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Opinion Dynamics

DNV·GL

Market Studies, BROs, & Low Income

2021 Potential and Goals

October 8, 2020

Agenda

01 Introduction

02 Market Adoption Study*

03 Industrial and Agricultural Study

04 BROs Approach

05 Low Income Analysis

06 Closing

*5 minute break afterward

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Conference Call Etiquette During Q&A Sessions

- We know everyone is working from home, background noise if you are speaking is inevitable.
- BUT please mute yourself when you aren't speaking.
- Please do not place the line on hold.
- We are actively monitoring the chat window; consider submitting questions/comments via chat.

CPUC EE Potential & Goals Study Team

- **Coby Rudolph**, Project Lead
- **Genesis Tang**
- **Lisa Paulo**
- **Jessica Allison**
- **Peter Franzese**
- **Travis Holtby**
- **Paula Gruendling**, Project Supervisor

Two EE Potential & Goals Tracks

1. Goals-adoption Policymaking Track (Policy Track):

Formal comments via EE rulemaking proceeding. Topics have included:

- Energy efficiency portfolio objectives and Goals metrics
- Energy efficiency / IRP Integration Opportunities
- Cost-effectiveness questions, treatment of non-resource programs and budget approval
- Prioritization & other issues

2. Potential and Goals Study Track (Study Track):

Informal work on the EE Potential & Goals Study.

- CPUC Energy Division staff (along with Guidehouse) is soliciting ongoing, informal feedback from stakeholders on methodological and technical issues related to the Study.
- As in previous studies, stakeholder engagement on technical will take place in coordination with the CEC's Demand Analysis Working Group (DAWG).

EE Potential & Goals Background

Potential and Goals Study serves multiple purposes:

1. PG Study informs the CPUC Decision adopting IOU Energy Efficiency Goals.

2. EE Goals inform the statewide Demand Forecast (& IRP), SB 350 forecast.

Potential & Goals Next steps (Subject to Change)

Activity	Track / Venue	When
ALJ Kao Ruling Questions (from 3/12/20)	Policy / formal comment	Completed
Study launch Workshop & Workplan	Study / informal comment	Completed
Measure characterization, data inputs	Study / informal comment	June 2020 DAWG mtg
Modeling	Study / informal comment	July 2020 DAWG mtg
Market studies, BROs, Low Income analysis	Study / informal comment	Today
Scenarios, Top-down scoping	Study / informal comment	Q3/Q4 2020
EE/DR/IRP Integration, Locational post-processing, Draft results	Study / informal comment	Q1 2021
Proposed Decision on Goals Adoption for 2022 and Beyond	Policy / formal comment	Q2 /Q3 2021
Decision on Goals Adoption for 2022 & Beyond	Policy / formal comment	Q3 2021
Additional Policy Activities TBD	Policy / formal comment	TBD

Complete / Nearly complete

Speakers Today

Amul Sathe
Project Director
Guidehouse

Tyler Capps
Modeling Team Lead
Guidehouse

Vania Fong
Modeling Support
Guidehouse

Melanie Munroe
Market Adoption Characteristics Study Lead
Opinion Dynamics Corporation

Christopher Dyson
Industrial and Agricultural Measure Study Lead
DNVGL

Dustin Bailey
Industrial and Agricultural Lead
Guidehouse

Brian Chang
Behavioral, Retrocommissioning, and Operational Efficiency Lead
Guidehouse

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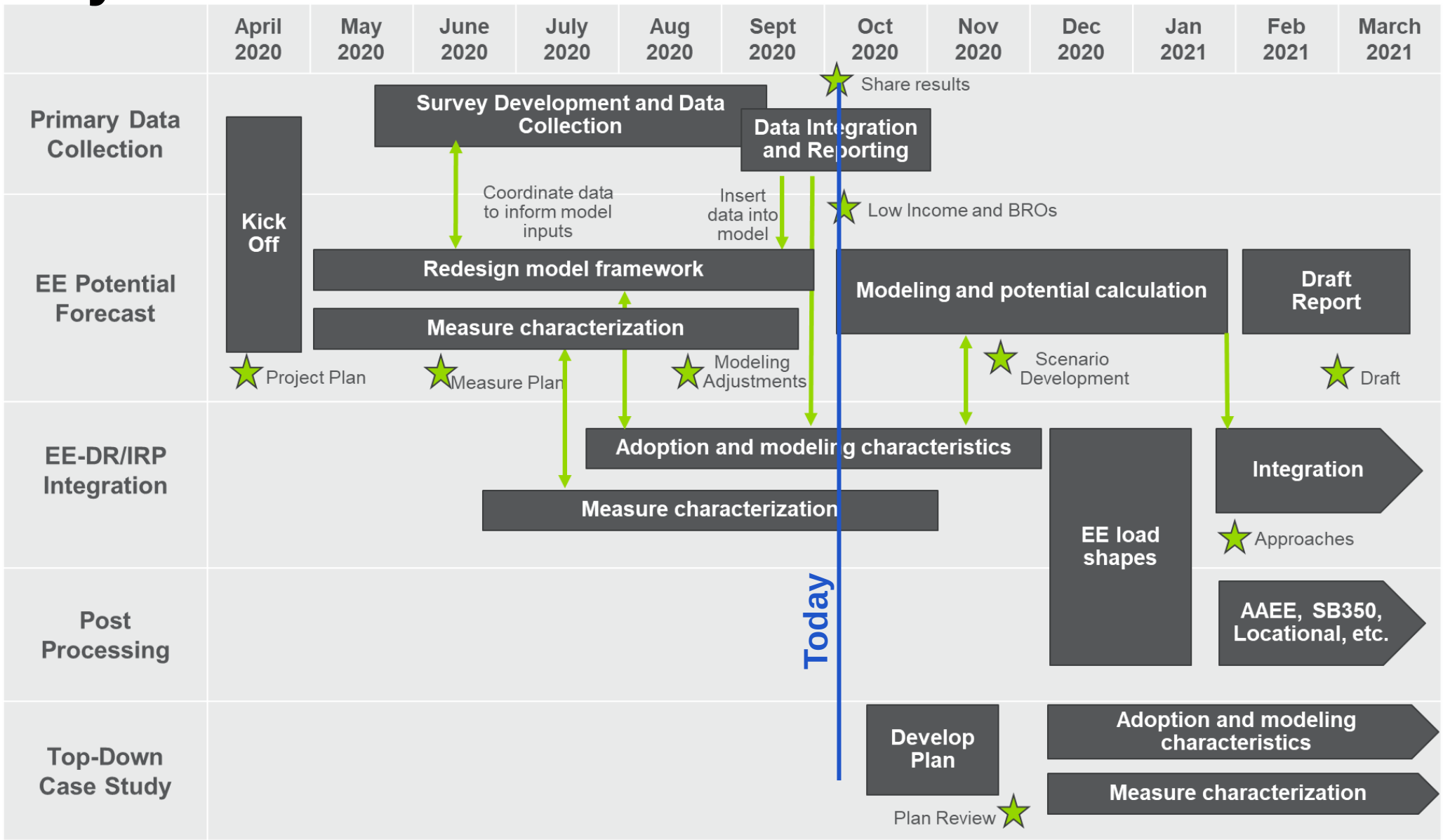
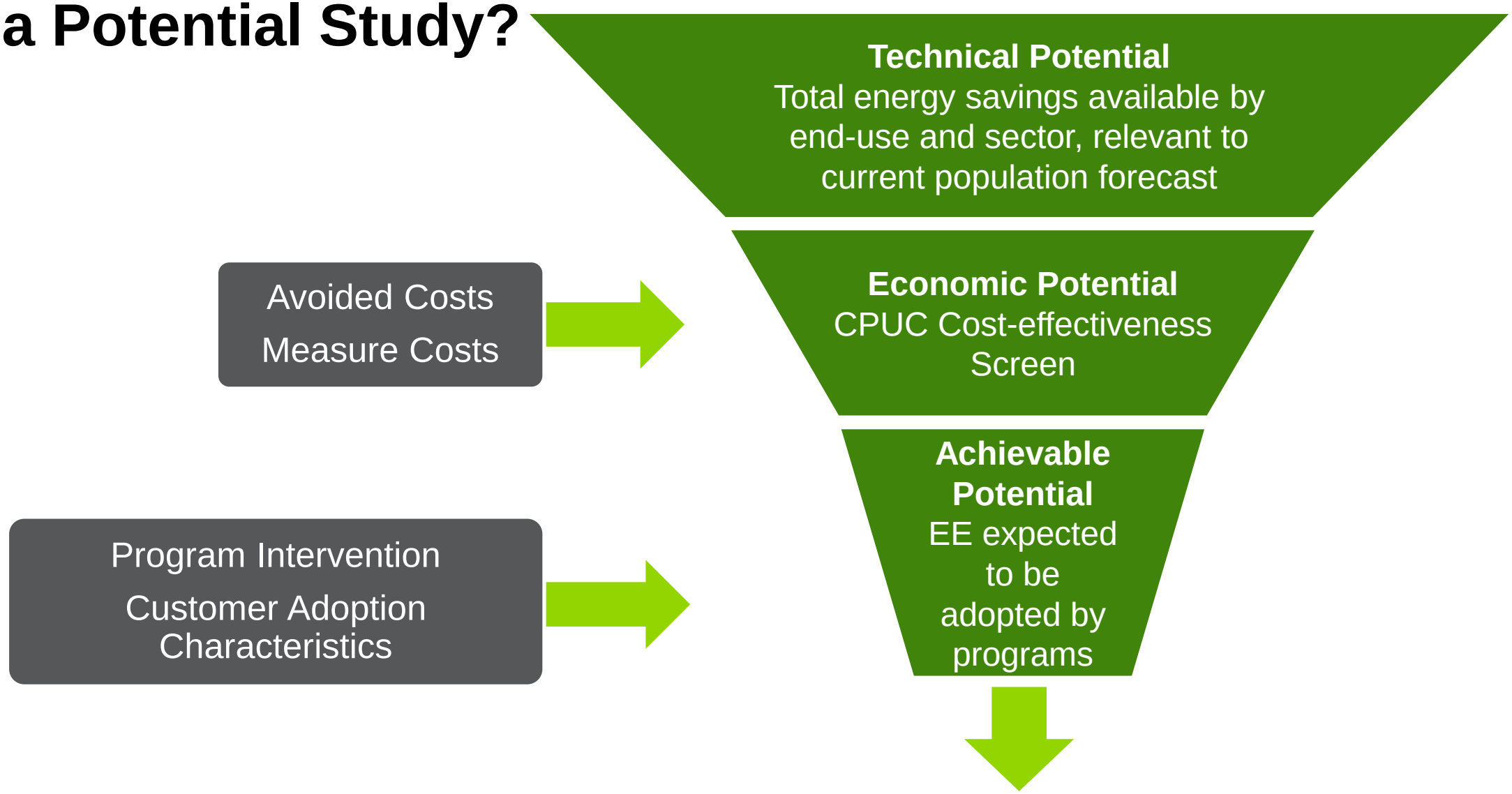
PG Study Workflow



What is a Potential Study?



