



# AMEREN ILLINOIS MARKET POTENTIAL STUDY PRELIMINARY POTENTIAL ESTIMATES

September 2, 2020

***Preliminary Results Prepared for  
Illinois SAG Meeting on 9/2/20***

# AGENDA

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Overview of the study

- Analysis approach
- Analysis steps
- Summary of results

Residential analysis

Commercial analysis

Industrial analysis

Key takeaways and next steps

# AEG'S PERSPECTIVE ON THE MPS AND THE PLAN

## Market Potential Study

What is the amount of savings potential given expected customer adoption of cost-effective measures under simulated market conditions?

Defining Characteristics:

- Unbiased assessment of the market potential for energy efficient savings over a nine-year period, 2022-2030
- Represents expected customer adoption of cost-effective measures
- Agnostic to CPAS goals, AAIG, spending requirements, and portfolio objectives
- Considers all measures that are technically feasible and available in the market

## 2022-2025 EE Plan

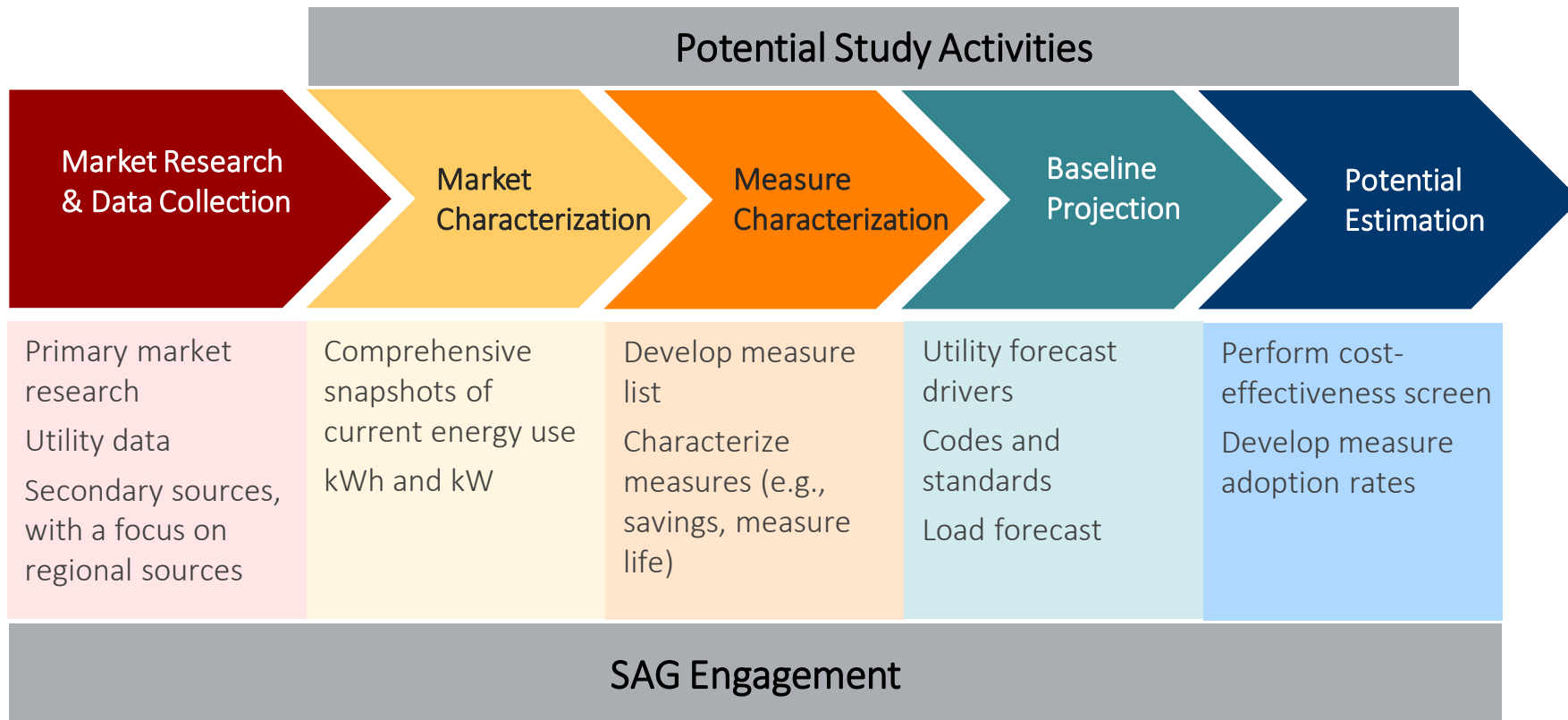
How can Ameren optimize portfolio savings given expected customer adoption under the Illinois regulatory framework?

Defining Characteristics:

- Programs designed to be implemented over a 4-year period
- Overall portfolio must be cost-effective, but individual measures do not
- Must balance expected customer adoption in addition to CPAS goals achievement, AAIG, and spending requirements
- Must address portfolio goals, objectives, and priorities (e.g., income qualified)

# ANALYSIS APPROACH

Applied proven, data-driven analysis approach using AEG's LoadMAP™ end-use forecasting model  
 Incorporated feedback from interested stakeholders



# MARKET RESEARCH

## Customer Surveys

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### Survey objectives

- Segment the market for analysis
- Quantify key inputs for study, primarily:
  - Appliance saturations
  - Energy intensity (e.g., use per household)
- Survey topics:
  - Appliance inventories
  - Dwelling characteristics
  - Occupant characteristics

### Residential sector

- Mail-to-web recruiting and data collection
- 1,021 completions

### C&I sectors used two approaches

- Small and medium business: Mail-to-web with telephone follow-up with selected segments
  - 618 completions
- Onsite surveys with large customers
  - 28 completions

Both C&I surveys were cut short by COVID-19 lockdown

- Resulted in fewer completions than planned
- Supplemented with previous-study survey results

# MARKET RESEARCH

## Data Sources

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### Primary data sources:

- Ameren data
  - Billing data
  - Load forecast assumptions & results
  - Program accomplishments
  - Economic assumptions (avoided costs, discount rate, prices, etc.)
  - Previous potential study
- Illinois TRM v.8
  - Except general service lighting, which uses the dual baseline from TRM v.9

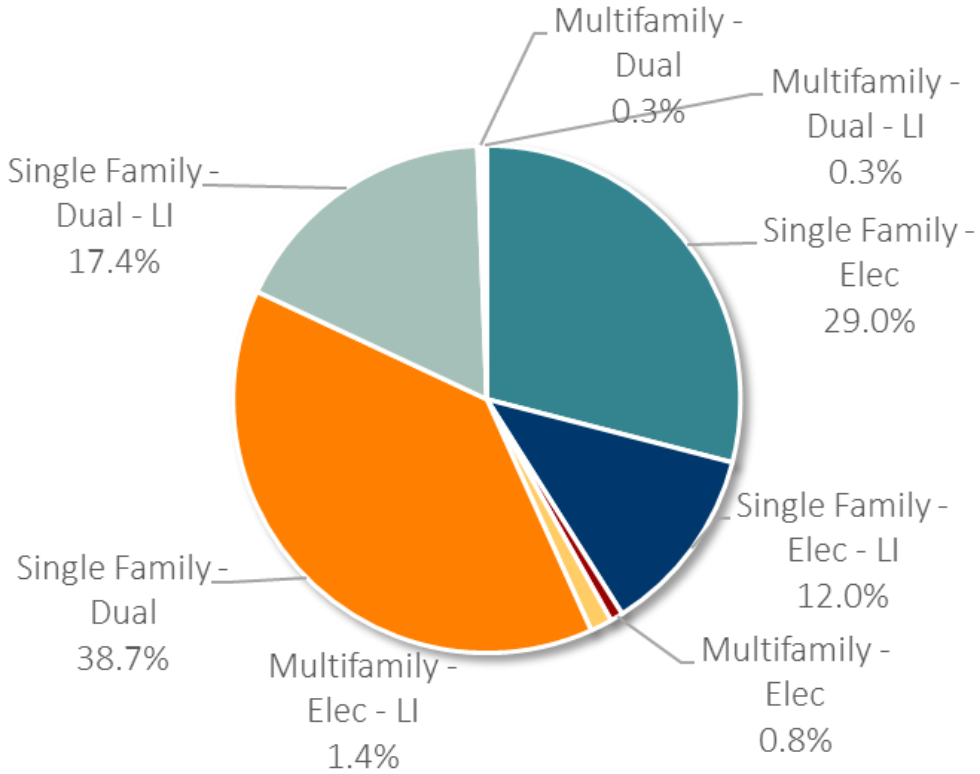
### Secondary data

- American Community Survey from Census
- DOE / Energy Information Administration (EIA) surveys:
  - Residential Energy Consumption Survey (RECS)
  - Commercial Building Energy Consumption Survey (CBECS)
- DOE / EIA Annual Energy Outlook
- AEG's Database of Energy Efficiency Measures (DEEM)

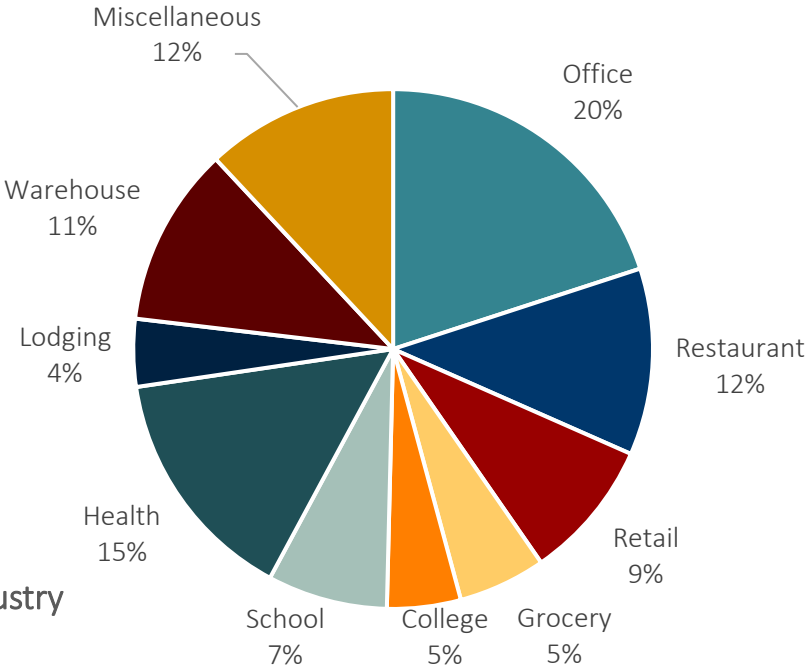
# MARKET CHARACTERIZATION

## High-level Characterization for Ameren, 2019

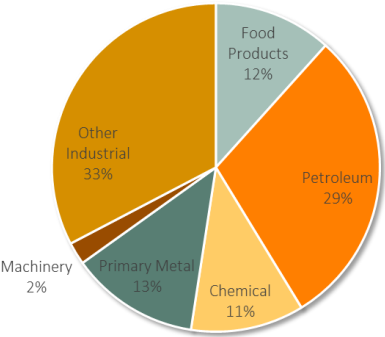
Residential Electricity Sales by Segment



Commercial\* Electricity Sales by Building Type



Industrial\* Electricity Sales by Industry



\*Includes customers <10 MW

# MEASURE CHARACTERIZATION AND BASELINE PROJECTION

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## Measures

- AEG developed preliminary measure list
- Vetted with stakeholders and incorporated feedback
- Produced finalized measure list
- Fully characterizes measures using Illinois TRM 8.0 except for:
  - Residential lighting – dual baseline

## Baseline end-use projection

- Baseline projection includes effects of standards, codes and naturally-occurring conservation
- The baseline projection is developed by technology and rolled up by end use
- Aligns with Ameren's load forecast, provided in Q2
  - Load forecast does not include future EE savings



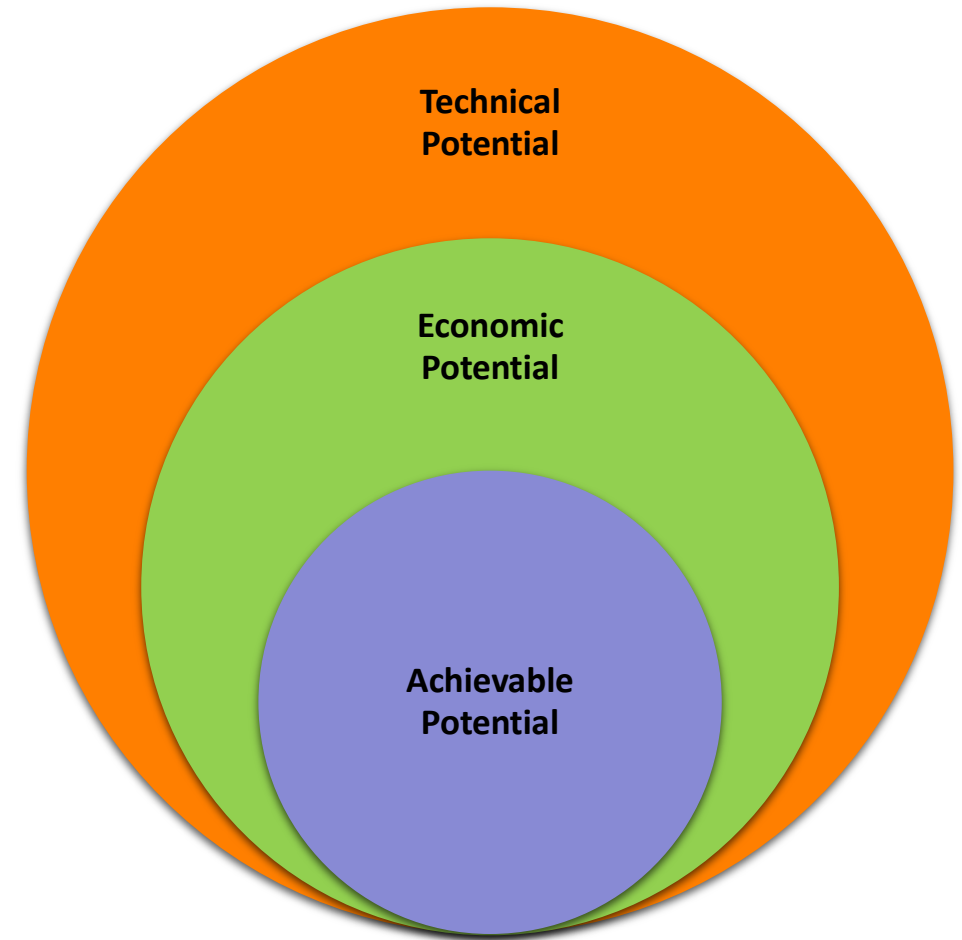
# LEVELS OF SAVINGS ESTIMATES

**Technical:** everyone chooses the most efficient option regardless of cost

**Economic:** is a subset of technical potential that includes only cost-effective measures

**Achievable:** is a subset of economic potential that accounts for likely measure adoption within the market

- Requires adoption rates



# APPROACHES FOR DEVELOPING ADOPTION RATES

Options AEG uses for MPS

Use previous program accomplishments to inform future adoption rates

- Answers “What are future savings likely to be if we keep doing what we are doing to deliver and evolve the programs?”

Estimate using “program interest” questions from customer surveys

- Answers “What do customer preferences imply for adoption rates under various economic and delivery approaches?”

Use prescribed adoption rates

- Answers “What are potential savings if we use rates of EE acquisition used in planning for other regions??”

Perform benchmarking and consider how best to use the results

- Answers “How do we compare with peer utilities and can/should we use the results to inform adoption rates?”

Hybrid approach

- Answers two or more of questions above

# APPROACH FOR AMEREN ADOPTION RATES

Use previous program accomplishments to inform future adoption rates

- Answers “What are future savings likely to be if we keep doing what we are doing to deliver and evolve the programs?”

Perform benchmarking and consider how best to use the results

- Answers “How do results compare with peer utilities and can/should we use the results to inform adoption rates?”

Use previous program accomplishments to develop adoption rates

- Group measures in potential study into **categories**
- Compute preliminary adoption rates as  $\text{Savings}_{2018-19} / \text{Technical Potential}_{2022}$
- For most categories with calculated adoption rates < 10%, set minimum to 10%

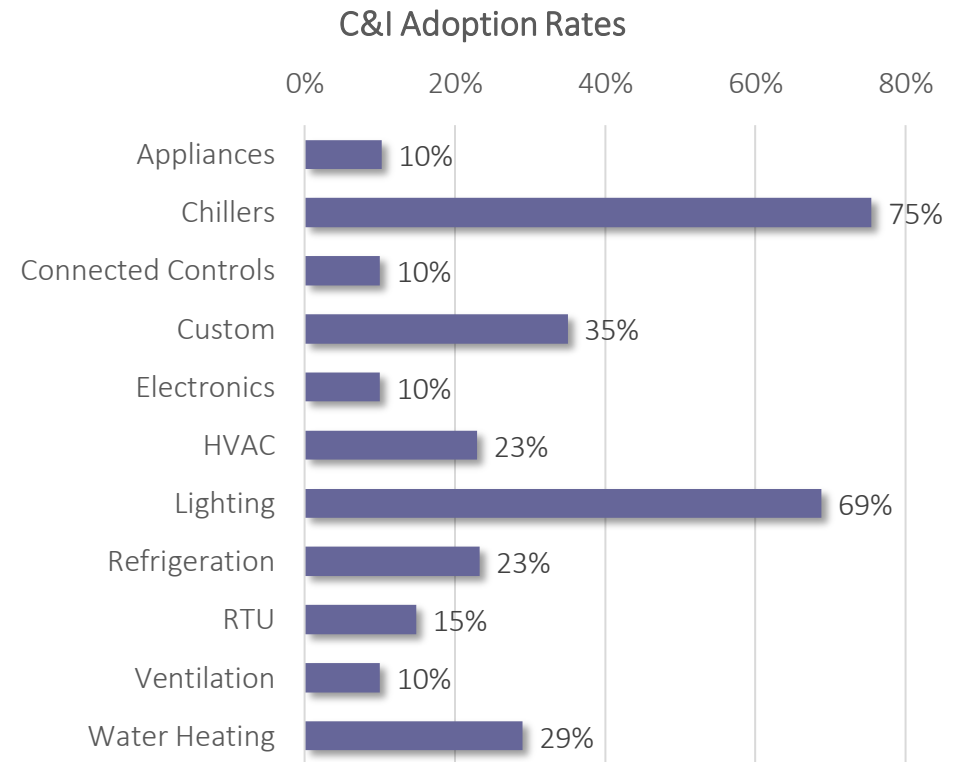
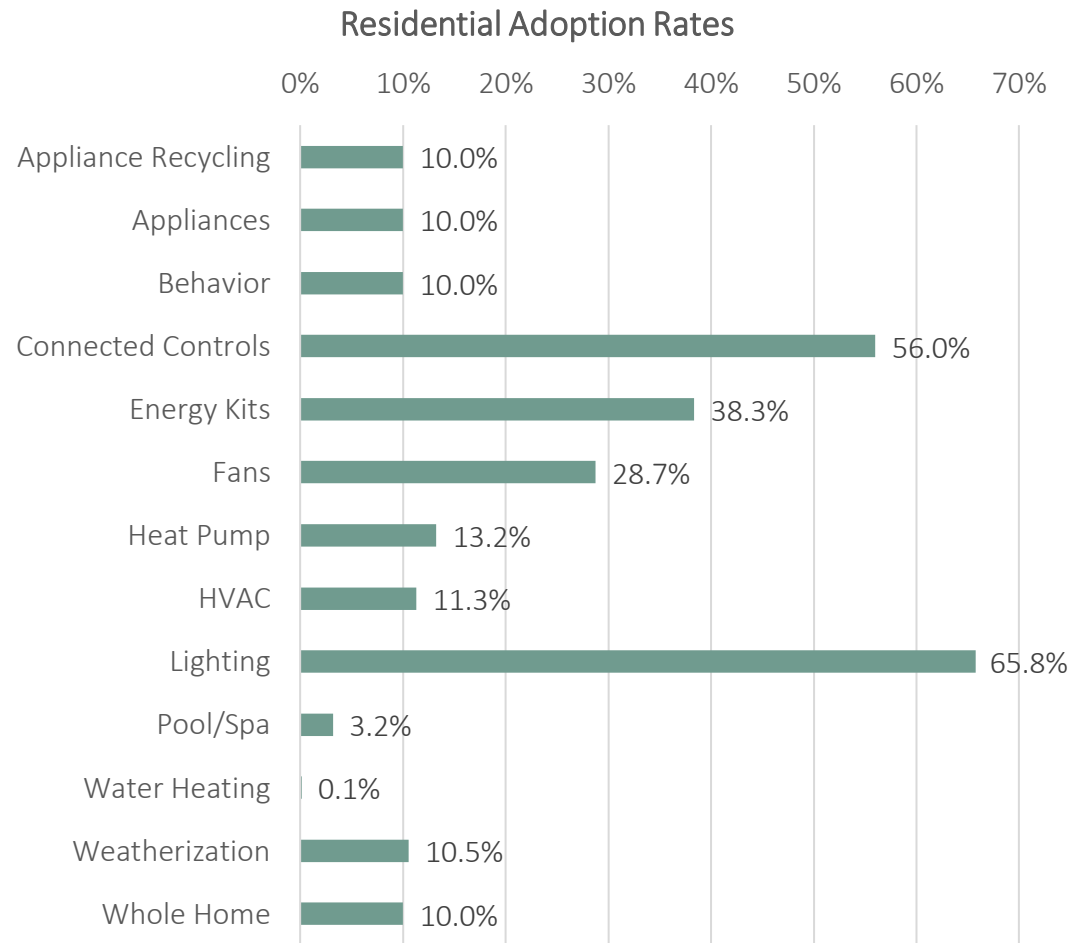
Apply adoption rates to compute achievable potential

