Ameren Illinois
DSM Market Potential Study

Preliminary Results

December 16, 2015
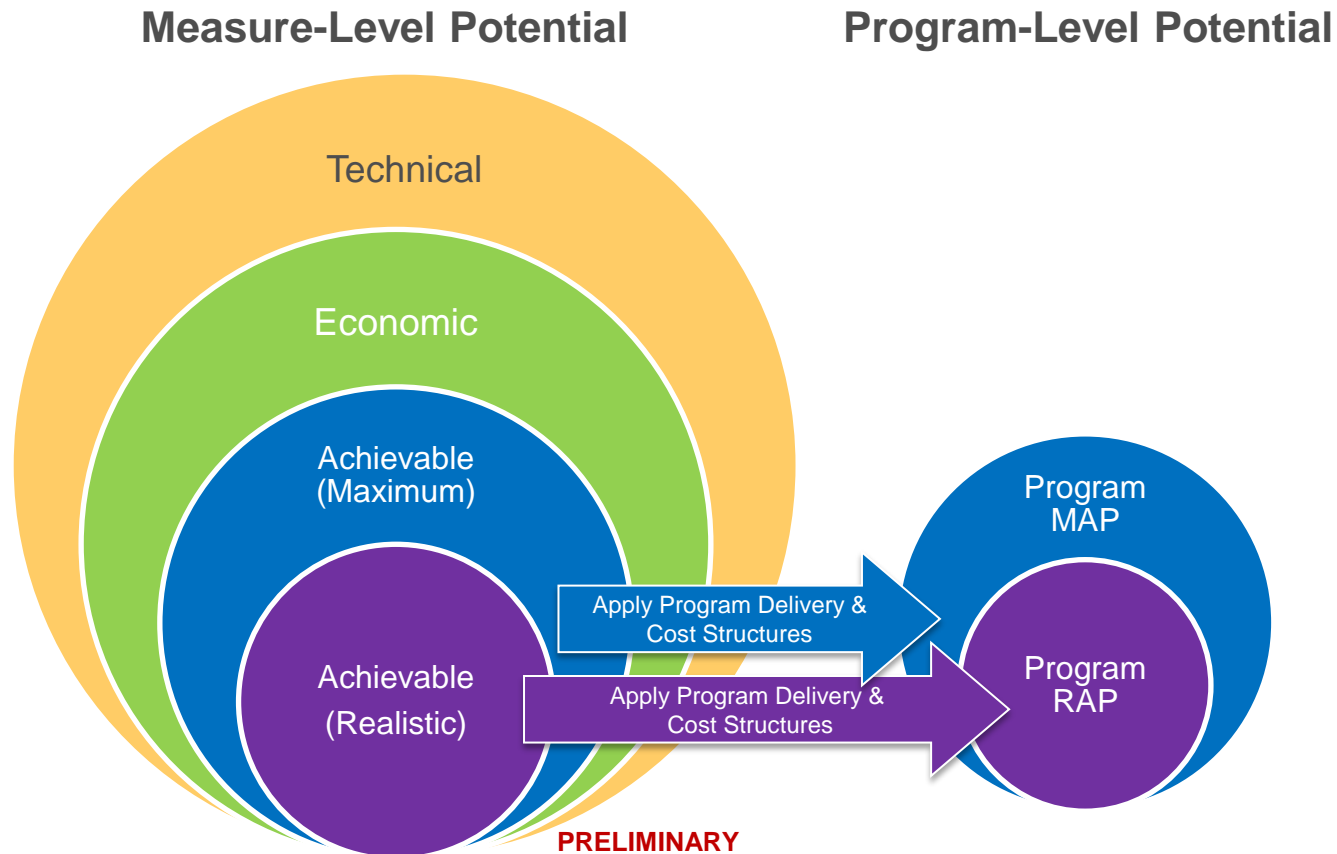
PRELIMINARY

Topics

- Introductions
- Recap of Study Objectives
- Measure-Level Potential
  - Residential
  - Commercial
  - Industrial
  - Street Lighting
- Program Potential
  - RAP
  - MAP
- Next Steps

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
  - 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
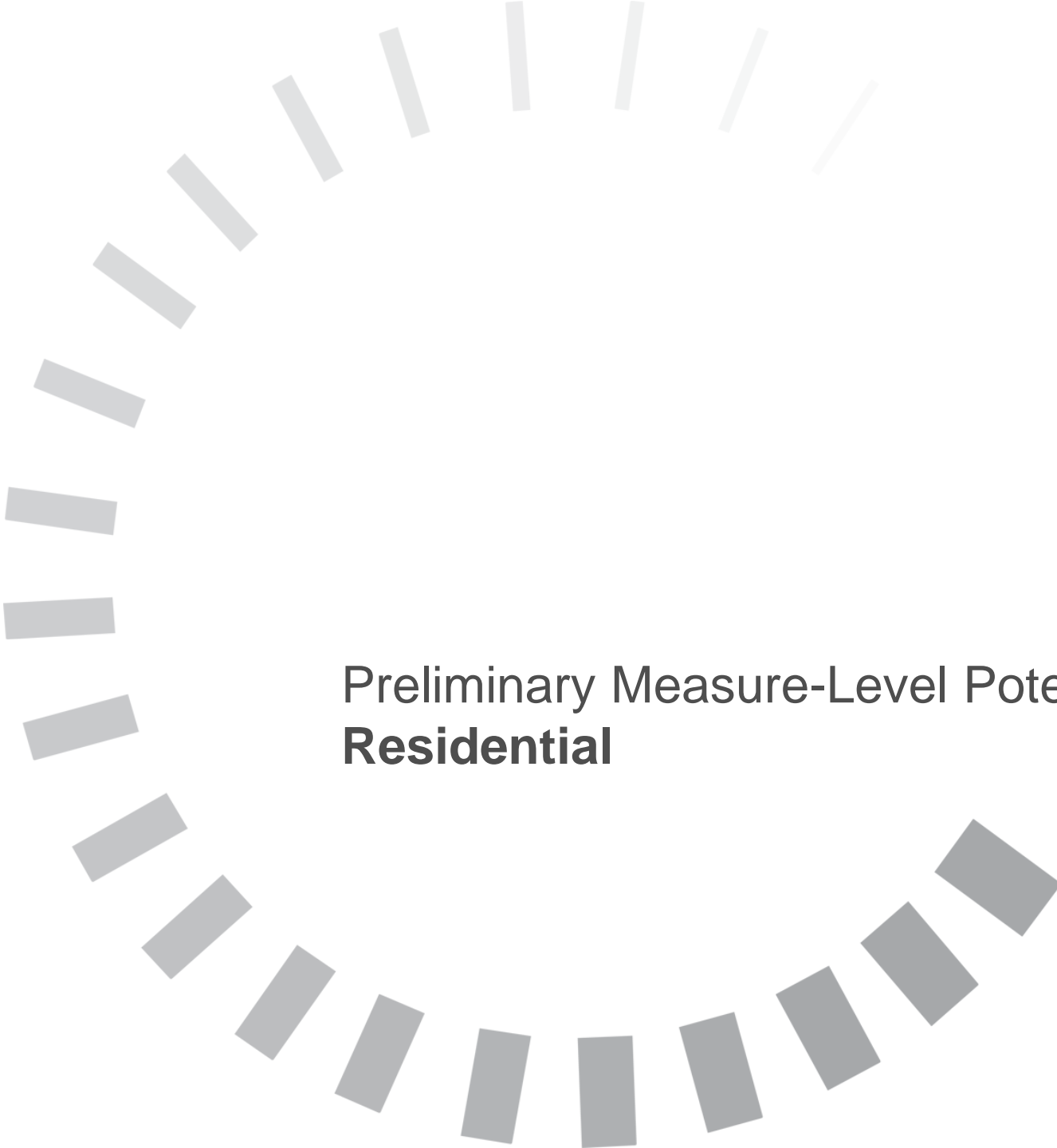
The Levels of Potential

- 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.

Measure-Level Potential   **Program-Level Potential**

Technical

Economic

Achievable (Maximum)

Achievable (Realistic)

Apply Program Delivery & Cost Structures

Apply Program Delivery & Cost Structures

Program MAP

Program RAP

PRELIMINARY

Updates Since October Meeting

- Revised Residential models
- Completed modeling for other sectors: Commercial, Industrial, & Street Lighting
- Added Lifetime Savings to our program potential models
- Redoubled focus on measures of interest identified by SAG:
  - Smart thermostats:
  - Behavioral programs
  - Smart power strips
  - Combined heat & power
  - Building analytics / retrocommissioning
- Created measure-level data file that will be included as report appendix
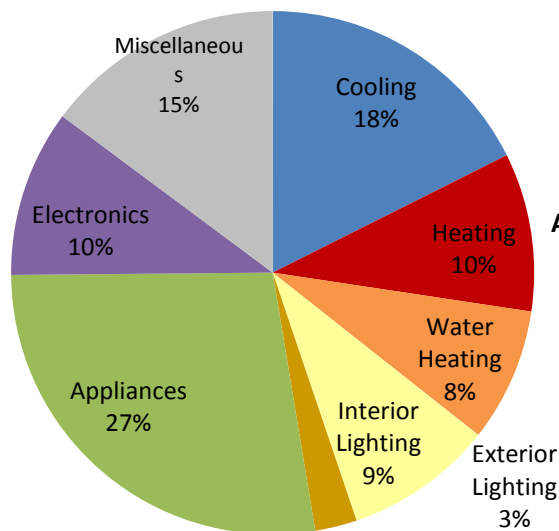
PRELIMINARY

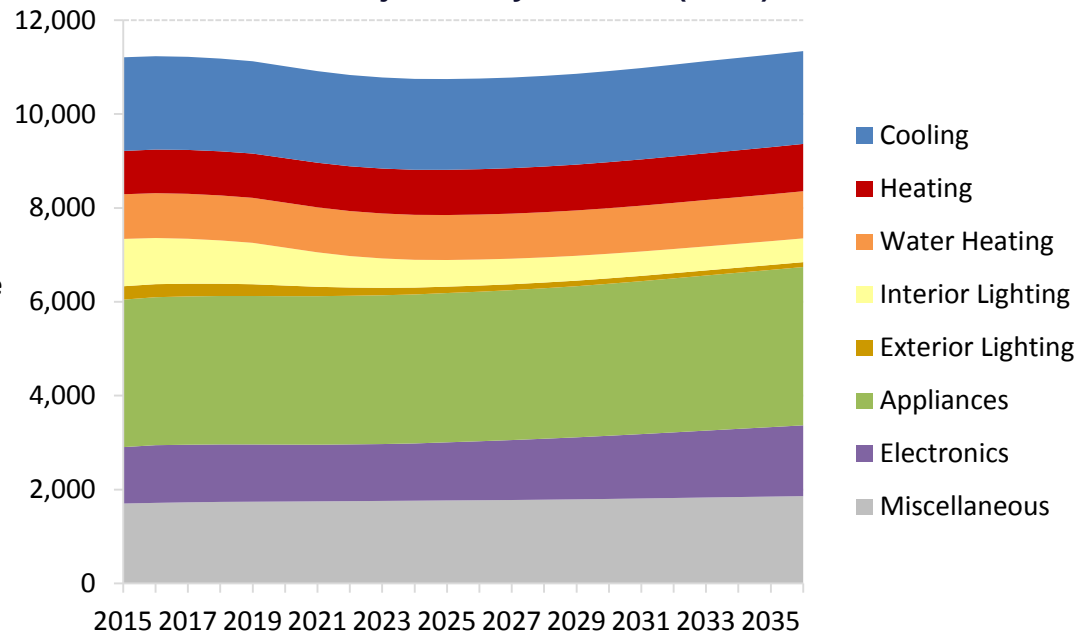Preliminary Measure-Level Potential
Residential

Residential Electricity Baseline

- The study's base year market profile is based on 2014 billing data and informed by market research conducted as a part of this study

- The baseline projection aligns with Ameren Illinois' most recent load forecast, and includes the effects of appliance standards, EISA, and naturally occurring efficiency

Annual Consumption by End Use in Base Year 2014 (%)

Pie chart: Cooling 18%, Heating 10%, Water Heating 8%, Exterior Lighting 3%, Interior Lighting 9%, Appliances 27%, Electronics 10%, Miscellaneous 15%

Baseline Projection by End Use (GWh)

Legend: Cooling, Heating, Water Heating, Interior Lighting, Exterior Lighting, Appliances, Electronics, Miscellaneous
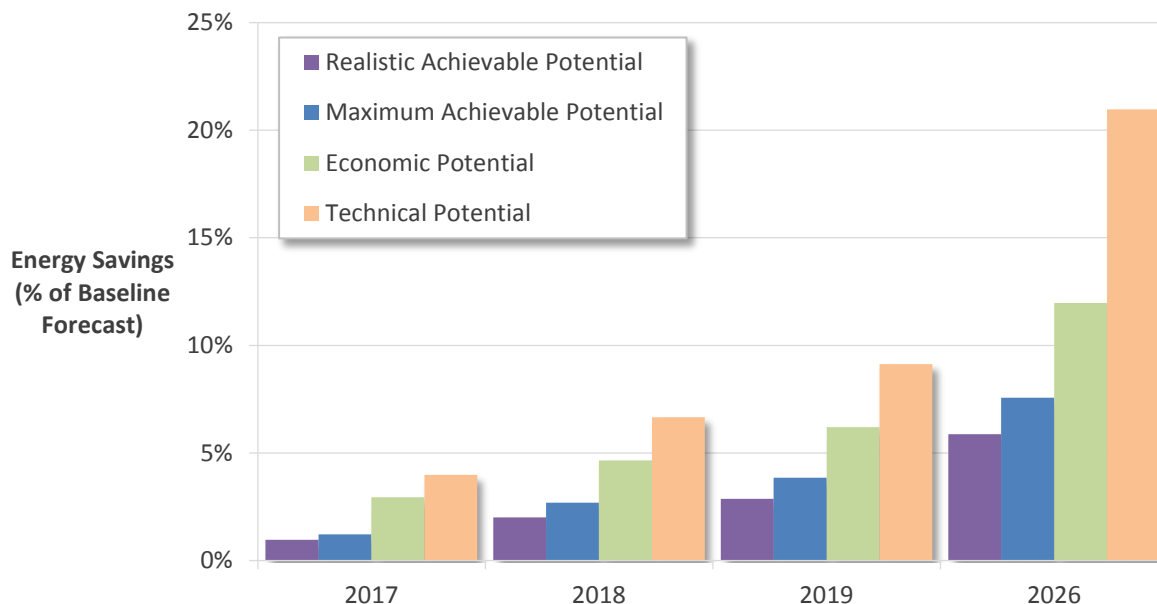
Annual Use (GWh)

Residential Electricity Measure-Level Potential - Revised

Realistic achievable energy savings are 320 GWh by 2019, 2.9% of the baseline forecast.

