Draft 2023 Energy Efficiency Potential & Goals Study

CPUC Workshop

May 3, 2023

California Public Utilities Commission

Agenda

Time Slot	Agenda Item
1:00-1:20	Part 1: Introduction
1:20 – 2:30	Part 2: High Level Methodology & Results
	5-minute break
2:35 – 3:30	Part 3: Key Topics Methodology & Results
3:30 – 4:00	Part 4: Policy Discussion

Conference Call Etiquette During Q&A Sessions

- We know many people are 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

- **Travis Holtby**, Project Lead
- **Ali Choukeir**
- **Hanna Navarro Goldberg**
- **Jennifer Kalafut**, Project Supervisor

Potential & Goals Stakeholder Engagement

Activity	Track / Venue	When
Study launch Workshop & Workplan	Study / informal comment	August 2022 Webinar
Measure characterization	Study / informal comment	September 2022 Stakeholder Review
Low Income analysis	Study / informal comment	Oct 2022 ESA Working Group
Scenarios	Study / informal comment	December 2022 Webinar
Draft results and additional study review	Study / informal comment	TODAY
Draft results Comment/Reply Comment Period	Policy / formal comment	Through May 8/May 18, 2023
Proposed Decision Mailed	Policy / formal comment	No later than July 7, 2023
Decision on Goals Adoption for 2024 & Beyond	Policy / Commission Voting Meeting	August 10, 2023
Additional Policy Activities TBD	Policy / formal comment	TBD

Completed Stakeholder Engagement

Two EE Potential & Goals Tracks

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

Formal comments via EE Rulemaking Proceeding R.13-11-005

- Ruling with draft study report issued on 4/17/23
- Comments and reply comments on Potential and Goals due 5/8/23 and 5/18/2023
- Proposed Decision on Goals late June/early July 2023
- Decision on Goals in August 2023

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

Informal work on the EE Potential & Goals Study.

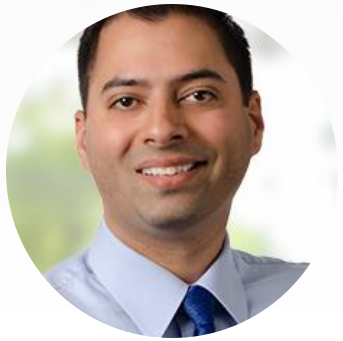
- CPUC Energy Division staff (along with Guidehouse) has solicited ongoing, informal feedback from stakeholders on methodological and technical issues related to the Study.
- Today's workshop is the 4th stakeholder engagement meeting on the 2023 EE Potential and Goals Study

Discussion & Questions

Introduction

Guidehouse Team

Speakers Today



Amul Sathe
Project Director
Guidehouse

Neil Podkowsky
Project Manager
Guidehouse

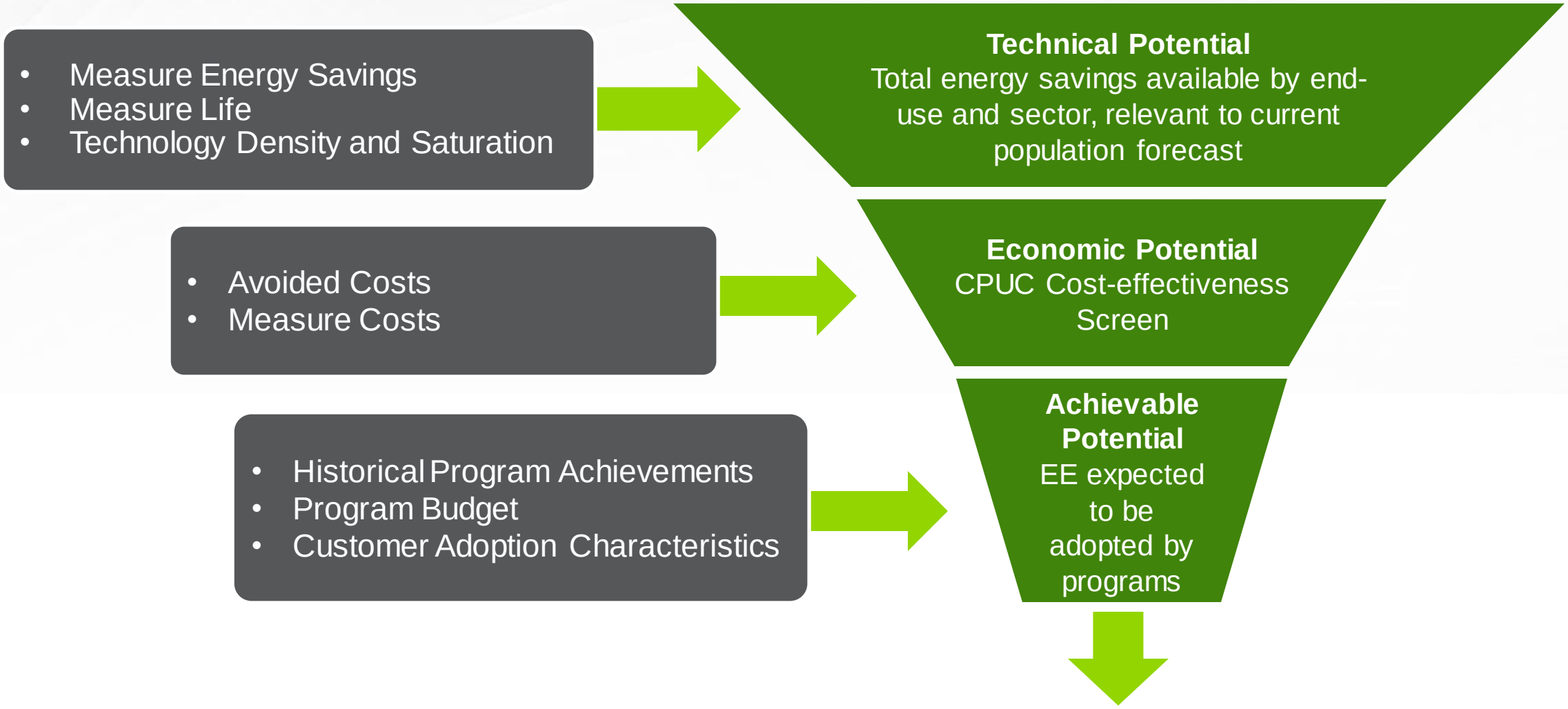
Rebecca Legett
Measure Lead
Guidehouse

What is the Potential and Goals (PG) Study?

- Develops estimates of total system benefit, energy impact, and demand impact potential in the service territories of California's major investor-owned utilities (IOUs)
- Forecast from 2024-2035, reporting **net** impacts
- Results have multiple uses:
  - Informs the CPUC goal setting process
  - Informs Program Administrators' EE program portfolio planning, budget setting, and procurement efforts
  - Supports planning efforts of the CPUC, CEC, CAISO
  - Informs strategic contributions to Demand Forecast, IRP, SB350 targets
  - Identifies new energy efficiency and fuel substitution savings opportunities

The PG Study itself does not set goals; Guidehouse does not make recommendations to CPUC regarding goal setting.

What is a Potential Study?



What is new in the 2023 Study?

Total System Benefit (TSB)	• Primary Goal Setting Metric
Inflation Reduction Act	• Tax Credits for IRA-specified EE and FS measures were incorporated into Scenarios 2, 3, and 4
Market Research	• Fuel Substitution Infrastructure Cost Literature Review
Fuel Substitution	• Broader characterization of FS technologies, model calibration utilizing FS-specific IOU program data
Gas Appliance Ban	• 2023 PG Study modeled an expected CARB ban on new natural gas appliance sales beginning in 2030

2023 PG Study Deliverables

EE and FS Potential Forecast

Core effort includes model development and producing scenario results.

Low Income Potential Forecast

Sector-specific effort to inform ESA Goal Setting Process.

In Progress

Market Research

Research and development of data to refine and inform inputs into the EE & FS potential forecast

Completed/In Progress

EE & IRP Integration

Optimization of EE and FS into the CPUC's Integrated Resource Plan (IRP) process.