Perform comparisons

- Compare potential savings with past Ameren performance
- Compare potential with regional peer utilities’ performance
- Ascertain applicable factors that could inform Ameren adoption rates

# ADOPTION RATES BASED ON PAST PERFORMANCE

Minimum of 10% Rate with Two Exceptions





# Summary of Preliminary Potential

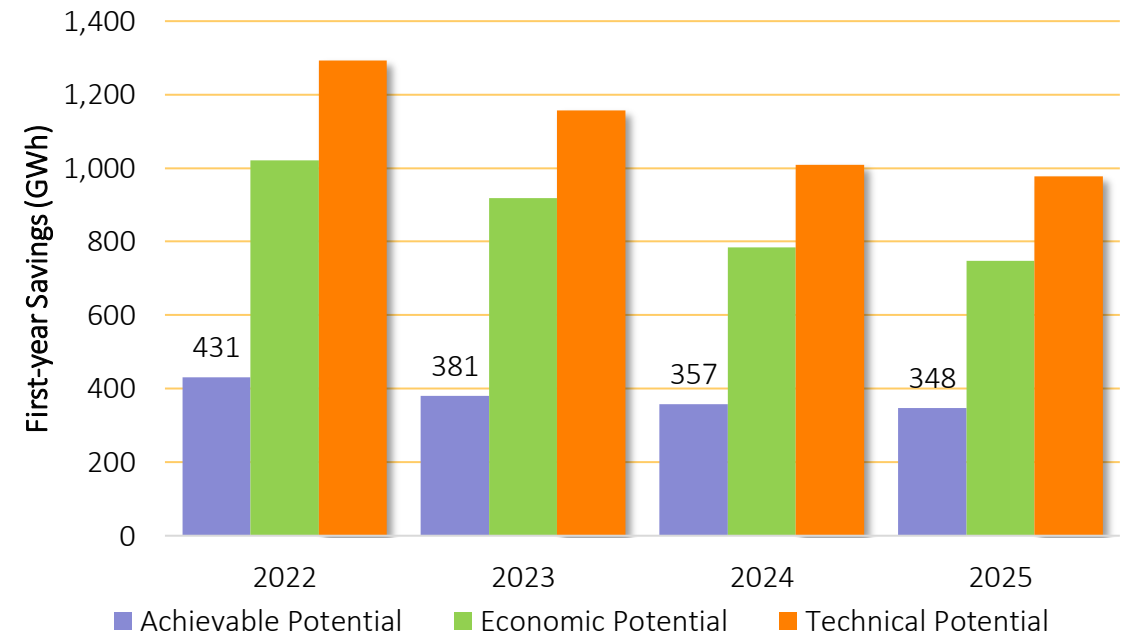
# SUMMARY OF POTENTIAL ESTIMATES

## First-year Savings, All Sectors

Achievable potential excludes savings from codes, standards and naturally-occurring efficiency

- Over program years, savings are between 431 and 348 GWh per year
  - Represents 1.6% to 1.3% of baseline

	2022	2023	2024	2025
<b>Reference Baseline (GWh)</b>	26,673	26,481	26,254	25,994
<b>First-year Savings (GWh)</b>				
Achievable Potential	431	381	357	348
Economic Potential	1,021	919	784	748
Technical Potential	1,292	1,157	1,008	977
<b>First-year Savings as % of Baseline</b>				
Achievable Potential	1.6%	1.4%	1.4%	1.3%
Economic Potential	3.8%	3.5%	3.0%	2.9%
Technical Potential	4.8%	4.4%	3.8%	3.8%



# SUMMARY OF ACHIEVABLE POTENTIAL BY SECTOR

## First-year Savings Compared to Prior-year Accomplishments

Commercial sector accounts for 50-60% of first-year savings in each program year

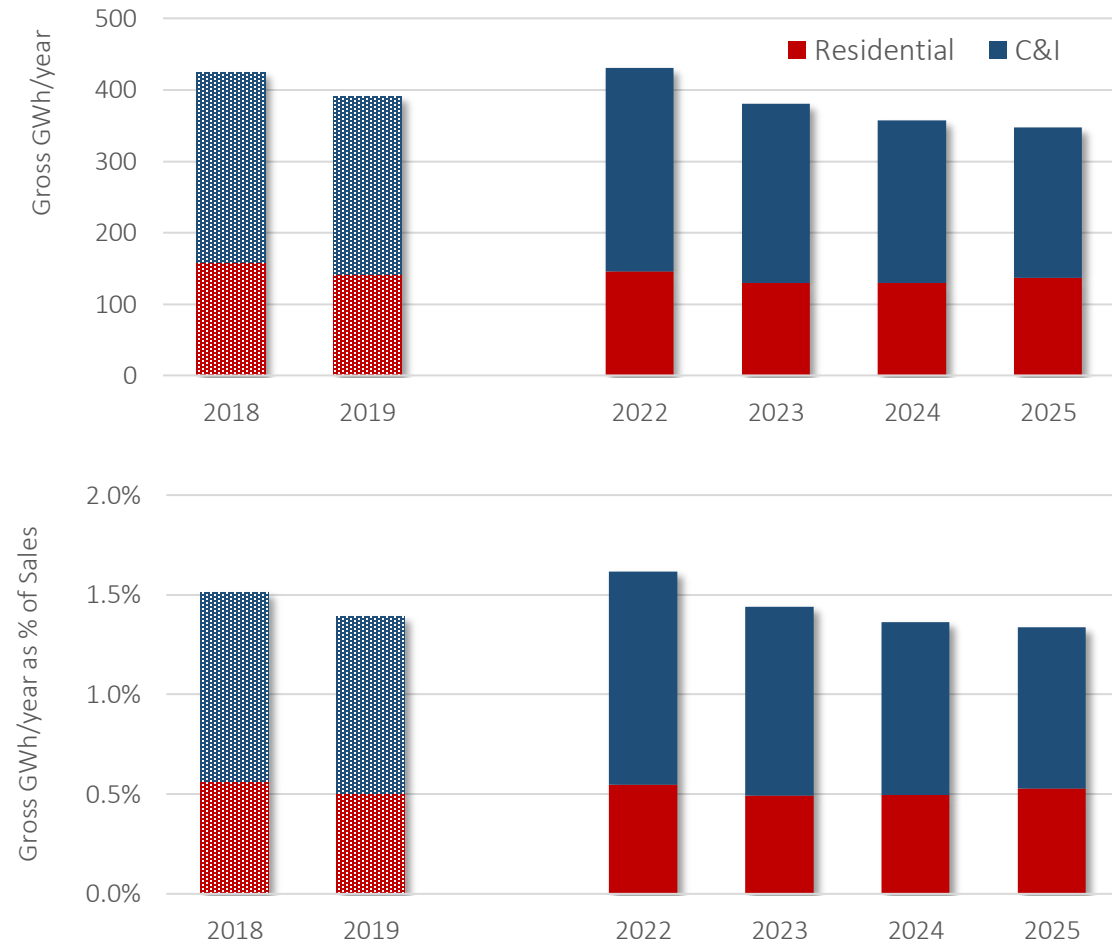
- Residential accounts for about one third
- Industrial is <10%, reflecting exclusion of largest customers

Future savings are comparable with past performance

- Existing measures still offer opportunity for additional savings
- New measures also contribute

Achievable Potential by Sector	2022	2023	2024	2025
<b>First-year Savings (GWh) - Total</b>	<b>431</b>	<b>381</b>	<b>357</b>	<b>348</b>
Residential	146	130	130	137
Commercial	241	208	186	168
Industrial	44	43	42	42
<b>First-year Savings (% of Baseline) - Total</b>	<b>1.6%</b>	<b>1.4%</b>	<b>1.4%</b>	<b>1.3%</b>
Residential	0.5%	0.5%	0.5%	0.5%
Commercial	0.9%	0.8%	0.7%	0.6%
Industrial	0.2%	0.2%	0.2%	0.2%

Ameren Accomplishments and Achievable Potential



# BENCHMARKING ANALYSIS

Comparing Prior-year performance, All Sectors

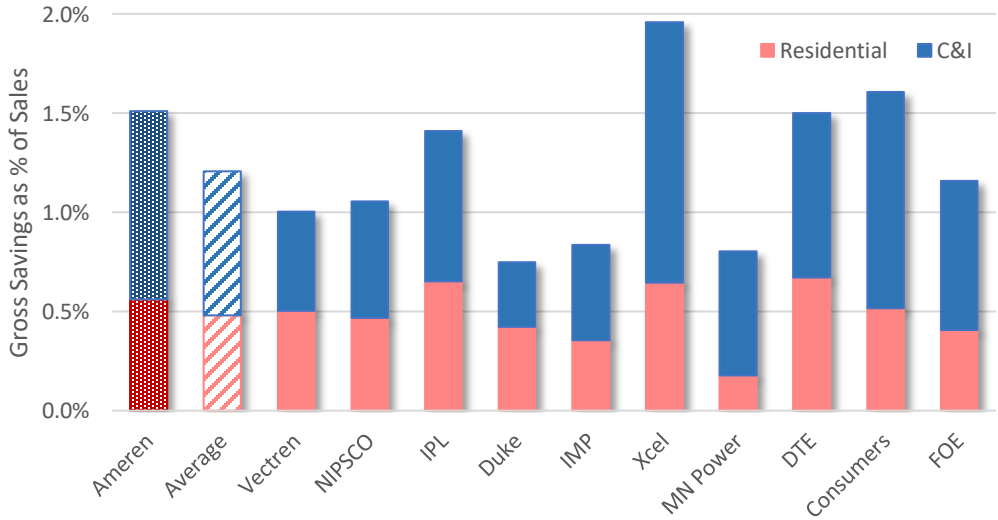
Compares Ameren’s recent accomplishments with regional peers from

- Minnesota, Wisconsin, Michigan, and Indiana
- Compared gross program savings as a percent of total annual sales (GWh)

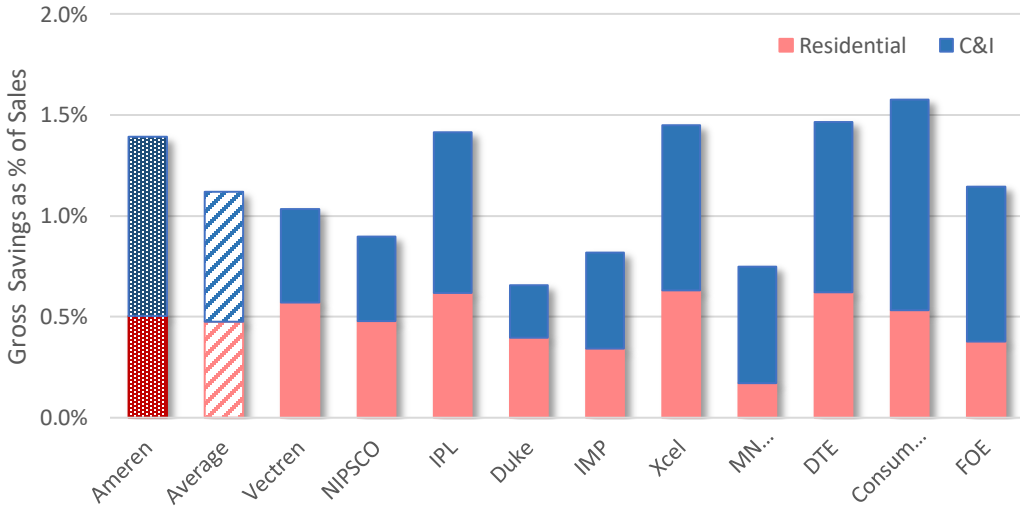
Conclusion:

- The potential in Ameren’s territory stacks up very well overall; outperforming many peers
- Results do not suggest adjustments to the estimated potential savings are warranted

Benchmarking Results for 2018



Benchmarking Results for 2019





# BENCHMARKING ANALYSIS

## Sector-level Results

Provides a better look at the sector-level comparisons

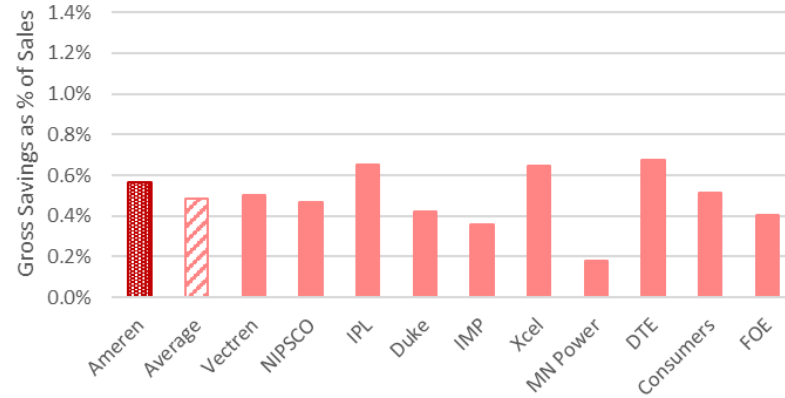
Compares Ameren <10MW segment with peer-group's total C&I

Ameren is well above average in 2018 and 2019 for C&I sectors

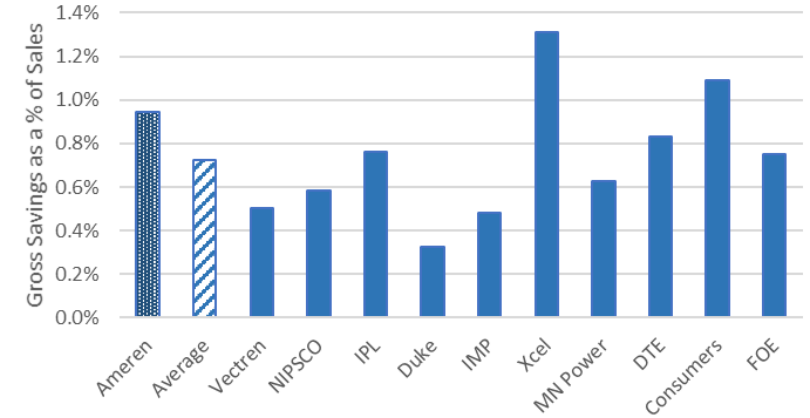
- Ameren is outperforming many peer utilities in each year

Ameren is also above average for residential sectors

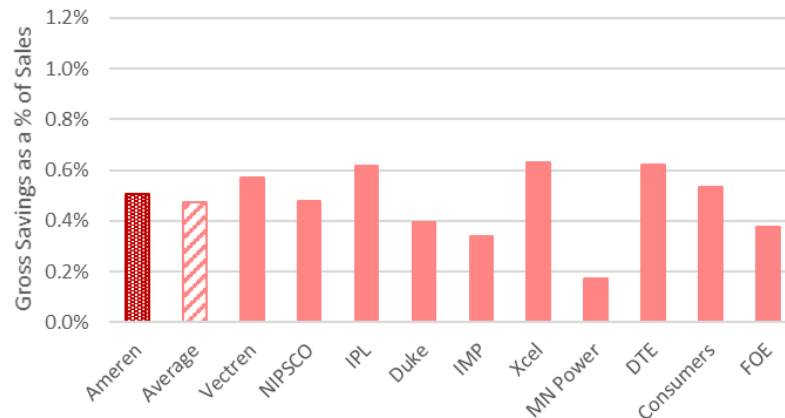
Residential Benchmarking Results for 2018



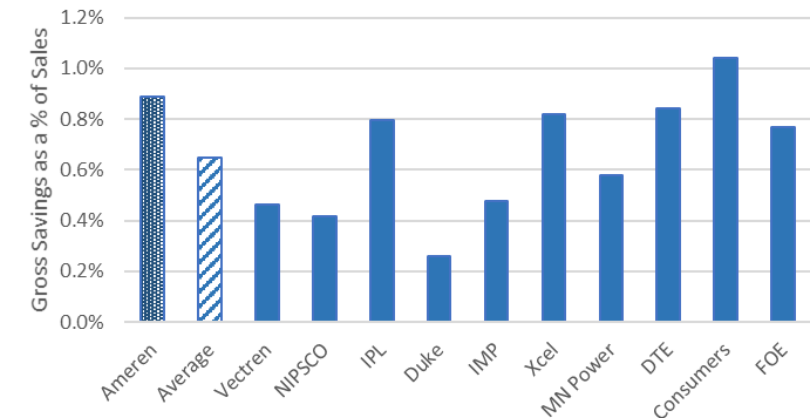
C&I Benchmarking Results for 2018



Residential Benchmarking results for 2019



C&I Benchmarking results for 2019



# WHAT ACCOUNTS FOR POTENTIAL SAVINGS?

Achievable Potential by Sector, Cumulative Savings in 2025

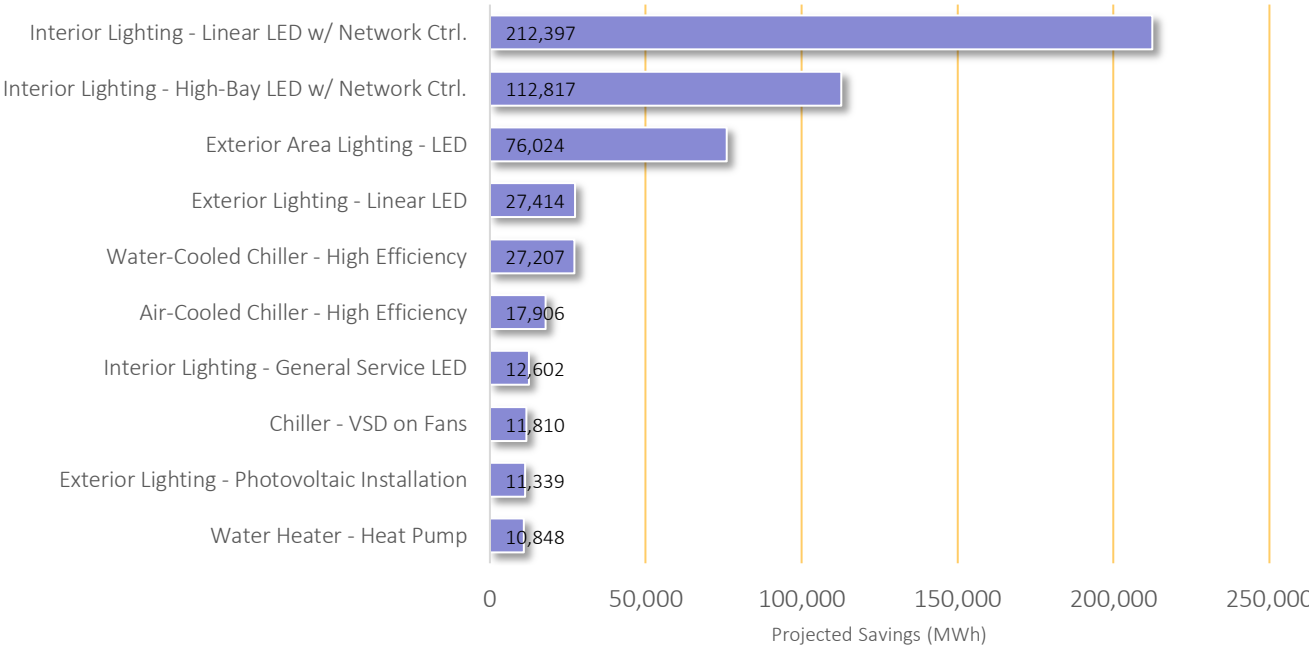
Commercial sector: Top 10 = 77% of total