Realistic achievable energy savings are 633 GWh by 2026, 5.9% of the baseline forecast.

These estimates are slightly higher than the October estimates and reflect refinement to some measure assumptions.
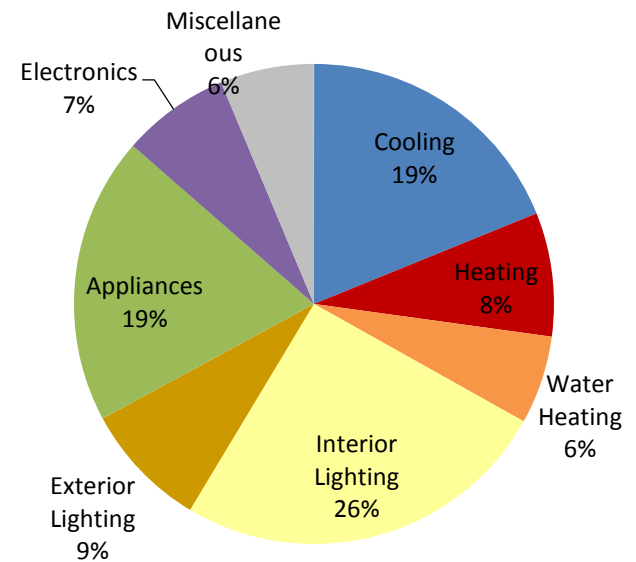

Cumulative Energy Savings	2017	2018	2019	2026
Baseline Forecast (GWh)	**11,219**	**11,182**	**11,125**	**10,756**
Cumulative Savings (GWh)				
Realistic Achievable Potential	109	225	320	633
Maximum Achievable Potential	137	302	428	815
Economic Potential	330	521	690	1,287
Technical Potential	447	746	1,016	2,255
Energy Savings (% of Baseline)				
Realistic Achievable Potential	1.0%	2.0%	2.9%	5.9%
Maximum Achievable Potential	1.2%	2.7%	3.8%	7.6%
Economic Potential	2.9%	4.7%	6.2%	12.0%
Technical Potential	4.0%	6.7%	9.1%	21.0%

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

Rank	Measure / Technology	2017-2019 Realistic Achievable Cumulative Savings (GWh)	% of Savings
1	Behavioral Programs	108.5	34.0%
2	Interior Lighting - General Service Screw-In LED	58.5	18.3%
3	Smart Thermostat - Programmable/Interactive	30.5	9.5%
4	Exterior Lighting - Screw-in LED	23.0	7.2%
5	Interior Lighting - Exempted Screw-In LED	15.1	4.7%
6	Refrigerator - Decommissioning and Recycling	11.2	3.5%
7	Freezer - Decommissioning and Recycling	7.6	2.4%
8	Cooling - Central AC Upgrade	7.2	2.2%
9	Building Shell - Air Sealing	7.1	2.2%
10	Electronics - Smart Power Strips – Tier 2	5.9	1.9%
11	Water Heating - Upgrade (<= 55 Gal)	5.1	1.6%
12	Appliances – Refrigerator Upgrade	4.0	1.2%
13	Appliances - Air Purifier EnergyStar	3.4	1.1%
14	Windows - Install Reflective Film	3.2	1.0%
15	Electronics - Personal Computers EnergyStar	2.6	0.8%
16	Insulation - Wall Cavity	2.6	0.8%
17	Ducting - Repair and Sealing	2.2	0.7%
18	Windows - High Efficiency	1.8	0.6%
19	Exterior Lighting - Photovoltaic Installation	1.7	0.5%
20	Appliances – Dehumidifier EnergyStar	1.6	0.5%
	Total	**302.7**	**94.7%**
	Total Cumulative Savings in 2019	**319.6**	**100.0%**

Cumulative Savings by End Use in 2019

Pie chart: Miscellaneous 6%, Electronics 7%, Cooling 19%, Heating 8%, Water Heating 6%, Interior Lighting 26%, Exterior Lighting 9%, Appliances 19%
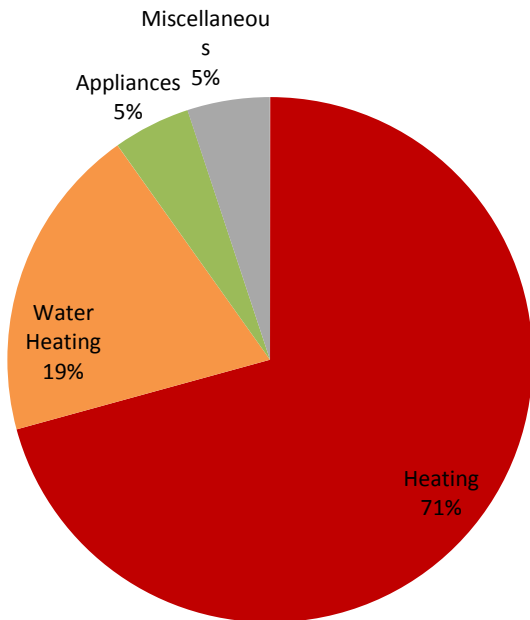
▸ The ranking is the same as in October:

▸ Behavioral programs and Lighting have the largest savings in Cycle 4. Behavioral savings split among all end uses proportional to baseline consumption.

▸ Approximately 200,000 smart thermostats in next 3-year cycle; 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
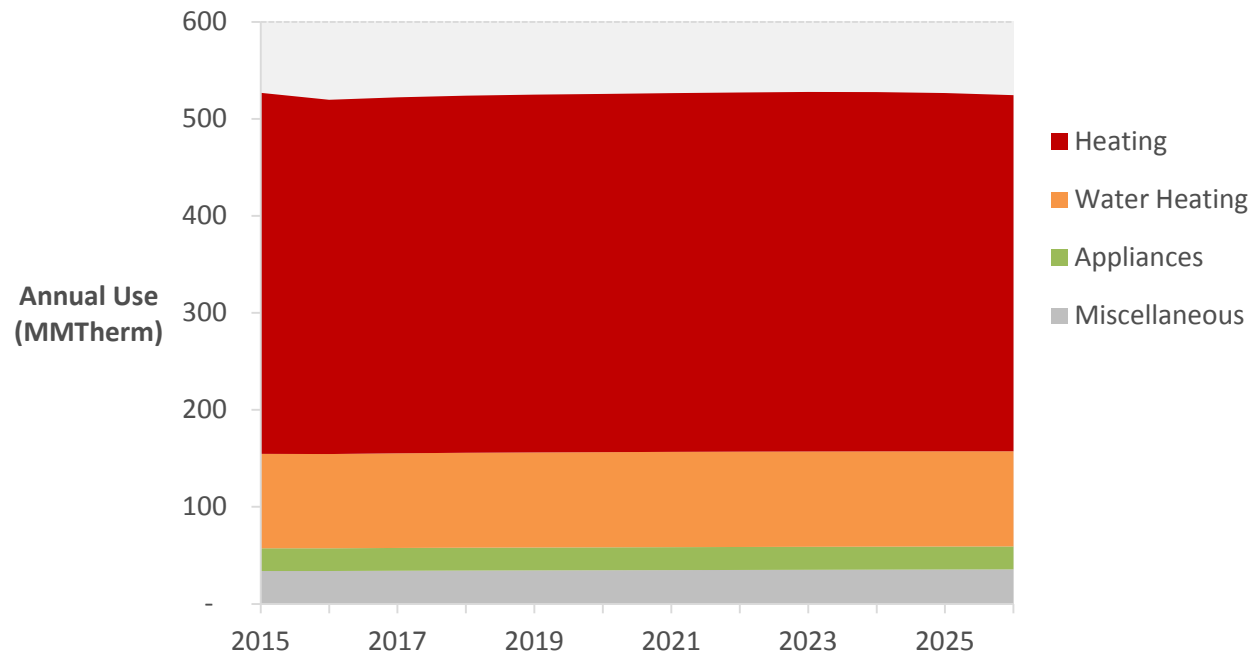
Residential Natural Gas Baseline

- The study's base year market profile is based on 2014 billing data and informed by market research conducted as a part of this study
- The baseline projection aligns with Ameren Illinois' most recent load forecast, and includes the effects of appliance standards and naturally occurring efficiency

Annual Consumption by End Use in Base Year 2014 (%)

- Heating 71%
- Water Heating 19%
- Appliances 5%
- Miscellaneous 5%

Baseline Projection by End Use (GWh)

Annual Use (MMTherm)

Legend:
- Heating
- Water Heating
- Appliances
- Miscellaneous

PRELIMINARY

Residential Natural Gas Measure-Level Potential - Revised

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.

The total savings are the same as in October, but relevant measure assumptions have been refined.
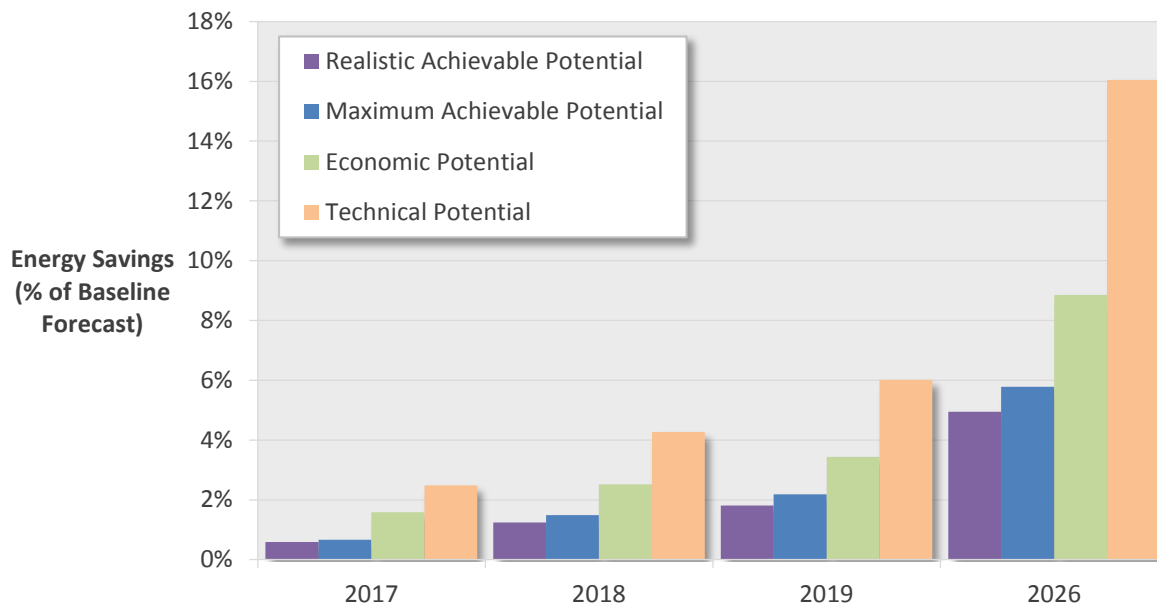
Cumulative Energy Savings Potential	2017	2018	2019	2026
Baseline Forecast (MMTherm)	**522.3**	**524.0**	**525.1**	**524.5**
Cumulative Savings (MMTherm)				
Realistic Achievable Potential	3.0	6.2	9.2	29.6
Maximum Achievable Potential	3.3	7.1	10.6	33.3
Economic Potential	6.6	11.3	15.9	47.0
Technical Potential	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 Realistic Achievable Potential (RAP) Top Measures in 2019 (Natural Gas) - Revised

Rank	Measure / Technology	2017-2019 Realistic Achievable Cumulative Savings (GWh)	% of Savings
1	Smart Thermostat - Programmable/Interactive	4.1	43.5%
2	Behavioral Programs	2.7	28.8%
3	Ducting - Repair and Sealing	0.6	6.0%
4	Heating – Furnace Upgrade	0.5	5.2%
5	Building Shell - Air Sealing	0.5	5.2%
6	Insulation - Radiant Barrier	0.2	2.0%
7	Insulation - Wall Cavity	0.2	1.7%
8	Windows - High Efficiency	0.2	1.7%
9	Insulation – Ceiling	0.1	1.2%
10	Water Heater - Tank Wrap	0.1	1.0%
11	Water Heater - Low-Flow Showerheads	0.1	0.9%
12	Water Heater - Pipe Insulation	0.1	0.6%
13	Insulation – Floor	0.0	0.5%
14	Boiler – Maintenance	0.0	0.4%
15	Water Heater - Thermostatic Restrictor Shower Valve	0.0	0.4%
16	Water Heater - Faucet Aerators	0.0	0.3%
17	Water Heater – Desuperheater	0.0	0.3%
18	Water Heater - Temperature Setback	0.0	0.2%
19	Boiler - Pipe Insulation	0.0	0.1%
20	Insulation - Basement Sidewall	0.0	0.1%
	Total	**9.4**	**100.0%**
	Total Cumulative Savings in 2019	**9.4**	**100.0%**

Cumulative Savings by End Use in 2019
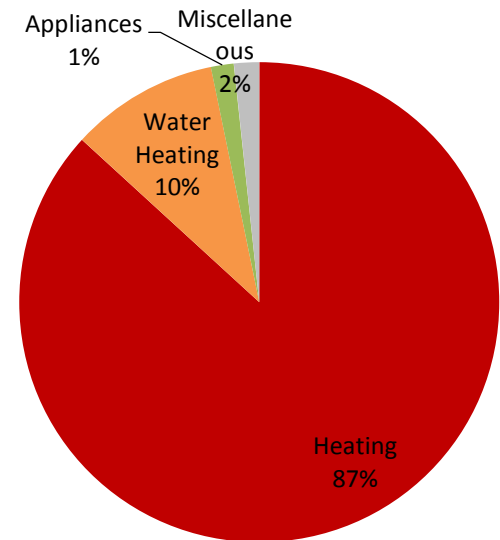
- Measure ranking is the same as October:

- Smart thermostats are 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.

