



# BEHAVIOR, RETROCOMMISSIONING, AND OPERATIONAL SAVINGS

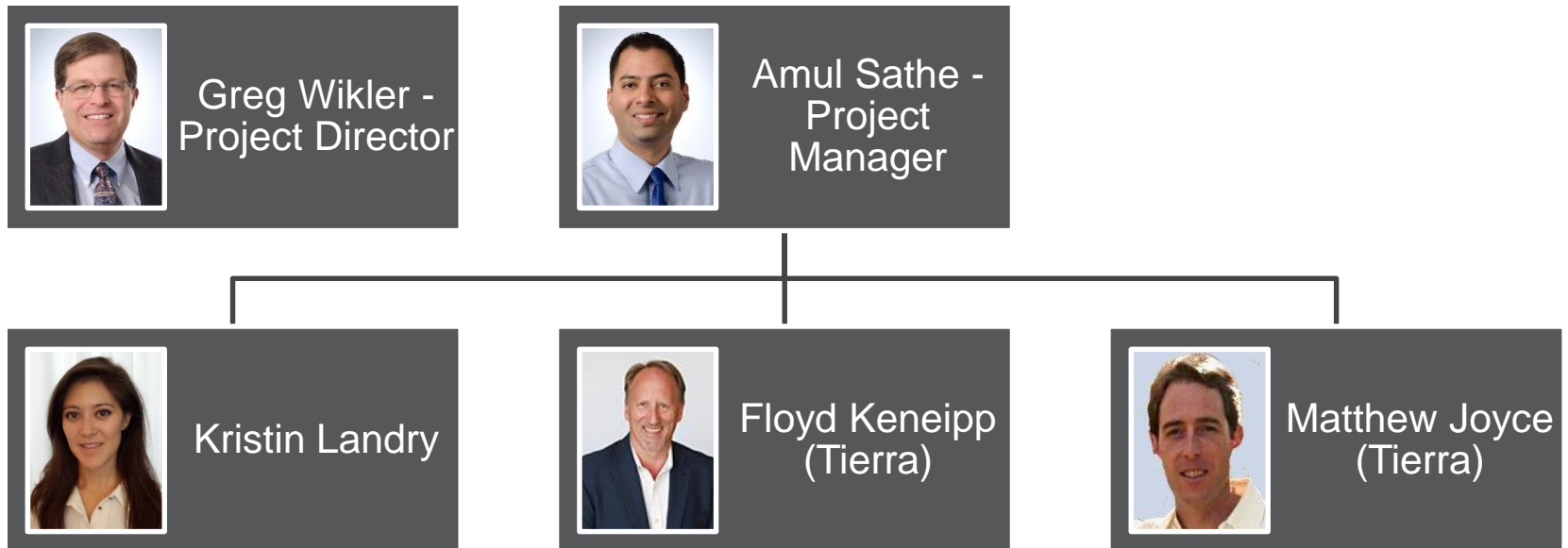
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RESIDENTIAL AND COMMERCIAL

APRIL 20, 2017

NAVIGANT

# NAVIGANT TEAM MEMBER ROLES



# OVERVIEW OF PROJECT STATUS

- Today
  - Residential and Commercial BROs draft results
  - Informal comment period to follow
- April 28
  - Residential Low Income Draft Results
  - Informal comment period to follow
- Mid-June:
  - Draft public report and all results (including rebate programs and C&S) available for public review
  - Formal comment period to follow
- TBD
  - Final report

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## **1. Overview of Methodology**

## 2. Results

## 3. Questions for Stakeholders

# DEFINING BROS IN RESIDENTIAL AND COMMERCIAL MARKETS

## Modelling Framework

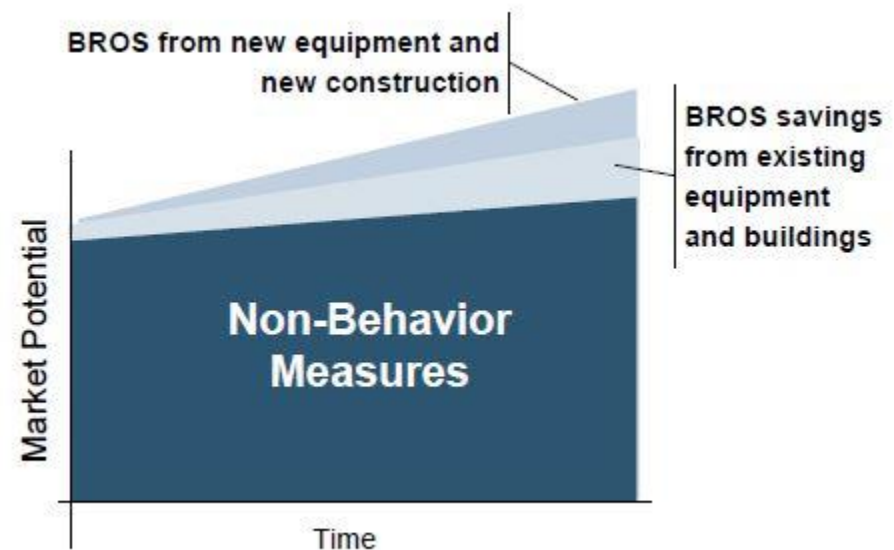
- Savings can apply to both existing equipment and retrofits/new construction
- Savings will be incremental to savings from equipment change-outs

## Behavioral Approaches

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

## Potential Actors

- Building occupants
- Building operators
- Building managers
- Company leadership
- Others



