



ELL 2027 IRP – EE, DR, and DER Potential Study

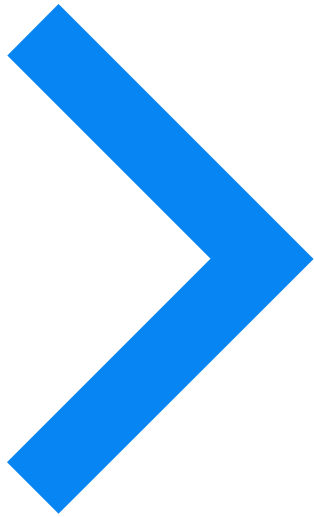
Draft Results



03/06/2026



→ Agenda



- › Introduction
- › Study Overview
- › Energy Efficiency Achievable Potential Draft Forecast
- › Demand Response Achievable Potential Draft Forecast
- › Distributed Energy Resources Achievable Potential Draft Forecast
- › Q&A



Introduction

ICF Presentation Team

In-Person



Ali Bozorgi
Project Director



Craig Schultz
DER Task Lead

On Phone



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EE Task Lead



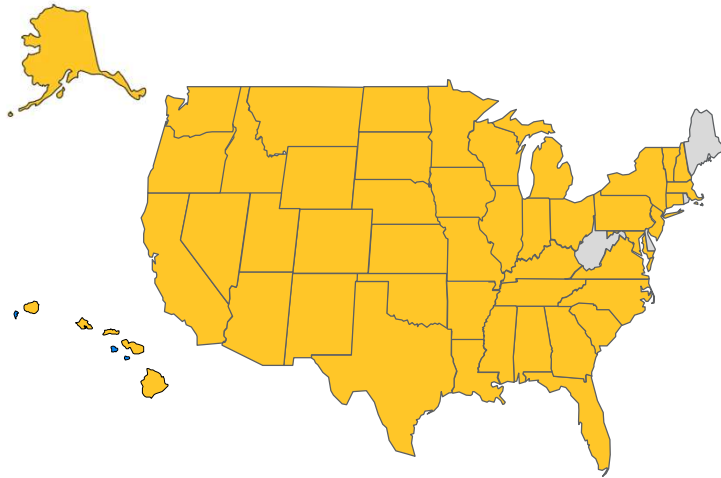
Praneeth Aketi
DR Task Lead

Utility Consulting

ICF is a leader in implementing various utility programs (energy efficiency, electrification, flexible load management and more)

Supporting utility transformation: grid resilience, distributed energy and electrification

Majority long-term contracts



Location of ICF U.S. energy clients



Utility work across North America

250+

Active programs

60+

Utility clients

20

Large portfolios

Industry leading planning and policy development

30+

DSM program design clients

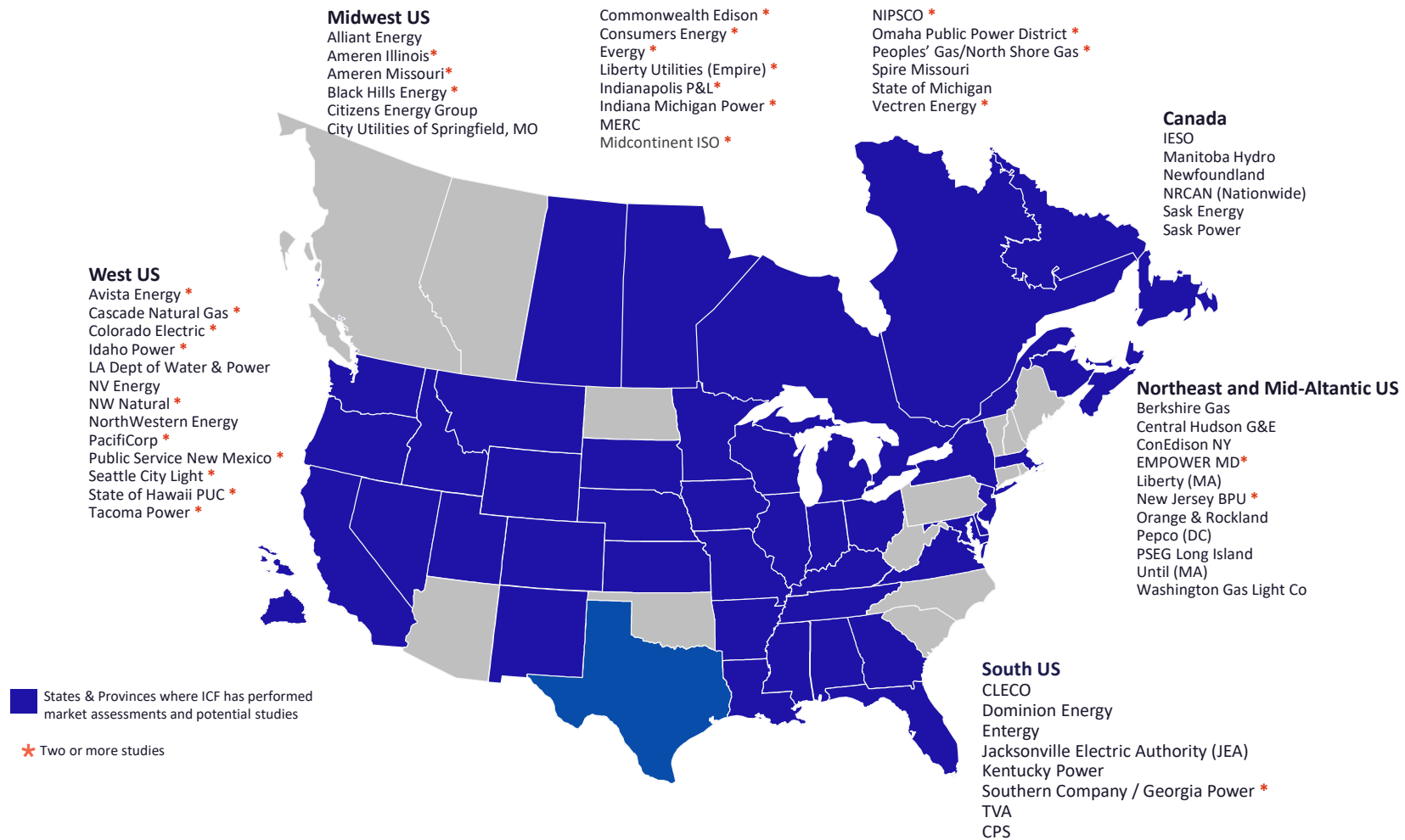
35+

Potential study clients

40+

Related regulatory testimonies

Consulting Client History – Potential Studies



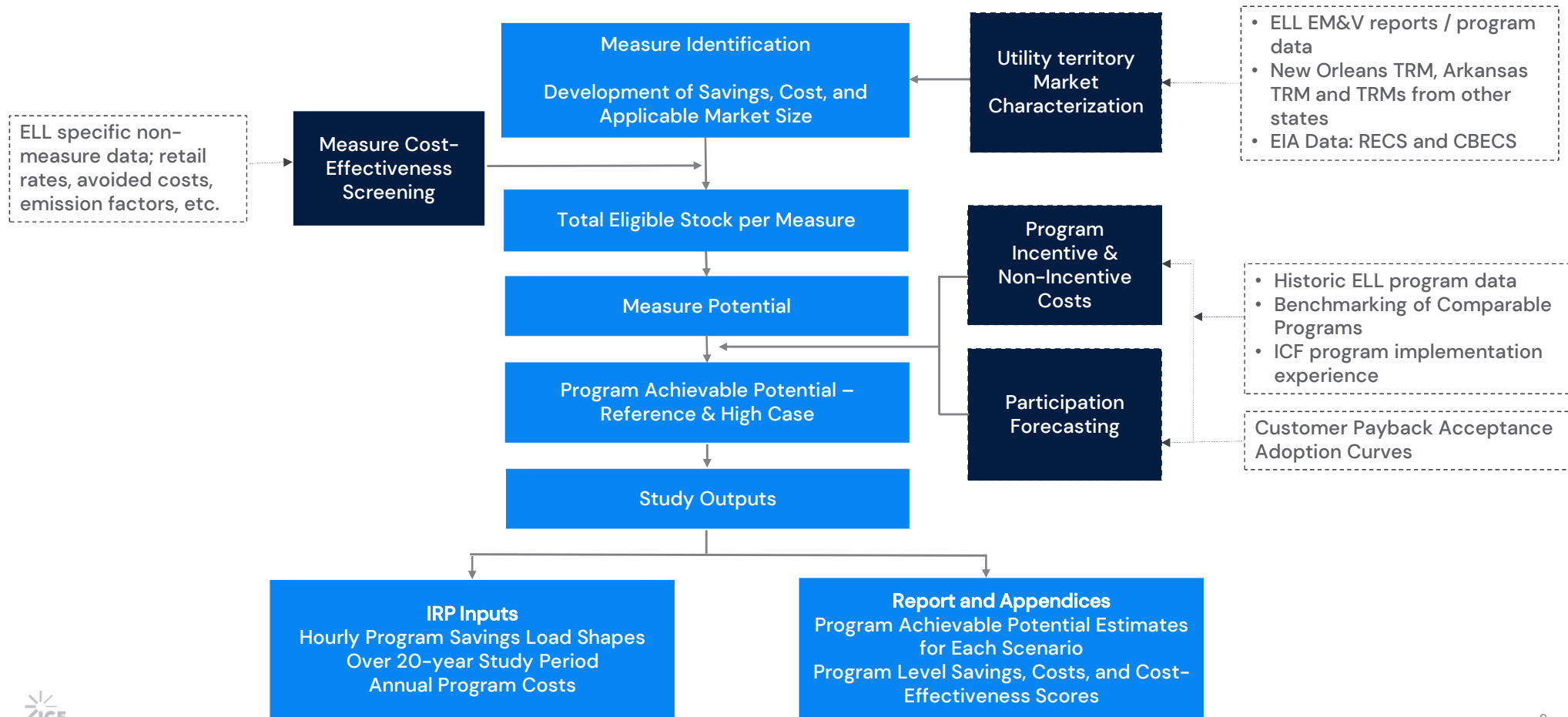


Study Overview

Study Overview

- Objective: Support ELL's 2027 IRP
- Demand side resources covered:
 - Energy Efficiency (EE)
 - Demand Response (DR)
 - Distributed Energy Resources (DER)
 - BTM Solar
 - BTM Storage
- Forecast period is 20 years (2027 – 2046)
- ELL service territory including legacy ELL and EGSL.

Bottom-up Market Potential Analysis Modeling Approach



Major Changes in This Study Compared to 2023 IRP Potential Study

- Updated measure list, savings and costs, and added new measures based on the latest version of TRMs:
 - New Orleans TRM V7
 - Arkansas TRM V10.0
 - Illinois TRM V13
- Updated measure saturations as well as applicability and current adoption percents based on new EIA surveys – RECS 2020 and CBECS 2018 and ENERGY STAR® Unit Shipment and Market Penetration Report Calendar Year 2023
- Updated DR program list
- Updated ELL specific data such as avoided costs, retail rates, line losses, and added carbon emission factors and avoided carbon costs, as provided by ELL.
- Used PY7–PY10 EM&V reports to update the program potential forecasts.
- Took new efficiency standards into account.



Federal Lighting Standard (effective July 2028)

The U.S. DOE will require all general service light bulbs to meet a minimum efficiency of about 120 lumens per watt, effectively making LEDs the baseline technology and phasing out less efficient options like compact fluorescent and incandescent bulbs.



