Ameren Illinois DSM Potential Study

Illinois SAG meeting on March 20, 2013

Topics

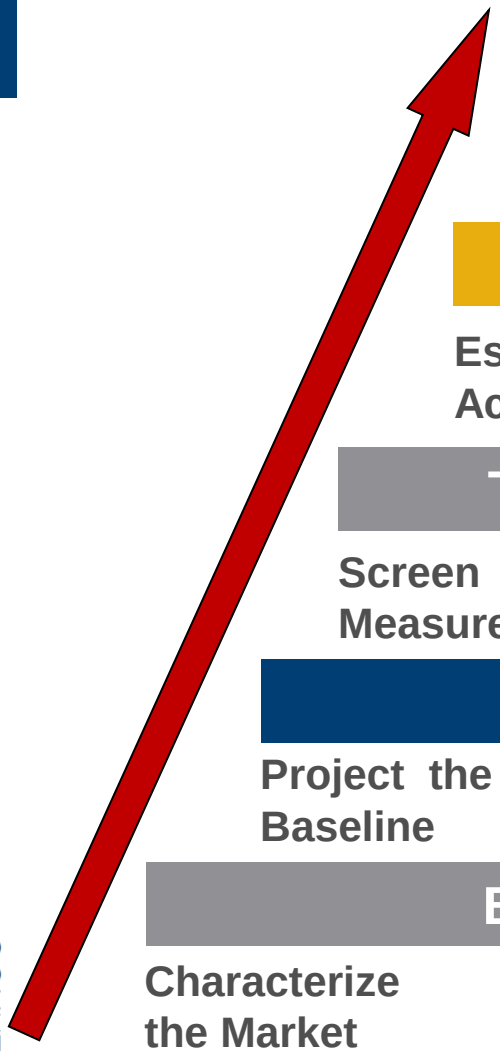
- Objectives of the study
- Analysis approach
- Electricity potential
- Natural gas potential
- Achievable targets

- Appendix
  - Additional background slides

Study Objectives

- Satisfy legislative requirement to provide an electric potential study each year with the IPA incremental savings filing that is no less than 3 years old (last one completed in 2010)
  - Ameren Illinois (AIC) chose to include gas as well
- Provide support for the development of integrated gas and electric Cycle 3 (2014-2017) Plan
- Conduct comprehensive market research to better represent customers in the AIC service territory
- Quantify wasted energy due to customer behavior
- Develop EE potential estimates for 2017-2024 for benchmarking and future analyses

Bottom-up Analysis Approach



Supply Curves

Synthesize — Preliminary program design; Sensitivity analysis

Achievable potential

Establish Customer Acceptance — Program interest surveys; Past program achievements

Technical and economic potential

Screen Measures — Illinois TRM; Emerging technologies; Avoided costs; *EnerNOC data/BEST*

End-use forecast by segment

Project the Baseline — Prototypes and energy analysis (*BEST*); Ameren forecast data; 2012 AEO; Secondary data

Base-year energy use by segment

Characterize the Market — Customer surveys; Previous studies; Ameren billing data; *Energy Market Profiles*; Secondary data

Research objectives

Market Research

Primary research = customer surveys

- Saturation surveys
  - Residential – 726 online
  - Small and medium business – 691 online
  - Large C&I – 101 onsite
- Program interest surveys (all online)
  - Residential – 749 online
  - Business – 610 online
- Ameren data
  - Billing data
  - Forecasts
  - Program data

Secondary research

- Illinois statewide data
  - TRM
  - Building codes
- EnerNOC databases/tools
  - Energy market profiles database
  - BEST simulation model
  - DEEM measure data
  - EnergyShape™
- Measure data sources
- Other
  - Annual Energy Outlook forecast
  - Census and EIA data
  - Other potential studies

Market Characterization for Electricity

Analysis Segmentation*

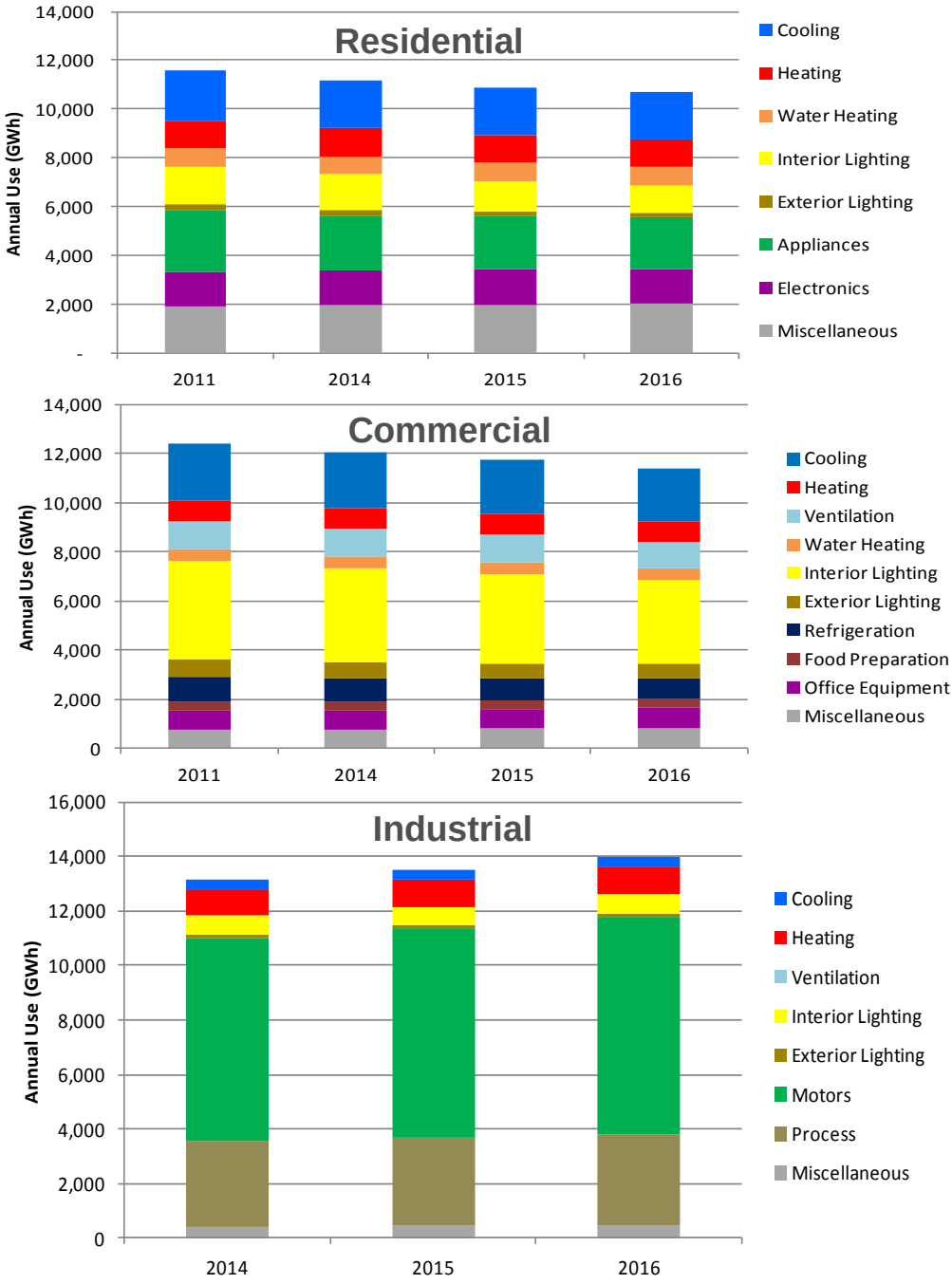
Market Dimension	Segmentation Variable	Dimensions
1	Sector	Residential, commercial, industrial
2	Building type	Residential (housing type) Commercial (Office, Restaurant, Retail, etc.) Industrial (Food Products, Petroleum, Metals, etc.)
3	Vintage	Existing and new construction
4	Fuel	Electricity, natural gas
5	End uses	Cooling, heating, lighting, water heat, motors, etc. (as appropriate by sector)
6	Appliances/end uses and technologies	Technologies such as lamp type, air conditioning equipment, motors by functional use, etc.
7	Equipment efficiency levels for new purchases	Baseline and array of higher-efficiency options as appropriate for each technology

*Study includes DCEO and excludes self-direct customers (SDCs) in gas analysis

Baseline Projection (GWh)

Electricity with naturally-occurring EE

- The baseline projection reflects forecasts of customer growth, electricity prices and other forecast drivers
- It also incorporates effects of:
  - Appliance/equipment standards
  - Building codes
  - Naturally-occurring conservation
- It is the metric against which EE savings are measured



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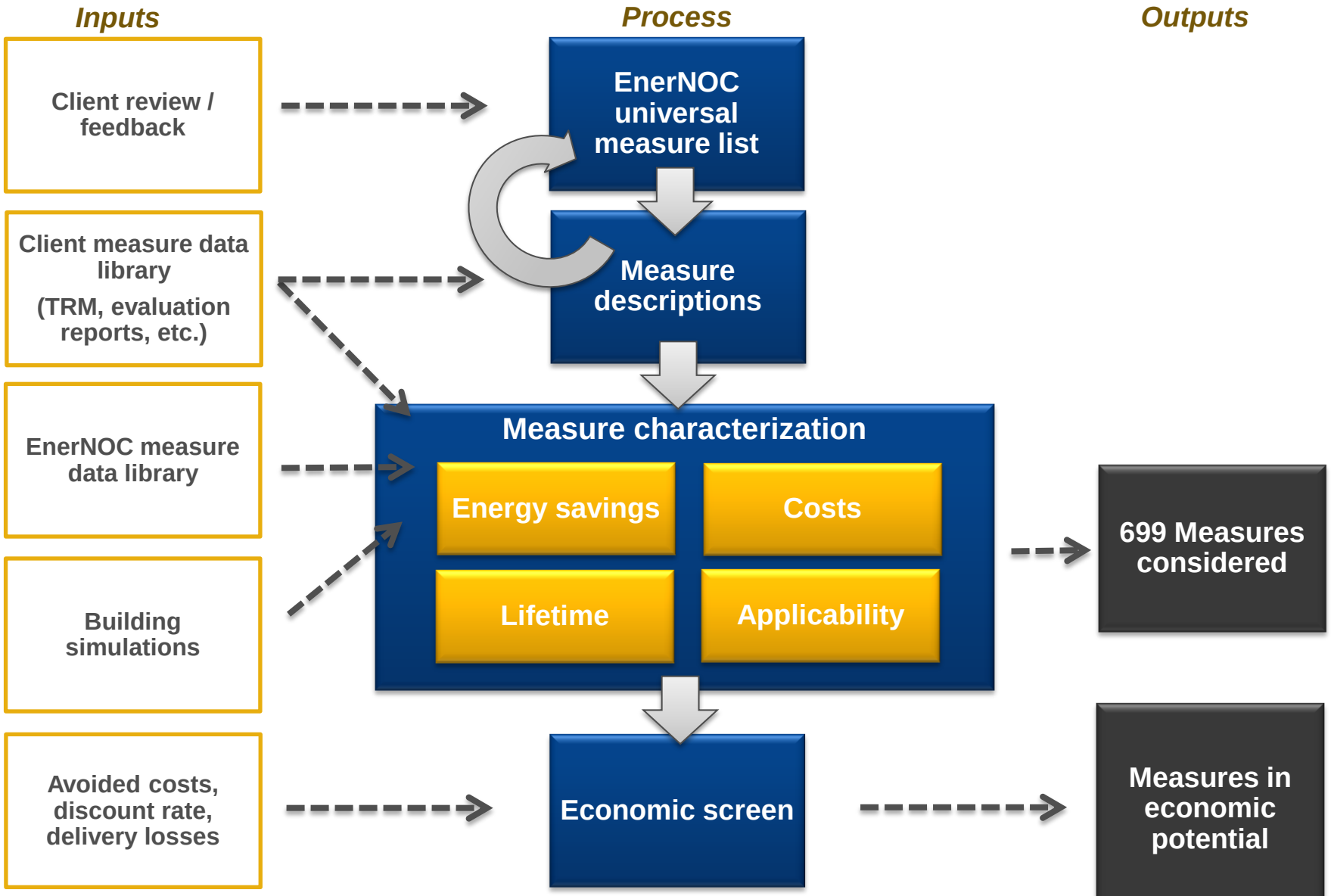
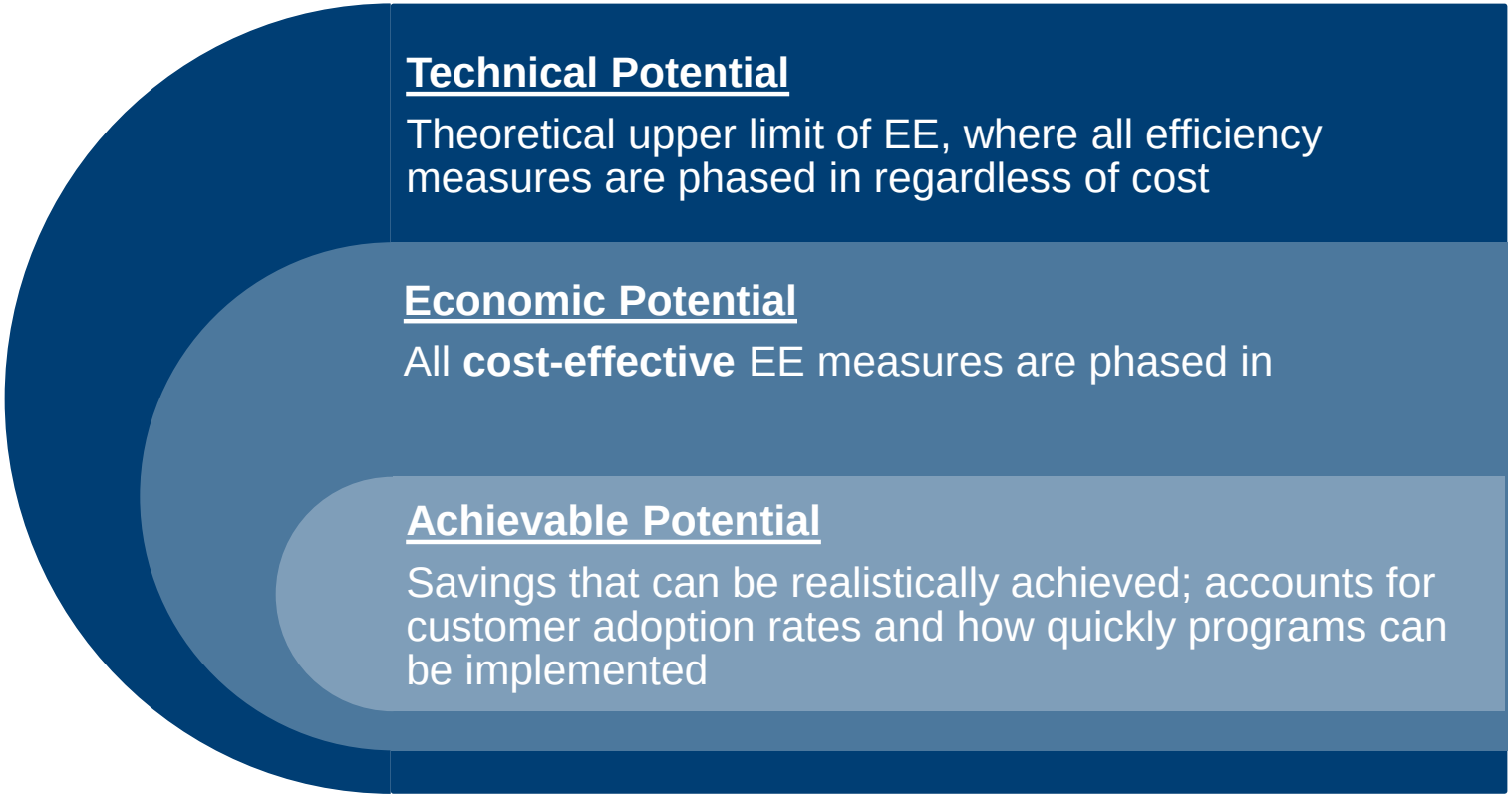
EE Measure Assessment Approach



