

# 2019 POTENTIAL AND GOALS STUDY WORKSHOP

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JANUARY 11, 2019

NAVIGANT

# AGENDA

- 1:00 – 1:15 Introductions and Overview of Group E Scope
- 1:15 – 3:45 2019 P&G Study
  - 1:15 – 1:30 Overview
  - 1:30 – 1:50 Res/Com Sectors
  - 1:50 – 2:10 AIMS Sectors
  - 2:10 – 2:20 Codes and Standards
    - 10 minute break --
  - 2:30 – 3:00 BROs
  - 3:00 – 3:30 Low Income, CCAs, RENs
  - 3:30 – 3:45 Model Delivery
- 3:45 – 4:00 Next Steps and Close



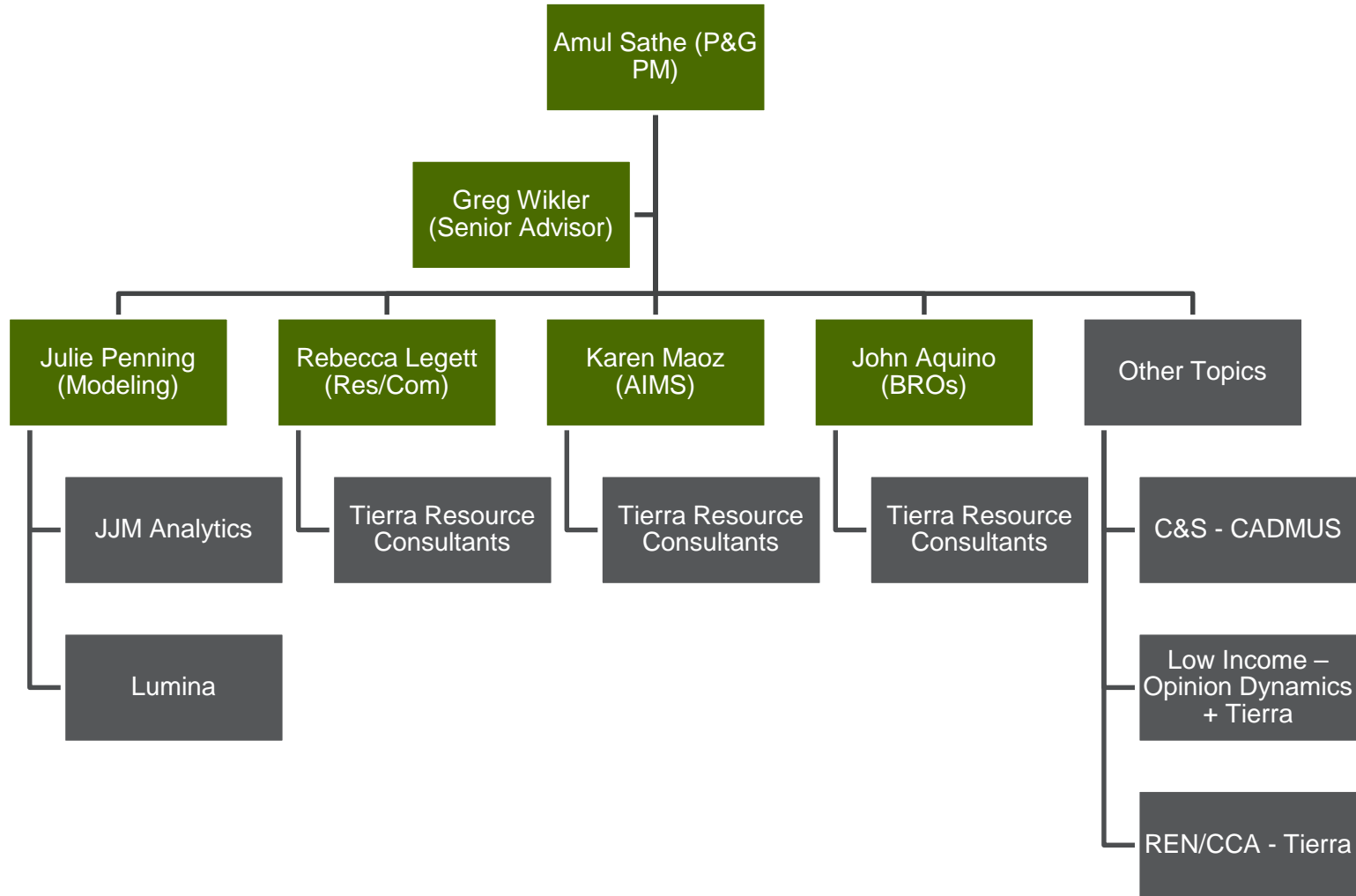
## 2019 P&G STUDY - OVERVIEW

# GROUP E CONTRACT – P&G STUDY DELIVERABLES

Del.	Deliverable Description	Timeline
11	2019 Potential and Goals (P&G) Study	May 1, 2019
11.1	P&G Energy Efficiency Adoption Simulation Model	May 1, 2019
12	Additional Achievable Energy Efficiency Scenarios	Oct 1, 2019
13	SB 350 IOU Territory Targets Update	Sep 1, 2019
14	Feasibility Study Related to the IRP Supply Curves	Sep 1, 2019
15	Feasibility Study on Setting Locational Energy Efficiency Targets	Dec 2019

- Full details can be found in our written workplan: *Group E Workplan- Deliverables 11-15* available at: <https://pda.energydataweb.com/#!/documents/2118/view>
- Purpose of today's presentation:
  - Focus on Deliverable 11
  - **NOT** simply restating what's already written in the workplan
  - Discuss research underway and key topics for which we appreciate stakeholder feedback

