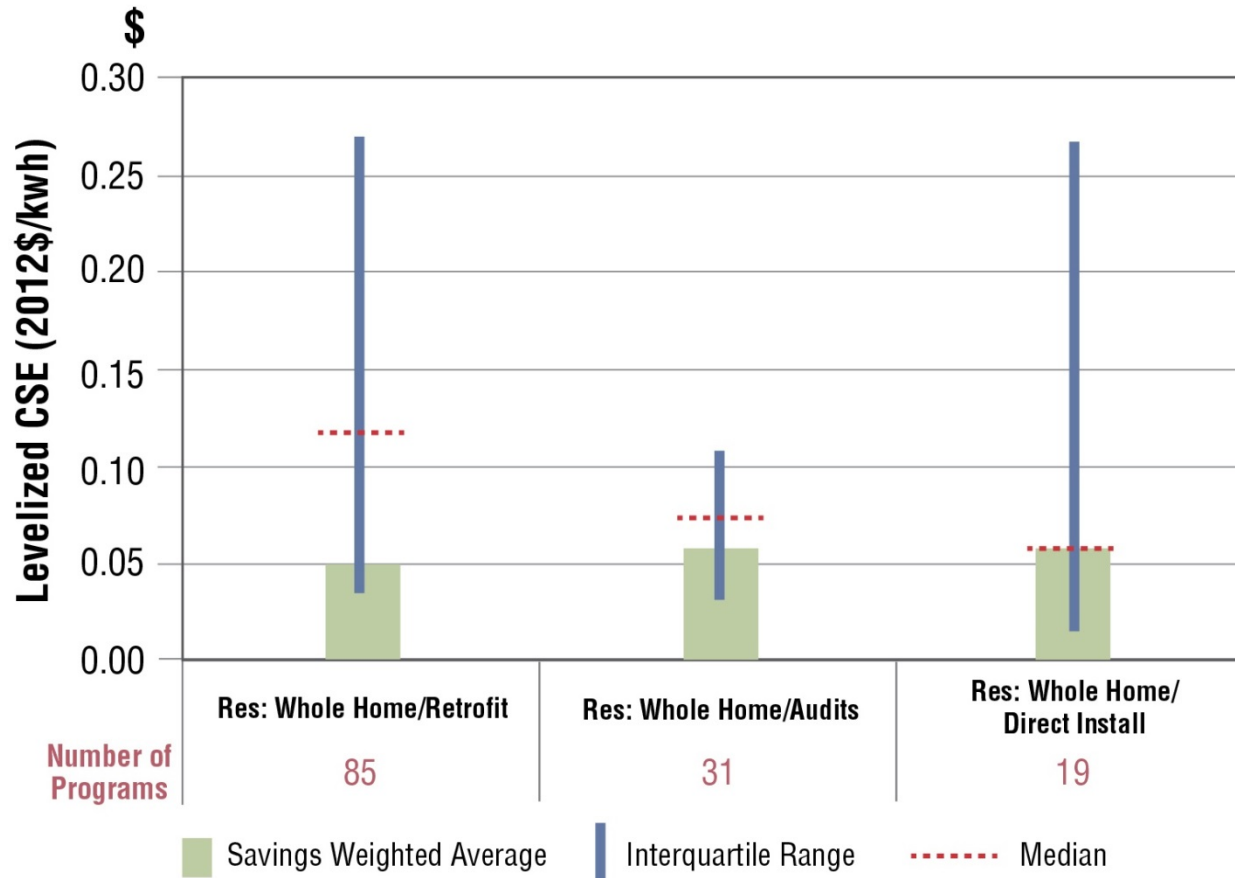


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CSE for Electricity Efficiency Programs

Residential Whole Home Programs

- All program types in this category have a savings-weighted average CSE between \$0.05-0.06/kWh
- The median value for CSE is \$0.116/kWh for whole home comprehensive retrofit programs

