2019 POTENTIAL AND GOALS STUDY WORKSHOP

MARCH 21, 2019

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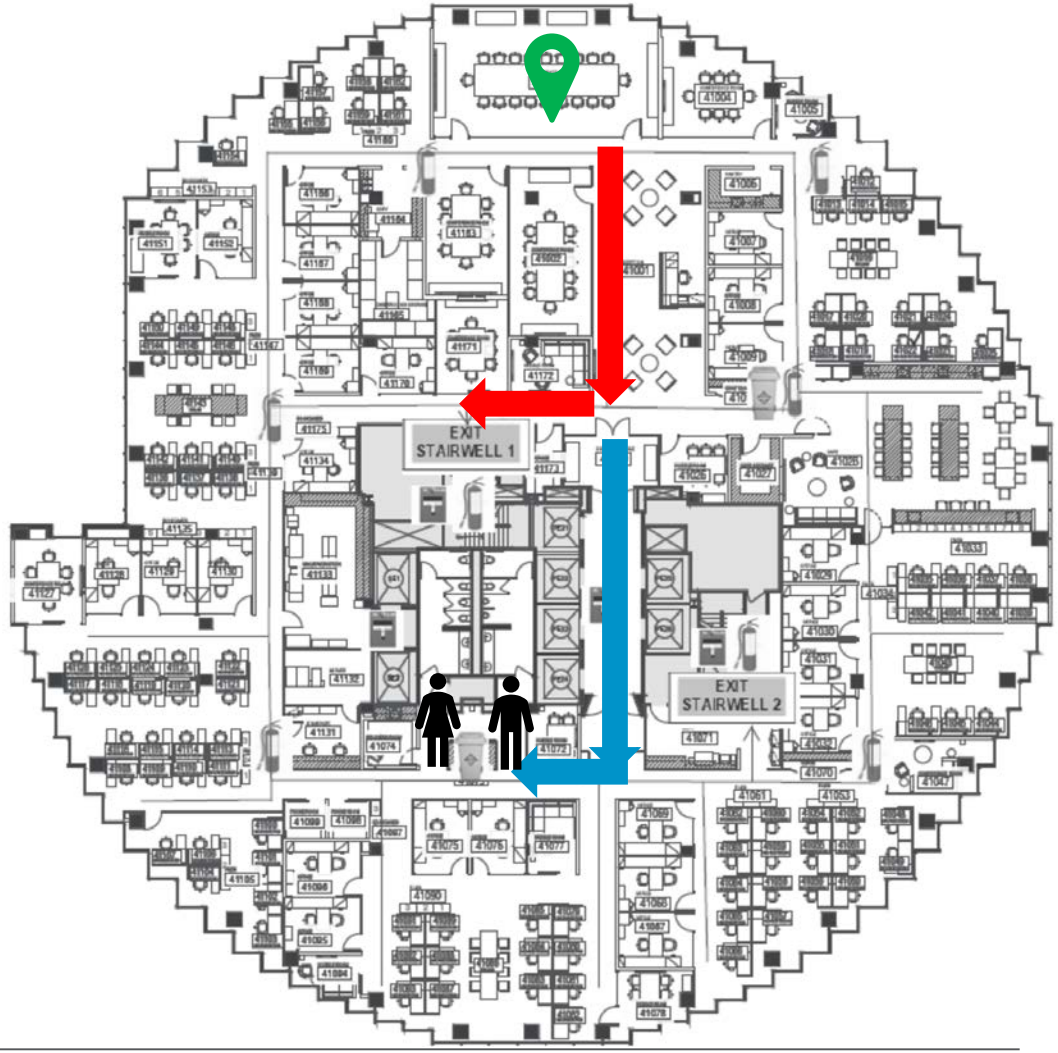
SAFETY/HOUSEKEEPING

- Emergency staircase is located past the lobby, turn right before the elevators and look to your left (Red Arrows on the map)

- Restrooms are located through the elevator banks, turn right and then right again (Blue Arrows on the map)



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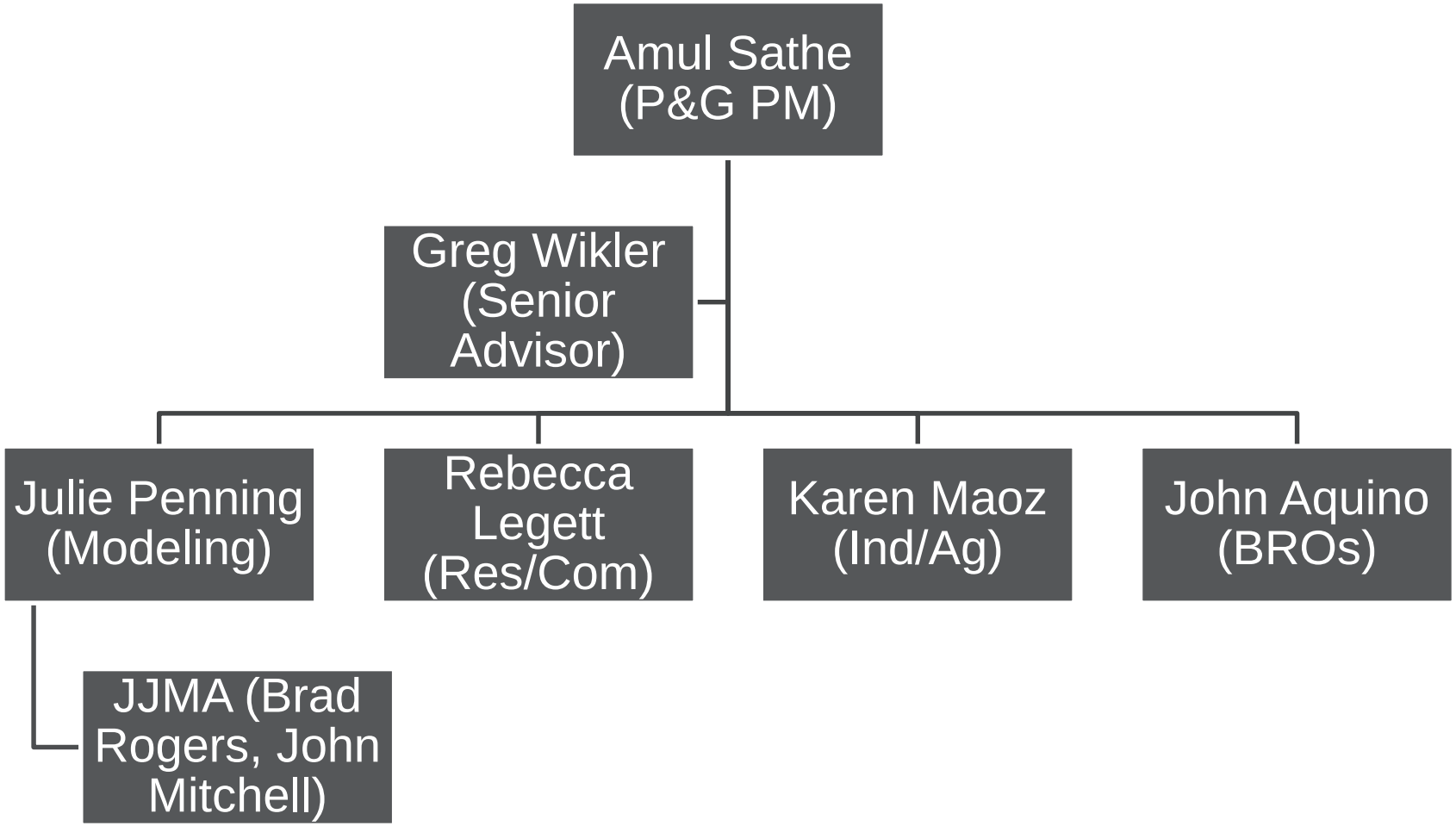
AGENDA

- 1:00 – 1:15 – Introductions and Overview
- 1:15 – 1:45 – Calibration Background
- 1:45 – 2:45 – High Impact Sectors/End-Uses Part 1

- 2:45 – 3:00 – Break

- 3:00 – 4:00 – High Impact Sectors/End-Uses Part 2
- 4:00 – 4:30 – BROs
- 4:30 – 5:00 – Open Discussion/Next Steps

2019 P&G STUDY - INTRODUCTIONS AND TEAM ROLES



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OVERVIEW OF WORKSHOP

- Present preliminary draft market potential results for:
  - Equipment rebate programs - high impact sectors and end uses
  - BROs
- Facilitate discussion and seek feedback regarding future trends that may not have been captured in the preliminary forecast.
- Navigant expects to use this critical input to make model adjustments following the meeting.

- **Feedback**
  - Due to the limited project timeline, feedback on **Res/Com/Ind calibration** will only be collected at this workshop and via e-mail until **COB 3/25/19**.
  - Feedback on **BROs** will be accepted until **COB 3/28/19**

- Please send your comments to Justin.Hagler@cpuc.ca.gov and Amul.Sathe@Navigant.com

PROJECT TIMELINE UPDATE

- Today:
  - Preliminary draft rebate programs (high impact sectors)
  - Stakeholder input to inform calibration
  - BROs draft results

- May 1, 2019
  - ALJ ruling releasing the draft report for formal (on the record) public comment
  - Public workshop to be scheduled shortly after May 1

- After May 1, 2019 (exact timeline TBD) “Volume 2 Technical Analysis”
  - Disaggregation to RENs, CCAs, DACs
  - Load shape library
  - Methodological considerations for future studies: fuel switching, EE/DR

CALIBRATION 101: WHY? HOW? TO WHAT?

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CALIBRATION 101: WHY?

- Calibration - a standard process of adjusting parameters such that model results are grounded in reality
- Calibration **is not drawing a future trend line of savings** based on past program accomplishments
- **Calibration develops parameters that describe the customer decision making process and the velocity of the market**
- Once we have these parameters, we use them as a starting point for the forecast period
- This applies to rebate programs only (BROs and C&S are modeled differently)

CALIBRATION 101: HOW?

Lever	Drivers and Impact on Model results
Awareness	• Increasing initial awareness shortens the time required for a measure to reach 100% consumer awareness and accelerates adoption. • Increasing marketing strength increases adoption rate of technologies in the nascent stage (i.e., having low initial consumer awareness).
Willingness	• Adjustments to incentive levels increase adoption, increase budget, and increase savings • Consumer implied discount rate can be adjusted to account for non-cost related market barriers that may be higher higher or lower than normal,
Stock Turnover	• The model assumes technologies turn over based on EUL. However, the real velocity of the market and turnover dynamics aren't this perfect/exact. Adjusting turnover rates allows the model to better reflect real world market dynamics.