Not Started

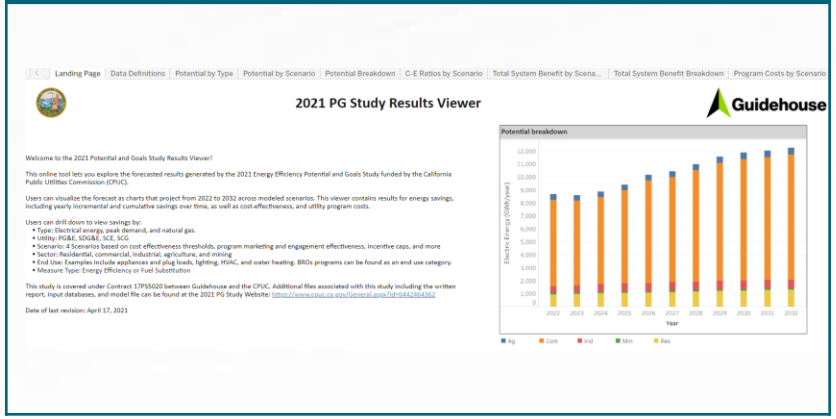
Post Processing

Post process the EE potential forecast to meet needs beyond the goal setting process.

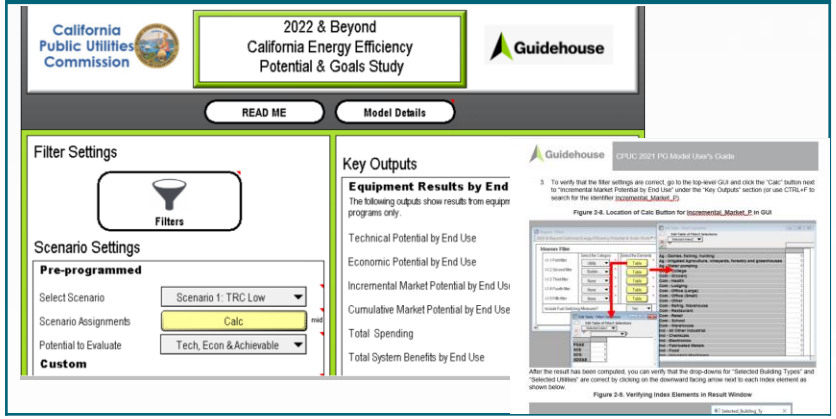
In Progress

Additional Study Products

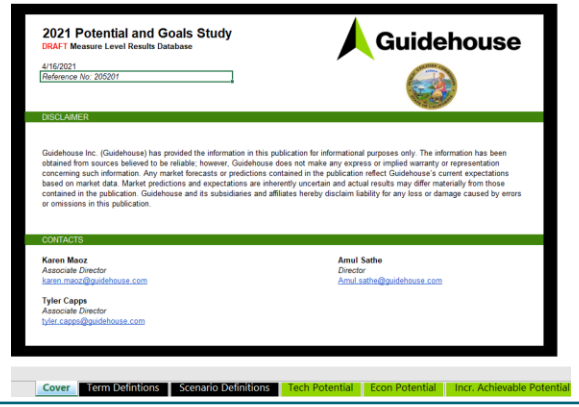
Online Results Viewer



Analytica Model/Users Guide



Measure Level Results Database



EE/BROs Technology Inputs

Available at: https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/demand-side-management/energy-efficiency/energy-efficiency-potential-and-goals-studies/2023-potential-and-goals-study

Discussion & Questions

2023 PG Study Key Updates and Scenario Design

What Changed Since the Previous Study?

Category	Update Relative to Previous Study	Directional Impact Relative to Previous Study	
Cost-Effectiveness	Updated avoided costs, measure inputs, and FS measures led to a 1%-5% increase in cost-effectiveness.	↑	Updated avoided costs and measure savings increased overall cost-effective potential. Greater proportion of first-year savings was attributed to measures with EUL.
Fuel Substitution	Calibration targets set using FS-specific program data. Panel upgrade costs incorporated into model.	↓	Using FS-specific program data resulted in an 81%-90% lower potential for Residential and Commercial FS measures in Scenarios 1, 2, and 4.
Natural Gas Measures	CARB SIP ruling for natural gas appliances	↓	CARB decision resulted in the removal of measures from model after 2030, yielding a 91-99% drop in FS potential and a 50% reduction in gas EE measures (HVAC and WH)
Inflation Reduction Act (IRA)	Tax credits for EE and FS measures were incorporated into Economic and Achievable potential analyses	↑	IRA tax credits increased potential for EE equipment by 15% and FS equipment by 42%. Largest impacts seen for Residential heat pump HVAC and water heating measures.
BROs	Introduced Low, Med, High HERs participant bins	↓	Residential BROs potential reduced 11%-21% Commercial and Industrial BROs reduced 1%-9%. SEM removed entirely from the Ag Sector

Total System Benefits

Represents the sum of the benefit that a measure provides to the electric and natural gas systems

$$\boldsymbol{Total\ System\ Benefit} = \boldsymbol{Net\ Avoided\ Cost\ Benefits\ (Energy\ and\ Capacity) - Increased\ Supply\ Cost}$$

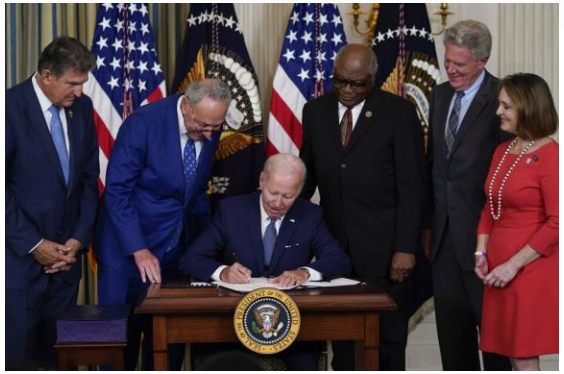
- Benefits ($) that EE/FS contributes to the electric and gas systems
- TSB relies on:
  - Annual energy savings
  - Avoided costs & measure load shape
  - Measure life (EUL)
- Net present value over the EUL

- Avoided Cost Benefits - Energy and capacity savings of fuels offered by IOUs
- Supply Costs: "negative energy savings" resulting from:
  - Measure interactive effects
  - Increased energy consumption resulting from fuel substitution

Inflation Reduction Act

- Signed into Federal law August 2022

- **Provisions included in the 2023 PG Study:** Tax Credits for Residential and Commercial measures. Applicable 2024-2032
- **Provisions <u>not</u> included in the 2023 PG Study:** State-administered Energy Efficiency Rebate programs



Impacts: ***Cost Effectiveness*** *&* ***Willingness to Adopt***

IRA Tax Credits

Residential Sector Treatment within the 2023 PG Study

- Measure level tax credits defined by IRA
  - Smaller of $1,200 or 30% of installed cost for non-HP HVAC, insulation and envelope measures
  - Smaller of $2000 or 30% of installed the measure cost for Heat Pump measures (HVAC or WH)
  - Smaller of $600 or 30% of installed measure cost for gas measures
- $/unit values adjusted to account for:
  - Single Family and Owner-Occupied installation requirements
  - Minimum tax burden

Representative Measures

- SEER 15+ Air Conditioner
- Heat Pump Water Heater
- Ductless Mini-Split
- Tankless Water Heater (gas or electric)

IRA Tax Credits

Commercial Sector Treatment within the 2023 PG Study

- IRA specifies a $/ft^2 tax credit
- PG Model tax credits applied at the measure level
- Translating IRA-specified $/ft^2 to $/unit in PG Model:
  - Estimate % of buildings (by type) that can achieve 25% reduction in baseline energy usage
    - *Aggressive assumptions increase value by 50%*
  - Estimate median savings potential for buildings above
  - Apply kWh/ft^2 or therms/ft^2 from model derive $/unit

Building Type	Conservative IRA tax credit value ($/ft^2)	Aggressive IRA tax credit value ($/ft^2)
Com - College	$0.28	$0.42
Com - Grocery	$0.80	$1.20
Com - Health	$0.45	$0.68
Com - Lodging	$0.54	$0.80
Com - Office (Large)	$0.26	$0.40
Com - Office (Small)	$0.26	$0.40
Com - Other	$0.54	$0.80
Com - Refrig. Warehouse	$0.45	$0.68
Com - Restaurant	$0.72	$1.08
Com - Retail	$0.81	$1.22
Com - School	$0.28	$0.42
Com – Warehouse	$0.45	$0.68