Definitions of Energy Efficiency Potential

Potential studies identify future opportunities for EE that can be achieved through programs



This study estimates a range of achievable potential:

- MAP – Maximum achievable potential
- RAP – Realistic achievable potential

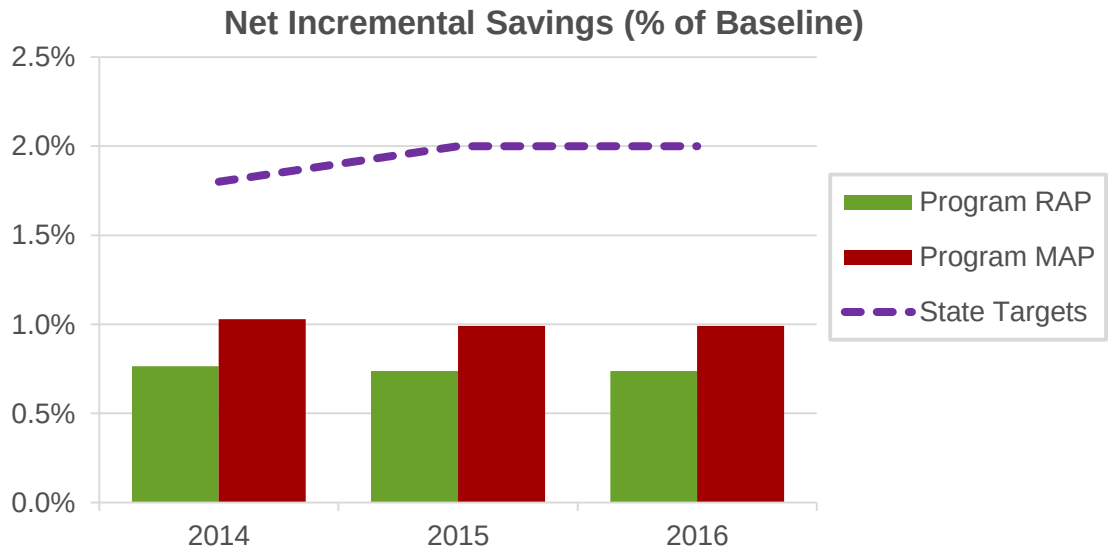
Electricity Potential

Potential Estimates for Electricity

- Without the rate cap, **average** incremental achievable savings over the 3-year period are
  - 268 to 360 GWh per year
  - 0.8 to 1.0% of baseline sales
- In 2016, cumulative Program RAP is 1/3 of economic potential; MAP is about half
- Program savings are well below targets each year

	2014	2015	2016
Baseline (GWh)	35,891	35,891	35,891
Cumulative Savings (GWh)			
Program RAP	275	540	805
Program MAP	369	725	1,087
Economic	1,151	1,933	2,609
Technical	1,578	2,583	3,488
Cumulative Savings (% of Baseline)			
Program RAP	0.8%	1.5%	2.2%
Program MAP	1.0%	2.0%	3.0%
Economic	3.2%	5.4%	7.3%
Technical	4.4%	7.2%	9.7%
Cumulative AIC Statutory	1.8%	3.8%	5.8%

Note: AIC 2013 Y6 = 0.84% of throughput including 8-103 + IPA

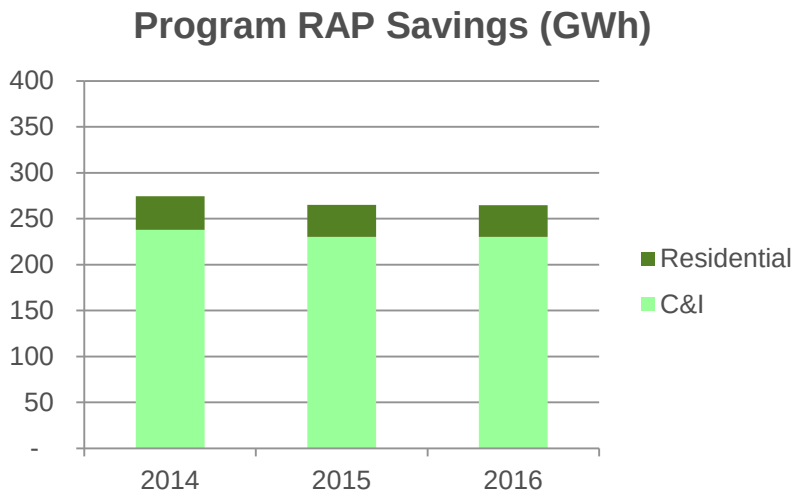


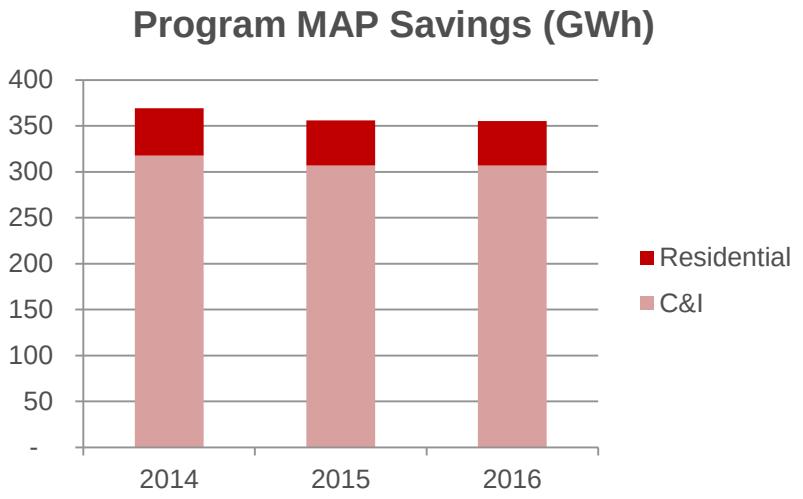
Electricity Potential by Sector

Incremental Savings (GWh)	2014	2015	2016
Program RAP (GWh)			
Residential	37	35	35
Commercial & Industrial	238	230	230
Total	275	265	265
Program MAP (GWh)			
Residential	51	49	49
Commercial & Industrial	318	307	307
Total	369	356	355

In contrast to previous studies and plans, residential accounts for only a small portion of program potential

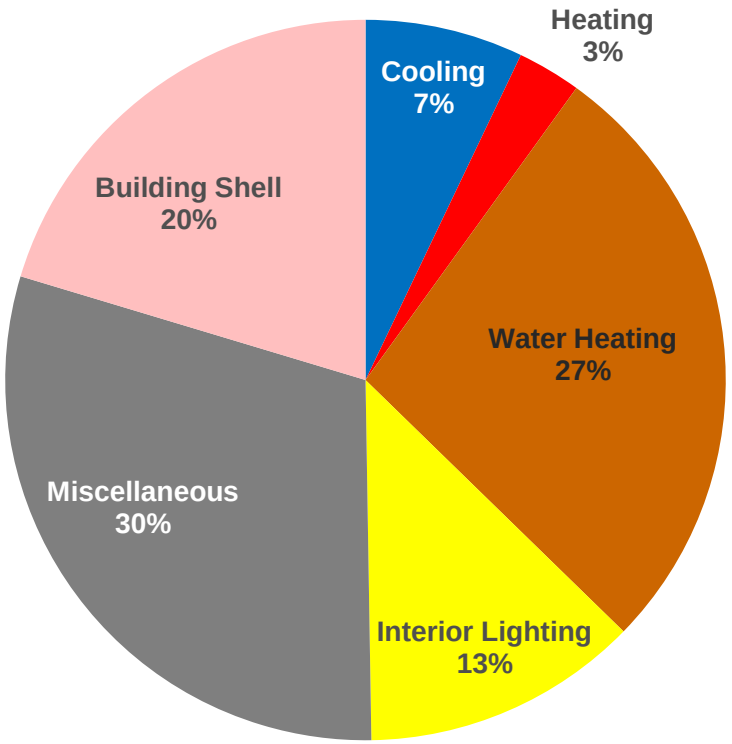
- About 15% of MAP and RAP





Key Measures for Residential Electricity Potential

Program RAP Lifetime Savings (107 GWh)