CALIBRATION 101: TO WHAT?

*"In assessing the feasibility and cost-effectiveness of energy efficiency savings … the Public Utilities Commission shall consider the results of energy efficiency potential studies that are **not restricted by previous levels of utility energy efficiency savings**."*

– SB350

- The P&G Study operates under this directive from SB350 by doing two things:
  - Calibrating consumer decision and market parameters (not a trendline of savings)
  - Developing alternate future scenarios (for CPUC to consider in goal setting process)

CALIBRATION 101: TO WHAT?

- The calibration process needs historic market data to inform our calibration process as we set these market/customer parameters

- We use 2013-2016 program data (net savings, gross savings, program spending data)
  - Why start in 2013? This the year where we have holistic saturation data for the entire market of EE technologies, it's a reasonable market starting point
  - Why end in 2016? Our model was set up to extract data from EEStats (goes through 2016)
  - Can't we calibrate using 2017-2018 data? We would still need to use 2013-2016 data and append it with additional years

- Remember, calibration develops parameters that describe the customer decision making process and the current velocity of the market

WHAT CALIBRATION DOESN'T CAPTURE

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WHAT CALIBRATION DOESN'T CAPTURE

- **Future Customer Decision Process:** the past decision parameters may not be representative of the future paradigm:
  - Programs are shifting to third party – the way programs market and influence customer decisions may change
  - Customer have more access to their own data – will they be a more informed customer, or be overburdened in their own "analysis paralysis"?

- **Future Program Focus:** Our "Crystal Ball" is hazy when it comes to:
  - How programs will redesign to accommodate LED "standard practice baseline"
  - Recent EM&V studies/pilots provide new data that may influence the future of program offerings
  - Greater role for third party implementation
  - Beyond Home Energy Reports: the lesser known BROs

- **"The Unknown, Unknowns"**

THIS IS WHERE **YOU** COME IN!

- The purpose of todays meeting is to collect insight from stakeholders that can be used to inform the foreword forecast
- We need:
  - Impressions/reactions to the magnitude of the savings and breakdown across different end uses
  - Thoughts on trends in key end uses
  - Insights regarding specific sectors/end uses will be significantly impacted by program changes (positive or negative)
  - Defensible reasoning to support changes

HIGH IMPACT SECTORS/END USES

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FOCUS OF TODAY

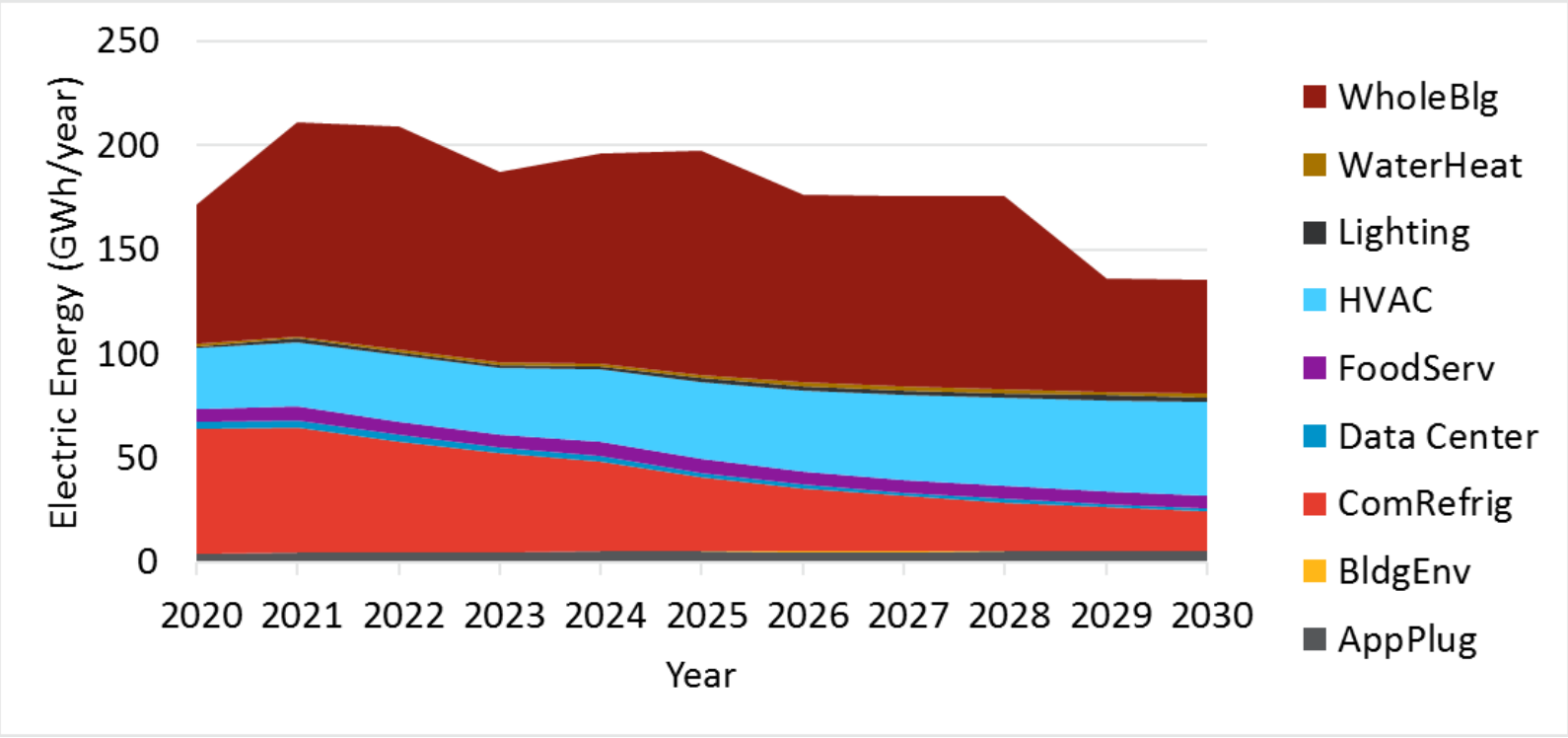
- Preliminary results you are going to see:
  - Are incremental net **market** potential
  - Are statewide (all IOUs combined)
  - Are modeled using calibrated parameters
  - Apply a 1.25 TRC threshold to include a measure in the forecast

- High Impact Markets
  - Commercial
  - Residential
  - Industrial
  - BROs (Across Res/Com/Ind/Ag)

- High impact markets accounted for 85% of the savings in the 2017 potential study

COMMERCIAL - ELECTRIC

- We want to focus our discussion today on lighting to confirm we are getting it right
- Whole Building, HVAC and Refrigeration remain as the largest savings
- Savings a % of sales: 0.22% in 2020, 0.15% in 2030



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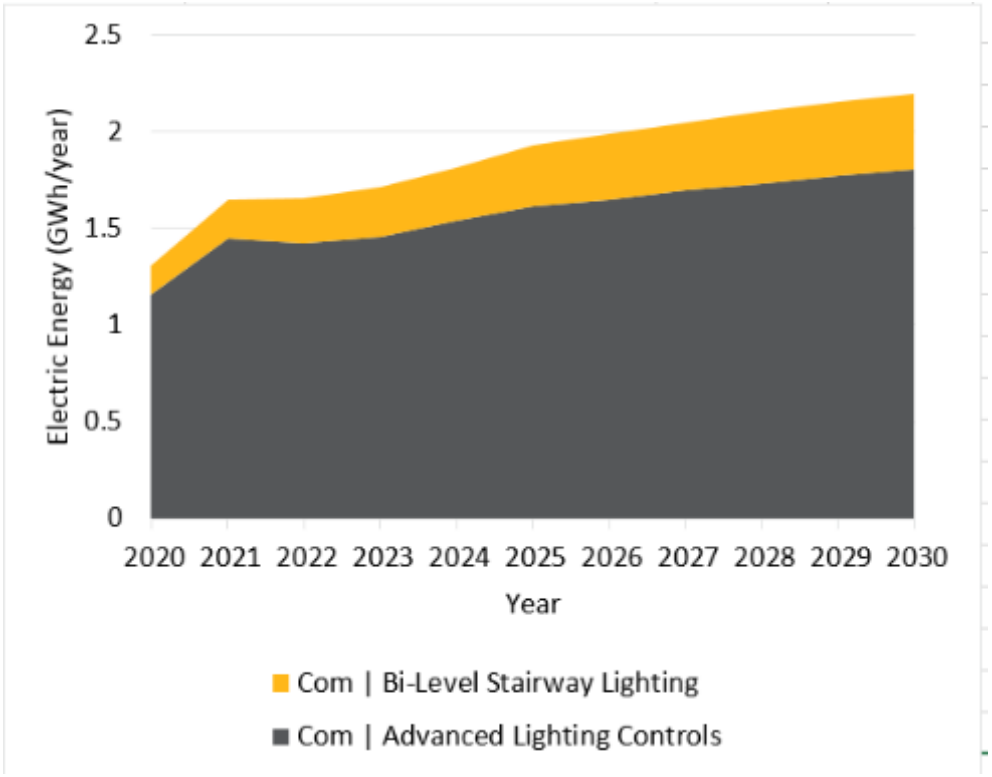
COMMERCIAL ELECTRIC - LIGHTING

- Commercial lighting savings come from lighting controls.
- There are no lamp or fixture savings because LEDs become standard practice in 2018/2019, per DEER Resolution E-4952.
- Commercial lamp and fixture measures are currently being characterized as Replace-on-Burnout with a code/standard practice baseline.
- Will IOU programs shift to accelerated replacement (retrofit) for commercial lighting?