Residential sector: Top 10 = 71% of total

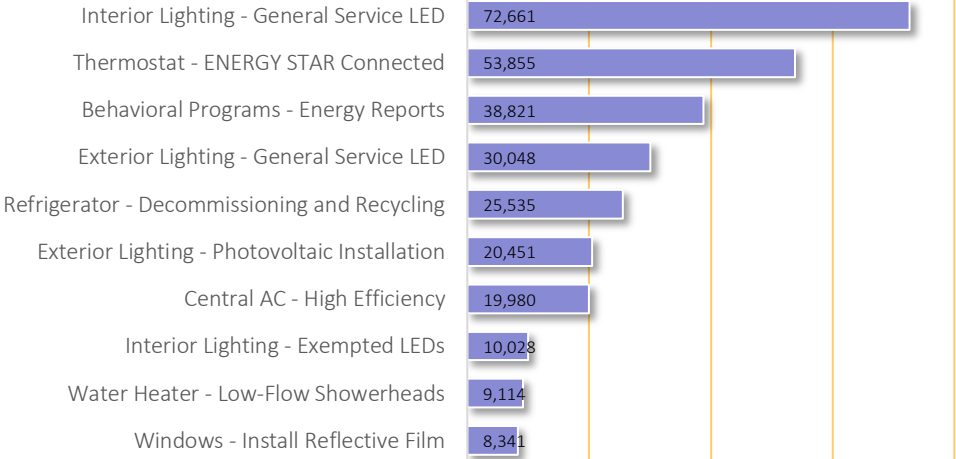
Industrial sector: Top 10 = 57% of total

These top 30 = 73% of all-sector achievable

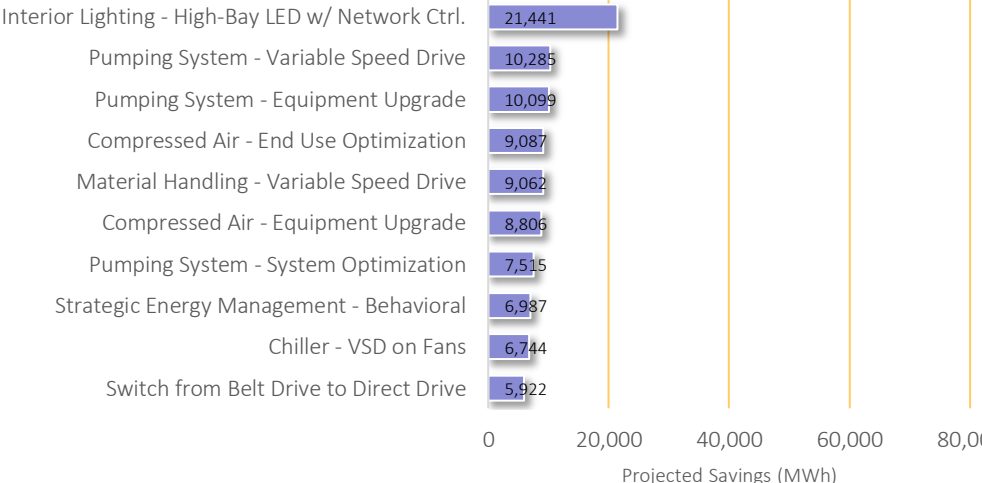
### Commercial Cumulative Potential



### Residential Cumulative Potential



### Industrial Cumulative Potential (A)



# TOP MEASURES, COMMERCIAL SECTOR

## Cumulative Savings in 2025

Shows top-measure savings ranked by achievable potential

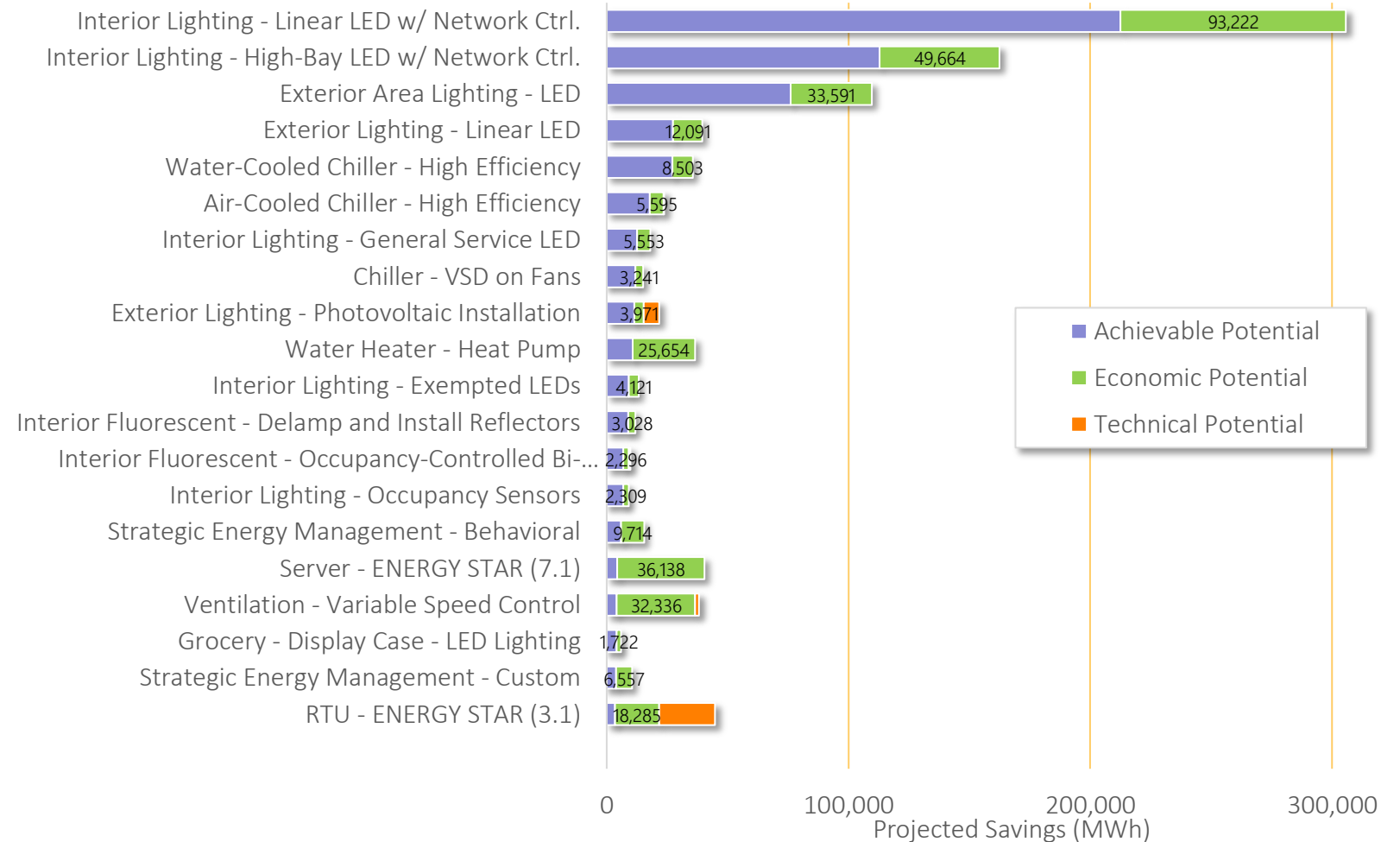
- If no orange showing, then economic = technical

Achievable potential of top 20 measures account for 86% of total commercial achievable

Interior linear and high-bay lighting with networked lighting controls are the top two measures

- For the interior variants, AEG models fixture controls at the time of replacement
- High lighting potential is indicative of an early-replacement practice where entire areas are retrofit during a project rather than just interspersed fixtures that burn out
- Exterior area lighting (high-intensity) are next on the list

Commercial Cumulative Potential (Additive), 2025



# TOP MEASURES, RESIDENTIAL SECTOR

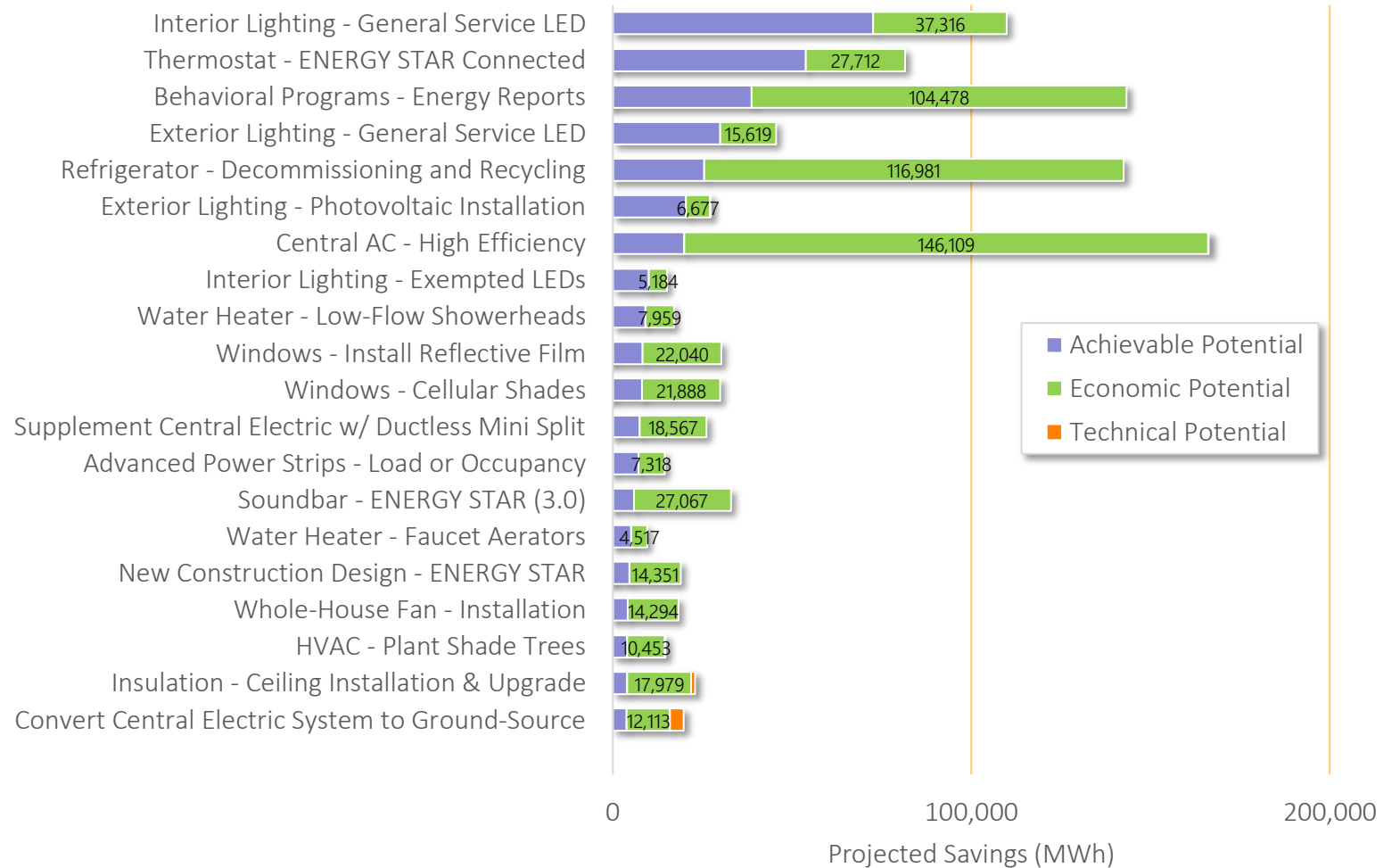
## Cumulative Savings in 2025

Top 20 measures account for 85% of total achievable potential

There is additional economic potential to explore in

- High efficiency central AC
- Refrigerator decom & recycle
  - Appliance recycling assumes 100% of units are removed and not replaced
- Behavioral programs
- Heat pump water heaters

Residential Cumulative Potential (Additive), 2025



# TOP MEASURES, INDUSTRIAL SECTOR

## Cumulative Savings in 2025

Top 20 measures account for 82% of industrial achievable potential

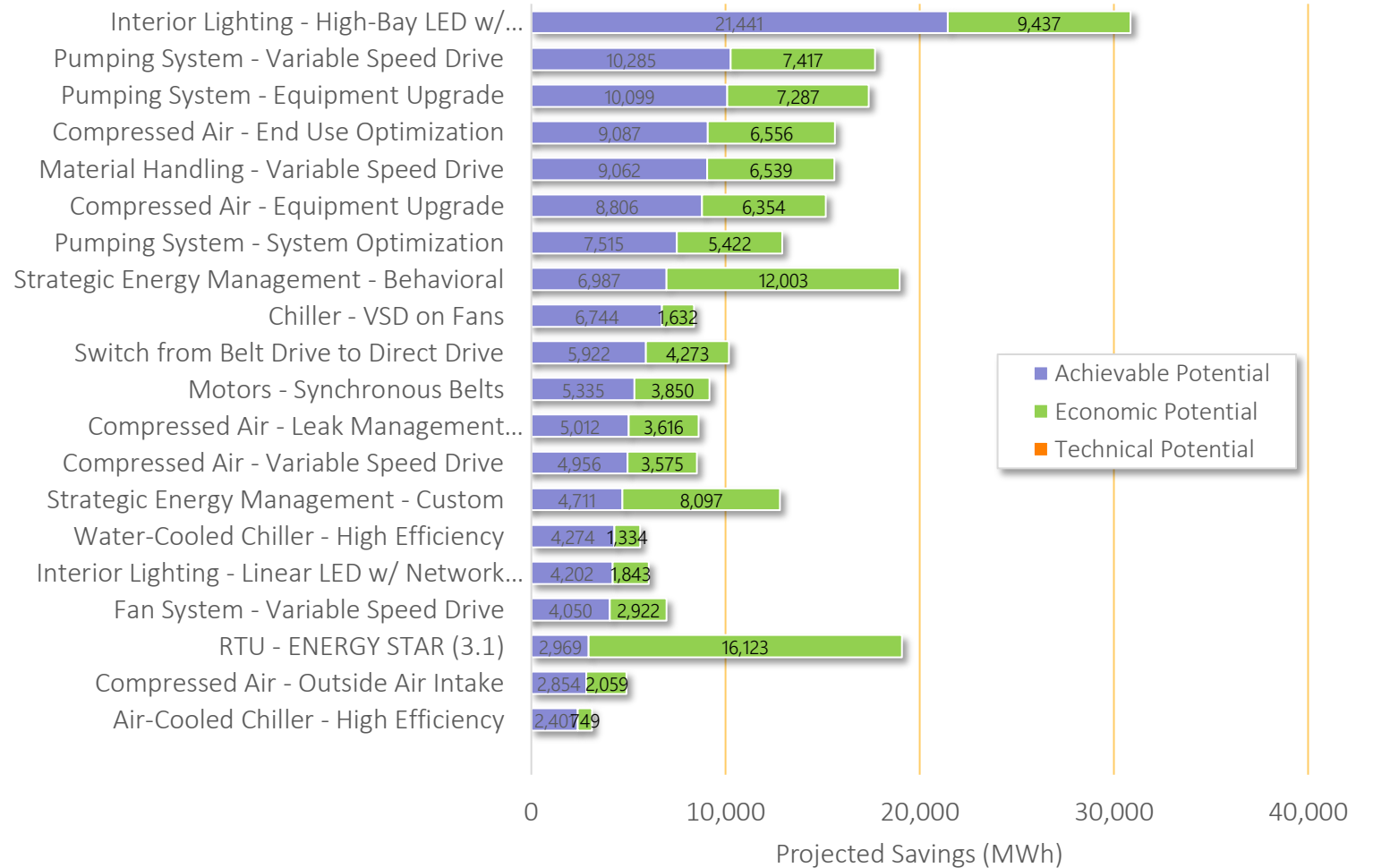
Potential represents customers <10 MW

High-bay lighting is top measure

Custom measure bundles are enumerated

- Includes variable speed drive installations, equipment upgrades and optimizations, and compressed air leak management

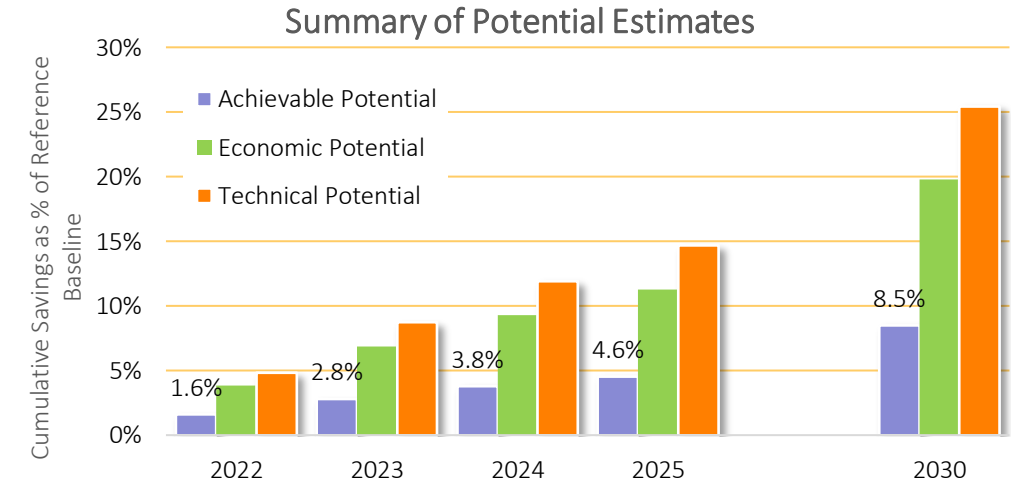
Industrial Cumulative Potential (Additive), 2025



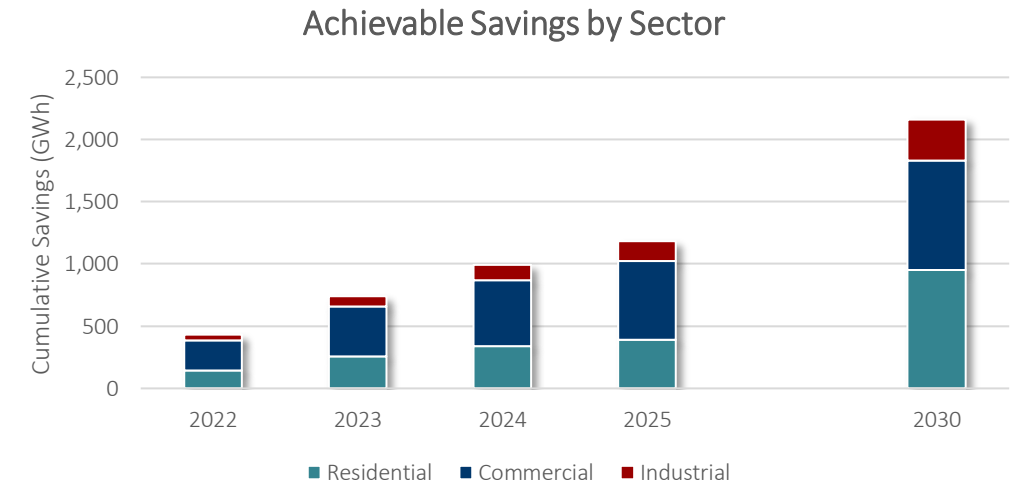
# SUMMARY OF POTENTIAL ESTIMATES THROUGH 2030

## Cumulative Savings, All Sectors

	2022	2023	2024	2025	2030
<b>Reference Baseline (GWh)</b>	26,673	26,481	26,254	25,994	25,426
<b>Cumulative Savings (GWh)</b>					
Achievable Potential	431	742	993	1,184	2,159
Economic Potential	1,021	1,820	2,434	2,934	5,036
Technical Potential	1,292	2,315	3,131	3,816	6,466
<b>Savings as % of Baseline</b>					
Achievable Potential	1.6%	2.8%	3.8%	4.6%	8.5%
Economic Potential	3.8%	6.9%	9.3%	11.3%	19.8%
Technical Potential	4.8%	8.7%	11.9%	14.7%	25.4%



Achievable potential is 1,184 GWh (4.4%) after 4 program years and 2,159 GWh (8.5%) after 9 years



# KEY TAKEAWAYS FROM THE POTENTIAL STUDY

## Preliminary

Ameren prior-years accomplishments compare favorably with regional peers

Analysis indicates a similar amount of potential will continue to be available in the market

- Please note we are not estimating the cost associated with achieving savings

Perhaps a deeper dive into benchmarking data could provide insights into individual programs

- Can we inform program design to unlock potential?