Objectives for today

PG study data integration and additional components

- Market Adoption Study Findings
- Ind/Ag Measure Characterization Study Findings
- Incorporation of Market Studies to Model
- Behavior, Retrocommissioning, and Operational Efficiency (BROs) Plan Overview
- Low-Income Analysis Overview

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Market Adoption Study Findings

Stakeholder Presentation

Melanie Munroe, Opinion Dynamics

Introduction

- **Discussion topics:**
  - Study objectives
  - Survey methods and results
  - Value factor metrics

Market Study Survey Objectives

Impetus for Updating Adoption Logic

- Historically, the model primarily considered levelized measure cost to inform EE adoption

- Stakeholder feedback from *Approaches for Assessing Energy Efficiency Potential & Goals Workshop* (October 2019)
  - Economics is not the only driver of adoption behavior, and in some cases, it may not even be the primary driver
  - Suggestions to study customer behavior and preferences

- Research outlines the importance of social and behavioral insights in modeling adoption of EE
  - Understanding of non-rational decision making
  - Other program features impact adoption beyond financial incentives

Market Adoption Study Objectives

- Consider a broader set of customer preferences on economic and noneconomic factors when modeling energy efficient technology adoption
- Collect residential and commercial customer characteristics, attitudes, and behaviors (value factors) to inform reported adoption decision-making
  - Energy Efficiency
  - Fuel Substitution
  - Demand Response
- Combine customer preferences and technology characteristics to determine market share within customer groups

Single Family, Multifamily, and Commercial Survey Methods and Results

Single-Family Survey Methods & Response Rate

- Mail-push-to-web survey approach
  - Survey invitation letter with web link
  - Email & postcard reminders with web link
  - Inbound phone option for those who didn't want to complete on web
- Fielded July 20 – September 4 and offered $10 gift card to respondents
- Sample of 7,475 California residents stratified proportionally by IOU
- 14% Response Rate (n=598)
- Must be non-low-income, must reside in home with 4 or fewer units, and must have responsibility in decisions about energy using equipment
- To reduce the potential for bias, we:
  - Mailed survey letters so as not to exclude those without an email address on record
  - Stratified the sample proportionally by IOU and applied weights
  - Weighted on age, income, education, race, and gender to offset any under- or over-represented groups

Single-Family Survey Topics and Measures

- Survey questions about:
  - Program awareness
  - Purchase decision-making, barriers, and attitudes about EE, DR, and fuel switching measures
  - COVID-19 impacts
  - Demographics and household characteristics

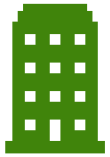
- Measures asked about in the survey:
  - High touch: refrigerator, clothes dryer, or smart thermostat
  - Low touch: furnace, central AC, insulation, water heater
  - DR: smart thermostat
  - Fuel switching: furnace and water heater
- Respondents assigned to be asked about one high touch measure, one low touch measure, one fuel switching measure, and one demand response program

Single-Family Segmentation Clusters

- Used Latent Class Analysis, a statistical method, to identify four attitudinal-based clusters
  - The attitudinal inputs included values related to environmental preservation, energy use and conservation, purchasing decisions, social signaling, and perceived financial wellbeing)

Cluster	Size	Description
Average Americans	50%	Attitudes and values are normally distributed (does not strongly skew in either direction on most items)
Eager Adopters	20%	Believes strongly in environmental issues, wants to save energy, and has the financial means to afford energy upgrades
Likely Laggards	19%	Not very concerned with environmental issues, saving energy, or social signaling; fairly apathetic
Economically Strained Environmentalists	11%	Extremely concerned with environmental issues, however efficiency upgrades can be out of financial reach, so desire to save energy is both altruistic and pragmatic; social signaling is important

Multifamily Survey Methods & Response Rate



- Mail-push-to-web survey approach
  – Survey invitation letter with web link
  – Postcard reminders with web link
- Fielded August 4 – August 28 and offered $25 gift card to respondents
- Sample of 3,030 multifamily building owners & property managers in California stratified proportionally by IOU
- 8% Response Rate (n=104)
- Must have 5 or more market rate units at the property and must have responsibility in decisions about energy-using equipment in units
- To reduce the potential for bias, we:
  – Mailed survey invitations so as not to exclude those without an email address on record
  – Stratified the sample by IOU and applied weights.

Multifamily Survey Topics and Measures

- Survey questions about:
  - Program awareness
  - Purchase decision-making, barriers, and attitudes about EE, DR, and fuel switching measures
  - COVID-19 impacts
  - Property and equipment characteristics

- Measures asked about in the survey:
  - Minor investment: refrigerator and smart thermostat
  - Major investment: insulation and water heater
  - Fuel switching: water heater
- Respondents assigned to be asked about one minor and one major measure

Commercial Survey Methods & Response Rate

- Mail-push-to-web survey approach
  - Survey invitation letters and emails with web link
  - Postcard & email reminders with web link
- Fielded August 7 – September 4 and offered a $25 gift card to respondents
- Sample of 19,270 commercial customers in California stratified by size (2/3 small/med and 1/3 large) based on annual energy usage (large = 300,000+ kWh/year) and proportionally by IOU
- 7% Response Rate (n=757)
- Must be a business segment other than industrial, agricultural, or governmental, must not be permanently closed, must have responsibility in decisions about energy-using equipment in the facility
- To reduce the potential for bias, we:
  - Mailed survey invitations so as not to exclude those without an email address on record
  - Stratified by Large and Small/Medium based on annual energy usage and proportionally by IOU, and applied weights

Commercial Survey Methods & Response Rate

- Survey questions about:
  - Program awareness
  - Purchase decision-making, barriers, and attitudes about EE, DR, and fuel switching measures
  - COVID-19 impacts
  - Firmographics and facility and equipment characteristics

- Measures asked about in the survey:
  - Minor investments: smart power strip, PC power management, smart thermostat, occupancy sensor
  - Major investments: refrigeration display case/storage unit, water heater, insulation, EMS
  - DR measure: smart thermostat and EMS
  - Fuel switching measures: water heater
- Respondents assigned to be asked about one minor measure, one major measure, one fuel switching measure, and one demand response program

Commercial Segments

Segment	Small* (n = 425)	Large* (n = 332)	Total Count (n = 757)	Total Percent
Office	137	103	240	32%
Retail	85	63	148	20%
Other	92	48	140	19%
Health	65	37	102	13%
Restaurant	43	55	98	13%
Warehouse	47	32	79	10%
Lodging	28	22	50	7%
School	20	19	39	5%
Grocery	16	14	30	4%
College	5	4	9	1%

* Size based on energy usage where large = annual usage of at least 300,000 kWh/year. When size is based on reported annual revenue and/or number of employees, 70 (9%) were large and 687 (91%) were small/medium

Value Factor Metrics from Surveys

Value Factor Descriptions

- Customers' considerations when making energy efficient equipment purchase decisions that can influence their willingness to make the purchase

  – Lifetime Costs: importance of long-term energy costs/savings of the equipment
  – Upfront Costs: importance of initial out-of-pocket price of equipment
  – Eco Impacts: importance of environmental impacts from energy consumption
  – Social Signals: importance of being perceived as environmentally/socially responsible
  – Hassle Factor: importance of ease/difficulty, convenience/inconvenience of installing/operating equipment
  – Non-consumption Performance: importance of non-energy benefits, aesthetics, features

- Mean scores will be reported across EE, DR, and fuel switching measures by segment
  – 1 to 5 scale where 1 means not at all important and 5 means very important in decision making.

DRAFT Residential Value Factors For All EE Measures

NOTE: Preliminary, unadjusted results. Further analysis/adjustments are pending.

Segment	Lifetime Costs	Upfront Costs	Hassle Factor	Eco Impacts	Social Signals	Non-Consumption Performance
Average Americans	18%	14%	16%	21%	15%	16%
Eager Adopters	18%	11%	15%	24%	16%	15%
Likely Laggards	18%	14%	18%	18%	16%	16%
Economically Strained Environmentalists	17%	15%	16%	21%	17%	14%
SF Total	18%	13%	16%	21%	16%	16%
MF Total	16%	14%	17%	21%	18%	14%

DRAFT Commercial Value Factors All EE Measures

NOTE: Preliminary, unadjusted results. Further analysis/adjustments are pending.

Segment	Lifetime Costs	Upfront Costs	Hassle Factor	Eco Impacts	Social Signals	Non-Consumption Performance
Office	18%	12%	16%	21%	18%	15%
Retail	18%	14%	17%	20%	17%	15%
Other	18%	14%	15%	21%	18%	14%
Health	18%	12%	17%	21%	18%	15%
Restaurant	17%	13%	16%	21%	18%	15%
Warehouse	18%	13%	16%	21%	18%	14%
Lodging	18%	12%	15%	21%	19%	15%
School	18%	12%	16%	20%	18%	15%
Grocery	17%	14%	16%	18%	18%	16%
College	18%	12%	16%	21%	18%	14%
Small/Medium	18%	13%	16%	20%	18%	15%
Large	18%	13%	17%	21%	19%	15%
Total	18%	13%	16%	20%	18%	15%

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Leveraging Market Study Results

Stakeholder Presentation

Vania Fong and Dustin Bailey, Guidehouse

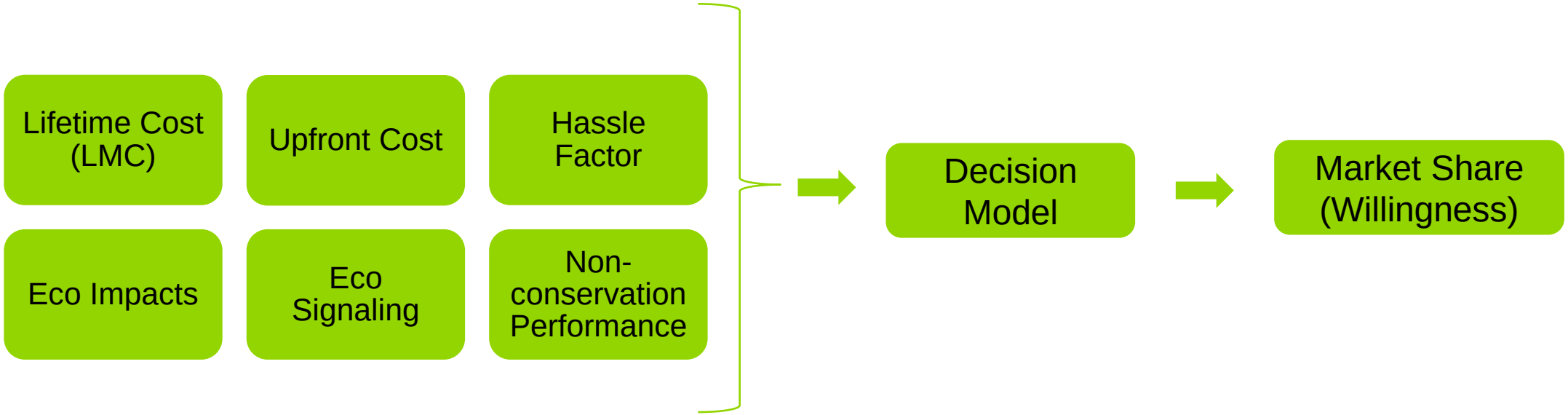
Introduction

- **Discussion topics:**
  - Willingness Calculation
  - Logic Flow
  - Impacts of DR and FS