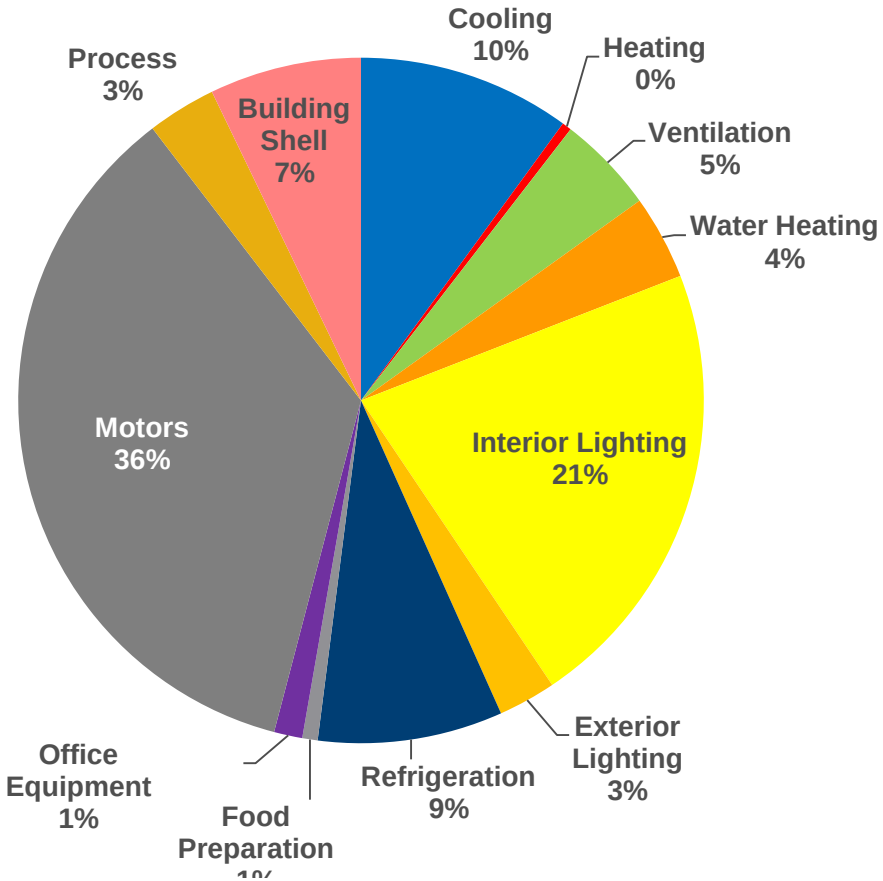
Key measures are considerably different than they were in the past due to appliance standards and exclusion of CFLs:

- Building shell:
  - Ducting repair and sealing
  - Ceiling fan installation
  - Programmable thermostat
- Water heating
  - Low flow showerheads
  - Faucet aerators
  - Larger than 55 gallon water heaters
- Interior specialty lighting
- Miscellaneous:
  - Pool/spa cover
  - Remove 2nd refrigerator or freezer
- Cooling: Remove 2nd room unit
- Space heating: Air source heat pump

Key Measures for C&I Electricity Potential

Program RAP Lifetime Savings (698 GWh)

- C&I measures are consistent with previous studies and programs
  - Interior lighting: Screw-in lighting, linear fluorescent lighting
  - Cooling: Rooftop unit, VSD on chiller fans, RTU-maintenance
  - Refrigeration: Anti-sweat door heater, glass door display, eCube
  - Building shell: High efficiency windows, Retrocommissioning-HVAC, EMS
  - Motors – Magnetic adjustable speed drives, variable speed drives, VSD on ventilation motors
  - Water heating: higher efficiency water heaters, pre-rinse spray valve, low flow showerheads
  - Exterior lighting: screw-in lighting, linear fluorescent lighting
  - Process: Timers and controls

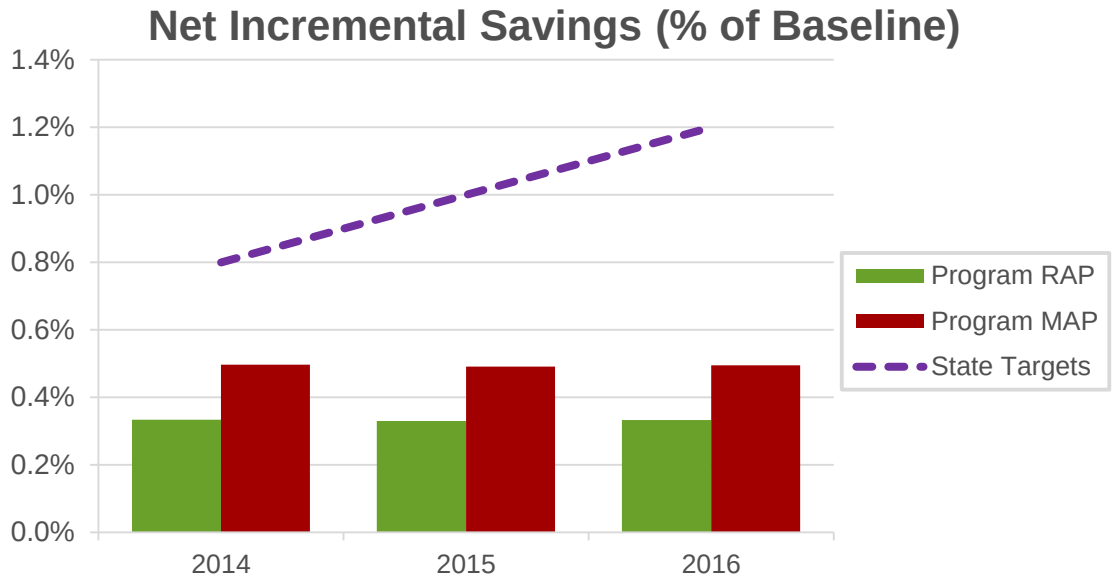


Gas Potential

Potential Estimates for Natural Gas

- Without the rate cap, average incremental achievable savings over the 3-year period is in the range of
  - 3.7 to 5.5 MMTherms per year
  - 0.3% to 0.5% of baseline sales
- In 2016, cumulative Program RAP is 1/4 of economic potential; MAP is about half
- Program savings are well below targets each year

	2014	2015	2016
Baseline (MMTherms)	1,107	1,107	1,107
Cumulative Savings (MMTherms)			
Program RAP	3.7	7.4	11.0
Program MAP	5.5	10.9	16.4
Economic	17.4	27.0	39.6
Technical	29.1	45.2	65.3
Energy Savings (% of Baseline)			
Program RAP	0.3%	0.7%	1.0%
Program MAP	0.5%	1.0%	1.5%
Economic	1.6%	2.4%	3.6%
Technical	2.6%	4.1%	5.9%
AIC Statutory (cumulative)	0.8%	1.8%	3.0%

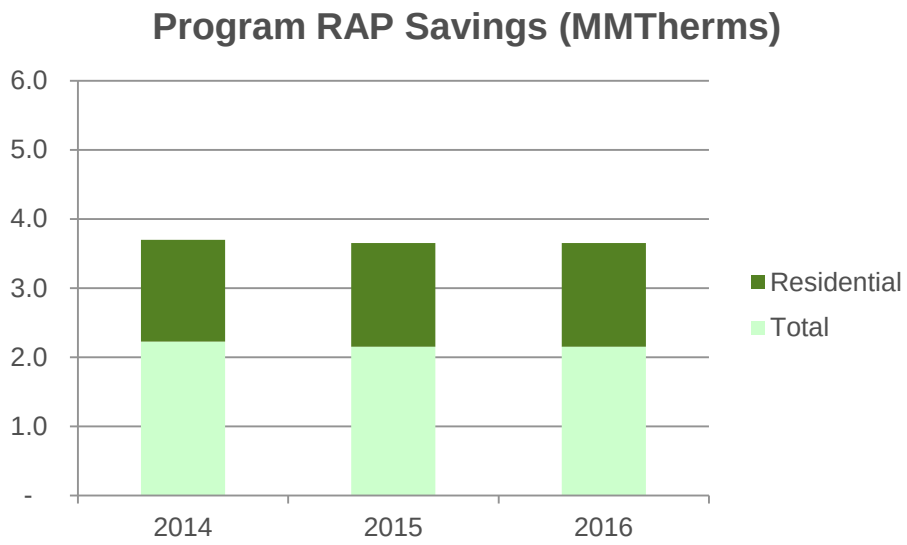


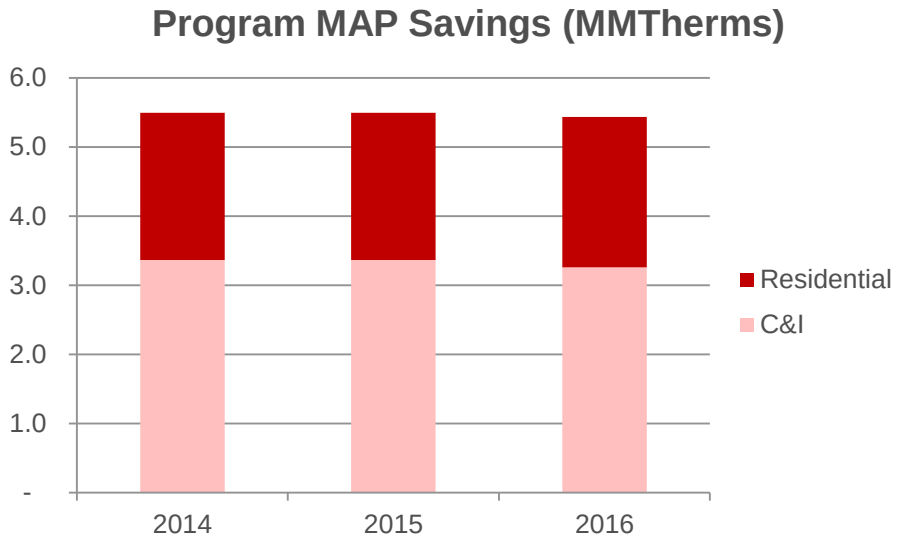
Natural Gas Potential by Sector

Incremental Savings (MMTherms)	2014	2015	2016
Program RAP			
Residential	1.5	1.5	1.5
Commercial & Industrial	2.2	2.2	2.2
Total	3.7	3.6	3.6
Program MAP			
Residential	2.1	2.1	2.2
Commercial & Industrial	3.4	3.4	3.3
Total	5.5	5.5	5.4

Natural gas savings are fairly balanced between sectors

- SDCs are not included in C&I





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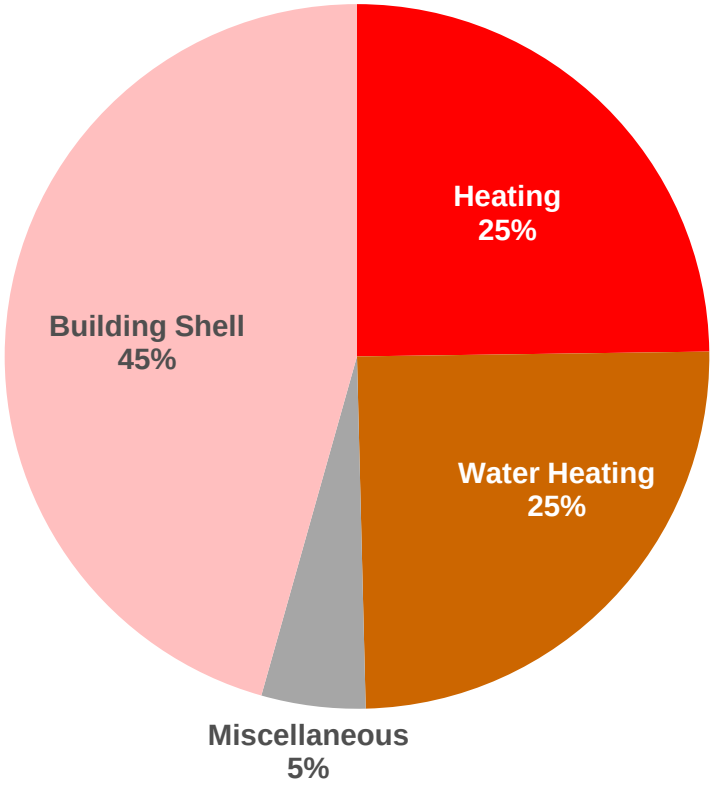
Key Measures for Residential Natural Gas Potential

Program RAP Lifetime Savings (4.5 MMTherms)