Representative Measures

- Unitary AC
- Packaged Heat Pump
- Heat Pump Water Heater
- Wall Insulation

Fuel Substitution

Infrastructure Cost

- **Literature Review**
  - **Approach:** Review of 16 reports published between 2016 and 2022 that included cost data on electrical panel upgrades for residential buildings in CA
    - Included a quote for a California homeowner
    - Assessed need for a panel upgrade for each technology type substituted with an electric appliance, disaggregated the technology market share so cost was applied only to that proportion of installations that would be expected to need upgrade
  - **Findings:** Panel upgrade cost varied considerably, ranging from $1,900 to $8,188 (average ~$4,600)
  - **Impact on Results:** The high cost of the panel upgrade reduced the achievable potential of the proportion of technology installations needing a panel upgrade, compared to the proportion of installations not needing a panel upgrade
- **Market Study (primary research in progress)**

CARB NG Appliance Ban

Impact post-2029

- **Background:** In September 2022, the California Air Resources Board (CARB) published a SIP memo proposing a "zero-emission standard for space and water heaters," banning the sale of NG appliances starting in 2030.
  - Residential and Commercial
  - Includes HVAC, WH
  - Does not include Insulation, envelope, controls
  - Ruling adoption anticipated in 2025
- **PG Study modeling approach:** NG baseline and any competing NG efficiency levels removed from the analysis post-2030. For FS technology groups, equivalent low-efficiency electric appliance was implemented in the measure characterization as "future baseline" level which becomes baseline in 2030
- **PG Study Impact:** For FS technologies post-2030, the minimum efficient appliance replacing a NG space or water heating appliance is minimum efficiency electric appliance. More efficient electric appliances within this technology group generate electric savings for FS measures from 2030 onward.

CARB NG Appliance Ban

Example Technology Group Change after Natural Gas Ban

Example Water Heater Technology Group – For Illustration Only

Pre-2030

Level Description	Technology
Code Level	Gas Storage Water Heater
High Efficiency Gas Level	Condensing Gas Storage Water Heater
High Efficiency Electric Level	Heat Pump Water Heater

2030 Onward

Level Description	Technology
Baseline Electric Level	Electric Resistance Water Heater
High Efficiency Electric Level	Heat Pump Water Heater

Fuel Substitution

PG Model Calibration

- **Calibration approach -** FS equipment competes with EE equipment using the same fuel as the baseline equipment; FS includes added electric load clarify that this includes the added electric load
- **Data applied for 2023 Study**
  - 2022 historical program activity
  - 2023 IOU budget filings data
  - Market saturation data
- **Adoption parameters**
  - Scenarios 1, 2, and 4 applied FS-specific calibration data
  - Scenario 3 aligns market adoption of FS with the values derived through EE calibration

Future Policy Impacts on Potential

Policies not Included in 2023 PG Study

- **Partial EE Natural Gas Incentive Phase Out**
  - August 2022 CPUC proposal outlining "an orderly and gradual transition away from using IOU ratepayer funds to incentivize natural gas EE measures."
  - D. 23-04-35, issued April 2023, eliminates rebates for non-exempt, non-cost-effective measures in Residential and Commercial NC
  - "Exempted": Measures that save therms but where NG is not directly consumed i.e. envelope, weatherization, thermostat measures.
  - Guidehouse conducted analysis of historic data and 2024-2027 forecast period, confirmed nominal impact on SCG potential
- **Inflation Reduction Act EE Rebate Programs**
  - IRA included funding for HOMES and HEEHR programs ($8.8B total nationwide)
  - Programs to be designed and administered by each state
  - Key uncertainties - eligible measures, eligible customers, incentive amounts, time frame
  - Recommend incorporation in future PG Studies

Scenario Design

Levers → Scenario ↓	C-E Test	C-E Threshold	IRA Tax Credits	Incentive Levels Capped	Fuel Substitution	Program Engagement
1: No IRA	TRC	0.85	None	EE 50% FS 75%	Reference	Reference
2: Reference IRA and FS	TRC	0.85	Conservative	EE 50% FS 75%	Reference	Reference
3: Reference IRA and Aggressive FS	TRC	0.85	Conservative	EE 75% FS 90%	Aggressive	Reference
4: Aggressive IRA and Reference FS	TRC	0.85	Aggressive	EE 50% FS 75%	Reference	Reference

C-E = cost-effectiveness

- IRA Tax Credits – applied at the measure level; Aggressive assumption applies to Commercial sector only
- Incentive Level Cap – represents % of measure incremental cost
- Fuel Substitution – Reference assumption applies FS-specific data to model calibration; Aggressive aligns FS adoption parameters with EE

Discussion & Questions

Overall Results

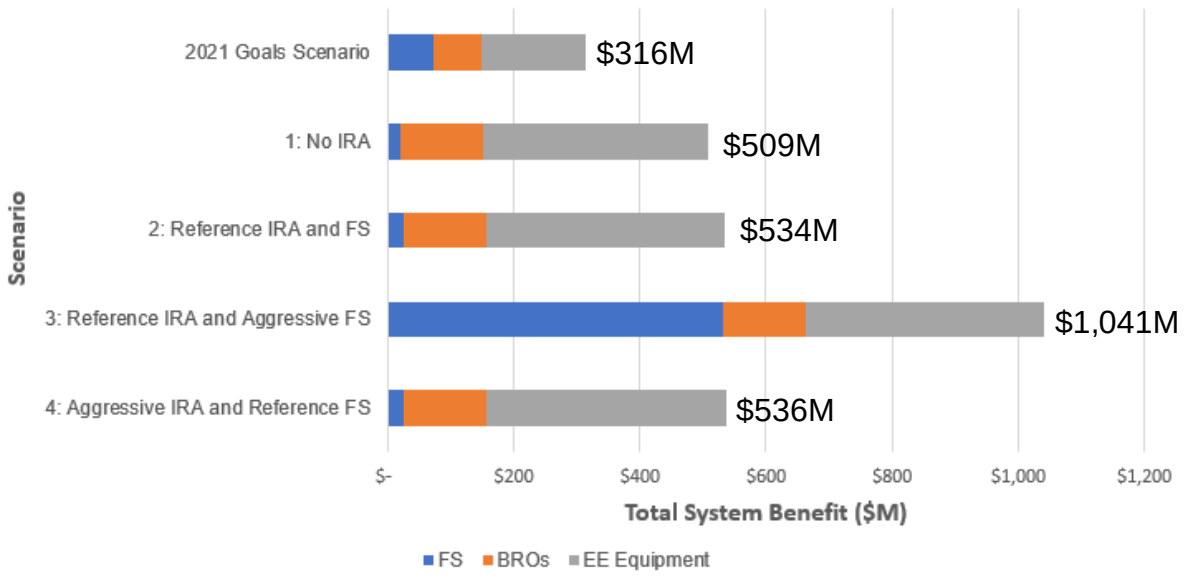
Includes Rebate Programs and BROs

Excludes ESA/Low Income and C&S

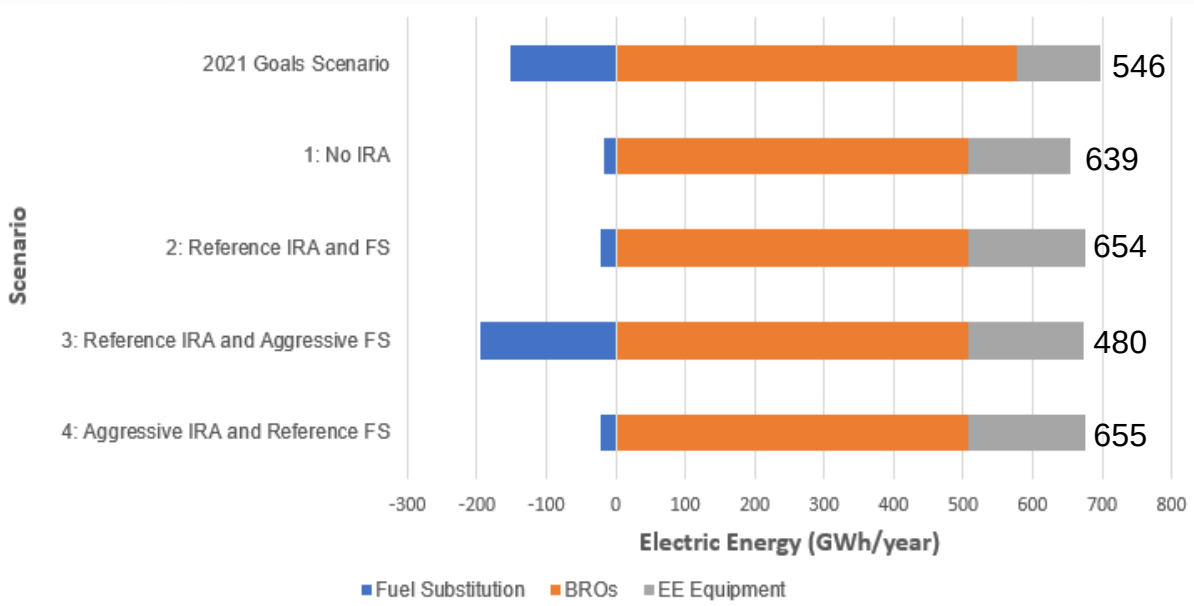
2024 Net Incremental Achievable Potential