2021 Study - Update to Willingness Calculation – Res/Com

Updating the Decision Model to include <u>Multiple Attributes</u>

- Accounts for factors beyond LMC in adoption decisions
- Will be informed by primary data collection from the parallel market studies



- Industrial/Agriculture modifications are still under development

Market Study Integration

Logic Flow

Survey Results to Model Inputs

Survey	Aggregation	Input Generation	Adoption Calculation
Field Survey	Aggregate Survey Responses	Create Customer Preference Weightings	Calculate Market Share
• 20-minute, online-based survey administered by Opinion Dynamics	• Program Awareness • Customer Cluster • Technology Group	• Aggregate survey responses to generate customer preference weightings	• Combine customer preferences and technology characteristics to determine market share within competition groups
		Compute Technology Characteristic Utility	
		• Quantify characteristics that differ across technologies and drive differences in adoption behavior	

Provided by ODC

Calculated in model

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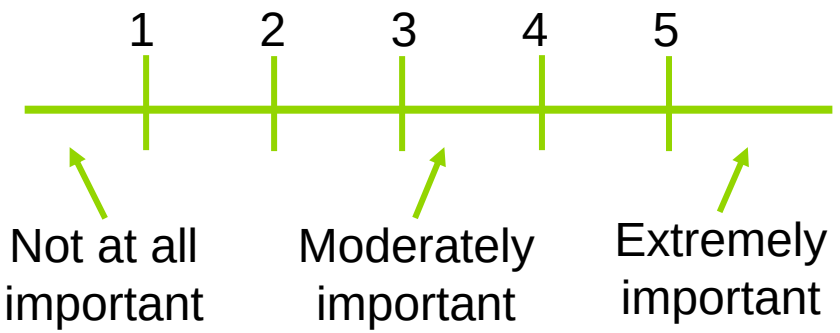
Aggregate Survey Responses

- Survey responses will be aggregated over each combination of the following dimensions

Program Awareness	Customer Cluster	Technology Group	Value Factor
EE	Average Americans	High Touch/Low Touch	Lifetime Cost (LMC)
DR Only	Eager Adopters		Upfront Cost
EE+DR	Likely Laggards		Hassle Factor
	Economically Strained Environmentalists		Eco Impacts
			Eco Signaling
			Non Conservation Performance

- We will apply an ordinal-to-metric transformation to the responses before calculating the average



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Create Customer Preference Weighting

Create Customer Preference Weighting

- Convert transformed responses for each technology attribute to relative weightings (0-100%) that indicate the importance of each technology characteristic in determining adoption
- Values can be interpreted as percentage of decision driven by each technology characteristic

$$\frac{Average\ Transformed\ Response\ (for\ Tech\ Attribute)}{Sum\ of\ Average\ Response\ (of\ all\ Tech\ Attributes)}$$

Technology Group and Awareness Group combination

Technology Attributes	Average Transformed Response: Sample Customer Group	Preference Weighting: Sample Customer Group
Lifetime Cost (LMC)	3.5	18%
Upfront Cost	2.6	13%
Hassle Factor	3.2	16%
Eco Impacts	4.1	21%
Eco Signaling	3.1	16%
Non Conservation Performance	3.1	16%
Total		*100%*

Illustrative

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Customer Weightings Impacted by DR and FS

- Preliminary, unadjusted results

Survey Topics	EE	DR	EE + DR	FS	EE + FS
Attribute	***Customer Preference Weighting***	***Attributes Asked About***	***Customer Preference Weighting***	***Attributes Asked About***	***Customer Preference Weighting***
Lifetime Cost (LMC)	18%	Y	20%	Y	15%
Upfront Cost	13%	Y	35%	Y	15%
Hassle Factor	16%	Y	15%	Y	35%
Eco Impacts	21%		15%	Y	15%
Eco Signaling	16%		10%		5%
Non-conservation performance	16%	Y	5%	Y	15%
Total	**100%**		**100%**		**100%**

Illustrative

Compute Technology Characteristic Utility

- Use measure characterization data and subject matter knowledge to develop a numerical or binary value for each characteristic for each measure
- Convert to a dimensionless “utility” value by dividing by the average over the competition group (CG). Can be interpreted as the relative value of the measure compared to the other CG measures

Attributes	Characteristic Value
Lifetime Cost (LMC)	NPV of All Costs ($)
Upfront Cost	Upfront Cost ($)
Hassle Factor	Labor Cost ($)
Eco Impacts	Energy Consumption (kWh, Therms)
Eco Signaling	Energy Consumption (kWh, Therms)
Non Conservation Performance	1 = High Touch 0 = Low Touch

Formula

$$Utility_{Attribute}(Measure) = \left(\frac{Characteristic\ Value\ (for\ measure)}{Average\ Characteristic\ Value\ (across\ CG)}\right)$$

Example

$$Utility_{LMC}(LED) = \left(\frac{\$400}{Average(\$400, \$100, \$500)}\right) = 1.2$$

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Variation Across Dimensions

- The table indicates if customer preference weightings and technology characteristics vary across each modeling dimension

	Program Awareness	Customer Cluster	Technology Group	Value Factor	Measure
Customer Preference Weights	x	x	x	x	
Technology Characteristics	x*			x	x

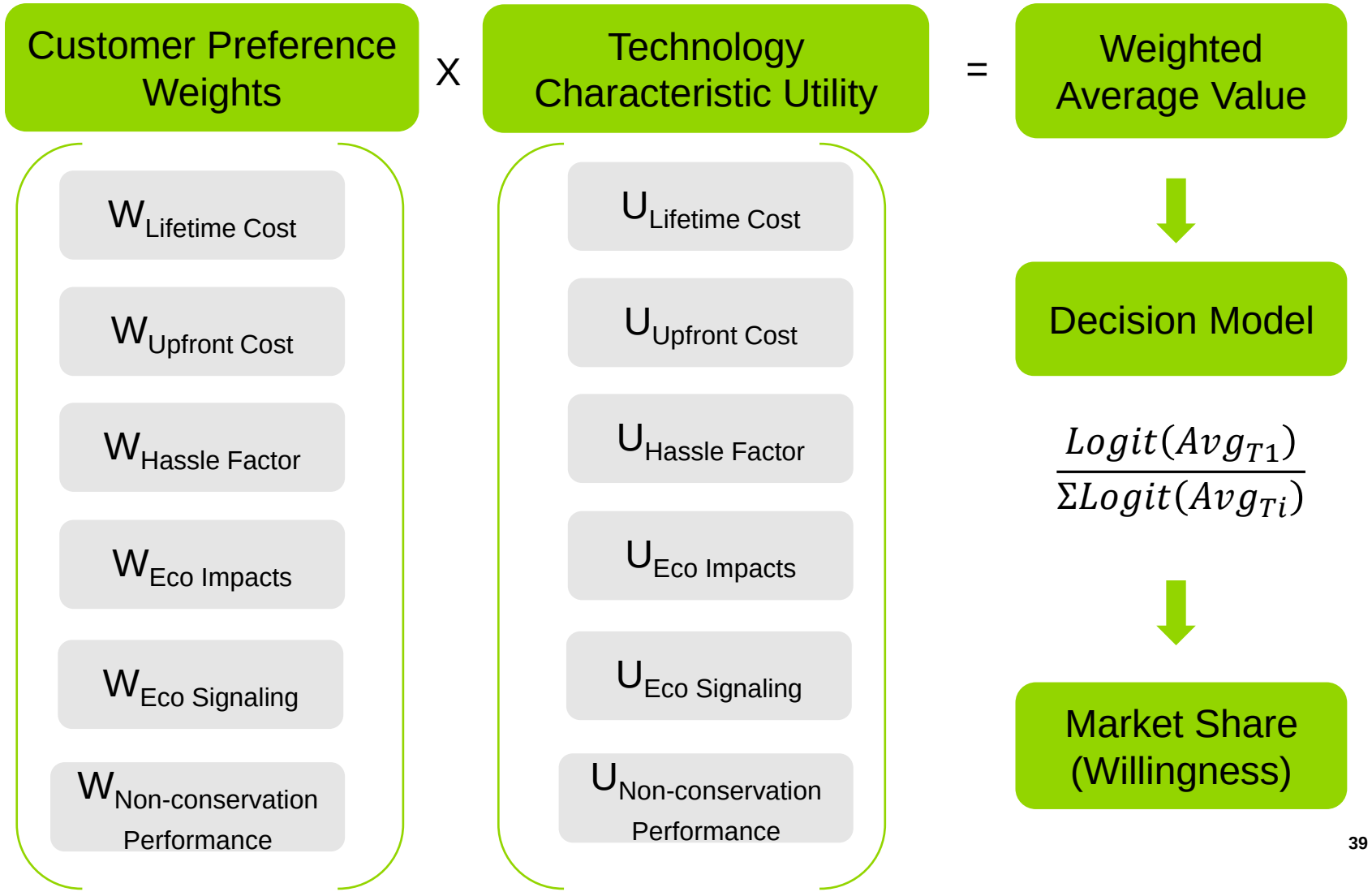
*Example: Customers only aware of EE programs would make decisions based on only EE benefit streams, whereas customers aware of both EE and DR would decide based on EE+DR benefit streams

Market Share Calculation

- Use customer preference weights to calculate weighted average of relative technology characteristics for every measure
- Feed weighted value into decision model to calculate market share

Measure and Customer Group Level

Competition, Program Awareness, and Customer Group Level



Market Share Calculation Example

Sample Customer Group

Customer Preference Weights

X

Sample Measures

Technology Characteristic Utility

=

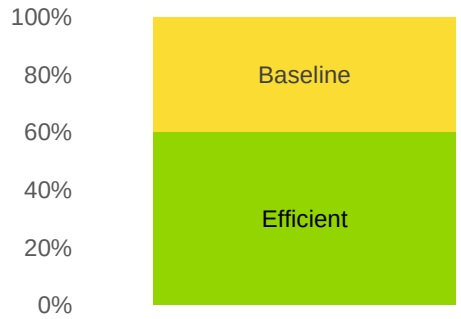
Sample Competition Group

Weighted Averages: 0.90, 0.97

	Customer Preference Weights	Efficient	Baseline
Lifetime Cost	18%	1.2	0.6
Upfront Cost	13%	1.7	0.3
Hassle Factor	16%	1.2	0.9
Eco Impacts	21%	0.2	1.4
Eco Signaling	16%	0.2	1.4
Non-conservation Performance	16%	1	1

Illustrative

Decision Model → Market Share (Willingness)



Industrial and Agricultural Market Study Findings

Stakeholder Presentation

Christopher Dyson, DNV GL

Introduction

- **Discussion topics:**
  - Research Objectives, Subsector Targets
  - EE Technology/ System Identification
  - Market Penetration Estimation

- Key questions for stakeholders:
  - *What considerations or other studies that may exist to supplement the finding, especially when it comes to measure cost?*

Research Objectives, Subsector Targets

Research Objectives

- Identifying up to 3 technologies/systems with greatest potential for future energy savings in 6 prioritized subsectors
- Quantifying market penetration of selected technologies/systems
- Determining factors preventing their wider adoption including whether customers opt for other demand-side options such as self-generation
- Projecting customer willingness to adopt EE technologies w/ and w/o program interventions

Measure characterization and market penetration forecasts will feed into the PG study.