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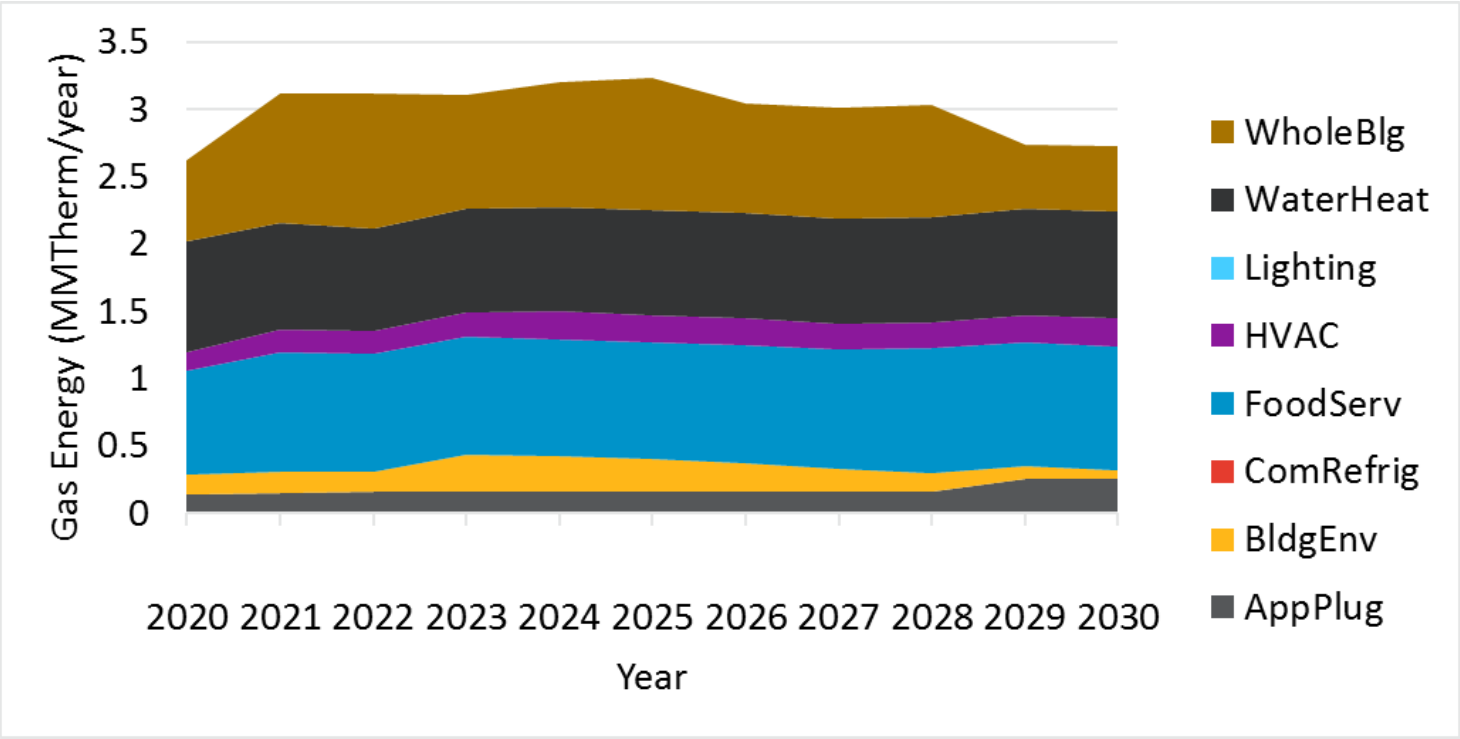
COMMERCIAL – GAS

- Cost effectiveness has decreased overall commercial gas savings
- HVAC is a much smaller share of savings (significant changes to DEER deemed savings values)
- Savings a % of sales: 0.12% in 2020, 0.12% in 2030



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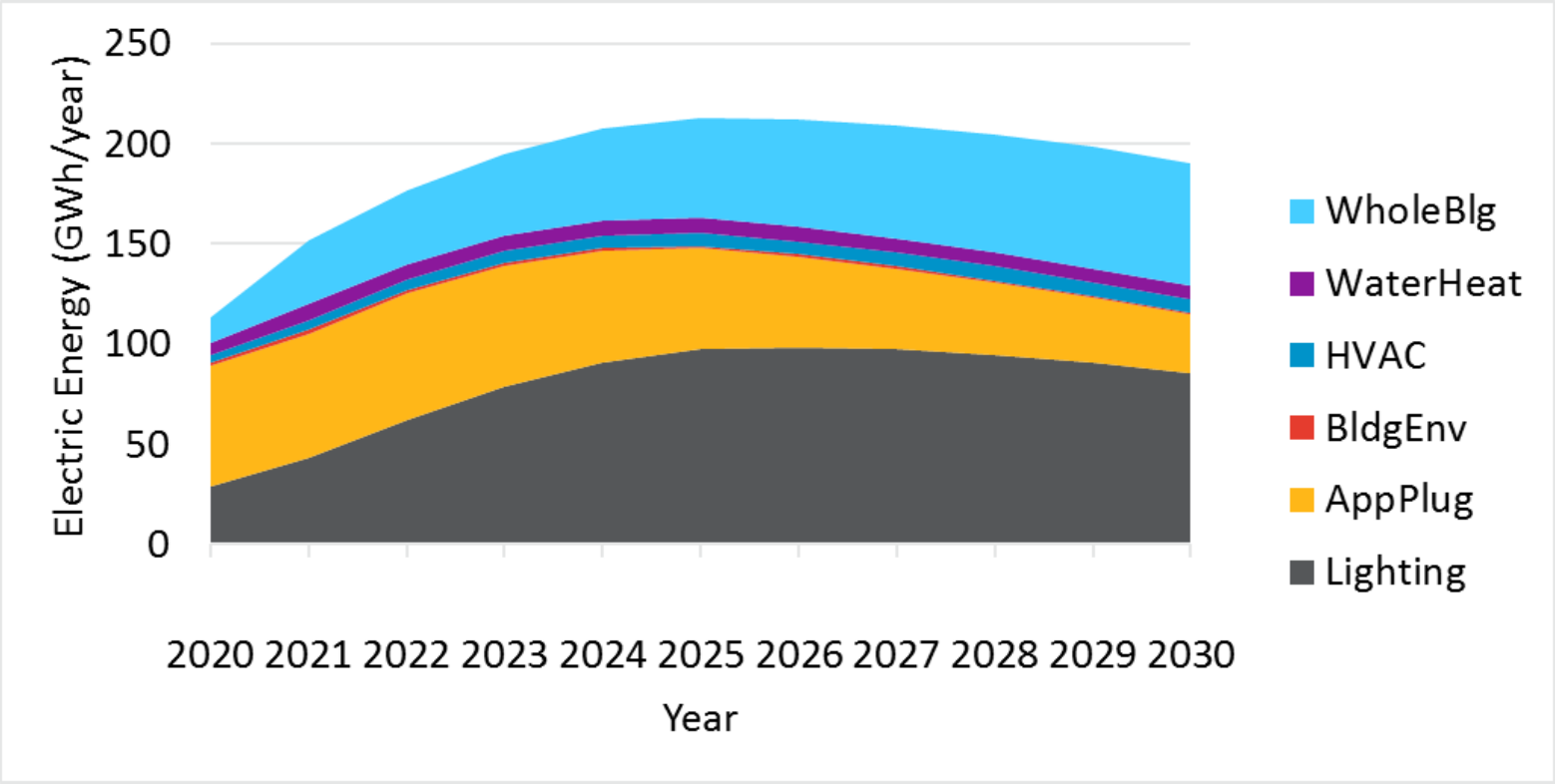
RESIDENTIAL - ELECTRIC

- Whole Building is ZNE NC homes, Energy Upgrade CA is not cost effective
- Lighting is a growing opportunity according to this preliminary forecast
- Savings a % of sales: 0.22% in 2020, 0.29% in 2030



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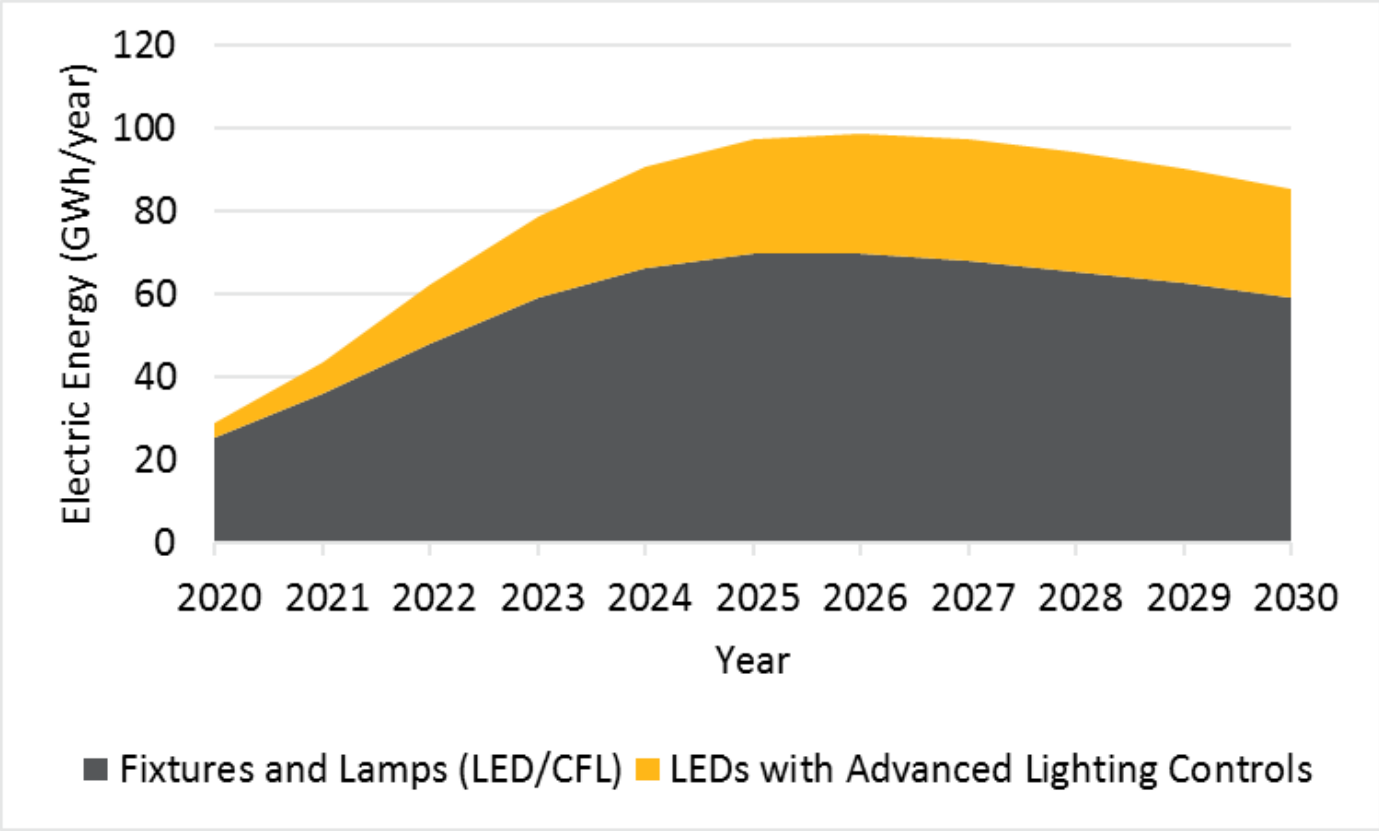
RESIDENTIAL ELECTRIC - LIGHTING

- New measure added to this study: LEDs with Advance Lighting Controls
- Is this still room for LEDs to grow in programs?