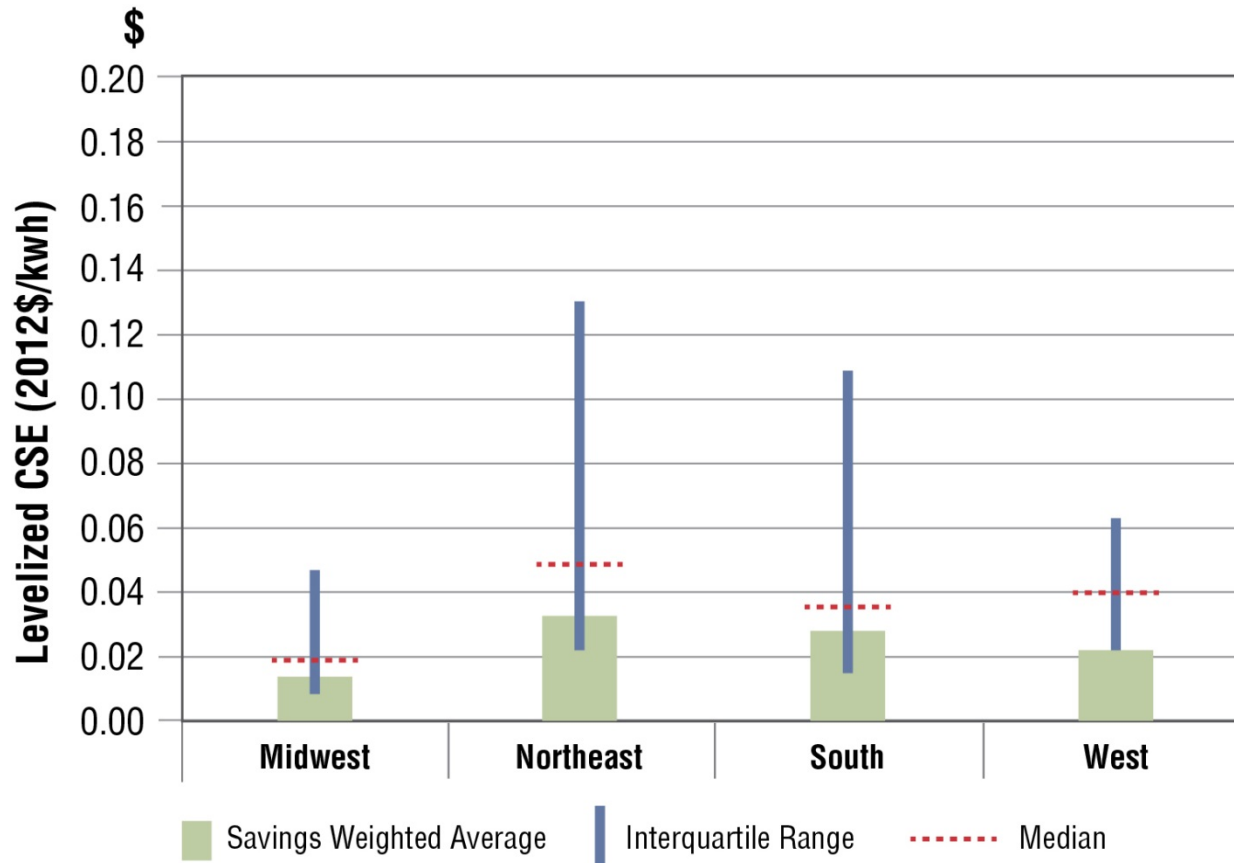


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CSE for Electricity Efficiency Programs