Federal Water Heating Standard (effective May 2029)

U.S. DOE regulations will require most electric storage water heaters over 35 gallons to use heat pump technology.



Energy Efficiency Achievable Potential Draft Forecast

Energy Efficiency Potential Scenarios Modeled

Our approach to achievable potential modeling is an evidence-based, data driven approach, which is based on a detailed benchmarking of actual EE program performance.

Two scenarios modeled:

Reference Case

Current ELL programs were modelled largely based on current program designs and current level of performance.

High Case

Includes new programs that ELL does not currently offer and expanded existing ELL programs.

Residential Programs Modeled

Current Programs

Residential

- A/C Solutions
- Home Performance with ENERGY STAR
- Income Qualified Solutions
- Multifamily Solutions
- Manufactured Homes
- Retail Appliances
- School Kits
- Residential New Construction

Commercial

- Large Commercial Solutions
- Small Commercial Solutions

New Programs

Residential

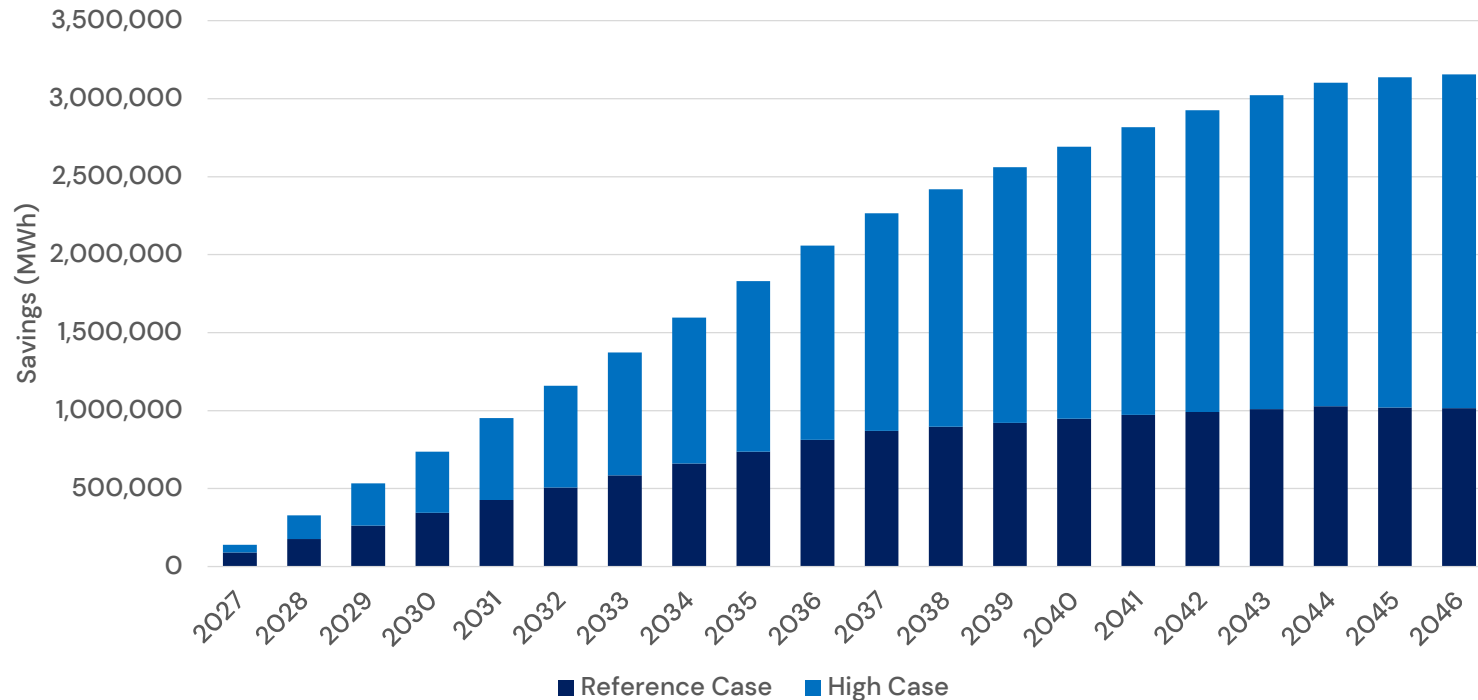
- Appliance Recycling
- Home Energy Report
- Midstream HVAC

Commercial

- Midstream Lighting

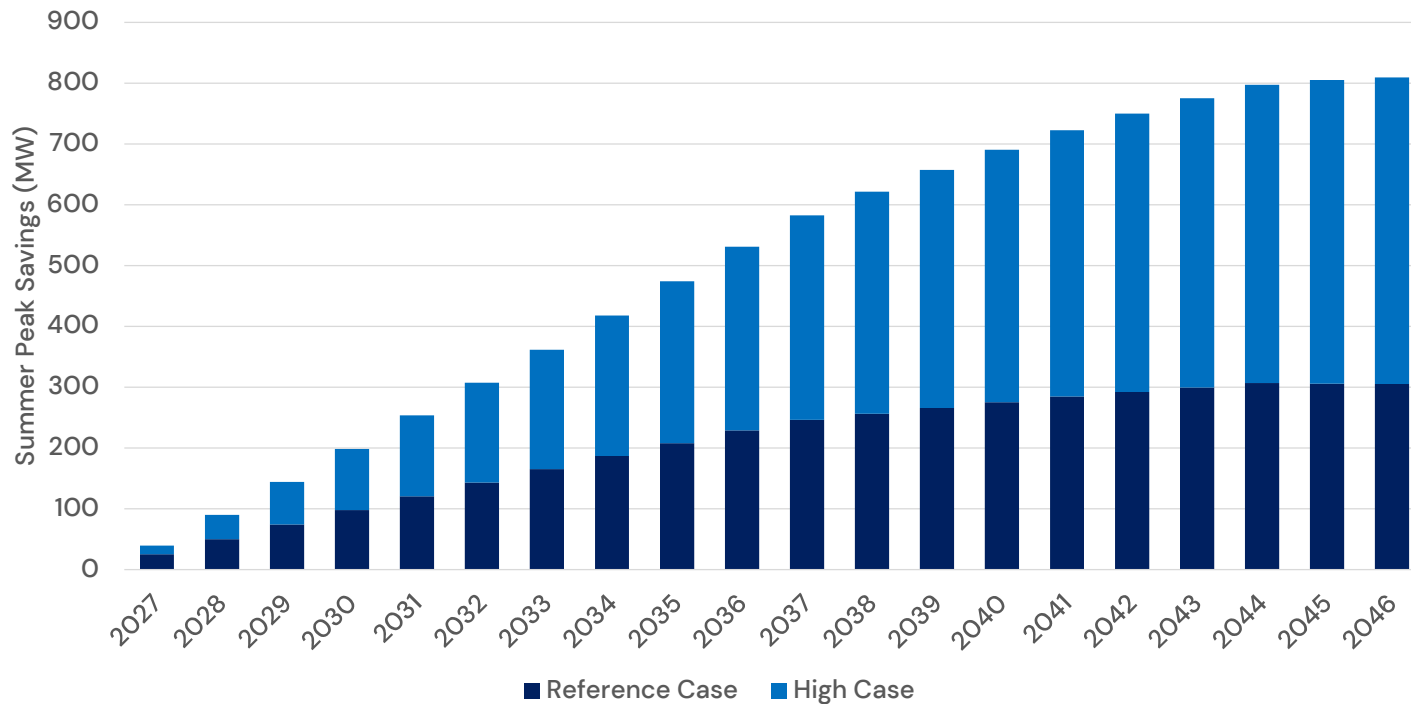
Cumulative MWh Savings Forecast

- For **Reference Case**, residential and commercial EE programs are projected to achieve cumulative savings of approximately 89 GWh in 2027 and nearly 1,000 GWh by 2046.
- Under **High Case**, cumulative savings begin at around 140 GWh in 2027 and reach up to 3,155 GWh by 2046.



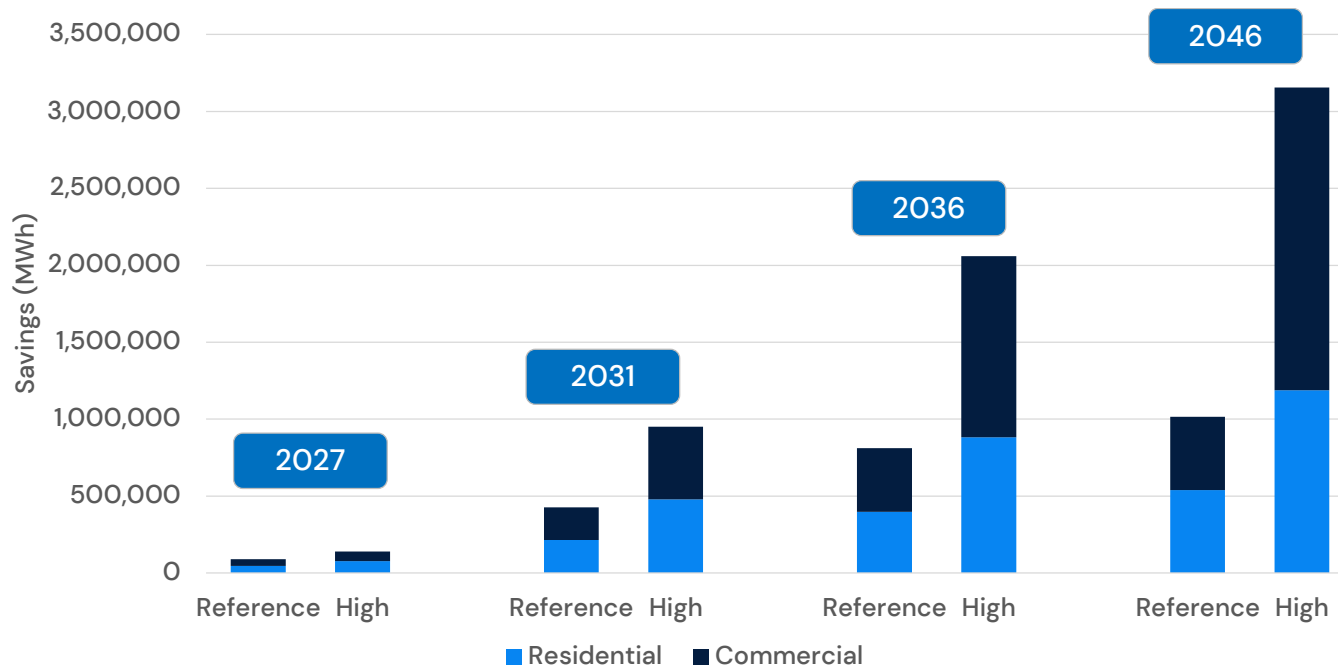
Cumulative Summer MW Savings Forecast

- For **Reference Case**, residential and commercial EE programs are projected to achieve cumulative MW savings of approximately 25 MW in 2027 and nearly 305 MW by 2046.
- Under **High Case**, cumulative savings begin at around 39 MW in 2027 and reach up to 809 MW by 2046.