The potential-study analysis provides insight into potential for all measures

- Sum of potential in study focuses on cost-effective potential – not all may be included in programs
- However, measures not cost-effective in study may also be included in the program

Adoption rates in potential study provide guidance for adoption rates in the plan

- Can vary from year to year
- Recommend considering the total estimated units across 4 program years

Potential study provides insight into segment-level potential for planners and implementers



# Residential Sector Analysis



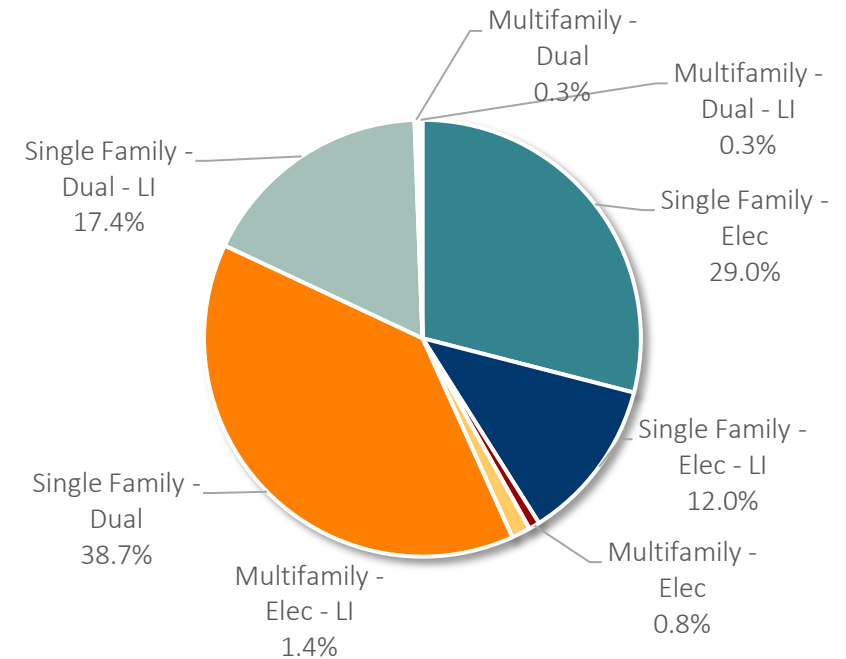
# MARKET CHARACTERIZATION

## Residential

- Sales are divided into eight segments based on housing type, income level, and fuel delivery
  - Income categories are **low income (LI)** and non low income
- Analysis of the AIC Billing System – Residential Database was used to distribute AIC-provided base-year sales and customer counts in 2019 by housing type and fuel delivery
- Results of the residential customer surveys (RCS) were used to further disaggregate sector usage and customers by income level

2019 Base Year Segment	Households	Electricity Sales (GWh)	Avg. Use (kWh/HH)
Single Family - Elec	277,856	3,307	11,902
Single Family - Elec – LI	127,791	1,372	10,736
Multifamily - Elec	15,639	92	5,880
Multifamily - Elec - LI	20,760	160	7,684
Single Family - Dual	426,600	4,415	10,350
Single Family - Dual - LI	213,566	1,988	9,310
Multifamily - Dual	5,922	34	5,732
Multifamily - Dual - LI	4,644	32	6,990
<b>Total Electricity, 2019</b>	<b>1,092,778</b>	<b>11,400</b>	<b>10,432</b>

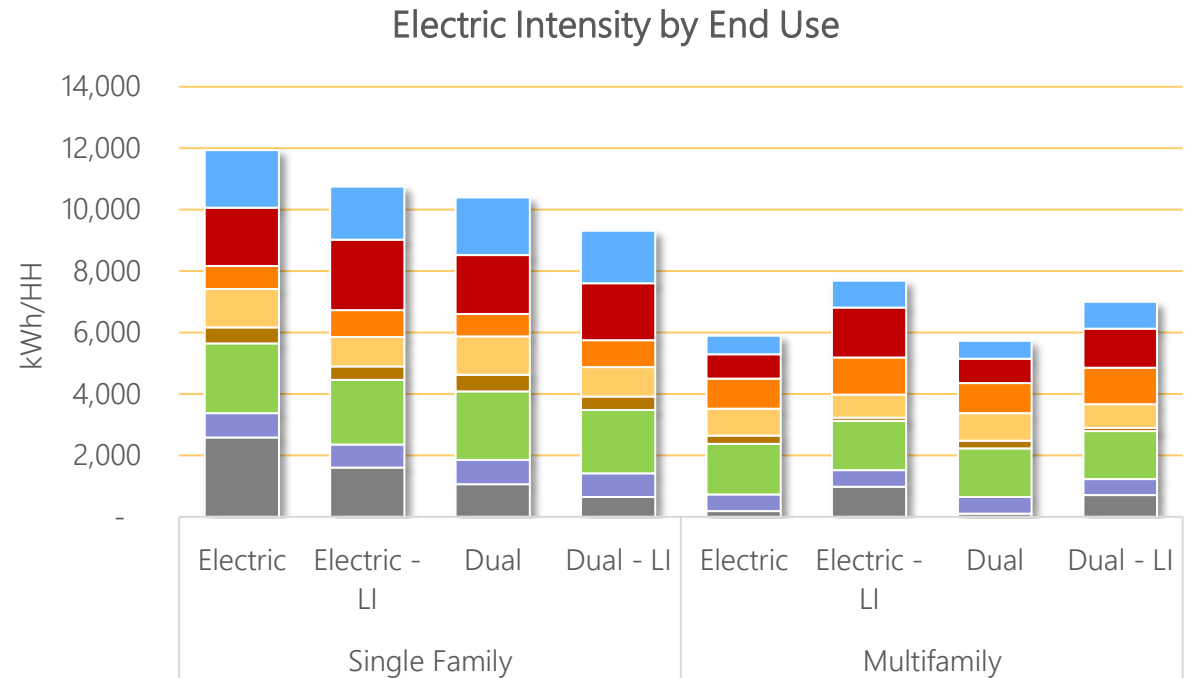
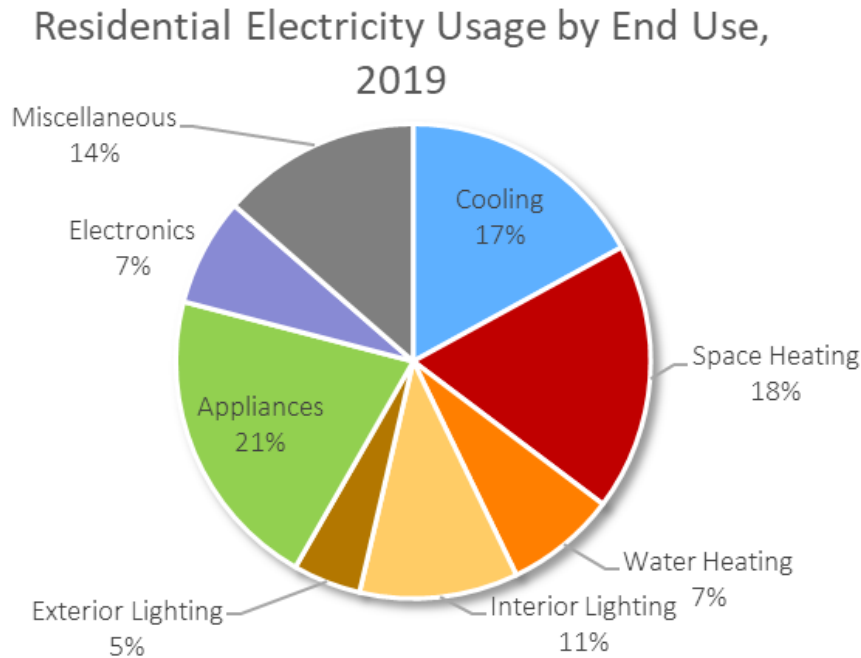
Residential Electricity Sales by Segment, 2019



# ANNUAL ENERGY USE BY END USE

## Residential

- Appliances, space heating and cooling end uses contribute to more than half of residential electricity consumption
- This end-use breakdown is shown by segment, where single family homes consume more electricity than their multifamily counterparts



# COMPARISON WITH PREVIOUS STUDIES

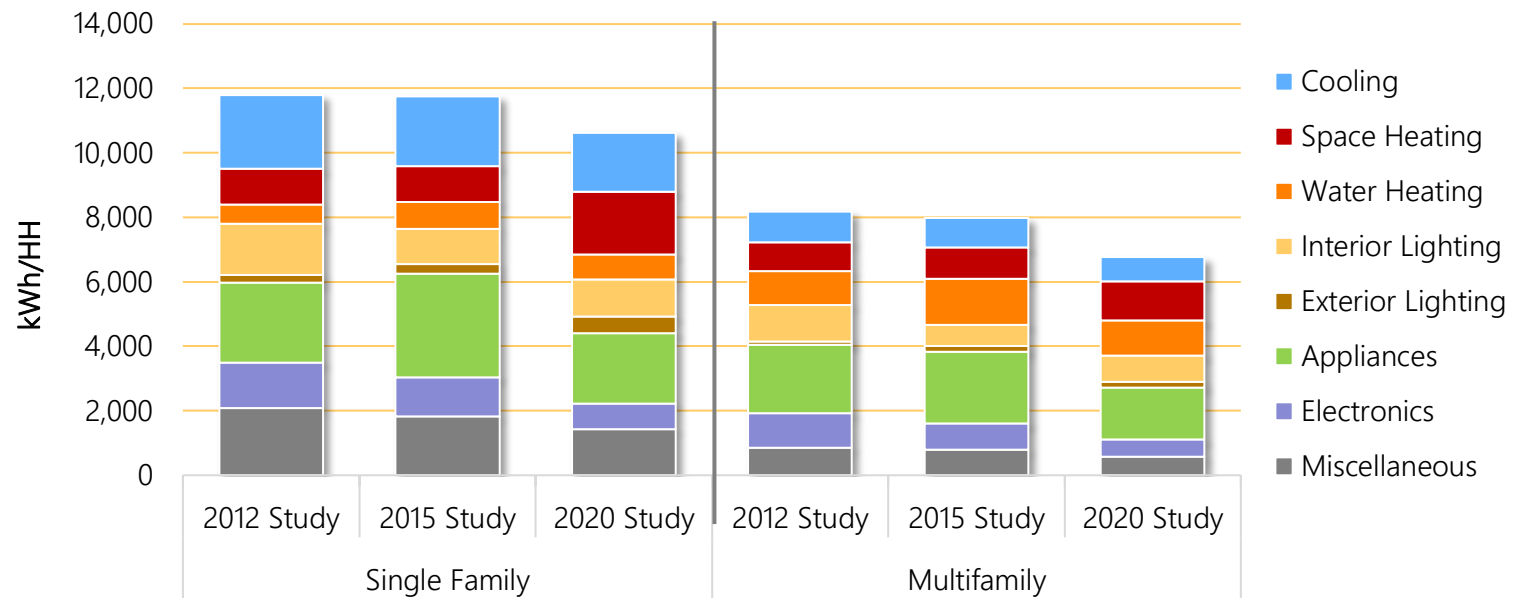
## Residential End-use Consumption

Compared to previous years' studies, the current use-per-household estimates are lower than both the 2015 and 2012 studies

Some notable differences from the 2015 study include

- Space heating: higher due to TRM calcs
- Water heating: lower HH occupancy and TRM changes
- Lighting: more LEDs
- Appliances: use market baseline

Comparison of Electric Intensity by End Use



# EE TECHNOLOGY OPTIONS & MEASURES

## Residential Sample

HVAC	Water Heating	Lighting	Appliances	Miscellaneous
<ul style="list-style-type: none"> <li>• Central AC</li> <li>• Room AC</li> <li>• Heat Pump</li> <li>• Insulation</li> <li>• Building Shell</li> <li>• Home Energy Management System (HEMS)</li> <li>• Connected T-stats</li> <li>• Windows</li> <li>• HVAC Tune-ups</li> </ul>	<ul style="list-style-type: none"> <li>• Heat Pump Water Heater</li> <li>• Low-Flow Showerheads</li> <li>• Faucet Aerators</li> <li>• Thermostatic Shower Restriction Valve</li> </ul>	<ul style="list-style-type: none"> <li>• LEDs</li> <li>• Occupancy Sensors</li> <li>• Exterior Photosensor Controls</li> <li>• Exterior Photovoltaic Installation</li> <li>• LED Pool and Spa Lighting</li> </ul>	<ul style="list-style-type: none"> <li>• Refrigerators and Freezers</li> <li>• Clothes Washer - ENERGY STAR (8.0)</li> <li>• Clothes Dryer</li> <li>• Stove/Oven</li> <li>• Dehumidifier</li> <li>• Air Purifier</li> </ul>	<ul style="list-style-type: none"> <li>• Pool Covers</li> <li>• Pool Heater - Solar Thermal</li> <li>• Pool Heater</li> <li>• Furnace Fan</li> <li>• Advanced New Construction Design - Zero Net Energy</li> <li>• Behavioral Programs</li> </ul>

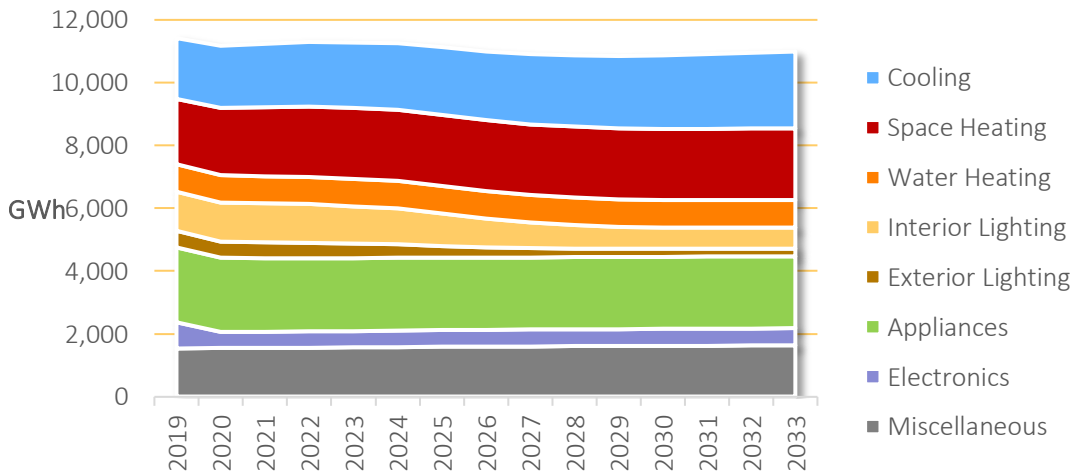
Note: Equipment measures in black text, non-equipment measures in red text

# BASELINE END-USE PROJECTION

## Residential

- Baseline includes effects of standards, codes and naturally-occurring conservation
- The baseline projection is developed by technology and rolled up by end use
- Significant reductions in lighting consumption decrease electricity by 46% (5.6% YoY) over the forecast period
- Decreases are driven by appliance standards
- Projection aligns well with Ameren load forecast

Residential End-Use Baseline Projection



Electricity Use (GWh)	2019	2025	2030	% Change ('19-'30)	Avg. Growth
Cooling	1945	2158	2332	20%	1.65%
Space Heating	2084	2260	2263	9%	0.75%
Water Heating	864	874	880	2%	0.17%
Interior Lighting	1254	884	682	-46%	-5.54%
Exterior Lighting	529	310	255	-52%	-6.64%
Appliances	2372	2310	2290	-3%	-0.32%
Electronics	841	527	541	-36%	-4.01%
Miscellaneous	1533	1619	1689	10%	0.88%
<b>Total</b>	<b>11,421</b>	<b>10,942</b>	<b>10,931</b>	<b>-4.30%</b>	<b>-0.40%</b>

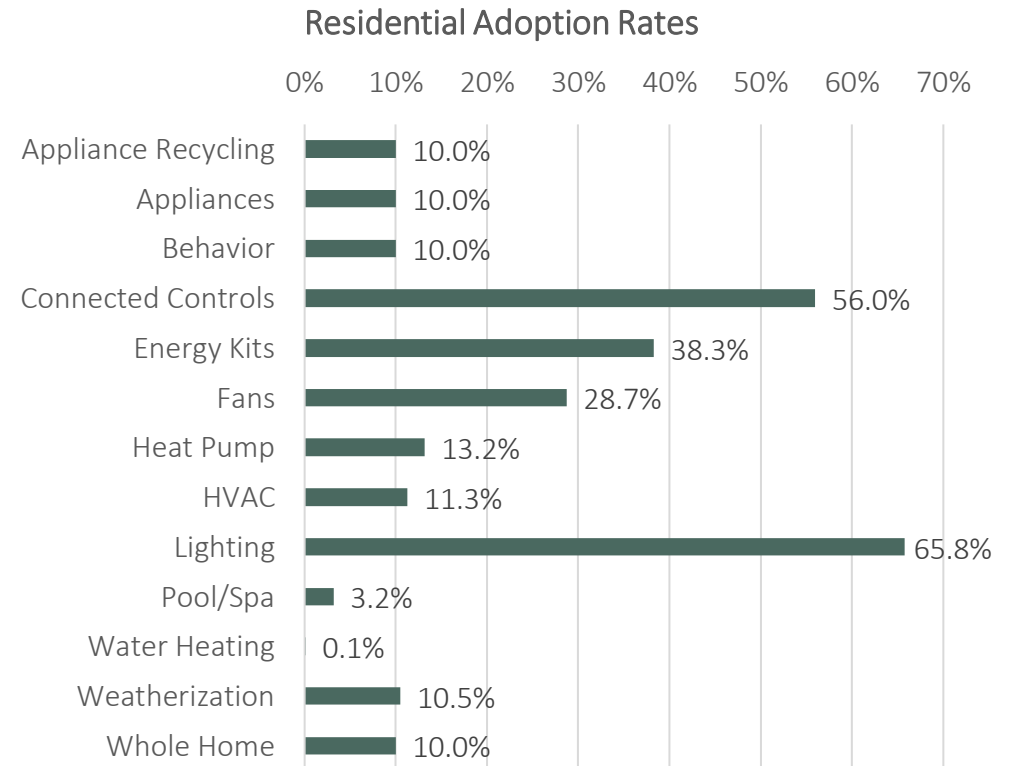
# ADOPTION RATE DEVELOPMENT

## Ameren Program Accomplishments – Residential

Preliminary achievable potential estimates rely on past program performance

- Will attempt to compare with program-level savings from regional peer utilities
- Vet with Ameren program teams