Regional Results

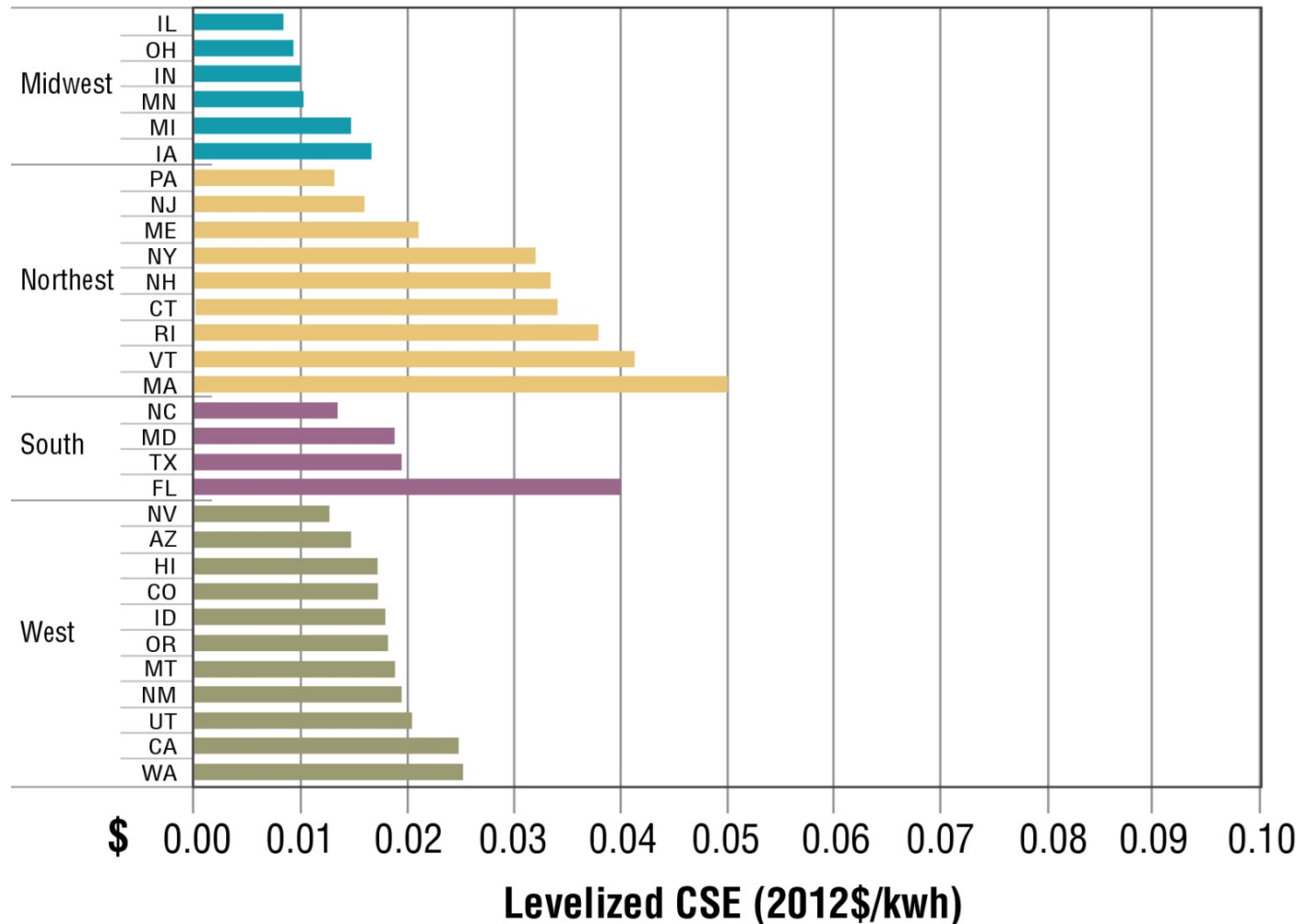
- The Midwest has the lowest savings-weighted CSE at \$0.014/kWh and the Northeast has the highest at \$0.028/kWh



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CSE for Electricity Efficiency Programs