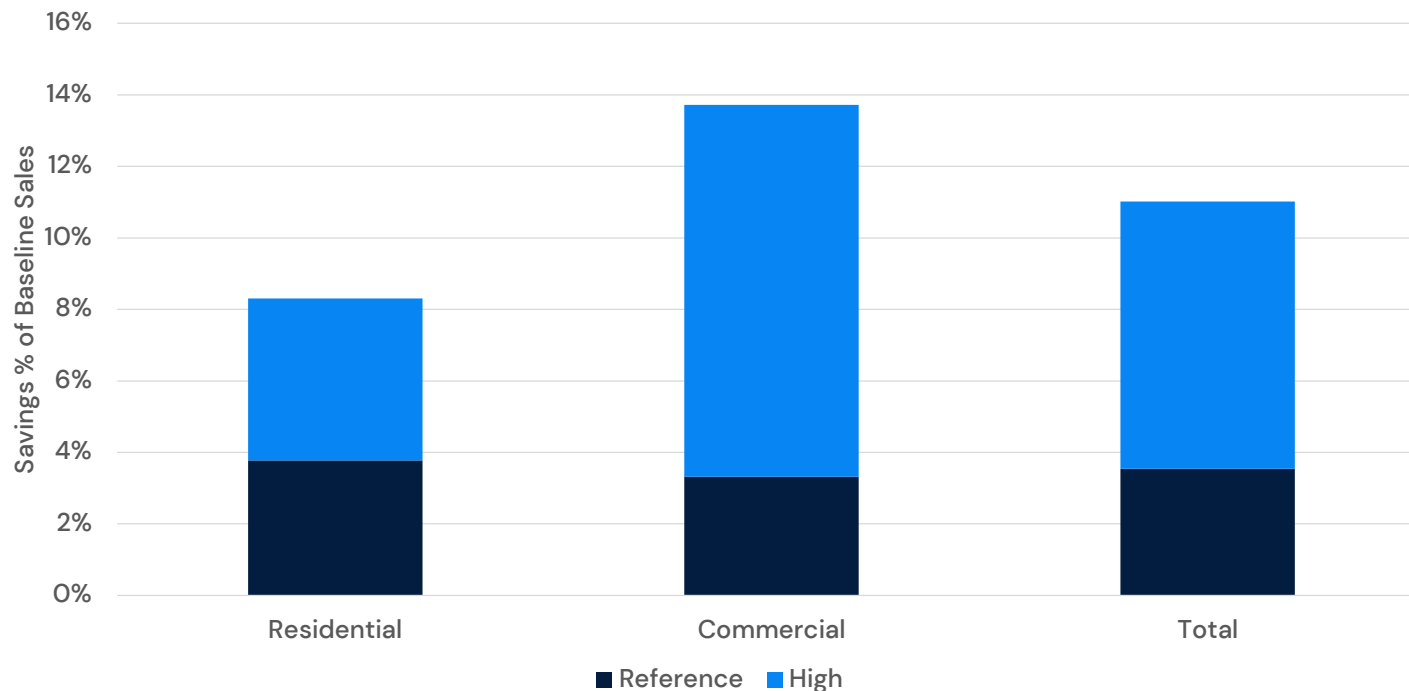
Cumulative MWh Savings by Sector

- The Reference Case shows a balanced contribution to savings from both residential and commercial sectors.
- Under the High Case, savings shift toward the commercial sector – more expansion opportunity exist for commercial programs.



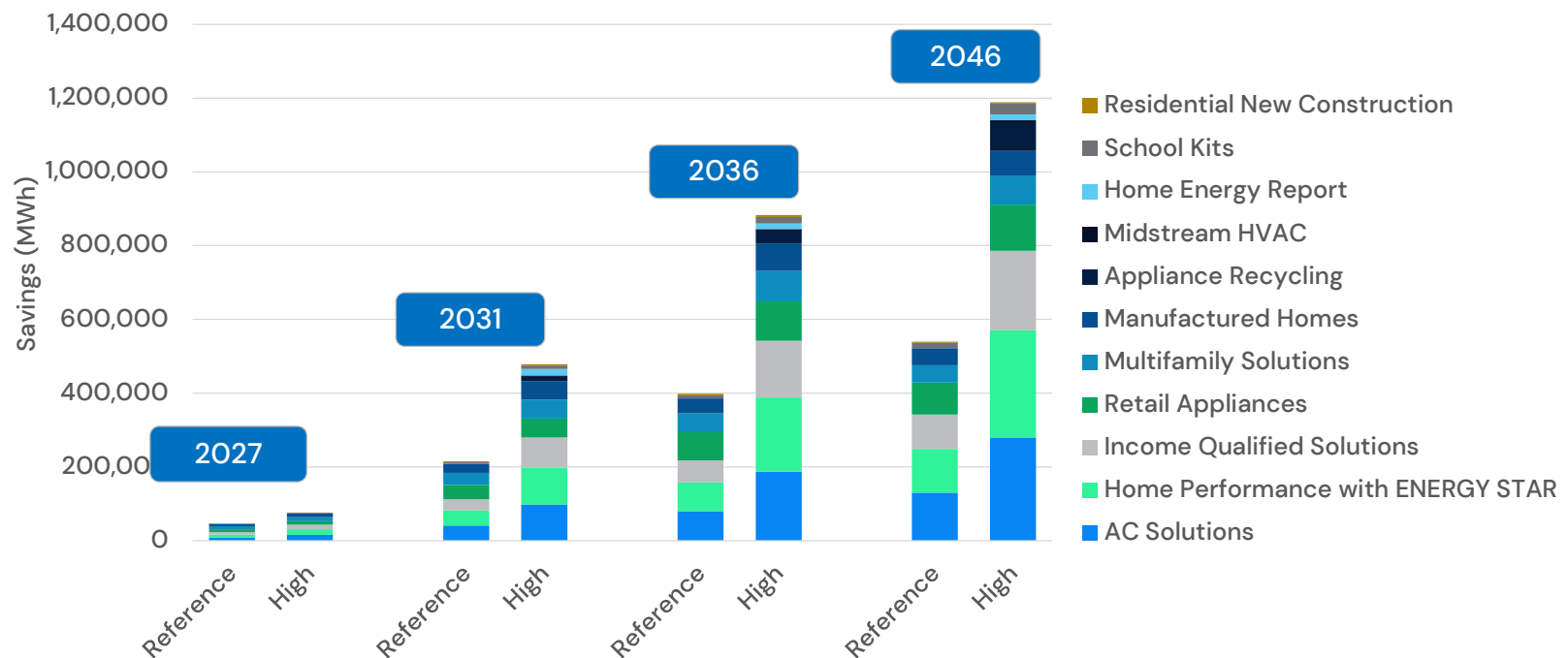
Cumulative MWh Savings by Sector in 2046

- Residential and commercial cumulative savings levels could reach up to 8% and 14% of sector sales, respectively, by 2046.
- Residential program cumulative savings could be approximately doubled by 2046
- Commercial program cumulative savings could be approximately increased by 3.5 times by 2046.



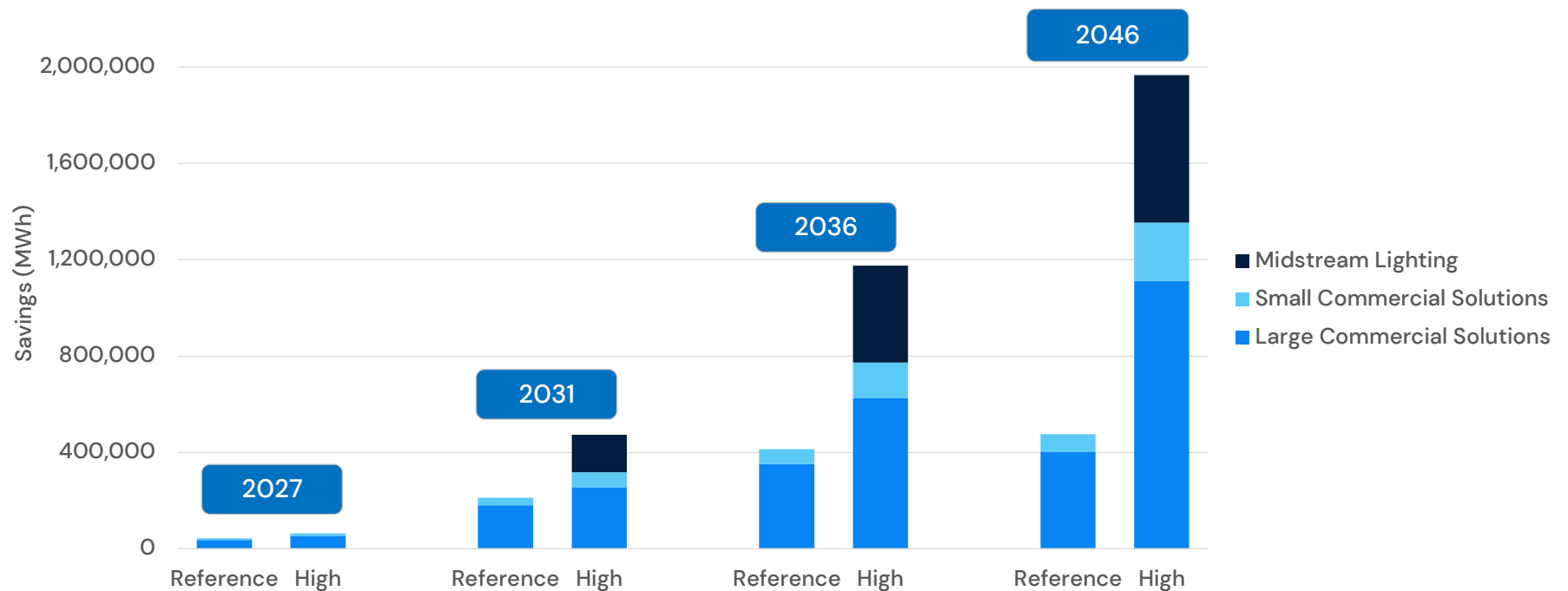
Cumulative MWh Savings by Program – Residential – 1, 5, 10 and 20-year

- In 2046, AC Solutions and Home Performance with ENERGY STAR have the biggest residential savings opportunity followed by Income Qualified Solutions and Retail Appliances.
- Expanded programs in the High Case can more than double residential savings by 2046.



Cumulative MWh Savings by Program – Commercial – 1, 5, 10 and 20-year

- In all years, Large Commercial Solutions represents the largest commercial savings opportunity, followed by Small Commercial Solutions in the Reference Case and Midstream Lighting in the High Case.
- In the High Case, expanded programs can more than triple commercial savings by 2046.