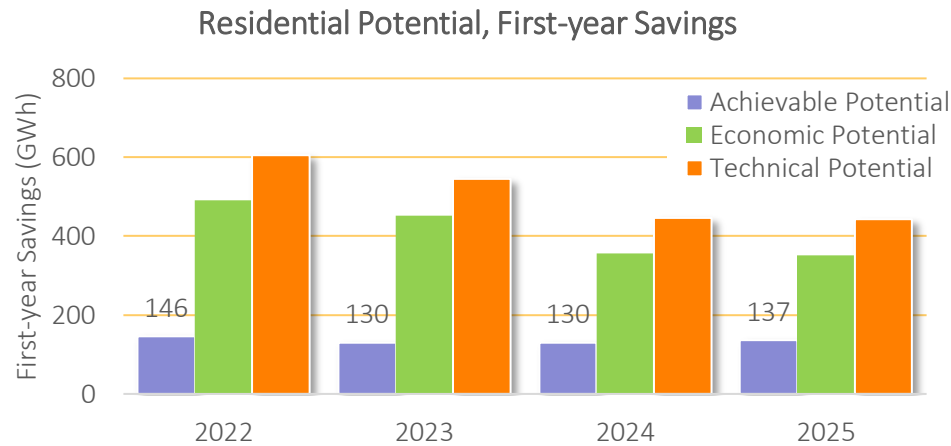
Category	Ameren Program Savings (2018-19)	MPS Technical Potential (2022)	Adoption Rate
Appliance Recycling	5,234	67,817	10.0%
Appliances	9	12,499	10.0%
Behavior	6,680	77,259	10.0%
Connected Controls	11,557	20,643	56.0%
Energy Kits	8,268	21,581	38.3%
Fans	3,441	2,810	28.7%
Heat Pump	2,698	20,435	13.2%
HVAC	5,503	48,837	11.3%
Lighting	93,752	142,526	65.8%
Pool/Spa	207	6,497	3.2%
Water Heating	43	36,674	0.1%
Weatherization	2,414	22,971	10.5%
Whole Home	423	7,642	10.0%



# SUMMARY OF MPS POTENTIAL ESTIMATES

## Residential, First-year and Cumulative Savings

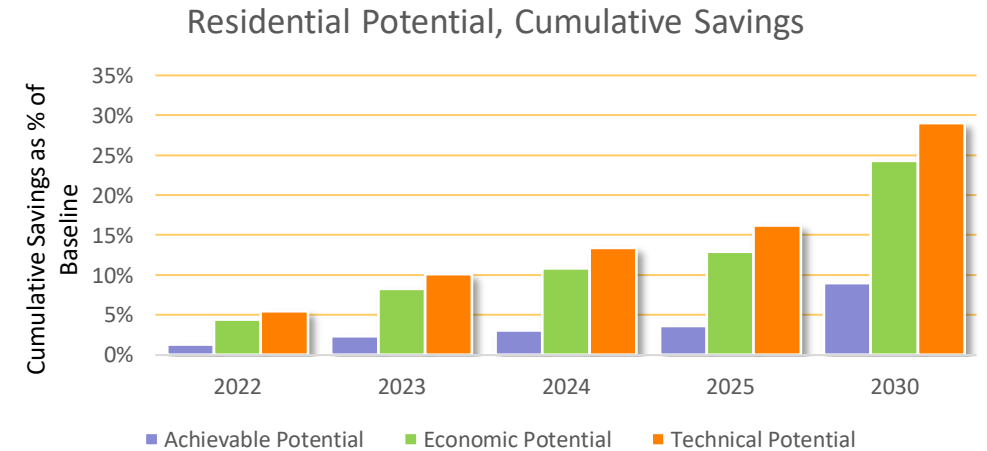
Residential first-year savings are between 146 and 130 GWh



	2022	2023	2024	2025
<b>Reference Baseline (GWh)</b>	11,099	11,006	10,903	10,776
<b>First-year Savings (GWh)</b>				
Achievable Potential	146	130	130	137
Economic Potential	491	451	356	352
Technical Potential	605	545	446	443
<b>Savings as % of Baseline</b>				
Achievable Potential	1.3%	1.2%	1.2%	1.3%
Economic Potential	4.4%	4.1%	3.3%	3.3%
Technical Potential	5.5%	5.0%	4.1%	4.1%

Achievable savings nearly triple between 2025 and 2030

	2022	2023	2024	2025	2030
<b>Reference Baseline (GWh)</b>	11,099	11,006	10,903	10,776	10,632
<b>Cumulative Savings (GWh)</b>					
Achievable Potential	146	259	337	390	953
Economic Potential	491	908	1,178	1,391	2,579
Technical Potential	605	1,110	1,458	1,747	3,089
<b>Savings as % of Baseline</b>					
Achievable Potential	1.3%	2.4%	3.1%	3.6%	9.0%
Economic Potential	4.4%	8.3%	10.8%	12.9%	24.3%
Technical Potential	5.5%	10.1%	13.4%	16.2%	29.1%



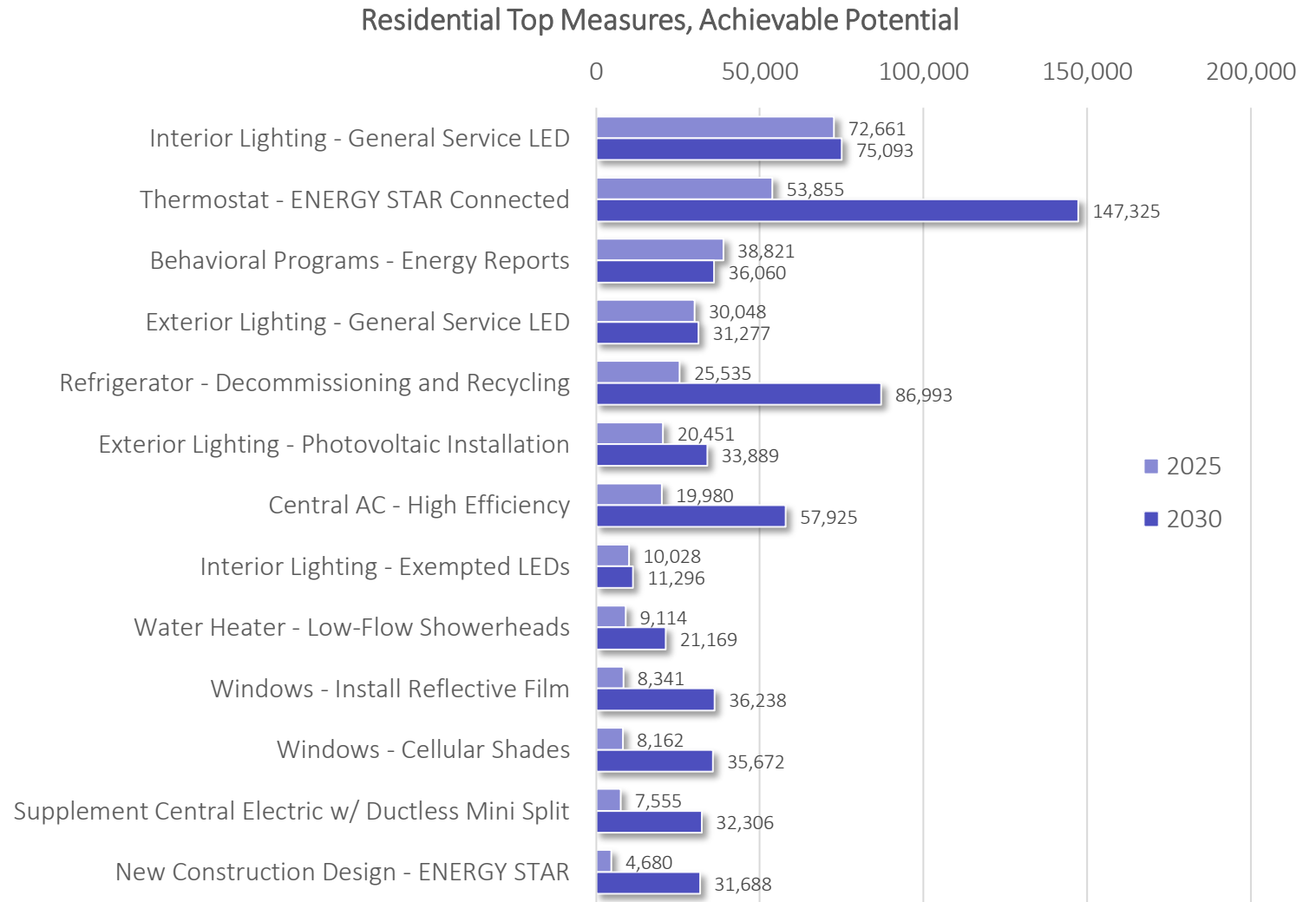
# TOP MEASURES, ACHIEVABLE POTENTIAL

## Residential, Cumulative Savings in 2025 and 2030

Lighting savings increase only slightly because of

- Dual baseline
- Declining eligible market

Substantial cooling savings exist in the later years of the study





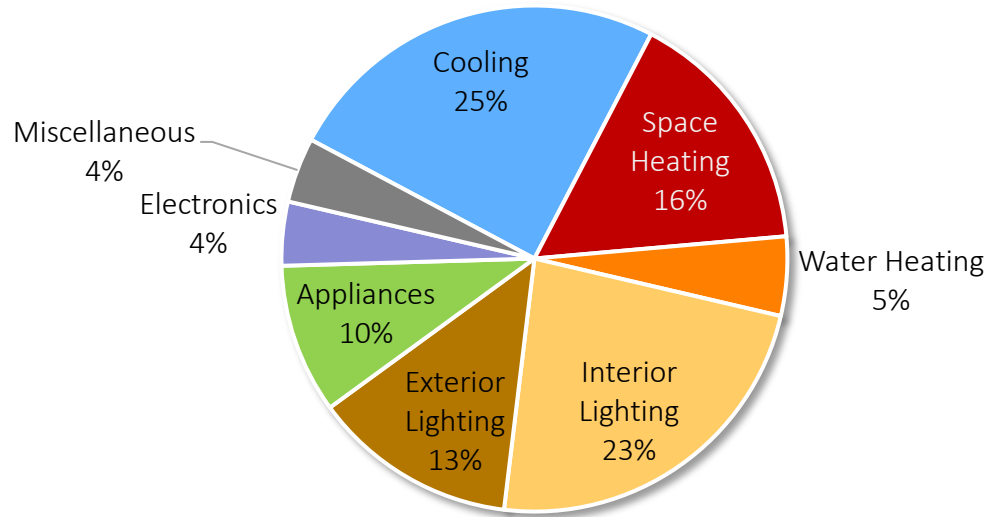
# ACHIEVABLE SAVINGS BY END USE

## Residential, Cumulative Savings

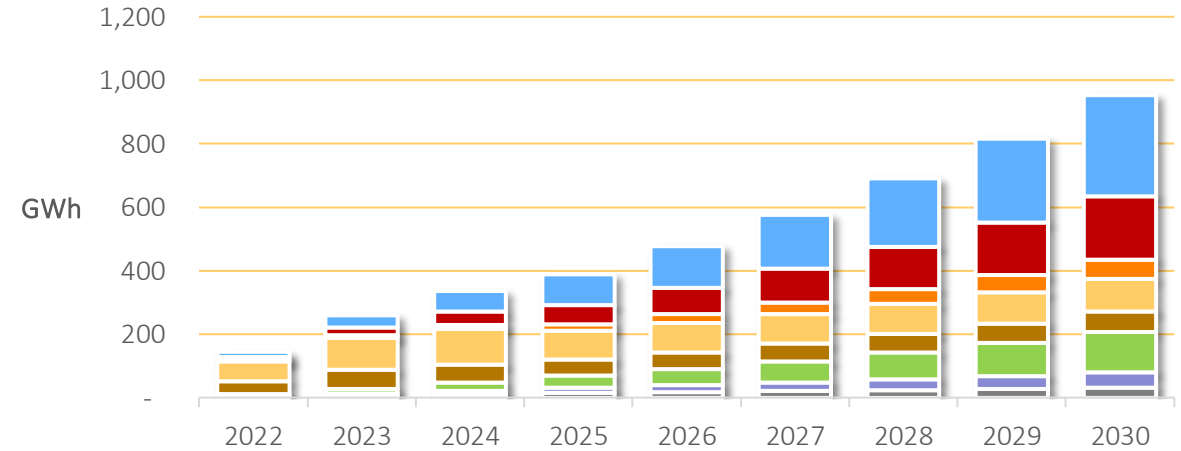
Savings by end use evolve:

- Dual baseline for lighting and decline in available market reduce lighting
- Stock turnover results in higher appliance and HVAC savings over time

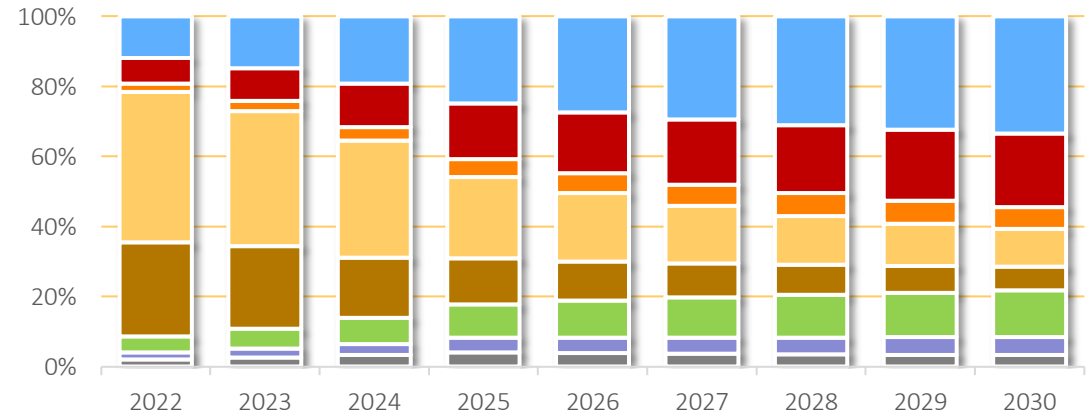
Savings by End Use in 2025



Savings by End Use



Savings by End Use





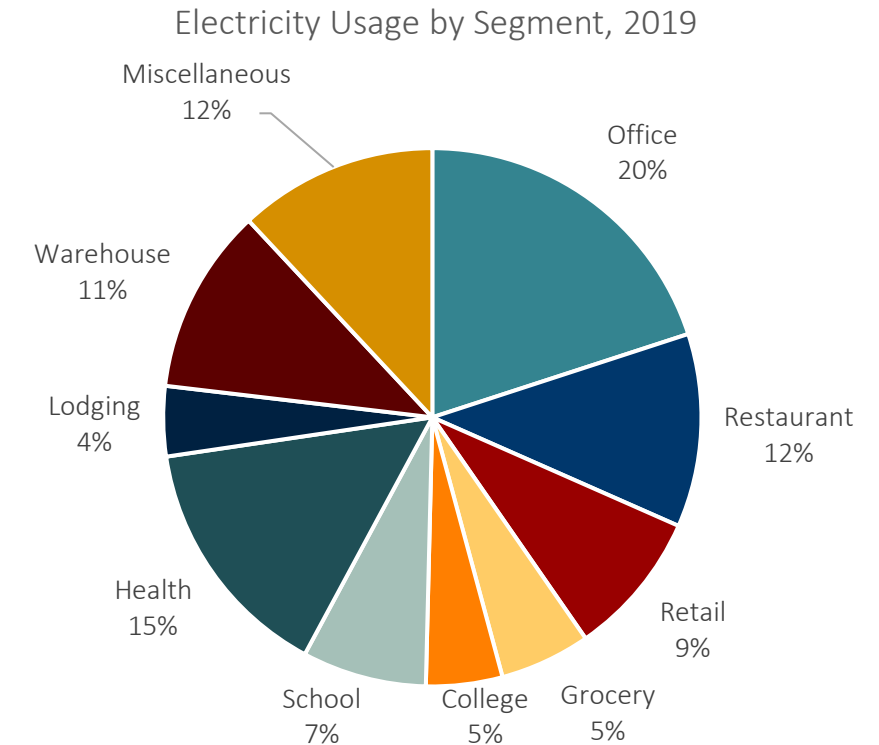
# Commercial Sector Analysis

# MARKET CHARACTERIZATION

## Commercial Electricity

- Sales are divided into 12 segments based on building type
- These results were developed using
  - AIC Billing System
  - 2020 C&I Customer Surveys, supplemented with 2014 survey to fill gaps
  - Secondary sources

Segment	Sales (GWh)	Floor Space (Million Sq. Ft. )	Intensity (kWh/sqft)
Office	2,216.5	169.2	13.10
Restaurant	1,288.6	37.4	34.43
Retail	969.1	117.1	8.28
Grocery	603.9	14.4	41.80
College	508.7	38.6	13.18
School	828.6	96.1	8.62
Health	1,641.4	75.6	21.72
Lodging	466.8	51.1	9.13
Warehouse	1,238.7	352.8	3.51
Miscellaneous	1,325.6	172.6	7.68
<b>Total</b>	<b>11,088.0</b>	<b>1,125.0</b>	<b>9.86</b>

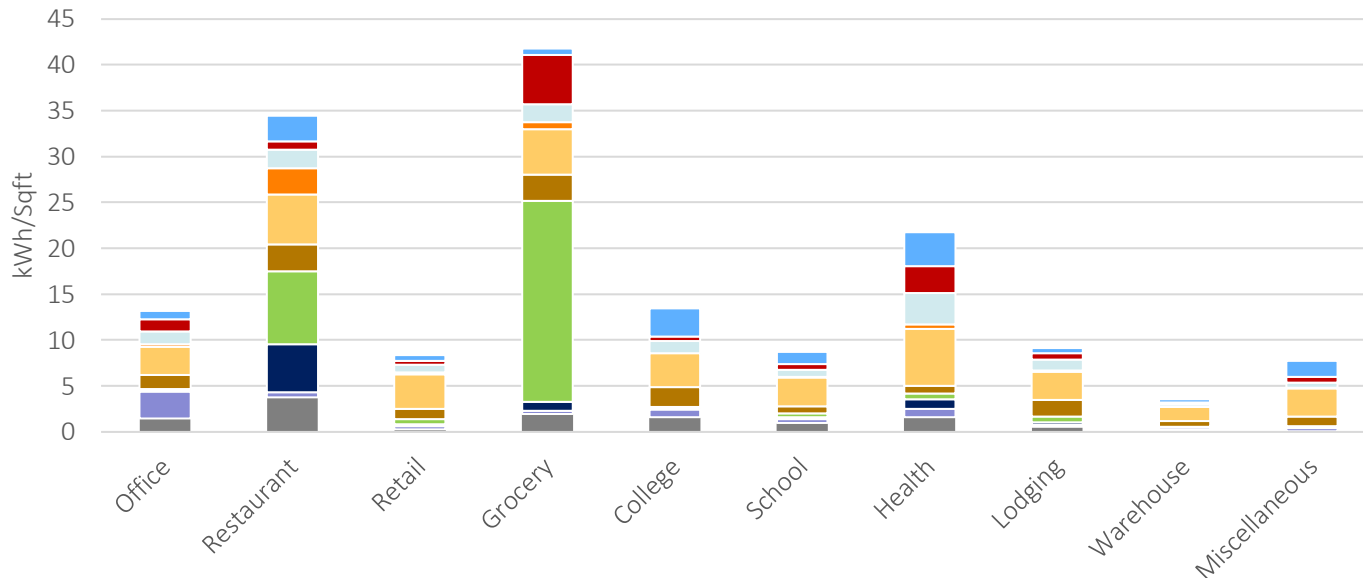


# MARKET CHARACTERIZATION RESULTS

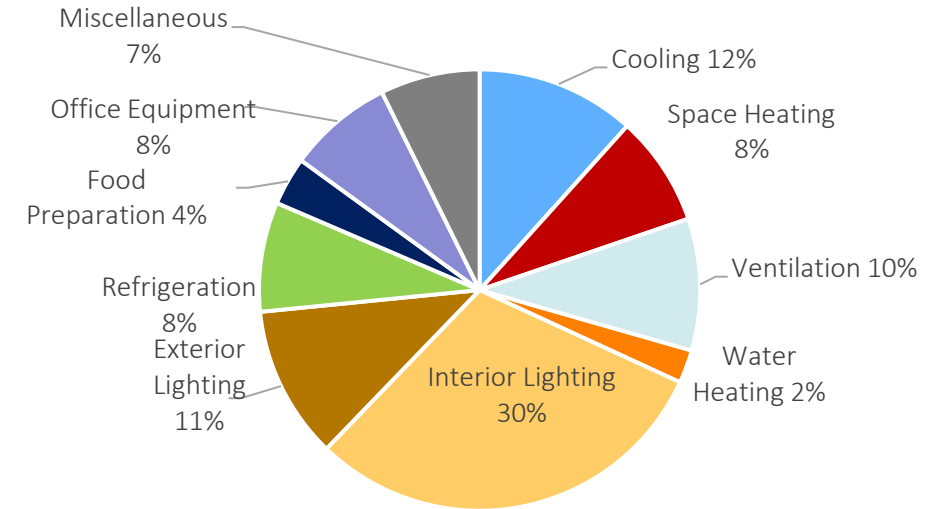
## Commercial Electricity

- Interior lighting, exterior lighting, and cooling end uses contribute to more than half of commercial electricity consumption.
- The end-use breakdown by segment shows that restaurants and grocery stores consume more electricity than other commercial sectors.