Preliminary Measure-Level Potential
Commercial

Take Rates

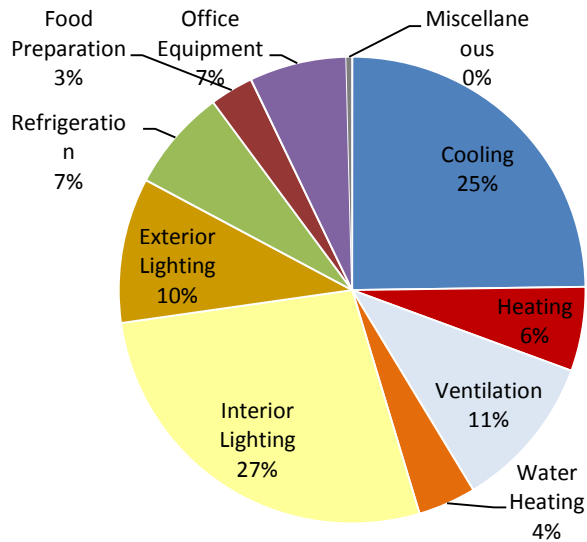## Estimating Customer Adoption of EE Measures

- AEG used the customer surveys to develop take rates for measures and programs

- Described in more detail for residential sector in September materials distributed to SAG

- Rather than take what customers said literally, we applied adjustments based on actual AIC program results to reflect what customers will actually do.

- Table at right shows take-rates developed in research. These are mapped and expanded to universe of measures, with program experience and 2012 research to inform and fill gaps.

Take Rates from Market Research (% of Likely Adopters for a Given Measure Purchase in Base Year)	Realistic Achievable Potential	Maximum Achievable Potential
Residential		
Refrigerator	37%	58%
Furnace / Boiler	37%	59%
AC Unit	37%	59%
Efficient Lamps	39%	62%
PC	34%	53%
Advanced Programmable Thermostat	33%	52%
Residential Low Income		
Refrigerator	30%	43%
Furnace / Boiler	30%	43%
AC Unit	30%	43%
Efficient Lamps	39%	56%
PC	29%	42%
Advanced Programmable Thermostat	27%	38%
Commercial & Industrial		
HVAC	39%	61%
Refrigeration	37%	57%
Motor	39%	60%
Energy Mgmt System	32%	49%
Occupancy Sensor	45%	69%
Server	35%	54%
Efficient Lamps	43%	66%
Advanced Programmable Thermostat	44%	69%

Commercial Electricity Baseline

- The study's base year market profile is based on 2014 billing data and informed by market research conducted as a part of this study

- The baseline projection aligns with Ameren Illinois' most recent load forecast, and includes the effects of appliance standards, EISA, and naturally occurring efficiency

Annual Consumption by End Use in Base Year 2014 (%)

- Food Preparation 3%
- Office Equipment 7%
- Miscellaneous 0%
- Cooling 25%
- Heating 6%
- Ventilation 11%
- Water Heating 4%
- Interior Lighting 27%
- Exterior Lighting 10%
- Refrigeration 7%

Baseline Projection by End Use (GWh)

Annual Use (GWh)

Legend:
- Cooling
- Heating
- Ventilation
- Water Heating
- Interior Lighting
- Exterior Lighting
- Refrigeration
- Food Preparation
- Office Equipment
- Miscellaneous

X-axis: 2014, 2017, 2020, 2023, 2026, 2029, 2032, 2035
Y-axis: -, 2,000, 4,000, 6,000, 8,000, 10,000, 12,000, 14,000
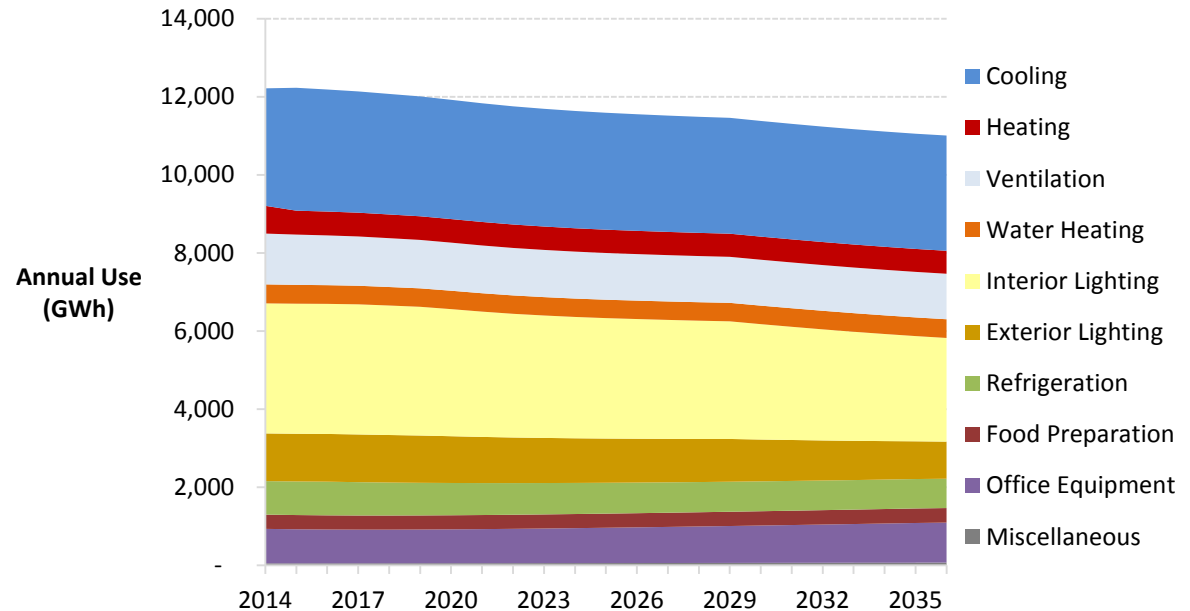
Commercial Electricity Measure-Level Potential
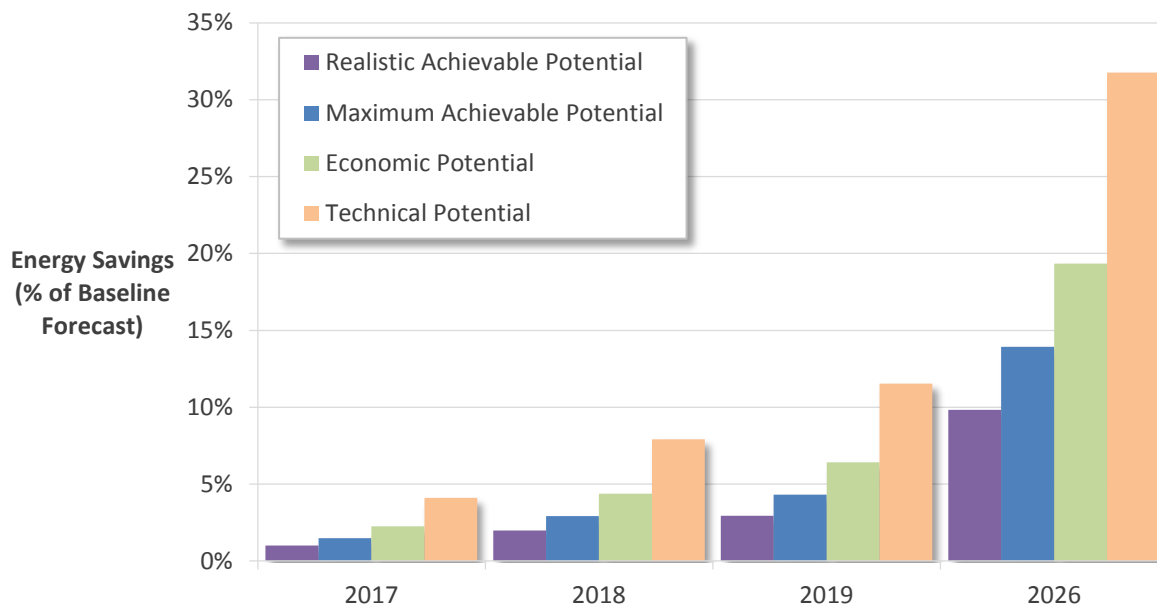
Realistic achievable energy savings are 351 GWh by 2019, 2.9% of the baseline forecast.

Realistic achievable energy savings are 1,129 GWh by 2026, 9.8% of the baseline forecast.

Cumulative Energy Savings	2017	2018	2019	2026
Baseline Forecast (GWh)	**12,070**	**12,006**	**11,942**	**11,481**
Cumulative Savings (GWh)				
Realistic Achievable Potential	121	237	351	1,129
Maximum Achievable Potential	179	350	514	1,599
Economic Potential	271	525	767	2,221
Technical Potential	496	950	1,379	3,648
Energy Savings (% of Baseline)				
Realistic Achievable Potential	1.0%	2.0%	2.9%	9.8%
Maximum Achievable Potential	1.5%	2.9%	4.3%	13.9%
Economic Potential	2.2%	4.4%	6.4%	19.3%
Technical Potential	4.1%	7.9%	11.5%	31.8%

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

Rank	Measure / Technology	2017-2019 Realistic Achievable Cumulative Savings (GWh)	% of Savings
1	Interior Lighting - Screw-in LED	37.8	10.8%
2	Interior Lighting - Occupancy Sensors	34.2	9.7%
3	Interior Lighting - Linear Lighting LED	33.9	9.7%
4	Cooling - Water-Cooled Chiller Upgrade	26.0	7.4%
5	Retrocommissioning	25.8	7.3%
6	Office Equipment - Desktop Comp. EnergyStar	21.0	6.0%
7	Interior Fluoresc - Delamp & Install Reflectors	16.3	4.7%
8	Interior Lighting - High-Bay Fixtures LED	13.9	4.0%
9	Chiller - Chilled Water Reset	13.5	3.9%
10	Office Equipment – Server Upgrade	9.6	2.7%
11	Cooling - Air-Cooled Chiller Upgrade	9.1	2.6%
12	Exterior Lighting - Screw-in LED	8.1	2.3%
13	HVAC – Economizer	7.9	2.3%
14	Ventilation – Efficient VAV Upgrade	7.5	2.1%
15	Water Heating – Upgrade	6.7	1.9%
16	Ventilation - Variable Speed Control	6.5	1.8%
17	Exterior Lighting - Area Lighting LED	5.4	1.5%
18	Destratification Fans (HVLS)	5.1	1.4%
19	Water Heater - Faucet Aerators/Low Flow Nozzles	4.2	1.2%
20	Interior Fluorescent - Bi-Level Fixtures	3.6	1.0%
	Total	**295.8**	**84.4%**
	Total Cumulative Savings in 2019	**350.6**	**100.0%**

Cumulative Savings by End Use in 2019
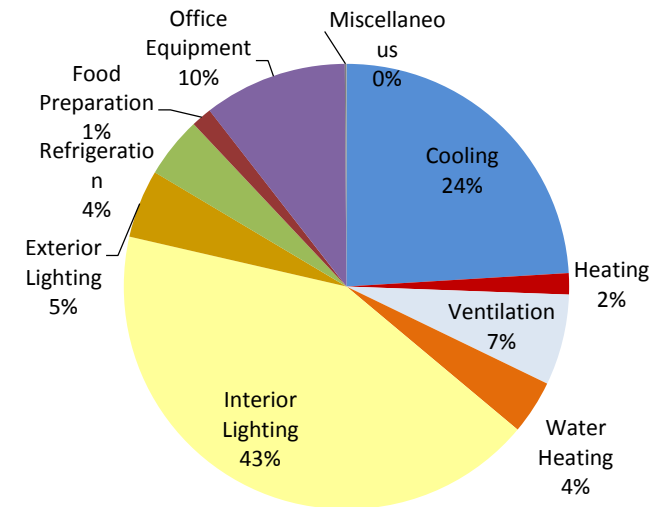
- Linear LEDs are only cost-effective in some high usage segments before 2020.

