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Ameren Illinois Market Potential Study

Study Overview and Preliminary
Residential Potential Estimates

October 27, 2015

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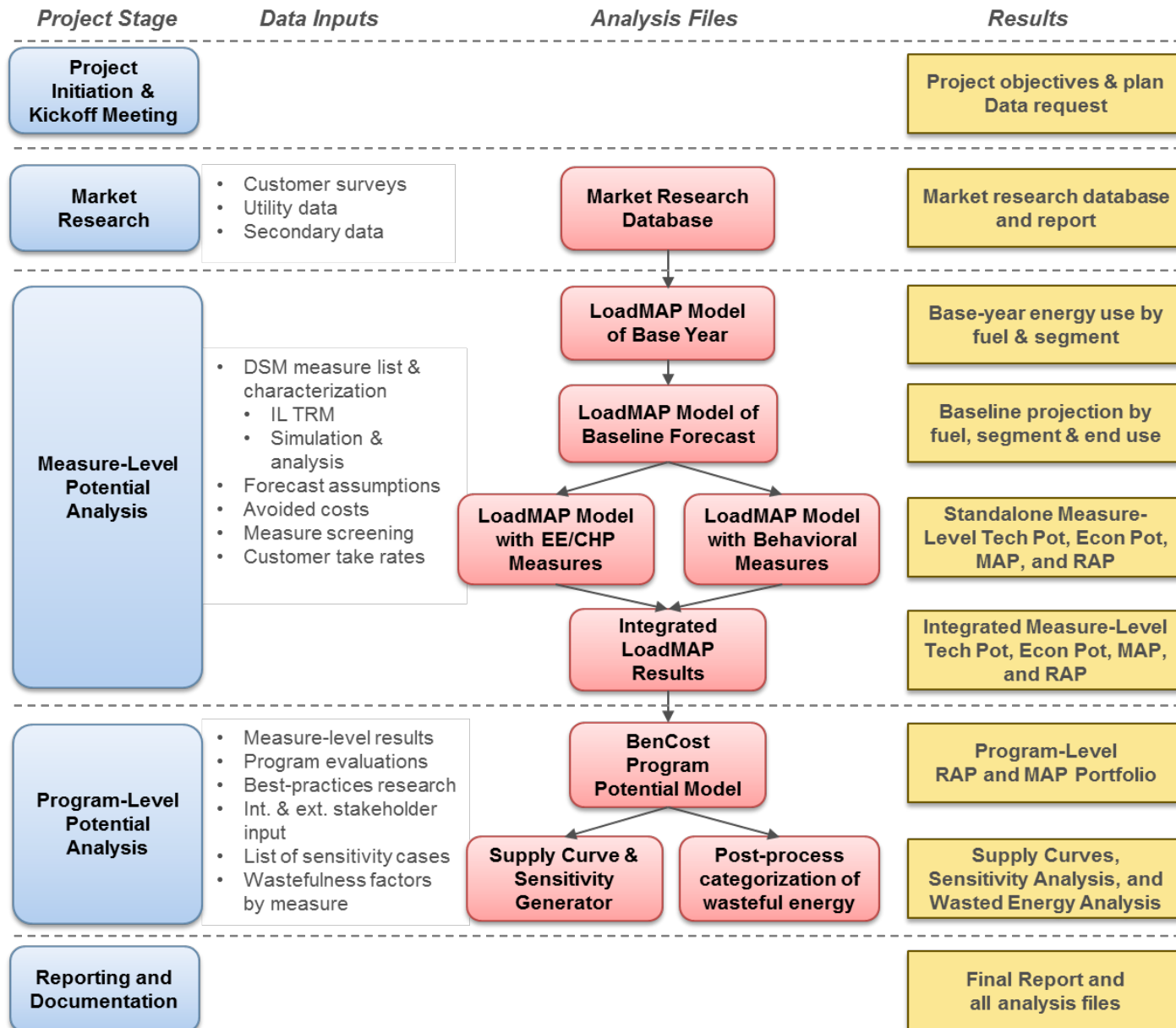
Topics

- Introductions
- Study Objectives
- Overview of Analysis Approach
- Preliminary Results for the Residential Sector
 - Customer surveys
 - Market characterization
 - Baseline projection
 - Potential estimates

Recap of Study Objectives

- The focus of this Study is to assess:
 - Traditional end-use energy efficiency potential
 - Behavioral energy efficiency potential including Home Energy Reports & Demand-side Rates
 - Combined heat and power (CHP) potential in the C&I sectors
- The Study:
 - Covers both electric and natural gas end uses
 - Assesses the technical potential, economic potential, maximum achievable potential (MAP), and realistic achievable potential (RAP) in each of the residential, commercial, and industrial sectors for the Ameren Illinois service area
 - Identifies all cost-effective measures both at the measure and program levels
 - Satisfies planning requirements with respect to Illinois DSM-related legislation for Plan Years 10 through 12

Overview of AEG Analysis Approach



Recap of Market Research Approach

- Our philosophy for this study:
 - Leverage past surveys and existing research
 - Add new survey content that “moves the ball forward” in terms of our ability to support more refined market potential estimates, as well as downstream program design and marketing
- We used one survey per sector to capture equipment saturations and attitudinal/behavioral data
- High priority items:
 - Better support the transition from economic potential to achievable potential
 - Place emphasis on the role of customer awareness
 - Give explicit consideration to the impact of non-economic program features on customer choices
 - Consider previous feedback from AIC stakeholders regarding participation rates

Customer Class	Survey Strategy	Number of Surveys Completed
Residential	Mail to web	1,004
Business	Mail to web	798
Very Large Business	Onsite surveys and telephone interviews	50

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Saturation Survey Results and
Residential Baseline Characterization

Residential Customer Survey

Saturation highlights

- The latest saturation survey shows a decline in incandescent lamps and an increase in both CFLs and LEDs

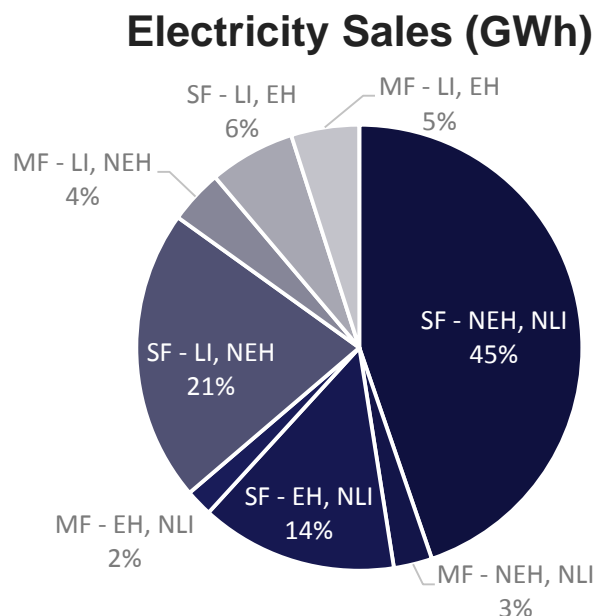
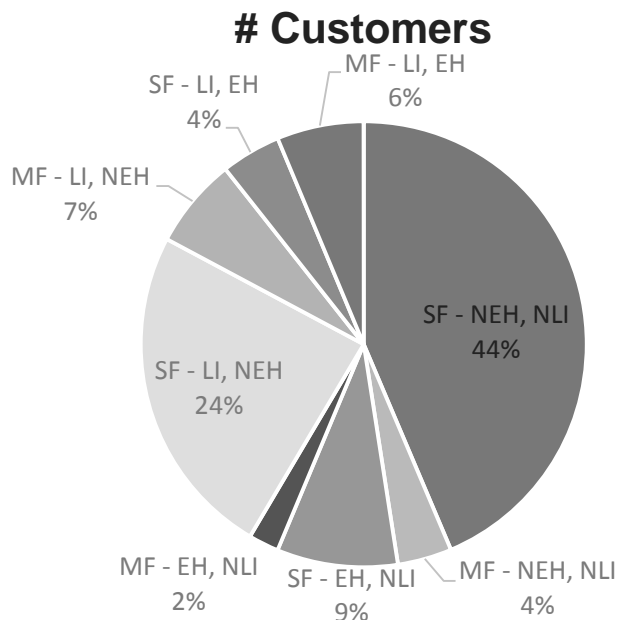
Distribution of Residential Indoor Lighting Technologies