Electricity Intensity by Segment (kWh/sqft)



Commercial Electricity Consumption by End Use, 2019



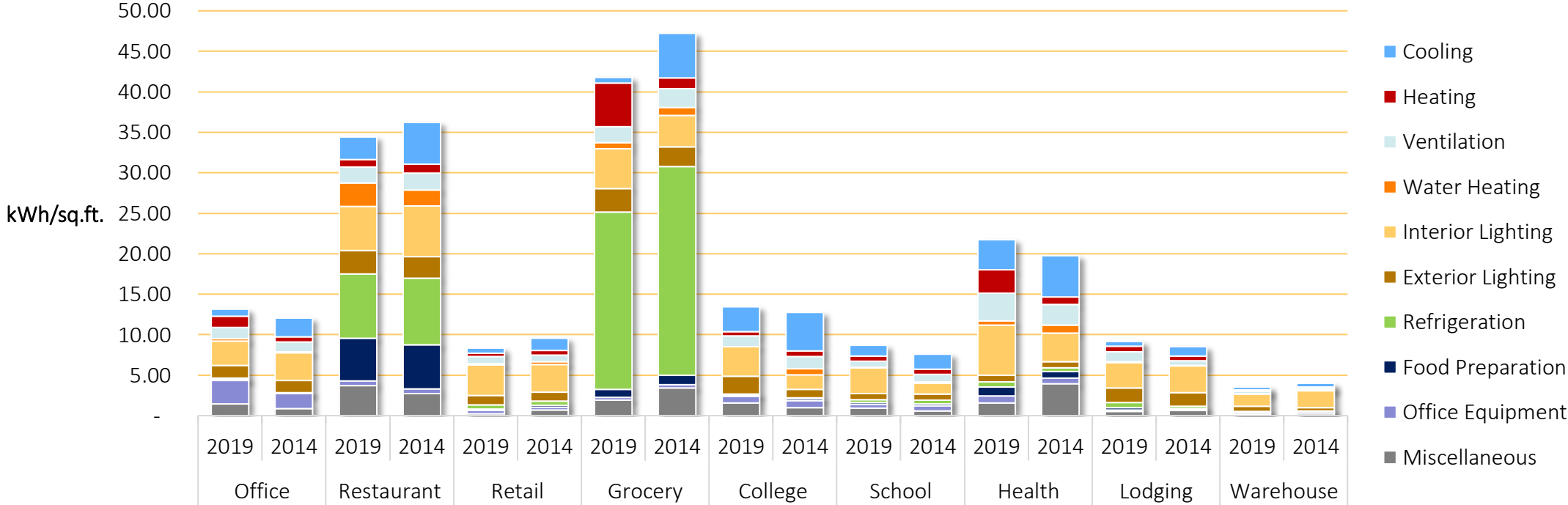
# COMPARISON TO PREVIOUS STUDY

## Commercial Electricity

Overall, the current intensity estimates are lower than the total in 2014

- However, the differences vary by segment

Comparison of Electric Intensity by End Use, 2014 vs 2019



# EE TECHNOLOGY OPTIONS & MEASURES

## C&I Sample

HVAC	Water Heating	Lighting	Refrigeration & Food Prep	Miscellaneous
<ul style="list-style-type: none"> <li>• Chiller</li> <li>• RTU</li> <li>• Heat Pump</li> <li>• Variable Air Volume Ventilation</li> <li>• Insulation</li> <li>• Building Shell</li> <li>• HVAC Economizer</li> <li>• Connected T-stats</li> <li>• Windows</li> <li>• Destratification Fans (HVLS)</li> <li>• Demand Controlled Ventilation</li> </ul>	<ul style="list-style-type: none"> <li>• Heat Pump Water Heater</li> <li>• Low-Flow Showerheads</li> <li>• Faucet Aerators</li> <li>• Pre-Rinse Spray Valve</li> </ul>	<ul style="list-style-type: none"> <li>• LEDs</li> <li>• Occupancy Sensors</li> <li>• Exterior Photovoltaic Installation</li> <li>• LED Exit Lighting</li> <li>• Multi-Level Fixture Controls</li> </ul>	<ul style="list-style-type: none"> <li>• Walk-in and Reach-in Refrig./Freezers</li> <li>• Display Cases</li> <li>• Icemakers</li> <li>• Oven</li> <li>• Fryer</li> <li>• Grocery Display Case LED Lighting</li> <li>• Grocery Display Case motion sensors</li> <li>• Anti-Sweat Heater Controls</li> <li>• Auto Refrigerator Door Closer</li> <li>• ECM Refrig. Fan Motors</li> </ul>	<ul style="list-style-type: none"> <li>• Pool Pumps</li> <li>• Retrocommissioning</li> <li>• Commissioning</li> <li>• Strategic Energy Management</li> <li>• Building Energy Mgmt. Systems (BEMS)</li> <li>• Advanced Power Strips</li> </ul>

Note: Equipment measures in black text, non-equipment measures in red text

# BASELINE END-USE PROJECTION

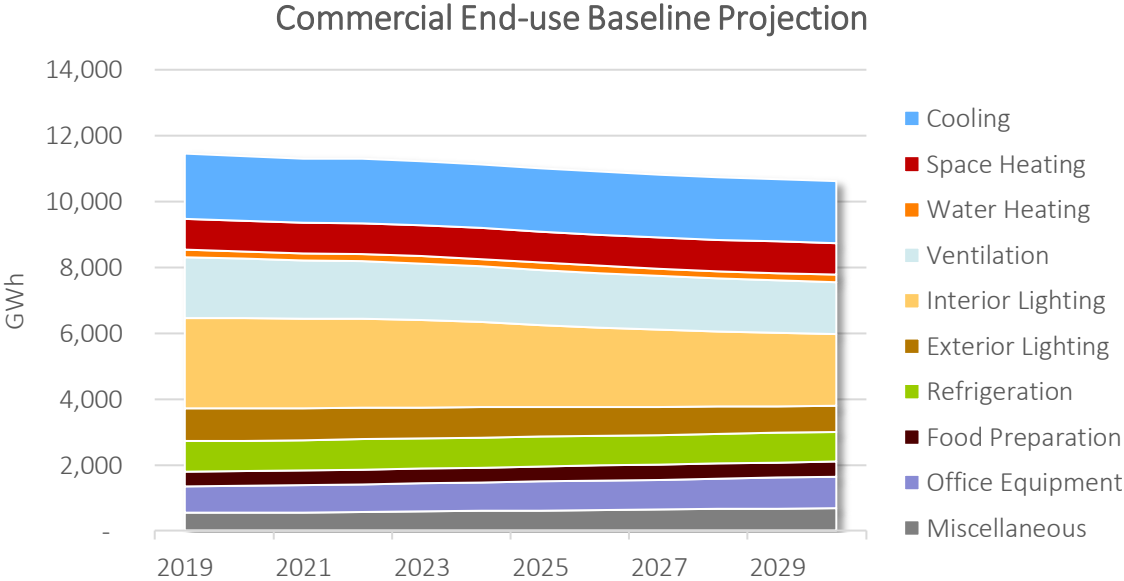
## Commercial Electricity

The baseline projection is developed by technology and rolled up by end use

Significant reductions in lighting consumption decrease electricity by 20% (2.03% YoY) over the forecast period

Aligns well with Ameren load forecast

Electricity Use (GWh)	2019	2025	2030	% Change ('19-'30)	Avg. Growth
Cooling	1285	1238	1214	-6%	-0.52%
Space Heating	880	894	910	3%	0.31%
Water Heating	308	308	311	1%	0.11%
Ventilation	1075	1077	1093	2%	0.15%
Interior Lighting	3374	2958	2700	-20%	-2.03%
Exterior Lighting	1246	1258	1261	1%	0.11%
Refrigeration	893	867	858	-4%	-0.36%
Food Preparation	394	405	417	6%	0.52%
Office Equipment	856	931	1005	17%	1.46%
Miscellaneous	812	945	1085	34%	2.64%
<b>Total</b>	<b>11,122</b>	<b>10,881</b>	<b>10,854</b>	<b>-2.40%</b>	<b>-0.22%</b>



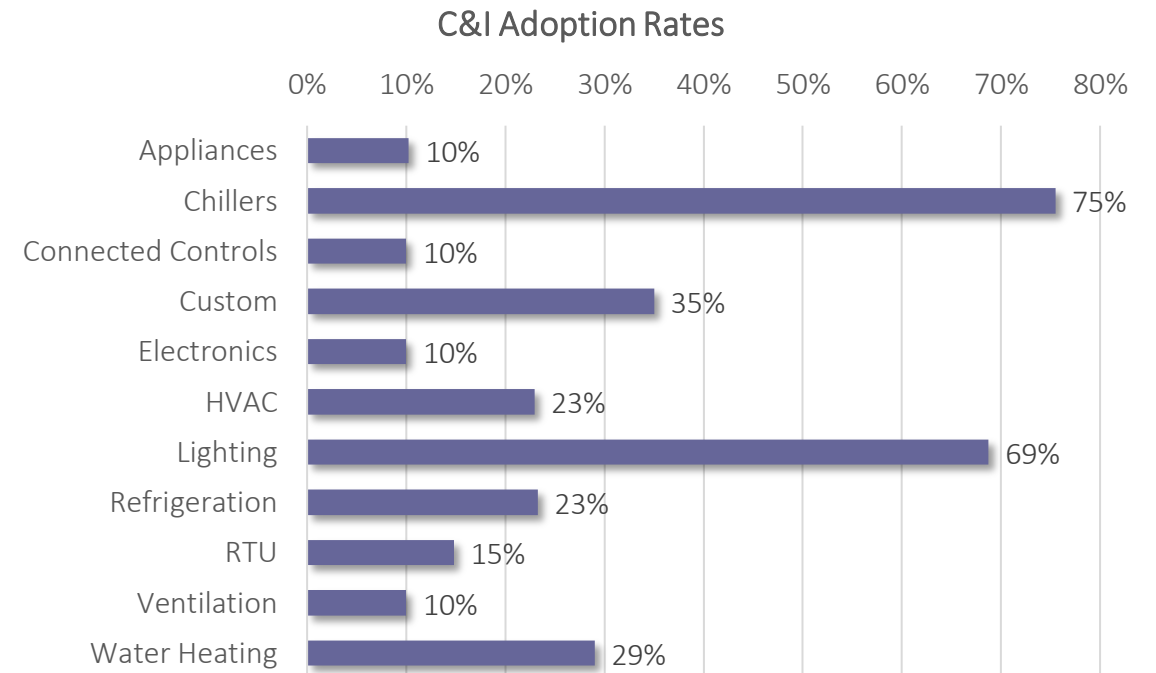
# ADOPTION DEVELOPMENT

## Ameren Program Accomplishments - C&I

Preliminary achievable potential estimates rely on past program performance

- Will try to compare with program-level savings from regional peer utilities
- Vet with Ameren program teams

	Ameren Programs	MPS Technical Potential	Take Rate
Appliances	599	5,841	10%
Chillers	11,883	15,746	75%
Connected Controls	303	16,489	10%
Custom	25,242	72,121	35%
Electronics	1	11,423	10%
HVAC	2,886	12,583	23%
Lighting	202,136	295,016	69%
Refrigeration	1,876	8,072	23%
RTU	218	1,472	15%
Ventilation	945	24,521	10%
Water Heating	39	135	29%

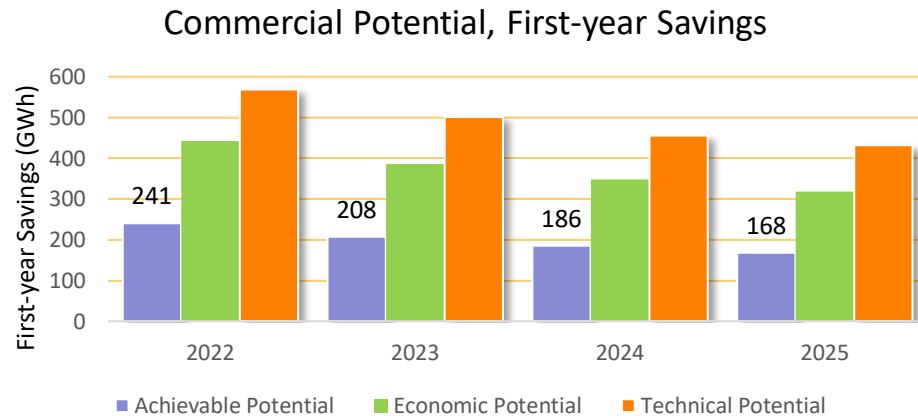




# SUMMARY OF MPS POTENTIAL ESTIMATES

## Commercial, First-year and Cumulative Savings

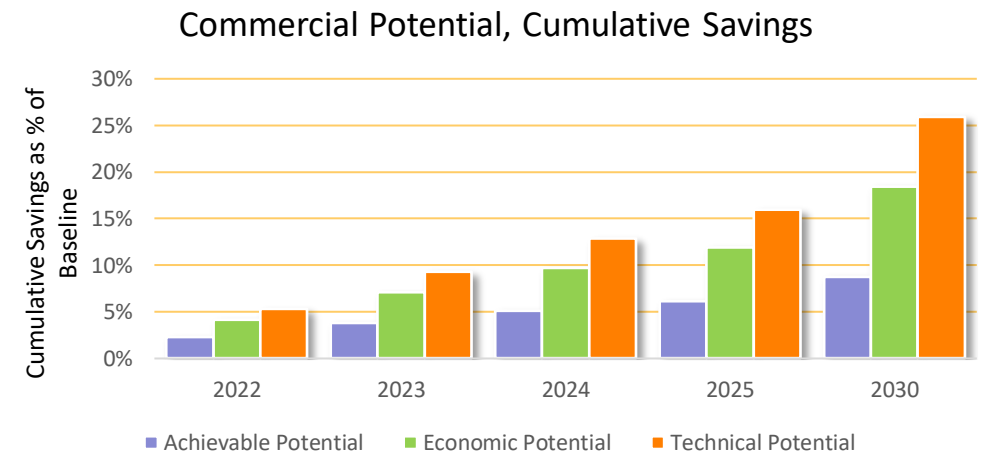
Commercial first-year savings are between 168 and 241 GWh



Achievable savings increase by 40% between 2025 and 2030

	2022	2023	2024	2025	2030
<b>Reference Baseline (GWh)</b>	10,681	10,594	10,484	10,364	10,000
<b>Cumulative Savings (GWh)</b>					
Achievable Potential	241	398	531	632	876
Economic Potential	443	747	1,016	1,232	1,840
Technical Potential	568	983	1,350	1,656	2,590
<b>Savings as % of Baseline</b>					
Achievable Potential	2.3%	3.8%	5.1%	6.1%	8.8%
Economic Potential	4.1%	7.1%	9.7%	11.9%	18.4%
Technical Potential	5.3%	9.3%	12.9%	16.0%	25.9%

	2022	2023	2024	2025
<b>Reference Baseline (GWh)</b>	10,681	10,594	10,484	10,364
<b>First-year Savings (GWh)</b>				
Achievable Potential	241	208	186	168
Economic Potential	443	385	349	318
Technical Potential	568	501	456	432
<b>Savings as % of Baseline</b>				
Achievable Potential	2.3%	2.0%	1.8%	1.6%
Economic Potential	4.1%	3.6%	3.3%	3.1%
Technical Potential	5.3%	4.7%	4.4%	4.2%



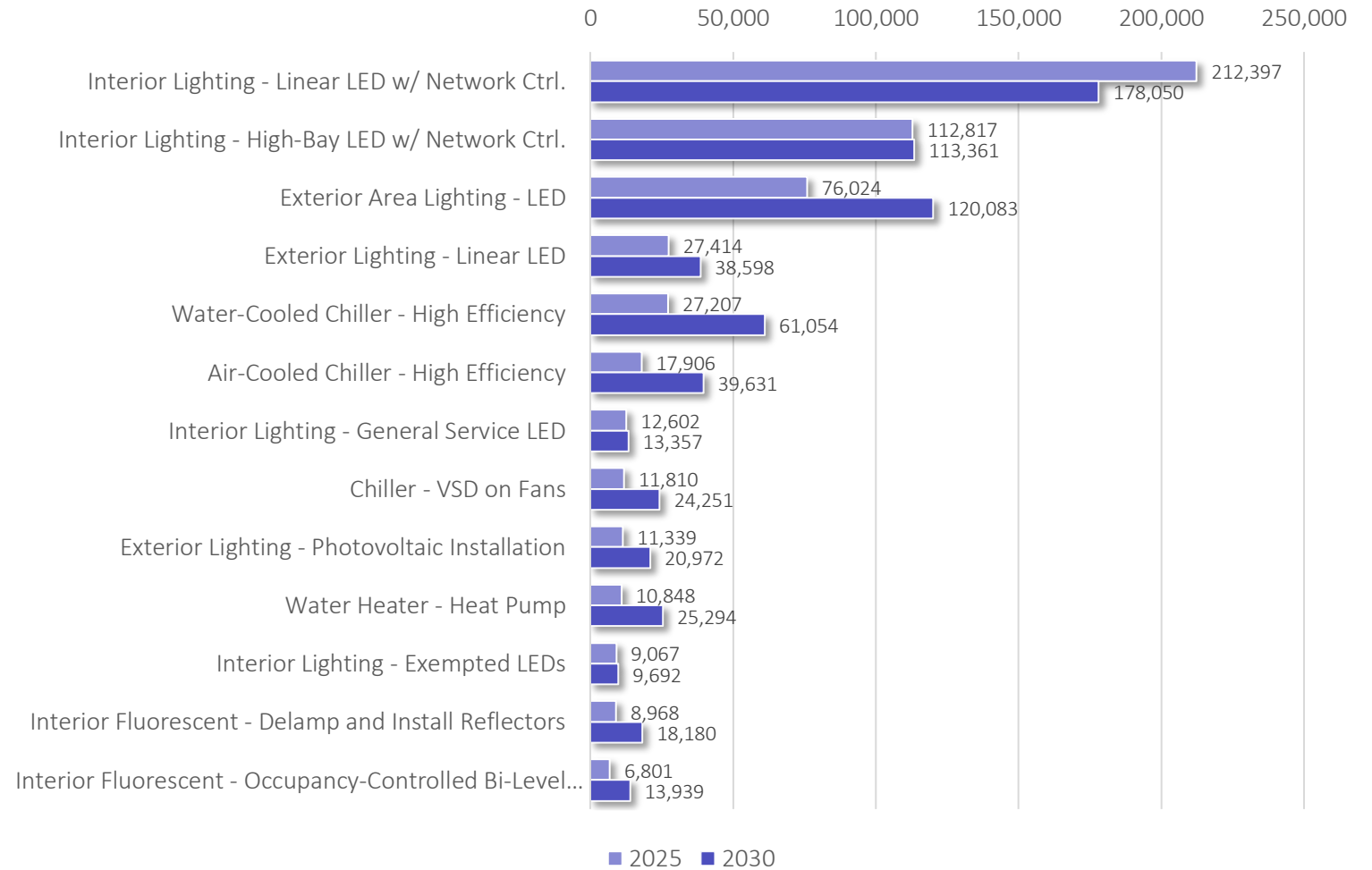
# TOP MEASURES, ACHIEVABLE POTENTIAL

## Commercial, Cumulative Savings in 2025 and 2030

Interior linear and high-bay lighting with networked lighting controls are the top two measures in 2025 and 2030