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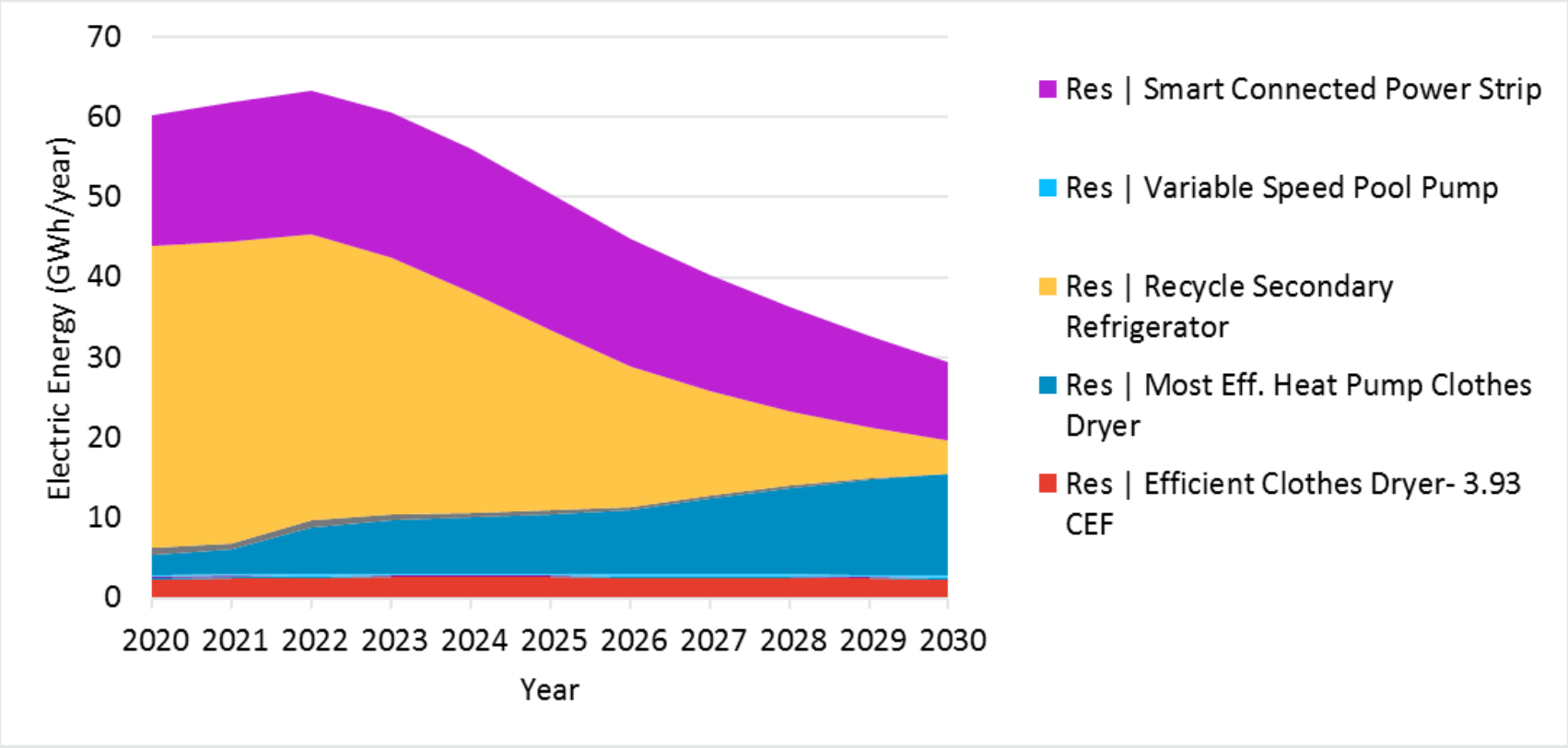
RESIDENTIAL ELECTRIC – APPLIANCES/PLUG LOAD

- New measure added to this study: Smart Connected Power Strips
- Refrigerator recycle potential decreases as opportunities diminish



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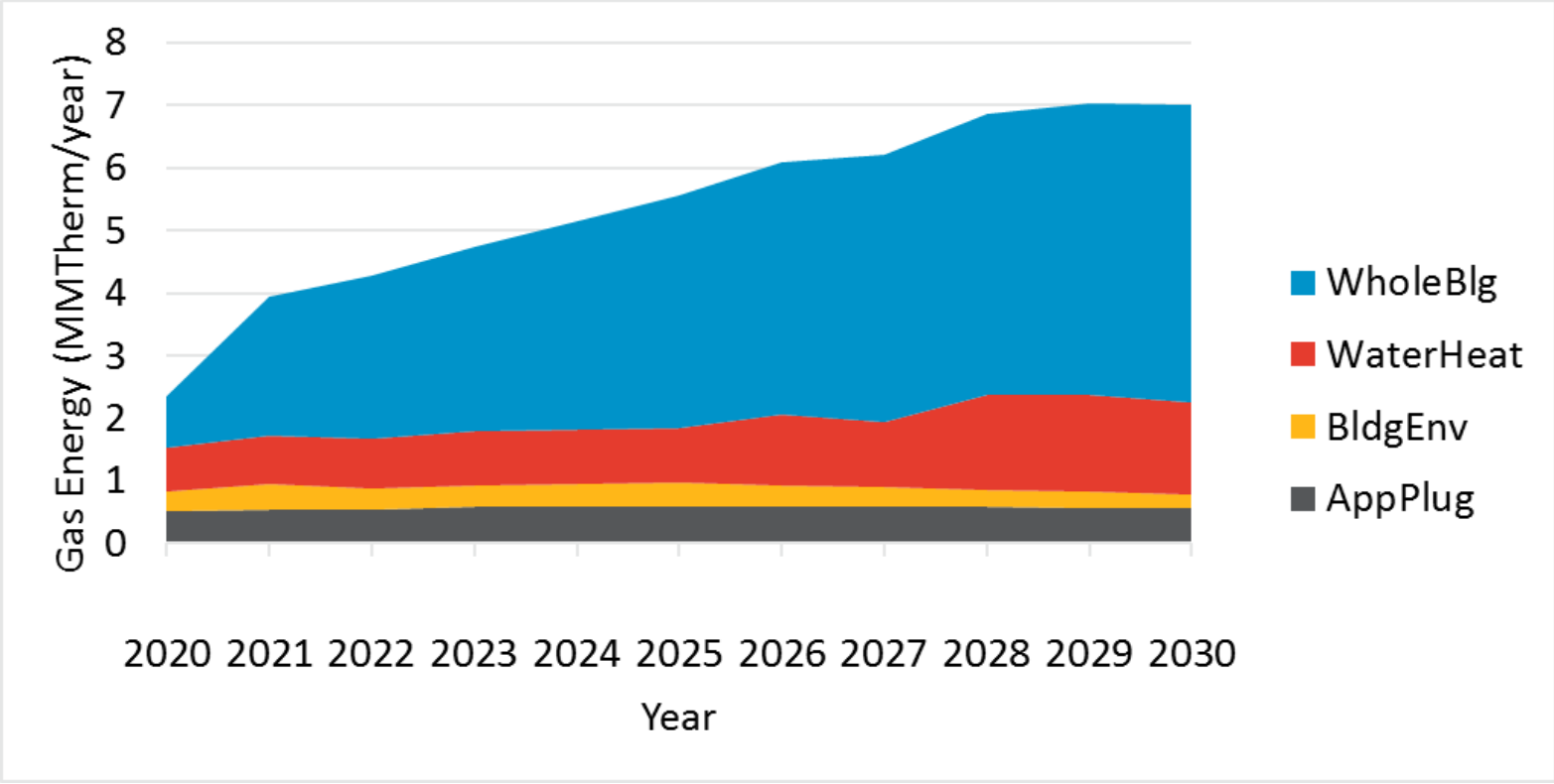
RESIDENTIAL - GAS

- No Gas HVAC is showing up as cost effective (TRC > 1.25)
- Whole Building is ZNE NC homes, Energy Upgrade CA is not cost effective
- Savings a % of sales: 0.05% in 2020, 0.14% in 2030