TSB and Electric Energy

Total System Benefit



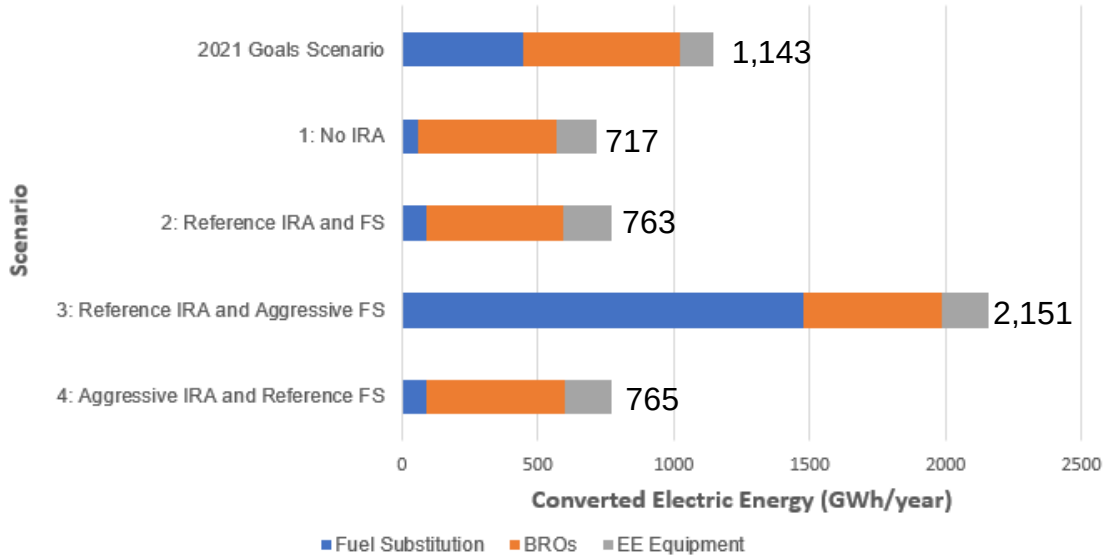
Electric Savings



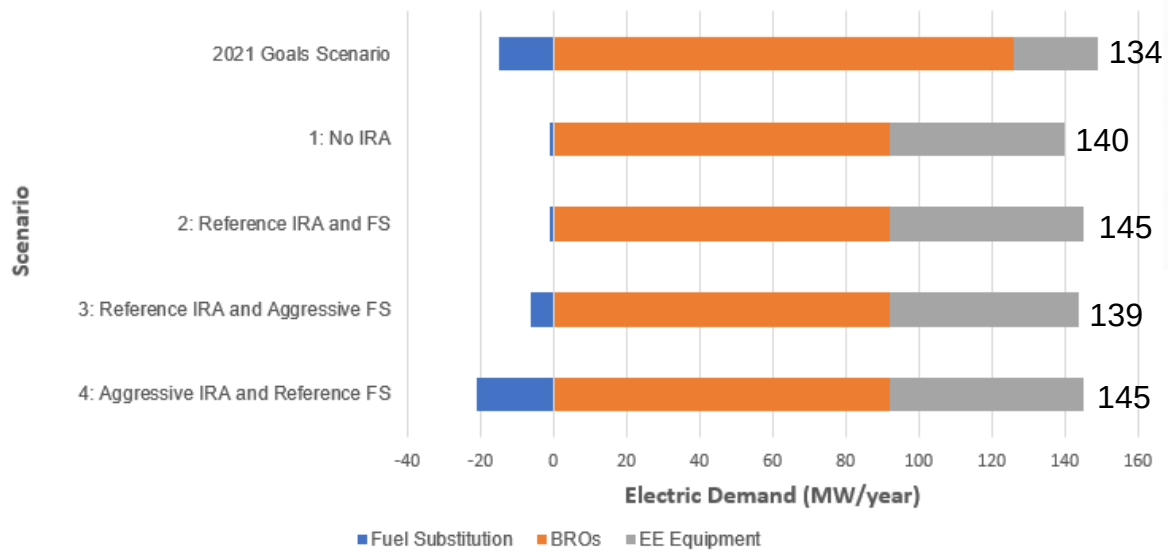
2024 Net Incremental Achievable Potential