Commercial Natural Gas Baseline

- The study's base year market profile is based on 2014 billing data and informed by market research conducted as a part of this study

- The baseline projection aligns with Ameren Illinois' most recent load forecast, and includes the effects of appliance standards and naturally occurring efficiency

Annual Consumption by End Use in Base Year 2014 (%)

Food Preparation 10%
Miscellaneous 2%
Water Heating 29%
Heating 59%

Baseline Projection by End Use (MMTherms)

Annual Use (MMTherm)

- Heating
- Water Heating
- Food Preparation
- Miscellaneous
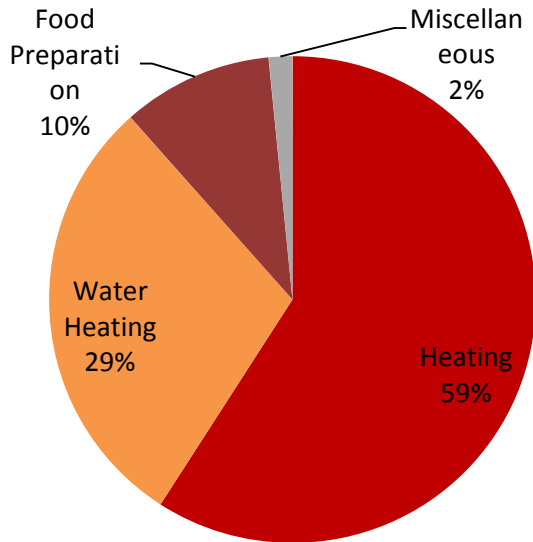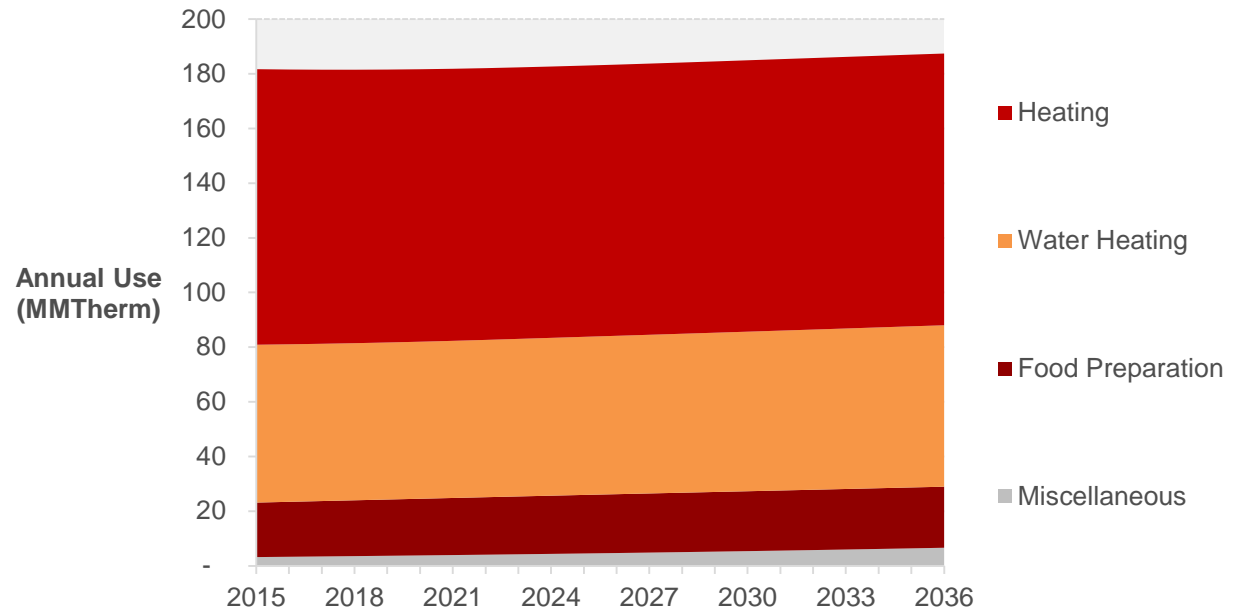
Commercial Natural Gas Measure-Level Potential

Realistic achievable natural gas savings are 1.8 MMtherms by 2019, or 1.0% of the baseline forecast.

By 2026, this is 6.2 MMtherms, or 3.5% of the baseline forecast.

Note – net natural gas impacts from CHP measures excluded
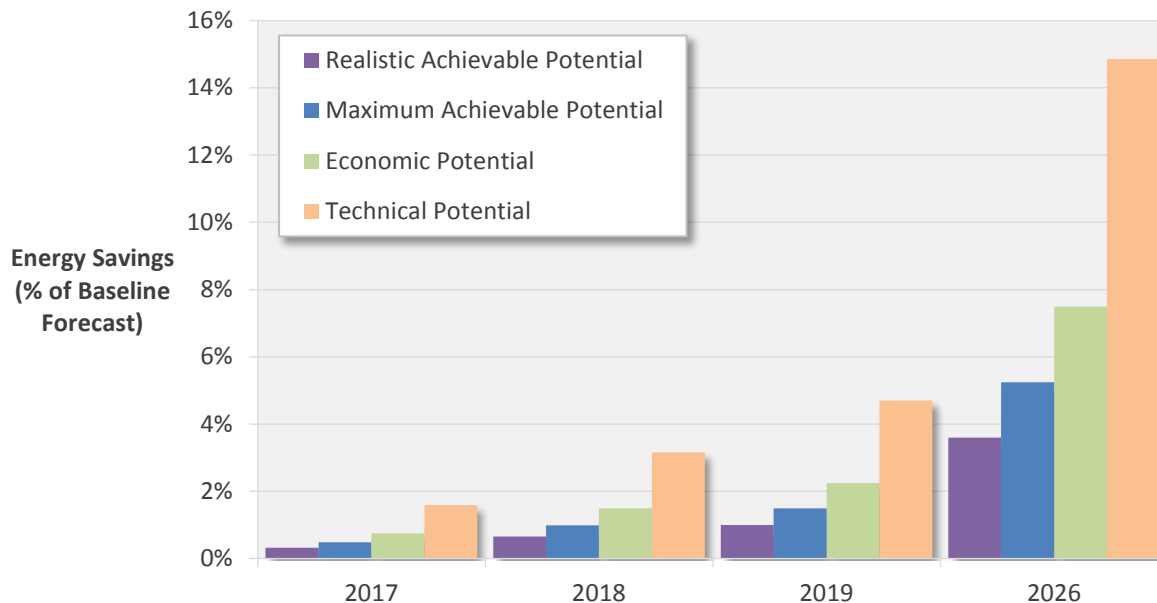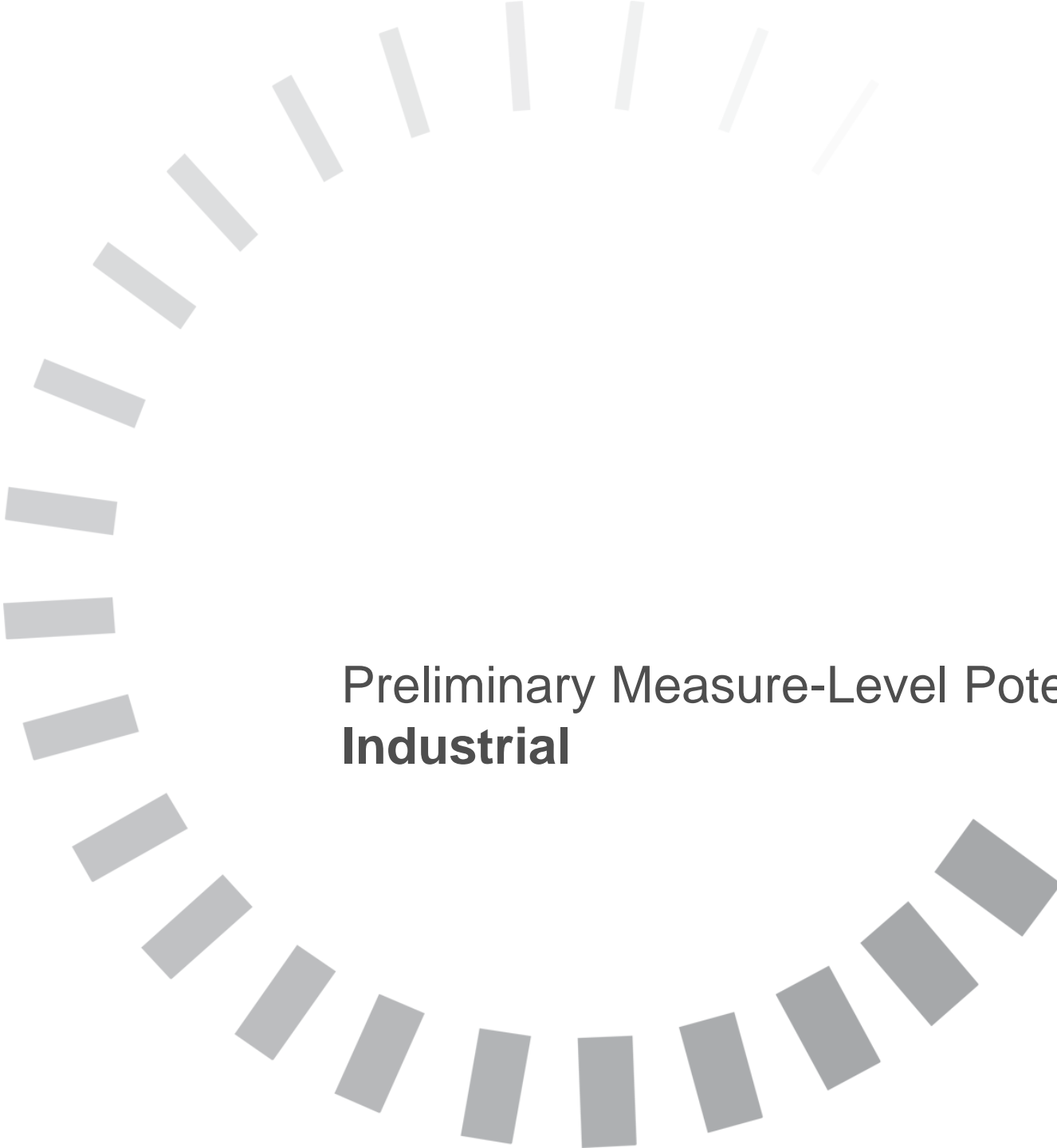
Cumulative Energy Savings Potential	2017	2018	2019	2026
Baseline Forecast (MMTherm)	**179.0**	**178.2**	**177.5**	**174.7**
Cumulative Savings (MMTherm)				
Realistic Achievable Potential	0.6	1.2	1.8	6.3
Maximum Achievable Potential	0.9	1.8	2.7	9.2
Economic Potential	1.3	2.7	4.0	13.1
Technical Potential	2.8	5.6	8.4	26.0
Energy Savings (% of Baseline)				
Realistic Achievable Potential	0.3%	0.7%	1.0%	3.6%
Maximum Achievable Potential	0.5%	1.0%	1.5%	5.2%
Economic Potential	0.8%	1.5%	2.2%	7.5%
Technical Potential	1.6%	3.2%	4.7%	14.9%

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

Rank	Measure / Technology	2017-2019 Realistic Achievable Cumulative Savings (GWh)	% of Savings
1	Water Heating - Water Heater	0.4	22.4%
2	Retrocommissioning	0.3	16.7%
3	Insulation - Wall Cavity	0.2	13.3%
4	Gas Boiler - Hot Water Reset	0.1	8.4%
5	Food Preparation - Fryer	0.1	8.4%
6	Destratification Fans (HVLS)	0.1	7.7%
7	Water Heater - Central Controls	0.1	7.3%
8	Commissioning	0.1	3.3%
9	Food Preparation - Oven	0.0	2.6%
10	Strategic Energy Management	0.0	2.4%
11	Food Preparation - Steamer	0.0	2.0%
12	Food Preparation - Griddle	0.0	1.7%
13	Steam Trap Maintenance	0.0	1.2%
14	Heating - Boiler	0.0	1.0%
15	Insulation - Foundation	0.0	0.9%
16	Advanced New Construction Designs	0.0	0.8%
17	Food Preparation - Broiler	0.0	0.6%
18	Miscellaneous - Pool Heater	0.0	0.0%
19	Food Preparation - Commercial Food Prep Other	0.0	0.0%
20	Food Preparation - Range	0.0	0.0%
	Total	**1.8**	**100.0%**
	Total Cumulative Savings in 2019	**1.8**	**100.0%**

Cumulative Savings by End Use in 2019

- Miscellaneous 0%
- Food Preparation 15%
- Heating 50%
- Water Heating 35%
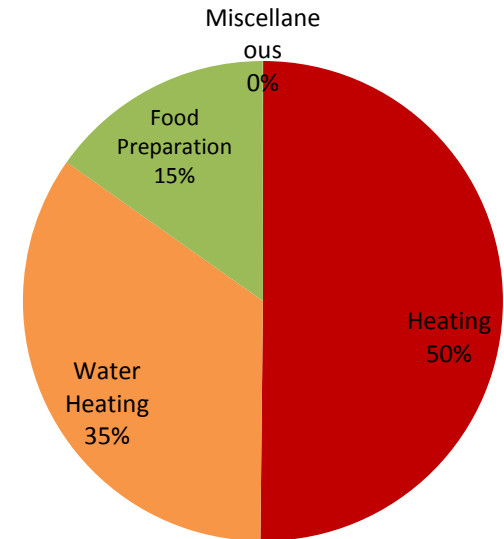
Preliminary Measure-Level Potential
Industrial

Industrial Electricity Baseline

- The study's base year market profile is based on 2014 billing data and informed by market research conducted as a part of this study

- The baseline projection aligns with Ameren Illinois' most recent load forecast, and includes the effects of appliance standards, EISA, and naturally occurring efficiency

Annual Consumption by End Use in Base Year 2014 (%)

Pie chart values:
- Miscellaneous 3%
- Cooling 6%
- Heating 2%
- Ventilation 4%
- Interior Lighting 8%
- Exterior Lighting 2%
- Motors 50%
- Process 25%

Baseline Projection by End Use (GWh)

Legend: Cooling, Heating, Ventilation, Interior Lighting, Exterior Lighting, Motors, Process, Miscellaneous

Y-axis: Annual Use (GWh) — -, 2,000.00, 4,000.00, 6,000.00, 8,000.00, 10,000.00, 12,000.00, 14,000.00

X-axis: 2015 2017 2019 2021 2023 2025 2027 2029 2031 2033 2035
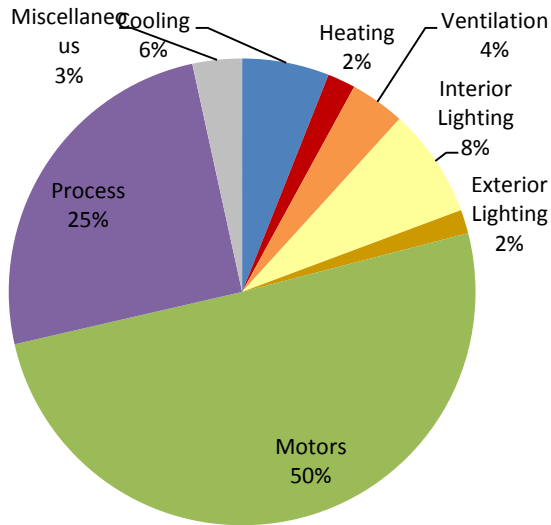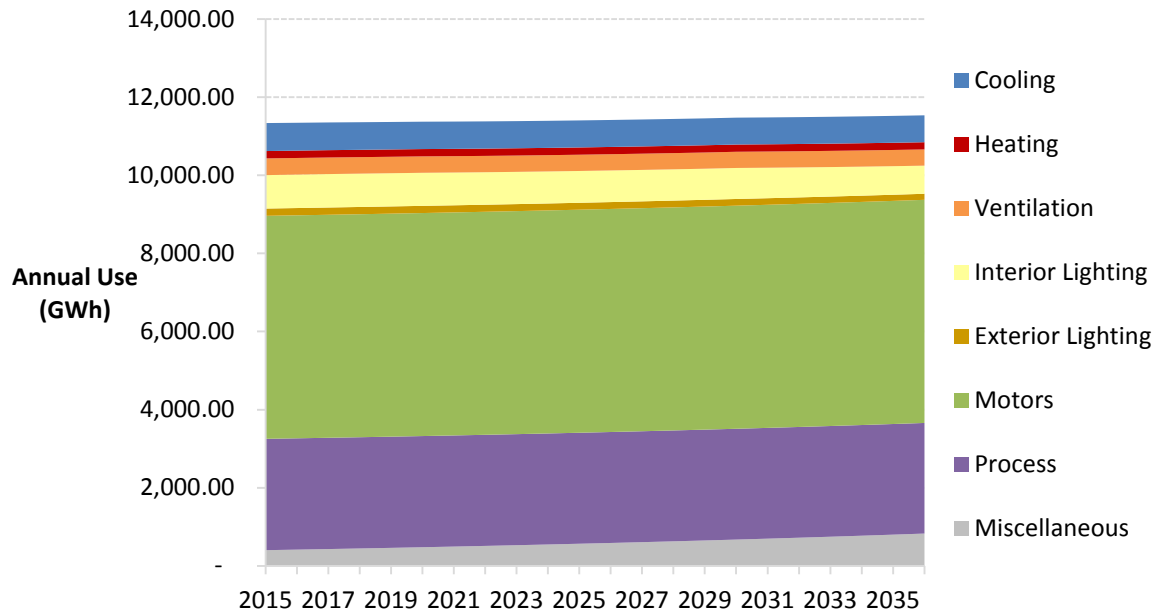
Industrial Electricity Measure-Level Potential

Realistic achievable energy savings are 153 GWh by 2019, 1.3% of the baseline forecast.