Source: Illustrative, Navigant

# MULTI-STEP PROCESS TO SELECT PROGRAMS

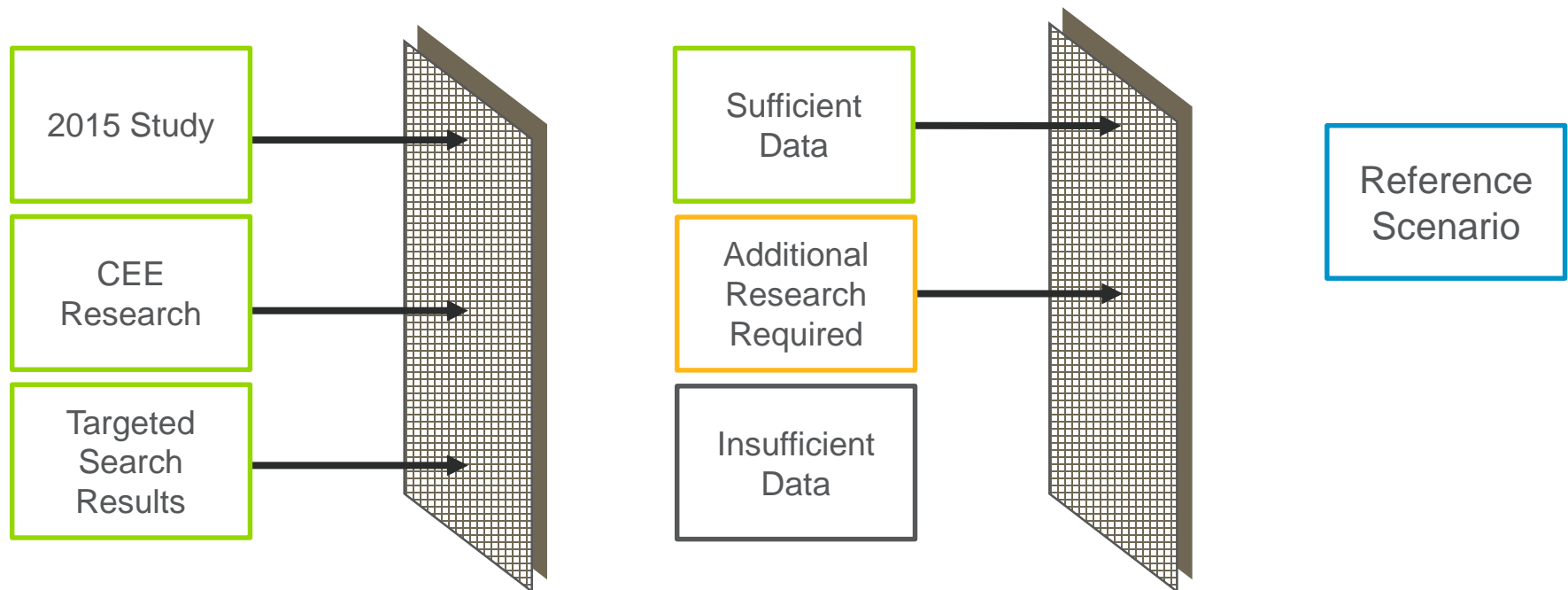
**Step 1:  
Identify Programs**

**Step 2:  
Data Screen**

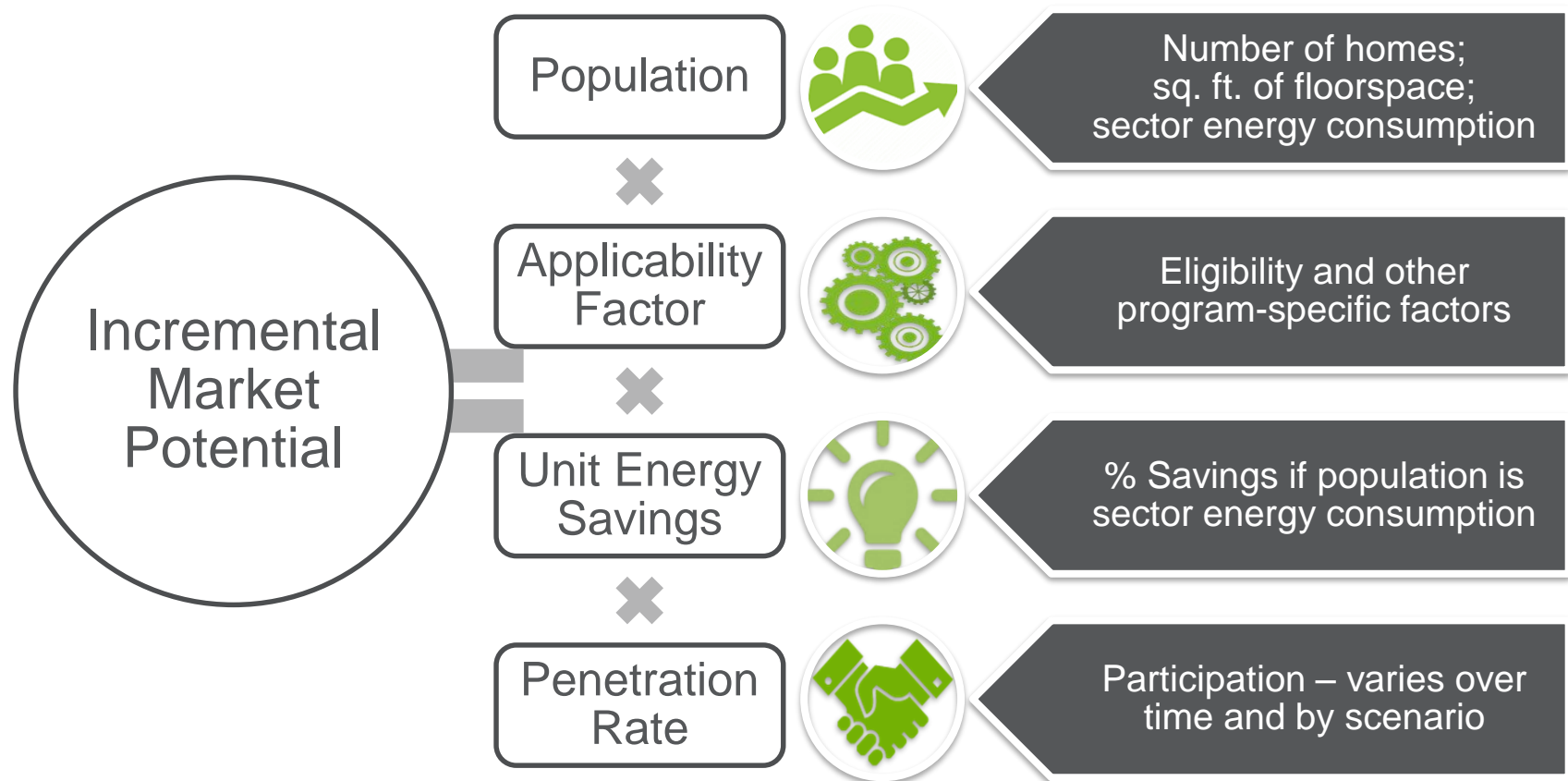
**Step 3:  
Characterize  
Programs**

**Step 4:  
Cost-Effectiveness  
Screen**

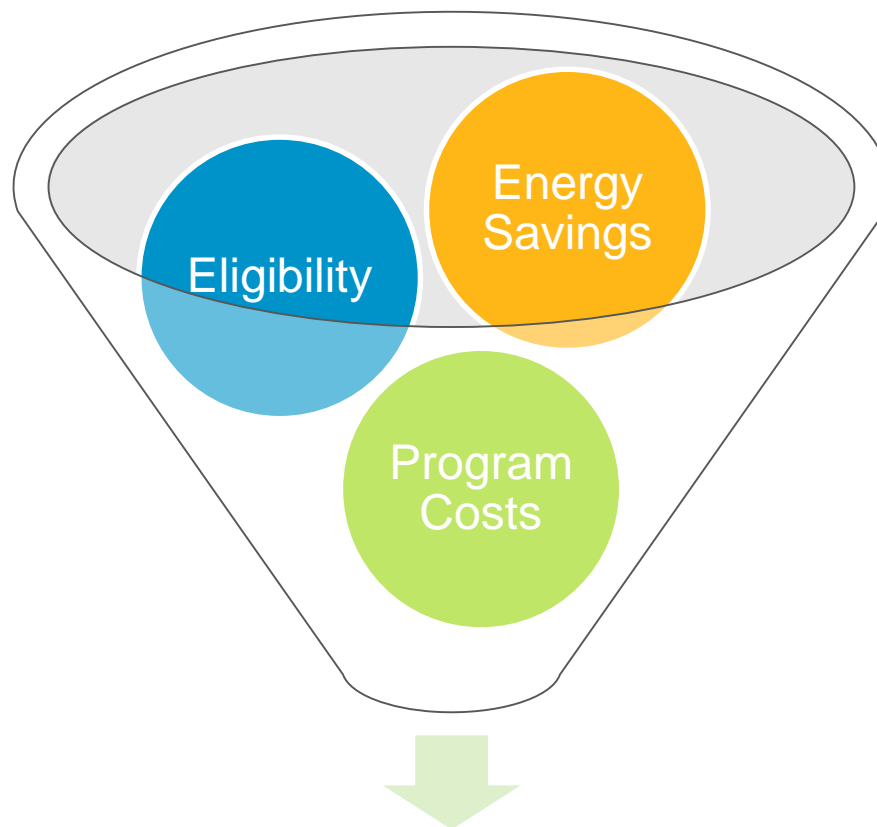
**Step 5:  
Forecast Potential**



# GENERAL MODELING EQUATION



# DATA NEEDS



Can we fill the gaps with  
professional judgement?



# RESIDENTIAL MEASURES

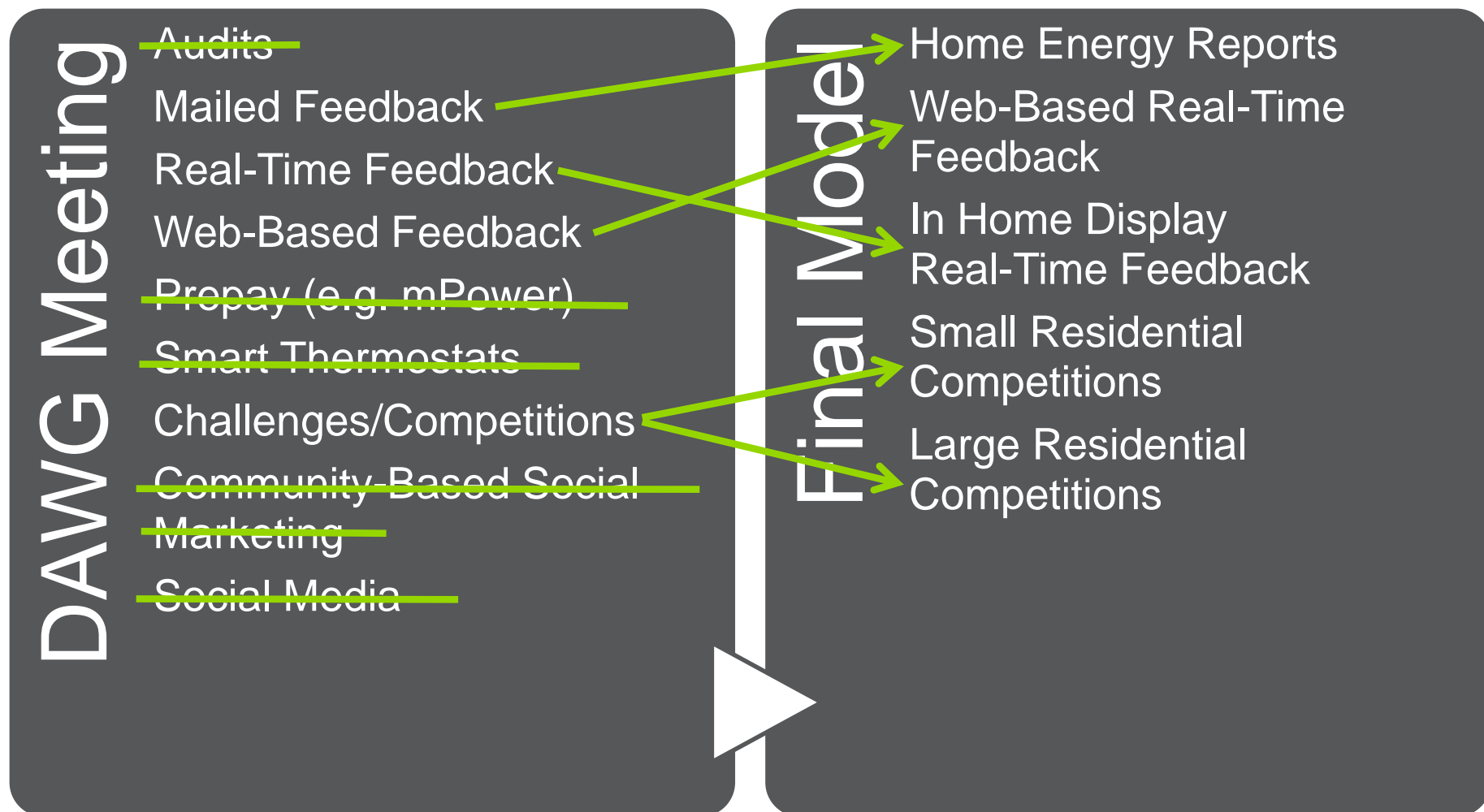
## DAWG Meeting

- Audits
- Mailed Feedback
- Real-Time Feedback
- Web-Based Feedback
- Prepay (e.g. mPower)
- Smart Thermostats
- Challenges/Competitions
- Community-Based Social Marketing
- Social Media