Home Size	Compact fluorescent lamps (CFLs)	Conventional / Incandescent lamps	LED screw-in	Tube fluorescent lamps	Halogen lamps	Panel / Tube LEDs	Other	TOTAL
Less than 1,000 sq. ft.	51%	31%	6%	6%	4%	0%	2%	100%
1,000-1,999 sq. ft.	42%	30%	11%	10%	5%	1%	1%	100%
2,000-2,999 sq. ft.	39%	31%	14%	9%	5%	1%	1%	100%
3,000+ sq. ft.	38%	31%	15%	10%	4%	1%	1%	100%
All Homes	39%	29%	12%	9%	4%	1%	3%	100%

- Electronics saturations have changed:
 - Heavy reductions in desktop PCs and cable set top boxes
 - Shift toward smaller, mobile devices such as tablets and smart phones
 - “Cord cutting,” where more consumers are using streaming, internet-based services rather than cable, DVDs, DVRs, and the like
- Approximately 1% of Ameren Illinois residential customers have a Solar PV system installed and 1% have a plug-in Electric Vehicle

Residential Market Characterization – Electricity

Segment	Number of Customers	Electricity Sales (GWh)	% of Total Usage	Avg. Use / Customer (kWh)	Peak Demand Summer (MW)	Peak Demand Winter (MW)
Single Family – Non-Elec Heat, Non-Low Income	463,394	5,232	45%	11,290	1,588	1,130
Multi Family– Non-Elec Heat, Non-Low Income	41,784	325	3%	7,776	72	88
Single Family - Elec Heat, Non-Low Income	93,187	1,669	14%	17,907	267	558
Multi Family - Elec Heat, Non-Low Income	23,431	229	2%	9,784	32	84
Single Family - Low Income, Non-Elec Heat	258,192	2,475	21%	9,586	783	498
Multi Family - Low Income, Non-Elec Heat	69,582	459	4%	6,603	148	107
Single Family - Low Income, Elec Heat	46,114	728	6%	15,796	112	238
Multi Family - Low Income, Elec Heat	66,960	578	5%	8,630	79	205
Total	1,062,644	11,695	100%	11,006	3,082	2,908

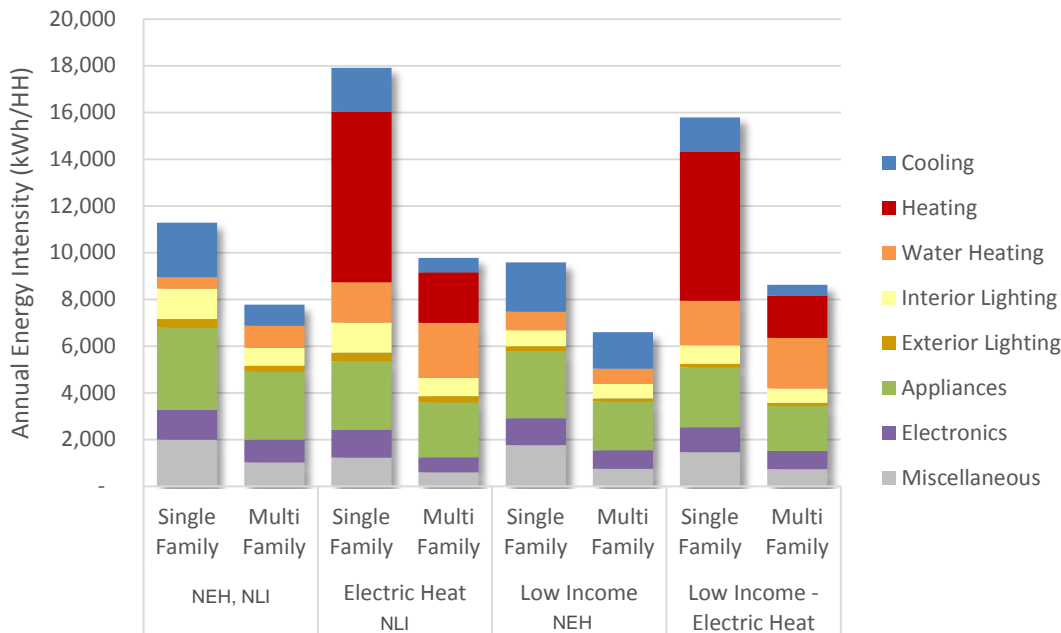


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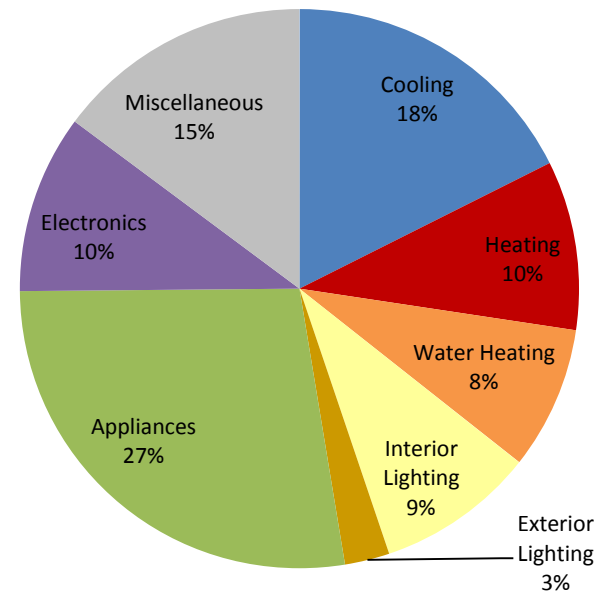
Residential Market Profile – Electricity

- Lighting has become a smaller share of total use, reflecting EISA standard and customer adoption of CFLs and, increasingly, LEDs
- Electronics has become a smaller share of total use as well as customers shift away from desktop computers to smaller devices
- On a weather-adjusted basis, average use per customer is about 4% lower compared to last study (base year 2011)

Annual Household Intensity by End Use (kWh/HH)