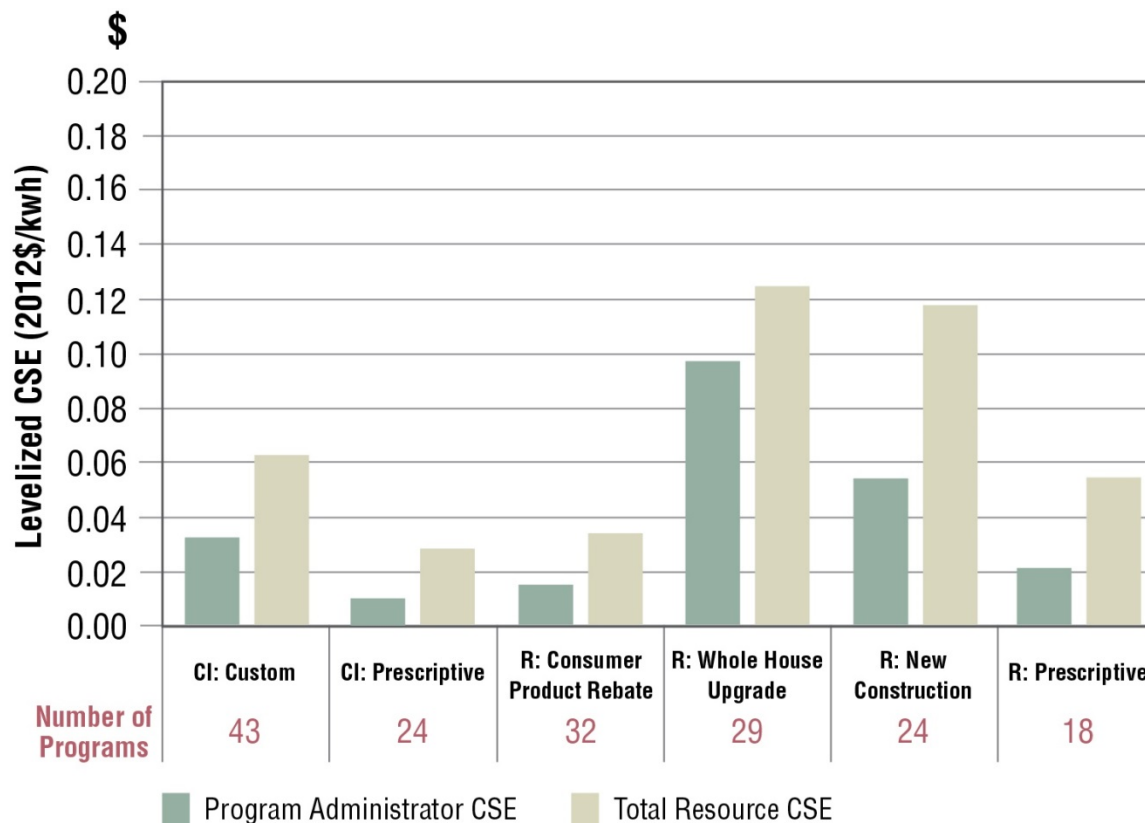
Cost of Saved Energy Results by State



Values in this figure are based on the 2009-2011 data in the LBNL DSM Program Impacts Database. CSE values are for program administrator costs and based on gross savings. Savings are levelized at a 6% real discount rate. The savings-weighted average CSE is calculated using all savings and expenditures at the level of analysis. The inter-quartile range and median CSE values are calculated for each program type.

Total Resource vs. Program Administrator Costs

- Savings-weighted average Program Administrator CSE values range from a third to a half of Total Resource CSE for most program types, except for Whole House Upgrade programs which have a Total Resource CSE that is 25-30% higher than the Program Administrator CSE