Converted Electric Energy and Electric Demand

Converted Electric Energy

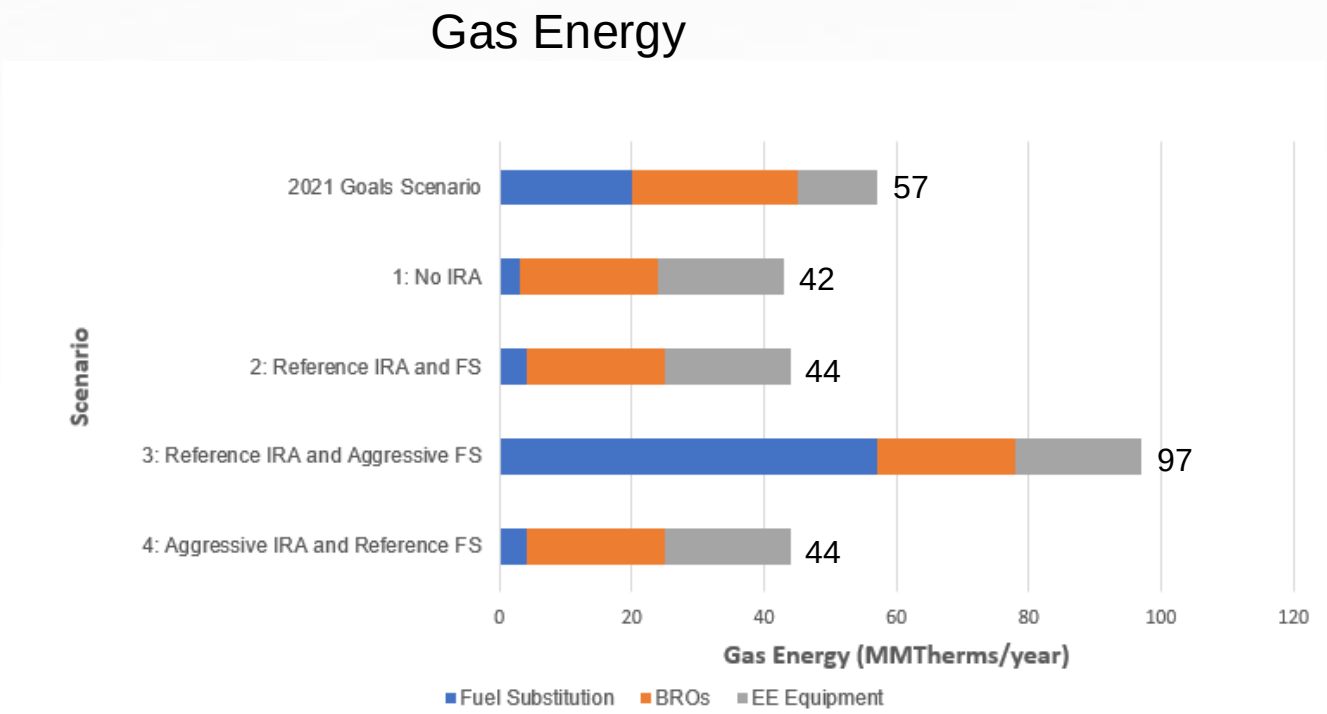


Electric Demand



2024 Net Incremental Achievable Potential

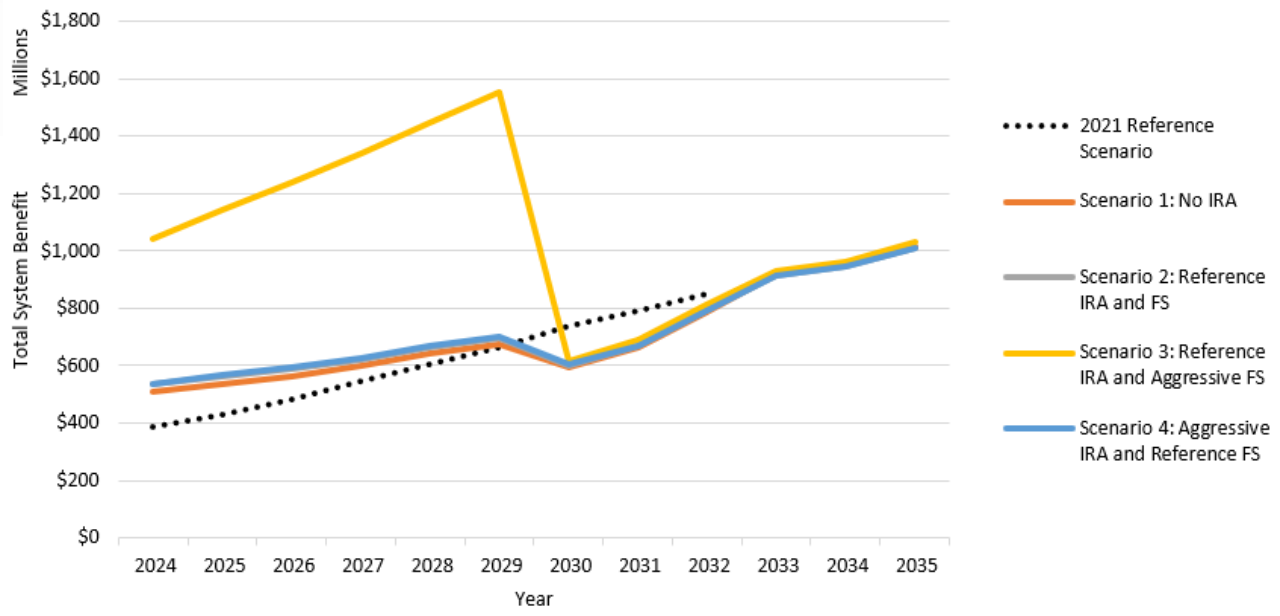
Gas Energy



Scenario Potential Results

Total System Benefits

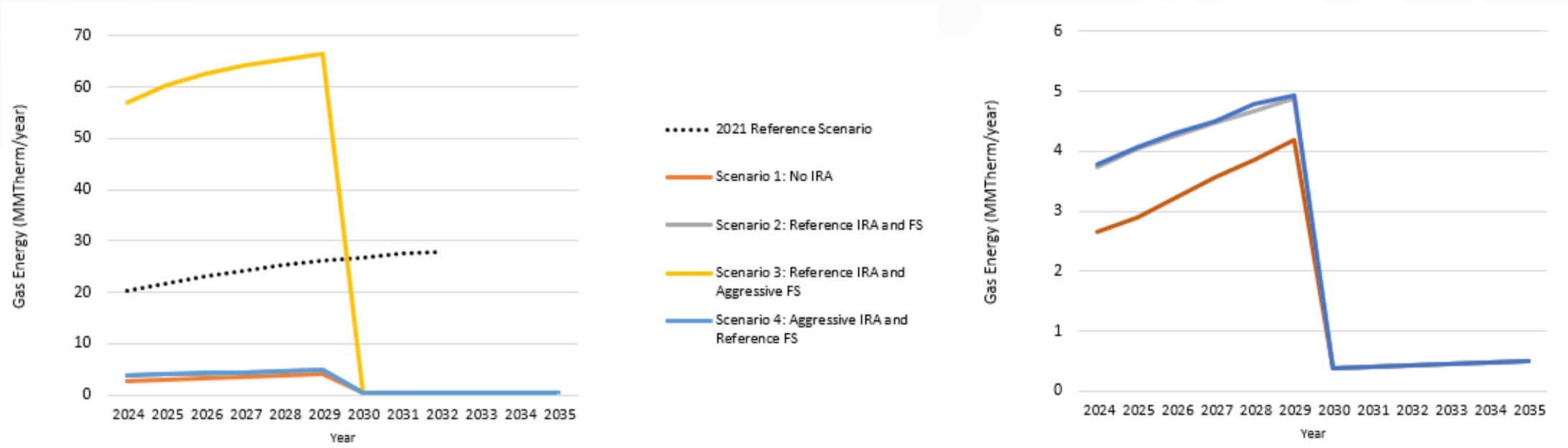
- TSB tracks with EE and FS equipment savings and avoided costs
- Scenario 3's aggressive FS adoption assumptions results in significantly higher TSB
- Gas appliance ban in 2030 dramatically reduces FS potential, resulting in TSB drop
- Smaller proportion of TSB comes from BROs compared to BROs' contribution to first year savings



Scenario Potential Results

Fuel Substitution - Electric and Gas Energy

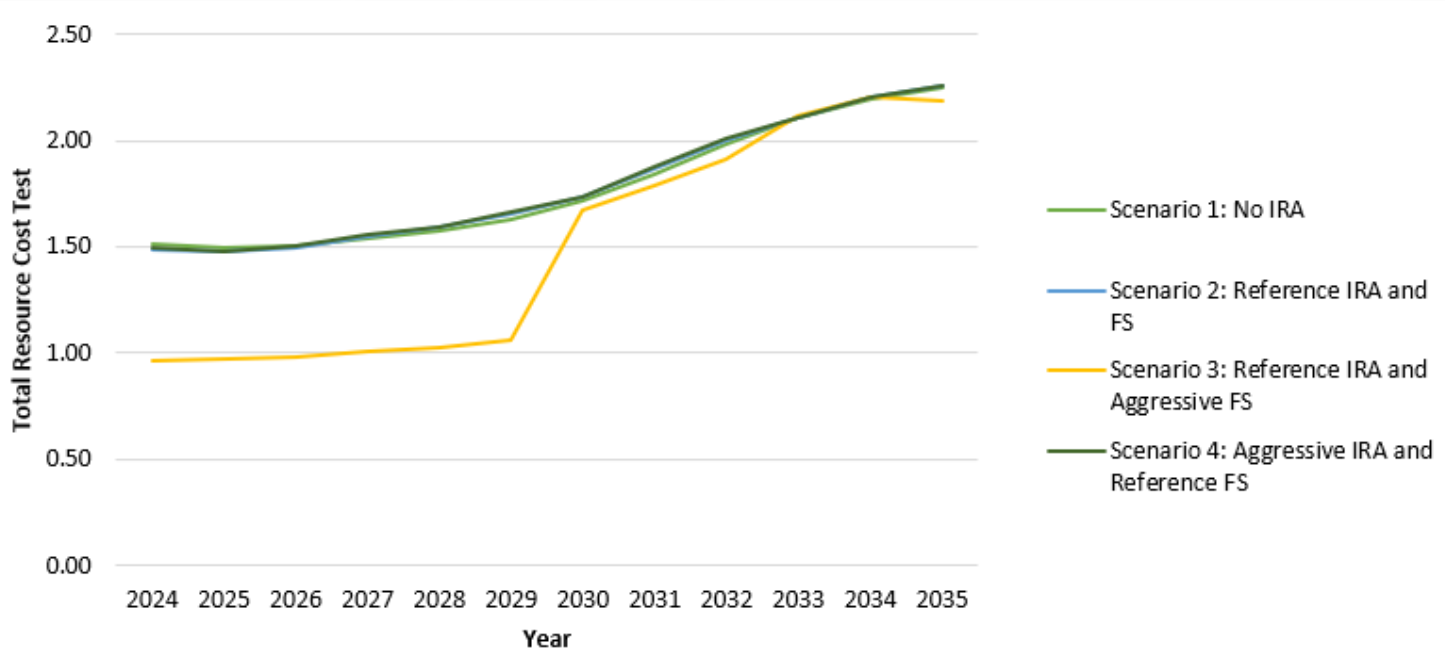
- Aggressive FS Assumptions in Scenario 3 drive potential up greater than 900%
- IRA tax credits increase Achievable FS potential by as much as 40%