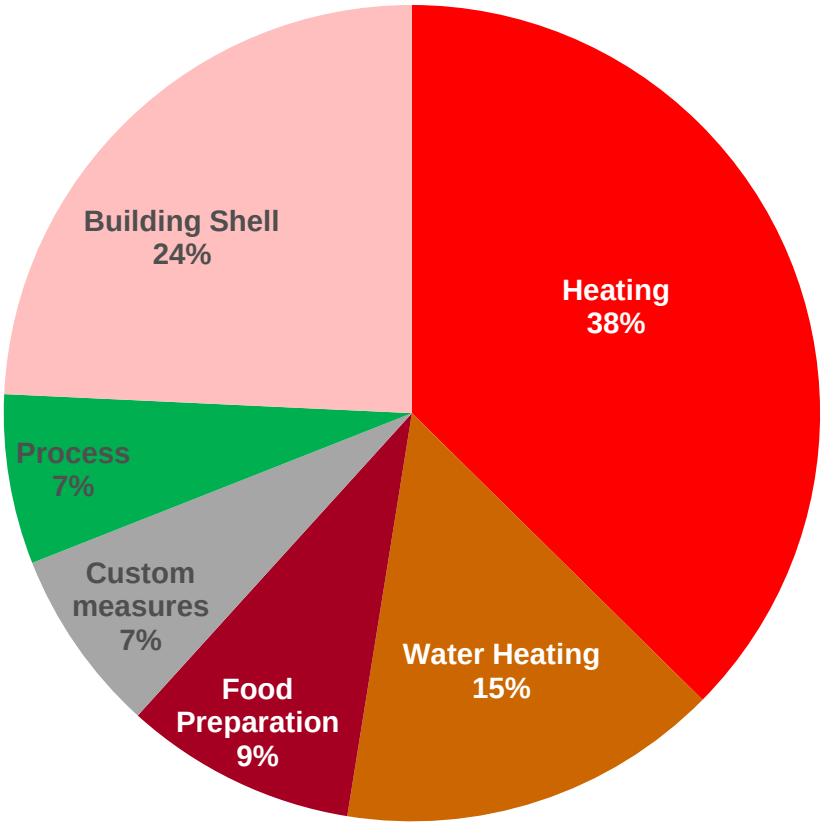
Only one equipment measure, high-efficiency furnaces, is included in the programs and this is because of the recent repeal of the standard. Measures include:

- Building shell
  - Programmable thermostat
  - Ducting repair and sealing
- Heating
  - Furnace
  - Boiler hot water reset
- Water heating
  - Low flow showerheads
- Miscellaneous
  - Pool/spa cover

Key Measures for Commercial Natural Gas Potential

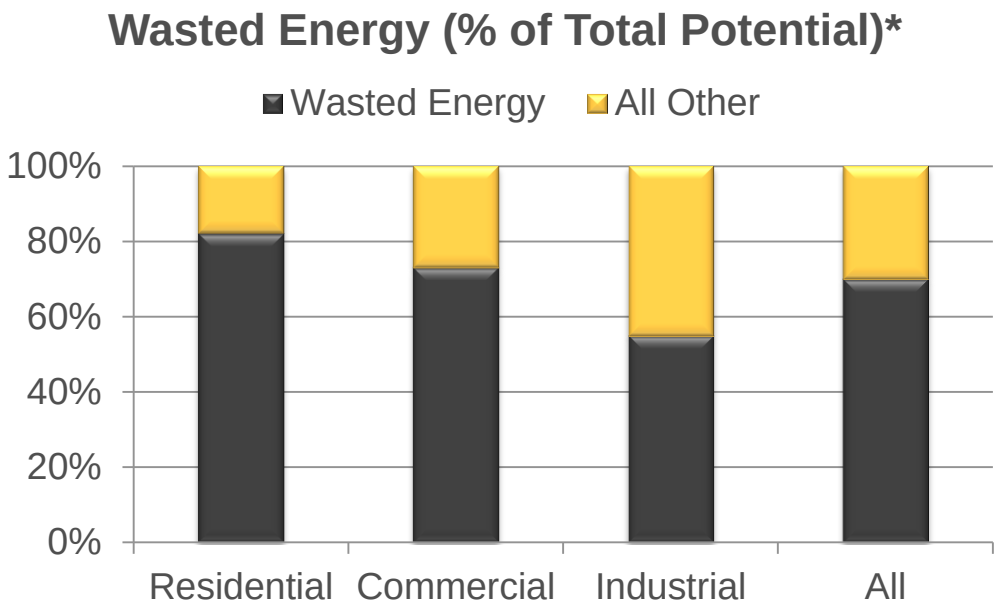
Program RAP Lifetime Savings (6.5 MMTherms)

- Building shell:
  - Retrocommissioning
  - High efficiency windows
- Heating:
  - Gas boiler hot water reset
  - Infrared heater
- Water heating
  - Higher efficiency water heaters
- Food preparation:
  - High efficiency fryer
- Custom measures
- Process:
  - Steam trap maintenance
  - Condensate return lines



Wasted Energy Estimates

- Wasted-energy analysis focused on measures that
  - Reduce behavior-related energy use
  - Do not affect customer lifestyles
- We developed a comprehensive measure list and identified those associated with wasted energy. Examples include:
  - Programmable thermostats, smart strips, equipment maintenance, occupancy sensors, power-savings modes for electronics



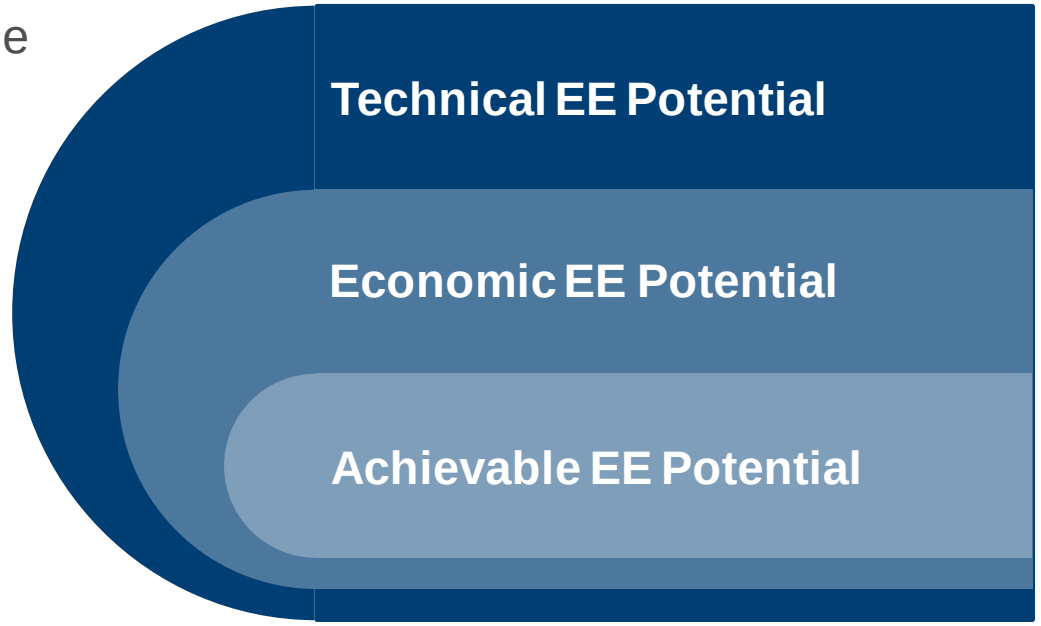
*Represents shares of Low Achievable potential at the measure level

Achievable Targets

Determining Achievable Potential

- Achievable potential is a subset of economic potential and is informed by program interest research with Ameren customers
  - This study estimates two levels of potential:
    - Maximum achievable potential (MAP)
    - Realistic achievable potential (RAP)

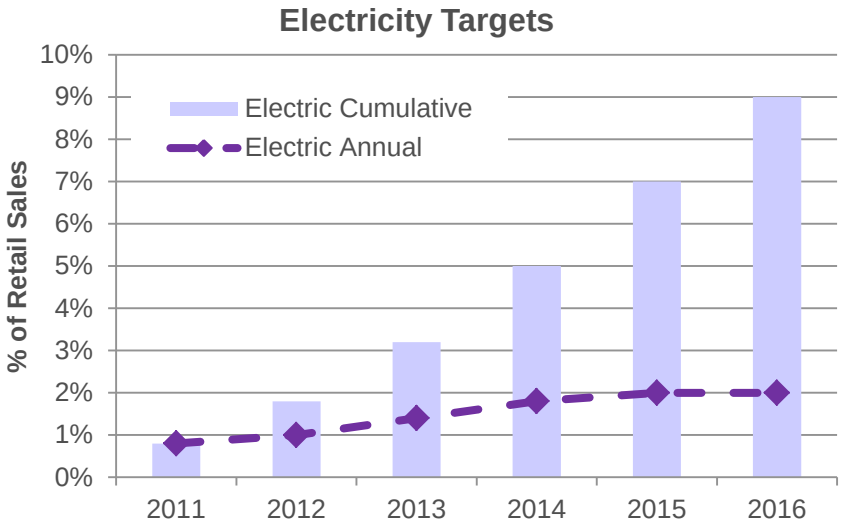
- How do estimates of achievable potential compare to
  - Annual savings goals set by Illinois legislation?
  - Spending cap?



Legislative Targets and Budget Caps

Electricity

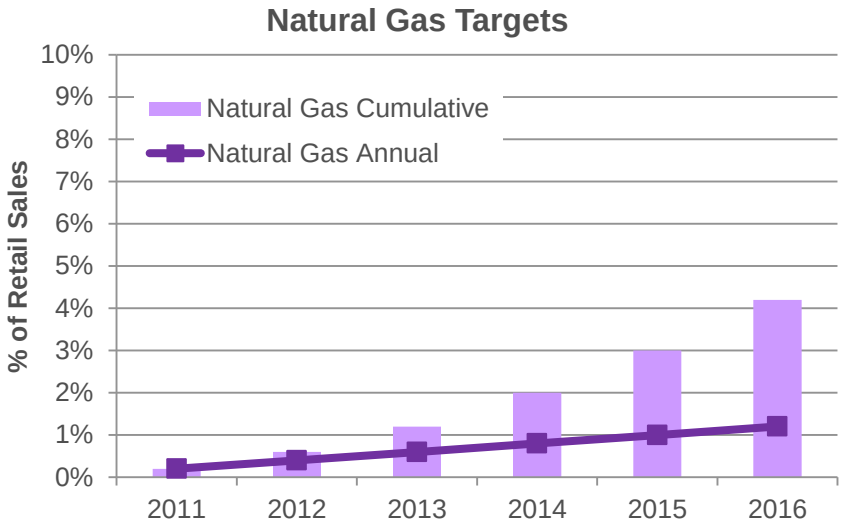
- Goals increase from 1.8% per year in 2014 to 2.0% in 2016



- Electricity program budget is capped at 2.015% of annual revenue

Natural Gas

- Goals increase from 0.8% per year in 2014 to 1.2% in 2016



- Natural gas program budget is capped at 2.0% of annual revenue

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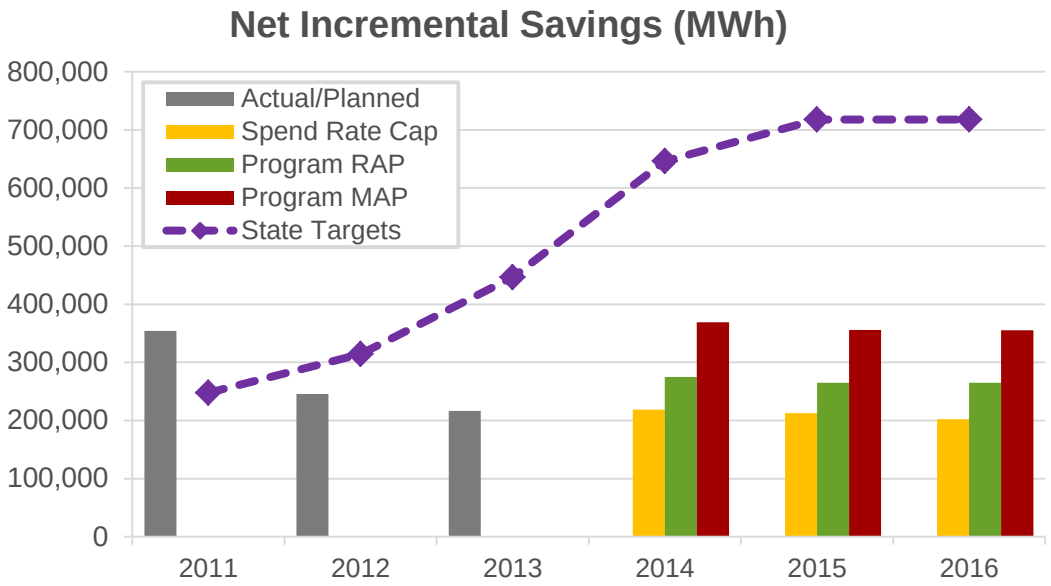
Summary of Achievable Electricity Savings

Net Incremental Savings (MWh)

- Program RAP and MAP in 2014 through 2016
  - Exceed actual savings in 2012 and expected savings for 2013
  - Exceed savings that correspond with the rate cap
  - Fall short of state targets