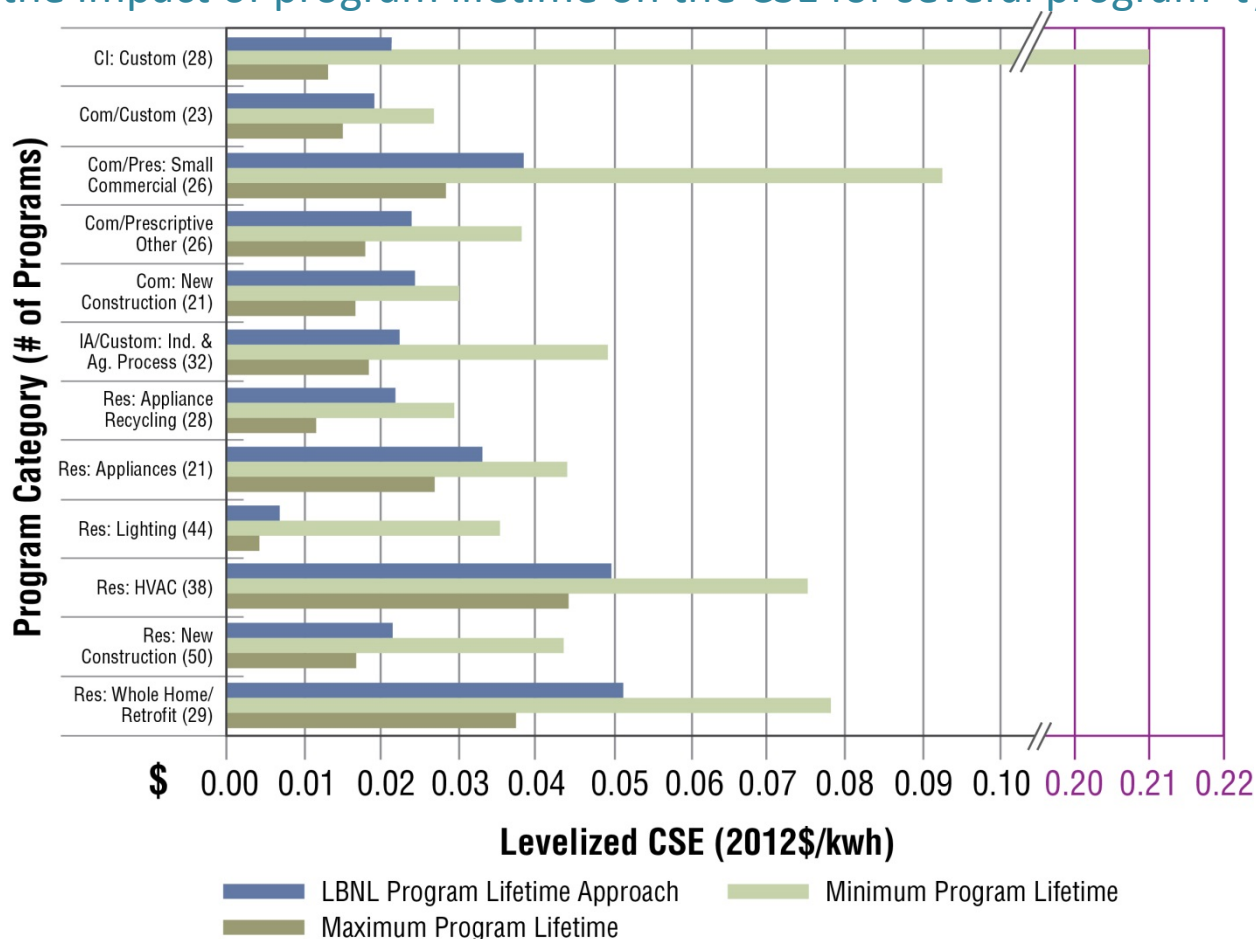


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CSE Sensitivity Analysis

Program Average Measure Lifetime

- Programs often reported a wide range for program average measure lifetime. We tested the impact of program lifetime on the CSE for several program types.

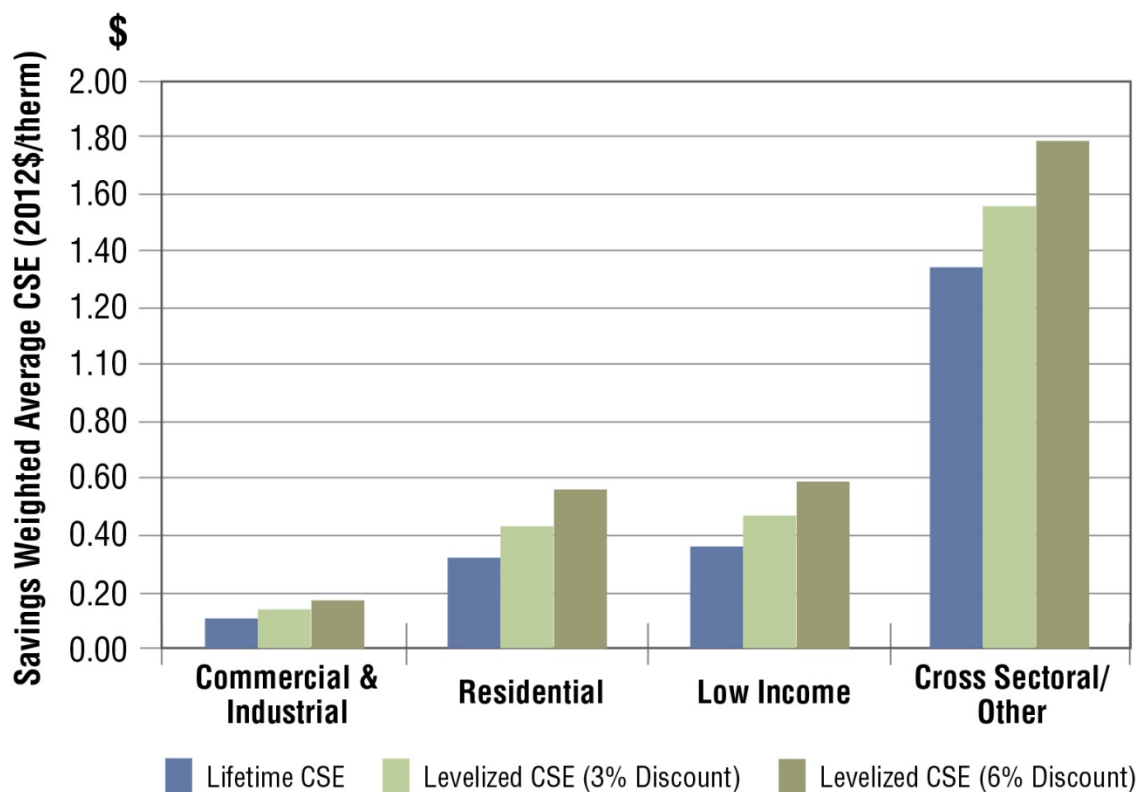


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CSE for Gas Efficiency Programs