Realistic achievable energy savings are 551 GWh by 2026, 4.8% of the baseline forecast.

Technical potential is lower than other sectors
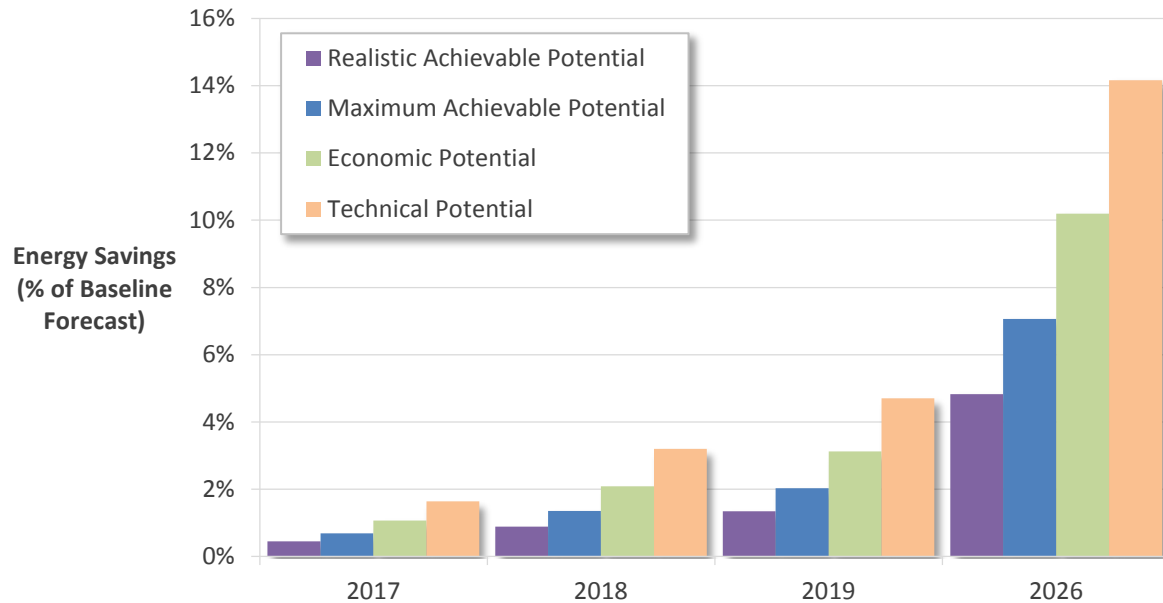
Cumulative Energy Savings	2017	2018	2019	2026
Baseline Forecast (GWh)	**11,354**	**11,360**	**11,367**	**11,418**
Cumulative Savings (GWh)				
Realistic Achievable Potential	51	101	153	551
Maximum Achievable Potential	78	154	231	806
Economic Potential	122	238	355	1,164
Technical Potential	186	363	535	1,617
Energy Savings (% of Baseline)				
Realistic Achievable Potential	0.4%	0.9%	1.3%	4.8%
Maximum Achievable Potential	0.7%	1.4%	2.0%	7.1%
Economic Potential	1.1%	2.1%	3.1%	10.2%
Technical Potential	1.6%	3.2%	4.7%	14.2%

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

Rank	Measure / Technology	2017-2019 Realistic Achievable Cumulative Savings (GWh)	% of Savings
1	Retrocommissioning	22.6	14.8%
2	Strategic Energy Management	16.2	10.6%
3	CHP - Combustion Turbine w/ Heat Recovery	13.7	9.0%
4	Interior Lighting - High-Bay Fixtures LED	9.4	6.1%
5	Interior Lighting - Occupancy Sensors	9.0	5.9%
6	Exterior Lighting - Area Lighting LED	6.8	4.5%
7	HVAC – Economizer	6.5	4.3%
8	Destratification Fans (HVLS)	6.5	4.3%
9	Pumping System - Variable Speed Drive	5.6	3.7%
10	Pumping System - System Optimization	5.1	3.3%
11	Compressed Air - Leak Management Program	4.8	3.1%
12	CHP - Reciprocating Engine w/ Heat Recovery	4.4	2.8%
13	CHP - Micro-turbine w/ Heat Recovery	4.3	2.8%
14	Cooling - Water-Cooled Chiller Upgrade	3.7	2.4%
15	Fan System - Flow Optimization	3.3	2.1%
16	Interior Lighting - Screw-in LED	3.0	2.0%
17	Interior Lighting - Linear Lighting LED	2.7	1.8%
18	Compressed Air - System Controls	2.6	1.7%
19	Chiller - Chilled Water Reset	2.5	1.6%
20	Cooling – RTU Upgrade	2.2	1.4%
	Total	**134.8**	**88.3%**
	Total Cumulative Savings in 2019	**152.7**	**100.0%**

Cumulative Savings by End Use in 2019

Pie chart: Process 14%, Miscellaneous 2%, Heating 2%, Cooling 17%, Ventilation 1%, Interior Lighting 20%, Exterior Lighting 6%, Motors 38%
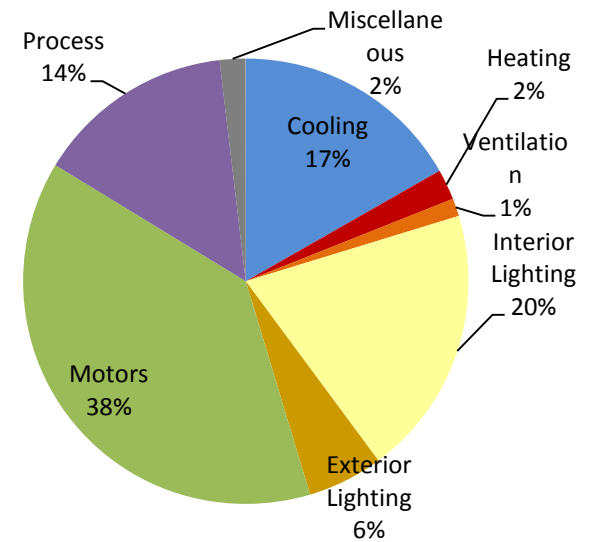
▸ Significant VFD savings are marginally non-cost-effective. Many were included in potential in previous Ameren IL study, but lower avoided cost benefits and refined measure inputs with higher installation costs cause them to fall off the table in many segments and applications.

Industrial Natural Gas Baseline

- The study's base year market profile is based on 2014 billing data and informed by market research conducted as a part of this study

- The baseline projection aligns with Ameren Illinois' most recent load forecast, and includes the effects of appliance standards and naturally occurring efficiency

Annual Consumption by End Use in Base Year 2014 (%)

Miscellaneous 4%

Process 45%

Heating 51%

Baseline Projection by End Use (MMTherms)

Annual Use (MMTherm)

Heating

Process

Miscellaneous

2014 2017 2020 2023 2026 2029 2032 2035
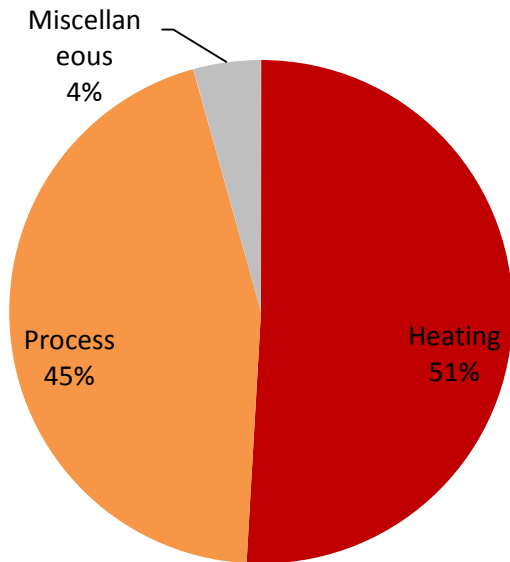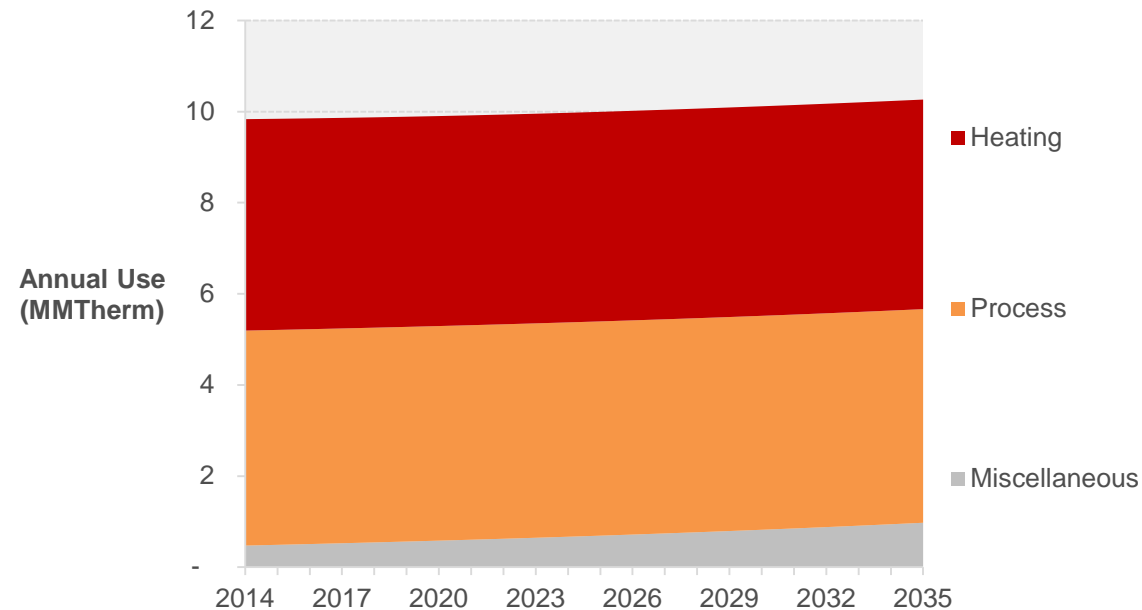
Industrial Natural Gas Measure-Level Potential

Realistic achievable natural gas savings are 0.11 MMtherms by 2019, or 1.2% of the baseline forecast.

By 2026, this is 0.38 MMtherms, or 5.6% of the baseline forecast.

Note – net natural gas impacts from CHP measures excluded.

Also Note – Industrial Gas potential basically de minimus since large opt-out customers are excluded (99% of eligible load).
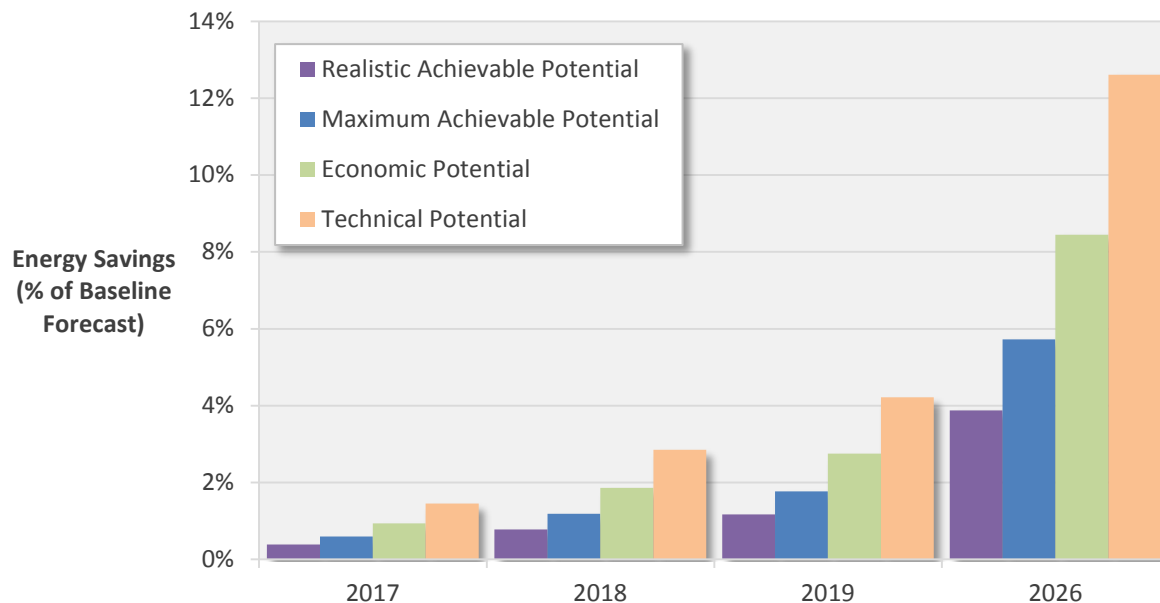
Cumulative Energy Savings Potential	2017	2018	2019	2026
Baseline Forecast (MMTherm)	**9.83**	**9.84**	**9.84**	**9.93**
Cumulative Savings (MMTherm)				
Realistic Achievable Potential	0.04	0.08	0.11	0.38
Maximum Achievable Potential	0.06	0.12	0.17	0.57
Economic Potential	0.09	0.18	0.27	0.84
Technical Potential	0.14	0.28	0.41	1.25
Energy Savings (% of Baseline)				
Realistic Achievable Potential	0.4%	0.8%	1.2%	3.9%
Maximum Achievable Potential	0.6%	1.2%	1.8%	5.7%
Economic Potential	0.9%	1.9%	2.8%	8.4%
Technical Potential	1.4%	2.9%	4.2%	12.6%

Preliminary Sector-Level Analysis:
Street Lighting

Street Lighting Electricity Measure-Level Potential

Street Lighting use in 2014 is 313 GWh with 95% of usage from Company-owned fixtures, half of which are 100-200W fixtures

Realistic achievable energy savings are 22 GWh by 2019, 7.0% of the baseline forecast.