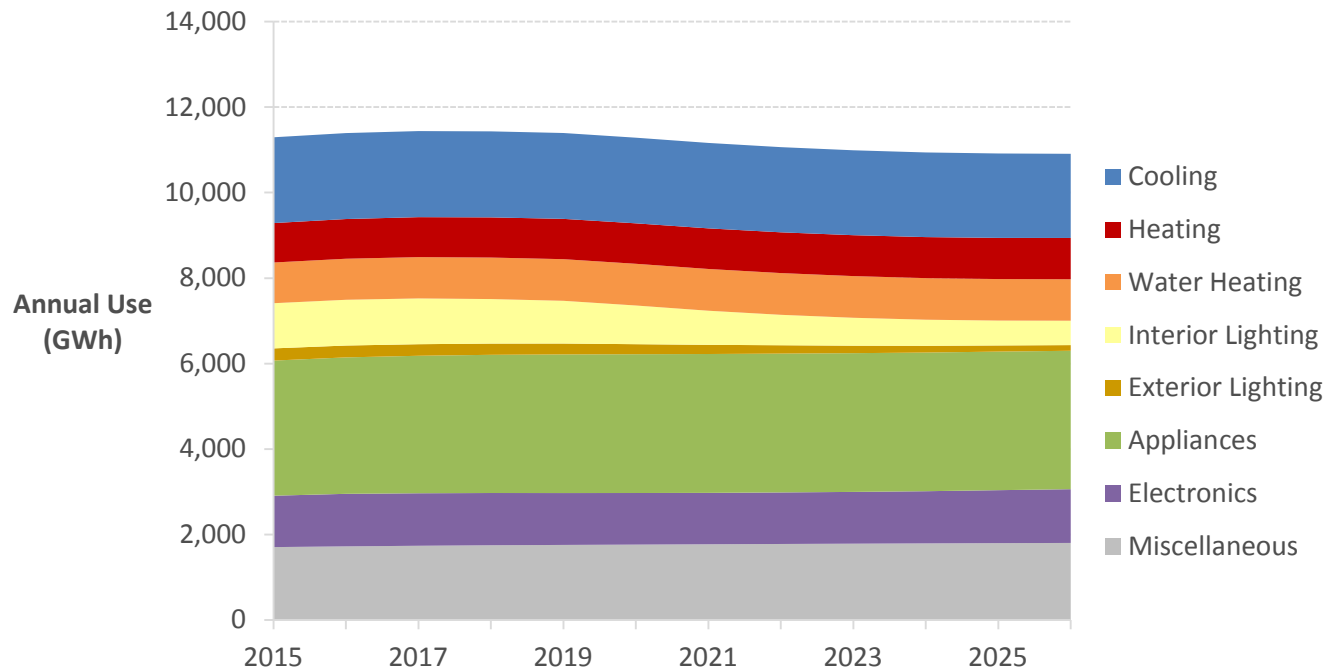


Annual Consumption by End Use (%)



Residential Baseline Electricity Projection

- The study's baseline projection aligns with Ameren Illinois' most recent load forecast
- The baseline projection includes effects of appliance standards, EISA and naturally occurring efficiency
- Baseline projection decreases by 3.4% from 2015 to 2026, average growth of -0.3% per year

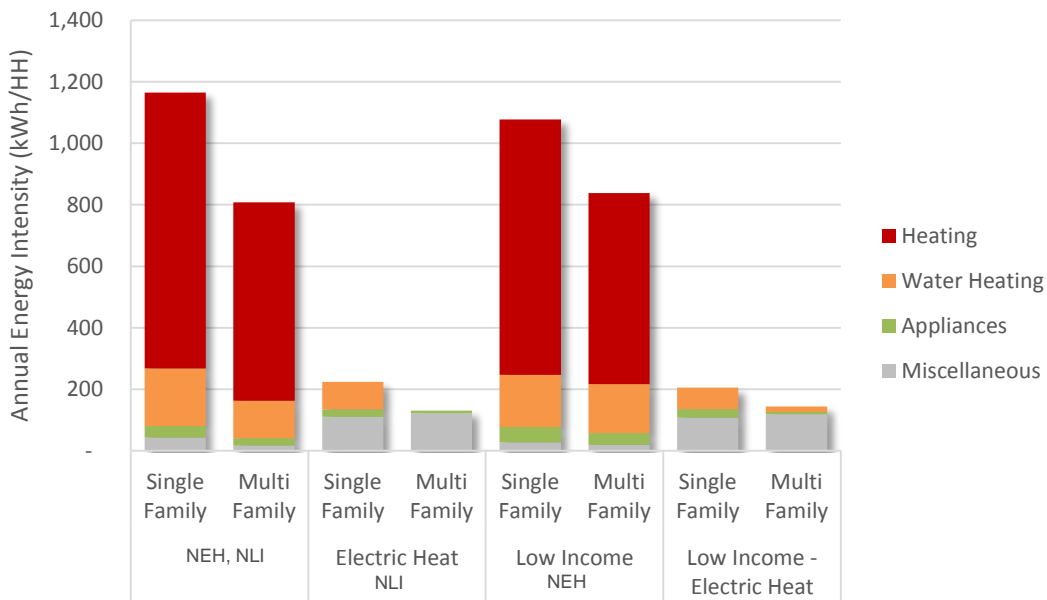


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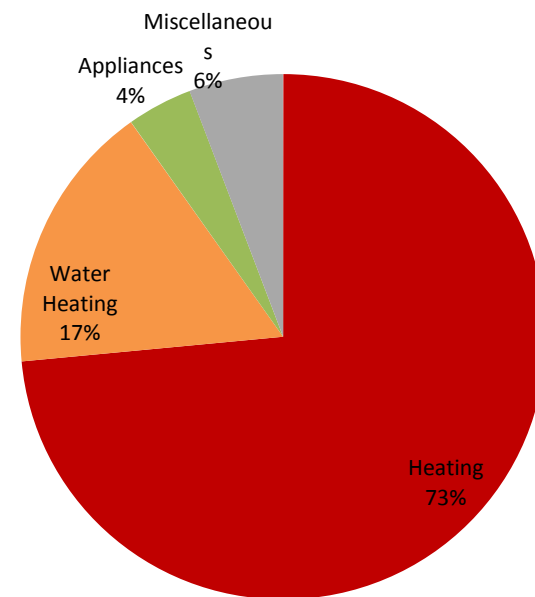
Residential Market Profile – Natural Gas

Segment	Number of Customers	Natural Gas Sales (MMtherms)	% of Total Usage	Avg. Use / Customer (therms)
Single Family – Non-Elec Heat, Non-Low Income	325,787	379	57%	1,165
Multi Family– Non-Elec Heat, Non-Low Income	29,376	24	4%	807
Single Family - Elec Heat, Non-Low Income	65,515	15	2%	224
Multi Family - Elec Heat, Non-Low Income	16,473	2	0%	130
Single Family - Low Income, Non-Elec Heat	181,521	196	29%	1,078
Multi Family - Low Income, Non-Elec Heat	48,919	41	6%	838
Single Family - Low Income, Elec Heat	32,420	7	1%	205
Multi Family - Low Income, Elec Heat	47,076	7	1%	144
Total	747,088	670	100%	897

Annual Household Intensity by End Use (kWh/HH)

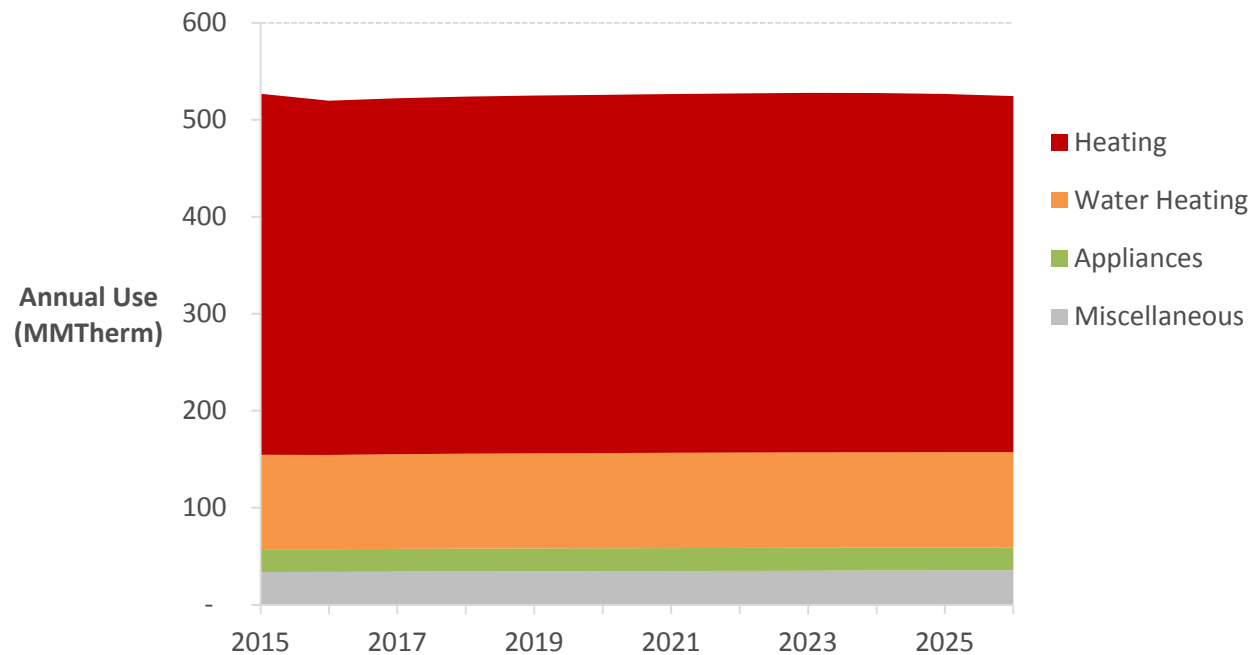


Annual Consumption by End Use (%)