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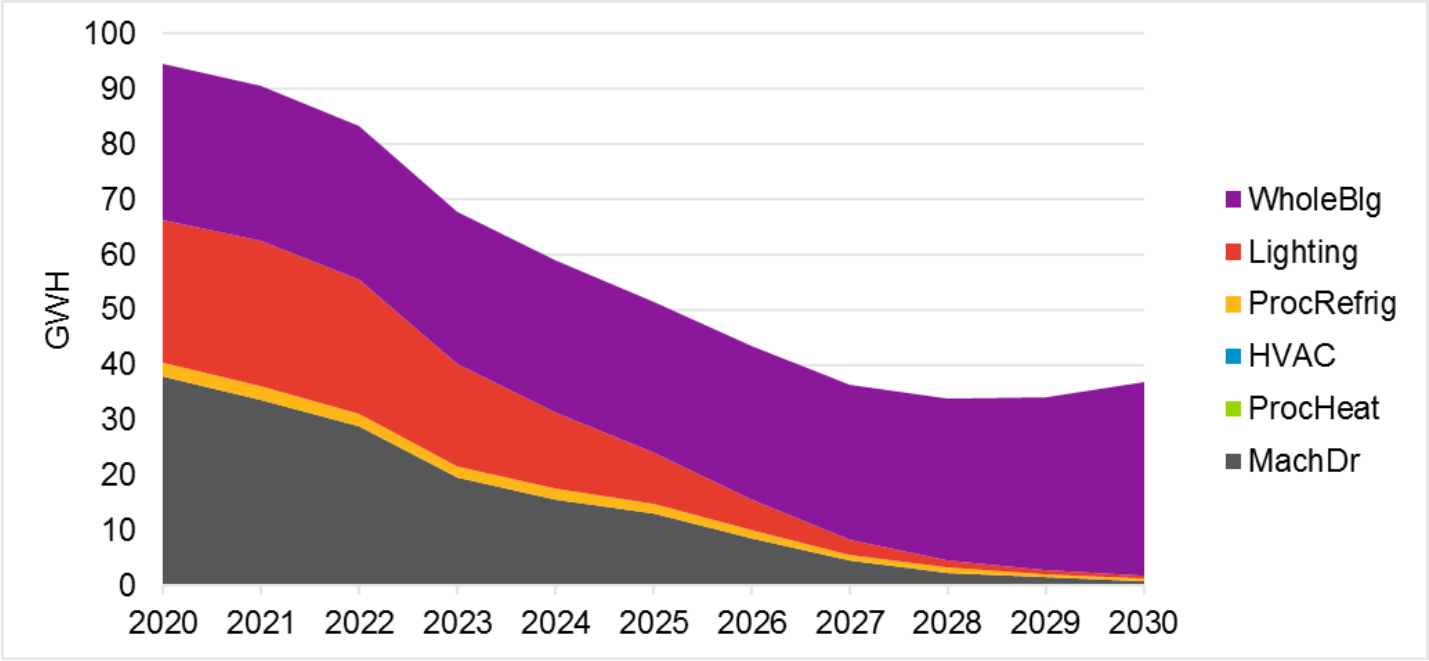
INDUSTRIAL – ELECTRIC

- Overall decreasing savings for Industrial, as consistent with the previous study
- Lighting decreases over time as opportunities saturate and LEDs move towards standard practice
- Savings a % of sales: 0.33% in 2020, 0.11% in 2030



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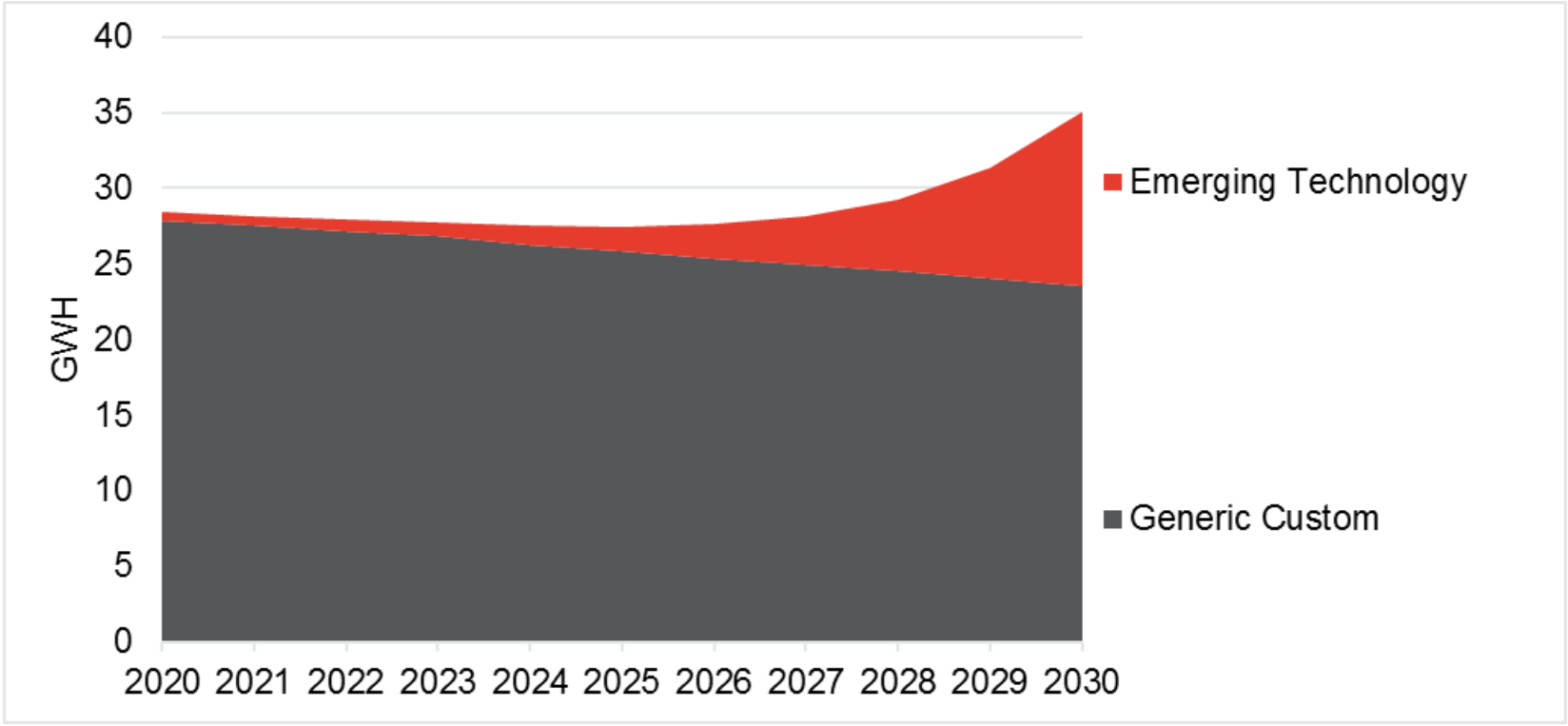
INDUSTRIAL – ELECTRIC WHOLE BUILDING

- Custom decreases over time as per recent trends in programs
- Emerging technologies will begin to back fill this decline



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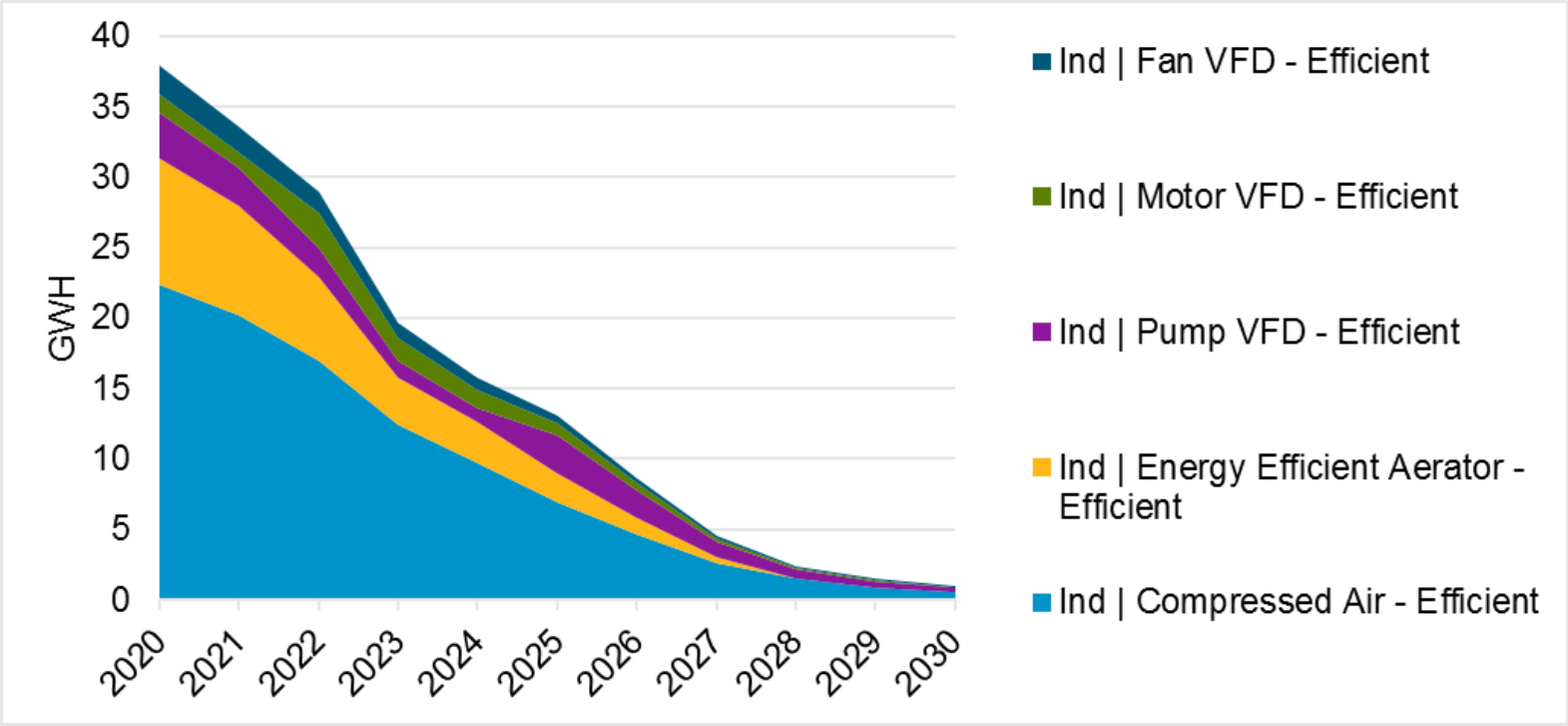
INDUSTRIAL – ELECTRIC MACHINE DRIVE

- Machine drives have less applicability/opportunity over time as the market saturations
- As motor standards/ISP become more stringent there are less opportunities for retrofit savings