National Results

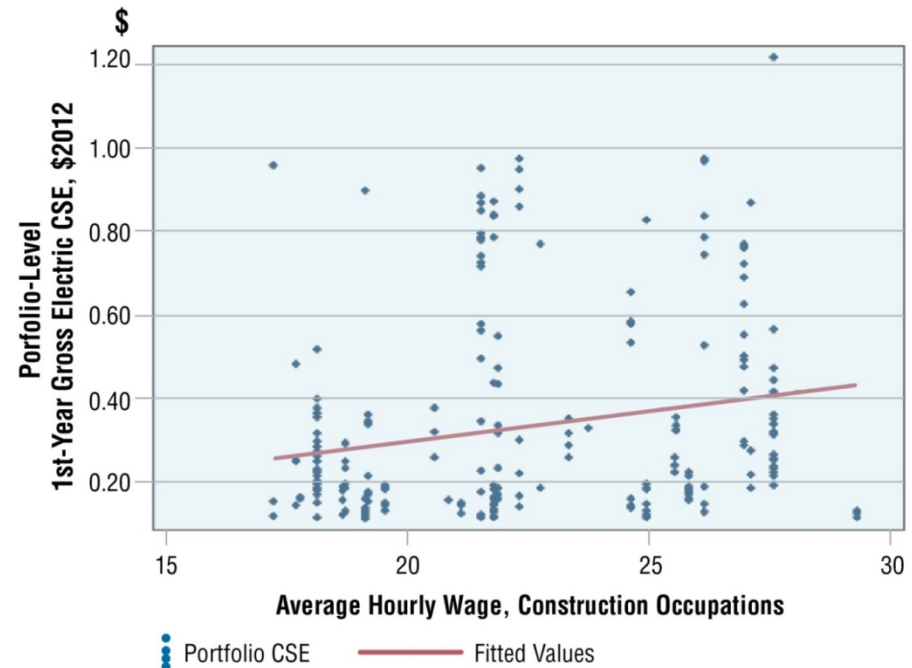
- The national savings-weighted average CSE is 0.38/therm
- C&I programs have the lowest savings-weighted CSE (\$0.19/therm)
- Residential and Low Income programs have similar savings-weighted CSE of \$0.56/therm and \$0.59/therm respectively



Values in this figure are based on the 2009-2011 data in the LBNL DSM Program Impacts Database. CSE values are for program administrator costs and based on gross savings. Savings are levelized at a 6% real discount rate. The savings-weighted average CSE is calculated using all savings and expenditures at the level of analysis. The inter-quartile range and median CSE values are calculated for each program type.

Preliminary Statistical Analyses

- Testing influences on the variation of program CSE through statistical regression analysis
- Possible hypotheses include:
 - Program administrator experience
 - Policy environment
 - Retail rates
 - Labor, materials costs
 - Program designs
 - Achieved savings
- Results varied substantially by market sector and program type
- Many relationships significant only at the 10%-15% level
- Further work in this area is needed

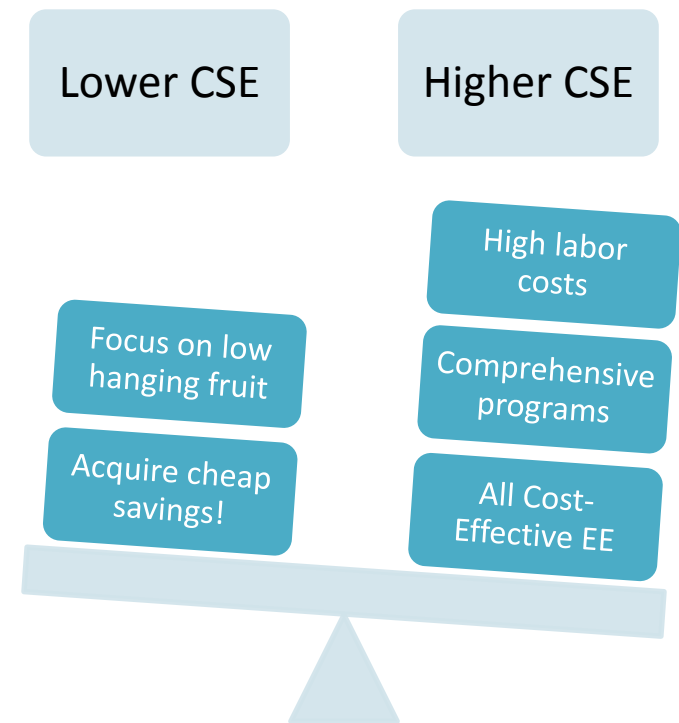




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Findings and Recommendations