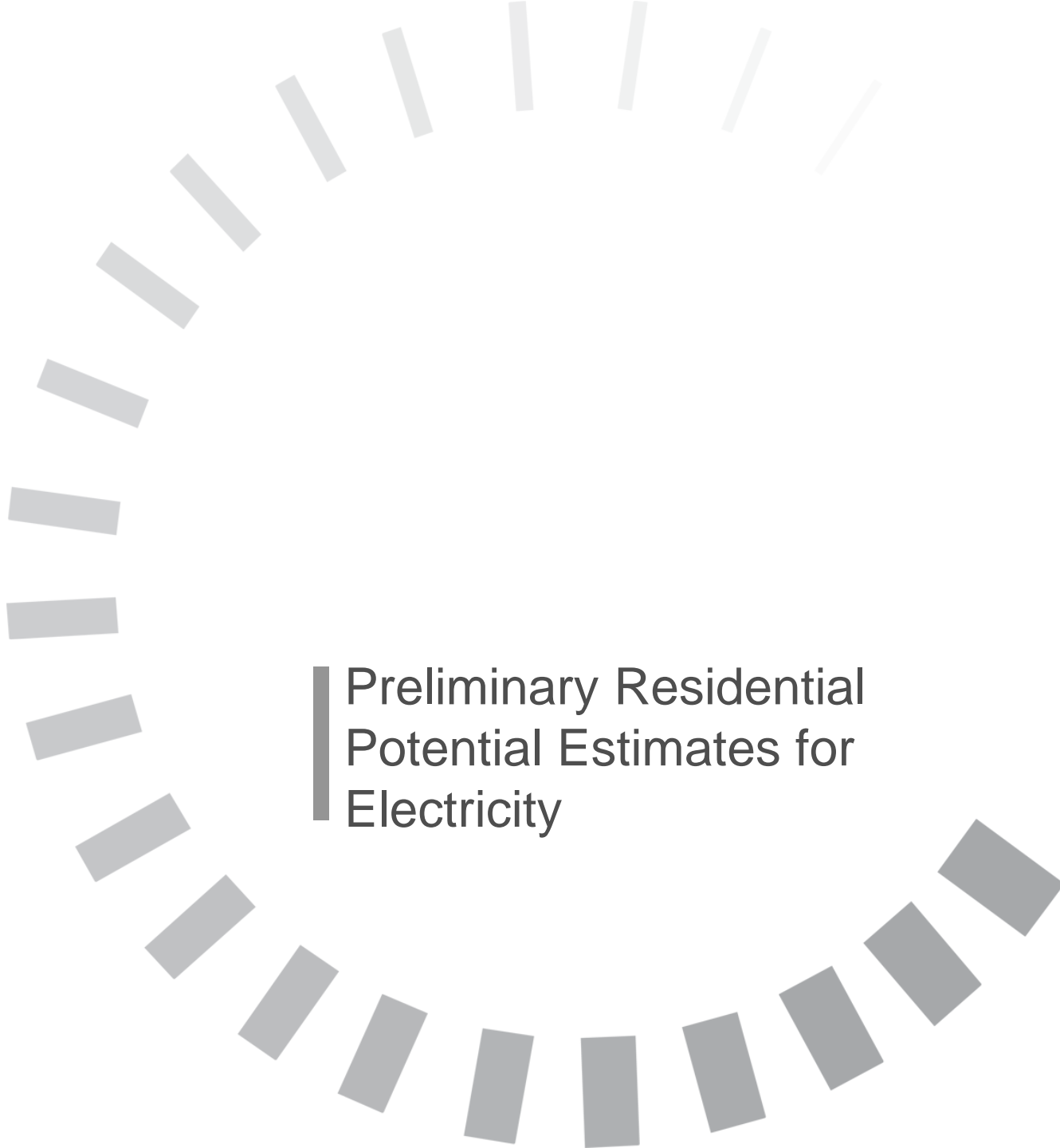


Residential Baseline Projection – Natural Gas

- Baseline projection aligns with Ameren Illinois' most recent load forecast
- It includes effects of appliance standards and naturally occurring efficiency
- Baseline load decreases by 0.5% from 2015 to 2026