Targeted Subsectors

- **Industrial**
  - Food services/production
  - Chemical manufacturing
  - Electronics/semiconductor

- **Agricultural**
  - Greenhouses
  - Dairies
  - Water pumping (agricultural sector only)

EE Technology/ System Identification

EE Technology/ System Identification

- **Literature/database review**
- **Completed interviews with 60 subsector experts**
  - Experts identified through lit review, industry knowledge, implementers of CA EE programs, referrals from initial interviewees including PA subsector specialists
- **Identified 3 promising EE technologies in each of 6 subsectors**
  - End use accounted for large % of subsector's energy use
  - Measures believed to have large untapped energy savings potential
  - Multiple experts recommended measure
  - Frequently mentioned in subsector literature
  - Frequently-recommended measure in Industrial Assessment Center (IAC) database
- **Experts also identified barriers to adoption:** Lack of EE knowledge among subsector operators and management, first cost, project competition for capital, low energy costs, low margins, fear of interrupting production

EE Technology/ System Identification

Industrial	Agriculture
Chemical Manufacturing	**Dairies**
Heat recovery	Heat recovery
Automation and optimization	VFDs on pumps
VSDs	Fans and ventilation
Electronics Manufacturing	**Greenhouses**
Chilled water plant optimization	LED growlights
O&M retrocommissioning	High efficiency HVAC
Low-pressure drop HEPA/ULPA filters	Energy curtains
Food Production	**Water Pumping for Agriculture**
Refrigeration system optimization	Efficient pumps and motors
Heat recovery	Sensors and controls
VFDs	Comprehensive program

Expert perspectives on DG/DR activity/potential within industrial subsectors

Subsector	DG/DR Activity
Chemical manufacturing	• Combined Heat and Power (CHP) is standard equipment in most new facilities & biggest driver of subsector's recent decline in energy intensity and GHG per unit of production. • DR activity for those whose operations can tolerate part-loads and non-steady state conditions • Some renewables for corporate sustainability goals
Electronics manufacturing	• Little use of cogeneration due to lack of sustained heat demand; competition for capital from production line improvements and retooling; energy is small % of overall expenditures • Some renewables for corporate sustainability goals
Food production	• Renewables adoption not widespread due to same concerns about interrupting production that are barrier to EE projects • Exceptions are companies who see branding value in green energy

Note: Not necessarily representative as the experts targeted (as was intended by our scope) were primarily in the EE space.

Expert perspectives on DG/DR activity/potential within agriculture subsectors

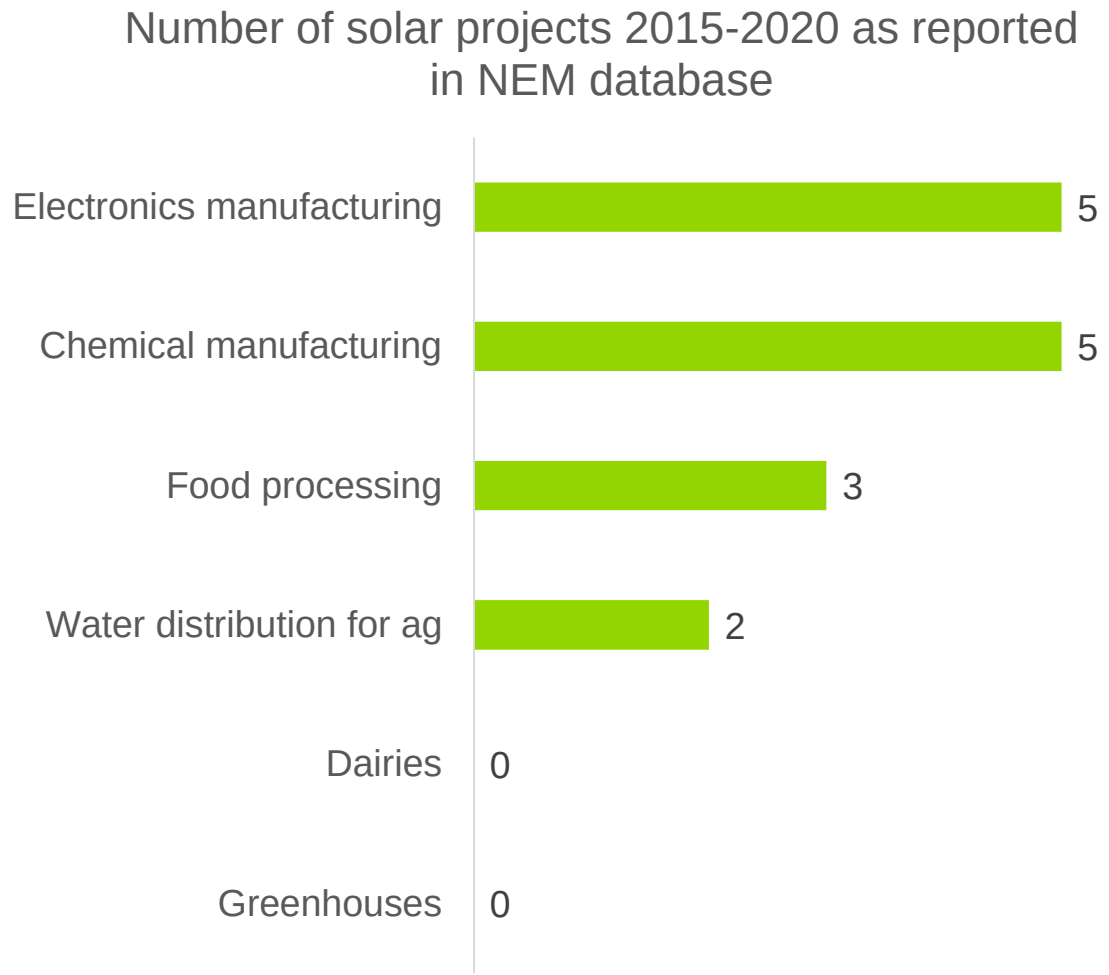
Subsector	DG/DR Activity
Dairies	• Competition with EE from solar PV opportunities is small-to-moderate and wind offered little competition with EE • Dairies more likely to lease land for solar arrays or wind turbines than install own generation equipment
Greenhouses	• CHP/cogen has high technical potential, but low market potential due to many greenhouses lacking access to natural gas • Compost heating, bio-gas steam heating, and geothermal heating are gaining traction. However, first cost is the primary barrier to adoption. Also some farmers fear crop damage from pests & wider temperature fluctuations using compost heating • Solar PV market penetration is low
Water pumping - agricultural	• Has long participated in utility DR programs

Note: Not necessarily representative as the experts targeted (as was intended by our scope) were primarily in the EE space.

CA Net Energy Metering (NEM) Database Review

- Examined the number of recent (2015-2020) solar projects for our six subsectors in the NEM database (by matching NAICS codes)
- Found recent solar activity was limited
  - Only 15 total solar projects across these 6 segments were found in the NEM database
  - While renewables may compete more w/ EE in future, this implies in recent past the competition has been limited.

- Caveat: unclear if NEM database is capturing all DG activity or if NAICS codes are fully accurate



Market Penetration Estimation

Vendor & Customer Interviews

- ~60 equipment vendor interviews for recommended EE measures - Vendors identified through web searches, lit review, PA referrals, and initial vendor interviews
- 50 end user interviews across the 6 subsectors – Identified by NAICS code in InfoSource database

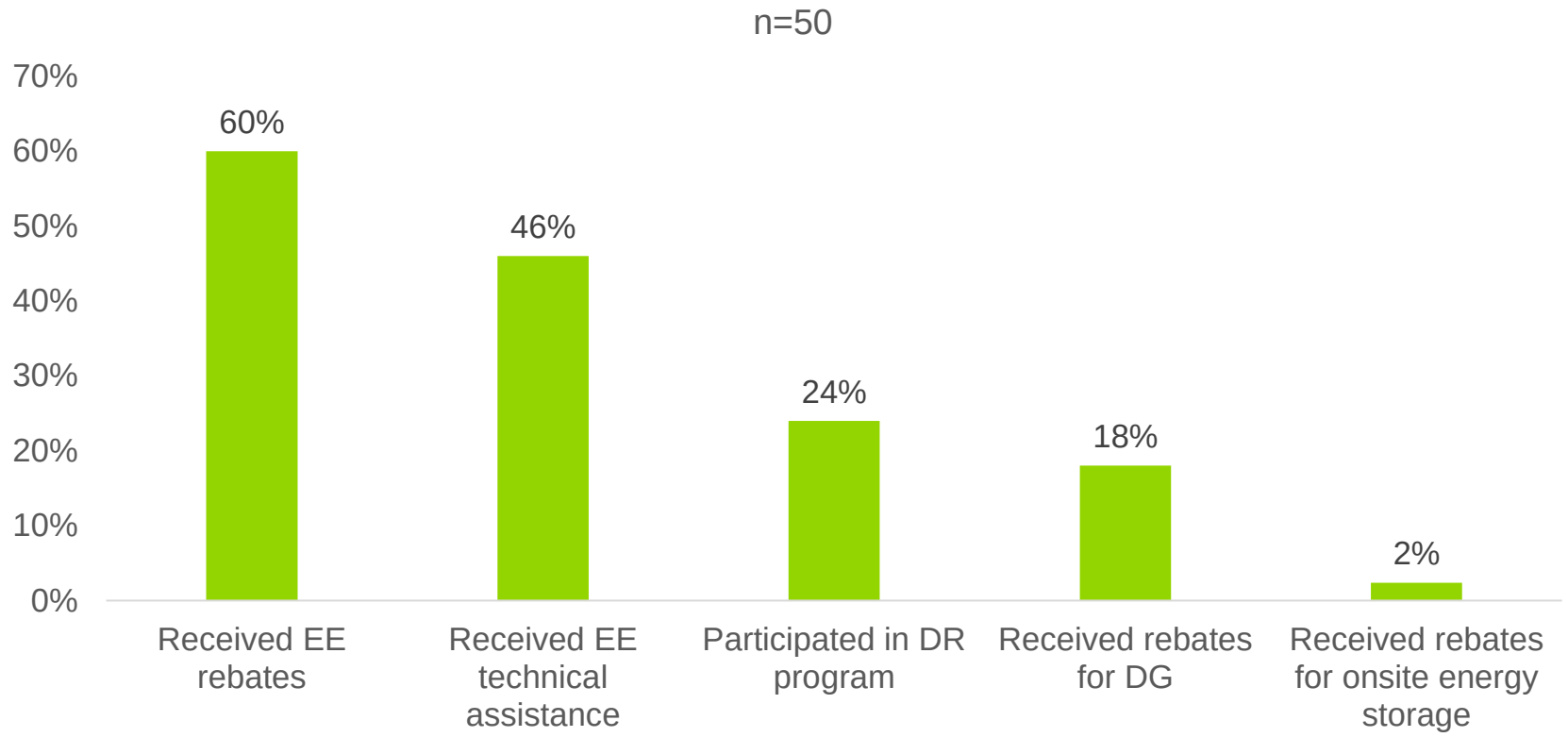
Scope of Vendor Interviews	Scope of Customer Interviews
• Penetration of recommended EE measures as observed among their client base • Barriers to EE implementation • Whether EE faced competition from renewables, DR • Average energy savings of these EE measures	• Penetration of recommended EE measures w/in their own facility • Barriers to EE implementation • Whether EE faced competition from renewables, DR • Payback/ROI criteria for EE projects • Awareness of, participation in EE, DG, and DR programs/rebates • Likelihood of purchasing EE equipment based on example incremental costs & incentive levels • Involvement in DG and its impacts on their willingness to invest in EE • Impact of COVID on operations