## Final Model

- Home Energy Reports
- Web-Based Real-Time Feedback
- In Home Display
- Real-Time Feedback
- Small Residential Competitions
- Large Residential Competitions

# RESIDENTIAL MEASURES



# COMMERCIAL MEASURES

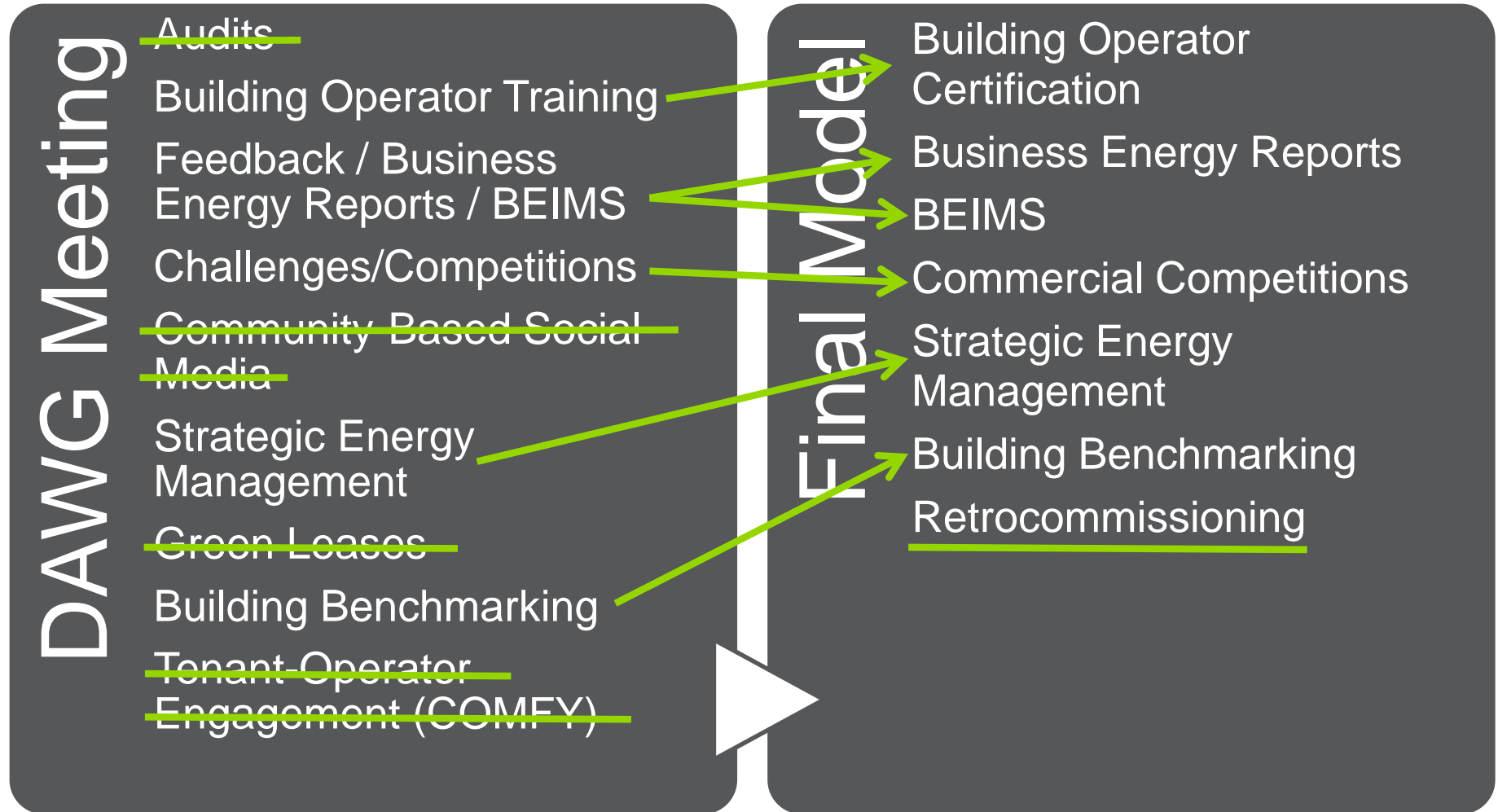
## DAWG Meeting

- Audits
- Building Operator Training
- Feedback / Business
- Energy Reports / BEIMS
- Challenges/Competitions
- Community-Based Social Media
- Strategic Energy Management
- Green Leases
- Building Benchmarking
- Tenant-Operator Engagement (COMFY)

## Final Model

- Building Operator Certification
- Business Energy Reports
- BEIMS
- Commercial Competitions
- Strategic Energy Management
- Building Benchmarking
- Retrocommissioning

# COMMERCIAL MEASURES



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# INPUTS DEVELOPED - RESIDENTIAL

Type	EUL years	Savings		Cost		kW/kWh Savings Ratio
		kWh	Therm	kWh	Therm	
Home Energy Reports (HERs)	1	1.0 – 2.3%	0.6 – 1.9%	\$0.09	\$3.06	0.00019058
Real-Time Feedback – In Home Display	1	2.3%	--	\$0.26	--	0.00019058
Real-Time Feedback – Online Portal	1	1.3%	1.3%	\$0.07	--	0.00019058
Small Competitions (<10,000 ppl)	1	8.1%	5.2%	\$0.050	\$1.344	0.00019058
Large Competitions (>10,000 ppl)	1	4.1%	5.2%	\$0.007	\$0.101	0.00019058

# INPUTS DEVELOPED - COMMERCIAL

Type	EUL years	Savings		Cost		kW/kWh Savings Ratio
		kWh	Therm	kWh	Therm	
Strategic Energy Management	15	3.0%	3.0%	\$0.29	\$3.65	0.000114
Building Operator Certification	6.5	18-151	0.8-14.2	\$0.29	\$3.65	0.000114
Building Energy and Information Management Systems	5	1.1% - 4.2%	0.2% - 7.4%	\$0.20 - \$0.46	\$0.18 - \$0.46	0.000138
Business Energy Reports (BERs)	2	1.6% - 2.2%	0.9% for restaurants	\$0.20	\$6.12	0.0001261
Building Benchmarking	2	1.1% - 2.2%	0.7%-1.3%	\$0.0396	\$0.2352	0.0001261
Competitions	2	4.5% - 6.0%	--	\$ 0.04	--	0.0001261
RCx	5	2.3% - 12.7%	2.3% - 12.7%	\$0.39	\$0.29	0.000138

# SCENARIOS

Increased Penetration



Aggressive



Reference



# COST-EFFECTIVENESS - RESIDENTIAL

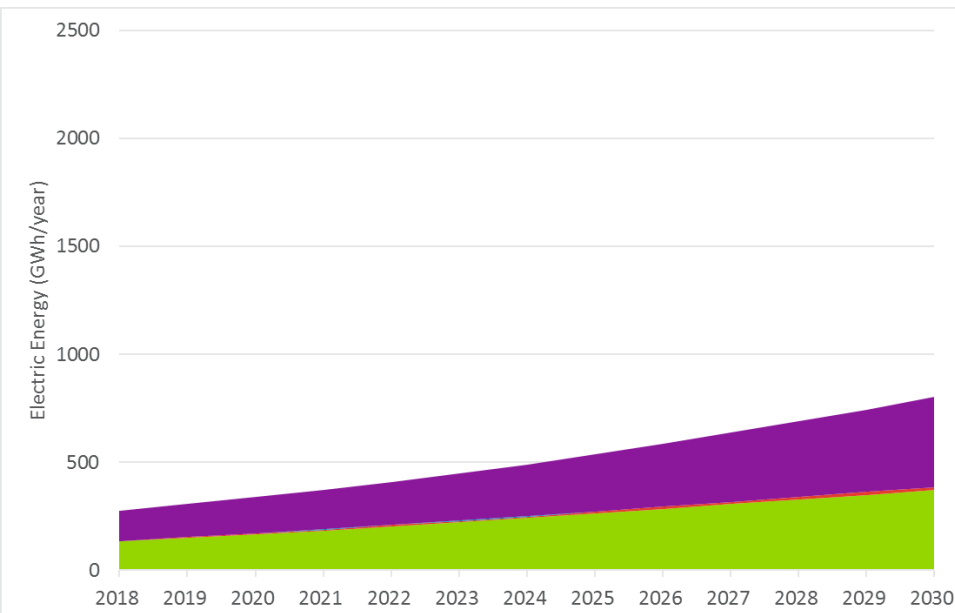
Type	PG&E	SCE	SCG	SDG&E
Home Energy Reports (HERs)	1.04	1.35	0.17	0.34
Real-Time Feedback – In Home Display	0.29	0.46	N/A	0.32
Real-Time Feedback – Online Portal	1.26	1.68	N/A	1.28
Small Competitions (<10,000 ppl)	1.95	2.40	0.39	1.92
Large Competitions (>10,000 ppl)	15.66	15.83	5.28	14.36