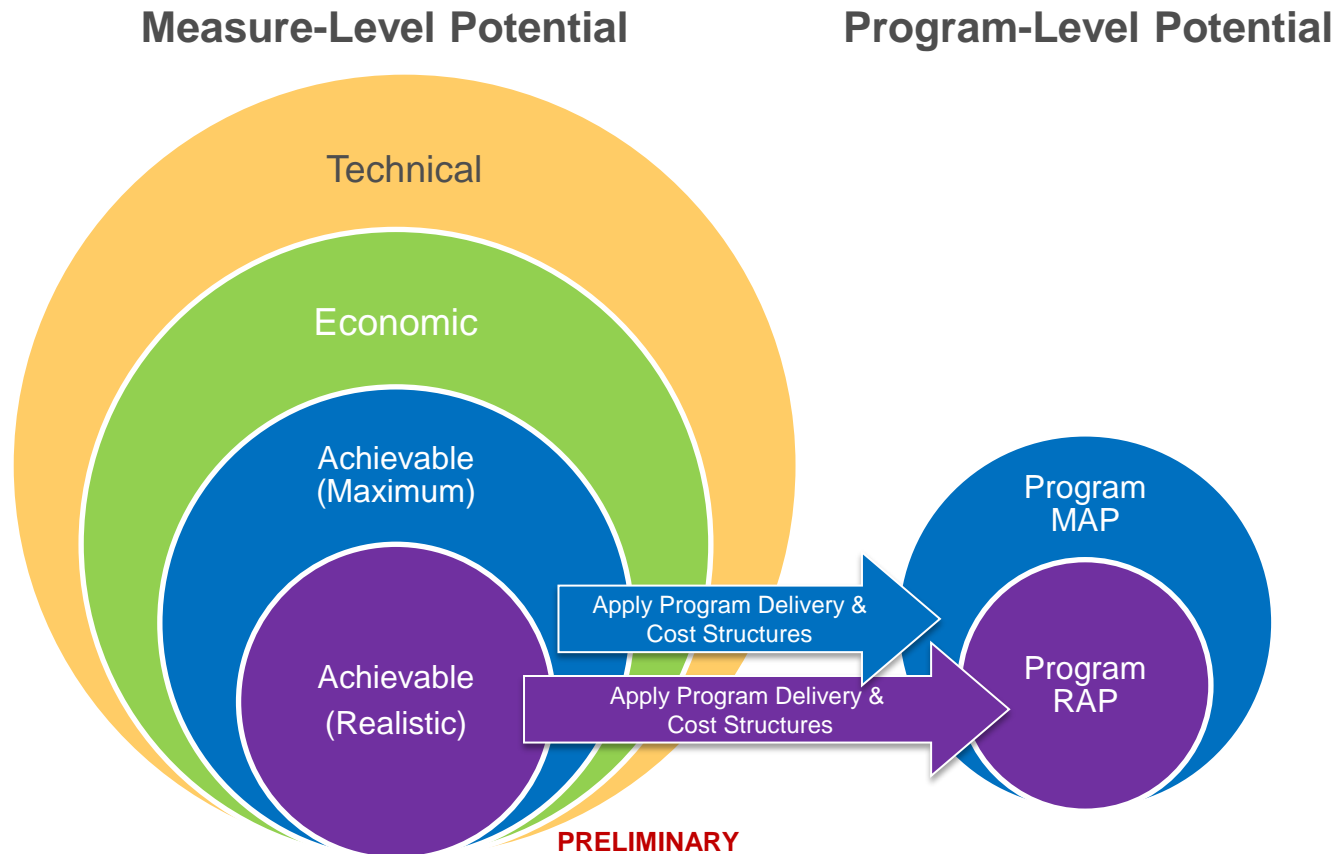


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The Levels of Potential

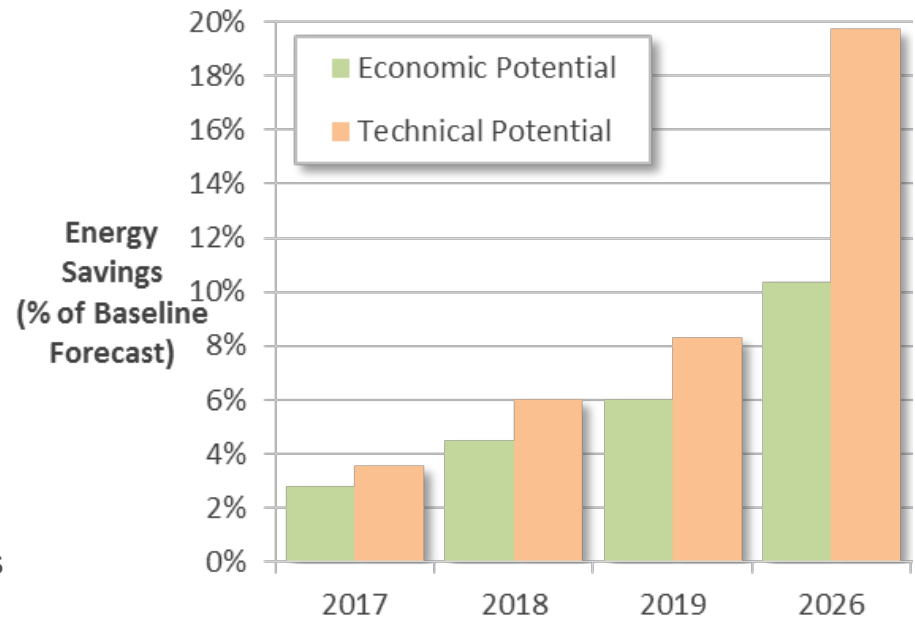
- Technical & economic potential are theoretical constructs. Savings cannot be realized in actual markets.
- Achievable potential at the measure-level is calculated by applying take-rates for achievable customer adoption.
- Measure-level potential must be translated into programs with realizable delivery, measure-bundling, and cost structures.



Residential Electricity Measure-Level Potential

Technical and Economic Potential

- Technical potential is 8.3% by end of next 3-year cycle. Reaches 19.7% by 2026.
- Top 5 measures include:
 - LED lamps
 - Behavioral programs
 - Central air conditioners
 - Smart thermostats
 - Heat pump water heaters
- Economic potential is 6.0% by end of next 3-year cycle and 10.4% by 2026.
 - LEDs, Behavioral, and Smart thermostats pass to Economic potential largely unchanged.
 - ACs: Lower SEER levels are cost effective than technical case
 - HPWHs not cost effective



Market Adoption Rates

Overview of Approach

- Estimating take rates using customer information is an important, and controversial, aspect of a potential study
- Common methods for developing adoption rates are:
 - Use past program accomplishments
 - Use customer surveys
 - Borrow from other studies
 - Use Delphi approach or survey of experts
 - Use judgment
- This Ameren Illinois study uses a hybrid approach

Residential Customer Survey (cont'd)

Approach for estimating adoption rates using customer-survey data & Ameren information

1) Start with surveys of Ameren Illinois Customers...

EXAMPLE QUESTION FORMAT:

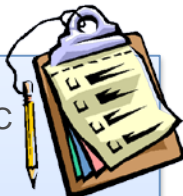
Suppose you need to replace your HVAC system...

<Begin with baseline rebate program description focusing on Economic Payback, then move on to understand the additional impact of Delivery Mechanism, Non-energy Factors, and/or Contextual Factors>

What is your likelihood of purchasing the high efficiency unit instead of the standard efficiency unit?

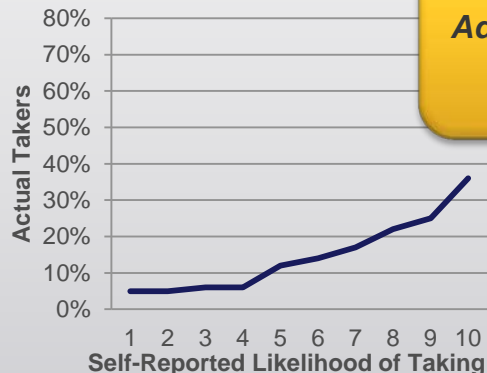
Not At All Likely To Do This										Extremely Likely To Do This	
1	2	3	4	5	6	7	8	9	10		

**Example
Unadjusted
Average Take Rate:
62%**



2a) Previous 2013 Study Method:

Implement Adjustment for Respondent Over-Optimism based on panel research (*The Say/Do Problem*)



**Example Average
Adjusted Take Rate:
37%**

2b) Current Study Method:

Calibrate Survey Responses to real-life Ameren Illinois Participation Data

Ameren Illinois
DSM Program
Data

**Example Average
Adjusted Take Rate:
39%**

Realistic Achievable Take Rates

Survey Anchor Question: Calibrate Survey Responses to Reality

	Average Unadjusted Take-Rate from Survey	Actual PY4 and PY5 Participation in this specific program	Survey Adjustment Factor
% of Homes Participating in Ameren Illinois CFL program	79%	39%	0.50

RAP Take Rates for Other Measures

Take Rates	Unadjusted Take Rate		Adjusted Take Rate (RAP with 3-year payback & reference conditions)	
	Low Income	High Income	Low Income	High Income
HVAC	60%	75%	30%	37%
Refrigerator	60%	74%	30%	37%
PC	59%	68%	29%	34%
Advanced Programmable Thermostat	54%	66%	27%	33%
Efficient lamps (CFLs & LEDs)	78%	79%	39%	39%

- Low Income HH's are less likely to adopt high cost items like HVAC equipment (0.82X) and slightly less likely to adopt low cost items like a light bulb (0.98X).
- The revised method of anchoring surveys in recent actual program Take Rates produces similar results to previous method

Maximum Achievable Take Rates

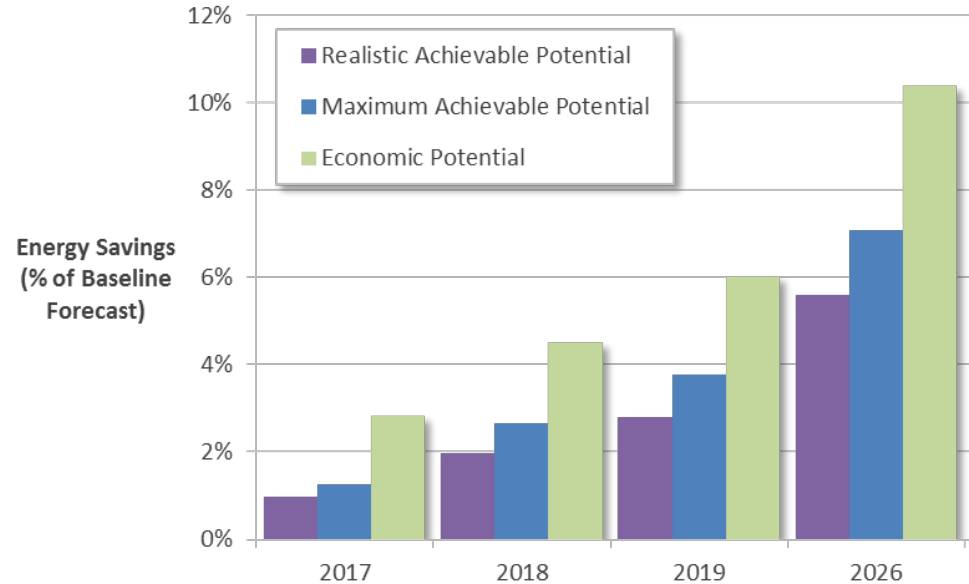
- Realistic Achievable Take Rates come from the mid-tier payback options without any “lift” or “penalty” from decision factors
- Maximum Achievable Take Rates are based on combining the most favorable scenarios in the survey
 - Stacks the “lift” in customers uptake based on shortest economic payback and best possible non-payback factors.