Current Activities/Next Steps

- Wrapped up end user interviews in late September
- Calculating inputs for PG model
  - Calculating current CA market penetration estimates for recommended EE measures using both vendor and customer interviews
  - Estimating energy savings for the recommended measures
  - Estimating customer willingness to pay for EE w/ and w/o incentives
- Summarizing other findings in October report
  - Barriers to EE implementation from 3 different perspectives (experts, vendors, and customers)
  - How investments in renewables/DR impact customer willingness to invest in EE
  - Industrial/ag customer interest in various DR options/programs
  - Impacts of COVID on ag & industrial sectors

Preliminary Results

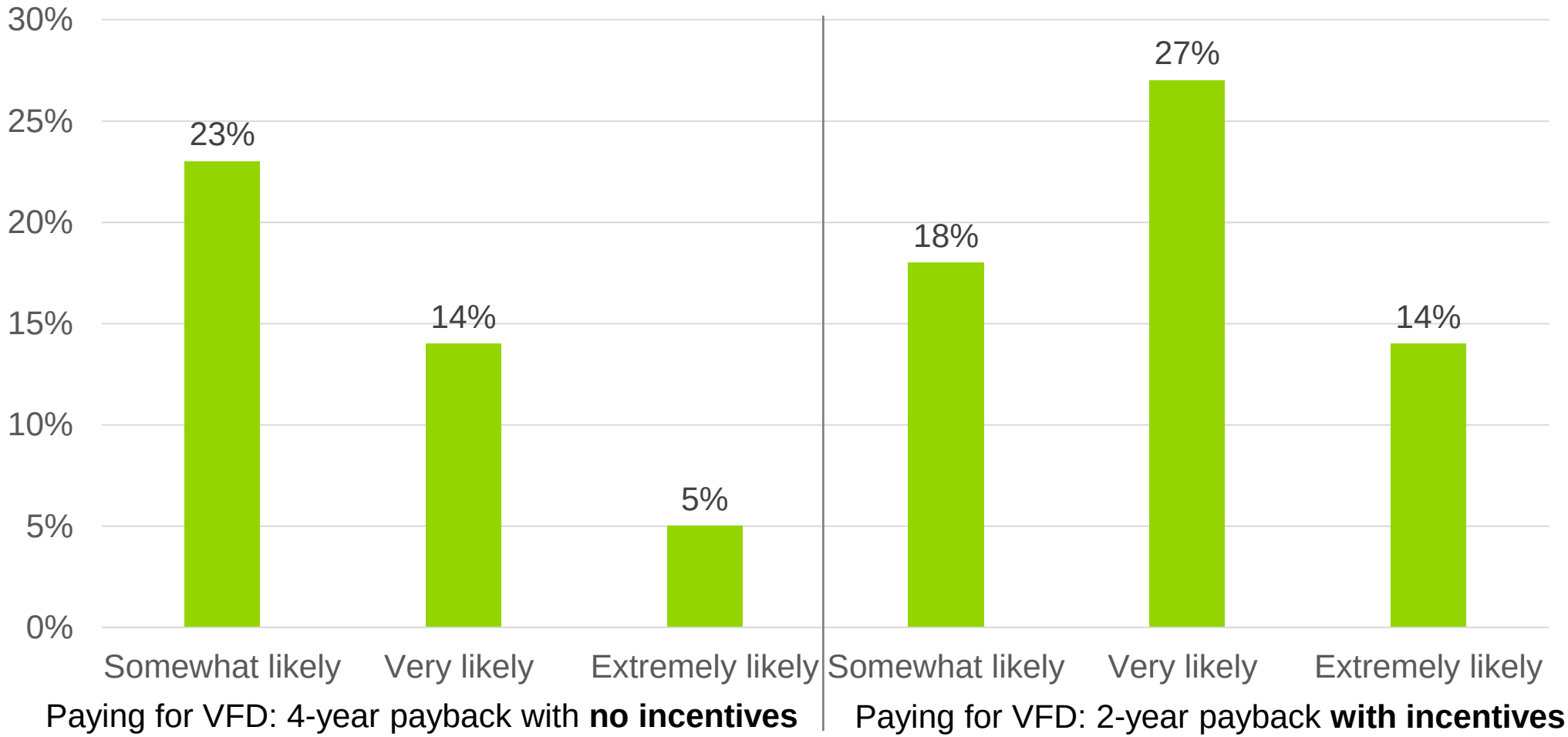
Much untapped potential in industrial/ag subsectors even for EE



~40% of facilities haven't reported ever receiving an EE rebate

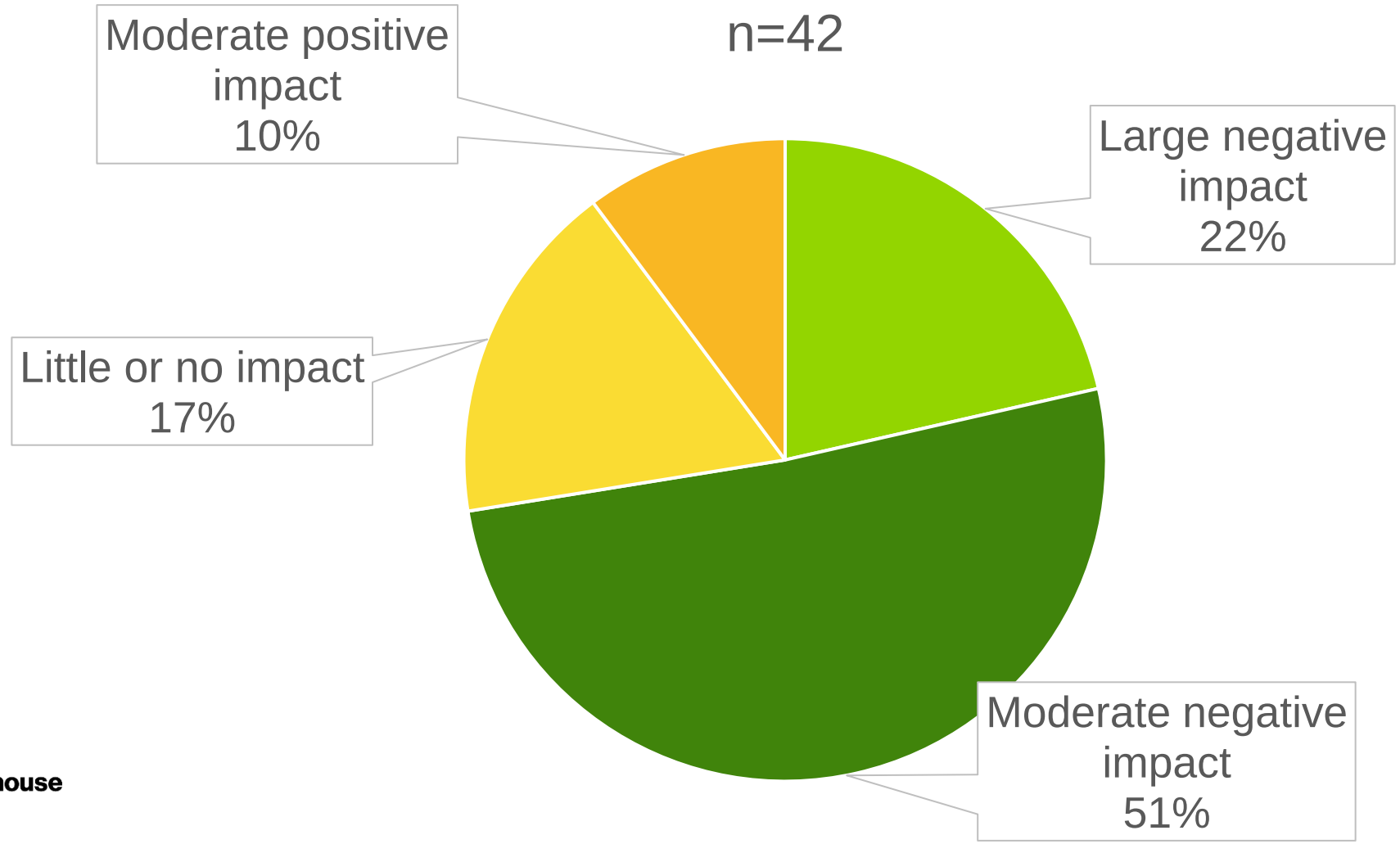
Preliminary Results

EE incentives can impact willingness to adopt EE



Preliminary Results

Overall, how much has the COVID-19 pandemic impacted your business since March 2020?



Industrial/ Agricultural Measure Characterization and Study Integration

Stakeholder Presentation

Dustin Bailey, Guidehouse

Measure Types and Approach

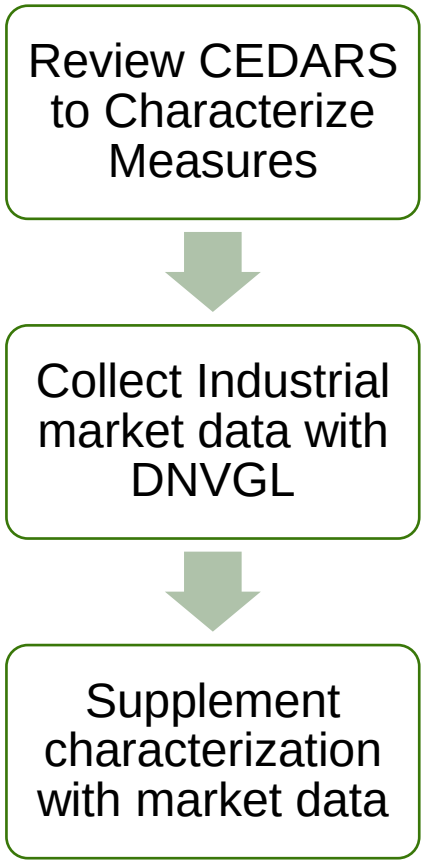
There are 4 types of measures under consideration.

Measure Type	Approach
Characterized Custom	Deemed measure characterization process using CEDARS, primary data collection*, and secondary source data
Generic Custom	Top-down analysis leveraging historical program trends and consumption forecasts
Emerging Technologies	
Strategic Energy Management (Including Retrocommissioning and Optimization)	BROs approach

* Data from the Ind/Ag Market Study described earlier.