	2011	2012	2013	2014	2015	2016
Net Incremental Savings (MWh)						
Actual/Planned	354,333	245,871	216,495			
Spend Rate Cap				218,458	212,855	202,125
Program RAP				274,636	265,107	264,857
Program MAP				369,148	356,041	355,453
State Target	**247,786**	**314,112**	**446,230**	**646,044**	**717,827**	**717,827**
Savings as a % of Baseline						
Actual/Planned	1.1%	0.8%	0.7%			
Spend Rate Cap				0.6%	0.6%	0.6%
Program RAP				0.8%	0.7%	0.7%
Program MAP				1.0%	1.0%	1.0%
State Target	**0.8%**	**1.0%**	**1.4%**	**1.8%**	**2.0%**	**2.0%**

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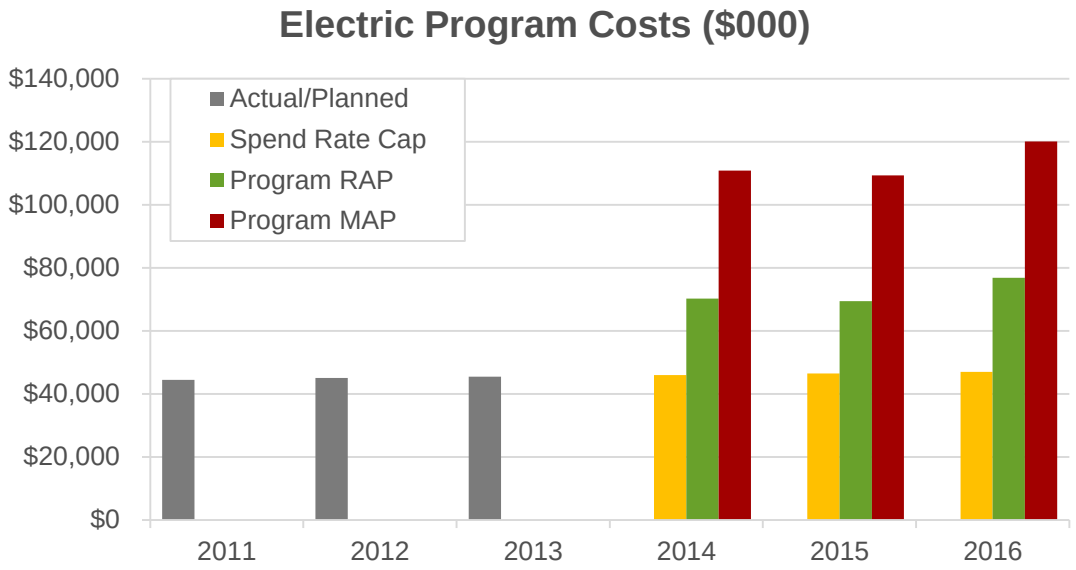
Costs to Achieve Electricity Savings

- Past program spending is consistent with the rate cap
- The costs associated with Program RAP and MAP are much higher than rate cap
- Estimated **minimum** cost to achieve state target is twice as much as Program MAP



	2011	2012	2013	2014	2015	2016
Total Utility Costs (000$)						
Actual/Planned	$44,440	$45,070	$45,450			
Spend Rate Cap	$44,440	$45,070	$45,450	$46,010	$46,490	$46,980
Program RAP				$70,192	$69,398	$76,883
Program MAP				$110,889	$109,280	$120,086
Target (est. min. cost)*				**$198,979**	**$232,711**	**$254,576**
Spending as % of Revenue						
Actual/Planned	2.000%	2.015%	2.015%			
Spend Rate Cap	2.000%	2.015%	2.015%	2.015%	2.015%	2.015%
Program RAP				3.1%	3.0%	3.3%
Program MAP				4.9%	4.7%	5.2%
Target (est. min. cost)*				**8.7%**	**10.1%**	**10.9%**

*Assumes same cost/kWh as for Program MAP case,

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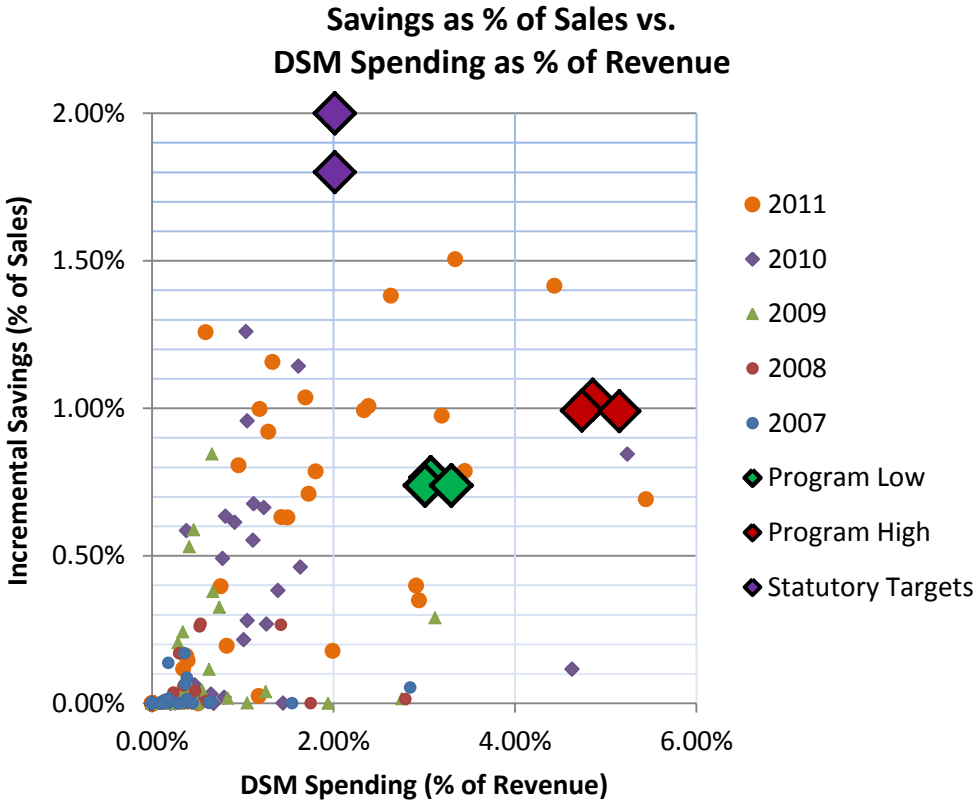
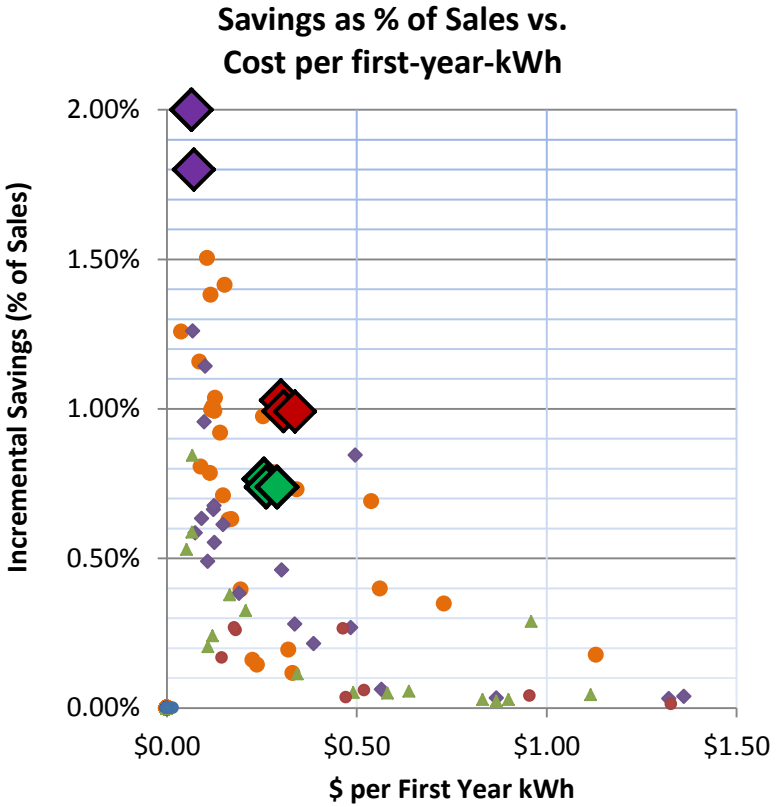
Comparison with Industry Benchmarks





Ameren Illinois Summary	Program Low			Program High			Statutory Targets		
	2014	2015	2016	2014	2015	2016	2014	2015	2016
DSM Spending as % of Revenue	3.07%	3.01%	3.30%	4.86%	4.74%	5.15%	2.02%	2.02%	2.02%
$ per first-year-kWh	$0.26	$0.26	$0.29	$0.30	$0.31	$0.34	$0.07	$0.06	$0.07
Incremental Savings as % of Sales	0.77%	0.74%	0.74%	1.03%	0.99%	0.99%	1.80%	2.00%	2.00%

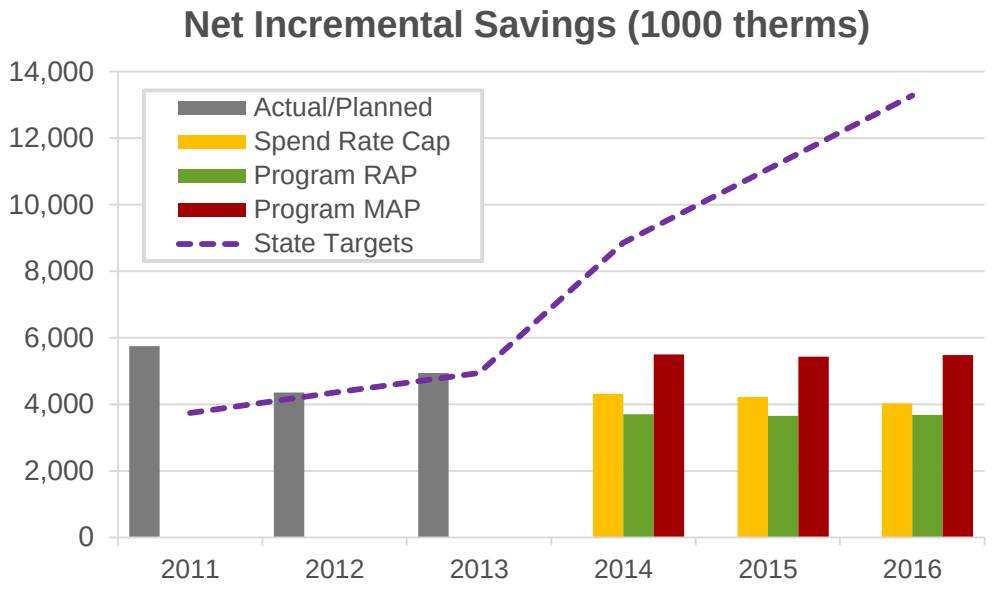
Source: Scatter plot data from EIA Form 861 filings for U.S. electric utilities in 2007-2011 in NERC regions RFC and SERC with over 500,000 customers

NOTE: We do not have an equivalent data source that tracks natural gas EE programs like EIA Form 861 does for electric.