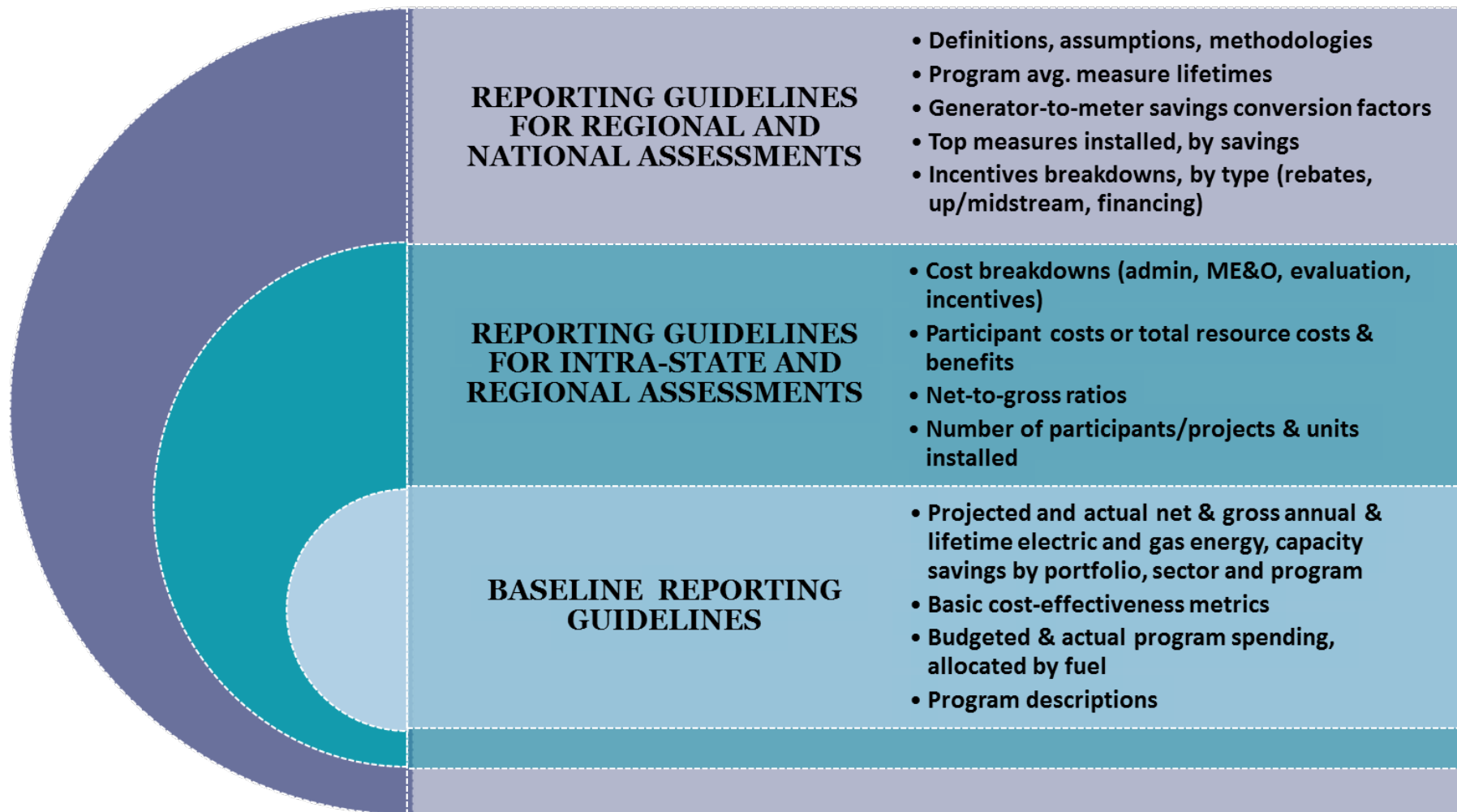
- CSE may vary across program administrator portfolios for reasons other than programmatic efficiency
 - Policies that mandate program administrator to acquire all cost-effective EE lead likely to result in more comprehensive (and costly) programs
 - Some state PUCs and program administrators focus on acquiring the cheapest savings possible
 - Differences in building stock and climate lead to variations in mix of measures and programs across administrators
 - Differences in program data reporting practices (e.g., estimated measure life)