Scenario Potential Results

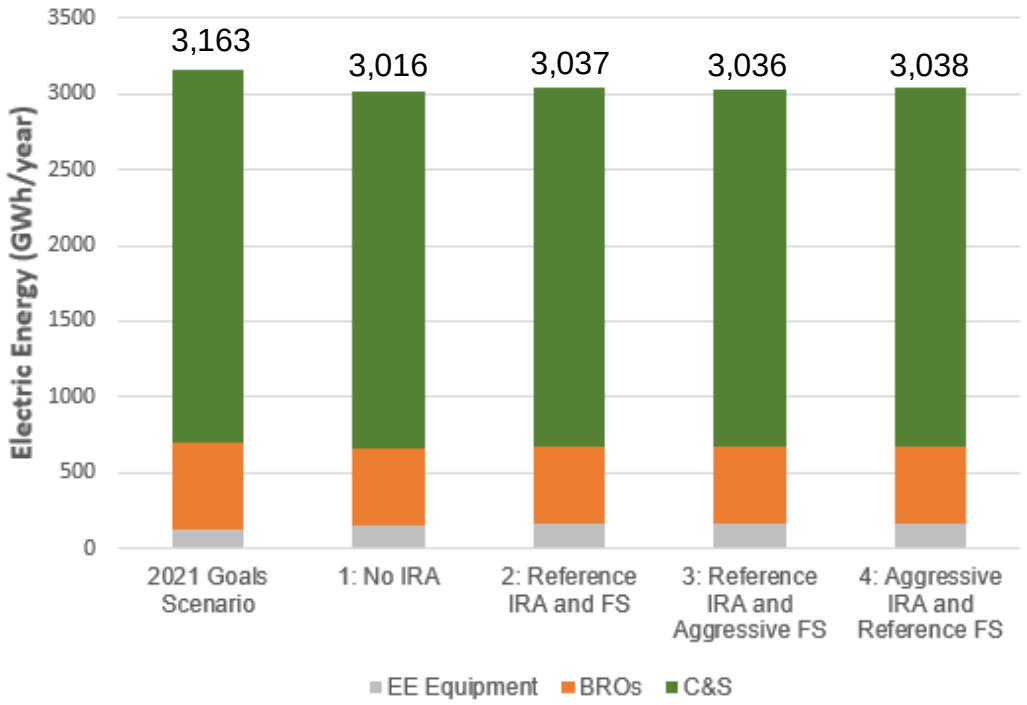
Cost-Effectiveness

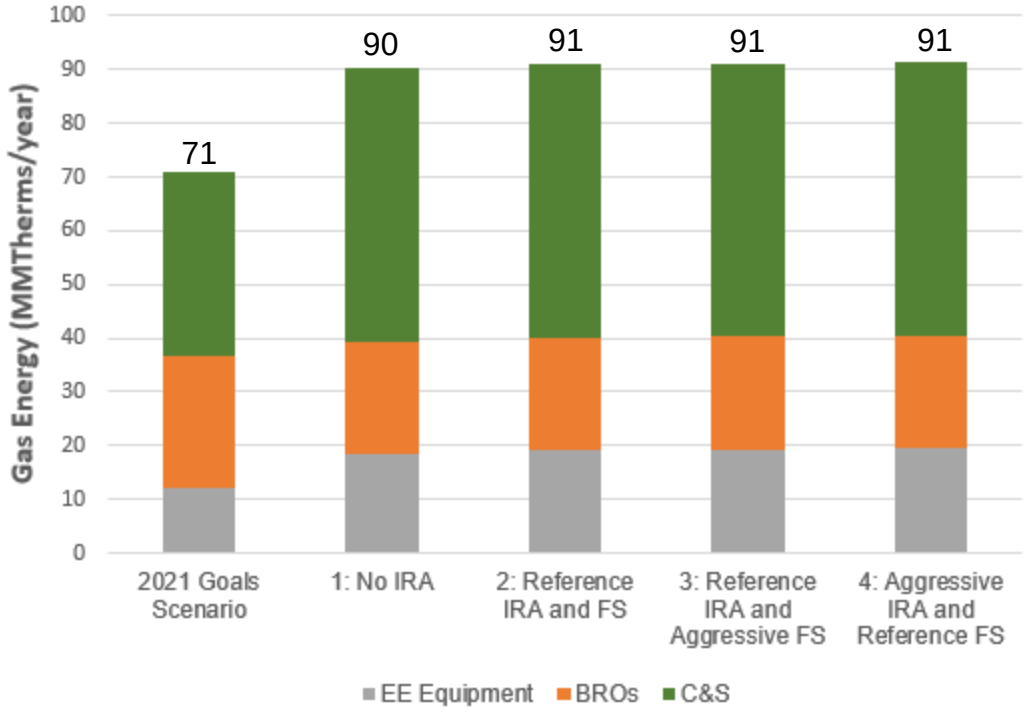
- Account for benefits and costs from rebated measures and BROs (exclude low income and C&S)
- Results exclude non-resource program costs, which are typically accounted for in a portfolio-level cost-effectiveness assessment.
- Scenario 3 is lower due to the higher assumed costs associated with FS