# COST-EFFECTIVENESS - COMMERCIAL

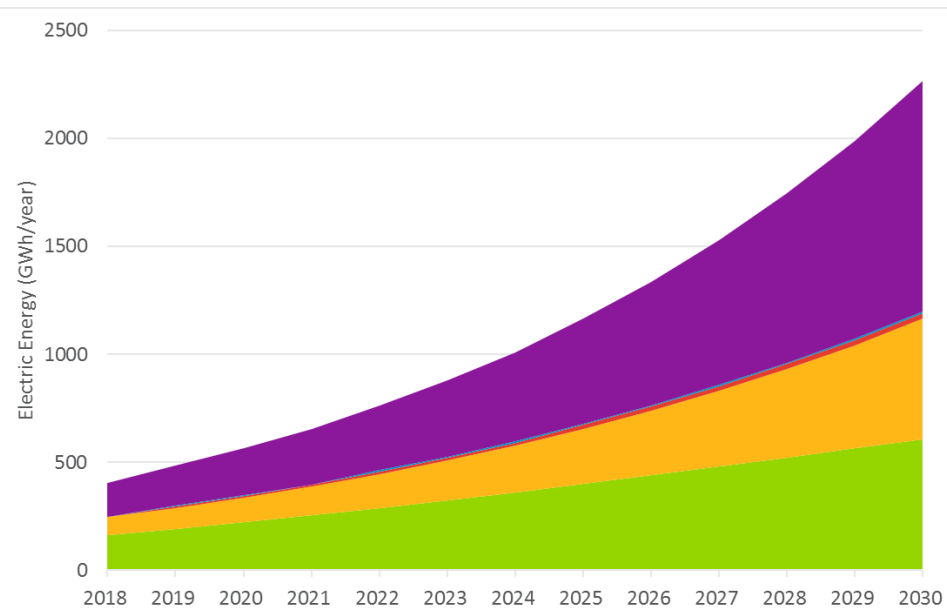
Type	PG&E	SCE	SCG	SDG&E
Strategic Energy Management	4.45	7.24	2.28	2.41
Building Operator Certification	1.74	3.24	0.94	1.14
Building Energy and Information Management Systems	1.51	3.65	14.42	1.07
Business Energy Reports (BERs)	1.16	1.57	0.17	0.66
Building Benchmarking	6.51	7.93	4.45	3.77
Competitions	5.62	7.59	N/A	3.20
RCx	2.95	3.59	6.70	1.81

# INCREMENTAL ELECTRIC ENERGY SAVINGS - RESIDENTIAL

## • Reference



## • Aggressive



■ Web-Real Time Feedback

■ Large Challenges and Competitions

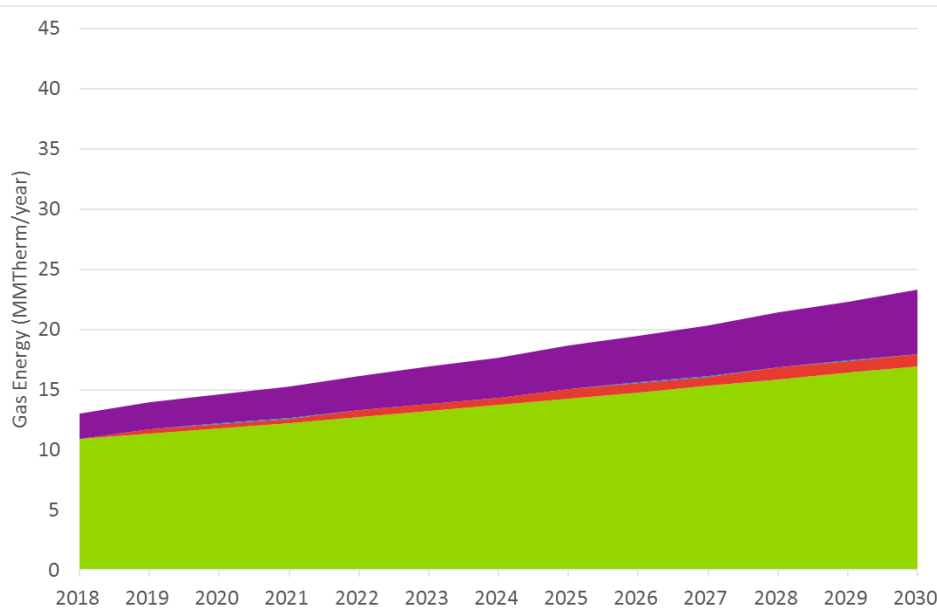
■ HERS

■ Small Challenges and Competitions

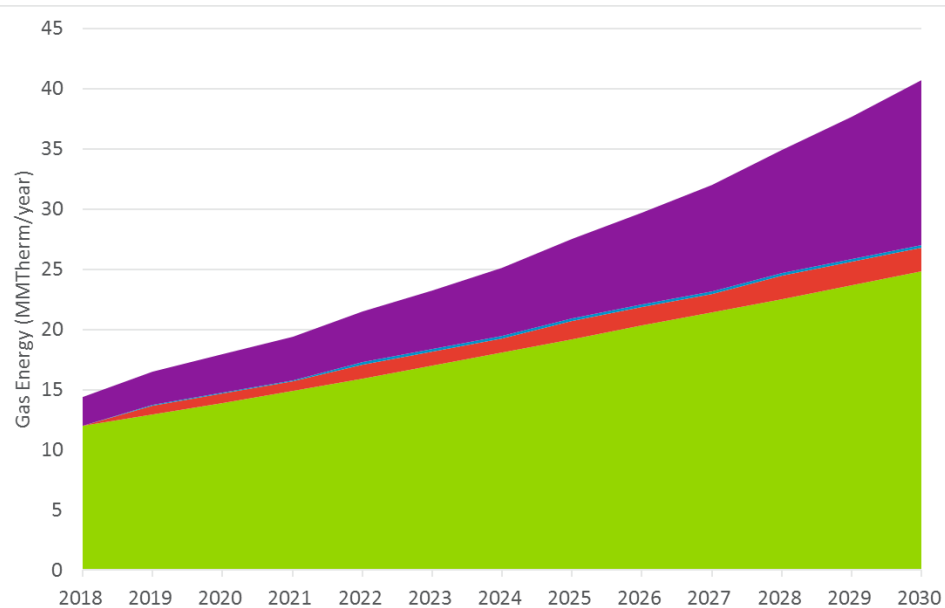
■ IHD- Real Time Feedback

# INCREMENTAL GAS ENERGY SAVINGS - RESIDENTIAL

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- Aggressive



■ Web-Real Time Feedback

■ Large Challenges and Competitions

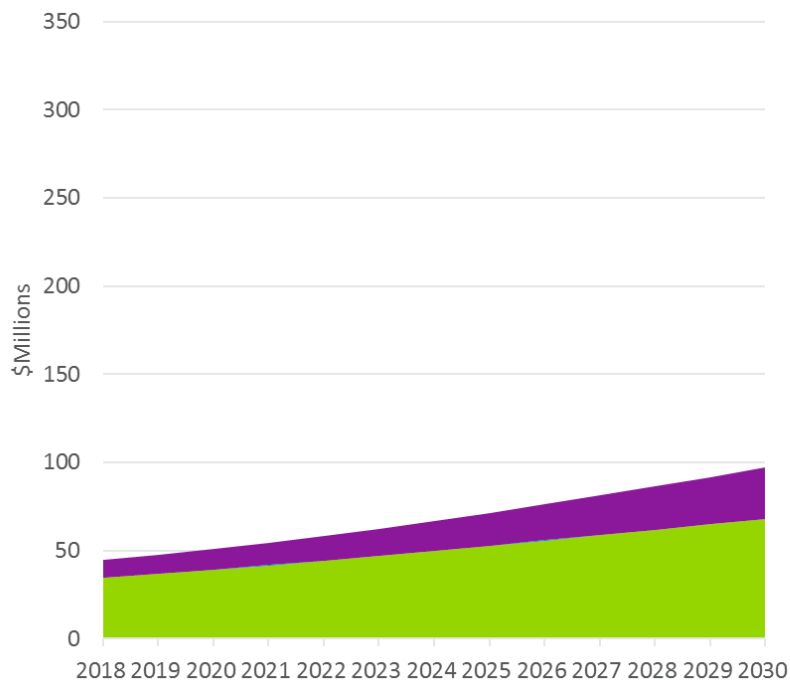
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■ Small Challenges and Competitions

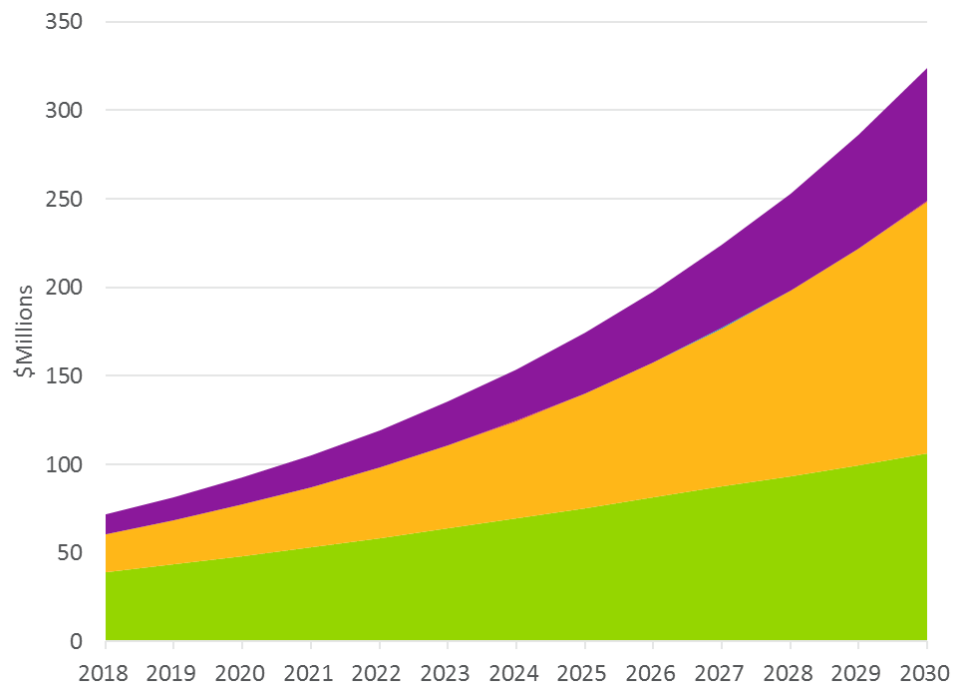
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# PROGRAM COSTS - RESIDENTIAL