Realistic achievable energy savings are 59 GWh by 2026, 19.0% of the baseline forecast.

Potential comes almost entirely from LED fixtures, with small contribution from enhanced controls/dimmers.
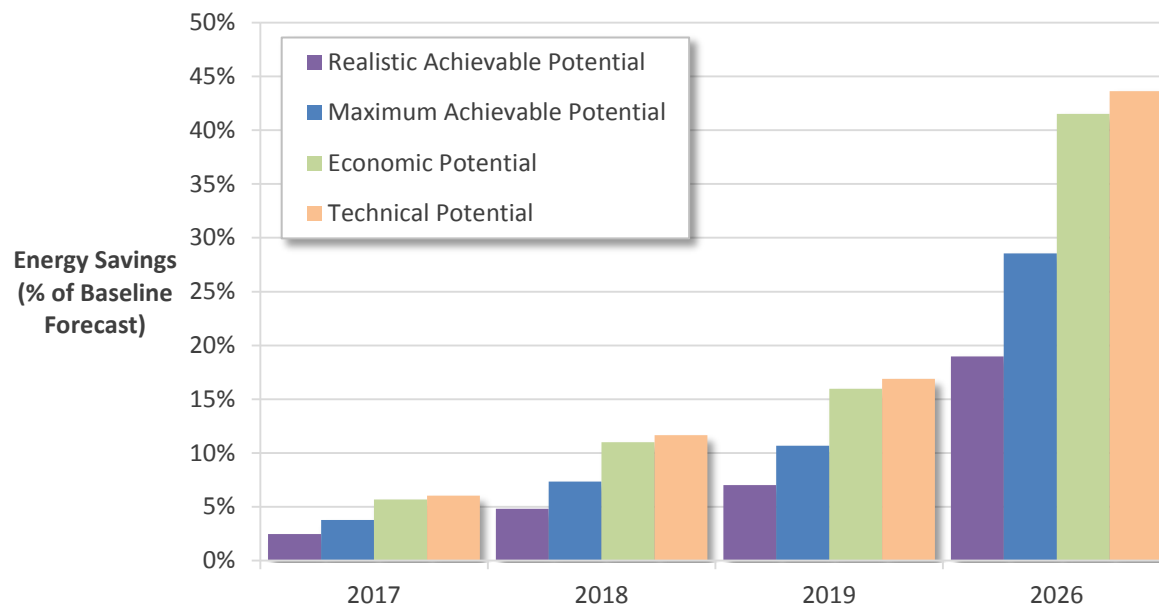
Cumulative Energy Savings	2017	2018	2019	2026
Baseline Forecast (GWh)	**313**	**313**	**313**	**313**
Cumulative Savings (GWh)				
Realistic Achievable Potential	8	15	22	59
Maximum Achievable Potential	12	23	34	89
Economic Potential	18	35	50	130
Technical Potential	19	37	53	137
Energy Savings (% of Baseline)				
Realistic Achievable Potential	2.5%	4.8%	7.0%	19.0%
Maximum Achievable Potential	3.8%	7.4%	10.7%	28.6%
Economic Potential	5.7%	11.0%	16.0%	41.5%
Technical Potential	6.0%	11.7%	16.9%	43.6%

Preliminary Measure-Level Analysis:
All-Sector Summary

Measure-Level DSM Potential at a Glance

Cumulative Electric Energy Savings

Legend:
- Realistic Achievable Potential
- Maximum Achievable Potential
- Economic Potential
- Technical Potential
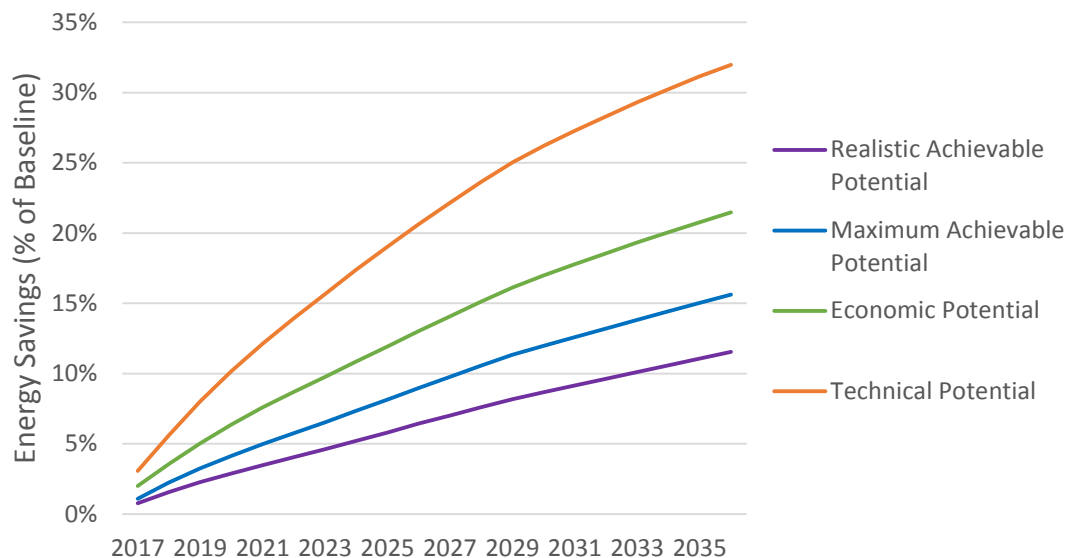
Cumulative Natural Gas Energy Savings
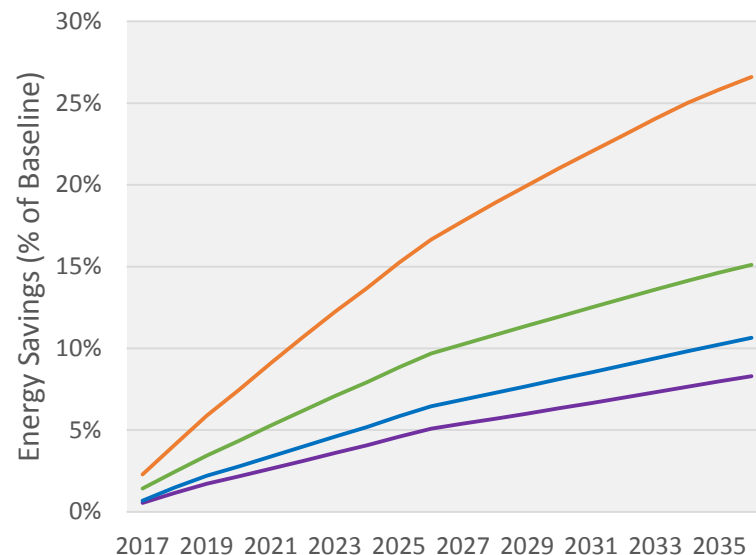
Cumulative Net Electric Energy Savings

	2017	2018	2019	2026	2036
Cumulative Savings (GWh)					
Realistic Achievable Potential	293	588	857	2,413	4,328
Maximum Achievable Potential	414	843	1,226	3,368	5,859
Economic Potential	752	1,340	1,889	4,885	8,050
Technical Potential	1,158	2,115	3,011	7,742	11,992
Energy Savings (% of Baseline)					
Realistic Achievable Potential	0.8%	1.6%	2.3%	6.4%	11.5%
Maximum Achievable Potential	1.1%	2.2%	3.3%	9.0%	15.6%
Economic Potential	2.0%	3.6%	5.0%	13.0%	21.5%
Technical Potential	3.1%	5.6%	8.0%	20.6%	32.0%

Cumulative Net Natural Gas Energy Savings

	2017	2018	2019	2026	2036
Cumulative Savings (MMtherms)					
Realistic Achievable Potential	4.2	8.8	12.9	37.2	60.7
Maximum Achievable Potential	5.2	11.3	16.6	47.2	77.8
Economic Potential	11.0	18.5	25.9	70.8	110.4
Technical Potential	17.4	31.1	44.4	121.7	194.3
Energy Savings (% of Baseline)					
Realistic Achievable Potential	0.6%	1.2%	1.7%	5.1%	8.3%
Maximum Achievable Potential	0.7%	1.5%	2.2%	6.5%	10.6%
Economic Potential	1.4%	2.4%	3.4%	9.7%	15.1%
Technical Potential	2.3%	4.1%	5.9%	16.6%	26.6%

Potential by Sector
10-Year Net Cumulative Savings at the Measure Level

2026 Net Cumulative Electric Potential (MWh)
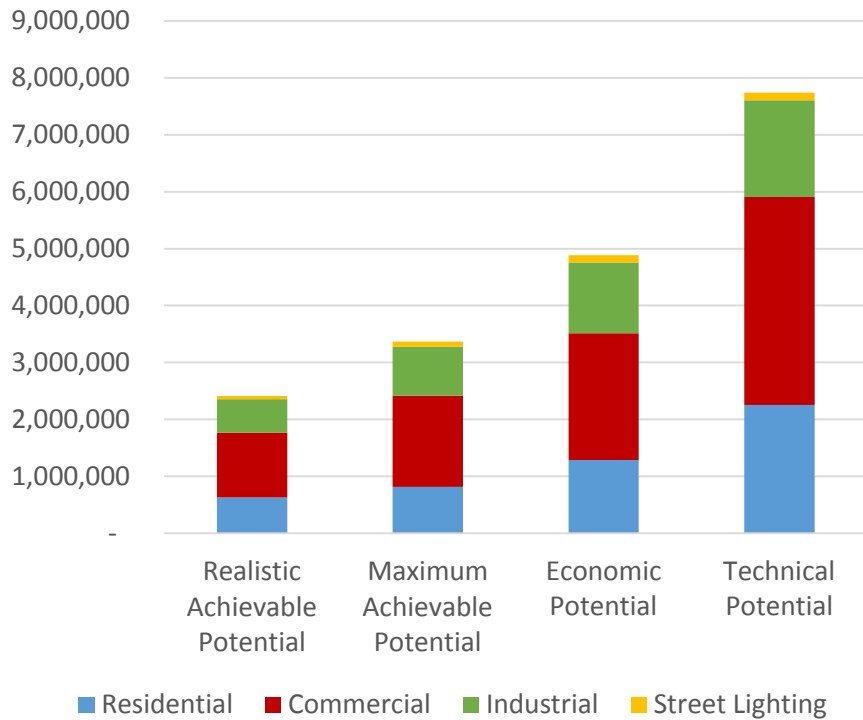
2026 Net Cumulative Natural Gas Potential (MMTherms)
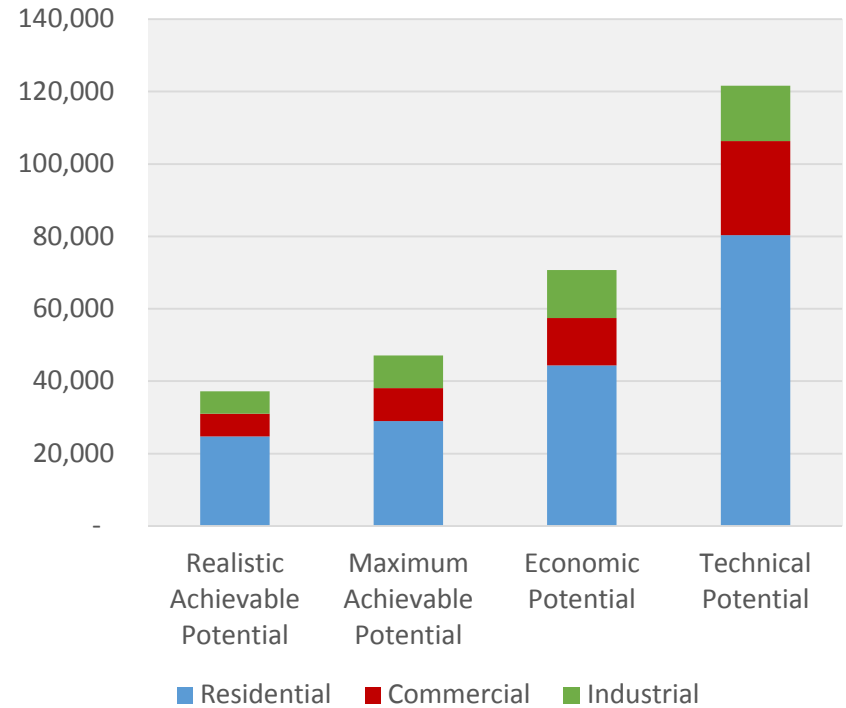
Pause for Additional Discussion

Preliminary Program Potential

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.