Program Cost and Cost-effectiveness Metrics – Residential

Scenario	Program	Annual Program Costs (Nominal, \$ million)				Cost Effectiveness		
		2027	2031	2036	2046	TRC	RIM	Levelized Cost (\$/kWh)
Reference	AC Solutions	\$ 1.4	\$ 1.4	\$ 1.5	\$ 1.7	10.3	0.9	0.01
	Home Performance with ENERGY STAR	\$ 1.6	\$ 1.6	\$ 1.7	\$ 1.9	6.6	0.9	0.02
	Income Qualified Solutions	\$ 2.2	\$ 2.2	\$ 2.3	\$ 2.5	3.4	0.9	0.03
	Manufactured Homes	\$ 1.2	\$ 1.0	\$ 0.8	\$ 0.8	6.5	0.6	0.02
	Multifamily Solutions	\$ 1.3	\$ 0.9	\$ 0.6	\$ 0.9	6.3	0.9	0.01
	Retail Appliances	\$ 0.7	\$ 0.8	\$ 0.9	\$ 1.1	3.3	0.8	0.01
	School Kits	\$ 0.2	\$ 0.2	\$ 0.2	\$ 0.3	5.4	0.6	0.02
	Residential New Construction	\$ 0.1	\$ 0.1	\$ 0.1	\$ 0.0	2.8	0.7	0.02
	Portfolio	\$ 8.8	\$ 8.2	\$ 8.0	\$ 9.3	5.3	0.8	0.02
High	AC Solutions	\$ 2.5	\$ 3.6	\$ 3.3	\$ 3.5	9.4	0.9	0.01
	Home Performance with ENERGY STAR	\$ 2.9	\$ 4.5	\$ 4.3	\$ 4.3	5.5	0.9	0.02
	Income Qualified Solutions	\$ 4.4	\$ 6.3	\$ 5.5	\$ 5.7	3.5	0.8	0.03
	Manufactured Homes	\$ 2.3	\$ 2.1	\$ 1.1	\$ 2.3	5.0	0.6	0.02
	Multifamily Solutions	\$ 1.7	\$ 1.6	\$ 1.1	\$ 1.7	4.8	0.9	0.02
	Retail Appliances	\$ 0.9	\$ 1.1	\$ 1.3	\$ 1.7	3.6	0.8	0.01
	School Kits	\$ 0.3	\$ 0.5	\$ 0.4	\$ 0.4	5.4	0.6	0.02
	Residential New Construction	\$ 0.1	\$ 0.1	\$ 0.1	\$ 0.1	3.9	0.6	0.02
	Appliance Recycling	\$ –	\$ 0.6	\$ 0.7	\$ 0.7	6.5	0.5	0.01
	Home Energy Report	\$ –	\$ 0.6	\$ 0.6	\$ 0.8	2.7	0.5	0.03
	Midstream HVAC	\$ –	\$ 0.1	\$ 0.1	\$ 0.1	4.1	0.4	0.01
	Portfolio	\$ 15.1	\$ 21.0	\$ 18.4	\$ 21.3	5.0	0.8	0.02

Program Costs and Cost-Effectiveness Metrics – Commercial

Scenario	Program	Annual Program Costs (Nominal, \$ million)				Cost Effectiveness		
		2027	2031	2036	2046	TRC	RIM	Levelized Cost (\$/kWh)
Reference	Large Commercial Solutions	\$ 7.6	\$ 8.0	\$ 8.8	\$ 10.7	4.2	0.6	0.02
	Small Commercial Solutions	\$ 1.8	\$ 1.9	\$ 2.1	\$ 2.6	2.5	0.5	0.03
	Portfolio	\$ 9.3	\$ 9.9	\$ 10.9	\$ 13.3	3.8	0.6	0.02
High	Large Commercial Solutions	\$ 11.1	\$ 14.0	\$ 25.2	\$ 34.1	3.6	0.6	0.02
	Small Commercial Solutions	\$ 2.8	\$ 4.3	\$ 6.6	\$ 8.7	2.5	0.5	0.03
	Midstream Lighting	\$ –	\$ 7.2	\$ 11.1	\$ 14.7	3.7	0.5	0.02
	Portfolio	\$ 13.9	\$ 25.5	\$ 42.9	\$ 57.5	3.4	0.6	0.02

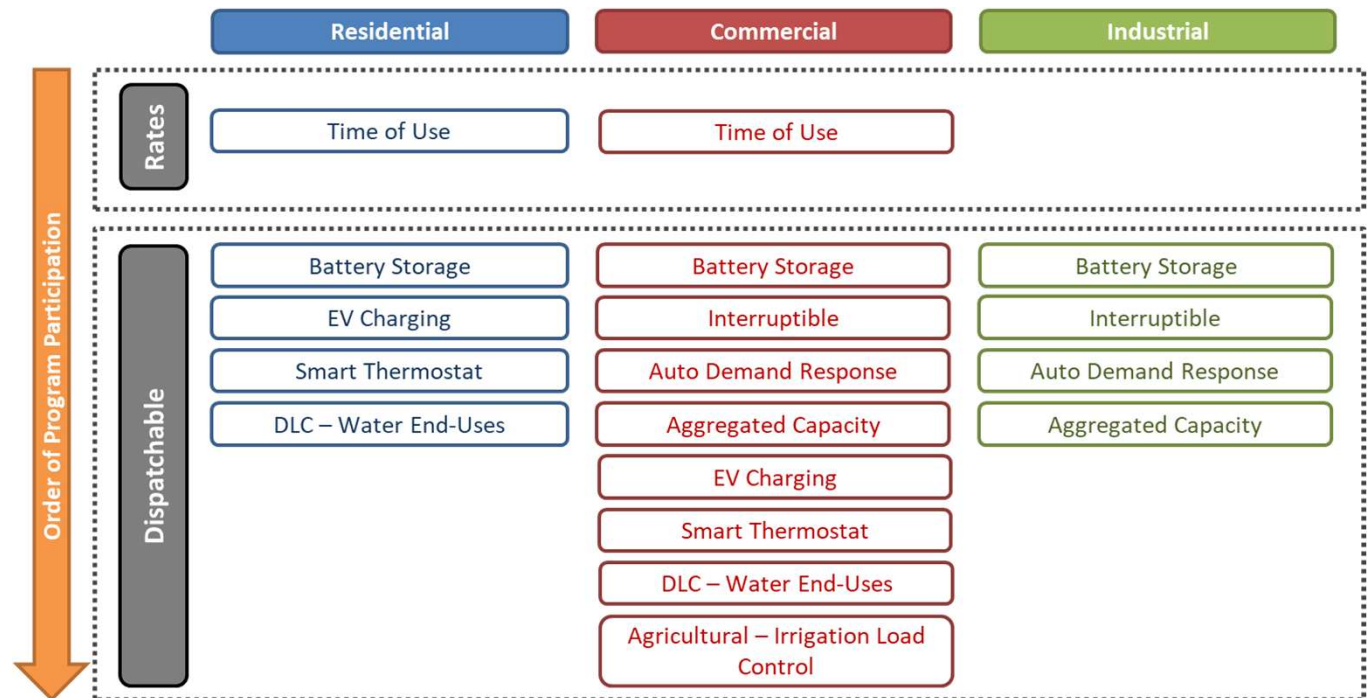
The overall EE portfolio, spanning across residential and commercial sectors, has a TRC of 4.6 and RIM of 0.7 in the reference case; and a TRC of 4.0 and RIM of 0.7 in the high case.



Demand Response Achievable Potential Draft Forecast

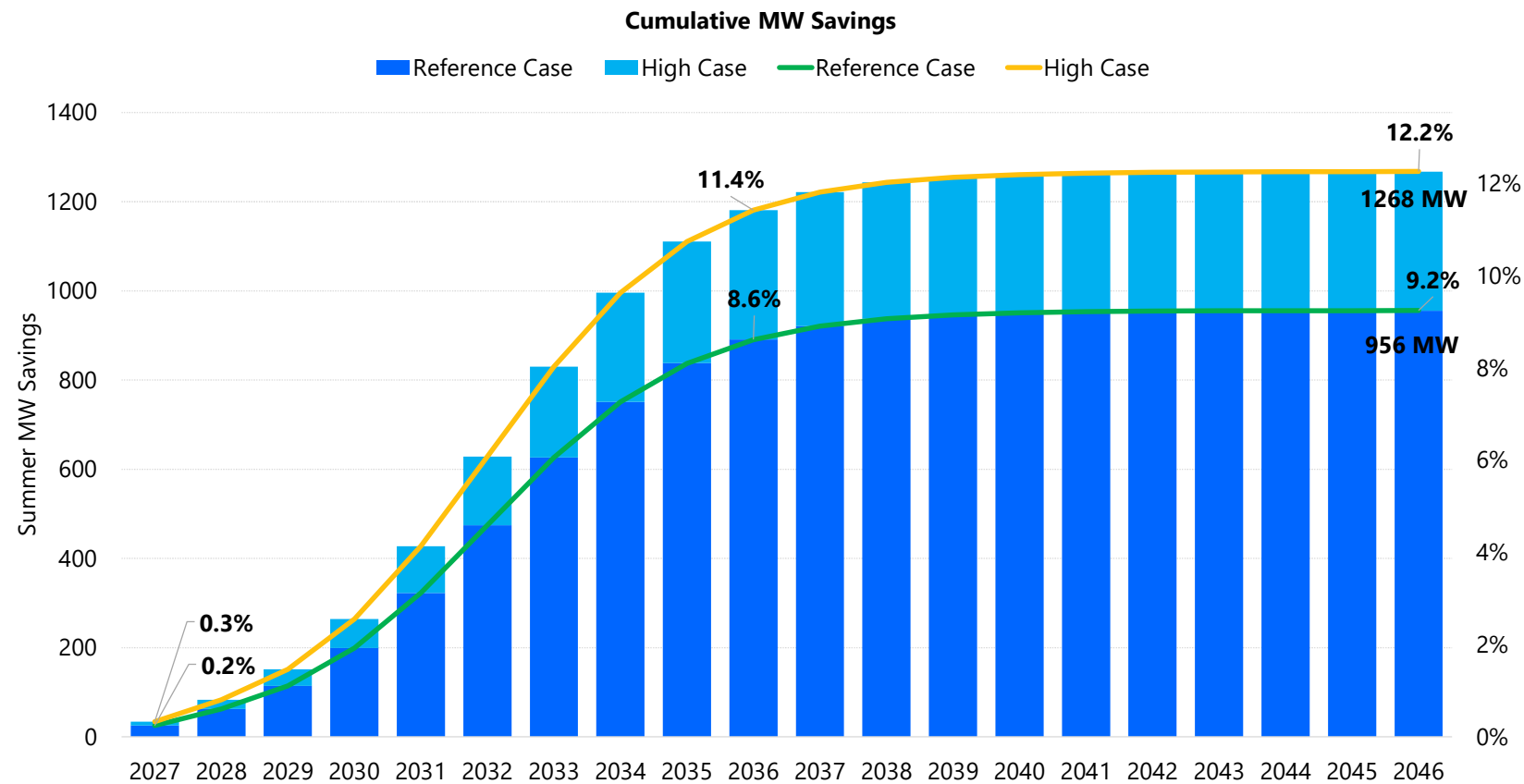
Programs and Scenarios

- Two scenarios
 - Reference Case – Levels of participation corresponding reasonably achievable levels of participation
 - High Case – Higher participation rates, with the maximum market share usually set to about 50% higher than that of the reference case
- A Bass diffusion curve takes the participation to the maximum market share level over the study period
- Program hierarchy determines participants available for enrollment
- All programs are opt-in.
- Water heating, smart thermostat, battery storage, and EV charging are modeled as BYOD programs