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- Aggressive



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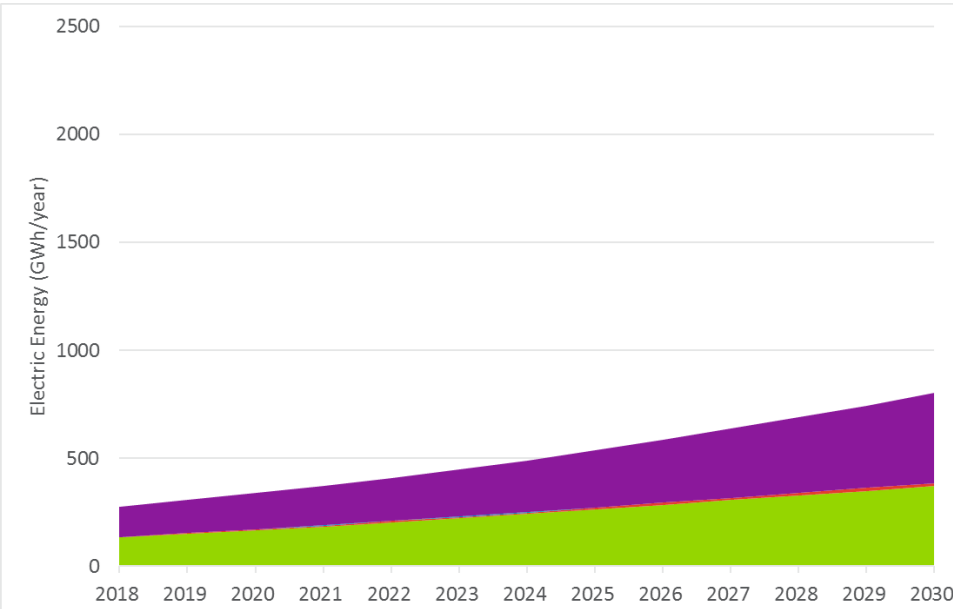
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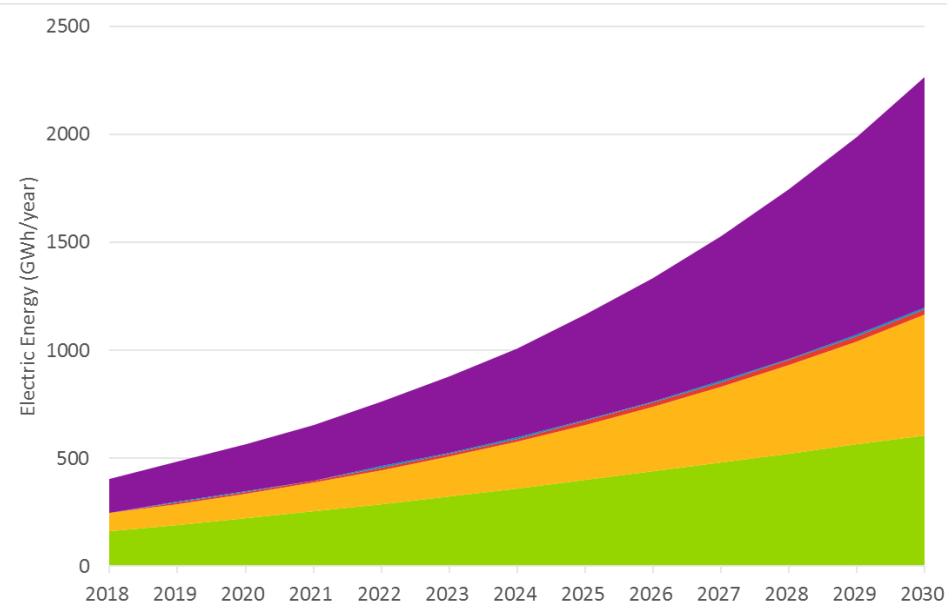
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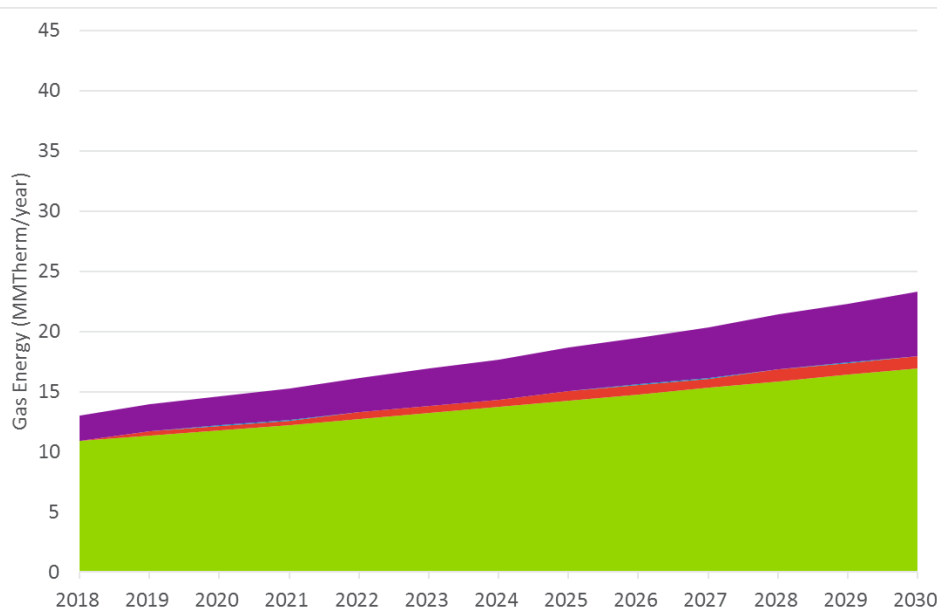
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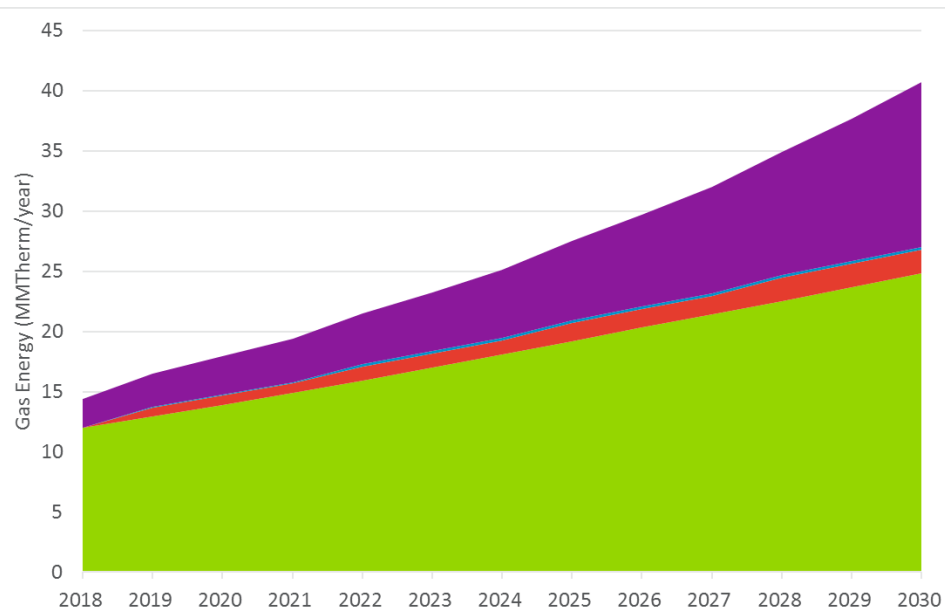
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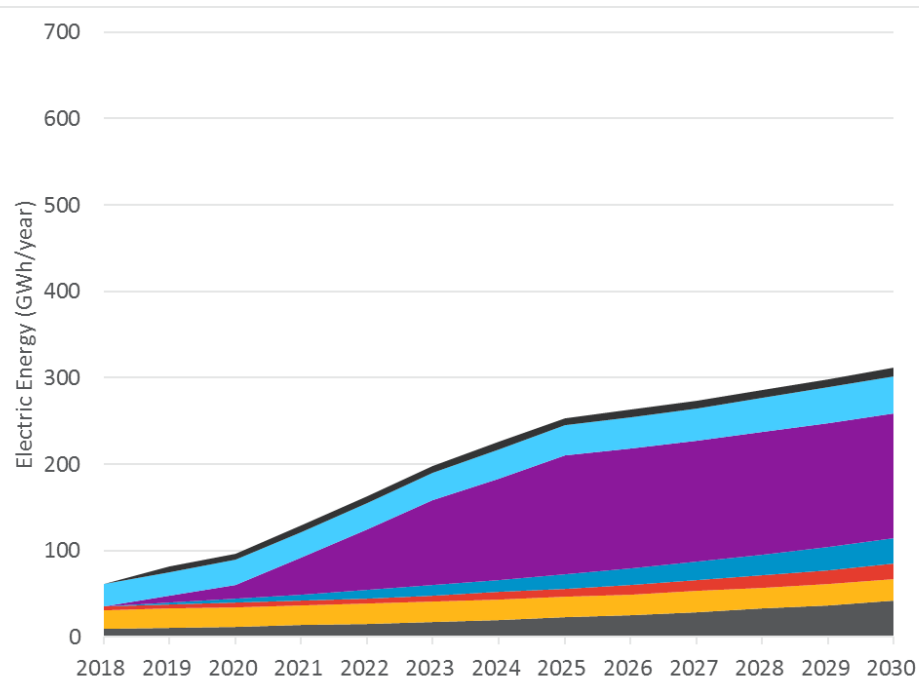
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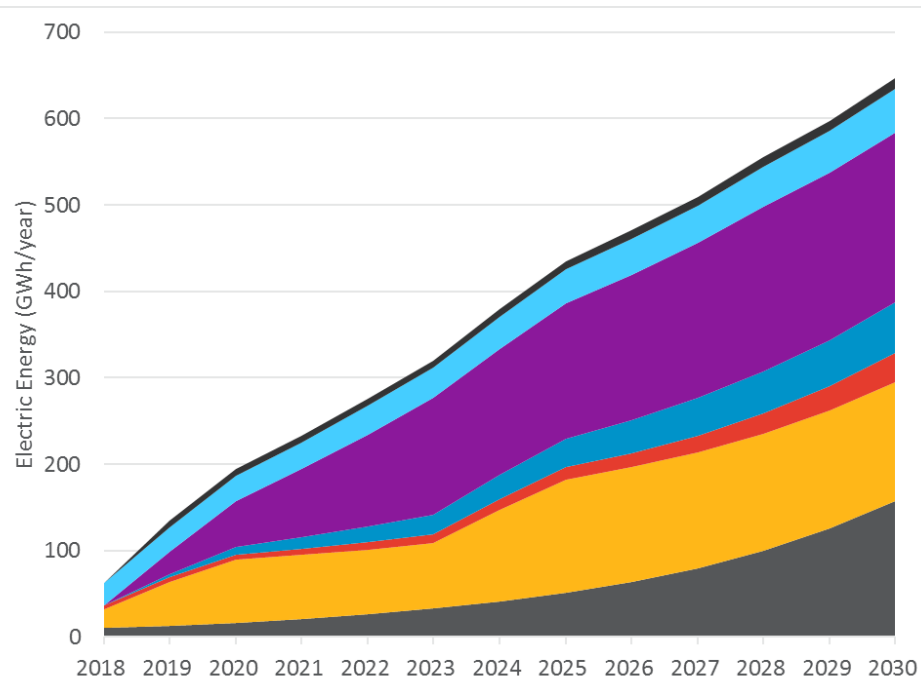
■ IHD- Real Time Feedback