Study Potential – All savings sources

2024 First Year Energy Efficiency Savings



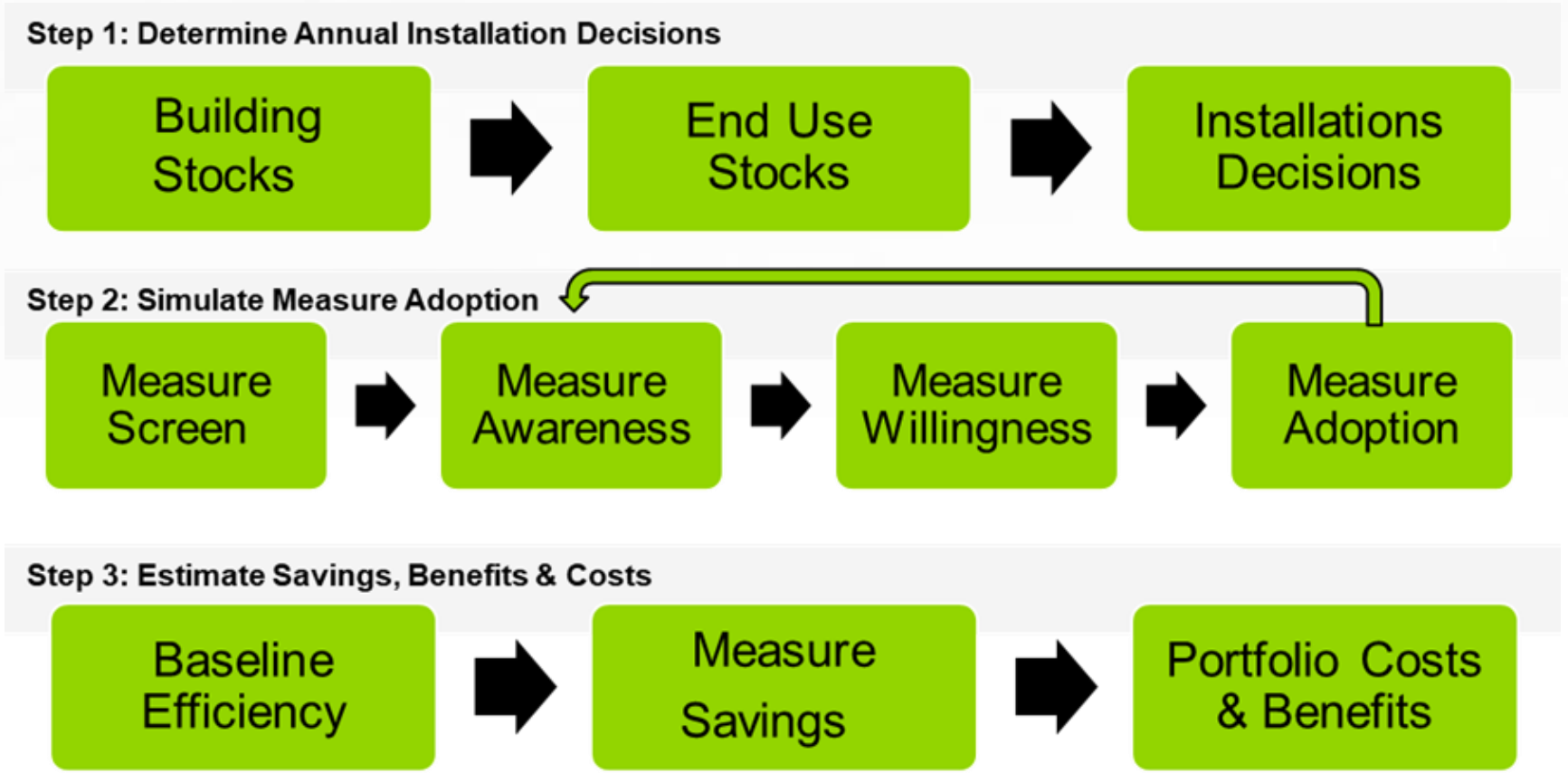


Detailed Results

Rebate and BROs Programs

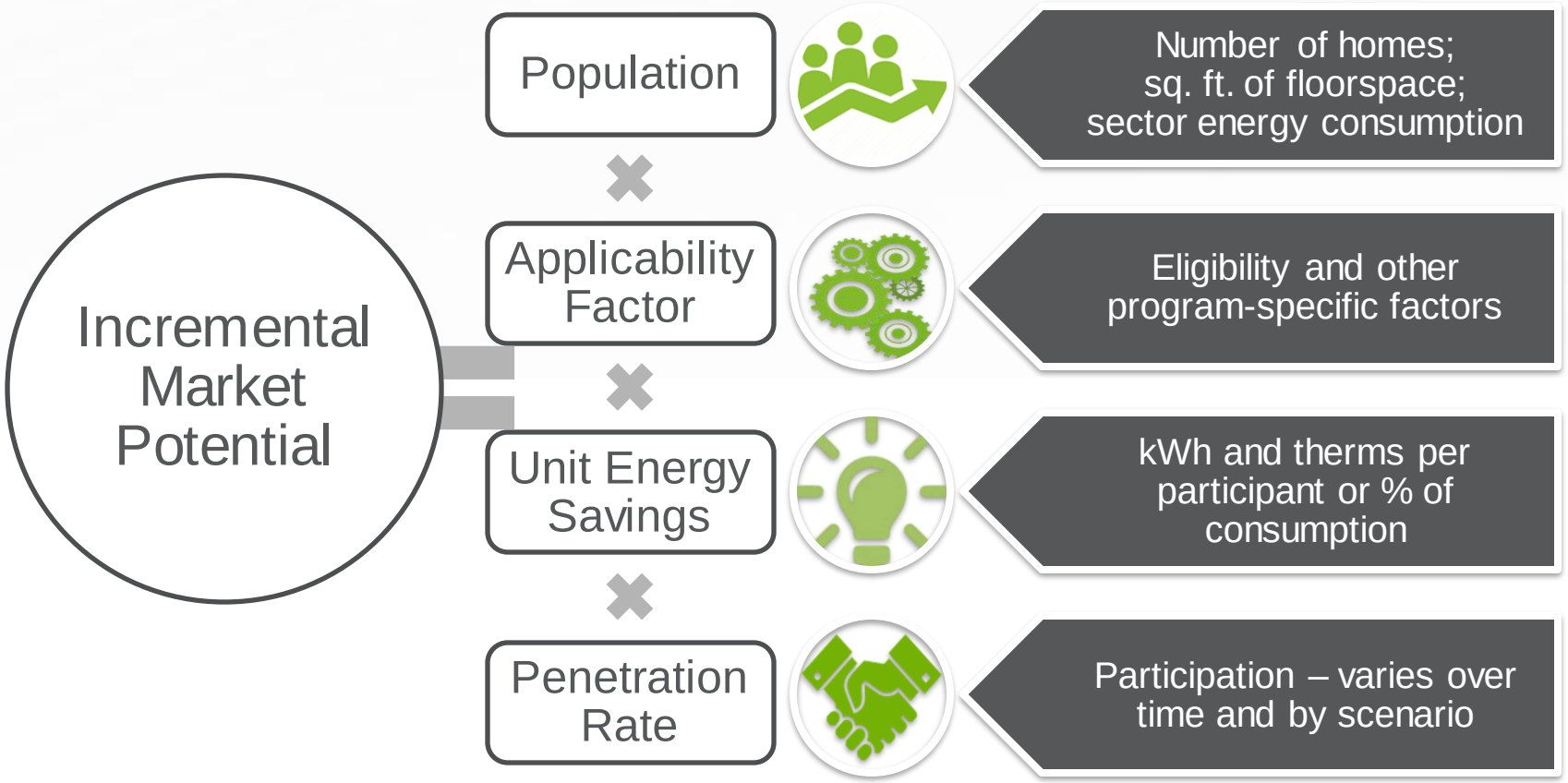
Bottom-up Approach – Rebated Technologies

Residential, Commercial, Characterized Custom Ind/Ag



Top-Down Approach – Rebated Programs and BROs

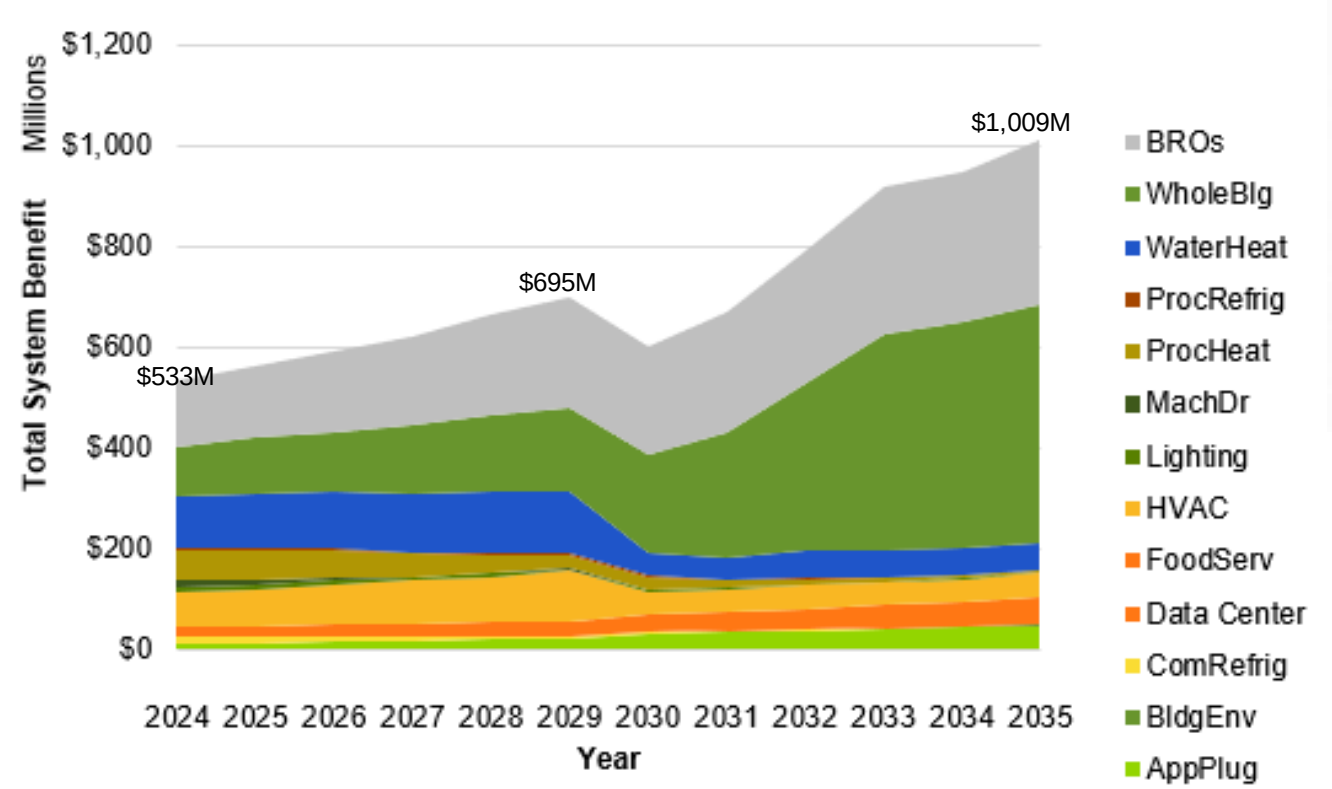
BROs Programs and Ind/Ag Generic Custom and Emerging Tech