- Exterior area lighting (high-intensity) are next on the list

Commercial Top Measures, Achievable Potential



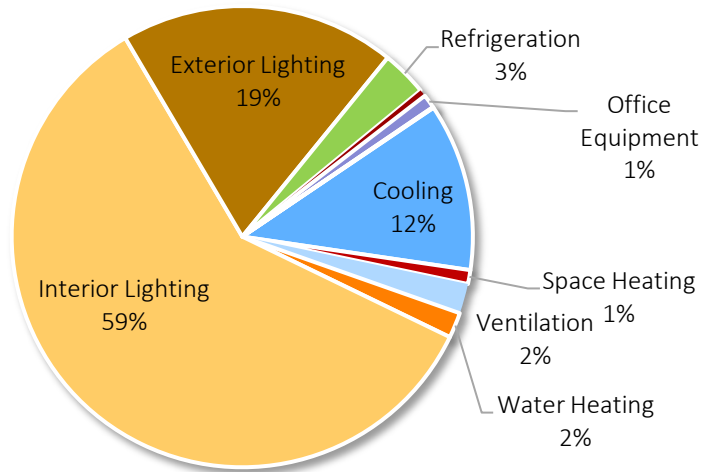
# ACHIEVABLE SAVINGS BY END USE

## Commercial, Cumulative Savings

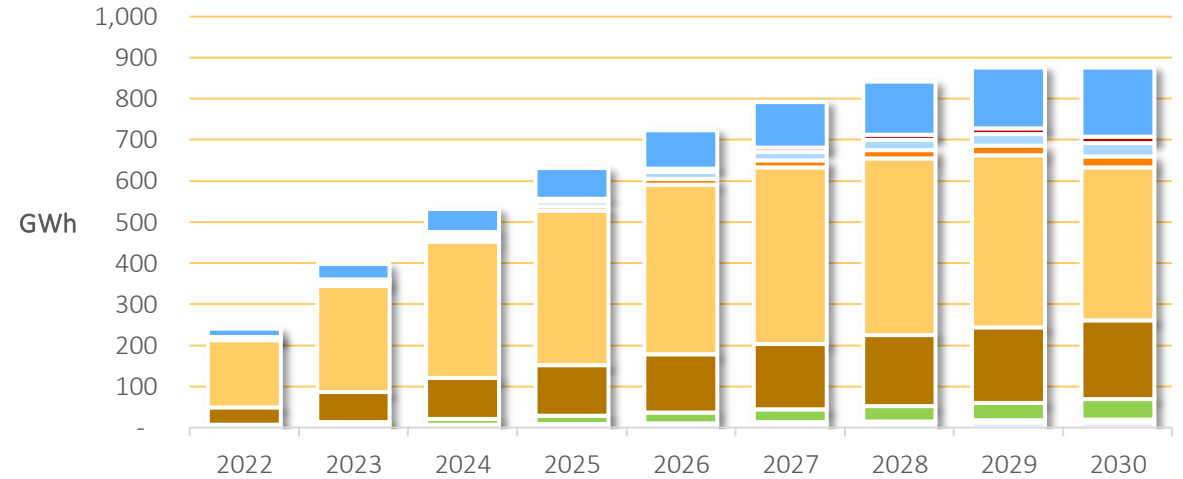
Lighting savings comprise a majority of the Achievable potential

- There is more HVAC and refrigeration in the Technical Potential case
- However, a good deal of that is not cost effective and the remaining potential is further reduced by participation rates that align with current programs.

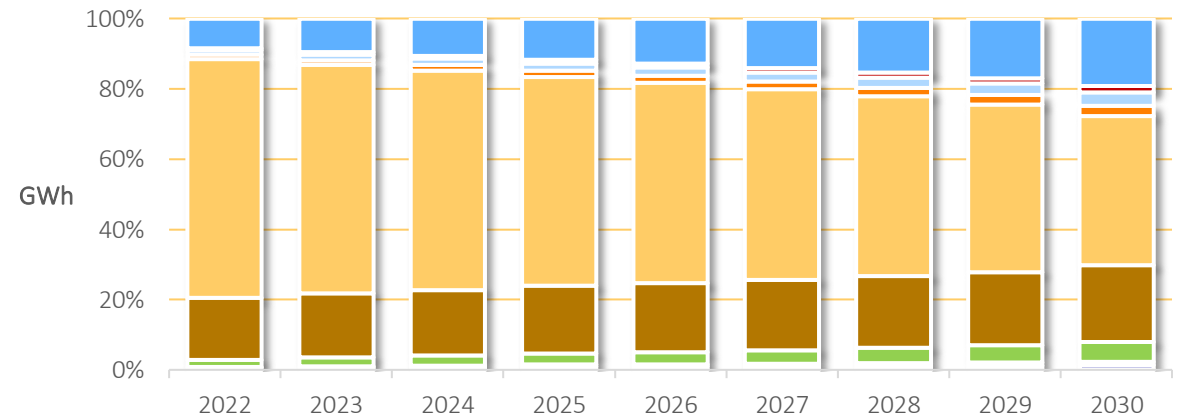
Savings by End Use in 2025



Savings by End Use



Savings by End Use





# Industrial Sector Analysis

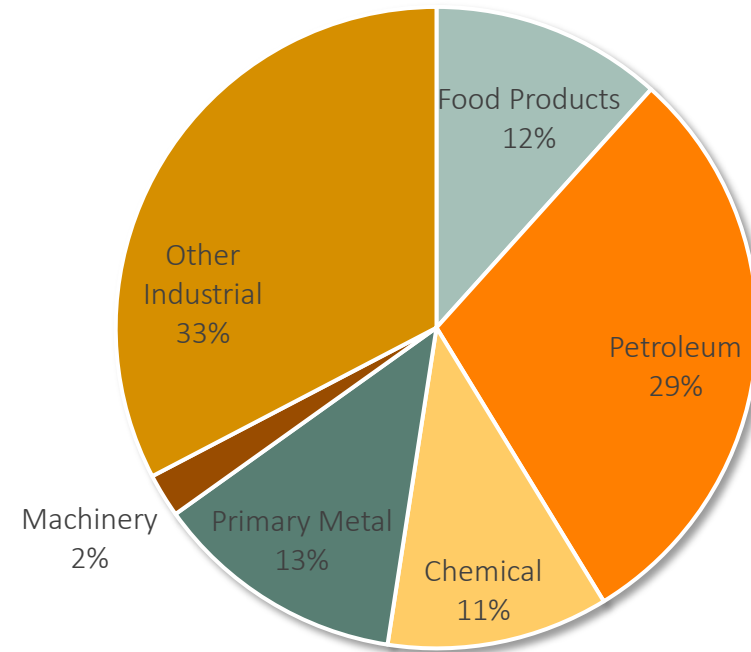
# MARKET CHARACTERIZATION

## Industrial Electricity

- Sales are divided into the top five industrial segments plus one more catch-all category
- These results were developed using
  - AIC Billing System
  - 2020 C&I Customer Surveys
  - Survey results from 2016 study
  - Secondary sources

Segment	Sales (GWh)
Food Products	576
Petroleum	1,462
Chemical	552
Primary Metal	627
Machinery	109
Other Industrial	1,613
<b>Total Electricity, 2019</b>	<b>4,939</b>

Industrial Electricity Usage by Segment, 2019



# ANNUAL ENERGY USE BY END USE

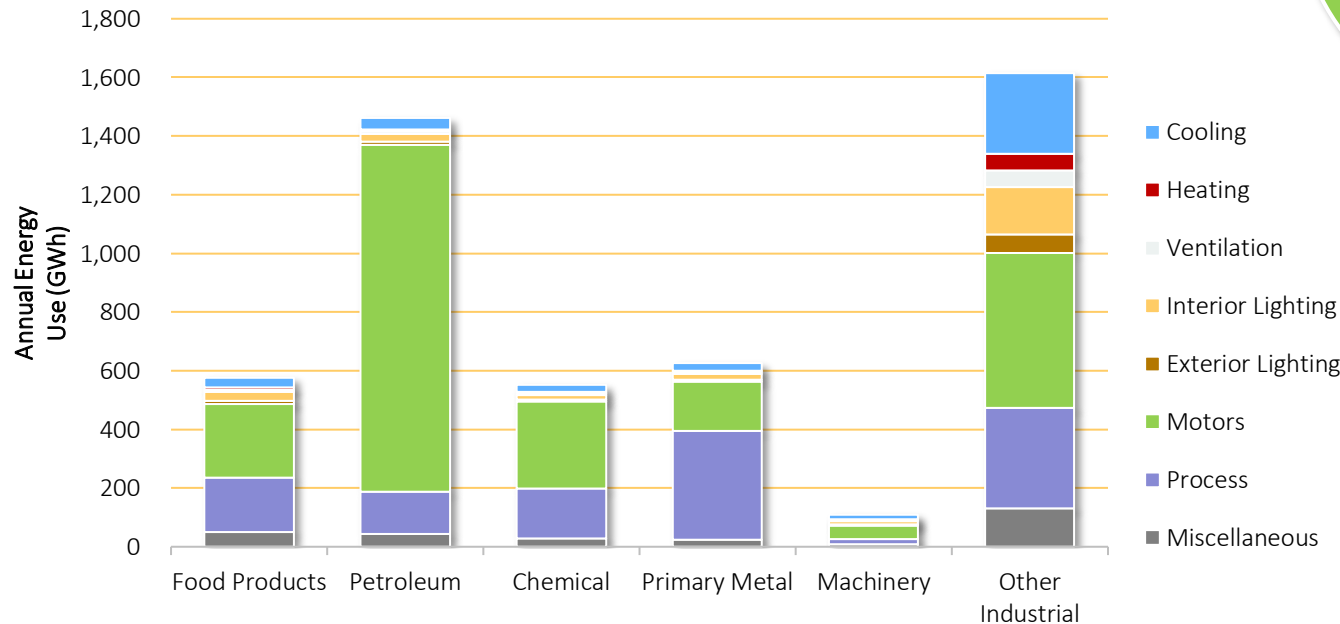
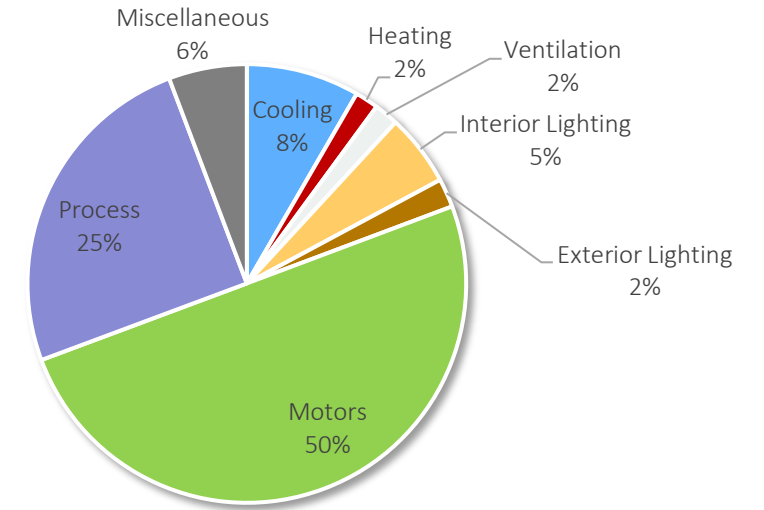
## Industrial Electricity

Across the industrial sector:

- Motors account for half of industrial usage
- Process accounts for another 25%

The end-use breakdown by industry varies considerably

Industrial Electricity Consumption by End Use, 2019



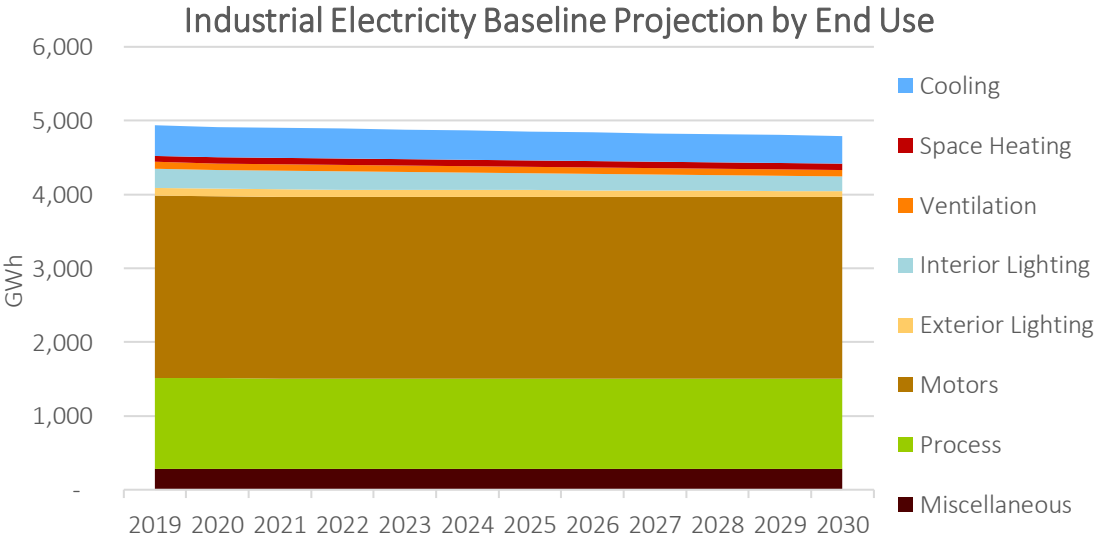
# BASELINE END-USE PROJECTION

## Industrial Electricity

The baseline projection is developed by technology and rolled up by end use in these charts

Significant reductions in lighting consumption decrease electricity by 24% over the forecast period

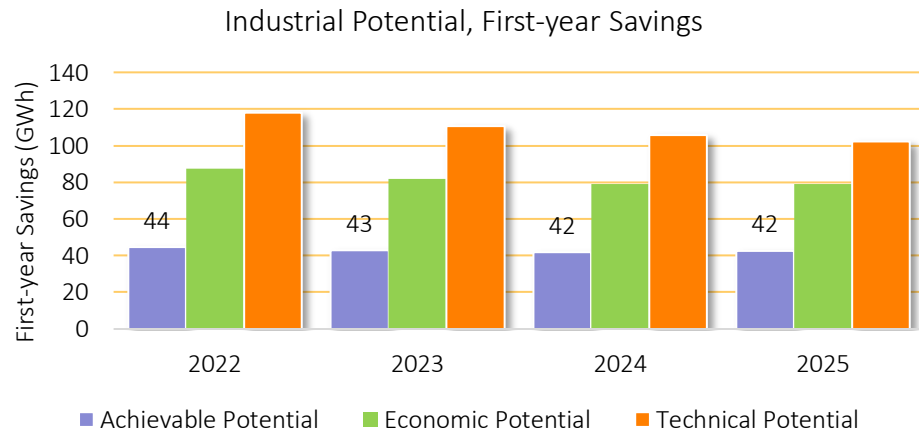
Electricity Use (GWh)	2019	2025	2030	% Change ('19-'30)	Avg. Growth
Cooling	413	392	377	-9%	-0.83%
Space Heating	85	84	84	-1%	-0.05%
Ventilation	88	87	87	-2%	-0.15%
Interior Lighting	262	232	200	-24%	-2.47%
Exterior Lighting	105	94	82	-21%	-2.18%
Motors	2472	2458	2458	-1%	-0.05%
Process	1231	1224	1224	-1%	-0.05%
Miscellaneous	285	283	283	-1%	-0.05%
<b>Total Electricity Use</b>	<b>4,939</b>	<b>4,855</b>	<b>4,795</b>	<b>-2.92%</b>	<b>-0.27%</b>



# SUMMARY OF MPS POTENTIAL ESTIMATES

## Industrial, First-year and Cumulative Savings

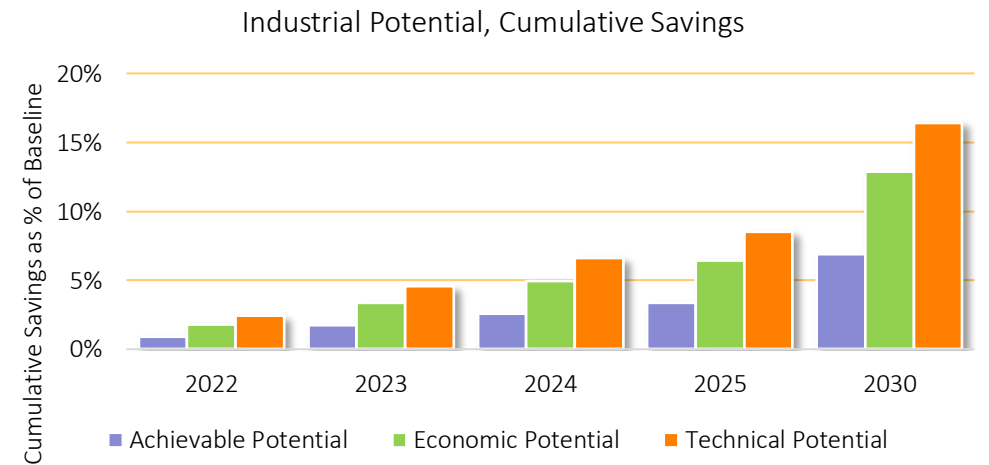
Industrial first-year savings are between 42 and 44 GWh



	2022	2023	2024	2025
<b>Reference Baseline (GWh)</b>	4,892	4,881	4,867	4,854
<b>First-year Savings (GWh)</b>				
Achievable Potential	44	43	42	42
Economic Potential	87	82	79	79
Technical Potential	118	111	106	102
<b>Savings as % of Baseline</b>				
Achievable Potential	0.9%	0.9%	0.9%	0.9%
Economic Potential	1.8%	1.7%	1.6%	1.6%
Technical Potential	2.4%	2.3%	2.2%	2.1%

Achievable savings doubles between 2025 and 2030

	2022	2023	2024	2025	2030
<b>Reference Baseline (GWh)</b>	4,892	4,881	4,867	4,854	4,794
<b>Cumulative Savings (GWh)</b>					
Achievable Potential	44	85	125	163	331
Economic Potential	87	164	240	312	617
Technical Potential	118	223	322	413	787
<b>Savings as % of Baseline</b>					
Achievable Potential	0.9%	1.7%	2.6%	3.4%	6.9%
Economic Potential	1.8%	3.4%	4.9%	6.4%	12.9%
Technical Potential	2.4%	4.6%	6.6%	8.5%	16.4%

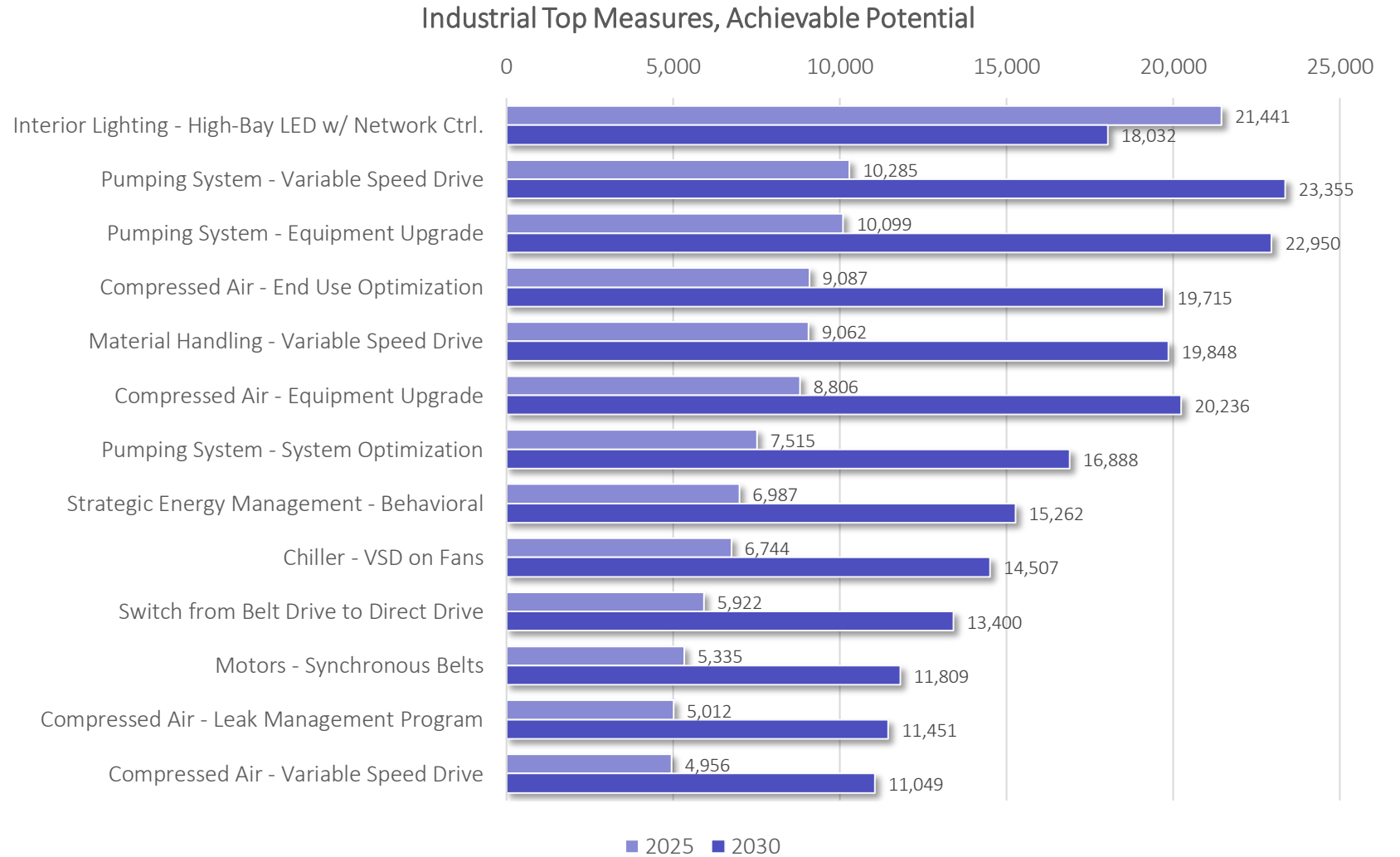




# TOP MEASURES, ACHIEVABLE POTENTIAL

## Industrial, Cumulative Savings in 2025 and 2030

Interior high-bay lighting is highest measure in 2025 but a variety of enumerated custom measures show larger potential in the long run.