Summary of Achievable Natural Gas Savings

Net Incremental Savings (1000 Therms)

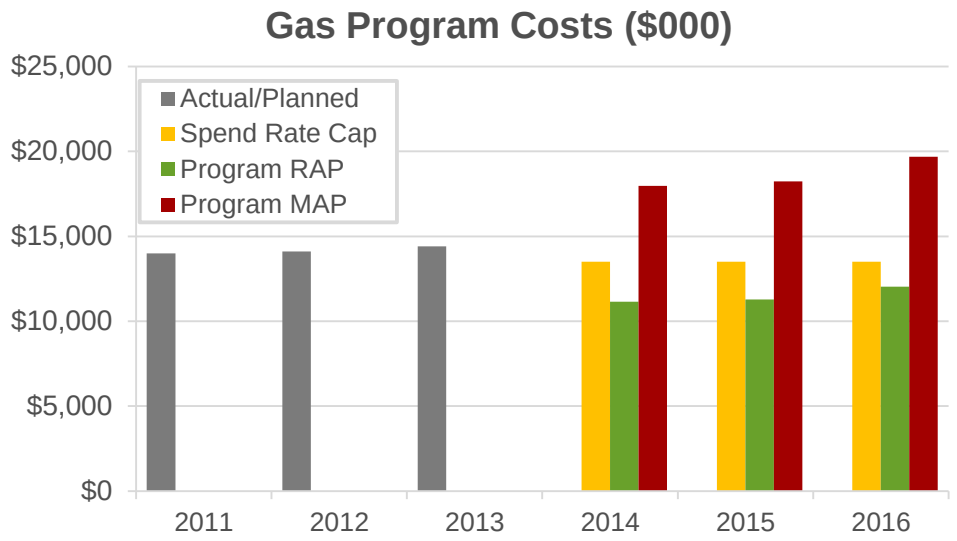
- Program RAP 2014 through 2016 is less than history and lower than rate-cap savings
- Program MAP exceeds average actual/expected savings for 2011-2013
- Program RAP and MAP fall far short of state targets



	2011	2012	2013	2014	2015	2016
Net Incremental Savings (MWh)						
Actual/Planned	5,751	4,356	4,942			
Spend Rate Cap				4,319	4,220	4,029
Program RAP				3,700	3,650	3,684
Program MAP				5,496	5,434	5,478
State Target	**3,735**	**4,356**	**4,942**	**6,590**	**7,908**	**9,489**
Savings as a % of Baseline						
Actual/Planned	0.3%	0.4%	0.6%			
Spend Rate Cap				0.4%	0.4%	0.4%
Program RAP				0.3%	0.3%	0.3%
Program MAP				0.5%	0.5%	0.5%
State Target	**0.2%**	**0.4%**	**0.6%**	**0.8%**	**1.0%**	**1.2%**

Costs to Achieve Natural Gas Savings

- Past program spending is consistent with the rate cap
- The costs associated with Program RAP are less than the rate cap
- Program MAP cost is higher than the rate cap but significantly less than the estimated minimum cost to achieve state targets



	2011	2012	2013	2014	2015	2016
Total Utility Costs (000$)						
Actual/Planned	$14,000	$14,100	$14,400			
Spend Rate Cap				$13,500	$13,500	$13,500
Program RAP				$11,150	$11,280	$12,030
Program MAP				$17,977	$18,230	$19,680
Target (est. min. cost)*				**$22,133**	**$27,869**	**$36,776**
Spending as % of Revenue						
Actual/Planned	2.0%	2.0%	2.0%			
Spend Rate Cap	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Program RAP				1.7%	1.7%	1.8%
Program MAP				2.7%	2.7%	2.9%
Target (est. min. cost)*				**3.3%**	**4.1%**	**5.4%**

*Assumes same cost/therm as for Program MAP case,

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Conclusions

Electricity

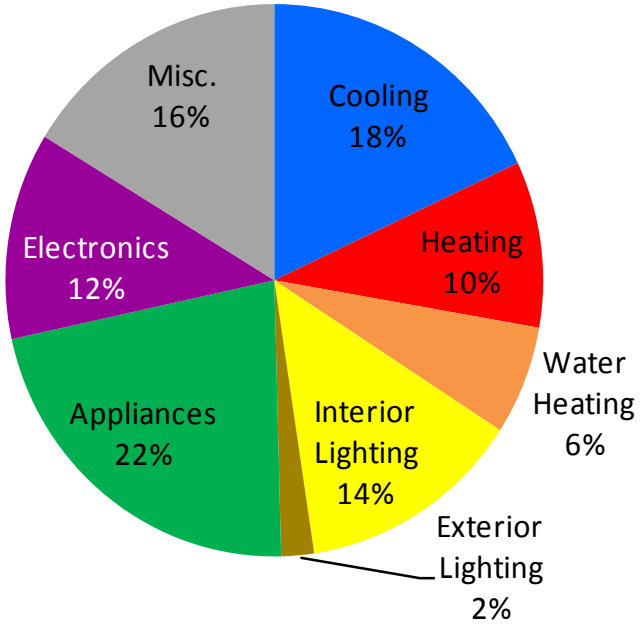
- To achieve program potential will require spending significantly more than the rate cap
  - Program MAP requires twice the rate cap level (~5% of revenue)
- State targets are substantially higher than Program MAP potential estimates

Natural Gas

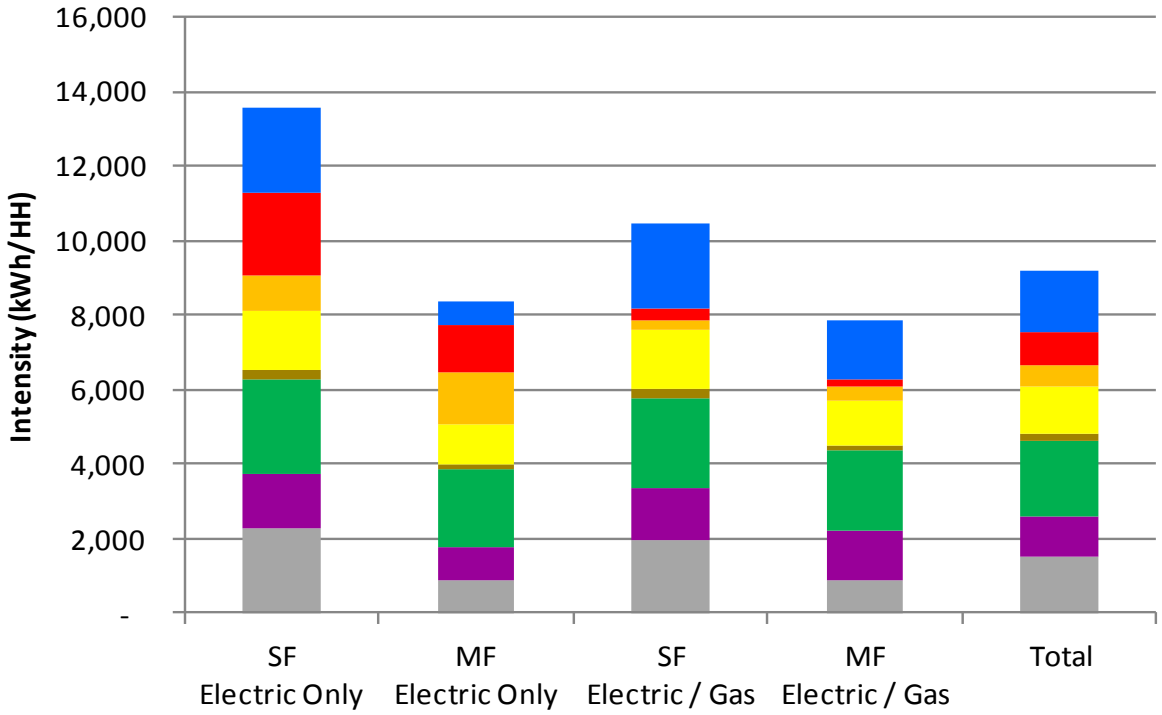
- Program RAP can be met with the rate-cap budget
- Program MAP exceeds the rate-cap budget by ~50%
- State targets are substantially higher than Program MAP

Appendix

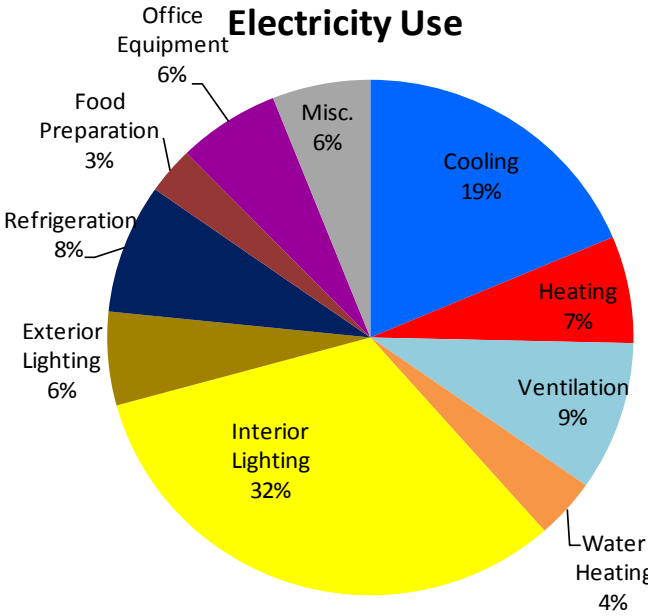
Residential End-Use Market Profiles for Electricity



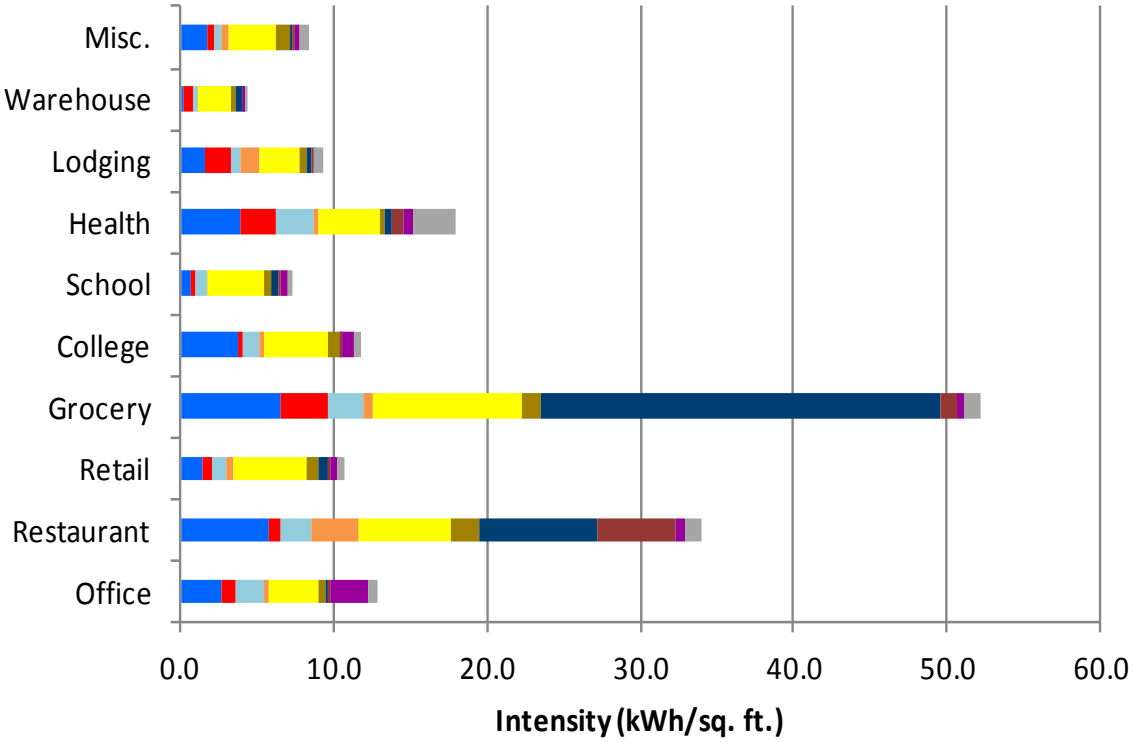
- White-goods appliances as a whole account for the largest share of residential use
- Use per household varies considerably by segment



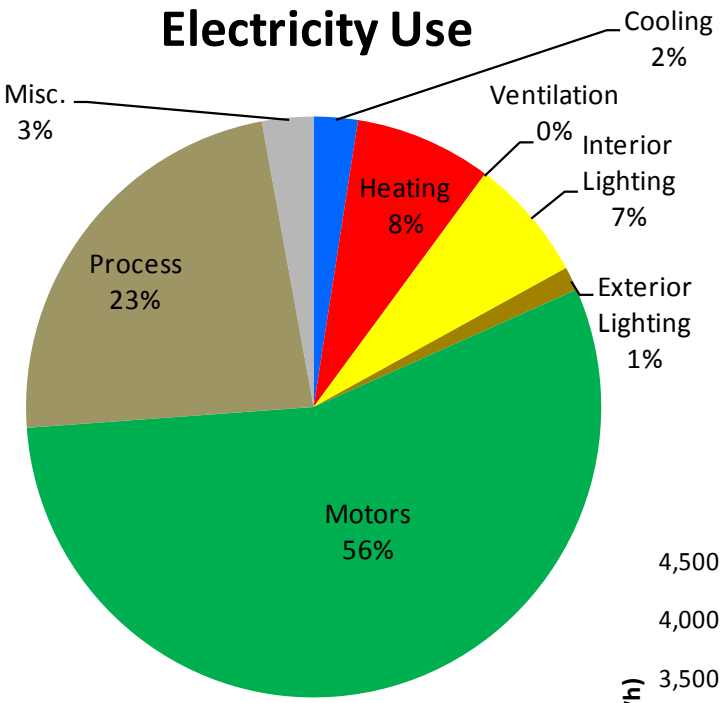
Commercial End-Use Market Profiles for Electricity



- Across the sector, lighting is the dominant end use
- In segments, use varies considerably by end use