# 2019 P&G STUDY - INTRODUCTIONS AND TEAM ROLES

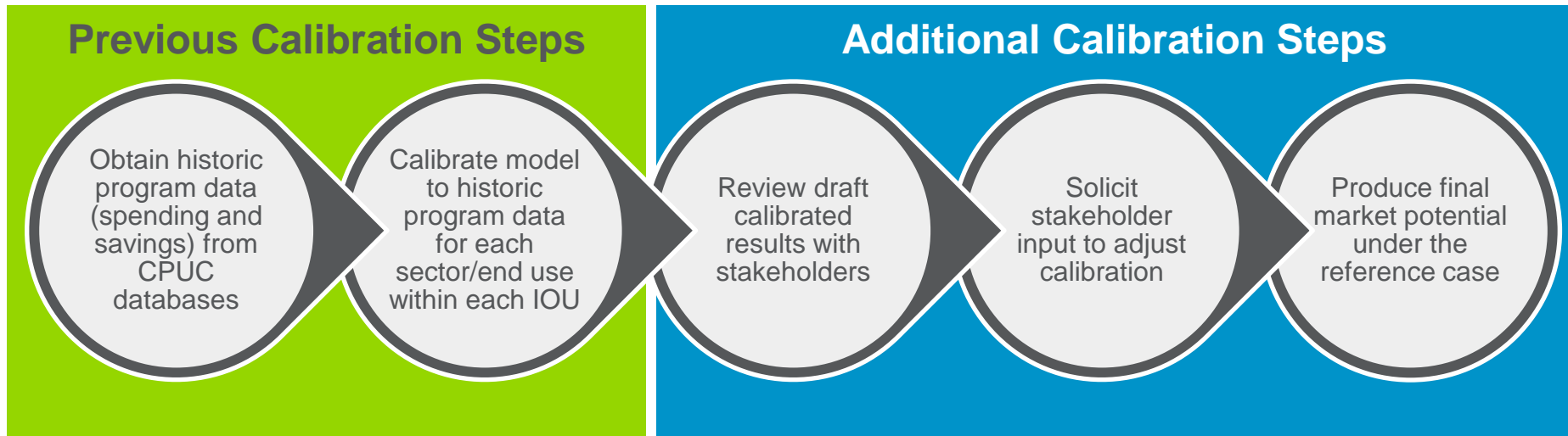


# 2019 P&G STUDY – OVERVIEW OF SCOPE

- Technical, Economic, and Market Potential for energy efficiency programs
- Include breakdown for:
  - Each IOU
  - Low Income Sector **(new!)**
  - RENs and CCAs **(new!)**
  - Disadvantaged Communities **(new!)**
- Codes and Standards (C&S) advocacy savings assessment
- BROs savings assessment
- Hourly load shapes **(new!)**
- Develop up to four scenarios in coordination with CPUC
  
- Excluded from potential model:
  - Fuel substitution (replacing gas appliances with electric appliances)
  - EE/DR integration

# MODELING APPROACH AND CALIBRATION


- Modify and update the 2018 PG model to meet the requirements of this study
- Primarily, a bottom up stock turnover model using Bass Diffusion to forecast adoption rates
- Detailed methodology is described in the workplan (Deliverable 11.1 and Appendix)
- Updated approach to model calibration



# STAKEHOLDER ENGAGEMENT TOPICS

<b>Stakeholder Meetings</b>	<b>Date</b>	<b>Webinar or In Person</b>
Work Plan and Measure Lists	Today	In Person at CPUC
AIMS Custom and Emerging Tech	Late Jan/Early Feb	Webinar
Scenarios	Early Feb	Webinar
Stakeholder input on Calibration	Mid to late Feb	In Person
Low income	Mid to late Feb	Webinar
REN/CCA/DAC	Early March	Webinar
Draft Results	4/5/2019	In Person





**2019 P&G STUDY –  
RES/COM  
SECTORS**

# RES/COM APPROACH

**Our approach is to update the analysis in the 2017 P&G study with new information.**

- We are prioritizing updates to the high-impact measures from the 2017 P&G study. Our updates cover 95% of the market potential from the previous study.
- New data sources include DEER 2019/2020 updates from the Preliminary Ex-Ante Review Database (PEAR) and new or updated workpapers.
- We are updating peak demand savings to use the new peak period definition in DEER 2020.
- We are including an analysis of low income households.
- We added three new measures to the measure list from the 2017 P&G study.

**We have already completed the majority of work for the residential and commercial sectors!**

# PEAK DEMAND FORECAST

**We are updating peak demand to be consistent with the DEER 2020 definition.**

- **New Peak Demand Definition:**

*Effective January 1, 2020 the DEER demand reduction shall be defined as the average demand impact as would be “seen” at the electric grid level for a measure **averaged across 15 hours from 4 p.m. to 9 p.m. during the three consecutive weekday period containing the highest algebraic sum of: the average temperature over the three-day period, the average temperature from noon to 6 p.m. over the three day period, and the peak temperature within the three-day period.** The three Peak Period days shall not include a holiday, and shall fall within the dates of June 1 through September 30, inclusive.”*

## Step 1: Determine peak period

Find period of three consecutive weekdays with the highest value for:

The average temperature over the three day period + The average temperature from noon to 6 p.m. over the three day period + The peak temperature within the three day period



## Step 2: Calculate DEER demand reduction

Find the average demand impact for the 15 hours from 4 p.m. to 9 p.m. on the three consecutive weekdays found in Step 1

# LOW-INCOME SECTOR

In this study, we are calculating the potential separately for the low-income residential sector.

- Income level is most likely to affect the **density** and **saturation** of certain technologies:
  - Low-income households may have a lower **density** of certain products: e.g., low-income households may be less likely to have an air conditioner than non-low-income households.
  - Low-income households may have a lower **saturation** of efficient products: e.g., low-income households may have less efficient air conditioners, on average, than non-low-income households.

## Simplified Example: Air Conditioners in Low-Income vs. Regular-Income Homes

	Low-Income	Non-Low Income
Density (average # of ACs per household)	0.6	0.8
Saturation of Baseline ACs (SEER 10)	90%	70%
Saturation of Efficient ACs (SEER 16)	10%	30%

# RES/COM NEW MEASURES

**We added new measures to this study to account for the increase in advanced, connected technologies and systems.**

- Residential LED lights with advanced networked lighting control systems
  - *“An LED-based lighting system with integrated sensors and controllers that are networked (either wired or wireless), enabling lighting products within the system to communicate with each other and transmit data.”*<sup>1</sup>
  - This measure is in the same technology group as LED lighting because it requires LED technology to operate.
- Smart connected power strips
  - *“Tier 2 Advanced Smart Connected Power Strip (wireless communications) [that] provides the ability to read real time power consumption of electronic equipment connected to the power saving sockets of the Tier 2 APS device via a smart device application.”*<sup>2</sup>
  - This measure is in the same technology group as non-communicating Tier 2 advanced power strips.
- Commercial energy management systems (EMS)

<sup>1</sup> Energy Savings Forecast of Solid-State Lighting in General Illumination Applications, September 2016