# INCREMENTAL ELECTRIC ENERGY SAVINGS - COMMERCIAL

## • Reference



## • Aggressive



■ Strategic Energy Management

■ Business Energy Reports

■ BIEMS

■ RCx

■ Building Operator Certification

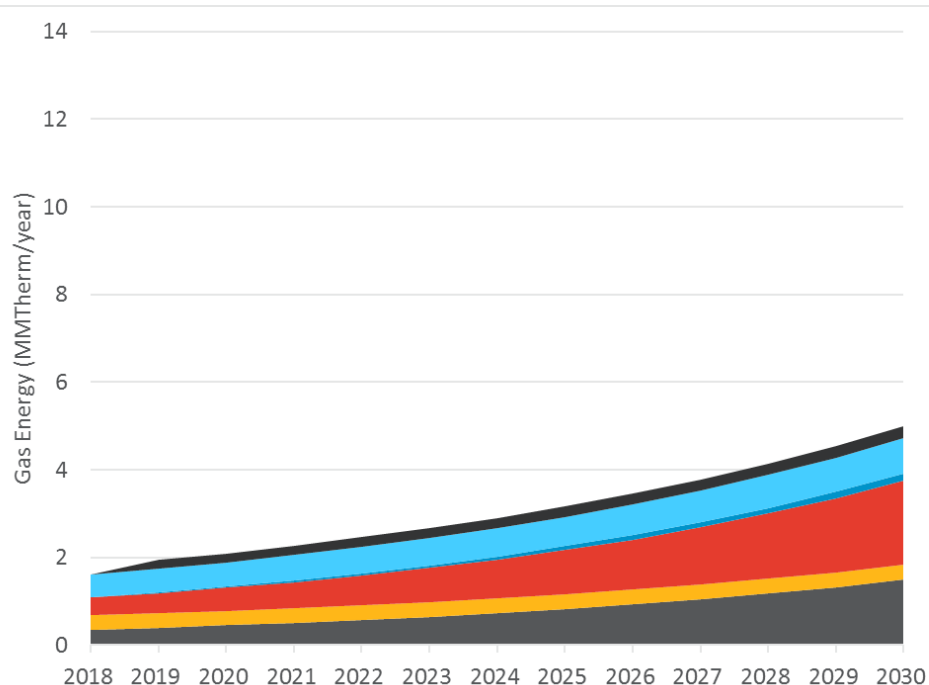
■ COM Competitions

■ Building Benchmarking

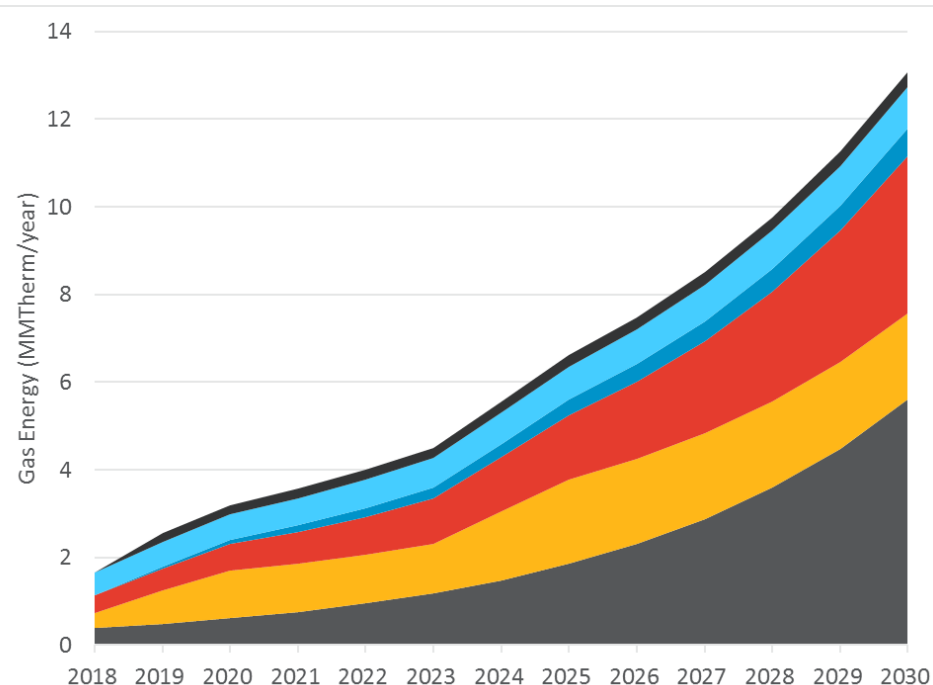


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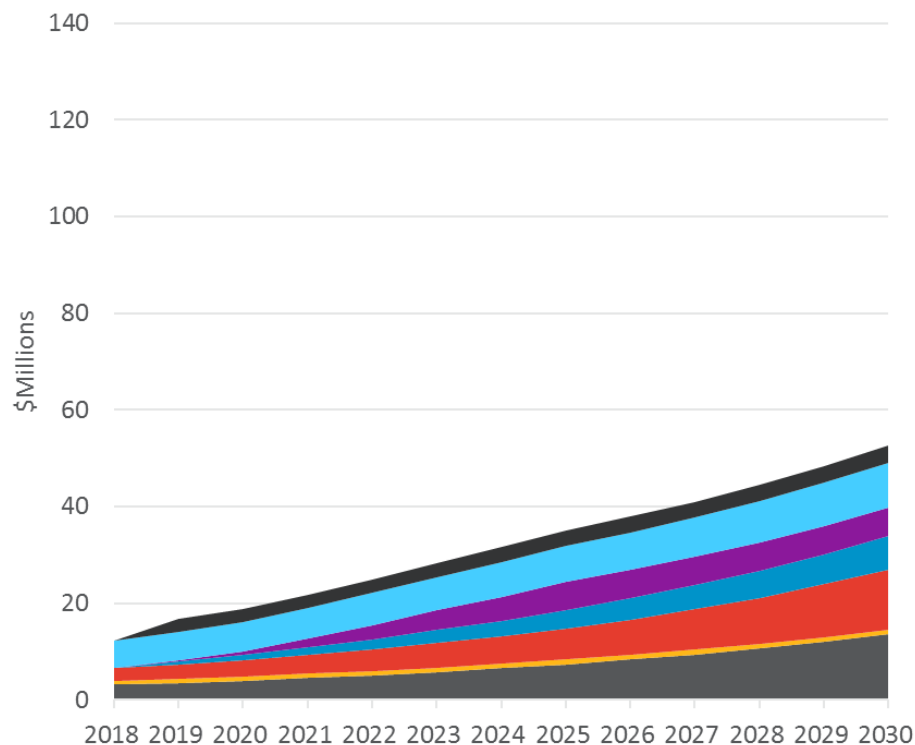
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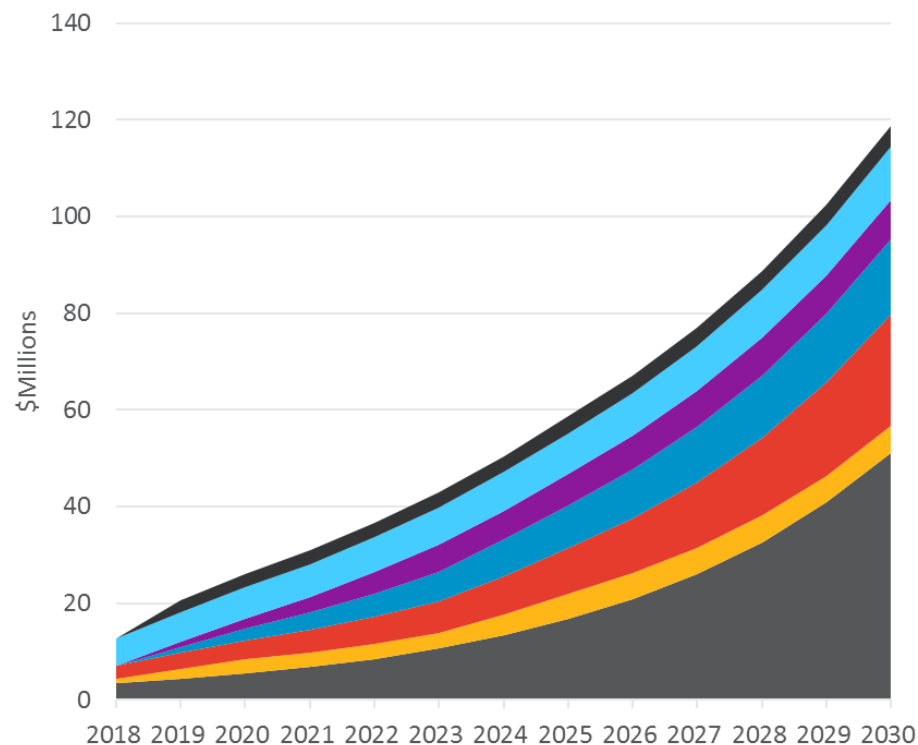
■ Building Benchmarking