Measure-Level Potential   **Program-Level Potential**

Technical

Economic

Achievable (Maximum)

Achievable (Realistic)

Apply Program Delivery & Cost Structures

Apply Program Delivery & Cost Structures

Program MAP

Program RAP
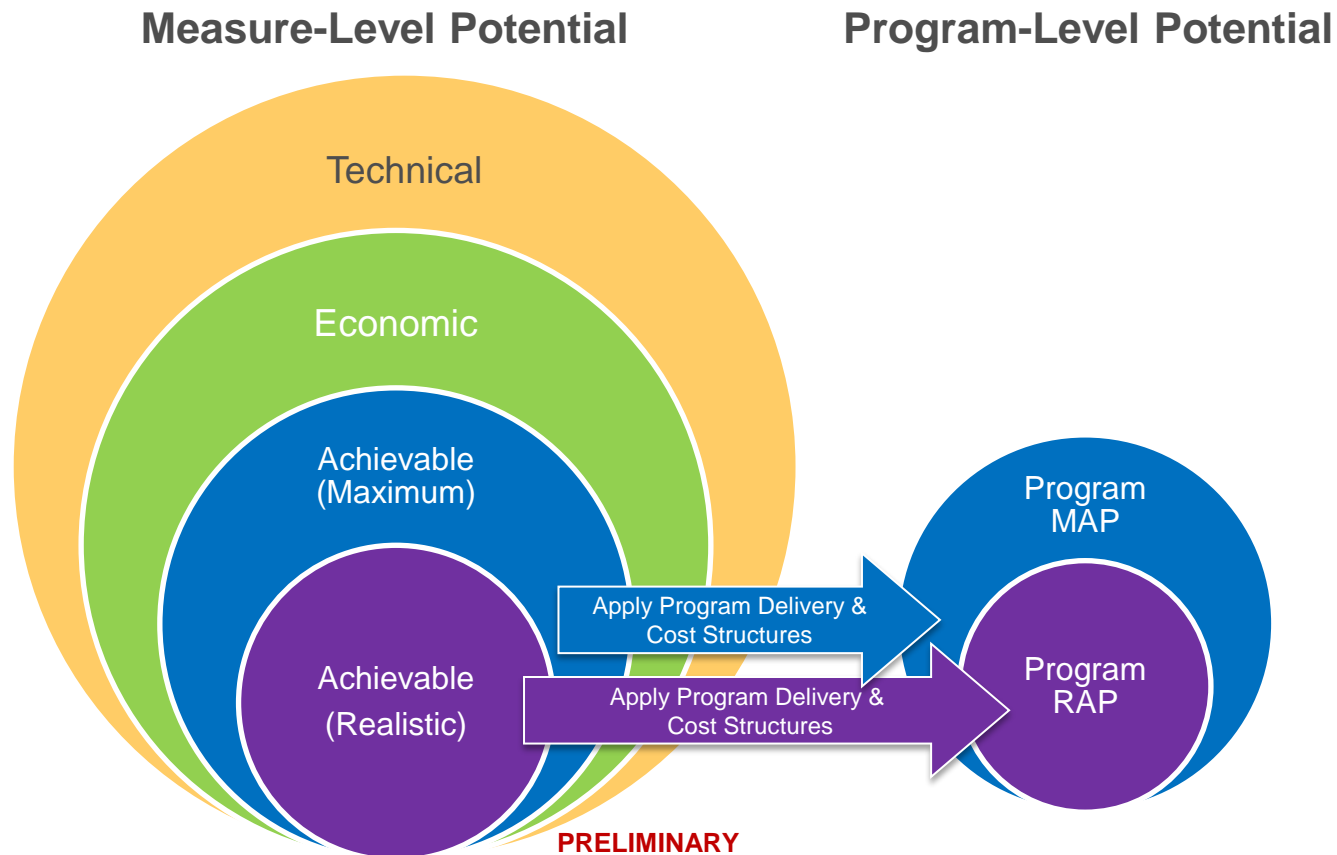
PRELIMINARY

Preliminary Program Potential

- This study is developing **preliminary estimates of program potential** that will be refined into program designs in a separate effort in 2016

- When translating from Measure-level potential to Program-level potential, we:

  - Excluded any measure that did not pass the measure-level TRC screen

  - Allocated each passing measure to one or more program

  - Added program administrative & delivery costs

  - Applied net-to-gross ratios

  - Considered measure bundling, delivery mechanisms, and program-level cost-effectiveness. For example, at this stage we excluded

    - Efficient residential electronics since there is no viable delivery method for a utility program in this market

    - Appliance Recycling since the program bundle is no longer cost-effective.

- The programs are very similar to those currently being offered in the Ameren Illinois service territory, with changes as described on the next slide.

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

Business Programs	
C&I Standard	Combined Heat and Power
C&I Custom	Institutional & Public Facilities
Retro-commissioning	
Small Business Direct Install	
Strategic Energy Management	
Street Lighting	

New Initiatives in Preliminary Program Potential

LED lamps
Solid state lighting is now a mainstream technology that will be taking the place of fluorescent lamps in all aspects of the portfolio over the planning horizon.

Combined Heat & Power
A new CHP program assumed to begin in year 2.

- Currently shown as electricity savings only. Excludes net *increases* in natural gas consumption (the natural gas fuel consumed by the generation units are not completely offset by the savings from captured waste heat)

Smart Thermostats
Similar to efforts in Northern Illinois and elsewhere in the country, we assume a large effort in the Ameren Illinois Program Potential toward accelerating the adoption of smart, programmable, learning, and wifi-enabled thermostats.

Street Lighting
LED retrofits and smart-dimming technologies in a possible new program offering provide a largely untapped source of cost-effective savings.

Smart Power Strips
We have modeled and included a second generation of smart, sensing power strips that combine occupancy, load, and other sensors to enable higher savings for electronics end uses.

Retrocommissioning
The existing Ameren Illinois RCx program could be bolstered by the use of more powerful Building Analytics software that is rapidly permeating the industry.

Strategic Energy Management
Ameren Illinois' Large C&I customer program will continue to focus on customized efficiency plans and cultural change, and could capitalize on national best practices in the SEM arena, including lessons learned from implementations of ISO-500001

PRELIMINARY

Portfolio Modeling Notes

- **Low & Moderate Income Programs:** Measure-level economic screen set to TRC>0.50 with subjective removal of measures until budget as a % of the residential portfolio is less than 41% (which is the portion of the residential population segmented in the analysis as low or moderate income).

- **Appliance Recycling:** Using current savings estimates, this program is no longer cost effective due to declining per-unit savings and low NTG. Program has been removed from the modeled portfolio.

- **Cooling avoided costs** in the HVAC program have been adjusted upward by 10 to 20% to account for increased seasonal energy costs.

- **Lighting** - NTG has been increased from 0.47 (PY6 Eval) to 0.70 to account for the transition from a CFL to an LED world. This aligns with the SAG NTG working group recommendations.

- **Lifetime Savings** have been added to the tables in this presentation per SAG feedback

- **Participation:** MAP Customer adoption is generally estimated at 1.5X higher than RAP

- **Incentives:**
  - RAP = Current levels with some adjustments for cost escalations
  - MAP = 100% of incremental costs, increased $/first-year-kW payments, faster paybacks, etc.

- **Administrative costs:** Generally derived as % of incentive budget, so these scale proportionally.

- **Behavioral programs:**
  - RAP Home Energy Reports holds steady at current levels of 250k HHs.
  - MAP Home Energy Reports start at 250k HHs and ramp up to 300k HHs over 3 years and holds.

Preliminary DSM Potential at a Glance

Cumulative Electric Energy Savings

Legend:
- Program RAP (dotted purple)
- Program MAP (dotted blue)
- Realistic Achievable Potential (purple)
- Maximum Achievable Potential (blue)
- Economic Potential (green)
- Technical Potential (orange)
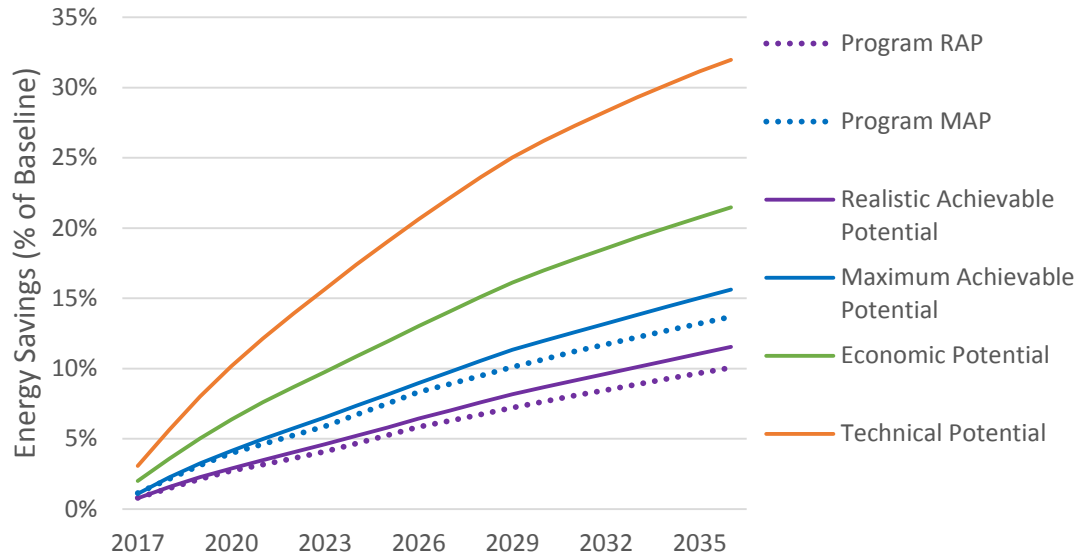
Cumulative Natural Gas Energy Savings
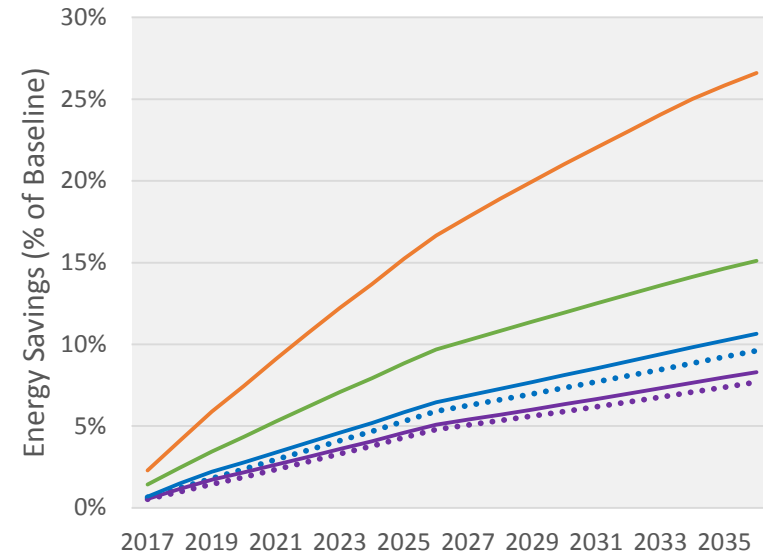
Cumulative Electric Energy Savings

	2017	2018	2019	2026	2036
Cumulative Savings (GWh)					
Program RAP	299	551	800	2,197	3,778
Program MAP	425	804	1,174	3,124	5,129
Realistic Achievable Potential	293	588	857	2,413	4,328
Maximum Achievable Potential	414	843	1,226	3,368	5,859
Economic Potential	752	1,340	1,889	4,885	8,050
Technical Potential	1,158	2,115	3,011	7,742	11,992
Energy Savings (% of Baseline)					
Program RAP	0.8%	1.5%	2.1%	5.9%	10.1%
Program MAP	1.1%	2.1%	3.1%	8.3%	13.7%
Realistic Achievable Potential	0.8%	1.6%	2.3%	6.4%	11.5%
Maximum Achievable Potential	1.1%	2.2%	3.3%	9.0%	15.6%
Economic Potential	2.0%	3.6%	5.0%	13.0%	21.5%
Technical Potential	3.1%	5.6%	8.0%	20.6%	32.0%

Cumulative Natural Gas Energy Savings

	2017	2018	2019	2026	2036
Cumulative Savings (MMtherms)					
Program RAP	4.1	7.4	10.8	35.0	56.2
Program MAP	4.9	9.3	13.6	43.1	70.2
Realistic Achievable Potential	4.2	8.8	12.9	37.2	60.7
Maximum Achievable Potential	5.2	11.3	16.6	47.2	77.8
Economic Potential	11.0	18.5	25.9	70.8	110.4
Technical Potential	17.4	31.1	44.4	121.7	194.3
Energy Savings (% of Baseline)					
Program RAP	0.5%	1.0%	1.4%	4.8%	7.7%
Program MAP	0.6%	1.2%	1.8%	5.9%	9.6%
Realistic Achievable Potential	0.6%	1.2%	1.7%	5.1%	8.3%
Maximum Achievable Potential	0.7%	1.5%	2.2%	6.5%	10.6%
Economic Potential	1.4%	2.4%	3.4%	9.7%	15.1%
Technical Potential	2.3%	4.1%	5.9%	16.6%	26.6%

Preliminary DSM Program Potential at a Glance

Electric Portfolio Savings

Net Incremental MWh Savings

	PY8	PY9	PY10	PY11	PY12
Plan 3 (AIC + IPA + DCEO)	382,291	393,549			
Program RAP			298,782	295,621	291,672
Program MAP			424,786	420,794	415,508

- ■ Plan 3 (AIC + IPA + DCEO) ■ Program RAP ■ Program MAP
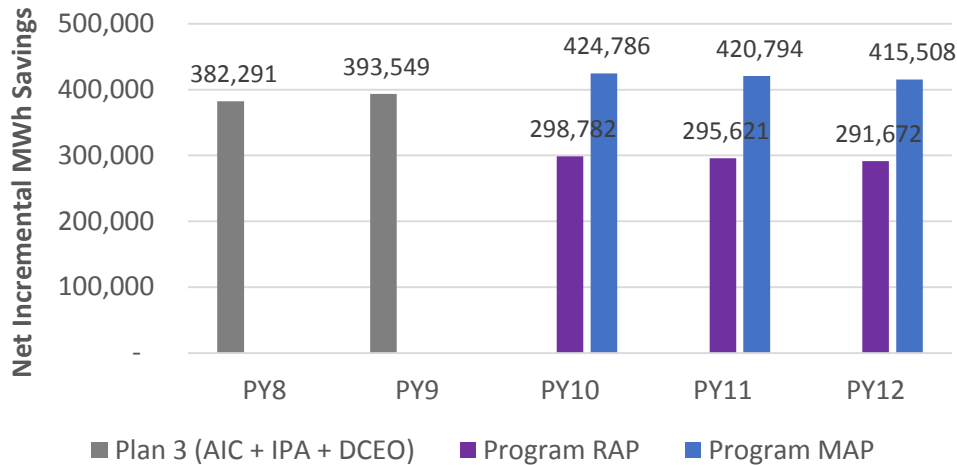
Natural Gas Portfolio Savings