<sup>2</sup> Work Paper SCE17CS014, Revision 0



**2019 P&G STUDY –  
AIMS SECTORS**

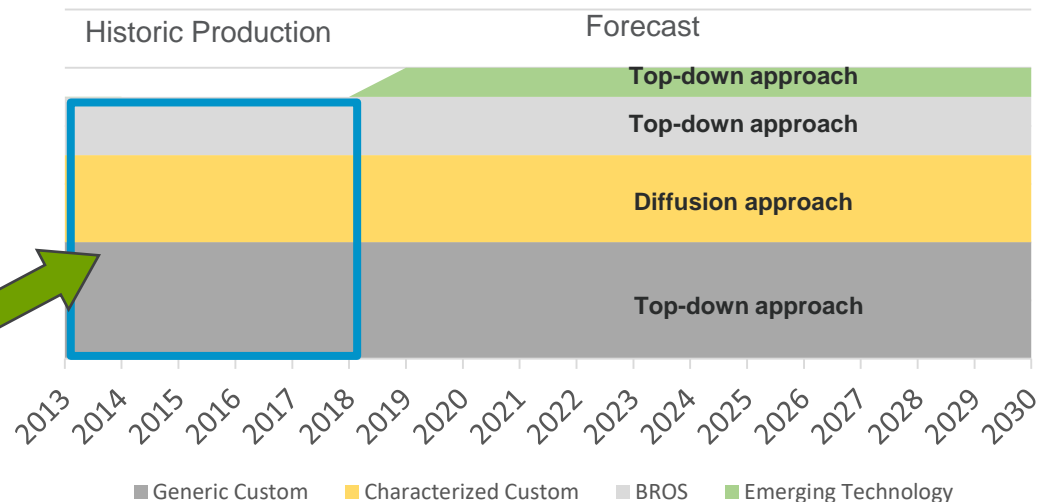
# AGRICULTURE, INDUSTRIAL, MINING STREETLIGHTING (AIMS) MODELING METHODOLOGY

- 2020 Study: Bottom-Up Approach where possible
  - Different approaches for different Ind/Ag measure types
  - Bass diffusion for Ind/Ag representative technologies (similar to Res/Com)
  - Top-down approach for other categories

## Measure Categorization

Categories	Model Approach
Emerging Technologies	Top-down approach
BROS*	Top-down approach
Characterized Custom**	Bottom-up bass diffusion approach
Generic Custom	Top-down approach

## Potential Forecast Measure Components and Methods



\*SEM is modeled as the AIMS BROS measure. We are allocating the historical RCx as a proxy for SEM savings.

\*\* Mining and Streetlighting only have characterized custom.

*Illustrative Example*

# AIMS SCOPE OVERVIEW

- Develop market baseline
  - By segment (and end use, using previous study assumptions)
    - Industrial: use QFER data for allocation across segments by IOU
    - Agricultural: only have historical 3 digit NAICS allocations
      - Previous study does not differentiate by IOU
      - Limited available data
    - Apply segment allocations to IEPR with self-generation (form 1.1b) forecast
- No change to Ag & Ind generic custom (GC), SEM, and emerging technology (ET) approach\*
- No change to Mining and Streetlighting market and measure savings characterization (except update Streetlighting market saturation based on recent installations)

\* Separate webinar on GC and ET methodology to be scheduled



# AGRICULTURAL MARKET CHARACTERIZATION

- Previous study based on market segment allocation from historical sources and mostly aligned to IOU programs

Subsector	Code	NAICS
Irrigated Agriculture	Irr	1111, 1119, 1112, 1113
Post-Harvest Processing	Har	115114, 115111
Dairies	Dry	112120
Refrigerated Warehouses	Ref	493120
Wineries and Vineyards	Vin	111332
Concentrated Animal Feeding Operation	Caf	112
Greenhouses	GHs	1114

- Based on the existing IEPR NAICS allocation to Ag, the following is the new market segments for the PG Study

Subsector	Code	NAICS
Irrigated Agriculture, vineyards, forestry and greenhouses	Ago	111, 113
Dairies, fishing, hunting	Dry	112,114
Water pumping	Wtp	221

# AIMS – MEASURE CHARACTERIZATION

Categories	Applicability
Emerging Technologies	Ag and Ind
BROS	Ag and Ind
Characterized Custom	Ag, Ind, StrLtg, and Mining
Generic Custom	Ag and Ind

Specific, widget-based measure characterization not applicable to highly specialized application of measures:

- Site, industry, and/or process-specific interventions (not feasible or appropriate to define a typical widget)
- No codes or standards directly relate
- Not saturating due to continual process changes, equipment retooling, product evolution
- Examples of Custom Projects:
  - Factory-level compressed air system improvements: equipment replacements, re-piping distribution system, sequencing compressor controls.
  - From EEStats: “Process Refrigeration Other”

# INDUSTRIAL AND AGRICULTURAL MEASURE CATEGORIES

- Mostly aligned to previous study
- Simplification in list using similar approach from last study
  - Review previous two years (2016-2017Q3) of measure installations from EESStats
  - Rank by the top 80%
  - Assign list of measures

Categories	Definition
<b>BROS</b>	RCx and some optimization = SEM
<b>Characterized Custom</b>	Top 80% not defined as BROS or GC
<b>Generic Custom (GC)</b>	Any “other” description in EESTATS and remaining measures (i.e., not in top 80%)

- Industrial – align measure descriptions to IAC (source for measure savings)
  - Updated Characterized Custom measure categories
  - Update measure inputs for industrial via Eestats and IAC data via aggregated measure categories
- Agricultural – similar approach, but no change to measure savings calculations except adding water pumping only to BROS and GC



**2019 P&G STUDY –  
CODES AND  
STANDARDS**

# CODES AND STANDARDS

- Forecast methodology for C&S savings is based on the Integrated Standards Savings Model (ISSM)
- Most of our work will focus on future C&S, existing C&S will leverage existing data sources and evaluations
- Future C&S is more uncertain, requires assumptions/adjustments to be able to forecast

Potential C&S	Information Sources
<b>Evaluated C&amp;S</b>	Past CPUC evaluations will be used to develop this list of C&S. These evaluations will also contain data necessary for modeling.
<b>IOU Claimed C&amp;S (Unevaluated)</b>	IOU C&S claims will be used to develop this list of C&S. Our team will consult the IOU program managers and their contractors to obtain the list and coordinate with the Group B EM&V team as needed. Additional data requests may be filed.
<b>Future C&amp;S</b>	Work with Codes and Standards Program administrators, the CEC staff, Commission staff, and knowledgeable consultants to monitor code and standard development and adoption plans.