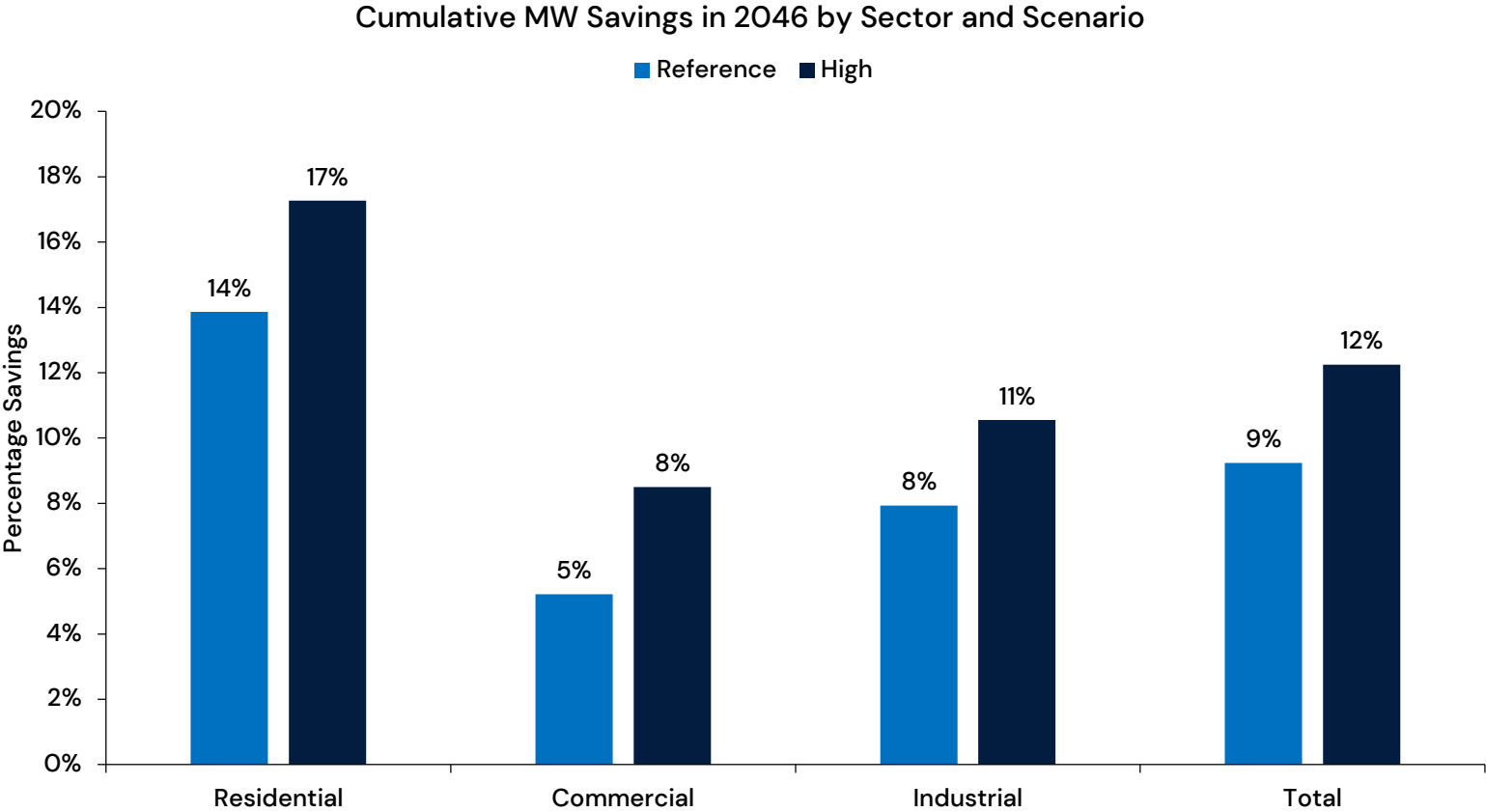
Summer MW Savings – All Sectors

NOTE: The % savings are calculated using 2027 peak as the baseline

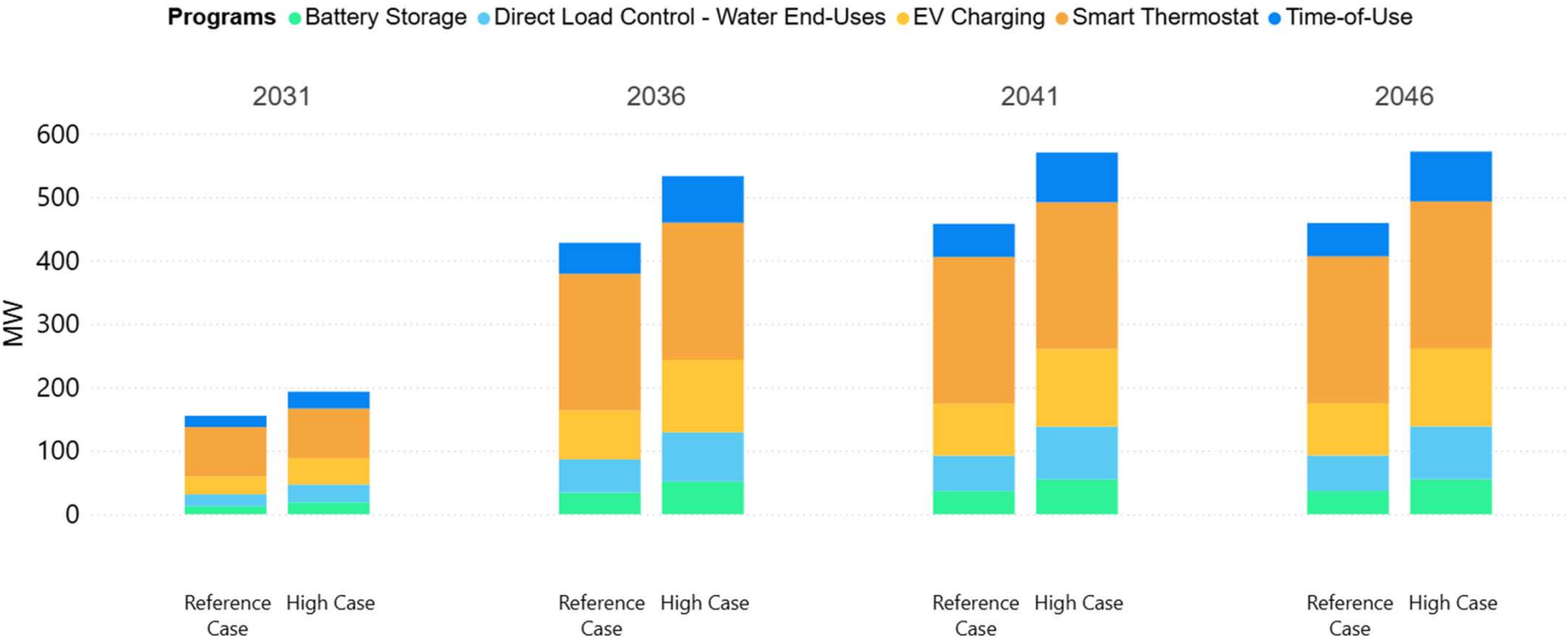


MW % Savings by Sector, in 2046

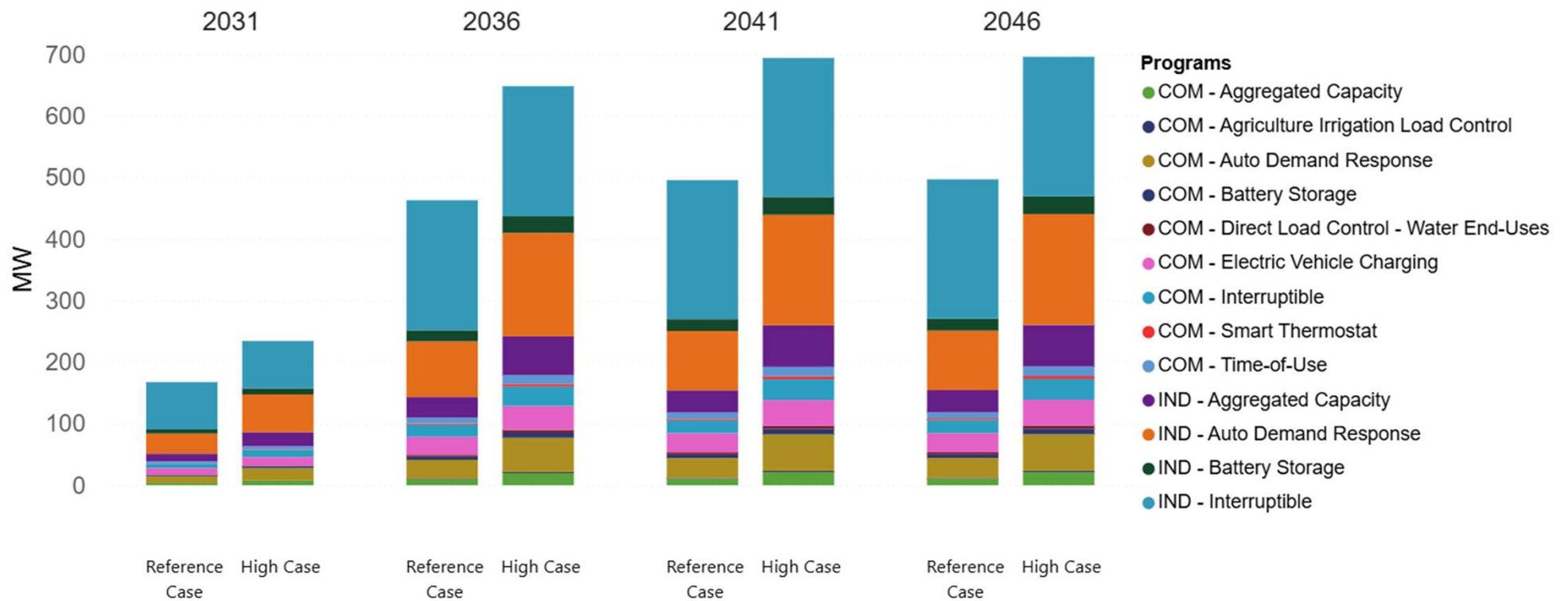
NOTE: The % savings are calculated using 2027 peak as the baseline



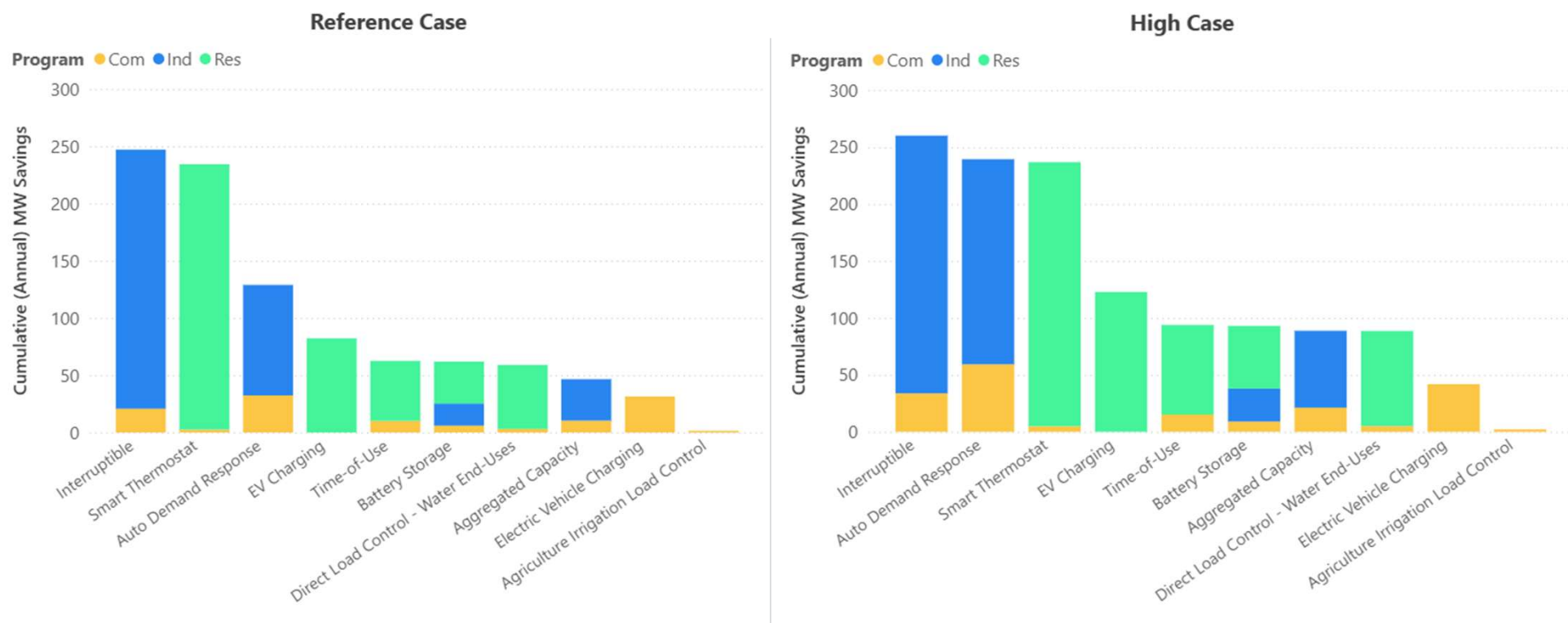
Residential Summer MW Savings



Commercial and Industrial Summer MW Savings



Program Composition, by Sector, in 2046, Cumulative MW Savings



DR Costs (Nominal) & Cost-effectiveness Metrics

The overall DR portfolio, spanning across sectors, has a TRC of 3.36 and a RIM of 2.01 in the reference case; and a TRC of 3.24 and RIM of 1.96 in the high case.