Industrial/Ag Characterization

2020 Measure Review



CEDARS Measure Data Reviewed in 2020

- Based on review no changes were made to characterized custom measure list from last study related to electric energy, demand, and/or gas savings
- Measure cost
  - Cost will be updated slightly but savings will remain the same and no new measures where identified

Ind/Ag Market Study

- Primary data is still processing but sector specific measures will be added based on the results of their study

Supplementing Characterization with Market Data

Industrial	Agriculture
Chemical Manufacturing	**Dairies**
Heat recovery	Heat recovery
Automation and optimization	VFDs on pumps
VSDs	Fans and ventilation
Electronics Manufacturing	**Greenhouses**
Chilled water plant optimization	LED growlights
O&M retrocommissioning	High efficiency HVAC
Low-pressure drop HEPA/ULPA filters	Energy curtains
Food Production	**Water Pumping for Agriculture**
Refrigeration system optimization	Efficient pumps and motors
Heat recovery	Sensors and controls
VFDs	Comprehensive program

Data from vendors and potential customers is being collected for each of these measures that will be included in the potential model. This data will be fed into the potential model including:

- Measure savings and applicability
- Scaling basis for each measure- how savings will scale to the population
- EUL- Measure life for each measure
- Cost- the total incremental cost to install a given measure
- Technology density- % of site with that have the equipment that could benefit from the measure
- Technology efficiency level- % of site that have the equipment in the baseline condition
- Technical suitability- % of sites that are willing and able to install a given technology

Industrial/Ag Characterization – Insights from CEDARS

Notable Points noted several interesting things while reviewing the CEDARS data

- In the industrial sector SEM is steadily becoming a larger % of the total industrial market savings with around 35% of the total claimed electric savings in 2020. This represents ~5% increase year over year.
- In the industrial sector “pipe insulation” represents around 70% of the total gas savings (2019 claims). This is a huge increase from previous years where this measures represented around 3% of the total industrial gas savings.

Questions:

- Can stakeholders confirm they have observed these as well?
- Do stakeholders think these trends are sustainable or an “exception”?

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Behavior, Retrocommissioning, and Operational Efficiency (BROs) Plan

Stakeholder Presentation

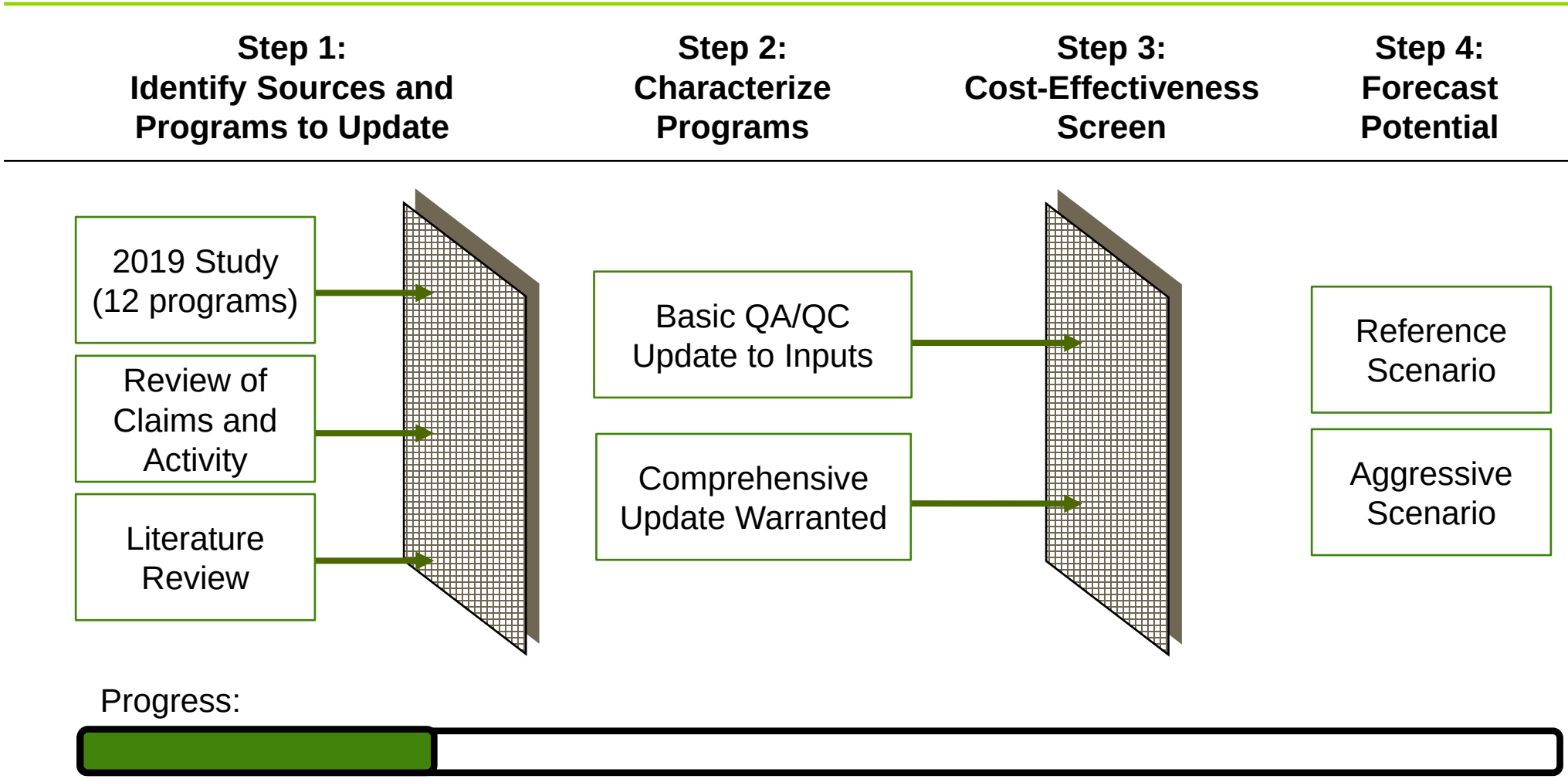
Brian Chang, Guidehouse

Introduction

- **Discussion topics:**
  - Overview of Work Plan and Approach
  - List of BROs programs and proposed updates

- **Key questions for stakeholders**:
  - Which BROs programs have seen significant changes in status over the past two years?
  - What other sources, reports, or evaluations are there that could inform updates?

BROs Work Plan



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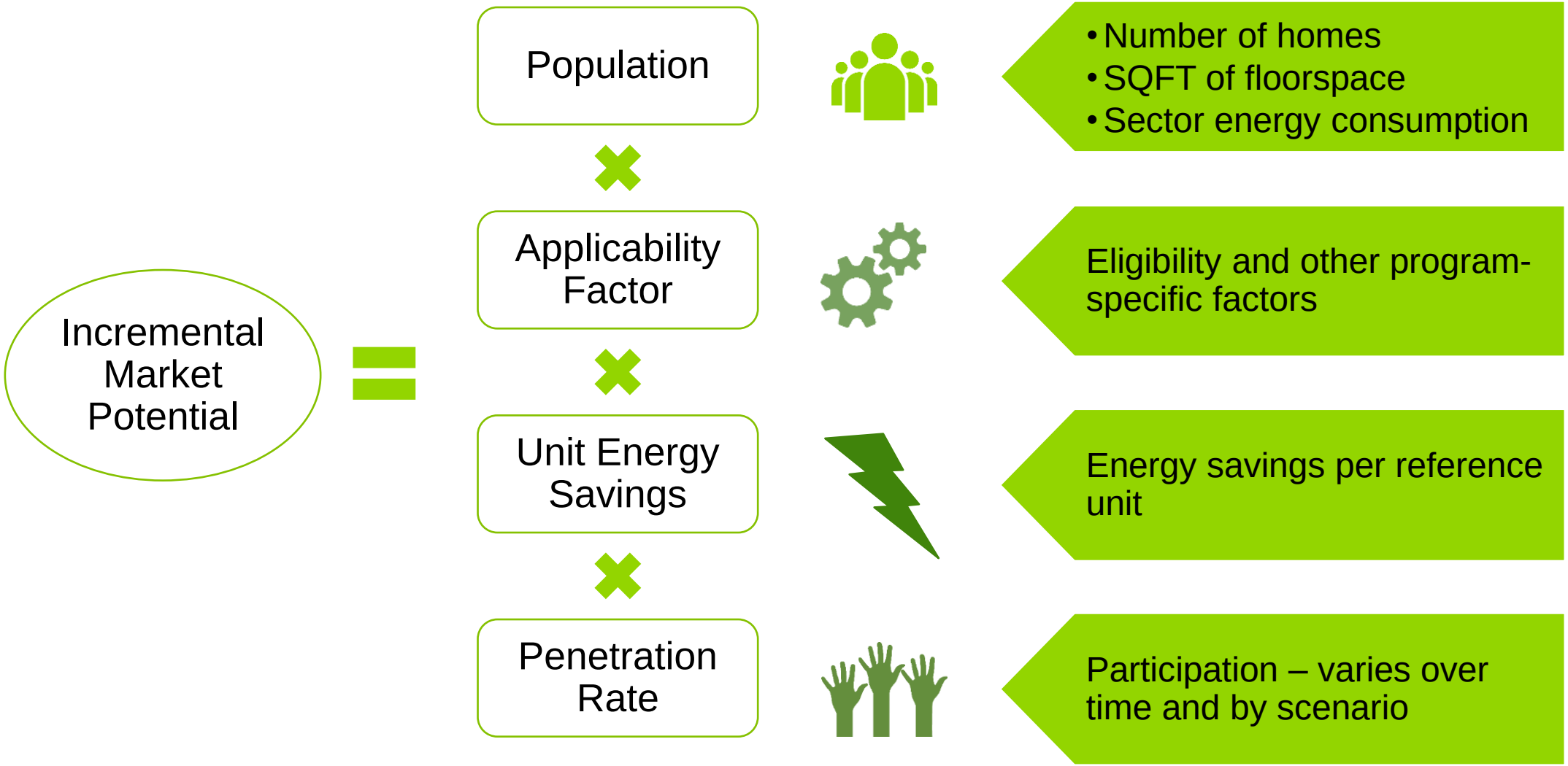
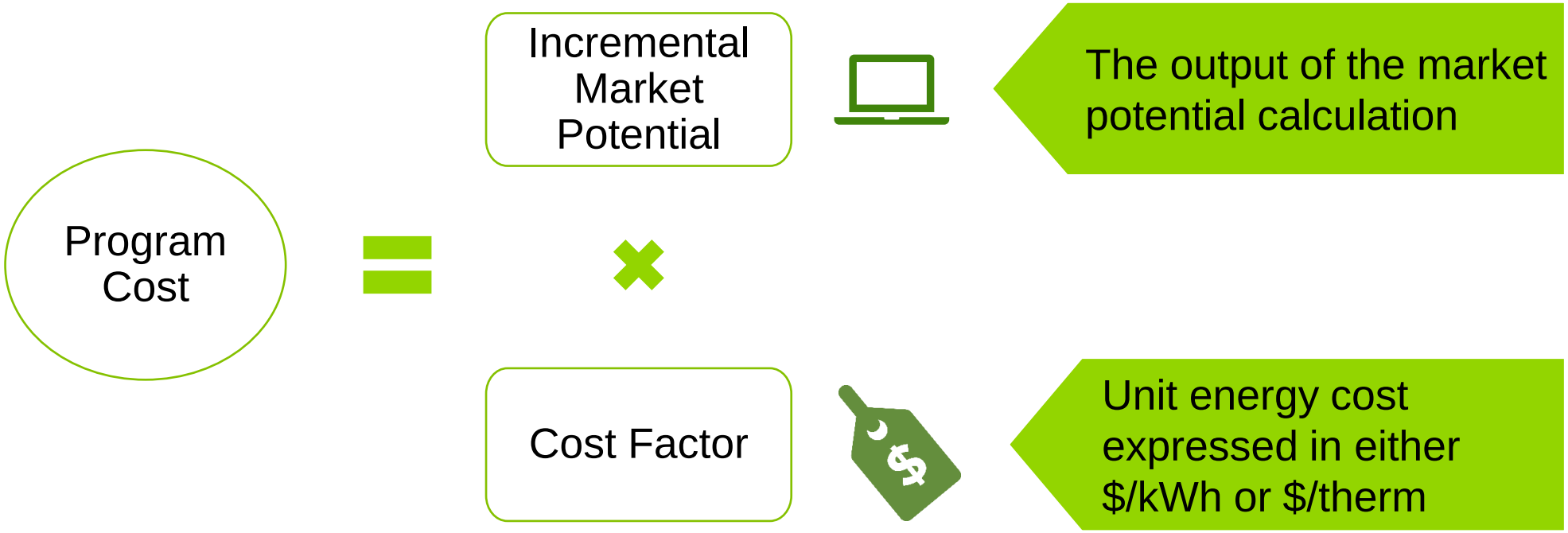
BROs Approach: Market Potential