# CODES AND STANDARDS

- IOU Claimed C&S (Unevaluated) in the previous study included
  - C&S from 2015 – 2023
  - 2016 T24
- Future C&S in the previous study included:
  - Appliances: Com Clothes Dryers, Res Clothes Washer, Pool Pumps & Spas
  - Electronics: Game Consoles, Set Top Boxes, Small Network Equipment
  - Lighting: Small Diameter Directional Lamps, High-Intensity Discharge Lamps
  - Water Meters

- What future C&S should we consider for this study? What data do you know of for your suggest items?
  - Compliance date
  - First year savings (kWh/kW/Therms)
  - Sales forecast
  - EUL of technology

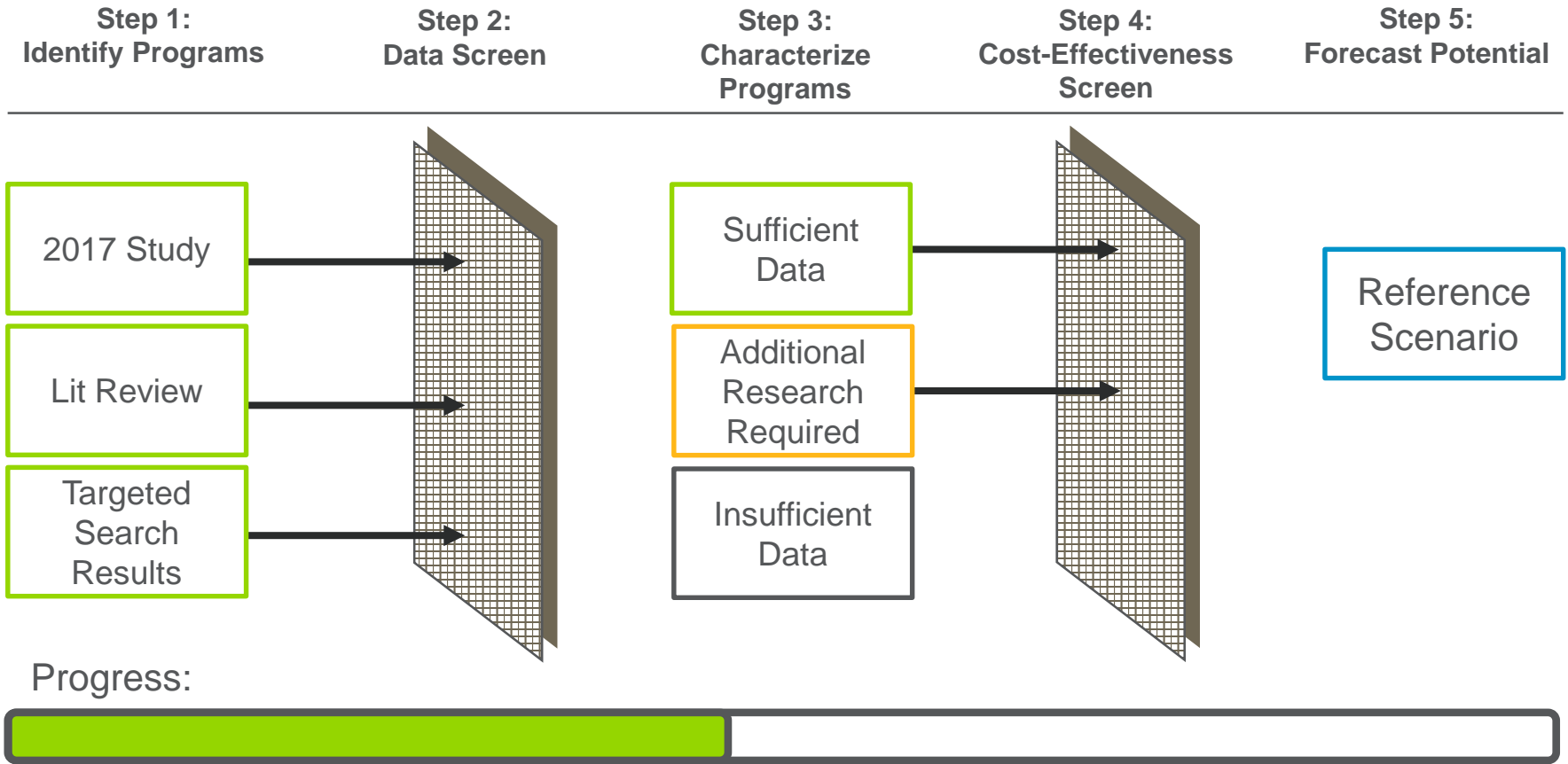


**2019 P&G STUDY -  
BROS**

# BROS

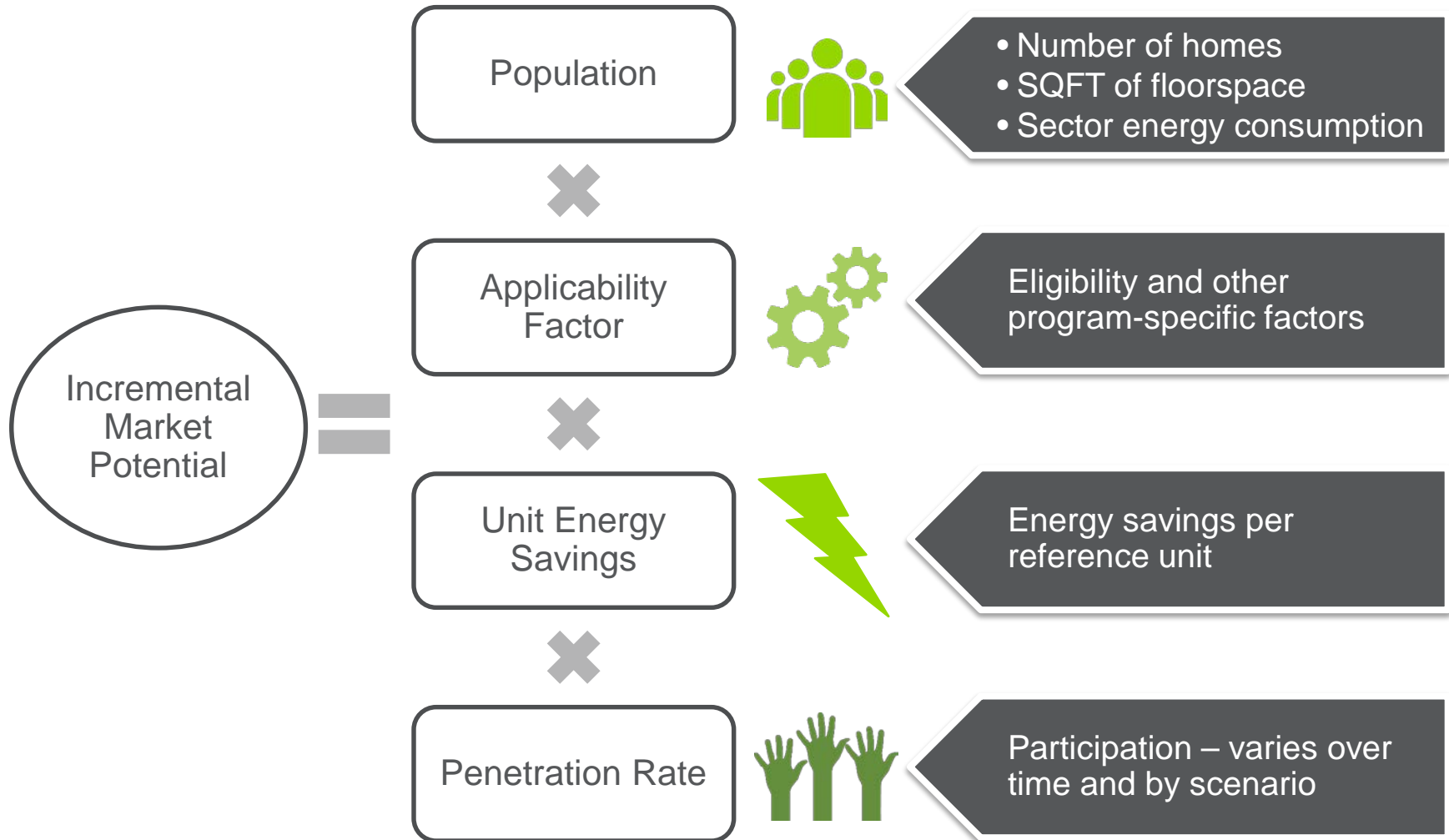
BEHAVIOR, RETROCOMMISSIONING, AND OPERATIONAL ENERGY EFFICIENCY

## General Work Plan:

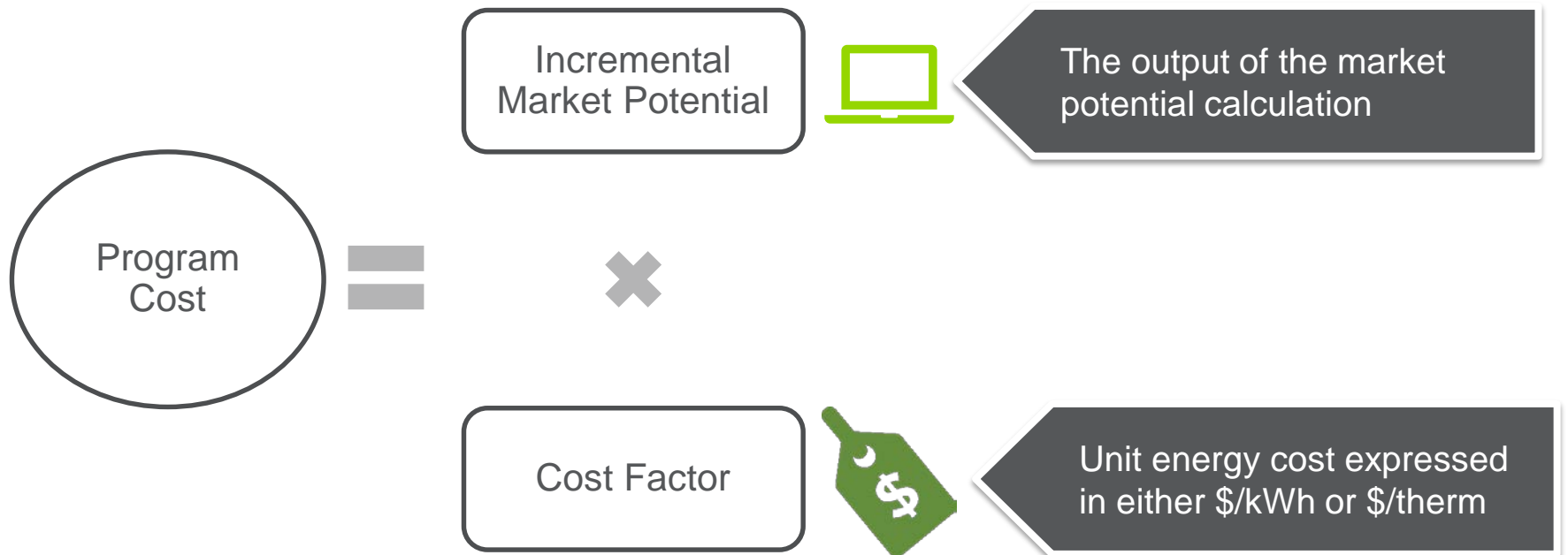




# DATA NEEDS– MARKET POTENTIAL



# DATA NEEDS – PROGRAM COST



# PROGRAM DATA AVAILABILITY

Sector	Program	Savings			Cost	Applicability	Participation Rate	Penetration Forecast	Data Updates
		kWh	therms	kW					
Residential	Audits*	●	●	●	⊗	●	●	●	✓
	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	●	●	●	●	●	●	⊗	✓
<b>Legend</b>									
●	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								

\* Program is newly added in the 2020 Potential & Goals Study.

# STAKEHOLDER ASKS

We have completed a thorough review of literature surrounding BRO programs which is included in the appendix to this presentation.


Are there any significant sources of evaluation data not included in the appendix list?

Our proposed list of BRO measures includes all programs for which we found sufficient data to include in the 2020 Potential & Goals Study.

\*Are there any additional programs that should be considered in the 2020 study? For any identified programs, please provide data sources for:

- › Population
- › Applicability
- › Energy Savings (kWh/therm)
- › Penetration
- › Cost

\* While we will make every effort to include additional programs for the 2020 P&G Study, decisions on final list will be made based on timeline and data availability.



**2019 P&G STUDY –  
LOW INCOME, CCA,  
REN, DAC**

# OVERALL APPROACH

- Low Income (LI), CCA, REN, Disadvantaged Communities (DAC) are new scope items to the P&G study
- LI savings are meant to model the potential from the Energy Savings Assistance (ESA) programs
- In the past, we forecasted savings in IOU distribution service territories; IOU potential was inclusive of savings for the CCA/RENs that fell within the IOU's