Residential

Scenario	Program	Annual Program Costs				Cost -Effectiveness		
		2031	2036	2041	2046	TRC	RIM	Levelized Cost (\$/kW)
Reference	Battery Storage	\$ 3.5	\$ 6.1	\$ 6.4	\$ 9.1	0.62	1.56	\$ 164
	Direct Load Control - Water End-Uses	\$ 3.8	\$ 4.7	\$ 5.4	\$ 6.8	3.11	2.73	\$ 94
	EV Charging	\$ 6.0	\$ 8.6	\$ 11.5	\$ 10.7	1.36	2.23	\$ 115
	Smart Thermostat	\$ 6.4	\$ 8.7	\$ 10.7	\$ 11.8	8.54	6.10	\$ 42
	Time-of-Use	\$ 0.2	\$ 0.2	\$ 0.2	\$ 0.3	50.20	7.52	\$ 5
	Residential Portfolio	\$ 19.9	\$ 28.3	\$ 34.2	\$ 38.8	2.77	3.65	\$ 67
High	Battery Storage	\$ 5.0	\$ 8.9	\$ 9.3	\$ 13.4	0.62	1.60	\$ 159
	Direct Load Control - Water End-Uses	\$ 4.9	\$ 6.3	\$ 7.2	\$ 9.4	3.55	3.05	\$ 84
	EV Charging	\$ 8.1	\$ 12.0	\$ 16.3	\$ 15.2	1.41	2.38	\$ 107
	Smart Thermostat	\$ 6.4	\$ 8.7	\$ 10.7	\$ 11.8	8.54	6.10	\$ 42
	Time-of-Use	\$ 0.2	\$ 0.2	\$ 0.2	\$ 0.3	75.33	7.92	\$ 4
	Residential Portfolio	\$ 24.7	\$ 36.1	\$ 43.8	\$ 50.0	2.53	3.56	\$ 68

DR Costs (Nominal) & Cost-effectiveness metrics – C&I

Reference Case

Sector	Program	Annual Program Costs				Cost -Effectiveness		
		2031	2036	2041	2046	TRC	RIM	Levelized Cost (\$/kW)
Commercial	Aggregated Capacity	\$ 0.3	\$ 0.7	\$ 0.8	\$ 0.8	9.61	1.80	\$ 63
	Agriculture Irrigation Load Control	\$ 0.2	\$ 0.2	\$ 0.3	\$ 0.3	1.15	0.82	\$ 221
	Auto Demand Response	\$ 1.0	\$ 2.6	\$ 3.1	\$ 3.4	10.64	1.67	\$ 74
	Battery Storage	\$ 0.7	\$ 1.2	\$ 1.2	\$ 1.7	0.09	0.92	\$ 196
	Direct Load Control - Water End-Uses	\$ 0.3	\$ 0.8	\$ 0.9	\$ 1.0	0.96	0.72	\$ 265
	Electric Vehicle Charging	\$ 0.3	\$ 0.4	\$ 0.5	\$ 0.5	1.18	2.77	\$ 14
	Interruptible	\$ 0.4	\$ 0.9	\$ 1.0	\$ 1.1	19.31	2.12	\$ 41
	Smart Thermostat	\$ 0.2	\$ 0.4	\$ 0.4	\$ 0.5	1.39	0.93	\$ 188
	Time-of-Use	\$ 0.2	\$ 0.2	\$ 0.2	\$ 0.3	9.68	2.02	\$ 26
Industrial	Aggregated Capacity	\$ 0.7	\$ 1.8	\$ 2.1	\$ 2.3	33.58	1.33	\$ 45
	Auto Demand Response	\$ 2.3	\$ 6.7	\$ 7.9	\$ 8.7	47.56	1.23	\$ 62
	Battery Storage	\$ 1.8	\$ 3.2	\$ 3.3	\$ 4.7	2.30	0.83	\$ 161
	Interruptible	\$ 2.6	\$ 7.5	\$ 8.8	\$ 9.8	209.93	1.45	\$ 29
	C&I Portfolio	\$ 11.2	\$ 26.4	\$ 30.4	\$ 35.1	5.10	1.42	\$ 50

DR Cost & Cost-effectiveness metrics – C&I

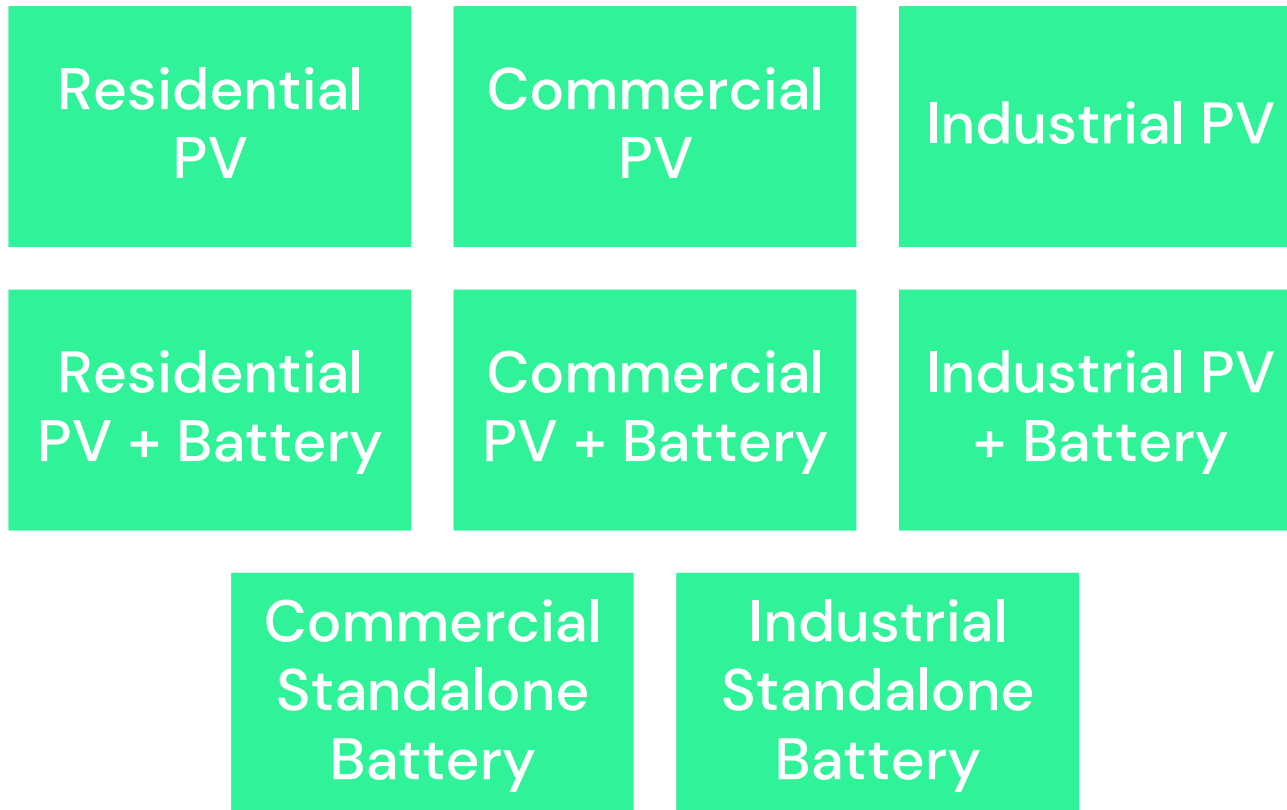
High Case

Sector	Program	Annual Program Costs				Cost -Effectiveness		
		2031	2036	2041	2046	TRC	RIM	Levelized Cost (\$/kW)
Commercial	Aggregated Capacity	\$ 0.5	\$ 1.1	\$ 1.3	\$ 1.4	19.70	1.99	\$ 50
	Agriculture Irrigation Load Control	\$ 0.2	\$ 0.2	\$ 0.3	\$ 0.3	1.71	1.08	\$ 152
	Auto Demand Response	\$ 1.5	\$ 4.1	\$ 4.9	\$ 5.4	19.49	1.81	\$ 63
	Battery Storage	\$ 1.0	\$ 1.6	\$ 1.7	\$ 2.4	0.09	0.98	\$ 180
	Direct Load Control - Water End-Uses	\$ 0.4	\$ 0.9	\$ 1.1	\$ 1.2	1.32	0.91	\$ 196
	Electric Vehicle Charging	\$ 0.3	\$ 0.4	\$ 0.5	\$ 0.5	1.19	2.86	\$ 11
	Interruptible	\$ 0.5	\$ 1.3	\$ 1.5	\$ 1.7	31.38	2.21	\$ 36
	Smart Thermostat	\$ 0.3	\$ 0.5	\$ 0.5	\$ 0.7	2.40	1.30	\$ 114
	Time-of-Use	\$ 0.2	\$ 0.2	\$ 0.2	\$ 0.3	14.51	2.17	\$ 17
Industrial	Aggregated Capacity	\$ 1.1	\$ 3.1	\$ 3.7	\$ 4.0	62.65	1.36	\$ 42
	Auto Demand Response	\$ 4.1	\$ 12.1	\$ 14.2	\$ 15.8	88.73	1.24	\$ 59
	Battery Storage	\$ 2.6	\$ 4.6	\$ 4.8	\$ 6.9	2.40	0.84	\$ 157
	Interruptible	\$ 2.6	\$ 7.5	\$ 8.8	\$ 9.8	209.93	1.45	\$ 29
C&I Portfolio		\$ 15.3	\$ 37.8	\$ 43.5	\$ 50.4	4.22	1.43	\$ 50