# PROGRAM COSTS - COMMERCIAL

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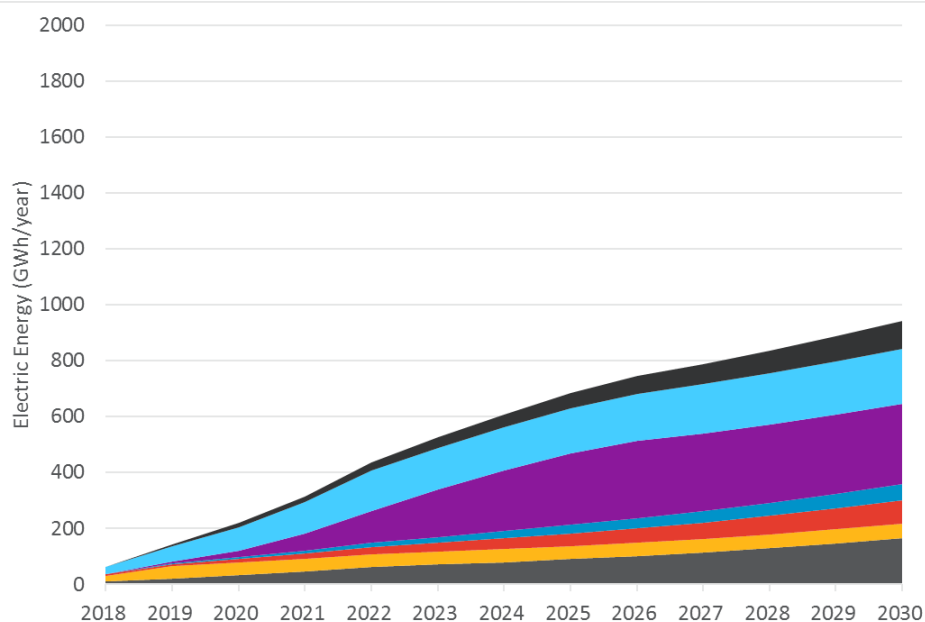
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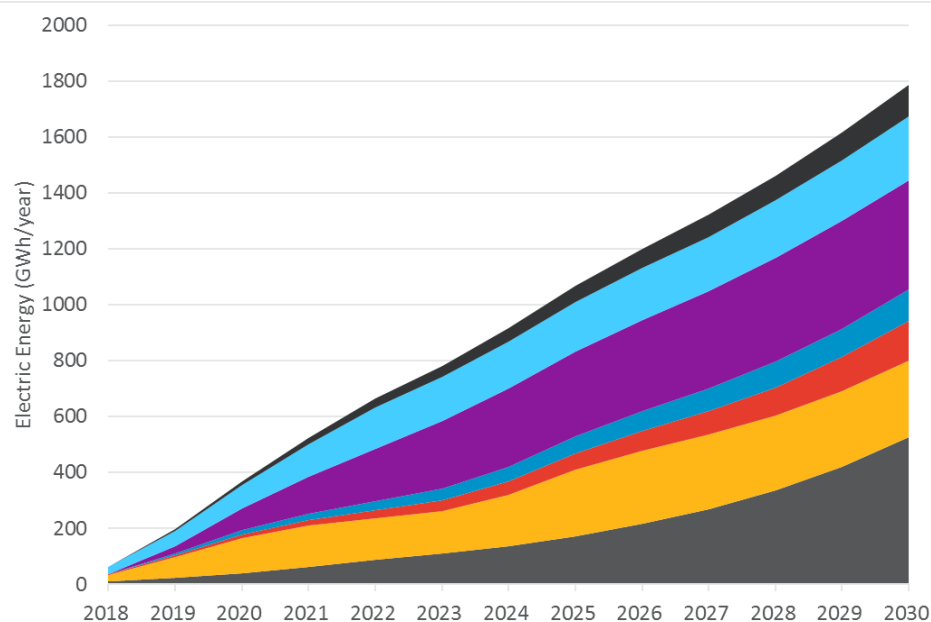
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## • Reference



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■ Strategic Energy Management