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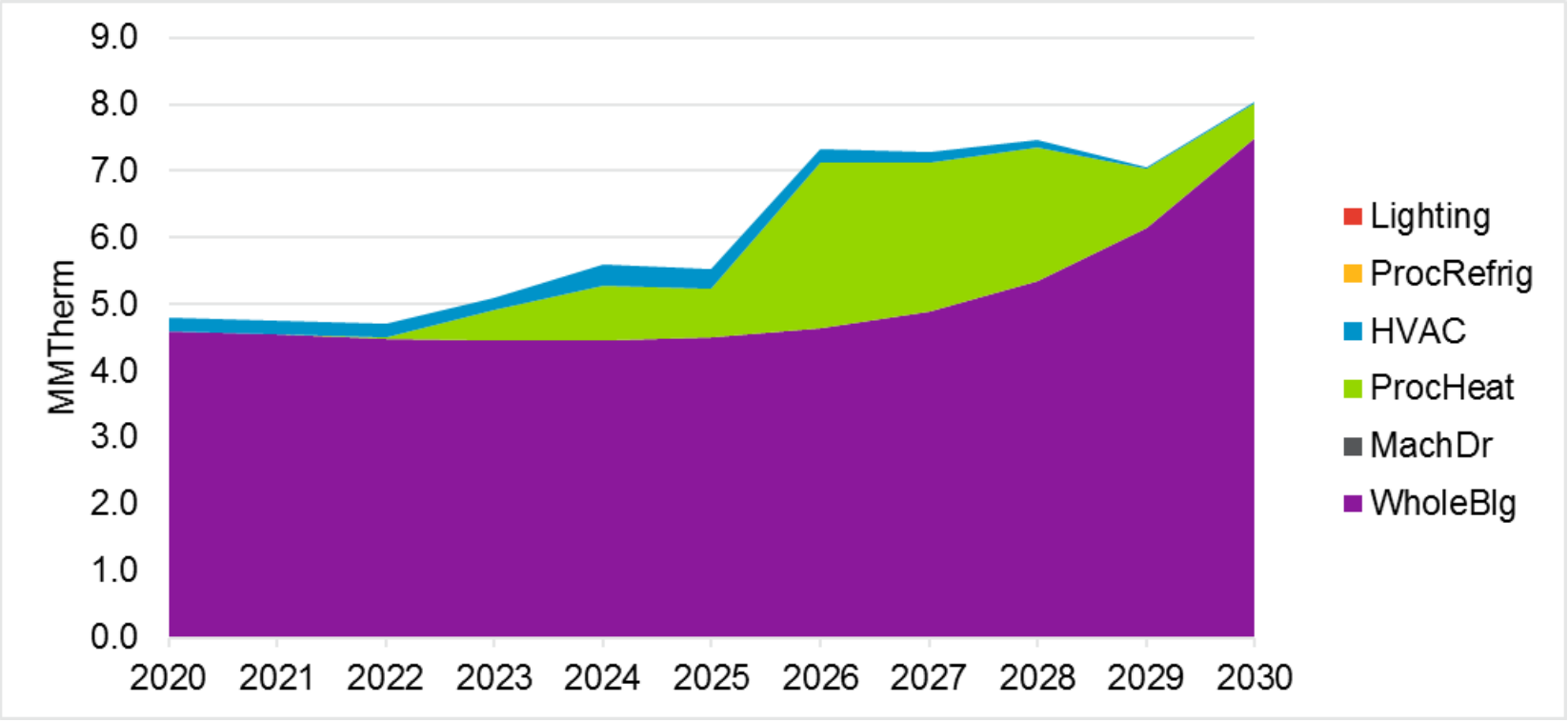
INDUSTRIAL – GAS

- Generic Custom (Whole Building) is the primary driver of gas savings
- There is limited cost effective savings (TRC>1.25) remaining
- Savings a % of sales: 0.32% in 2020, 0.25% in 2030



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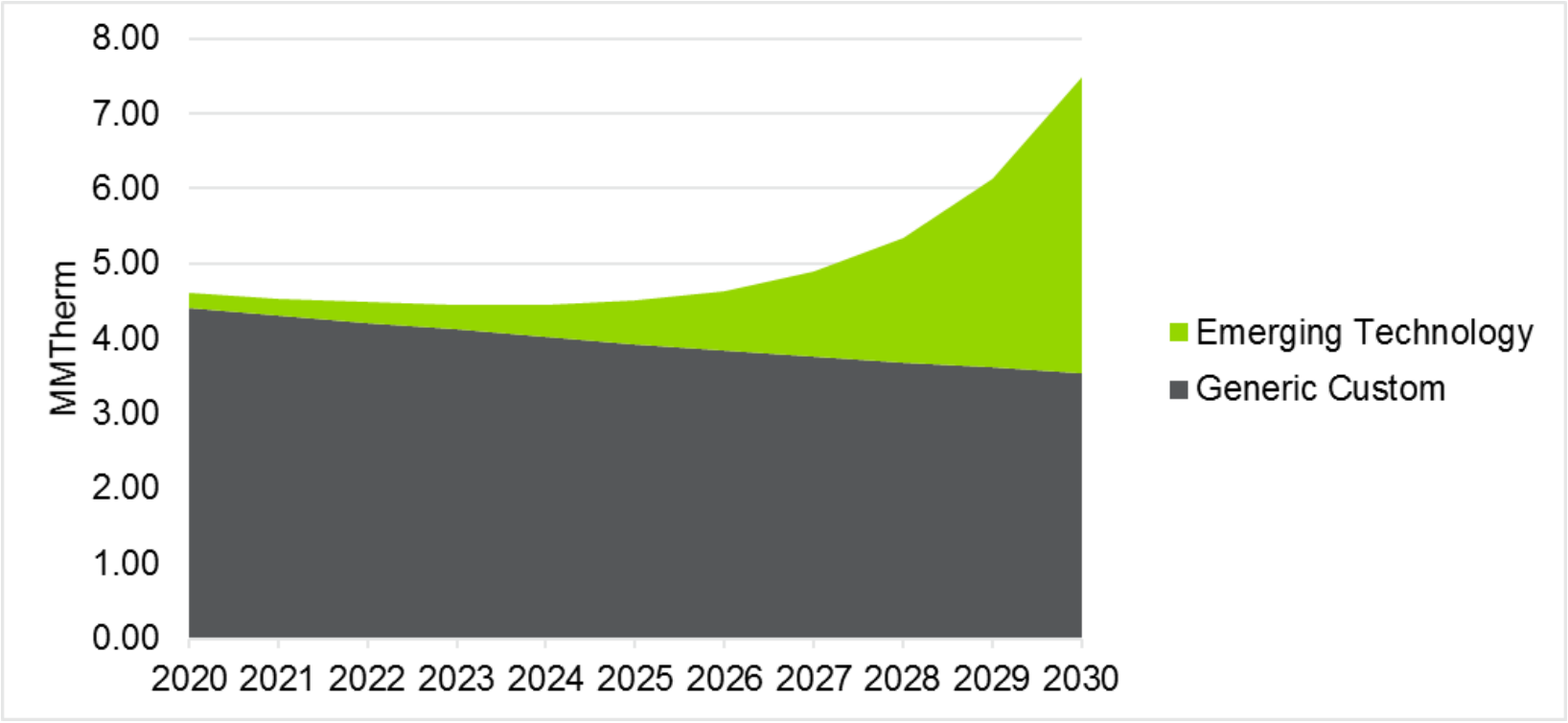
INDUSTRIAL – GAS WHOLE BUILDING

- Custom decreases over time as per recent trends in programs
- Emerging technologies will play a bigger role in later years



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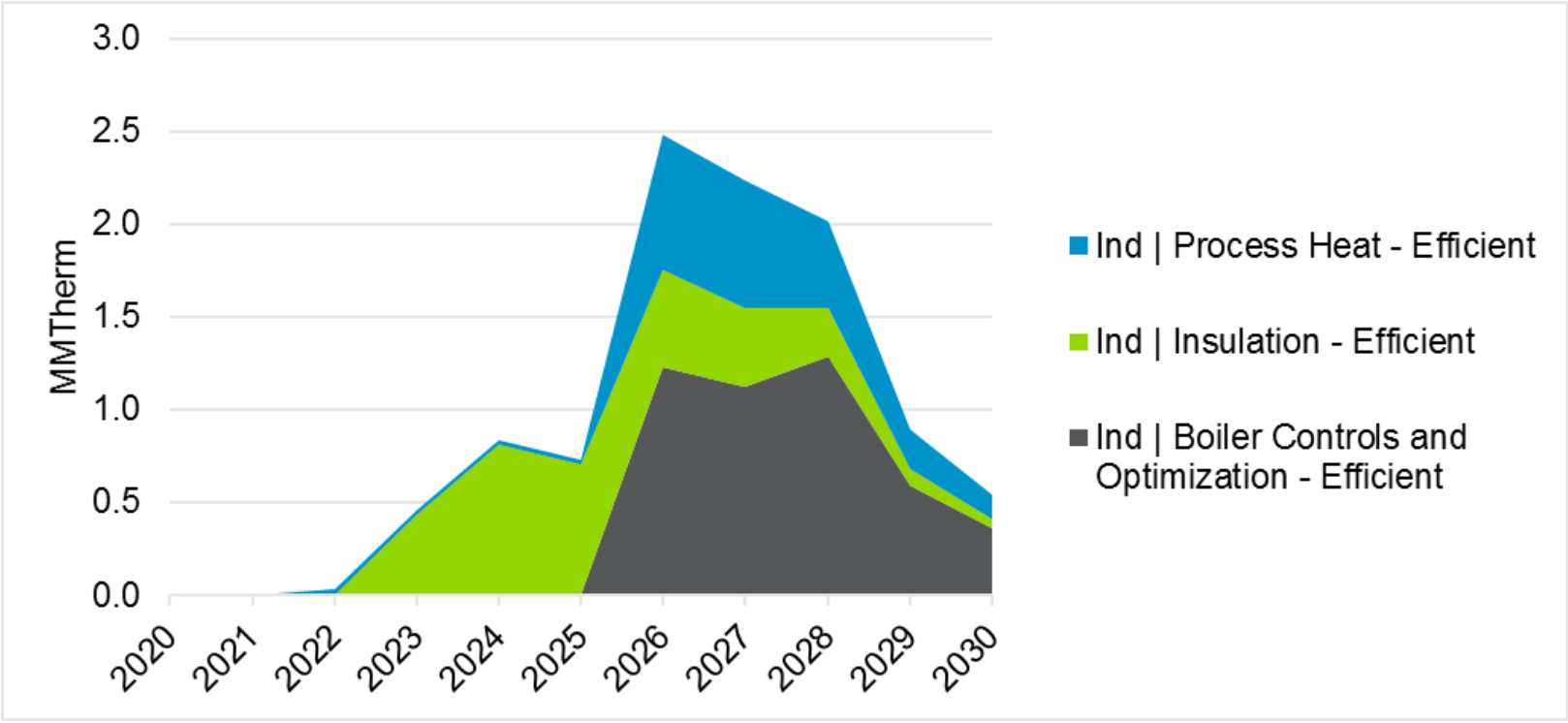
INDUSTRIAL – GAS PROCESS HEAT

- Process heat is not cost effective in the early years, becomes cost effective later as avoided costs increase