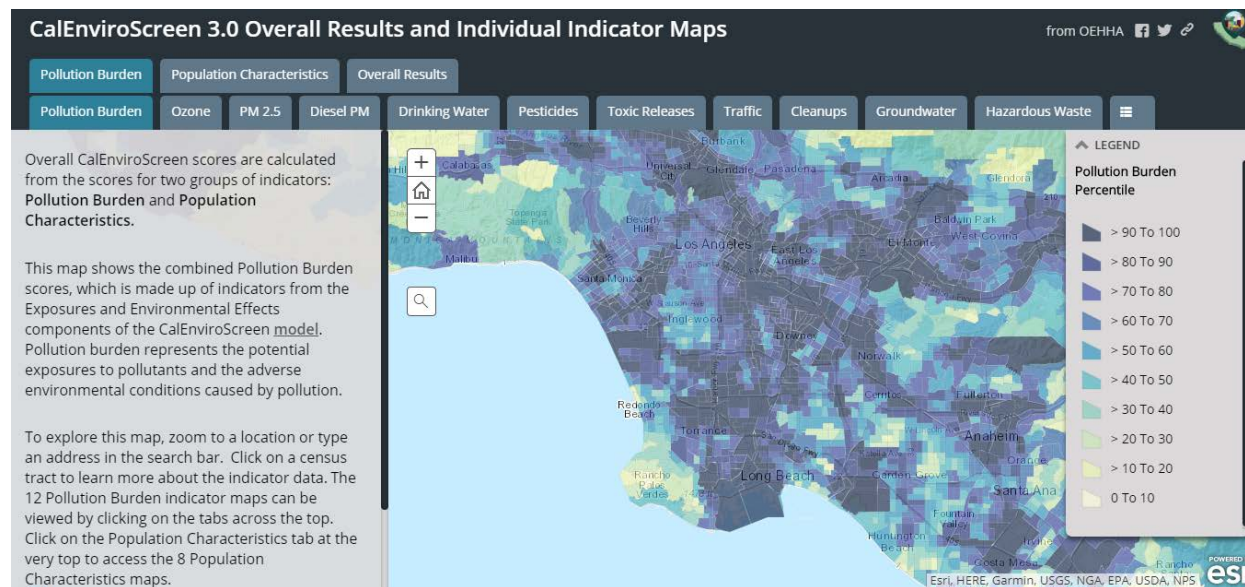
Low Income	CCA/REN/DAC
<ul style="list-style-type: none"><li>• Conduct a <b><u>bottom-up</u></b> forecast using the residential measure list</li><li>• Segment the Res population into LI and non-LI</li><li>• Collect LI-specific market data to inform forecast</li></ul>	<ul style="list-style-type: none"><li>• Conduct a <b><u>top-down disaggregation</u></b> of IOU level results</li><li>• Post processing step based on population and historic program savings data</li></ul>

# LOW INCOME SECTOR – UNIQUE CONSIDERATIONS

- **Measure Density and Saturation** – *Discussed earlier in Res/Com section*
- **Net-to-Gross Ratio** – ESA does not apply a NTG value, or rather assumes a NTG of 1.0.
- **Economic Potential** – ESA programs are not required to pass the TRC test; the traditional definition of economic potential in the P&G study may not apply
- **Incentives** – The Low Income Potential forecast will assume rebate is essentially 100% of equipment cost
- **Calibration Data** – The Low Income Potential forecast will be calibrated based on historic savings achieved by ESA at the end use level.
- **Re-participation** – CPUC Decision 16-11-022 allows IOUs to seek “retreatment” of Low Income Customers; the model will allow re-participation of measures that reach the end of their useful life.

# DISADVANTAGED COMMUNITIES

- Develop disaggregation factor to slice out the portion of each IOU's potential into what falls under DACs for their region
- DACs boundaries are defined by the CalEnviroScreen 3.0 tool
- Disaggregation factors will be informed by:
  - Population/energy consumption within the DACs
  - Historic EE savings within DACs





# CCAS AND RENS

- Develop disaggregation factor to slice out the portion of each IOU's potential into what falls under existing CCAs and RENS for their region
- Disaggregation factors will be informed by:
  - Population/energy consumption by CCA customers
  - Historic EE savings by CCA customers
  - Historic EE savings by RENS
- Do not currently plan to account for:
  - New CCAs
  - Expansion of existing CCAs
  - Expansion of REN budgets beyond current level

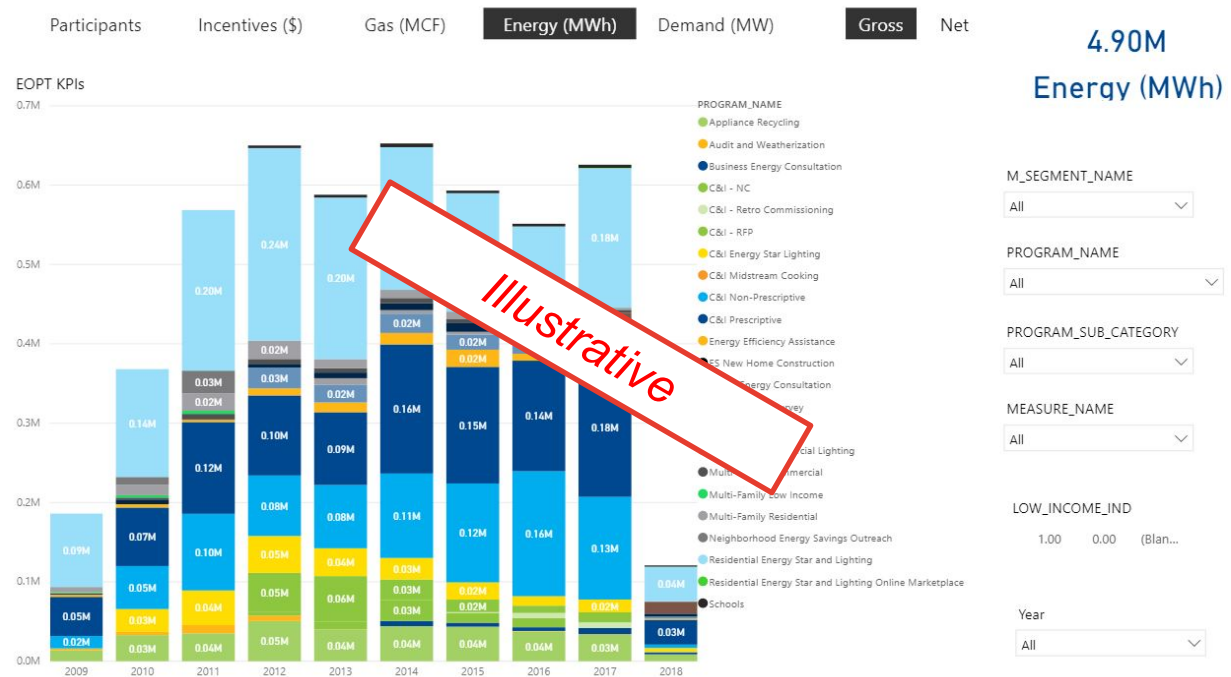
- What other available data can inform disaggregation of savings?
- If we should account for expansion, what reliable, vetted data is available to inform the forecast?