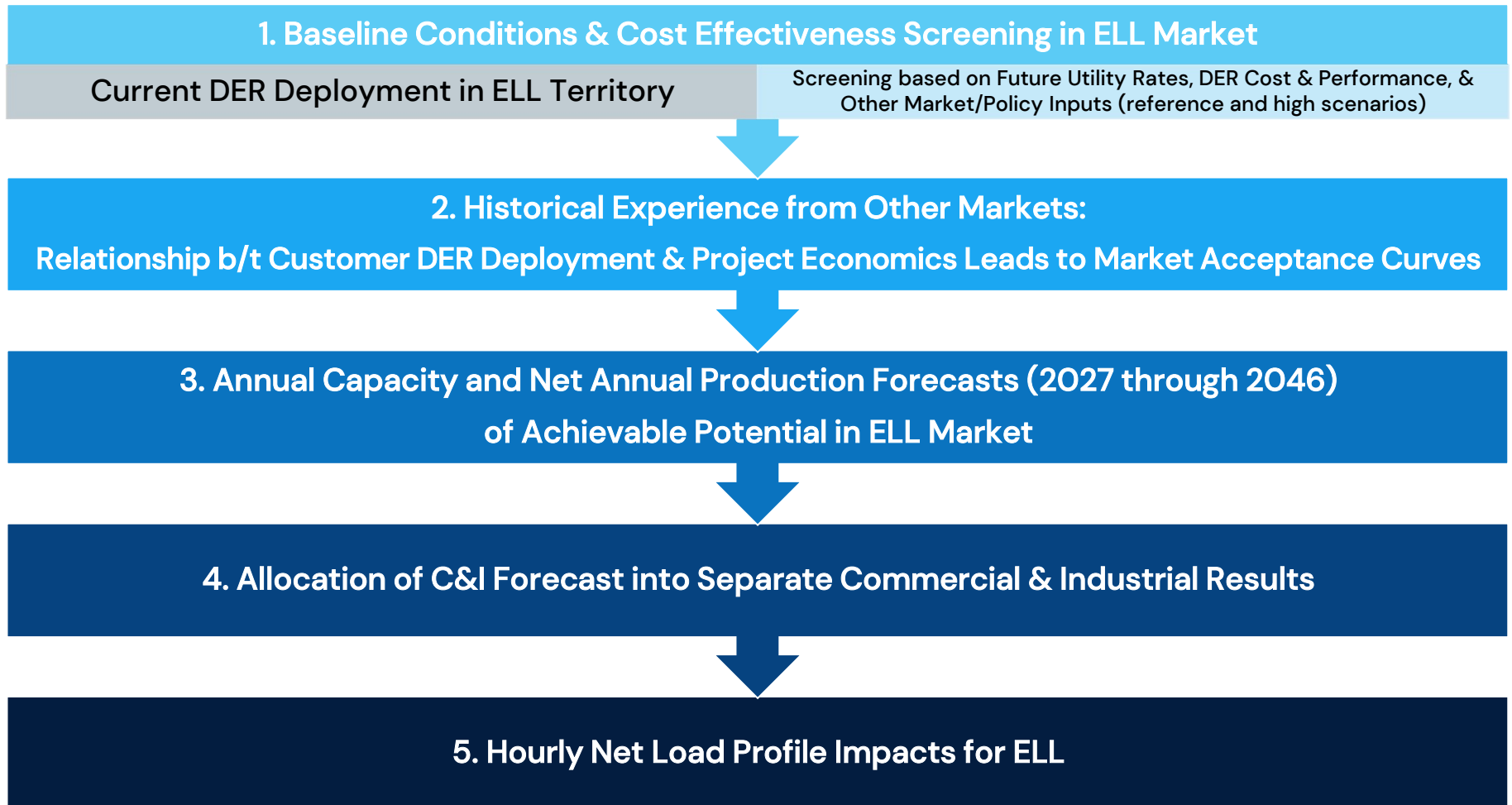


Distributed Energy Resources (DER) Achievable Potential Draft Forecast

Behind-the-Meter (BTM) DER Technology & Customer Combinations Forecasted



Overview of DER Analytic Approach



DER Cumulative Installed Capacity: Reference Scenario Forecast for Selected Years (data in MW_{AC}; for battery storage, “power” capacity is shown)

Year	Residential PV	C&I PV	Residential Battery (paired with PV)	C&I Battery (paired with PV)	Standalone C&I Battery
2026	88	8	< 1	< 1	< 1
2037	218	29	8	1	< 1
2038	234	31	10	1	< 1
2039	250	34	12	2	< 1
2040	267	36	13	2	< 1
2041	284	39	15	2	< 1
2042	301	41	18	2	< 1
2043	319	44	20	3	< 1
2044	336	46	23	3	< 1
2045	355	49	25	3	< 1
2046	373	52	28	4	< 1

• Capacity forecast data for the years 2027–2036 are displayed later in an Appendix to this presentation.

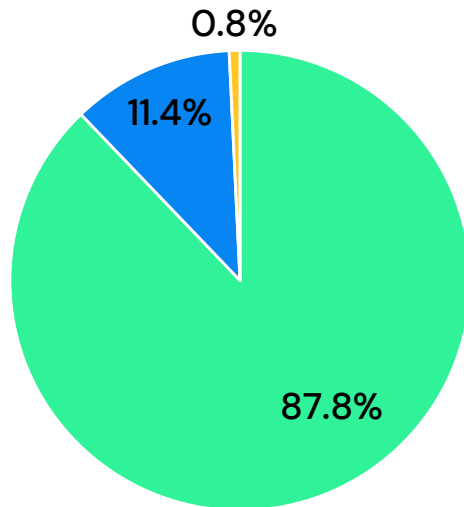
DER Cumulative Installed Capacity: High Scenario Forecast for Selected Years (data in MW_{AC}; for battery storage, “power” capacity is shown)

Year	Residential PV	C&I PV	Residential Battery (paired with PV)	C&I Battery (paired with PV)	Standalone C&I Battery
2026	88	8	< 1	< 1	< 1
2037	333	40	35	3	3
2038	363	44	41	4	3
2039	394	48	48	5	3
2040	426	52	56	5	4
2041	458	55	65	6	4
2042	491	59	74	7	4
2043	524	63	84	8	5
2044	557	67	94	9	7
2045	592	71	106	10	8
2046	626	75	118	11	10

 Capacity forecast data for the years 2027–2036 are displayed later in an Appendix to this presentation.

Cumulative Distributed PV Capacity Forecast: Share by Customer Class in 2046

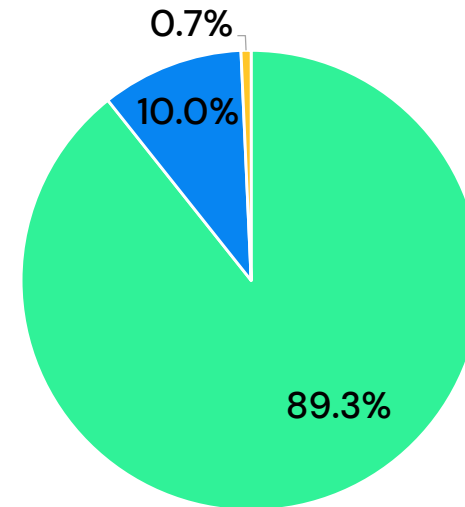
Reference Scenario (2046)



■ Residential ■ Commercial ■ Industrial

Total Capacity =
425 MW_{AC}

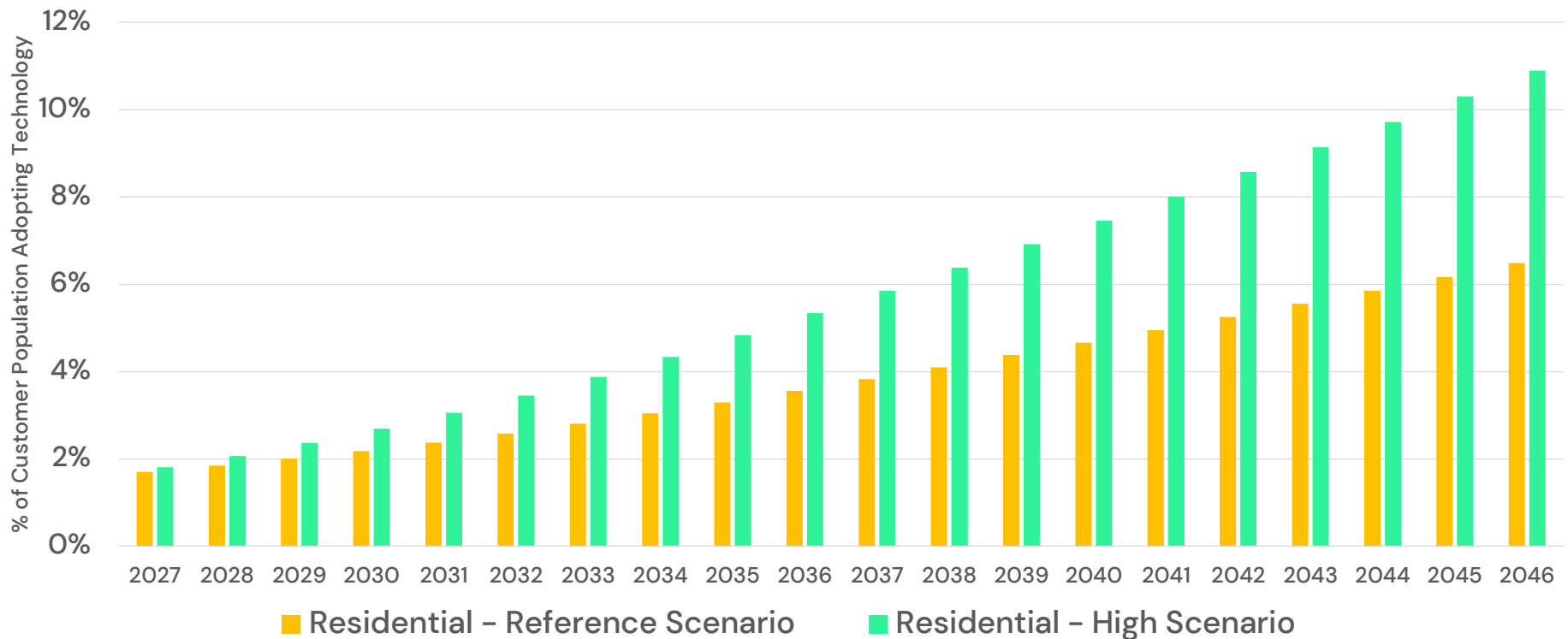
High Scenario (2046)



■ Residential ■ Commercial ■ Industrial

Total Capacity =
701 MW_{AC}

Forecasted Share of ELL Residential Customer Population Adopting PV: Reference & High Scenarios