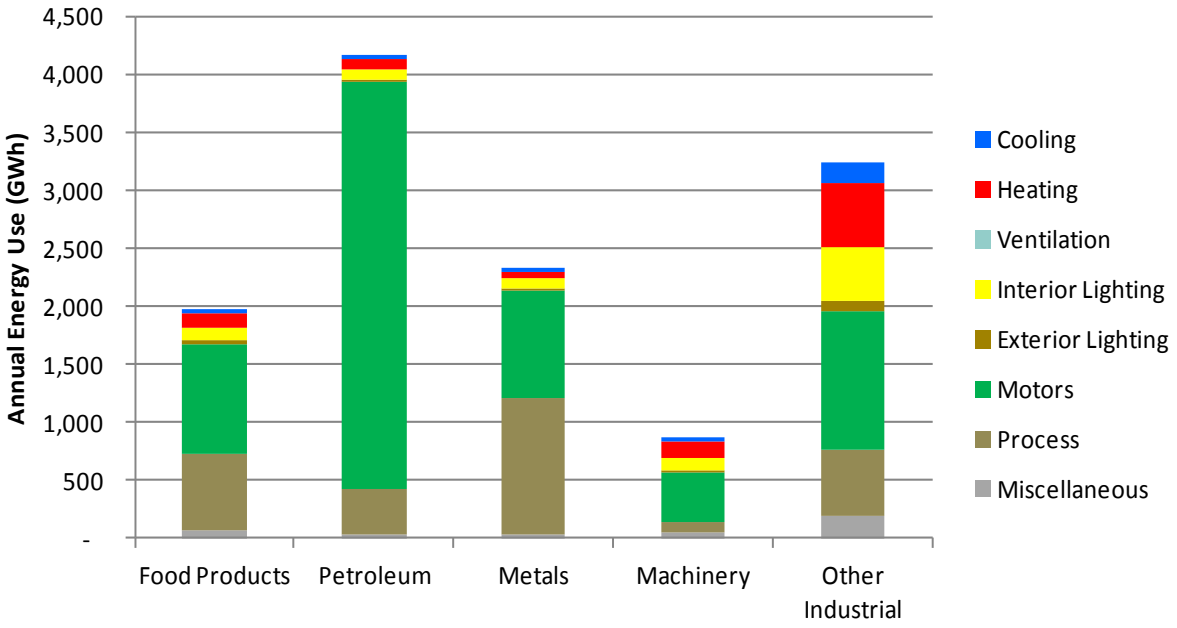


Industrial End-Use Market Profiles for Electricity



All variety of motor applications accounts for the largest share of electricity use

In segments, use varies somewhat but motors dominate



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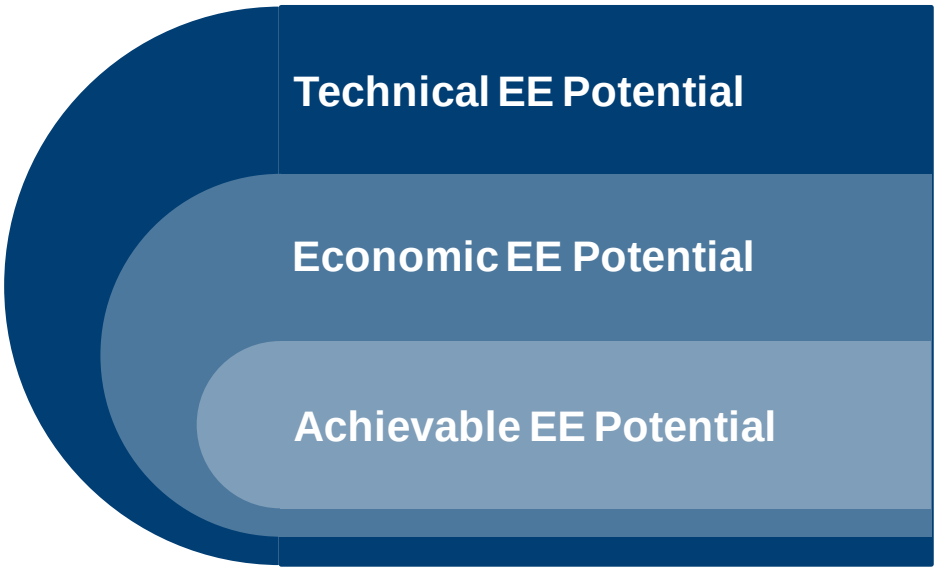
Overview of Achievable Potential Estimation

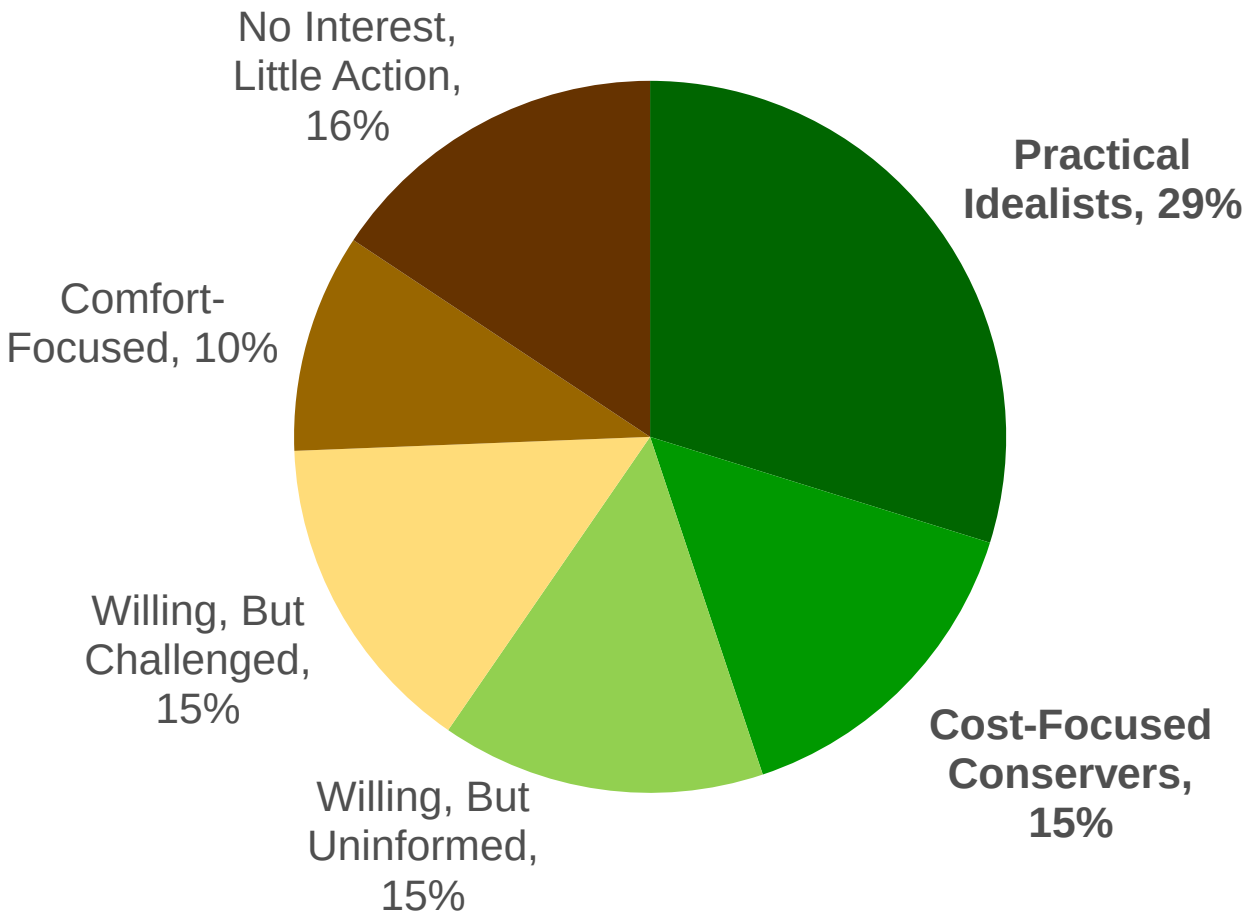
- Achievable potential is the subset of economic potential that can be reasonably achieved given the realities of customer preferences, market adoption, limited information and education, and program implementation barriers
- We developed a range because predicting human behaviors and responses to market conditions is inherently uncertain
  - **Program Realistic Achievable Potential (RAP)** = expected program participation with significant barriers to customer acceptance, non-ideal implementation conditions and finite program budgets
  - **Program Maximum Achievable Potential (MAP)** = expected program participation given ideal implementation conditions and customer preferences for EE technologies and programs
    - Establishes a maximum target for savings that program administrators can hope to achieve
    - Corresponds to relatively high incentive, administrative and marketing costs
- Customer acceptance rates define transition from economic to achievable potential



Development of Customer Acceptance Rates

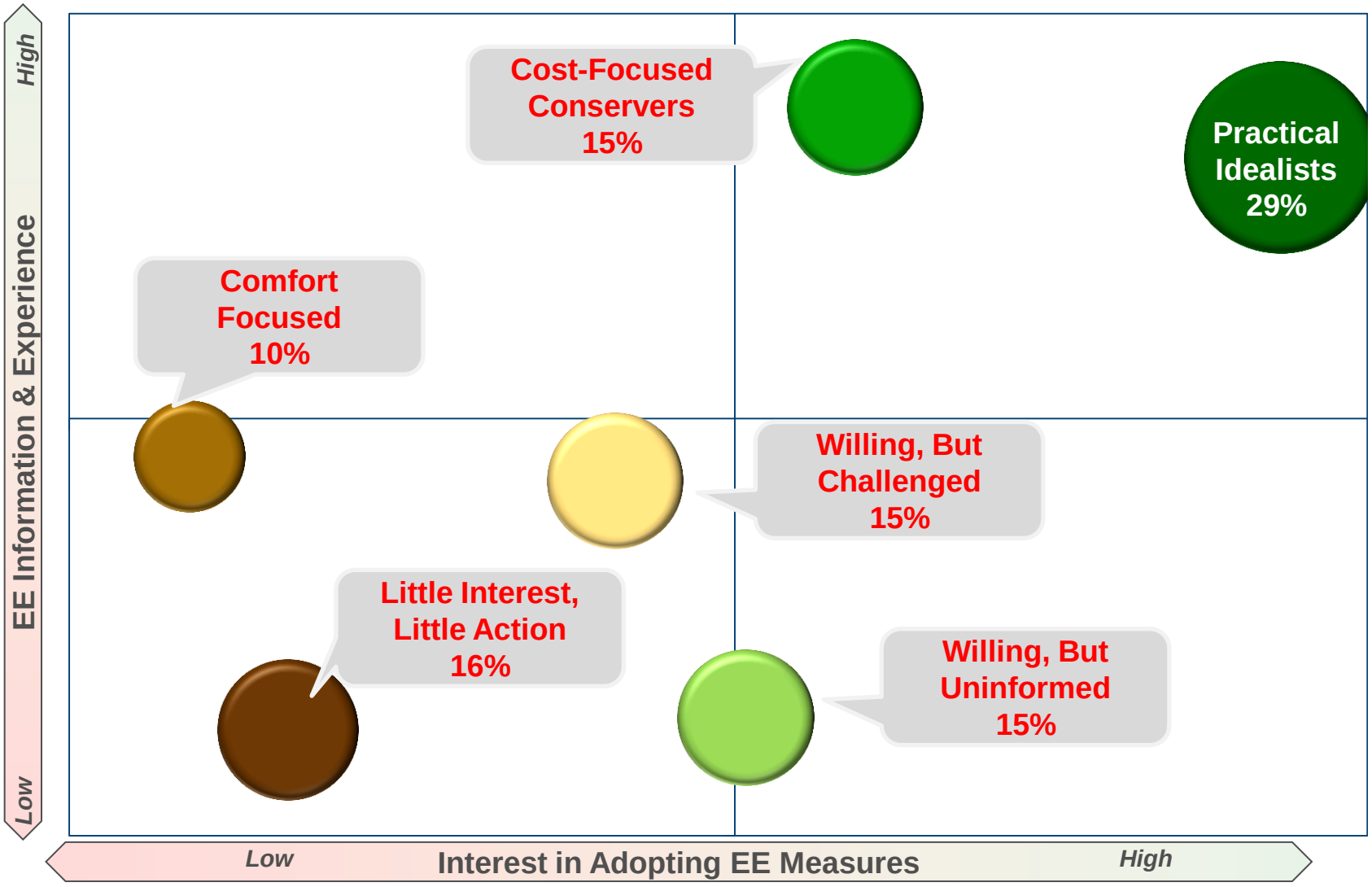
- Program-interest surveys provide the foundation for customer acceptance rates
- Program-interest survey respondents were asked about
  - Equipment holdings
  - Recent EE purchase behavior
  - Attitudes toward EE and attitudes about Ameren Illinois
  - Likelihood that they would participate in a variety of energy efficiency / conservation programs
- Surveys captured information on the stated likelihood that respondent would adopt this measure either immediately on offer or at appliance end of life was captured
- Initial customer responses were then adjusted to account for the “say / do” overstatement issue. Adjustments are based on proprietary research conducted by YGDI and depends on:
  - The rating they provided for that program
  - Their level of familiarity with the product category (in this case, energy efficiency)
  - The regularity of their purchase . Lighting purchases are more “regular” so a different adjustment factor was used
- The “likely taker” values shown below represent these “adjusted” values