**2019 P&G STUDY –  
MODEL DELIVERY**

# MODEL DELIVERY AND RESULTS VIEWER OPTIONS

- Replace Excel-based Results Viewer with a more interactive platform such as:
  - Analytica Cloud Player
  - Microsoft's PowerBI
- Does not require downloading large files or the model!
- CPUC website can link to the dashboard, which users can easily access and manipulate to view results from the study.



- Any suggested/requested improvements relative to the last study in terms of how results are presented/disseminated?



## NEXT STEPS

# NEXT STEPS

- Comments on workplan due: January 18, 2019
- Access workplan and submit comments via the CPUC Public Document Archive (PDA): <https://pda.energydataweb.com/#!/documents/2118/view>
- Be on the lookout for invites to future stakeholder workshops

# CONTACTS

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# APPENDIX: BROS LITERATURE REVIEW SOURCES\*

## California Investor Owned Utilities

1. **PG&E. 2017.** *RTR for the Review and Validation of 2015 Pacific Gas and Electric Home Energy Reports Program Impacts (Final Report) (DNV GL, Calmac ID #CPU0155.01, ED WO #ED\_D\_Res\_3).* s.l. : California Public Utilities Commission, 2017. Calmac ID: CPU0155.01.
2. **SCE. 2017.** *RTR for the Review and Validation of 2015 Southern California Edison Home Energy Reports Program Impacts (Final Report) (DNV GL, Calmac ID #CPU0156.01).* s.l. : California Public Utilities Commission, 2017. Calmac ID: CPU0156.01.
3. **SDG&E. 2017.** *RTR for the Impact Evaluation of 2015 San Diego Gas & Electric Home Energy Reports and Manage-Act-Save Programs (Final Report) (DNV GL, Calmac ID #CPU0157.01).* s.l. : California Public Utilities Commission, 2017. Calmac ID: CPU0157.01.
4. **SCE, PG&E, SCG, SDG&E. 2017.** *RTR for the Universal Audit Tool Impact Evaluation-Residential.* s.l. : California Public Utilities Commission, 2017. Calmac ID #CPU0160.01, ED WO #ED\_D\_Res\_9.
5. **SCE, PG&E, SCG, SDG&E. 2017.** *RTR for the 2013-2015 Multifamily Property Manager Training: Impact and Outcome Study (Opinion Dynamics, Calmac ID #CPU0180.01, ED WO #ED\_O\_WET\_).* s.l. : California public utilities commission, 2017. Calmac ID #CPU0180.01.
6. **SCE, PG&E, SCG, SDG&E. 2017.** *California Industrial SEM Design Guide. VERSION 1.0, FEBRUARY 8, 2017, VERSION 1.0, (Sergio Dias Consulting LLC) FEBRUARY 8, 2017*
7. **SCE, PG&E, SCG,, SDG&E. 2017 .** *Responses to comments that were posted concerning the Strategic Energy Management program design and EMV guides. February 13, 2017*
8. **SCE, PG&E, SCG,, SDG&E. 2017.** *California Industrial SEM Design Overview, RELIMINARY DRAFT VERSION 0.7A (Sergio Dias Consulting LLC) JANUARY 9, 2017*
9. **SCE, PG&E, SCG, SDG&E. 2015.** *RTR-PY2013-2014 California Energy Efficiency and Demand Response Residential Behavior Market Characterization Study Report.* s.l. : California Public Utilities Commission, 2015. Calmac ID: CPU0109.01.
10. **PG&E. June 5, 2015.** *Comments on EM&V 2013-2014 Draft Energy Efficiency and Demand Response Residential Behavior Market Characterization Study Report.* s.l. : California Public Utilities Commission, June 5, 2015.

## California Regulatory Bodies:

1. **Research into Action. August 31, 2018.** *Step up and Power down Evaluation of Commercial and Residential Initiatives Final Report.* s.l. : California Public Utilities Commission, August 31, 2018. CALMAC Study ID PGE0423.01.

\* Sources listed represent sources reviewed since the prior 2018 Potential & Goals Study. Sources reviewed for 2018 study are not included in this list.

# APPENDIX: BROS LITERATURE REVIEW SOURCES\*

## Behavior Energy and Climate Conference (BECC)

1. Kontokosta, Constantine E. and Spiegel-Feld, Danielle and Papadopoulos, Sokratis, 2018. "Do Mandatory Energy Audits Reduce Building Energy Use?: A Bayesian Analysis of New York City's Local Law 87" (October 31, 2018). Available at SSRN: <https://ssrn.com/abstract=3275809> or <http://dx.doi.org/10.2139/ssrn.3275809>
2. Brannan, Debbie. 2018. "Energy-Saving Tweaks: A Viable Solution?" Presentation at the 2018 BECC Conference. Available at: [https://beccconference.org/wp-content/uploads/2018/10/brannan\\_presentation2018.pdf](https://beccconference.org/wp-content/uploads/2018/10/brannan_presentation2018.pdf)
3. Nelson, Hal; Bjurstron, Sean; Rustamov, Galib; Chen, Caroline; Tabizon, Larry and Jose Buendia. 2018. "Mass-Scale, Multi-Family Benchmarking and Conservation Lessons from a Behavioral Energy and Water Competition Pilot." Proceedings of the 9th international conference on Energy Efficiency in Domestic Appliances and Lighting. European Commission: Ispra, Italy.
4. Perry, Lisa; Patterson, Olivia; and Ann Collier. 2018. "Two for the Price of One? Integrating Small Business EE and DR." Presentation at the 2018 BECC Conference. Available at: [https://beccconference.org/wp-content/uploads/2018/10/perry\\_presentation2018.pdf](https://beccconference.org/wp-content/uploads/2018/10/perry_presentation2018.pdf)
5. Malinick, Todd. 2018. "Assessment of PG&E's Online Marketplace." PG&E's Emerging Technologies Program - Project Number ET14PGE1731. (April 6, 2018).
6. Henderson, Gina and Anne West. 2018. "Continuous Energy Improvement in Schools: A Collaborative Approach." Presentation at the 2018 BECC Conference. Available at: [https://beccconference.org/wp-content/uploads/2018/10/henderson\\_presentation2018.pdf](https://beccconference.org/wp-content/uploads/2018/10/henderson_presentation2018.pdf)
7. Steiner, Ellen. 2018. "PG&E Architecture at Zero Competition Evaluation." Presentation at the 2018 BECC Conference.