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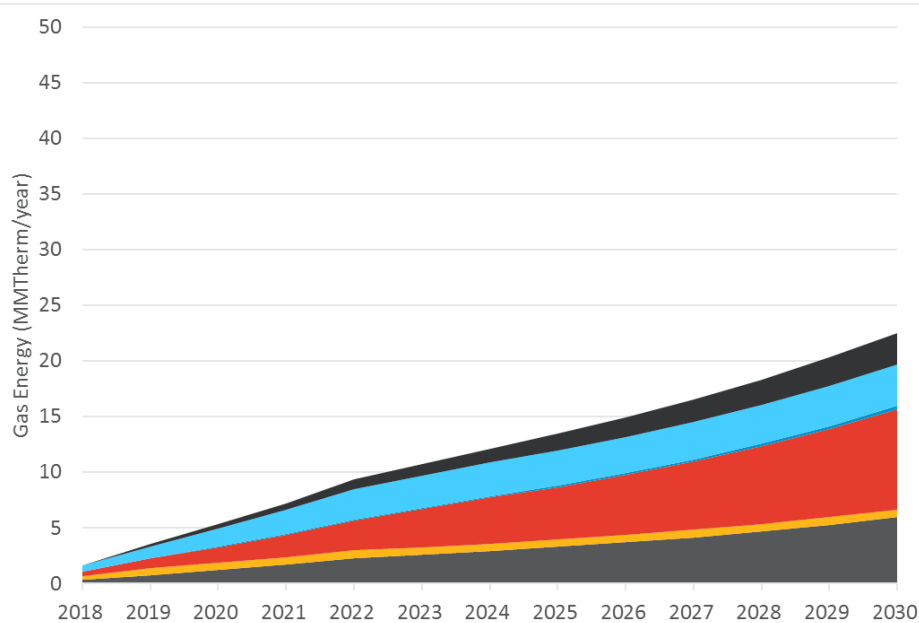
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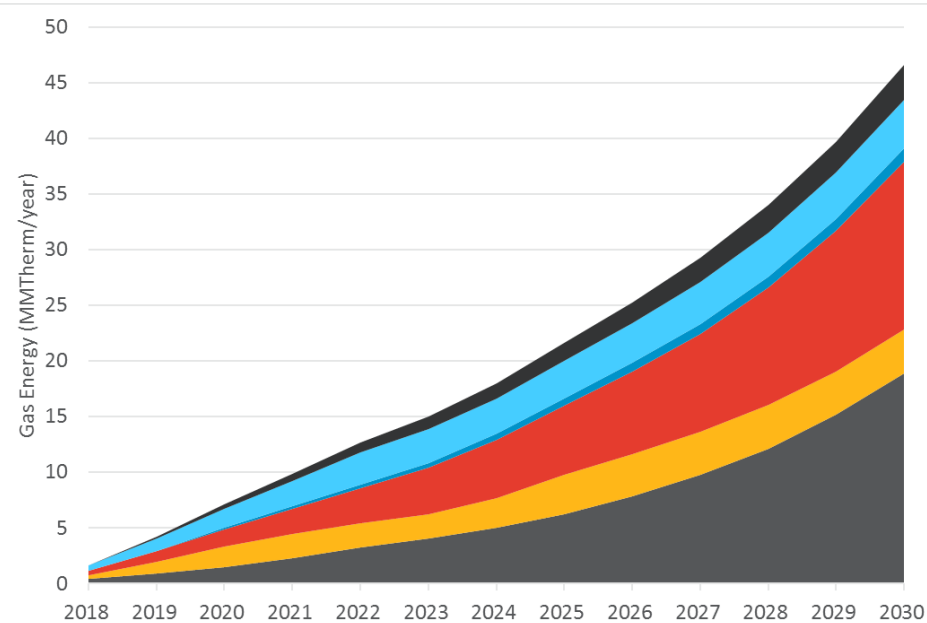
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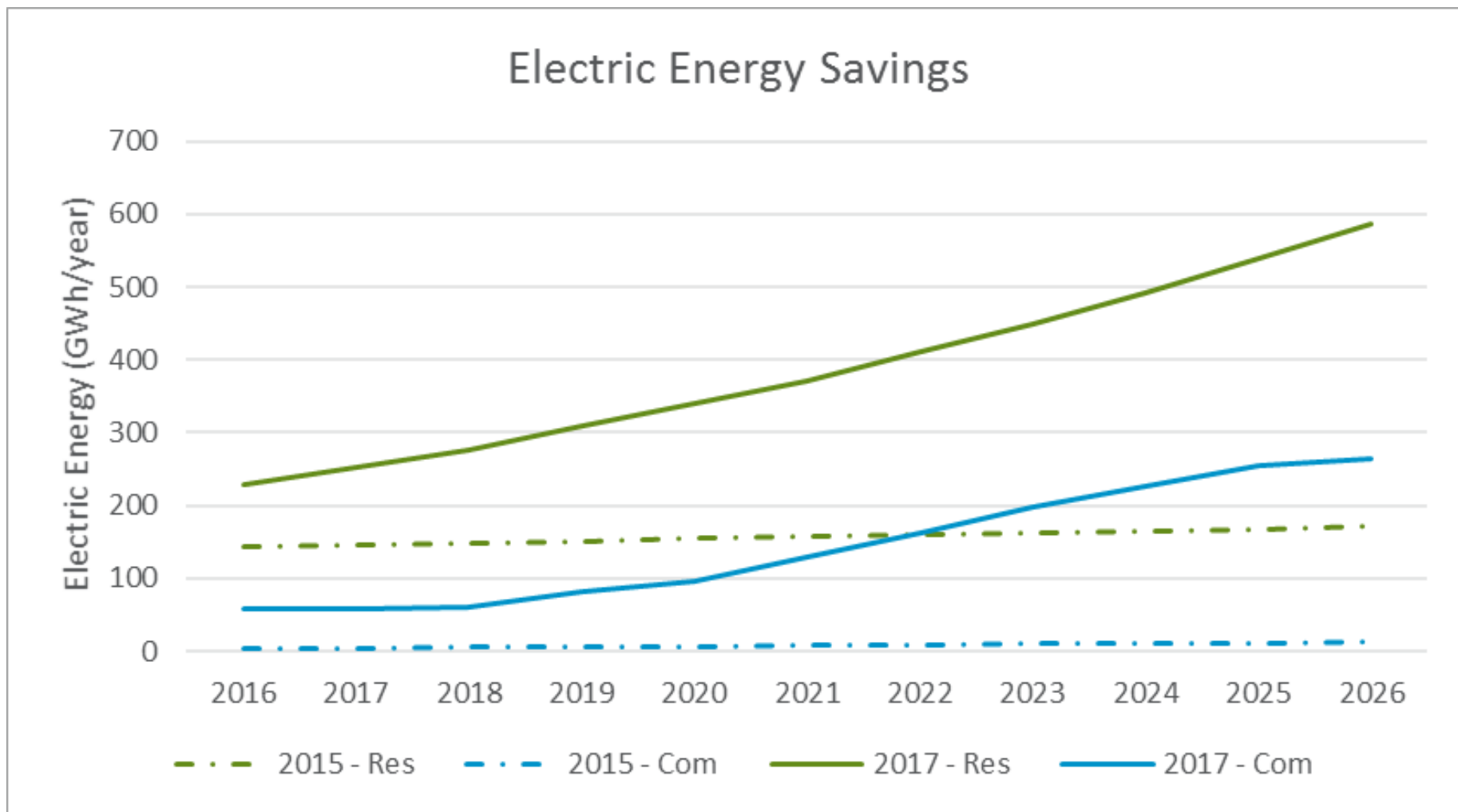
■ RCx

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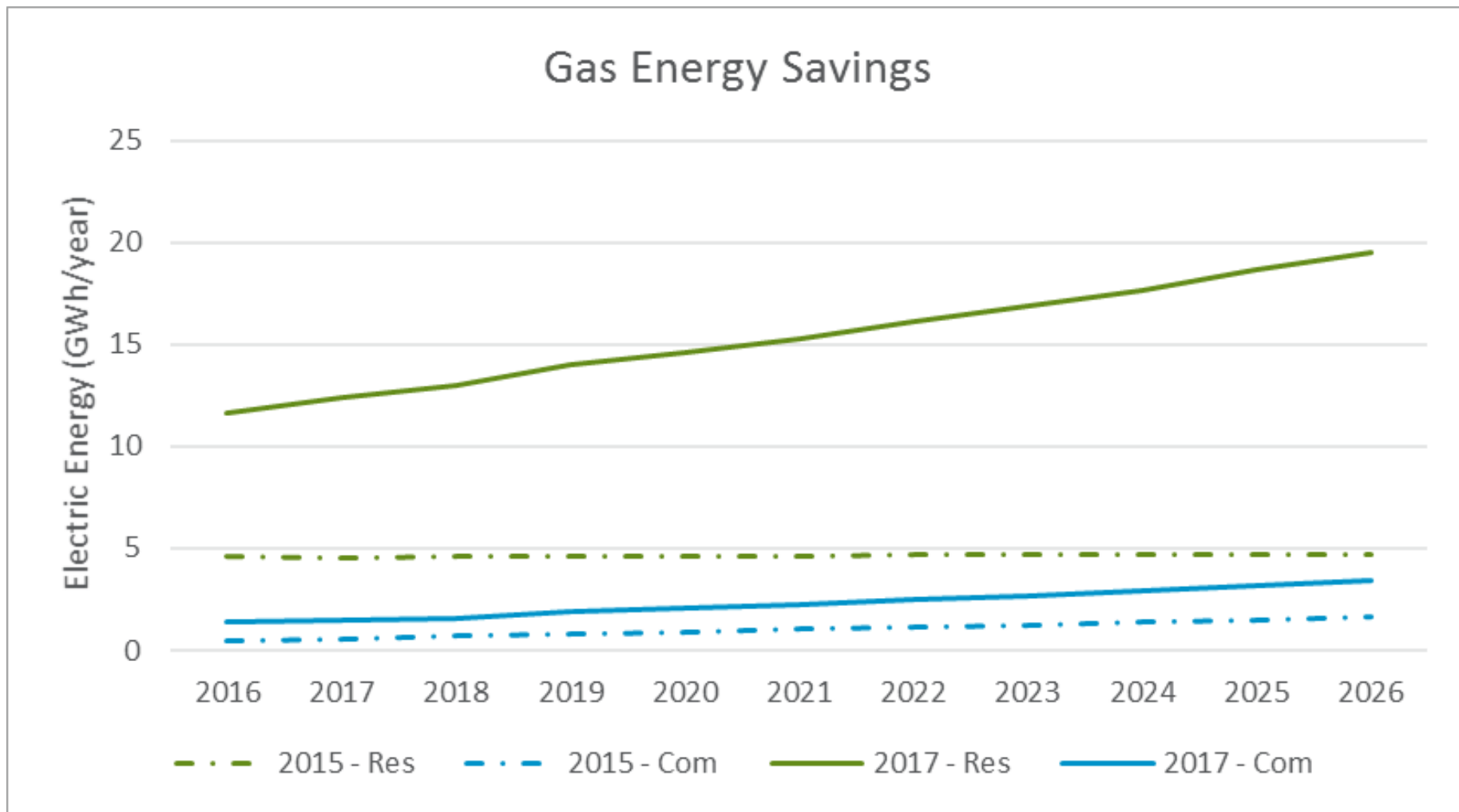
■ COM Competitions

■ Building Benchmarking

# INCREMENTAL SAVINGS COMPARED TO 2015 PG STUDY



# INCREMENTAL SAVINGS COMPARED TO 2015 PG STUDY



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# RESOURCES RELEASED



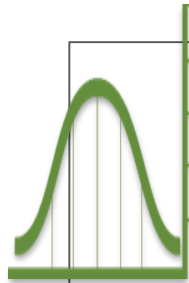
## Appendix

- Detailed methodology



## Input Data

- Savings, cost, EUL, and penetration rates



## Results Viewer

- Cost and incremental and cumulative savings



# QUESTIONS FOR STAKEHOLDERS

- Do you have specific comments on our input assumptions?  
If so, please provide any data you have to improve our analysis.
- Are the right programs in each scenario: Reference vs. Aggressive?
- Are the EULs reasonable (i.e., is a 15 year EUL reasonable for SEM)?

# INFORMAL WRITTEN COMMENTS

- CPUC staff welcome additional informal, written comments.
- Due date: May 4, 2017
- E-mail to **all three**:
  - Paula Gruendling [paula.gruendling@cpuc.ca.gov](mailto:paula.gruendling@cpuc.ca.gov)
  - Amul Sathe [amul.sathe@navigant.com](mailto:amul.sathe@navigant.com)
  - Chris Ann Dickerson [cadickerson@cadconsulting.biz](mailto:cadickerson@cadconsulting.biz)
- No need to e-mail the entire service list, these are not formal comments.

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