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BROS DRAFT RESULTS

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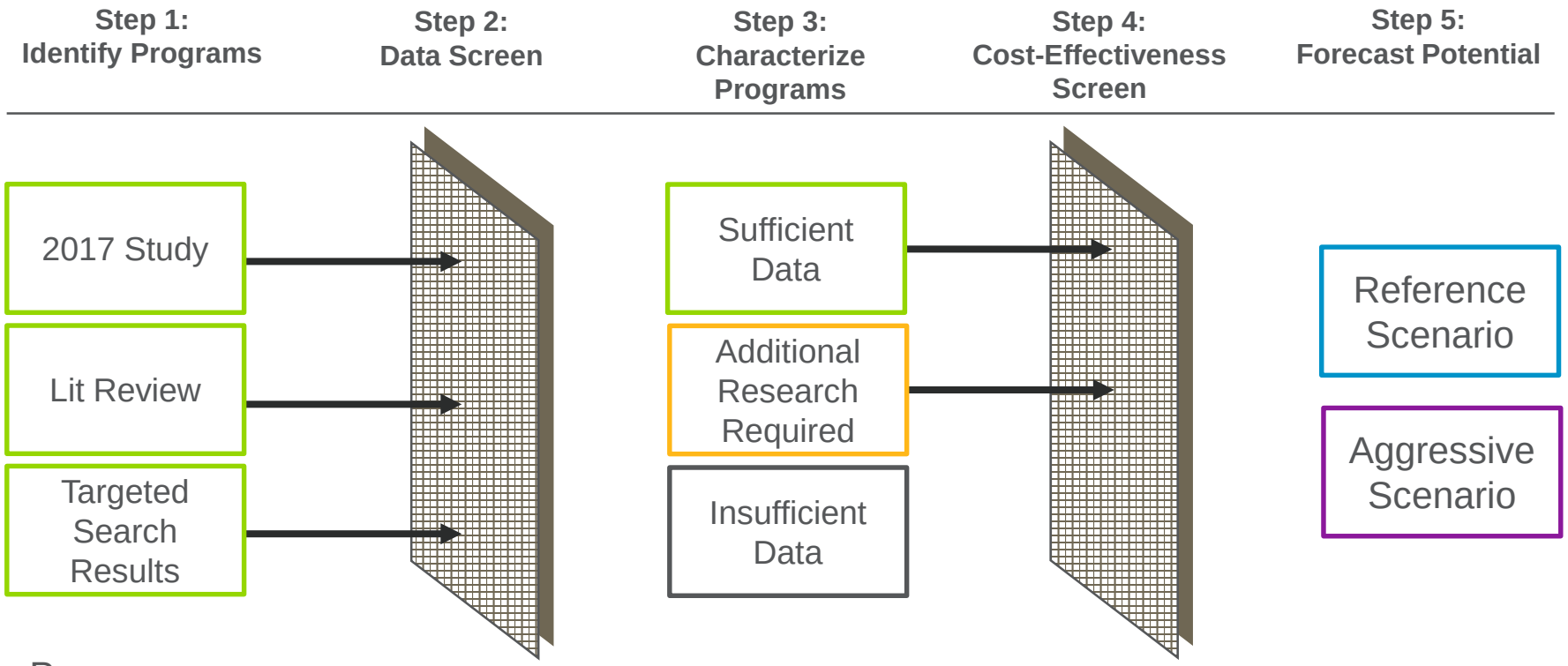
BROS

BEHAVIOR, RETROCOMMISSIONING, AND OPERATIONAL ENERGY EFFICIENCY

General Work Plan:



Progress:

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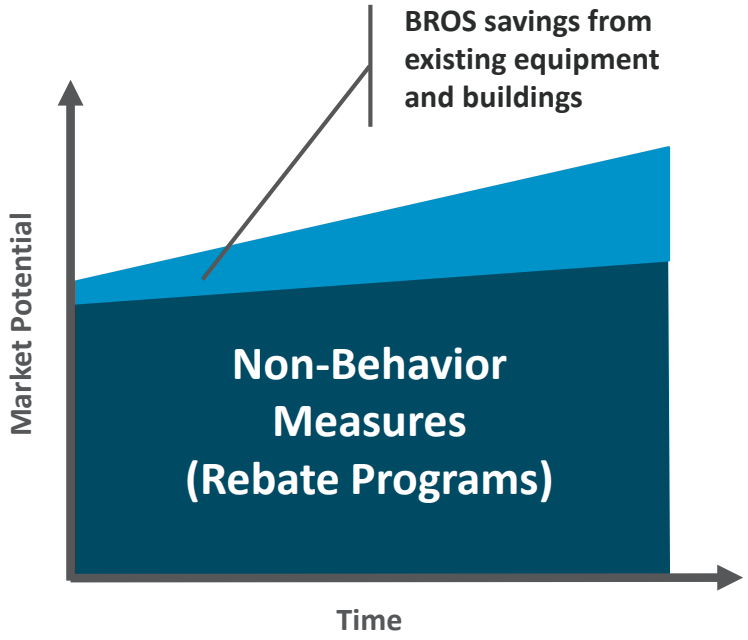
DEFINING BROS IN RESIDENTIAL AND COMMERCIAL MARKETS

Modelling Framework

- Savings can apply to both existing equipment and retrofits/new construction
- Savings will be incremental to savings from equipment change-outs

Behavioral Approaches

- Reducing or avoiding the use of technologies
- Technology operating practices
- Changes in technology settings



Source: Illustrative, Navigant

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PROGRAM DATA AVAILABILITY

Sector	Program	Savings			Cost	Applicability	Participation Rate	Penetration Forecast	Data Updates
		kWh	therms	kW					
Residential	Audits [1]	●	●	●	◌	●	●	●	✓
	Prepay Programs [1]	○	NA	◌	○	○	◌	○	✓
	Home Energy Reports	●	●	●	●	●	●	●	✓
	In Home Display RT Feedback	○	○	◌	○	●	◌	◌	
	Web-Based Real-Time Feedback	○	○	◌	●	●	●	●	
	Small Residential Competitions	○	○	◌	○	●	○	◌	
	Large Residential Competitions	●	●	◌	○	●	●	◌	
Commercial	Building Operator Certification	●	●	◌	◌	●	◌	◌	✓
	Business Energy Reports	●	●	◌	◌	●	◌	◌	
	BEIMS	●	●	●	●	●	●	◌	✓
	Commercial Competitions	●	●	◌	○	◌	●	◌	
	Strategic Energy Management	○	◌	◌	◌	●	◌	◌	✓
	Building Benchmarking	○	○	◌	●	●	◌	◌	✓
	Retrocommissioning	●	●	●	●	●	●	◌	✓

Legend	
●	California program data and its derivatives
○	Aggregated reports and non-verified savings reported by utilities outside of California
◌	Assumed equivalence to similar programs or other forms of professional judgment
✓	Indicates that inputs for this program have new data available since the 2018 Potential and Goals Study
NA	The majority of prepay programs reviewed were electric programs. While some gas programs exist, savings were excluded due to data insufficiency.

[1] Program is newly added in the 2020 Potential & Goals Study.

INPUTS DEVELOPED - RESIDENTIAL

Type	EUL years	Savings		Cost		2022 Penetration
		kWh	Therm	kWh	Therm	
Home Energy Reports (HERs)	1	1.3 - 5.9%	0.7 - 4.4%	$0.14 - $0.26	$3.06 - $8.03	20 - 38%
Real-Time Feedback – In Home Display	1	2.3%	--	$0.19	--	0.05 - 0.19%
Real-Time Feedback – Online Portal	1	2.2%	1.3%	$0.07	--	2 - 7%
Small Competitions (<10,000 ppl)	1	8.1%	5.2%	$0.050	$1.344	0.01 - 0.05%
Large Competitions (>10,000 ppl)	1	14.0%	5.2%	$0.002	$0.101	0.02%
Online Audits	1	1.2 - 1.8%	1.5 - 2.6%	$0.09 - $0.47	$0.06 - $7.79	1.0 - 1.6%
Prepay Programs	1	5.5%	--	$0.01	--	2.7%

Program not updated from 2018 Study

Program updated for 2020 Study

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INPUTS DEVELOPED - COMMERCIAL

Type	EUL years	Savings		Cost		2022 Penetration
		kWh	Therm	kWh	Therm	
Strategic Energy Management	5	3.0%	3.0%	$0.27	$3.65	1%
Building Operator Certification	3	14 - 153 [a]	0.3 - 35.7 [a]	$0.29	$3.65	3%
Building Energy and Information Management Systems	3	1.1% - 4.2%	0.2% - 9.3%	$0.20 - $0.44	$0.18 - $0.49	2%
Business Energy Reports (BERs)	2	0.3%	--	$0.20	$6.12	4%
Building Benchmarking	2	1.1% - 2.2%	0.7% - 1.3%	$0.05	$0.24	8%
Competitions	2	1.9%	--	$ 0.04	--	2 - 42%
RCx	3	2.3% - 5.2%	2.3% - 5.2%	$0.21	$0.38	2%

[a] Savings for Building Operator Certification are in units of per thousand square feet instead of percent savings..