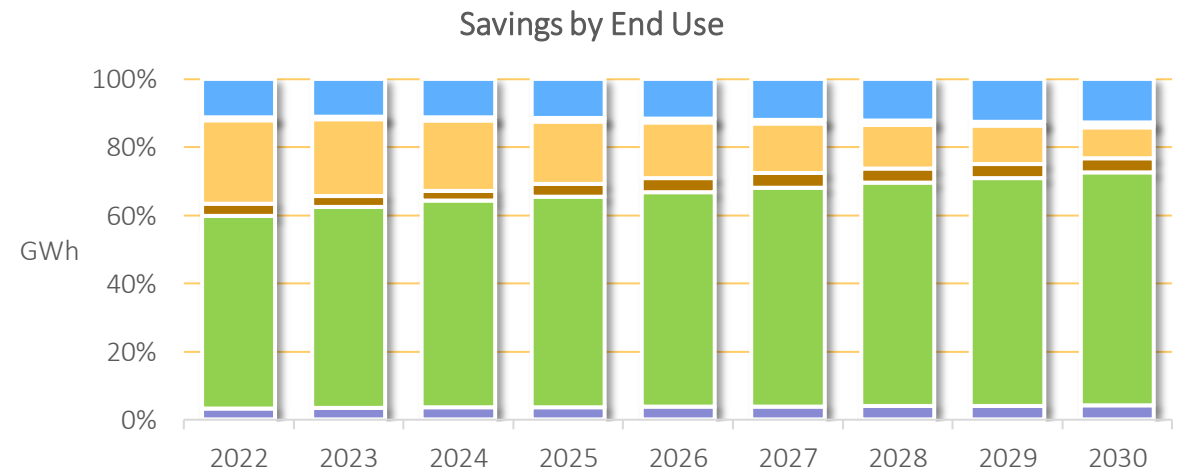
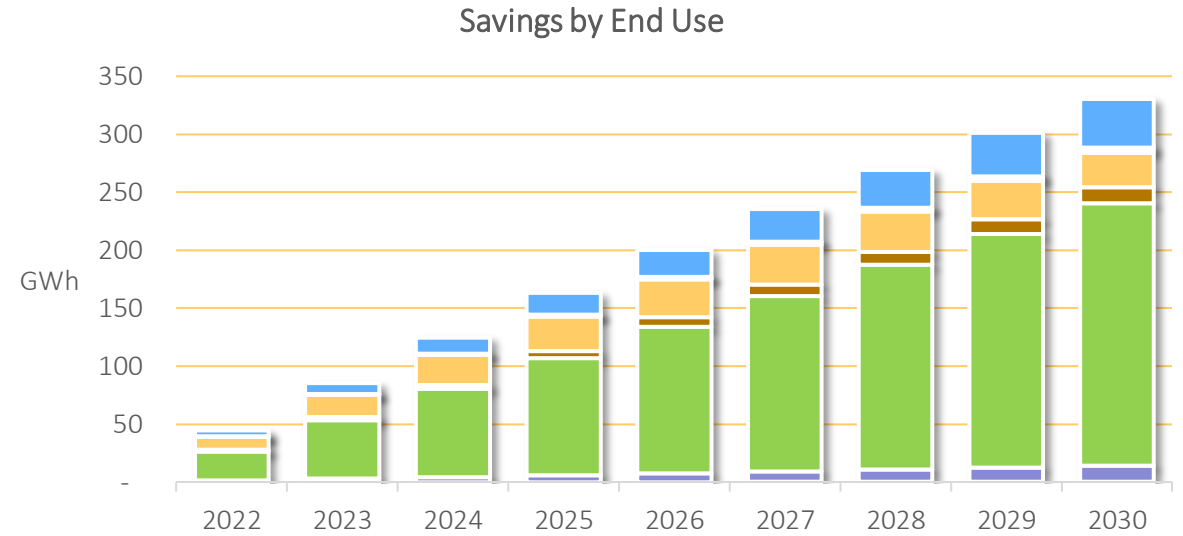
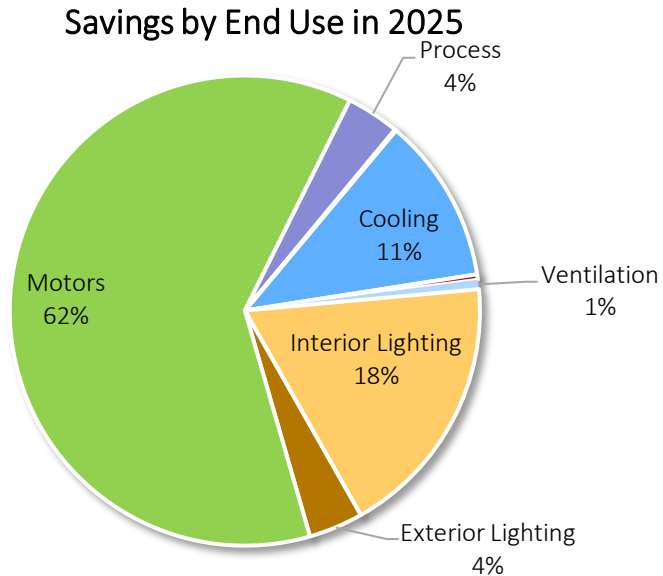


# ACHIEVABLE SAVINGS BY END USE

## Industrial, Cumulative Savings

A majority of savings are in the motor category

- Split between O&M/energy management measures and custom applications for each motor type
- The lighting baseline is substantially more efficient than in the prior study, lower savings in that end use





## Key Takeaways and Next Steps

# KEY TAKEAWAYS FROM THE POTENTIAL STUDY

## Preliminary

Ameren prior-years accomplishments compare favorably with regional peers

Analysis indicates a similar amount of potential will continue to be available in the market

- Please note we are not estimating the cost associated with achieving savings

Perhaps a deeper dive into benchmarking data could provide insights into individual programs

- Can we inform program design to unlock potential?

The potential-study analysis provides insight into potential for all measures

- Sum of potential in study focuses on cost-effective potential – not all may be included in programs
- However, measures not cost-effective in study may also be included in the program

Adoption rates in potential study provide guidance for adoption rates in the plan

- Can vary from year to year
- Recommend considering the total estimated units across 4 program years

Potential study provides insight into segment-level potential for planners and implementers

# NEXT STEPS

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Solicit feedback from SAG members

- Provide additional information, if needed

Deeper dive into program data for regional peer utilities from benchmarking analysis

Finalize potential results

Revise, if needed, to incorporate any new assumptions

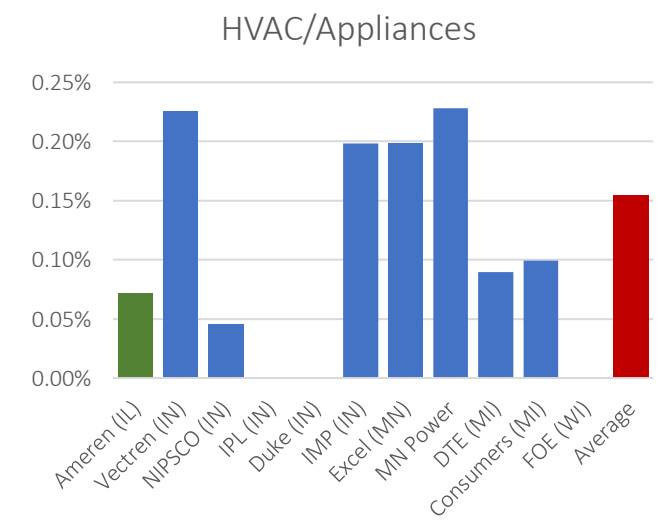
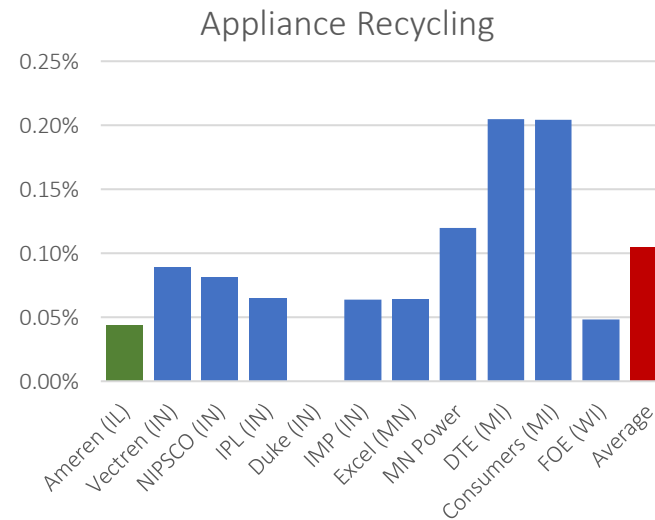
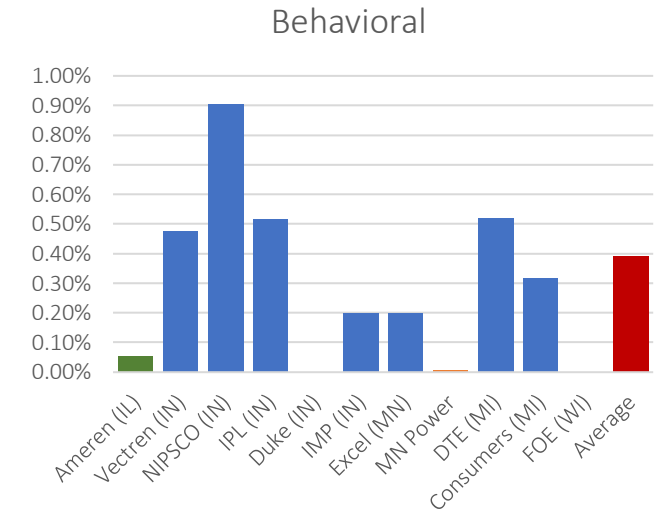
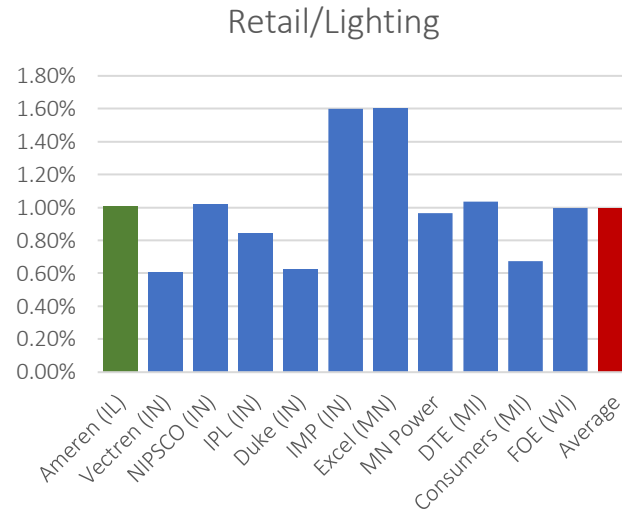
# PROGRAM-LEVEL BENCHMARKING ANALYSIS

## Residential

For some programs, it is relatively straightforward to compare

The results may:

- Inform adoption rates
- Provide reasonable bases for recommendations for program design





# Supplemental Slides

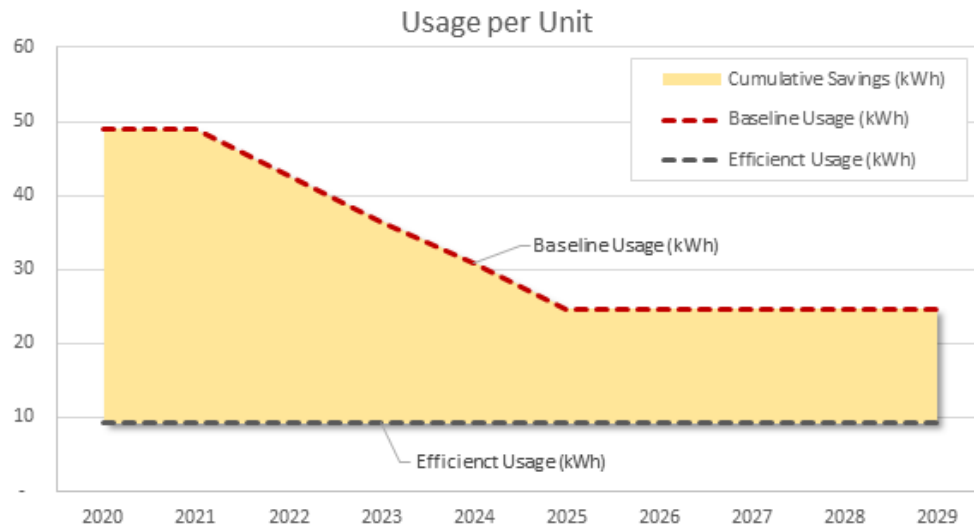
# IMPACT OF DUAL BASELINE ON CUMULATIVE SAVINGS

Dual baseline is phased in over five years

Impact of dual baseline on use per unit is shown below

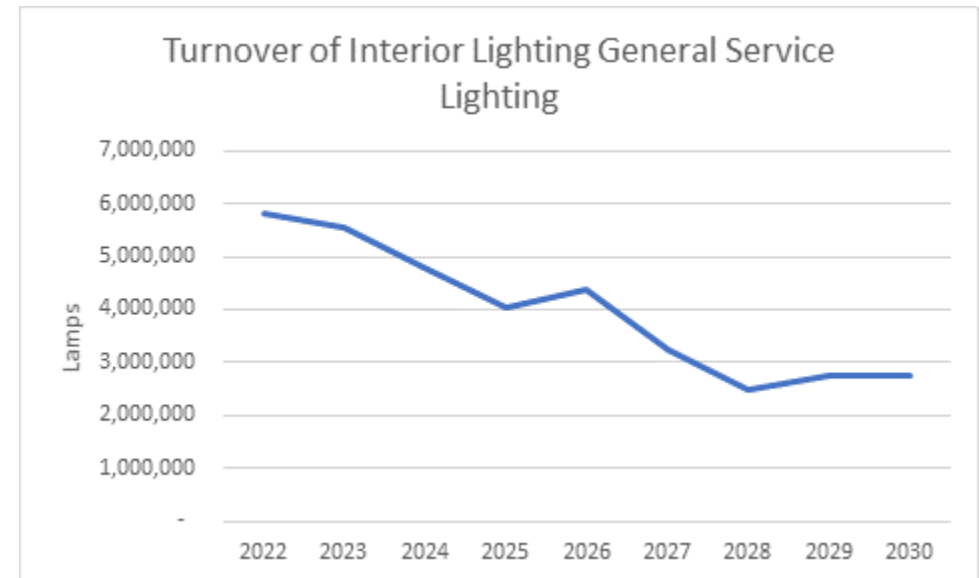
- Savings from lamps replaced in 2020 will have much higher lifetime savings than lamps installed after 2024

Affects all sectors



Number of lamps replaced each year declines during the study

Combining the effects of both factors results in lifetime savings of later-year replacements is much lower





# ADOPTION RATE DEVELOPMENT

## Ameren Program Accomplishments – Residential

- Equipment measures are installed when existing units fail
- Non-equipment measures do not have natural turnover so they are phased in according to adoption schedules that align with the diffusion of similar equipment measures
  - Phased in over 5, 10, 15, or 20 years based on capital cost, technical maturity, and market acceptance
  - Number of units converted each year generally align with Ameren program accomplishments

Measure	Category	Technical Diffusion Years	Avg. Available Market
Refrigerator - Decommissioning and Recycling	Appliance Recycling	5	50%
Behavioral Programs - Energy Reports	Behavior	2	85%
Freezer - Decommissioning and Recycling	Appliance Recycling	5	38%
Thermostat - ENERGY STAR Connected	Connected Controls	10	57%
Soundbar - ENERGY STAR (3.0)	Electronics	5	84%
Windows - Install Reflective Film	Weatherization	10	17%
Building Shell - Air Sealing (Infiltration Control)	Weatherization	20	15%
Windows - Cellular Shades	Weatherization	10	10%
Exterior Lighting - Photovoltaic Installation	Lighting	10	24%
HVAC - Maintenance and Tune-Up	HVAC	10	39%
Supplement Central Electric w/ Ductless Mini Split	Heat Pump	10	8%
Insulation - Wall Cavity Installation	Weatherization	20	15%
Insulation - Ceiling Installation & Upgrade	Weatherization	20	4%
Advanced Power Strips - IR Sensing	Energy Kits	10	35%
Convert Zonal Electric System to Ductless Mini Split	Heat Pump	10	34%

# ADOPTION RATE DEVELOPMENT

## Ameren Program Accomplishments – C&I

- Equipment measures are installed when existing units fail
- Non-equipment measures do not have natural turnover so they are phased in according to adoption schedules that align with the diffusion of similar equipment measures
  - Phased in over 5, 10, 15, or 20 years based on capital cost, technical maturity, and market acceptance
  - Number of units converted each year align with Ameren program accomplishments

Measure	Category	Technical Diffusion Years	Avg. Available Market
Retrocommissioning	Whole Building	20	38%
Commissioning	Whole Building	10	65%
Ventilation - Variable Speed Control	Ventilation	15	34%
Windows - High Efficiency Glazing	Weatherization	20	14%
Building Energy Management System (BEMS)	Connected Controls	20	13%
Refrigeration - Variable Speed Compressor	Refrigeration	20	30%
Advanced New Construction Designs	Whole Building	20	20%
Exterior Lighting - Photovoltaic Installation	Lighting	20	15%
HVAC - Economizer	HVAC	20	57%
Interior Lighting - Solar Light Tubes	Lighting	20	6%
Thermostat - Connected	Connected Controls	10	55%
Ventilation - Nighttime Air Purge	Ventilation	15	48%
Exterior Lighting - Enhanced Controls	Connected Controls	15	22%
Refrigeration - High Efficiency Compressor	Refrigeration	20	30%
Refrigeration - Evaporative Condenser	Refrigeration	15	12%



THANK YOU!