- **Energy savings and program costs are often not *defined* consistently**
 - **Examples:**
 - Net energy savings is most common issue
 - Definition of measure lifetime and program average measure lifetime
 - Allocating portfolio costs between programs (e.g., program costs between combined gas and electric programs)
- **Programs and sectors are not characterized in a standardized fashion**

LBNL Policy Brief *Energy Efficiency Program Typology and Data Metrics: Enabling Multi-State Analyses Through the Use of Common Terminology* available at <http://emp.lbl.gov>

- Utility customer-funded EE programs offered in 45 states; only 31 states report with sufficient transparency to complete a program-level CSE analysis
- EE reporting practices are product of resource characteristics, state PUC guidelines/policies and commitment of administrators
- LBNL CSE Project highlights current reporting practices and challenges in creating national program database and developing benchmarks for assessing efficiency as a resource
 - Program data are not *reported* consistently across states by program administrator
 - Less than 45% of program administrators report lifetime savings
 - Only ~50% of program administrators report both net and gross annual saving
 - Only ~30% of electric program administrators report participant costs



- Many program administrators report program-level data at high level of completeness and transparency
- But other program administrators did not provide the basic data needed to calculate the CSE at program level
- We believe that there is a direct connection between maturation of EE as a utility and national resource and increased consistency in periodic reporting of efficiency program costs and impacts
- Additional rigor, completeness, standard terms, and consensus on essential elements of program-level reporting could increase confidence in EE among policymakers and other stakeholders
 - Program measure lifetimes are essential for estimating lifetime savings
 - Participant (or incremental measure) costs are essential for calculating total resource costs of energy savings

- **Encourage** program administrators and state PUCs to support more consistent, transparent reporting of EE program data
 - Check out the program typology policy brief under Publications at emp.lbl.gov
- Webinars/Briefings: Outreach to **share initial results** and encourage consistent reporting
- More **targeted analyses** of program-level and regional results

Project Contacts

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- **Sponsors: Larry Mansueti & Cynthia Wilson - DOE OE, National Electricity Delivery Division**

Appendices

Program Administrator Reporting Summary

Metric	Program Administrators that Report Electric Values		Program Administrators that Report Gas Values	
	Number of program administrators reporting this data	Percentage of program administrators that reported this data	Number of program administrators reporting this data	Percentage of program administrators that reported this data
Average measure lifetime (yrs.)	23	26%	15	30%
Claimed Lifetime Gross Savings	39	44%	29	58%
Claimed Lifetime Net Savings	20	23%	18	36%
Claimed Gross Annual Savings	86	98%	48	96%
Evaluated Gross Annual Savings	24	27%	7	14%
Projected Gross Annual Savings	47	53%	17	34%
Claimed Net Annual Savings	45	51%	35	70%
Evaluated Net Annual Savings	17	19%	12	24%
Projected Net Annual Savings	19	22%	19	38%
Program Participation (# of Participants)	75	85%	22	44%
Program Participation (# of equipment units)	36	41%	15	30%

Program Administrator Reporting Summary



Metric	Program administrators that report electric values		Program administrators that report gas values	
	Number of program administrators reporting this data	Percentage of program administrators that reported this data	Number of program administrators reporting this data	Percentage of program administrators that reported this data
Total Program Administrator Program Costs				
Total Electric Budget	53	60%	N/A	
Total Electric Expenditures	84	95%		
Total Electric Committed	11	13%		
Total Gas Budget	N/A		29	58%
Total Gas Expenditures			44	88%
Total Gas Committed			2	4%
Program Administrator Program Cost Breakdown				
Administration/ Management Costs	54	61%	30	60%
Customer Incentive Costs	56	64%	29	58%
Education/Marketing/ Outreach Costs	39	44%	25	50%
Evaluation Costs	36	41%	25	50%
Other Costs	24	27%	18	36%
Non-Program Administrator Costs				
Participant Costs	26	30%	10	20%