Net Incremental therm Savings

	PY8	PY9	PY10	PY11	PY12
Plan 3 (AIC + IPA + DCEO)	6,279,533	6,190,726			
Program RAP			4,116,185	4,235,460	4,302,501
Program MAP			4,955,226	5,196,786	5,362,461

- ■ Plan 3 (AIC + IPA + DCEO) ■ Program RAP ■ Program MAP
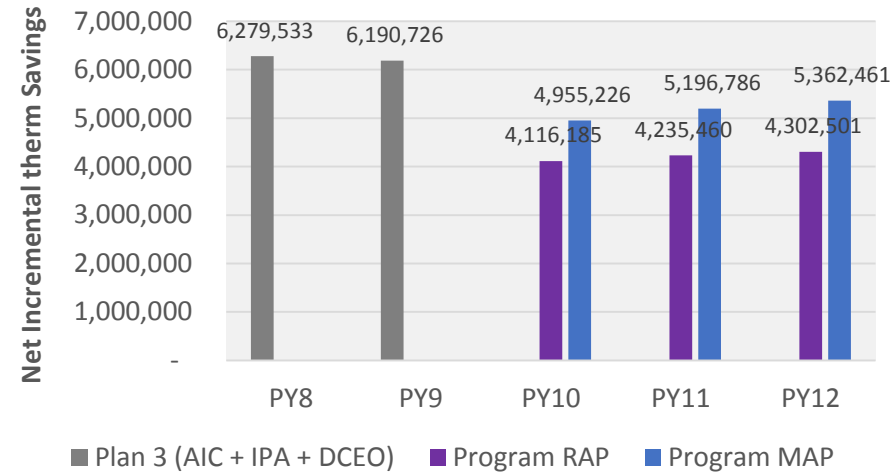
Electric Program Budgets

$ Millions

	PY8	PY9	PY10	PY11	PY12
Plan 3 (AIC + IPA + DCEO)	$99.2	$99.0			
Program RAP			$74.5	$77.3	$78.6
Program MAP			$137.2	$141.9	$143.5

- ■ Plan 3 (AIC + IPA + DCEO) ■ Program RAP ■ Program MAP
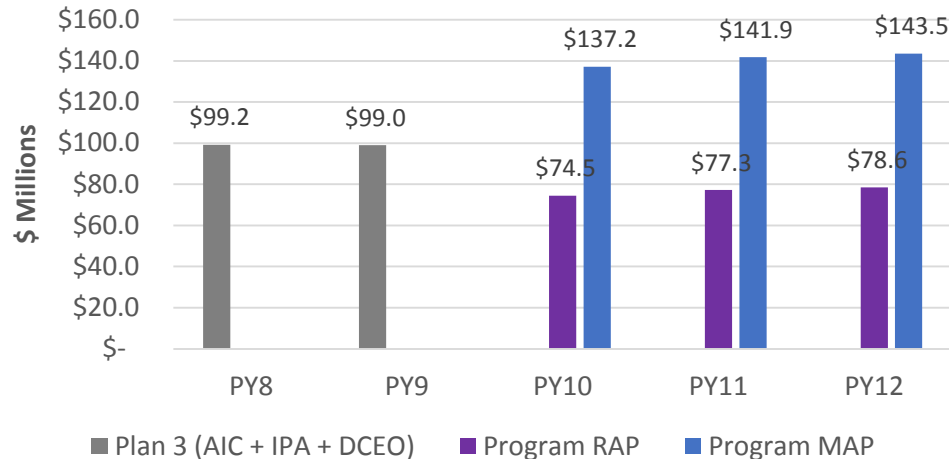
Natural Gas Program Budgets

$ Millions

	PY8	PY9	PY10	PY11	PY12
Plan 3 (AIC + IPA + DCEO)	$15.8	$15.8			
Program RAP			$10.7	$11.1	$11.3
Program MAP			$19.5	$20.2	$20.6

- ■ Plan 3 (AIC + IPA + DCEO) ■ Program RAP ■ Program MAP
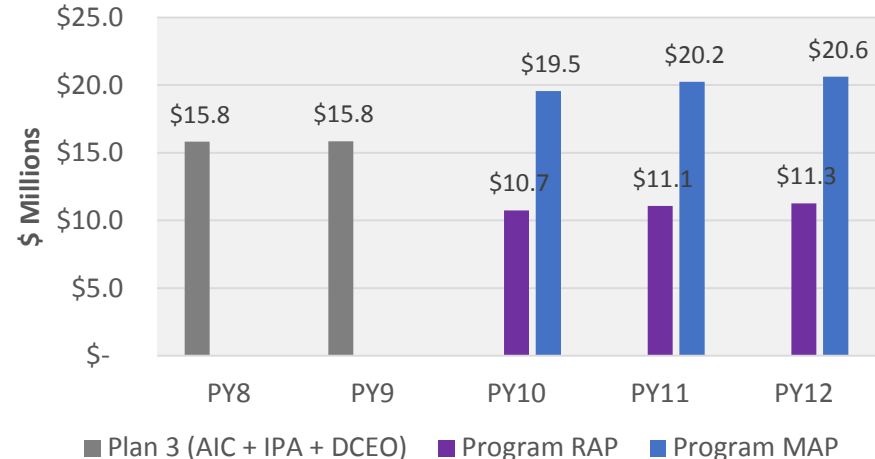
PRELIMINARY

Preliminary Program Potential
At the Sector Level

Preliminary Program Potential Summary Tables

Electricity and Natural Gas Combined

Program RAP

Program	Total Budget (000s)			Net Incremental Electric Savings (MWh)			Net Incremental Gas Savings (therms)		
	2017	2018	2019	2017	2018	2019	2017	2018	2019
Residential Total:	$32,811	$34,129	$33,793	115,198	112,650	108,052	3,537,502	3,647,245	3,703,321
Business Total:	$52,431	$54,215	$56,031	183,584	182,971	183,619	578,683	588,214	599,180
Portfolio Total:	$85,242	$88,344	$89,824	298,782	295,621	291,672	4,116,185	4,235,460	4,302,501
% of Total Revenue or Baseline				0.80%	0.80%	0.79%	0.55%	0.57%	0.58%

Program MAP

Program	Total Budget (000s)			Net Incremental Electric Savings (MWh)			Net Incremental Gas Savings (therms)		
	2017	2018	2019	2017	2018	2019	2017	2018	2019
Residential Total:	$58,518	$61,060	$60,176	145,235	144,467	140,517	4,085,672	4,318,881	4,474,035
Business Total:	$98,197	$101,055	$103,954	279,551	276,327	274,991	869,553	877,905	888,426
Portfolio Total:	$156,715	$162,116	$164,130	424,786	420,794	415,508	4,955,226	5,196,786	5,362,461
% of Total Revenue or Baseline				1.14%	1.13%	1.12%	0.66%	0.69%	0.72%

Preliminary Electric Program Potential Summary Tables

Program RAP

Program	Electric Budget (000s)			Net Incremental Electric Savings (MWh)			Net LIFETIME Electric Savings (MWh)		
	2017	2018	2019	2017	2018	2019	2017	2018	2019
Residential Total:	$27,248	$28,352	$27,957	115,198	112,650	108,052	652,994	646,026	611,697
Business Total:	$47,246	$48,911	$50,609	183,584	182,971	183,619	1,882,044	1,921,719	1,965,467
Portfolio Total:	**$74,494**	**$77,262**	**$78,566**	**298,782**	**295,621**	**291,672**	**2,535,038**	**2,567,744**	**2,577,164**
% of Total Revenue or Baseline	2.44%	2.47%	2.44%	0.80%	0.80%	0.79%			

Program MAP

Program	Electric Budget (000s)			Net Incremental Electric Savings (MWh)			Net LIFETIME Electric Savings (MWh)		
	2017	2018	2019	2017	2018	2019	2017	2018	2019
Residential Total:	$48,700	$50,687	$49,559	145,235	144,467	140,517	896,866	883,627	828,574
Business Total:	$88,466	$91,185	$93,951	279,551	276,327	274,991	2,855,324	2,892,331	2,934,448
Portfolio Total:	**$137,166**	**$141,872**	**$143,511**	**424,786**	**420,794**	**415,508**	**3,752,190**	**3,775,958**	**3,763,022**
% of Total Revenue or Baseline	4.49%	4.53%	4.46%	1.14%	1.13%	1.12%			

Preliminary Natural Gas Program RAP Summary Tables

Program RAP

Program	Natural Gas Budget (000s)			Net Incremental Gas Savings (therms)			Net LIFETIME Gas Savings (therms)		
	2017	2018	2019	2017	2018	2019	2017	2018	2019
Residential Total:	$5,563	$5,777	$5,836	3,537,502	3,647,245	3,703,321	33,789,741	35,319,842	35,981,864
Business Total:	$5,185	$5,305	$5,422	578,683	588,214	599,180	7,373,801	7,456,435	7,565,676
Portfolio Total:	$10,748	$11,082	$11,258	4,116,185	4,235,460	4,302,501	41,163,542	42,776,277	43,547,540
% of Total Revenue or Baseline	1.94%	1.96%	1.94%	0.55%	0.57%	0.58%			

Program MAP

Program	Natural Gas Budget (000s)			Net Incremental Gas Savings (therms)			Net LIFETIME Gas Savings (therms)		
	2017	2018	2019	2017	2018	2019	2017	2018	2019
Residential Total:	$9,818	$10,374	$10,617	4,085,672	4,318,881	4,474,035	41,779,592	43,714,204	44,385,035
Business Total:	$9,731	$9,870	$10,003	869,553	877,905	888,426	10,981,042	11,034,108	11,127,830
Portfolio Total:	$19,549	$20,244	$20,620	4,955,226	5,196,786	5,362,461	52,760,633	54,748,312	55,512,866
% of Total Revenue or Baseline	3.53%	3.58%	3.56%	0.66%	0.69%	0.72%			

Preliminary Program Potential Cost Effectiveness

Program RAP

TRC Ratio	2017	2018	2019
Residential Total:	1.15	1.18	1.29
Business Total:	1.57	1.57	1.61
Portfolio Total:	**1.39**	**1.41**	**1.48**

3-Year TRC Ratio (2017-2019)	20-Year TRC Ratio (2017-2036)
1.20	1.31
1.58	1.64
1.43	**1.53**

Levelized Elec $/kWh (2017-2036)	Levelized Gas $/therm (2017-2036)	First-Year Elec $/kWh (2017-2019)	First-Year Gas $/therm (2017-2019)
$0.065	$0.23	$0.249	$1.58
$0.047	$1.31	$0.267	$9.01
$0.051	**$0.45**	**$0.260**	**$2.61**

Program MAP

TRC Ratio	2017	2018	2019
Residential Total:	1.00	1.02	1.10
Business Total:	1.42	1.41	1.45
Portfolio Total:	**1.25**	**1.26**	**1.32**

3-Year TRC Ratio (2017-2019)	20-Year TRC Ratio (2017-2036)
1.04	1.13
1.43	1.43
1.28	**1.33**

Levelized Elec $/kWh (2017-2036)	Levelized Gas $/therm (2017-2036)	First-Year Elec $/kWh (2017-2019)	First-Year Gas $/therm (2017-2019)
$0.085	$0.35	$0.346	$2.39
$0.058	$1.62	$0.329	$11.23
$0.064	**$0.65**	**$0.335**	**$3.89**

A Note on Behavioral Lifetime & Cost-Effectiveness

▶ **AEG Currently Modeling Cost-Effectiveness with Option 3**

Option 1) Program RAP Behavioral Savings with 1-Year Measure Life

	Year 1	Year 2	Year 3	3-Year Portfolio
Customers	250,000	250,000	250,000	
Annual MWh Savings	42,383	41,932	41,449	
NPV Benefits	$ 2,169,568	$ 2,264,152	$ 2,428,559	$ 6,862,278
NPV Costs	$ 2,319,613	$ 2,199,311	$ 2,085,248	$ 6,604,171
TRC Ratio	0.94	1.03	1.16	1.04

Option 2) Program RAP Behavioral Savings with 2-Year Measure Life

	Year 1	Year 2	Year 3	Year 4	3-Year Portfolio
Customers	250,000	500,000	500,000	250,000	
Annual MWh Savings	42,383	84,315	83,381	41,449	
NPV Benefits	$ 2,169,568	$ 4,433,719	$ 4,692,711	$ 2,428,559	$ 13,724,557
NPV Costs	$ 2,319,613	$ 2,199,311	$ 2,085,248	$ -	$ 6,604,171
TRC Ratio	0.94	2.02	3.42	n/a	2.08

Option 3) Program RAP Behavioral Savings with 2-Year Measure Life for Final Year

	Year 1	Year 2	Year 3	Year 4	3-Year Portfolio
Customers	250,000	250,000	250,000	250,000	
Annual MWh Savings	42,383	41,932	41,449	41,449	
NPV Benefits	$ 2,169,568	$ 2,264,152	$ 2,428,559	$ 2,428,559	$ 9,290,838
NPV Costs	$ 2,319,613	$ 2,199,311	$ 2,085,248	$ -	$ 6,604,171
TRC Ratio	0.94	1.03	2.33	n/a	1.41

Option 4) Track the Incremental, Maintained, and Attrition from Year to Year

....gets complicated...

Next Steps for This Study

- Receive and review feedback from SAG

- Perform three sensitivity analyses:

  o High avoided costs

  o Low load growth

  o Alternate economic screening method

- Develop supply curves, savings, & budgets for various strategic and legislative cases

- Prepare written report

Thank You!

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