## American Council for an Energy-Efficient Economy (ACEEE)

1. Hayes, Julie; Bunzendahl, Elly; Jirikovic, Tashina; Stewart, Clint; and McGregor Snow. 2018. "Applying Strategic Energy Management to Multi-Family." Proceedings of the ACEEE Summer Study on Energy Efficiency in Buildings. Washington, DC: ACEEE..
2. Hirayama, Sho; Tsurusaki, Takahiro; Nakamura, Mikiko; Yaw, Ruo Lin; Kikuchi, Jun; and Ayaka Tokuta. 2018. "Do Smart Thermostats + Nudges Yield Greater Energy Savings." Proceedings of the ACEEE Summer Study on Energy Efficiency in Buildings. Washington, DC: ACEEE.
3. Calas, Guillaume; and Kimberly Conley. 2018. "Why Redesign a Mature Home Energy Report Program?" Proceedings of the ACEEE Summer Study on Energy Efficiency in Buildings. Washington, DC: ACEEE.
4. Calas, Guillaume; Conley, Kimberly; Wayland, Stefanie; and Olivia Patterson. 2018. "Leveraging HER Analytics: Data Driven Approaches to Informing Program Redesign by Understanding Participant Performance." Proceedings of the ACEEE Summer Study on Energy Efficiency in Buildings. Washington, DC: ACEEE.
5. Vetromile, Julia; Canseco, Jennifer; Rudyk, Michael; Degens, Phil; and Michael Noreika. 2018. "Persistence is not futile: Assessment of persistence of operations, maintenance, and behavioral measures in commercial and industrial sectors." Proceedings of the ACEEE Summer Study on Energy Efficiency in Buildings. Washington, DC: ACEEE.

\* Sources listed represent sources reviewed since the prior 2018 Potential & Goals Study. Sources reviewed for 2018 study are not included in this list.



# APPENDIX: BROS LITERATURE REVIEW SOURCES\*

## Navigant Studies

1. **Navigant. January 25, 2016.** Brookshire Gas Home Energy Report Program Evaluation. s.l. : Massachusetts Program Administrators and the Energy Efficiency Advisory Council, January 25, 2016.
2. **Navigant. July 20, 2016.** ComEd Home Energy Report Program Decay Rate and Persistent Study Year 2. s.l. : Commonwealth Edison, July 20, 2016.
3. **Navigant, December 16, 2016.** Gas Strategic Energy Management (SEM) Evaluation Report; ComEd and Nicor December 16, 2016.
4. **Navigant. April 27, 2017.** Home Energy Report Program 2016 evaluation report. s.l. : AEP Ohio, April 27, 2017.
5. **Navigant. April 30, 2018.** Home Energy Report Program 2017 Evaluation Report. s.l. : AEP Ohio, April 30, 2018.
6. **Navigant. August 14, 2018.** Peoples Gas and North Shore Gas Residential Energy and Outreach Program Impact Evaluation for Home Energy Reports Program. s.l. : People's Gas and North Shore Gas, August 14, 2018.
7. **Navigant. August 28, 2018.** WGL Maryland: 2017 Energy Efficiency Impact Evaluation Report. s.l. : Washington Gas, August 28, 2018.
8. **Navigant. July 26, 2017.** WGL Virginia: Home Energy Reports Program Impact Evaluation Program Year 7 May 2016-April 2017. s.l. : Washington Gas, July 26, 2017.
9. **Navigant. June 20, 2018.** WGL Virginia: home energy reports program year 8 impact evaluation report for May 2017-April 2018. s.l. : Washington Gas, June 20, 2018.
10. **Navigant. March 2, 2018.** ComEd and Nicor Gas Strategic Energy Management Program Impact Evaluation Report; ComEd and Nicor Gas March 2, 2018

## Out-of-state Utilities Regulatory Bodies

1. **CenterPoint Energy. May 1, 2017.** Energy Efficiency Program Portfolio Annual Report 2016 Program Year. s.l. : CenterPoint Energy Arkansas, May 1, 2017.
2. **CenterPoint Energy. May 1, 2018.** Energy Efficiency Program Portfolio Annual Report 2017 Program Year. s.l. : CenterPoint Energy Arkansas, May 1, 2018.
3. **ComEd. December 16, 2016.** ComEd And Nicor Gas Strategic Energy Management Evaluation Report Electric Plan Year 8 (EPY8) / Gas Plan Year 5 (GPY5) (EPY8) / Gas Plan Year 5 (GPY5) (6/1/2015-5/31/2016). s.l. : ComEd and Nicor Gas, December 16, 2016.
4. **Puget Sound Energy. 2017.** 2016-2017 Biennial Conservation Report. s.l. : Puget Sound Energy, 2017.

\* Sources listed represent sources reviewed since the prior 2018 Potential & Goals Study. Sources reviewed for 2018 study are not included in this list.

# APPENDIX: BROS LITERATURE REVIEW SOURCES\*

## Public Third-party Evaluations

1. **DNV-GL. May 5, 2017.** Impact Evaluation of 2015 Marin Clean Energy Home Utility Report Program (final report). s.l. : California Public Utilities Commission, May 5, 2017. CALMAC Study ID: CPU0158.01.
2. **Opinion Dynamics. November 2017.** 2013-2015 Multifamily Property Manager Training: Impacted Outcome Study. s.l. : California Public Utilities Commission, November 2017. CALMAC ID: CPU0180.01.
3. **Opinion Dynamics. April 14, 2015.** Energy Efficiency and Demand Response Residential Behavior Market Characterization Study Data Collection and Calculations. s.l. : California Public Utilities Commission, April 14, 2015.
4. **Opinion Dynamics. May 5, 2017.** Impact and Process Evaluation of 2015 Ameren Illinois Company Behavioral Modification Program. s.l. : Ameren Illinois, May 5, 2017.
5. **Opinion Dynamics. July 1, 2015.** PY2013–2014 California Energy Efficiency and Demand Response Residential Behavior Market Characterization Study Report Volumes One and Two. s.l. : California Public Utility Commission, July 1, 2015. CALMAC Study ID: CPU0109.01.
6. **Cadmus. February 10, 2017.** Evaluation of the Southern California Edison 2015 Energy Efficiency Survey Program. s.l. : California Public Utilities Commission, February 10, 2017.
7. **Nexant. September 21, 2015.** Comparison of Methods for Estimating Energy Savings for Home Energy Reports. s.l. : PG&E, September 21, 2015.
8. **Nexant. May 9, 2016.** Seattle City Light 2014-2015 Home Energy Report Program Impact Evaluation. Seattle City Light : s.n., May 9, 2016.

\* Sources listed represent sources reviewed since the prior 2018 Potential & Goals Study. Sources reviewed for 2018 study are not included in this list.