BROs Approach: Program Cost



2021 Study: BROs Updates

- The scope of BROs updates for the 2021 study is more focused than the 2019 study.
  - The list of 12 programs will remain the same. No programs will be removed. All programs will receive a QA/QC of key inputs.
  - We will focus on comprehensive updates to select high-priority programs.

- High-priority programs are those that:
  - Have new sources of evaluated program data or pilot program results.
  - Have begun or significantly increased implementation since the 2019 study.

Please provide us with any reports or data sources to inform updates.

Please provide us with any information of new or pending programs.

List of BROs Programs

- All programs will receive a QA/QC of key inputs. Programs with a ✓ are a high-priority for comprehensive updates based on new evaluations, pilots, or other studies.

Sector	Program (2019 Study)	High-Priority 2021 Update	Notes / Sources (From review of published studies, CEDARS, ABALs)
Residential	Home Energy Reports	✓	New PY 2016 and 2017 evaluations, 2021 ABALs
	Universal Audit Tool	✓	Nexant Phase I Early EM&V for PG&E UAT
	Web-Based Real-Time Feedback		
	In Home Display RT Feedback		
	Competitions: Large and Small		
Commercial	Strategic Energy Management		*Major updates not expected until release of new CEUS*
	Retrocommissioning	✓	CEDARS claims for RCx and Facility Assessment Service Program
	BEIMS		*Major updates not expected until release of new CEUS*
	Building Benchmarking	✓	Review local ordinances and ability to claim savings
	Building Operator Certification		
	Business Energy Reports		
	Competitions		

Question for Stakeholders

- Which BROs programs have seen significant changes in status over the past two years?

- The following Appendix lists sources that we have identified for updating high-priority programs
  - Are there other significant sources of evaluation data for these programs?

Appendix: BROs Sources for 2021 Update

Residential: Home Energy Reports (HERs)

Nexant. Sep 2, 2020. Evaluation of Southern California Edison's HER Persistence Pilot. Southern California Edison Co. CALMAC ID: SCE0447.

California IOUs. 2020. RTR for the Impact Evaluation of Home Energy Report: Residential Sector – Program Year 2018 (EM&V Group A). CALMAC ID: CPU0206.02.

DNV-GL. Apr 16, 2020. Impact Evaluation of Home Energy Reports: Residential Sector – Program Year 2018. California Public Utilities Commission. CALMAC ID: CPU0206.01.

Nexant. Mar 25, 2020. PG&E HER 2017 Energy and Demand Savings Early EM&V. Pacific Gas & Electric. CALMAC ID: PGE0448.001.

DNV-GL. May 1, 2019. Impact Evaluation Report: Home Energy Reports – Residential Program Year 2017. California Public Utilities Commission. CALMAC ID: CPU0194.01.

DNV-GL. May 1, 2019. Impact Evaluation Report: Home Energy Reports – Residential Program Year 2016. California Public Utilities Commission. CALMAC ID: CPU0190.01.

Opinion Dynamics. Dec 10, 2018. PG&E Home Energy Report (HER) Energy Savings Distribution Analysis and Trends Study. CALMAC ID: PGE0426.01.

Appendix: BROs Sources for 2021 Update

Residential: Universal Audit Tool (UAT)

Nexant. Sep 2020. Phase I: Residential Online Audit Early EM&V for 2019 Savings Claim (PG&E).

Commercial: Strategic Energy Management (SEM) and Retrocommissioning

Navigant: Luboff, J., Legett, R., Jangra, V., & Firme, R. Commercial Strategic Energy Management: Approaches and Best Practices. *UC Berkeley: Behavior, Energy and Climate Change Conference*. 2016.

Strategic Energy Group. Strategic Energy Management Case Study: Clovis Unified School District—Clovis, CA.

Strategic Energy Group. Strategic Energy Management Case Study: Idaho Office of Energy Resources K12 Energy Efficiency Project.

Annual Budget Advice Letters (ABALs):

PG&E. Sep 1, 2020. 2021 Energy Efficiency Annual Budget Advice Letter. Advice 4303-G/5936-E.

SCE. Sep 3, 2019. Efficiency Program and Portfolio Annual Budget Advice Letter for Program Year 2020. Advice 4068-E.

SCG. Sep 1, 2020. Request for Approval of Annual Energy Efficiency Budget Filing for Program Year 2021. Advice 5684.

SDG&E. Sep 1, 2020. 2021 Annual Energy Efficiency Program and Portfolio Budget Request. Advice 3599-E/2897-G.

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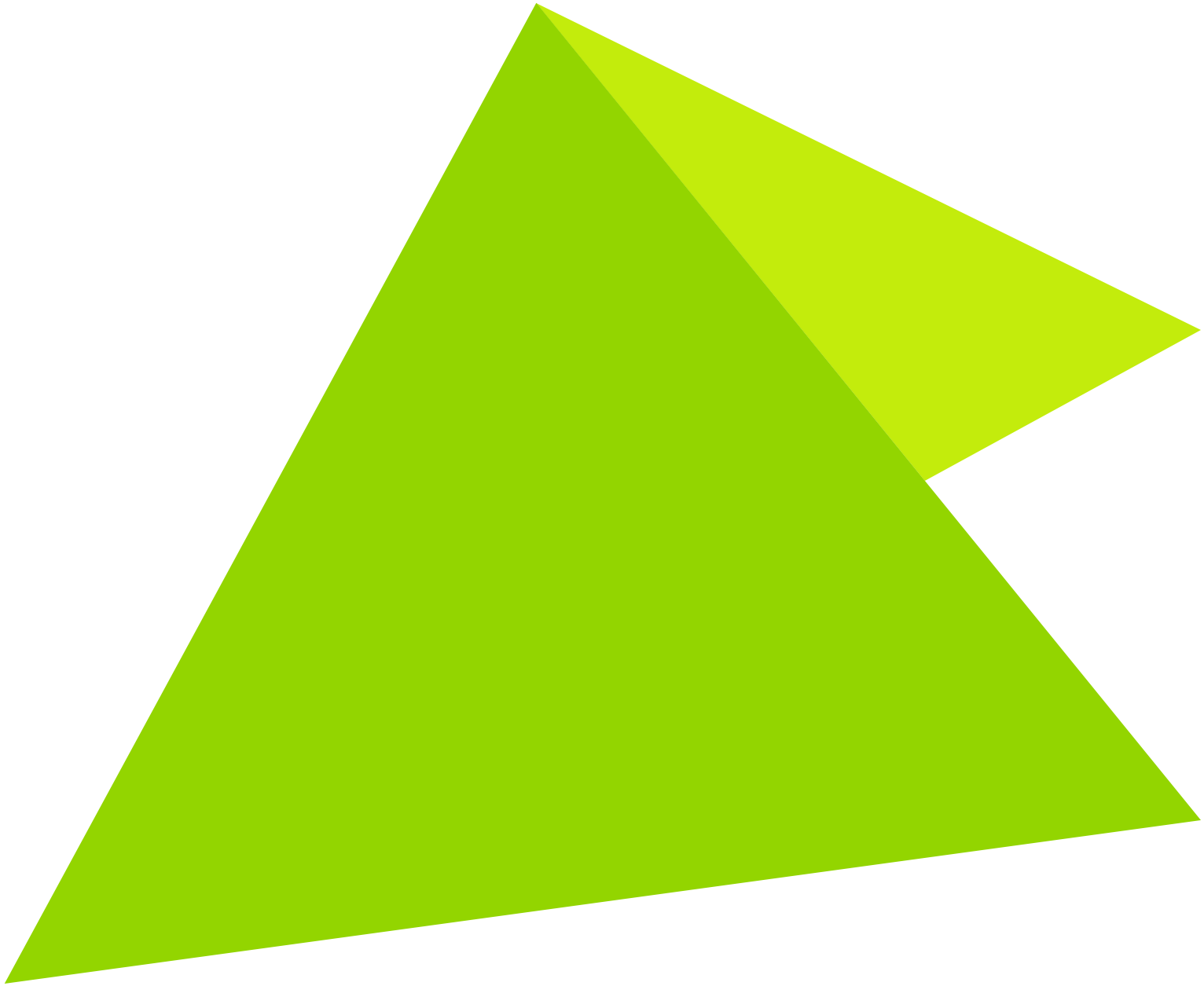
Low Income Plan Overview

Stakeholder Presentation

Amul Sathe, Guidehouse



Overview

- The original scope for the Low Income (LI) sector in the study was documented in the 2021 PG study workplan as follows:

  "…this study will revert back to the method utilized by the 2018 PG study. The method is to request data from the IOUs on the number of expected program treatments and retreatments and apply estimated unit energy savings values (based on IOU reports or impact evaluations) to forecast market potential."

- New direction is for this task to **inform the CPUC low income proceeding**
  – The original scope wasn't designed with this in mind
  – A more granular scope is being considered

Objectives and Priorities

CPUC Low Income Team's Objectives

1. Identify measures that can provide deeper energy savings at the household level including those that do not meet CPUC's EE portfolio cost effectiveness thresholds.
2. Identify measures that have high participant benefits – cost savings, health/comfort/safety if possible.
3. Estimate a total achievable energy efficiency potential that could act as a benchmark to guide policymaking in the ESA program.