Take Rate “Lift” from Various Factors	
Lift from Fastest Payback (0 or 1-year) vs. 3-year	10%
Lift from Best Delivery Mechanism vs Avg.	22%
Lift from Best Features vs Avg.	1%
Lift from Best Customer Financial Situation vs Avg.	14%
Lift from Highest Awareness vs Avg.	11%
Maximum Lift with All Factors Stacked	57%

Residential Electricity Measure-Level Potential

Realistic achievable energy savings over the next 3-year cycle are about half of economic potential:

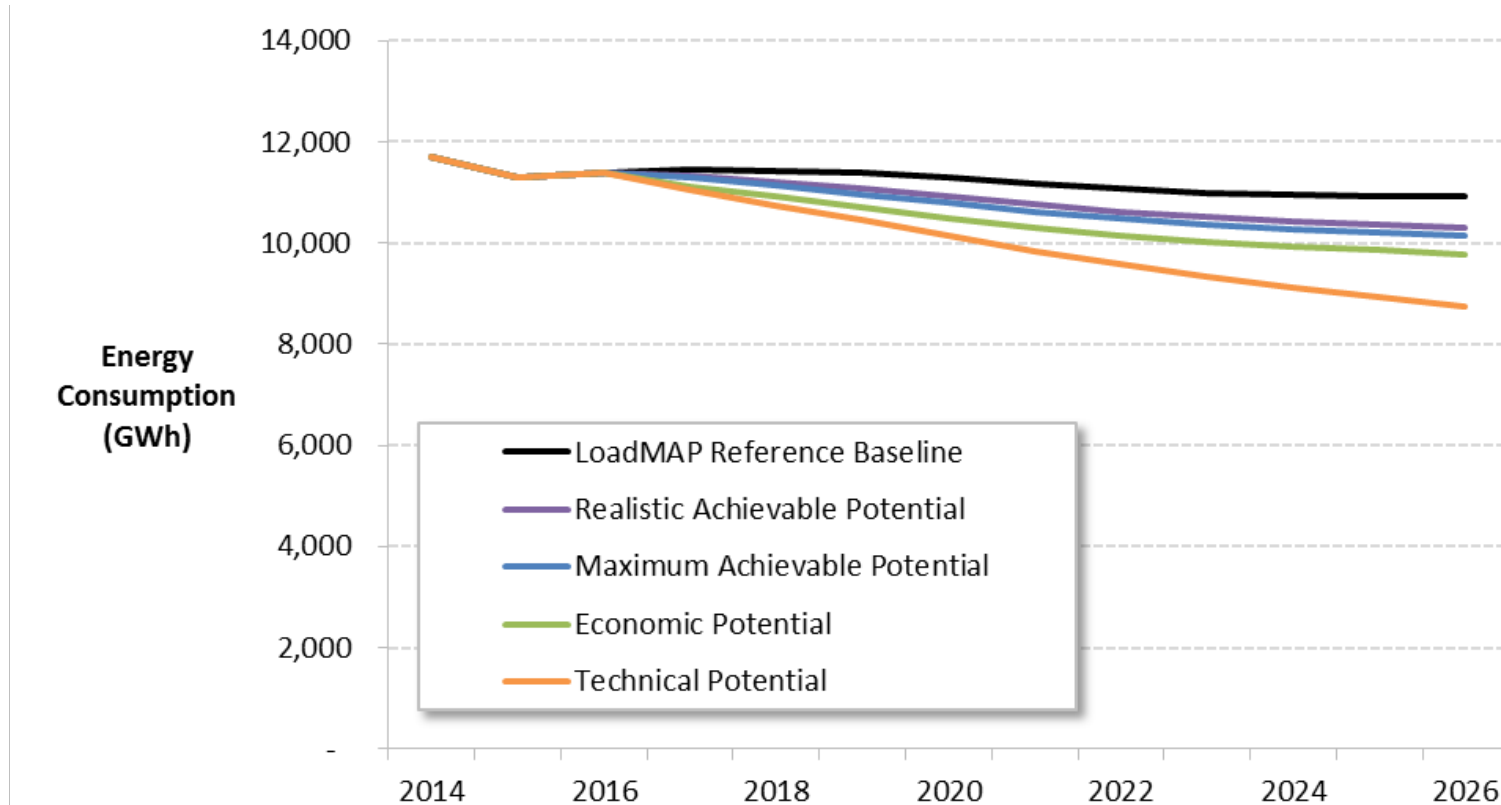
- 318 GWh by 2019 or 2.8% of the baseline forecast.
- By 2026, this is 610 GWh, or 5.6% of the baseline forecast.



Cumulative Energy Savings	2017	2018	2019	2026
Baseline Forecast (GWh)	11,440	11,434	11,395	10,909
Potential Forecasts (GWh)				
Realistic Achievable Potential	11,330	11,209	11,077	10,298
Maximum Achievable Potential	11,297	11,129	10,966	10,135
Economic Potential	11,119	10,917	10,709	9,776
Technical Potential	11,031	10,743	10,447	8,756
Cumulative Savings (GWh)				
Realistic Achievable Potential	111	225	318	610
Maximum Achievable Potential	144	305	430	773
Economic Potential	322	517	687	1,133
Technical Potential	409	691	948	2,153
Energy Savings (% of Baseline)				
Realistic Achievable Potential	1.0%	2.0%	2.8%	5.6%
Maximum Achievable Potential	1.3%	2.7%	3.8%	7.1%
Economic Potential	2.8%	4.5%	6.0%	10.4%
Technical Potential	3.6%	6.0%	8.3%	19.7%

Baseline Projection and Potential Forecasts

- Realistic achievable potential reduces average annual load growth from -0.3% to -0.9%
- MAP reduces load growth to -1.0%