Residential Customer Segment Profile



If programs continue as currently run, we would not expect significant participation from the 56%

Sorting the Residential Customer Segments



Bubble size represents segment size

Residential Take Rates from Program Interest Surveys

Likely Takers

(Total Residential Customers; n range=134-749)

Overall maximum and minimum

Maximum take rate for a single program: *47%*

(Turn down the heating or cooling while sleeping or away from home / away; at a 1 year payback period)

Minimum take rate for a single program: *20%*

(Install a whole house / attic fan to improve air flow in your home; at a 5 year payback period)

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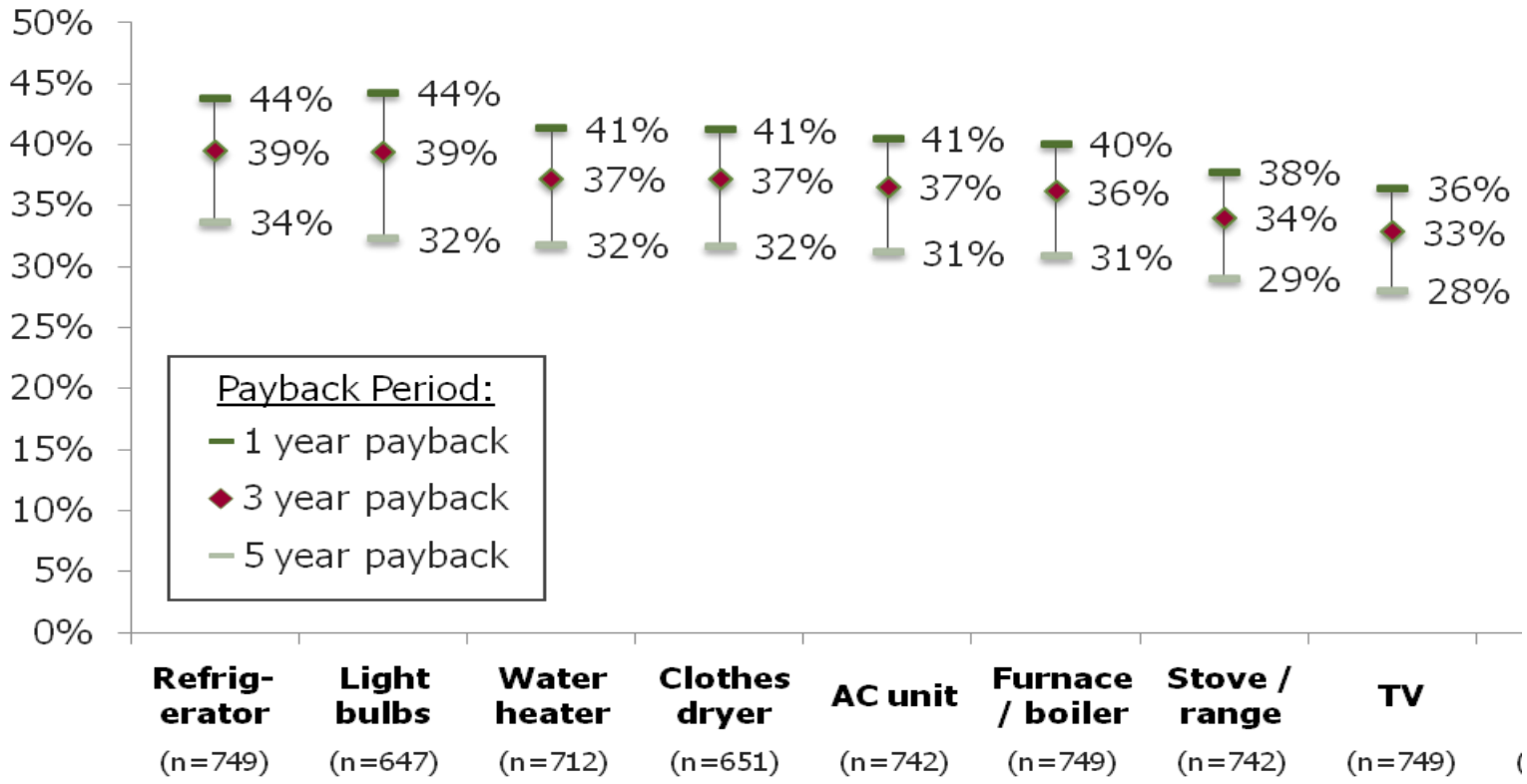
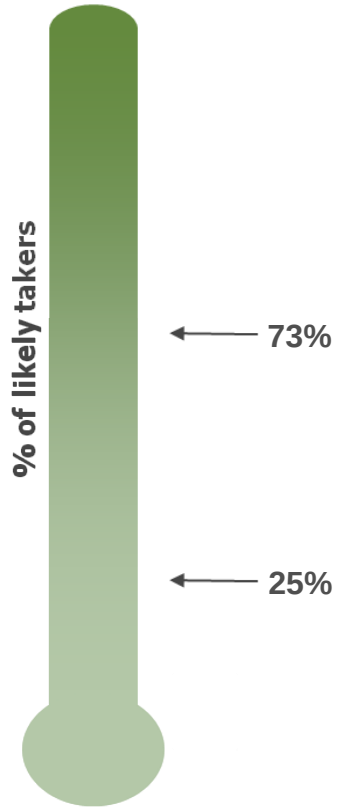
Residential Take Rates for Specific Programs



Business Take Rates from Program Interest Surveys



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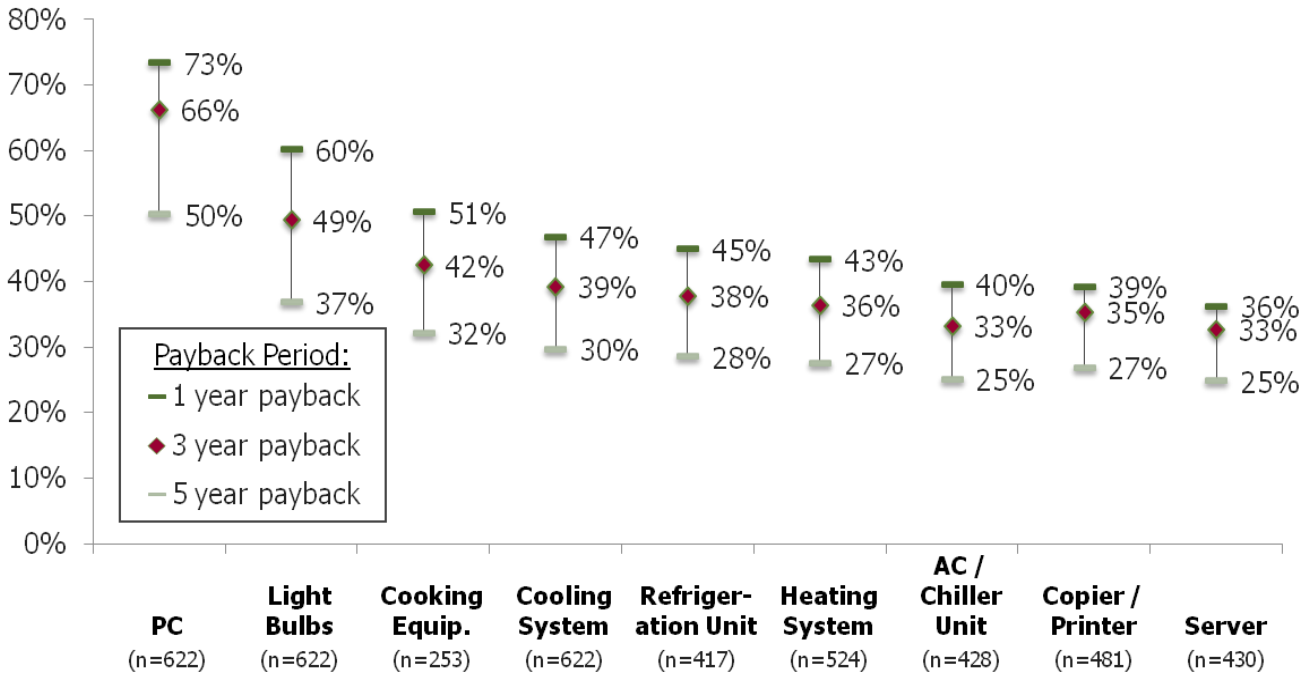

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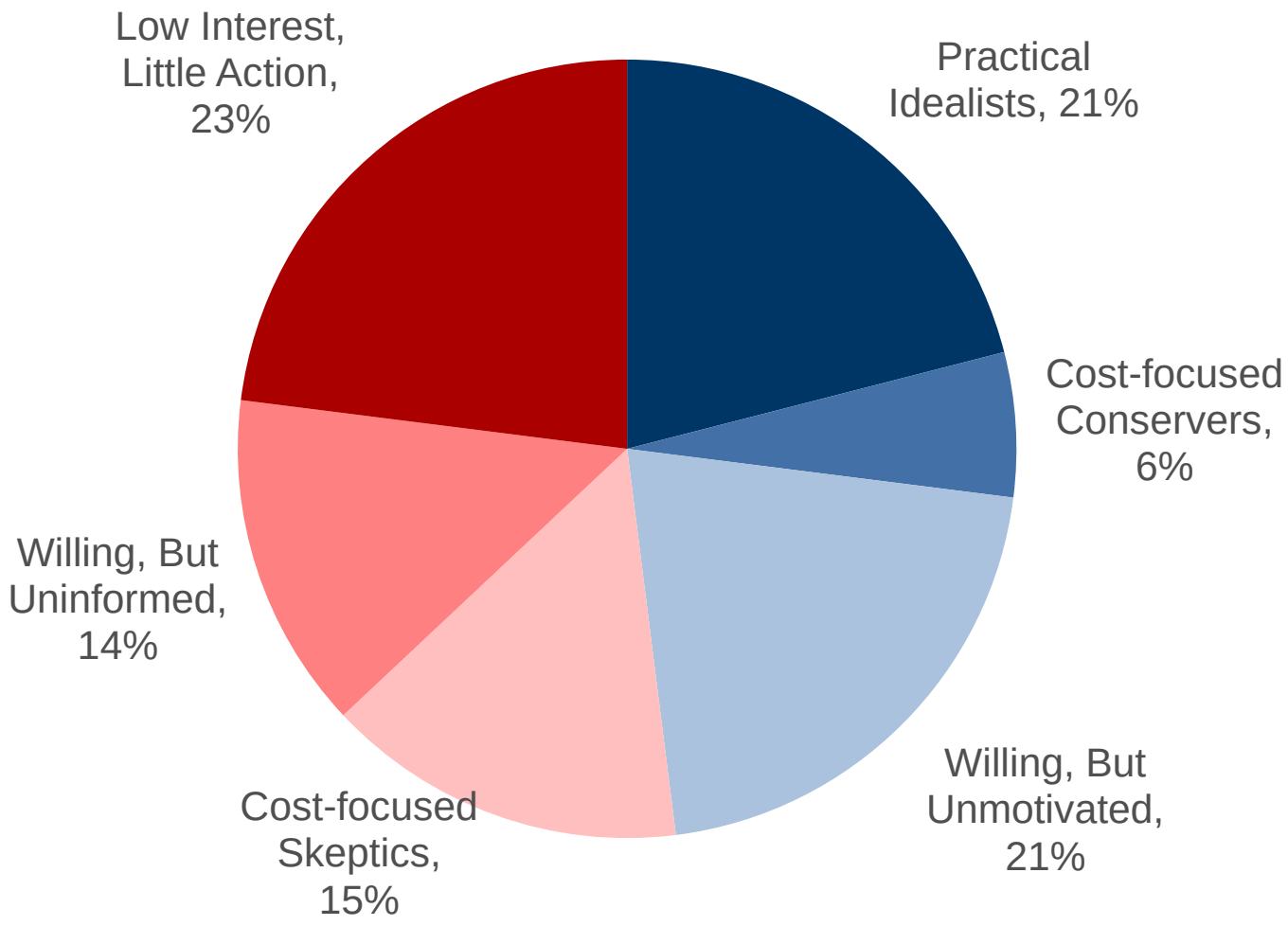
Business Customer Segment Profile



If programs continue as currently run, we would not expect significant participation from the 52%

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