Program not updated from 2018 Study

Program updated for 2020 Study

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FORECAST SCENARIOS

Reference

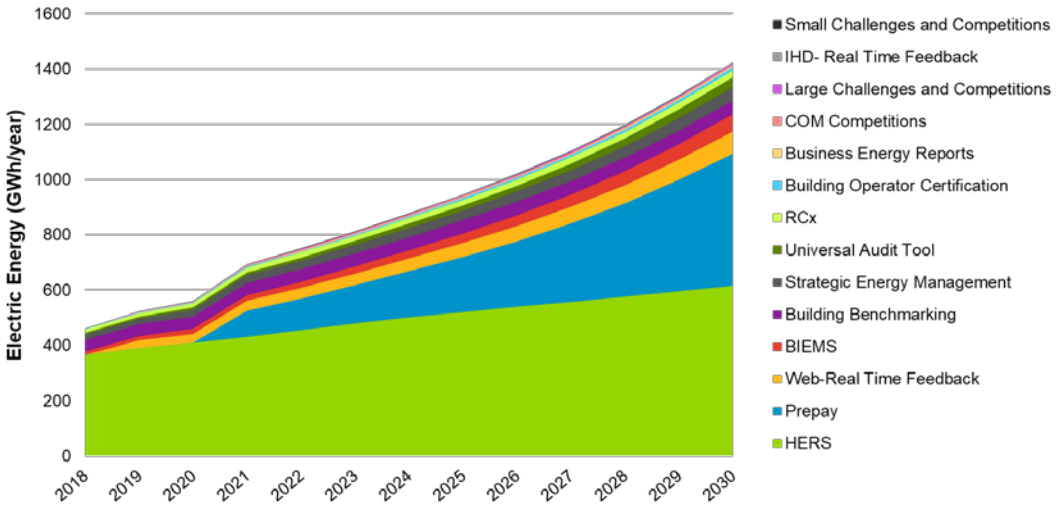
Aggressive

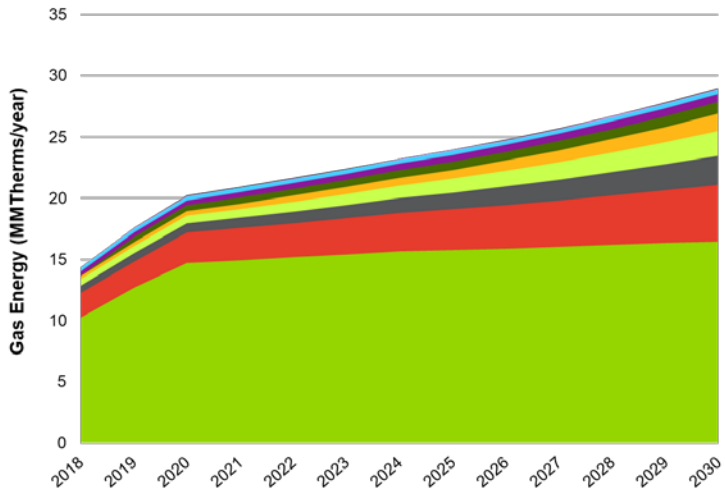
- Reference: Continued offering of existing BROs interventions and planned new interventions based on policy directions

- Aggressive: Intervention penetration grows faster or starts earlier due to ramped up program delivery approaches relative to the reference case

BROS RESULTS - REFERENCE*

- **Residential**: Home Energy Reports (HERs) presents the greatest potential due to the high penetration rates forecasted for this proven program. Due to high forecast penetration, Prepay programs show significant savings.
- **Commercial**: BIEMS shows the most opportunity for savings, followed by Building Benchmarking which had relatively good penetration and high percent savings.
- **Industrial/Agricultural**: Strategic Energy Management holds a significant amount of potential for gas savings.





* No cost-effectiveness screen is applied to savings in the above figures.

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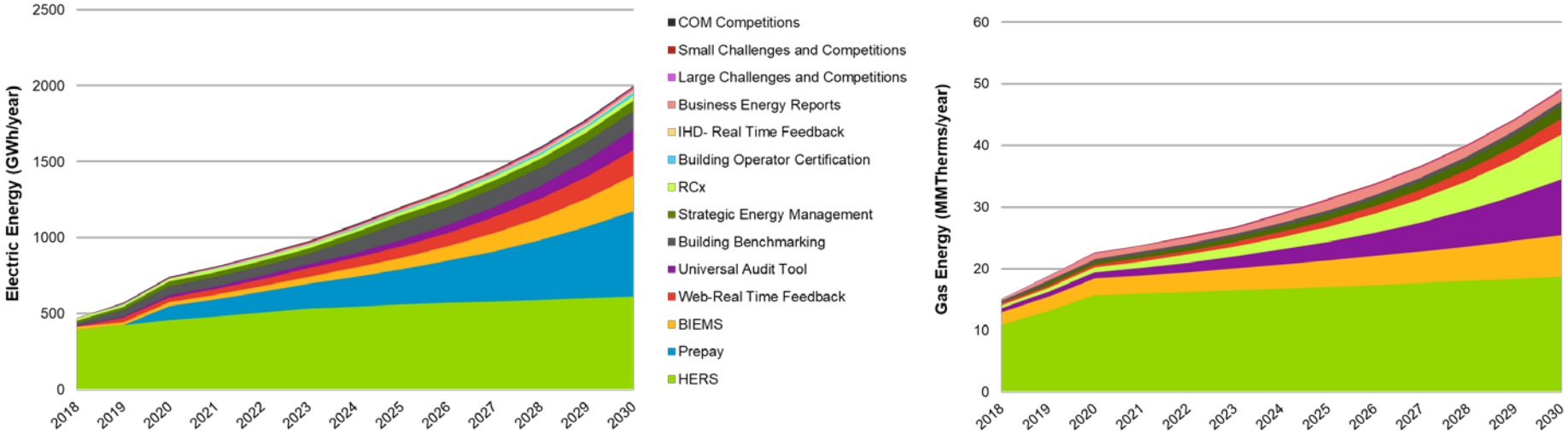
BROS RESULTS - AGGRESSIVE*

- **Residential**: In Home Displays (IHDs) show the lowest potential for savings in the residential sector
- **Commercial**: Without much room to grow from its high penetration in the reference case, commercial competitions show the least savings in the aggressive scenario.
- **Industrial/Agricultural**: Strategic Energy Management (SEM) shows a good potential from growth in the aggressive scenario.



* No cost-effectiveness screen is applied to savings in the above figures.

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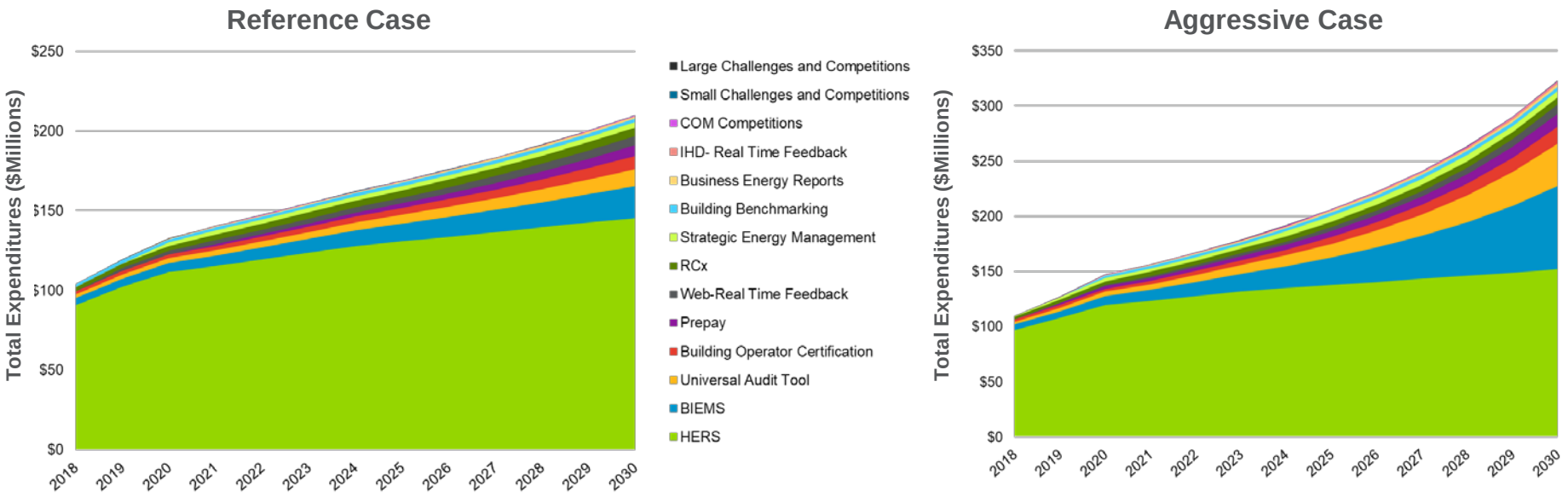
BROS RESULTS - COST

- **Residential**: Due to its long-standing history and large percentage of the BROs portfolio, HERs represents the majority of the portfolio expenditure.
- **Commercial**: BIEMS shows the most expenditure in both scenarios in the commercial sector.
- **Industrial/Agricultural**: Although a fair portion of the overall savings, SEM proves to be a relatively small piece of the overall portfolio expenditure.



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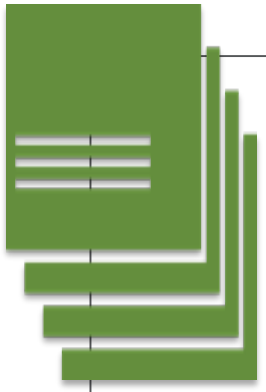
COST-EFFECTIVENESS - RESIDENTIAL

Type	PG&E	SCE	SCG	SDG&E
Home Energy Reports (HERs)	0.77	2.98	0.36	0.34
Real-Time Feedback – In Home Display	0.82	1.34	N/A	0.43
Real-Time Feedback – Online Portal	2.62	3.71	N/A	1.31
Small Competitions (<10,000 ppl)	3.91	5.19	0.82	1.92
Large Competitions (>10,000 ppl)	82.99	119.08	10.88	41.81
Online Audits	1.72	5.60	0.87	0.49
Prepay Programs	17.04	29.66	N/A	8.61

COST-EFFECTIVENESS - COMMERCIAL

Type	PG&E	SCE	SCG	SDG&E
Strategic Energy Management	4.50	7.54	3.21	1.40
Building Operator Certification	1.35	2.67	0.86	0.55
Building Energy and Information Management Systems	1.15	2.59	11.79	0.49
Business Energy Reports (BERs)	2.03	2.64	N/A	0.69
Building Benchmarking	9.44	11.46	8.70	3.21
Competitions	9.82	12.78	N/A	3.34
RCx	3.12	3.74	8.12	1.07

RESOURCES RELEASED



Appendix

- Detailed methodology

Input Data

- Savings, cost, EUL, and penetration rates

STAKEHOLDER ASKS

- Do you have specific comments on:

  - Our input assumptions and results? If so, please provide any data you have to improve our analysis.

  - The handling of low income customers enrolled in Prepay programs? If so, do you have any recommendations and/or reasoning for those recommendations?

  - Our cost-effectiveness results and the implications they might have for program implementation? If so, how do you recommend handling implementation? Please provide detailed data where pertinent.

OPEN DISCUSSION/ NEXT STEPS

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NEXT STEPS

- Slides will be posted on CPUC PDA
- BROs materials (data and appendix) will be made available via PDA as well

- Please send your comments to Justin.Hagler@cpuc.ca.gov and Amul.Sathe@Navigant.com

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