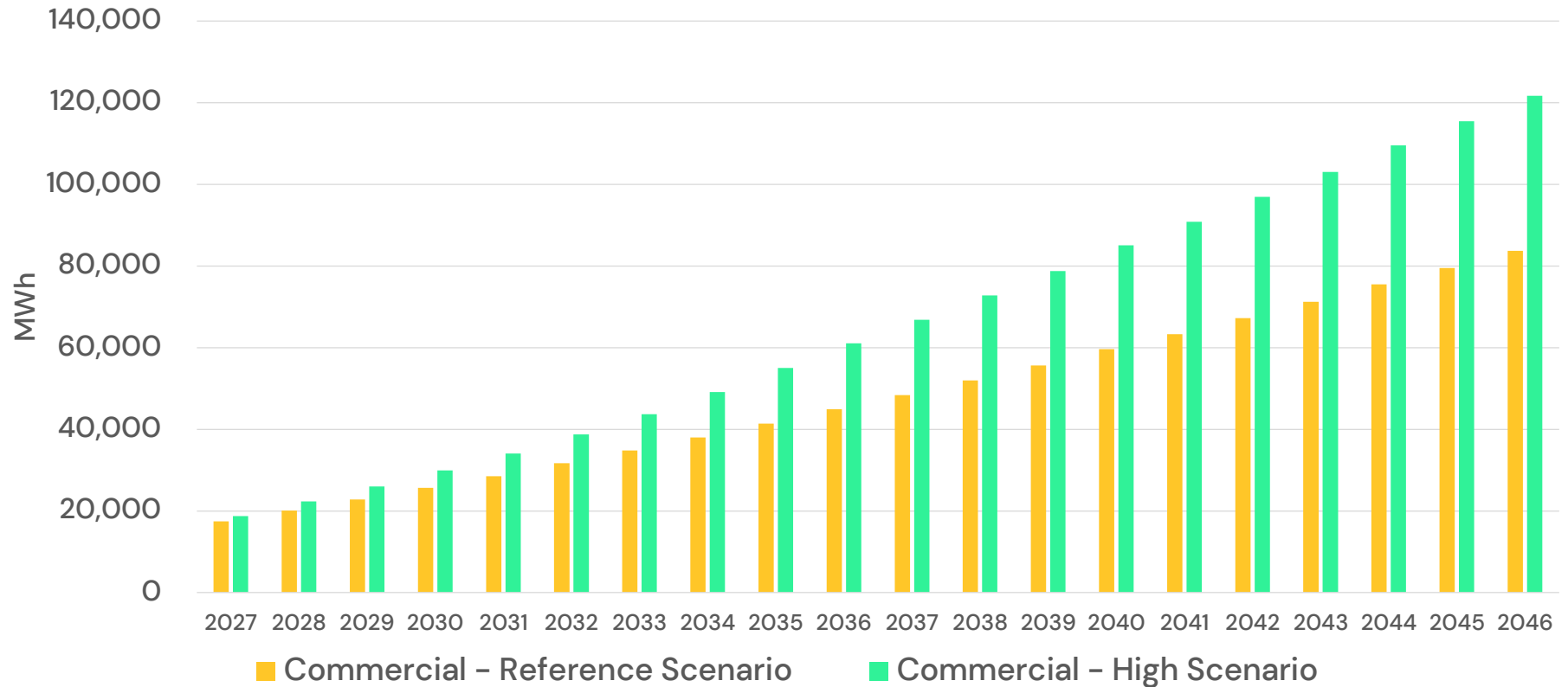
- By the end of 2024, about 1.5% of ELL's residential customers had interconnected PV systems.
- By 2046, the reference scenario forecasts that 6.5% (of the bigger residential customer base at that time) will adopt PV. In the high scenario, the corresponding 2046 PV adoption value is about 11%.

Forecasted Annual Residential PV Production (in MWh)



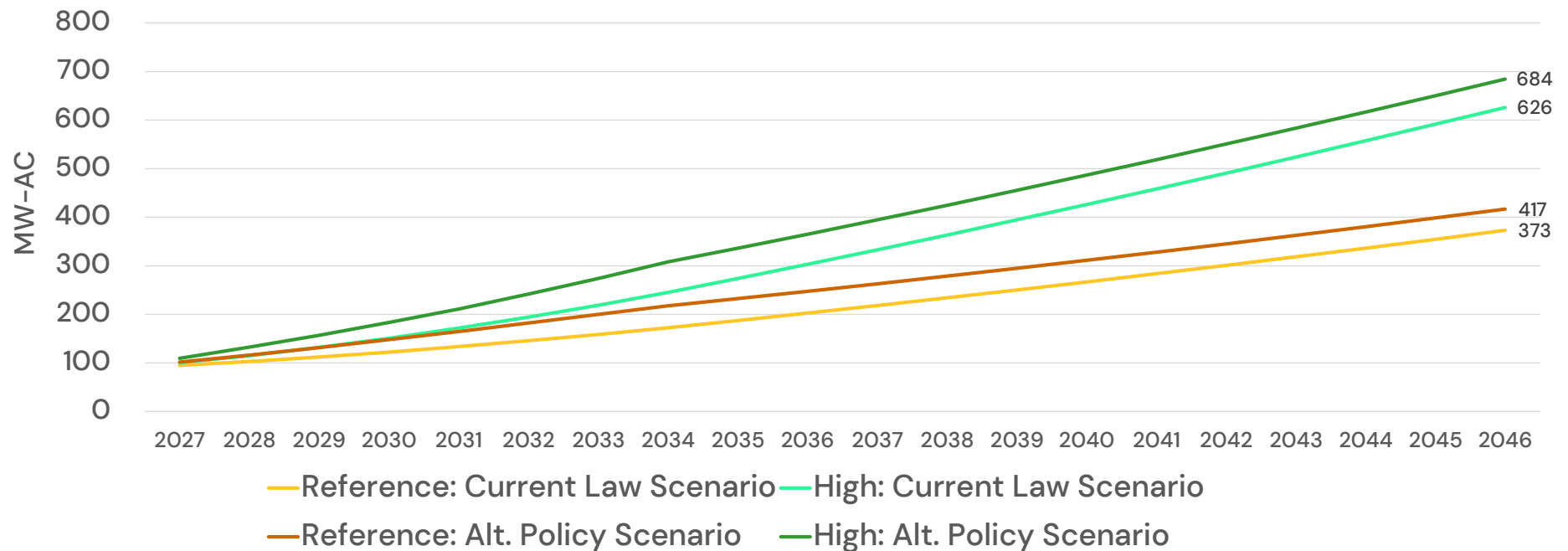
- This production includes both PV electricity consumed on-site and PV electricity exported back to the utility. Production data shown are at the central station generator, after grossing up for T&D losses.

Forecasted Annual Commercial PV Production (in MWh)



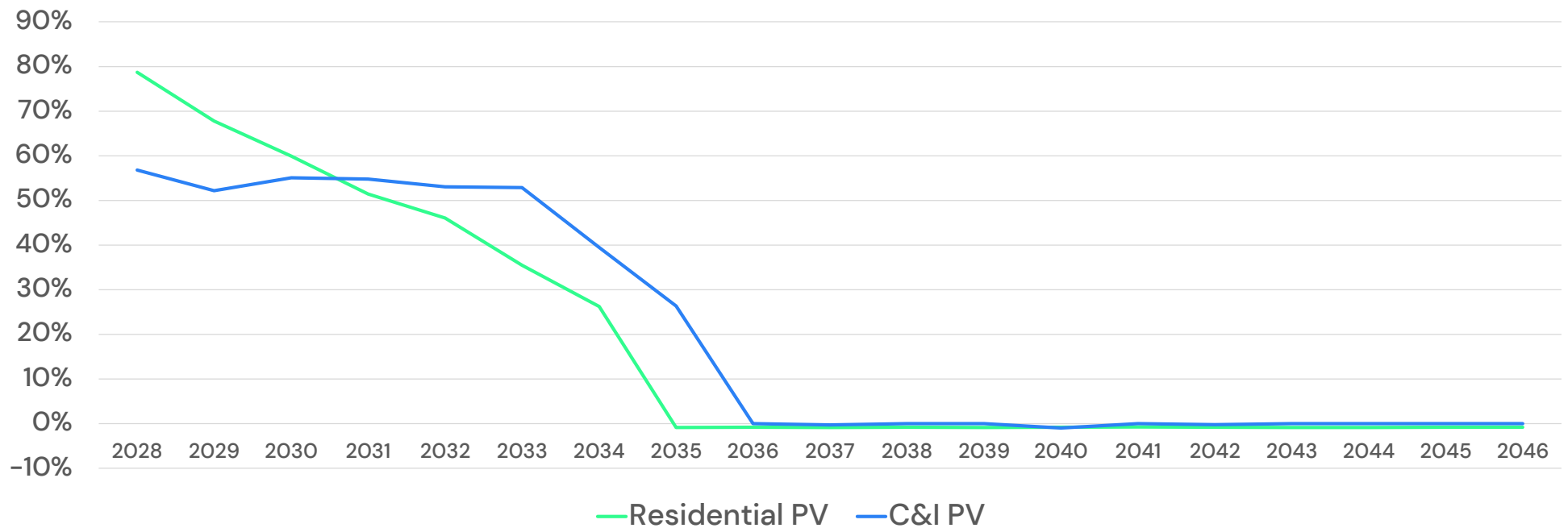
- This production includes both PV electricity consumed on-site and PV electricity exported back to the utility. Production data shown are at the central station generator, after grossing up for T&D losses.

Cumulative Capacity Forecast: Residential PV under two Federal Incentive Policies (Current Law & Alternative Federal Policy Scenarios)



- All prior results in this presentation have been for the “current law” scenario for the federal investment tax credit (ITC). This and the next slide display comparative results under an alternative federal ITC policy.
- Current Law Scenario = One Big Beautiful Bill Act ITC.
- Alternative (Alt.) Policy Scenario = Inflation Reduction Act ITC.

% Change in Forecasted Annual PV Capacity Growth between Alternative Federal Incentive Policy and Current Law: PV Reference Scenarios



- Modifying ITC assumptions makes a large percentage difference in **forecasted, annual new builds of PV**.
- While these annual impacts of policy assumptions can be large, they have tempered impacts on cumulative deployment by 2046 because (i) they only affect about one-third of the 20-year forecast period, and (ii) they do not affect deployment occurring prior to the 2027-2046 forecast period.



Q&A



Appendix

DER Cumulative Installed Capacity: Reference Scenario Forecast for 2027–2036 (data in MW_{AC}; for battery storage, “power” capacity is shown)

Year	Residential PV	C&I PV	Residential Battery (paired with PV)	C&I Battery (paired with PV)	Standalone C&I Battery
2027	95	10	< 1	< 1	< 1
2028	103	12	< 1	< 1	< 1
2029	112	13	1	< 1	< 1
2030	122	15	1	< 1	< 1
2031	133	17	2	< 1	< 1
2032	146	19	2	< 1	< 1
2033	159	21	3	1	< 1
2034	172	23	4	1	< 1
2035	187	25	6	1	< 1
2036	203	27	7	1	< 1



- Capacity forecast data for the years 2037–2046 are displayed earlier in this presentation.

DER Cumulative Installed Capacity: High Scenario Forecast for 2027–2036 (data in MW_{AC}; for battery storage, “power” capacity is shown)

Year	Residential PV	C&I PV	Residential Battery (paired with PV)	C&I Battery (paired with PV)	Standalone C&I Battery
2027	100	11	< 1	< 1	< 1
2028	115	13	1	< 1	< 1
2029	132	15	2	< 1	< 1
2030	151	18	4	< 1	< 1
2031	172	20	6	1	1
2032	194	23	9	1	1
2033	219	26	13	1	2
2034	245	29	18	2	3
2035	274	33	23	2	3
2036	303	37	29	3	3



- Capacity forecast data for the years 2037–2046 are displayed earlier in this presentation.

Residential Battery Storage: Modest Annual Net Production Impacts

- Battery storage, unlike PV, increases ELL loads on a net basis.
 - Due to the roundtrip efficiency losses on charging and discharging battery storage.
- Annual sum of residential battery charging in 2046 in high scenario: 39,112 MWh.
- Annual sum of residential battery discharging in 2046 in high scenario: 33,246 MWh.
 - Annual net load impact in residential high scenario: increase of 5,866 MWh at customer meter.
 - That annual net load impact is less than 0.1% of total residential load in 2046.
 - In any given hour, the net impact on ELL's loads can be positive or negative, depending on the aggregate battery charging and discharging behavior of ELL customers at that time.

C&I Standalone Battery Storage: Notes on Population and Use Cases

- Applicable C&I population for standalone battery storage adoption
 - Evaluated ELL tariffs for best economic opportunities for demand reduction by C&I customers.
 - Approximately 1,300 C&I customers are on tariffs with peak demand charges high enough and have other characteristics to potentially justify economic investment in battery storage.
- Economic use cases
 - Customer cost savings are obtained by charging the battery system during times of low customer demand and discharging the battery during times of high customer demand to reduce peak demand charges on a monthly basis.
 - Estimated economic benefits are calculated by summing demand charge savings, net of battery roundtrip efficiency losses, adding demand response program revenues, and deducting battery system capital costs (net of tax credits and depreciation benefits) and annual O&M costs as well as income taxes where applicable.



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