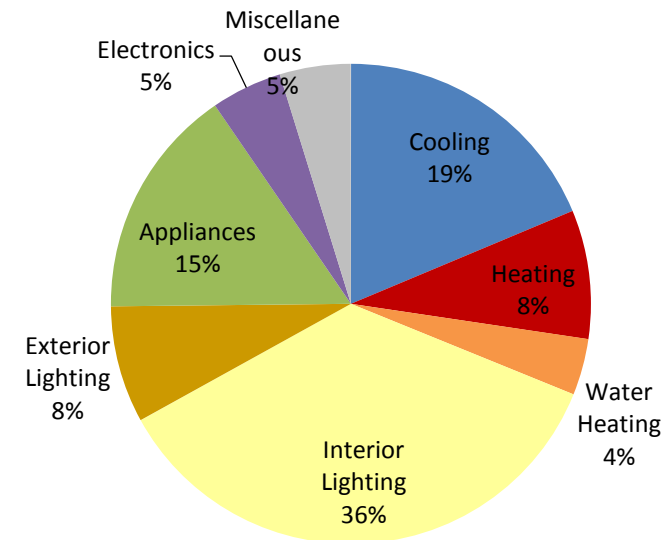


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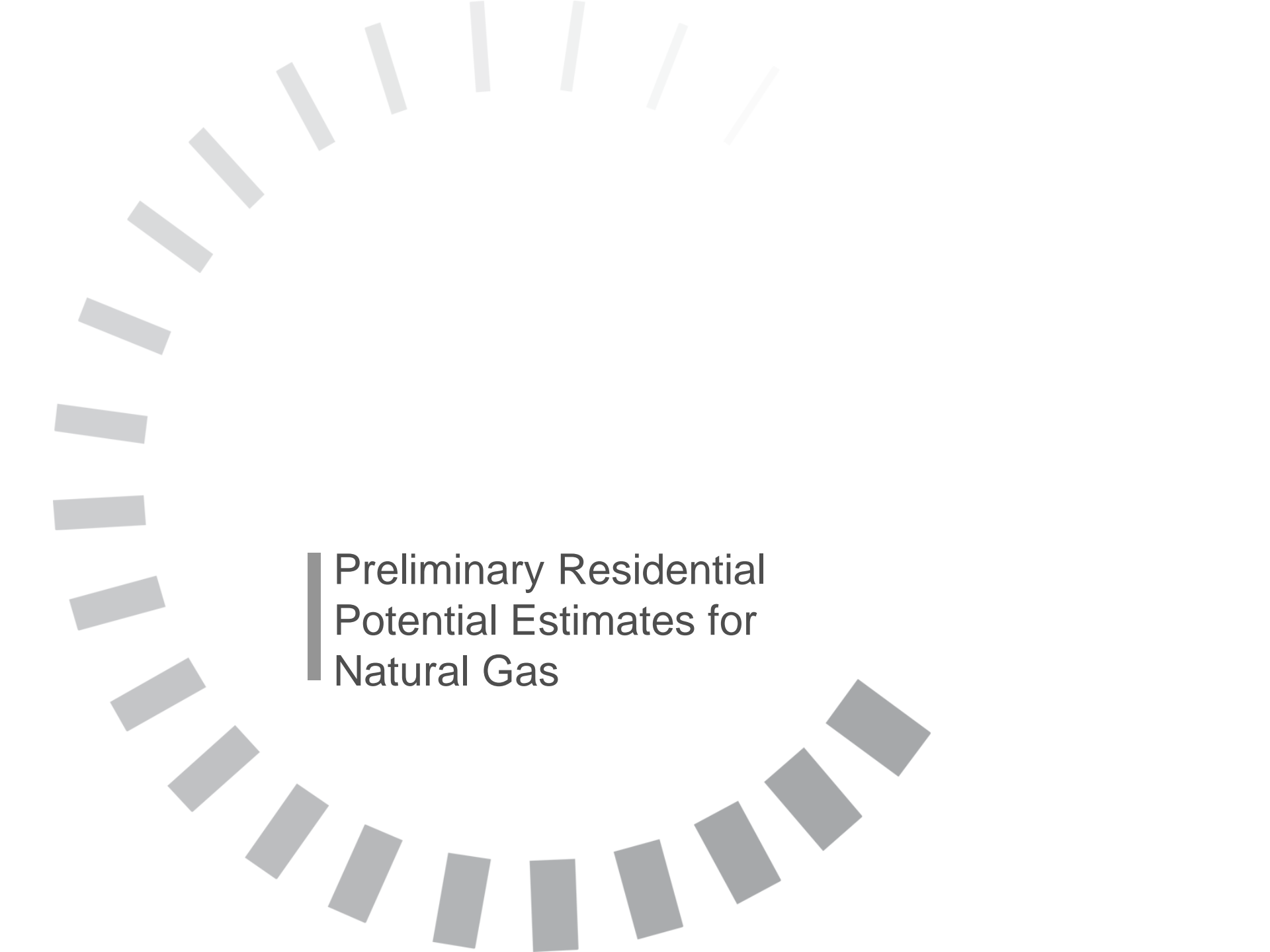
Residential Realistic Achievable Potential (RAP) Top Measures in 2019 (Electricity)

Rank	Measure / Technology	2019 Realistic Achievable Cumulative Savings (GWh)	% of Savings
1	Behavioral Programs	90.7	28.5%
2	Interior Lighting - General Service Screw-In	87.5	27.5%
3	Thermostat - Programmable/Interactive	42.1	13.2%
4	Exterior Lighting - Screw-in	22.5	7.1%
5	Interior Lighting - Exempted Screw-In	19.3	6.1%
6	Refrigerator - Decommissioning and Recycling	11.6	3.6%
7	Freezer - Decommissioning and Recycling	7.7	2.4%
8	Building Shell - Air Sealing	7.2	2.3%
9	Cooling - Central AC	4.1	1.3%
10	Windows - Install Reflective Film	3.3	1.0%
11	Appliances - Air Purifier	2.8	0.9%
12	Electronics - Personal Computers	2.7	0.8%
13	Ducting - Repair and Sealing	2.3	0.7%
14	Insulation - Wall Cavity	1.6	0.5%
15	Electronics - Laptops	1.5	0.5%
16	Appliances - Dehumidifier	1.3	0.4%
17	Insulation - Radiant Barrier	1.2	0.4%
18	Water Heater - Low-Flow Showerheads	1.0	0.3%
19	Electronics - TVs	0.9	0.3%
20	Pool Pump - Timer	0.9	0.3%
	Total	312.0	98.0%
	Total Cumulative Savings in 2019	318.3	100.0%

Cumulative Savings by End Use in 2019



- ▶ Behavioral programs and Lighting have the largest savings in Cycle 4.
- ▶ Approximately 200,000 smart thermostats in Cycle 4; ranked the number 3 measure by savings.
- ▶ About 5,000 refrigerators recycled per year indicates a ramp down from current levels as the available stock becomes more efficient and decreases in numbers

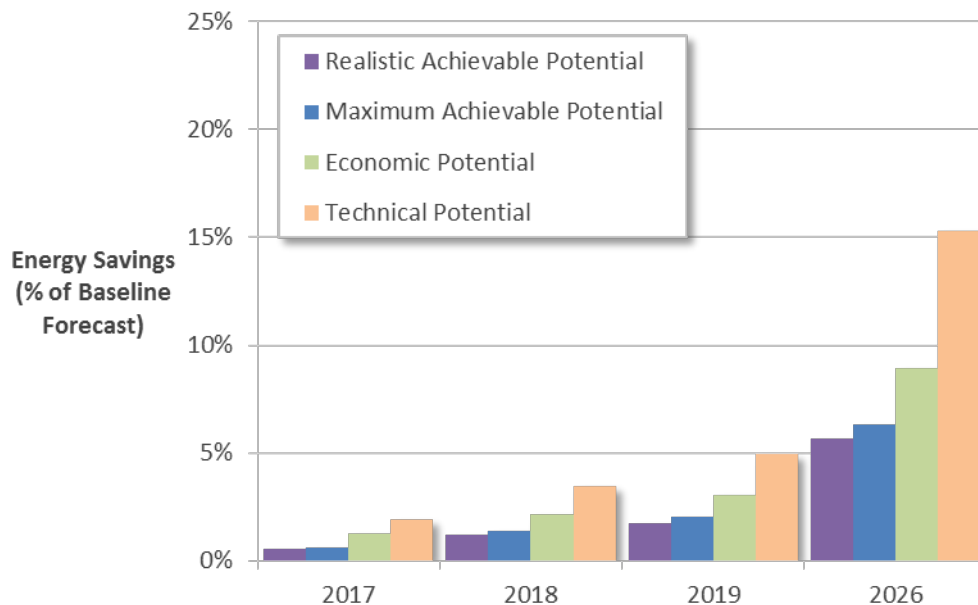


Preliminary Residential
Potential Estimates for
Natural Gas

Residential Natural Gas Measure-Level Potential

Realistic achievable natural gas savings are 9.2 MMtherms by 2019, or 1.8% of the baseline forecast.