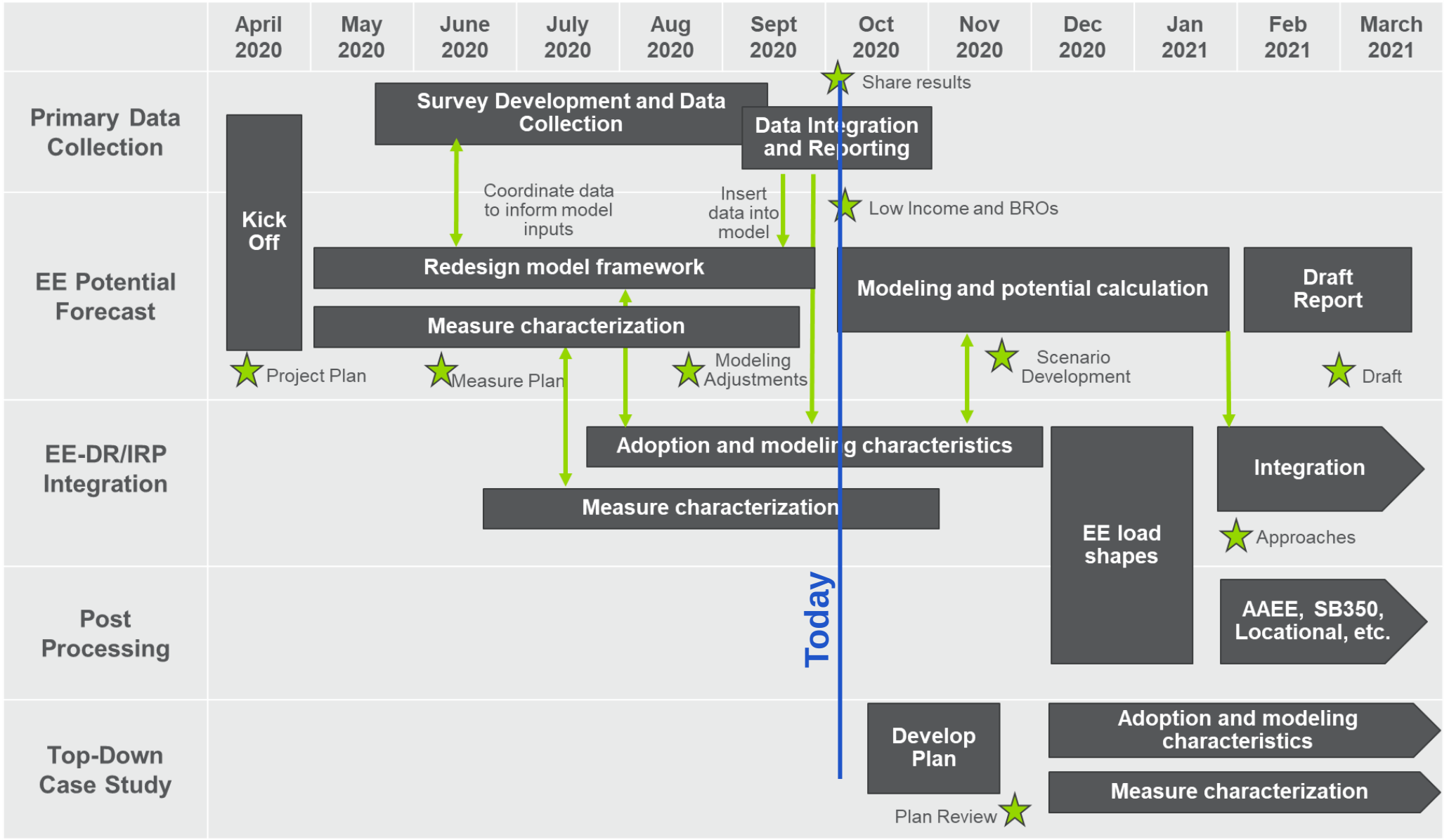
Priorities for the 2021 PG Study

- Develop a bottom-up, measure-level potential for Energy Savings Assistance (ESA) Program
- Estimate
  - Technical potential
  - Achievable potential
  - Associated program budget

Draft Revised Scope

- **Measure Selection and Characterization**
  - Develop a list of current and potential future ESA measures
  - Characterize measures using existing data sources
- **Technical Potential Analysis**
  - Represents the remaining untapped potential
  - Leverage recent saturation data from RASS
- **Achievable Potential Analysis**
  - Represents the potential that is achievable through ESA program intervention
  - Forecasting methodology considers historical program treatments and uptake of measures, as well as forward looking analysis for how new measures might penetrate the low-income sector
- **Program Budget Analysis**
  - Calculates the measure costs and program expenditures associated with both the technical and achievable potential

Overall Schedule Reminder



Reminders and Next Steps

Stakeholder engagement is critical and CPUC and the Potential and Goals Study team values the input and direction provided.

- Study-related comments are informal.
- Study-related comments on the topics covered today are due **October 22** via e-mail to: coby.Rudolph@cpuc.ca.gov & travis.holtby@cpuc.ca.gov.

- We suggest comments be focused on the questions posed throughout this slide deck
- For topics with no explicitly posed questions, open comment is welcome.

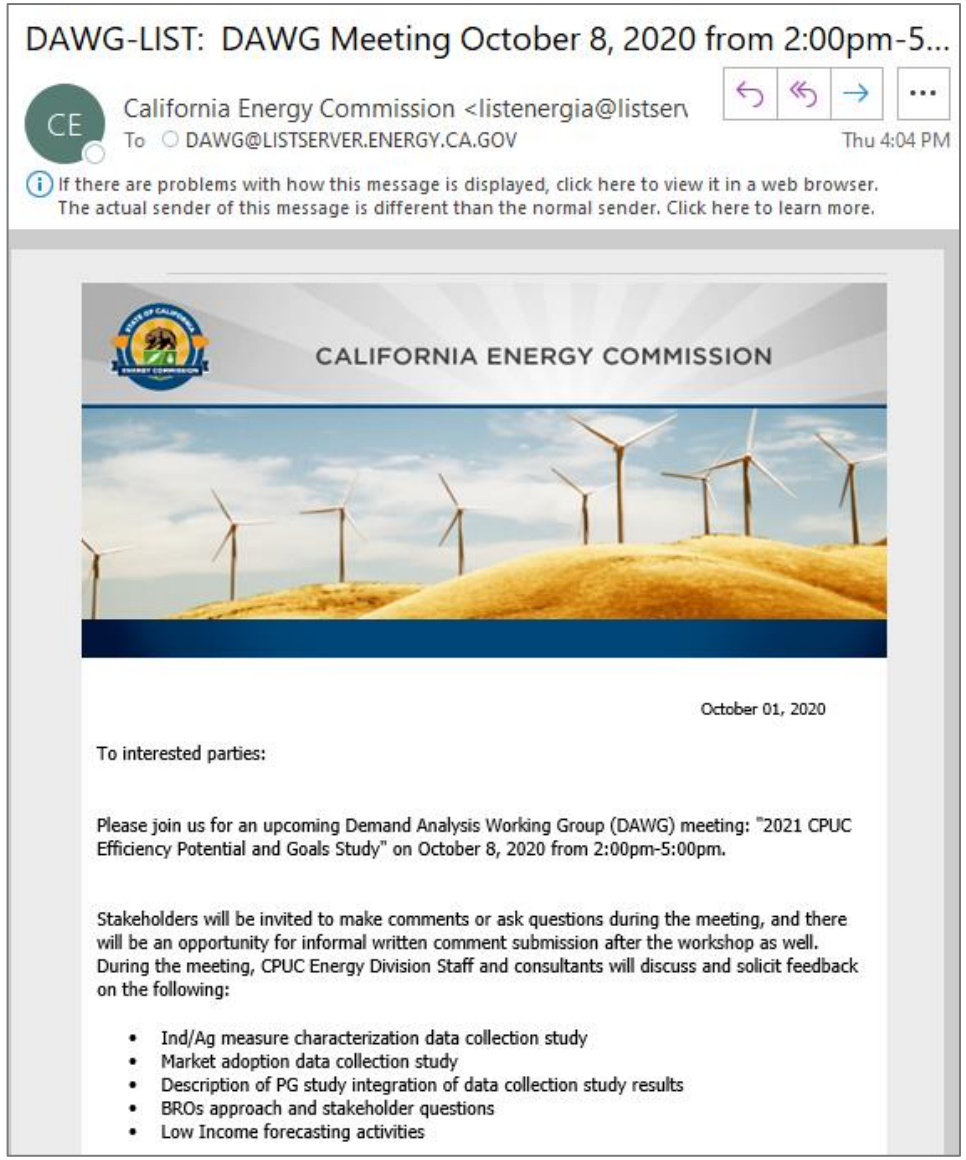
Stay Informed

CPUC's 2021 Energy Efficiency Potential & Goals Webpage:

- https://www.cpuc.ca.gov/General.aspx?id=6442464362

CEC's Demand Analysis Working Group (DAWG):

- This meeting and future meetings are being noticed to the DAWG listserv (not the EE proceeding listserv)
- Sign up for the DAWG listserv to get future notices here: https://www.energy.ca.gov/programs-and-topics/topics/energy-assessment/demand-analysis-working-group-dawg


DAWG-LIST: DAWG Meeting October 8, 2020 from 2:00pm-5...

CE California Energy Commission <listenergia@listserv

To DAWG@LISTSERVER.ENERGY.CA.GOV Thu 4:04 PM

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CALIFORNIA ENERGY COMMISSION

October 01, 2020

To interested parties:

Please join us for an upcoming Demand Analysis Working Group (DAWG) meeting: "2021 CPUC Efficiency Potential and Goals Study" on October 8, 2020 from 2:00pm-5:00pm.

Stakeholders will be invited to make comments or ask questions during the meeting, and there will be an opportunity for informal written comment submission after the workshop as well. During the meeting, CPUC Energy Division Staff and consultants will discuss and solicit feedback on the following:

- Ind/Ag measure characterization data collection study
- Market adoption data collection study
- Description of PG study integration of data collection study results
- BROs approach and stakeholder questions
- Low Income forecasting activities

Contact

Amul Sathe
Director, Project Director
Amul.Sathe@guidehouse.com
(415) 399-2180

Vania Fong
Consultant, Modeling Support
Vania.Fong@guidehouse.com
(415) 356-7133

Karen Maoz
Associate Director, Project Manager
Karen.Maoz@guidehouse.com
(415) 399-2172

Brian Chang
Consultant, BROs Lead
Brian.Chang@guidehouse.com
(415) 356-7145

Tyler Capps
Managing Consultant, Modeling Team Lead
Tyler.Capps@guidehouse.com
(916) 631-3205

Melanie Munroe
Director, Opinion Dynamics
mmunroe@opiniondynamics.com
(617) 492-1400

Dustin Bailey
Senior Consultant, Ind/Ag Lead
Dustin.Bailey@guidehouse.com
(360) 828-4006

Christopher Dyson
Principal Consultant, DNV GL
Christopher.Dyson @dnvgl.com
(608) 417-9664

Guidehouse