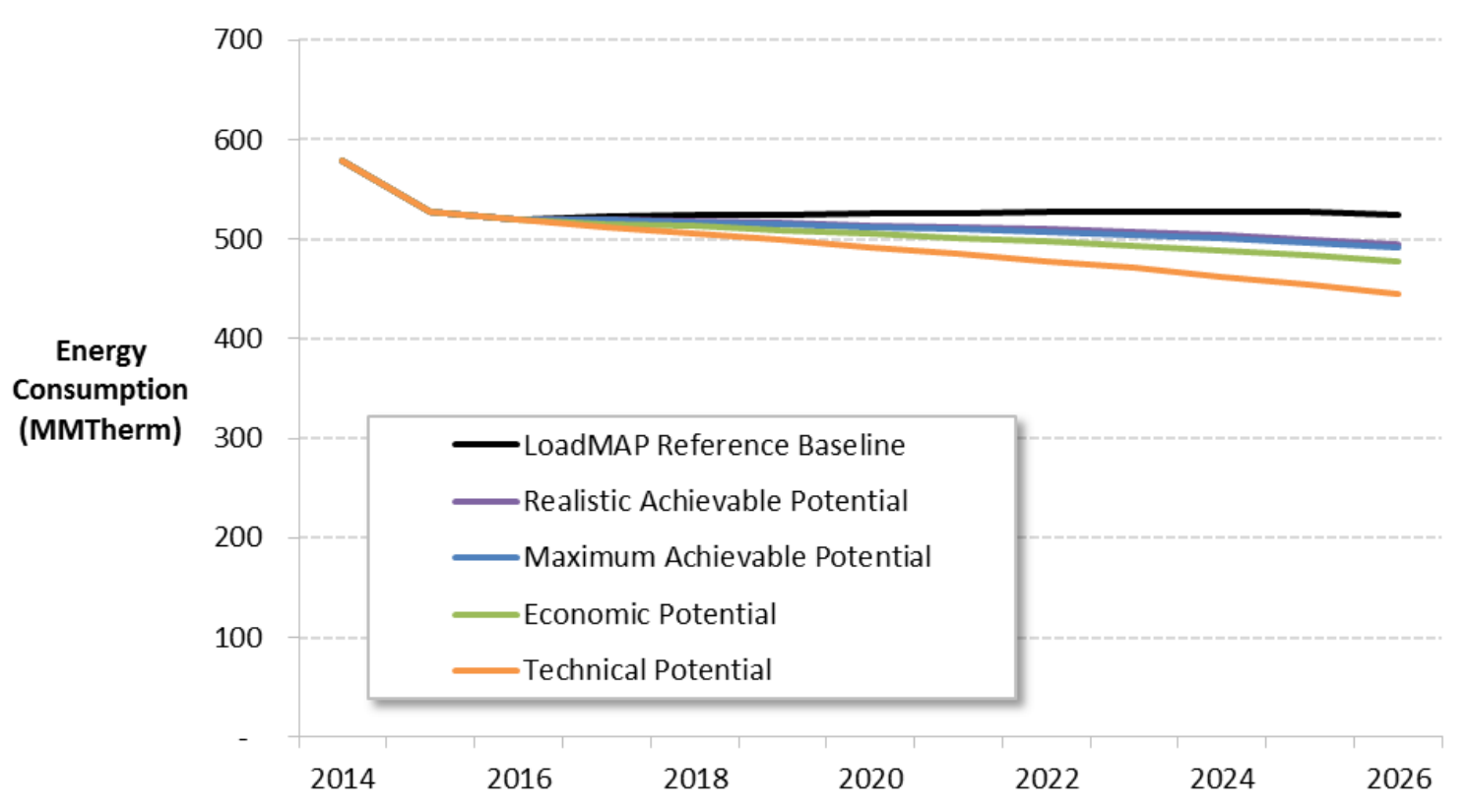
By 2026, this is 29.6 MMtherms, or 5.6% of the baseline forecast.



Cumulative Energy Savings Potential	2017	2018	2019	2026
Baseline Forecast (MMTherm)	522.3	524.0	525.1	524.5
Potential Forecasts (MMTherm)				
Realistic Achievable Potential	519.3	517.8	515.8	494.9
Maximum Achievable Potential	519.0	516.9	514.5	491.3
Economic Potential	515.7	512.7	509.2	477.6
Technical Potential	512.3	506.0	499.1	444.3
Cumulative Savings (MMTherm)				
Realistic Achievable Potential	3.0	6.2	9.2	29.6
Maximum Achievable Potential	3.3	7.1	10.6	33.3
Economic Potential	6.6	11.3	15.9	47.0
Technical Potential	10.0	18.0	26.0	80.2
Energy Savings (% of Baseline)				
Realistic Achievable Potential	0.6%	1.2%	1.8%	5.6%
Maximum Achievable Potential	0.6%	1.4%	2.0%	6.3%
Economic Potential	1.3%	2.1%	3.0%	9.0%
Technical Potential	1.9%	3.4%	4.9%	15.3%

Residential Baseline Projection and Potential Forecasts (Natural Gas)

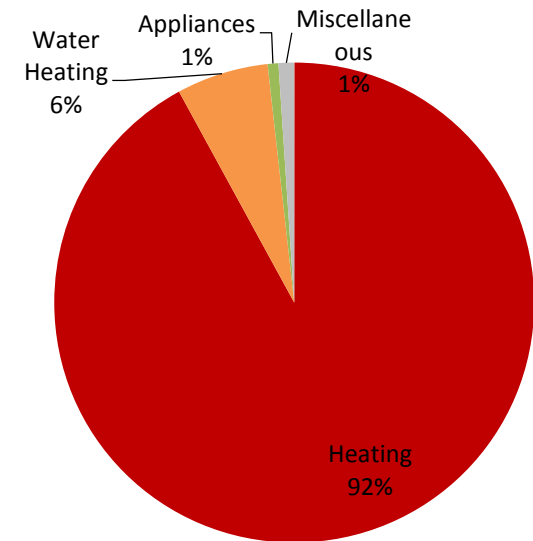
- Realistic achievable potential reduces average annual load growth from flat to -0.5%
- MAP reduces load growth to just under -0.5%



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Residential Realistic Achievable Potential (RAP) Top Measures in 2019 (Natural Gas)

Rank	Measure / Technology	2019 Realistic Achievable Cumulative Savings (MMTherm)	% of Savings
1	Thermostat - Programmable/Interactive	6.2	66.6%
2	Behavioral Programs	1.5	16.0%
3	Ducting - Repair and Sealing	0.5	5.5%
4	Building Shell - Air Sealing	0.4	4.7%
5	Insulation - Radiant Barrier	0.3	2.8%
6	Water Heater - Tank Wrap	0.1	0.9%
7	Water Heater - Low-Flow Showerheads	0.1	0.8%
8	Water Heater - Pipe Insulation	0.0	0.5%
9	Insulation - Floor	0.0	0.4%
10	Boiler - Maintenance	0.0	0.4%
11	Heating - Furnace	0.0	0.3%
12	Water Heater - Thermostatic Restrictor Shower Valve	0.0	0.3%
13	Water Heater - Faucet Aerators	0.0	0.3%
14	Water Heater - Desuperheater	0.0	0.2%
15	Water Heater - Temperature Setback	0.0	0.2%
16	Insulation - Basement Sidewall	0.0	0.1%
	Total	9.2	100.0%
	Total Cumulative Savings in 2019	9.2	100.0%



- ▶ Smart thermostats are now the top measure, followed by behavioral programs and shell measures.
- ▶ Low avoided costs result in a low incidence of equipment, weatherization, and maintenance measures relative to the previous study.



Program Potential

- This study is developing preliminary estimates of program potential that will be refined into program designs in a separate effort in 2016
- General considerations when translating from Measure-level potential to Program-level potential:
 - Consider measure bundles that include measures that are not cost-effective on a stand-alone basis
 - May include multiple efficiency levels for a particular technology
 - May exclude some measures that have very small potential or are challenging to implement
 - Adds program administrative & delivery costs may render certain measures or bundles not cost-effective
 - May adjust participation rates to reflect priorities
 - Net to gross and realization rates may affect savings

Program Potential (Cont'd)

Specifically, for this analysis we will:

- Exclude any measure that did not pass the measure-level TRC screen
- Exclude Residential Electronics Measures – no viable program delivery method
- Apply program delivery costs to Behavioral programs – they are modeled with a nominal cost of \$0.01 at the measure level
- Allocate each passing measure to one or more program
- The programs (shown below) are very similar to those currently being offered in the Ameren Illinois service territory:

Residential Programs	
Appliance Recycling	Multifamily
Lighting	School Kits
Behavior Modification	Rural Kits
New Homes	Moderate Income
Whole Home	Low Income - Single Family
HVAC	Low Income - Multi Family



Thank You!

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