TSB Results – EE/FS Equipment + BROs Combined

Scenario 2: Reference IRA and FS

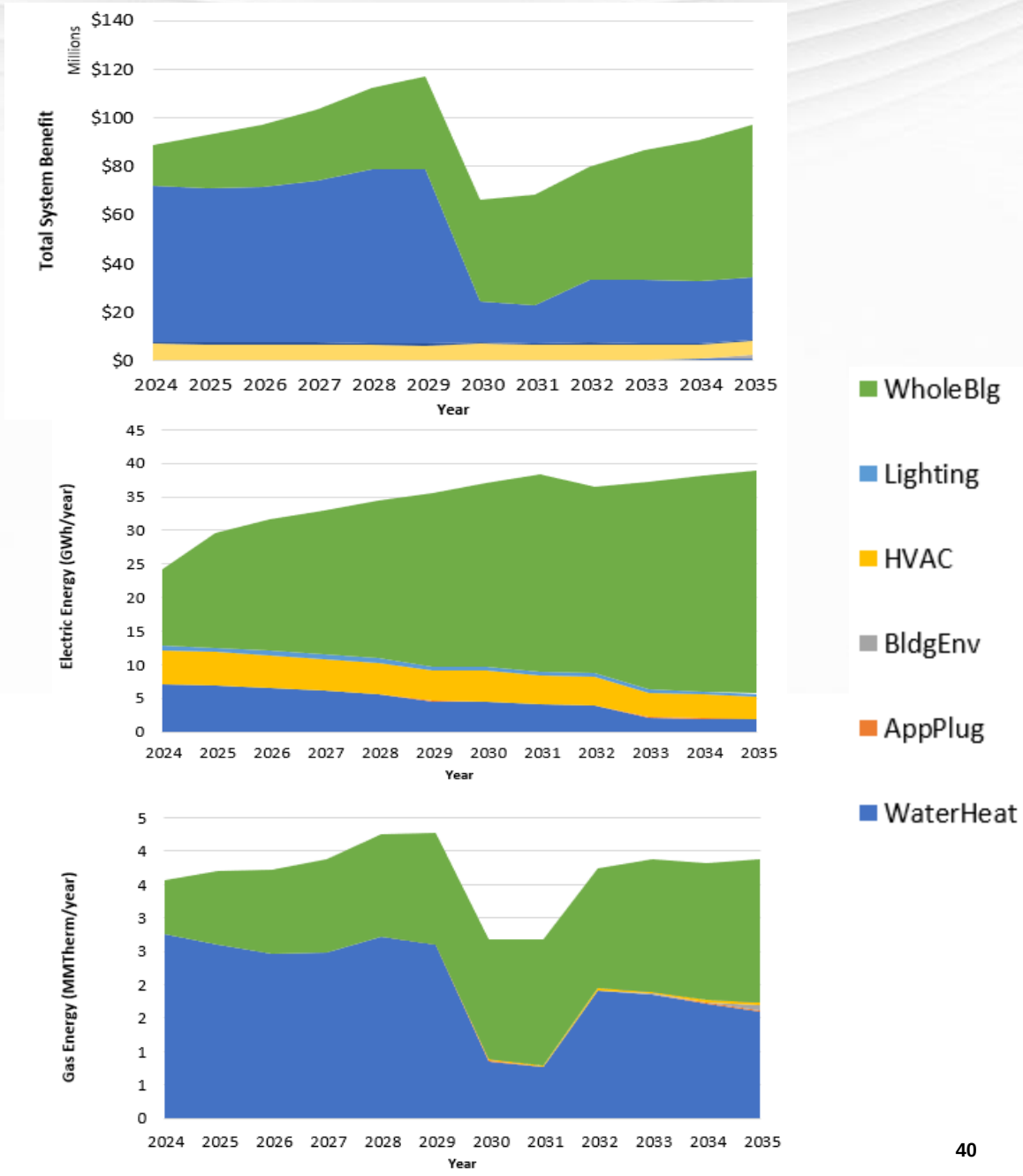
- TSB increases over time as achievable EE potential and avoided costs increase
- BROs contributes over 50% of the first-year energy savings, but a smaller portion of the TSB due to its short EUL
- Decline in TSB from 2029-2030 is primarily driven by Water Heating and HVAC FS measures. Gas EE also has an impact.



Residential - EE Equipment

Scenario 2: Reference IRA and FS

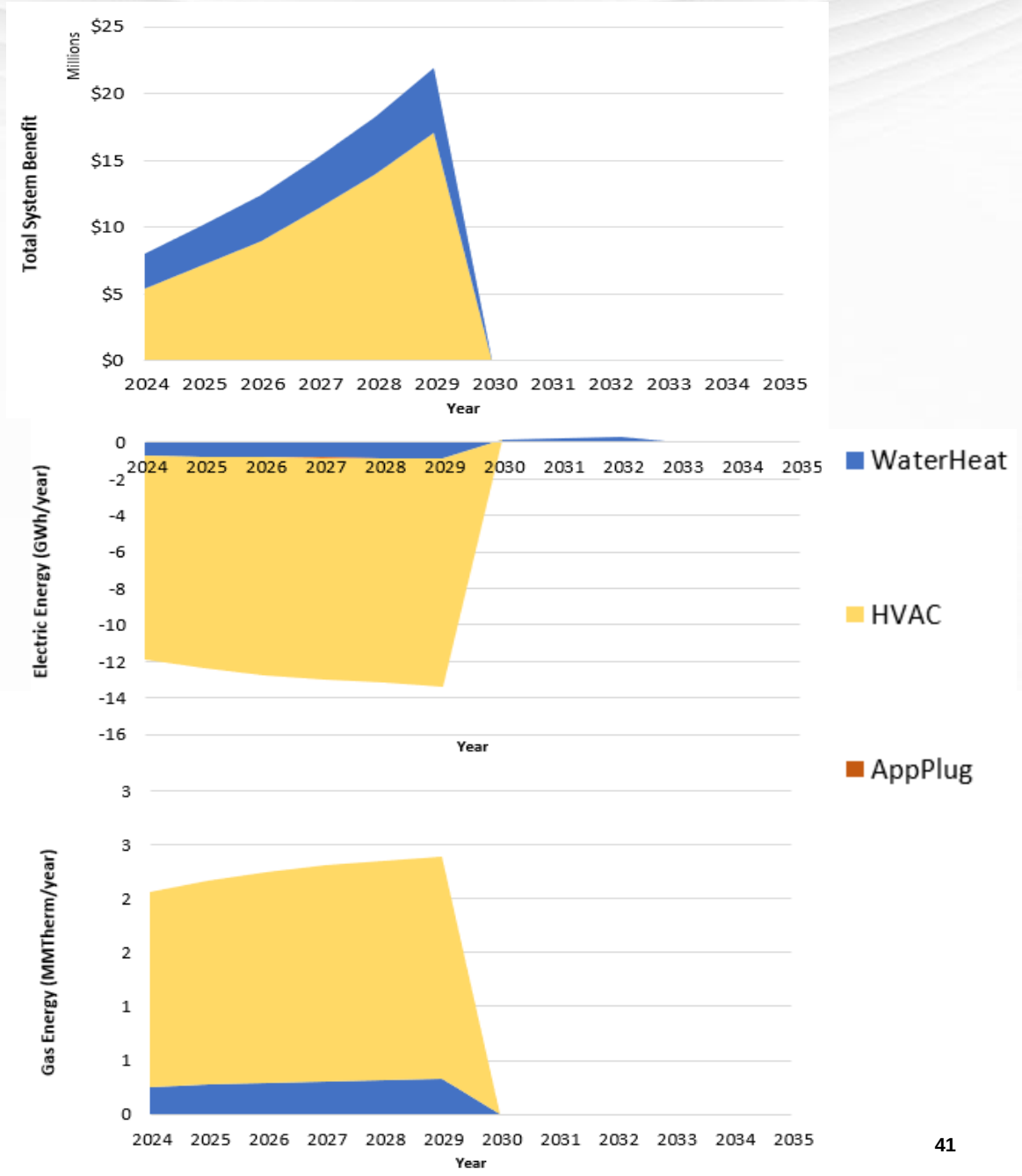
- Whole building and water heating are key drivers of both TSB and energy impacts
- Whole building savings are mostly from exceeding building code in new construction homes
- Water heating generates the 49% of total TSB of all Residential end uses for duration of Study, and as much as 72% annually (2024)
  - Gas WH generate 58% of achievable TSB from 2024-2027
  - HPWH generate 6% of achievable TSB from 2024-2027



Residential – FS Equipment

Scenario 2: Reference IRA and FS

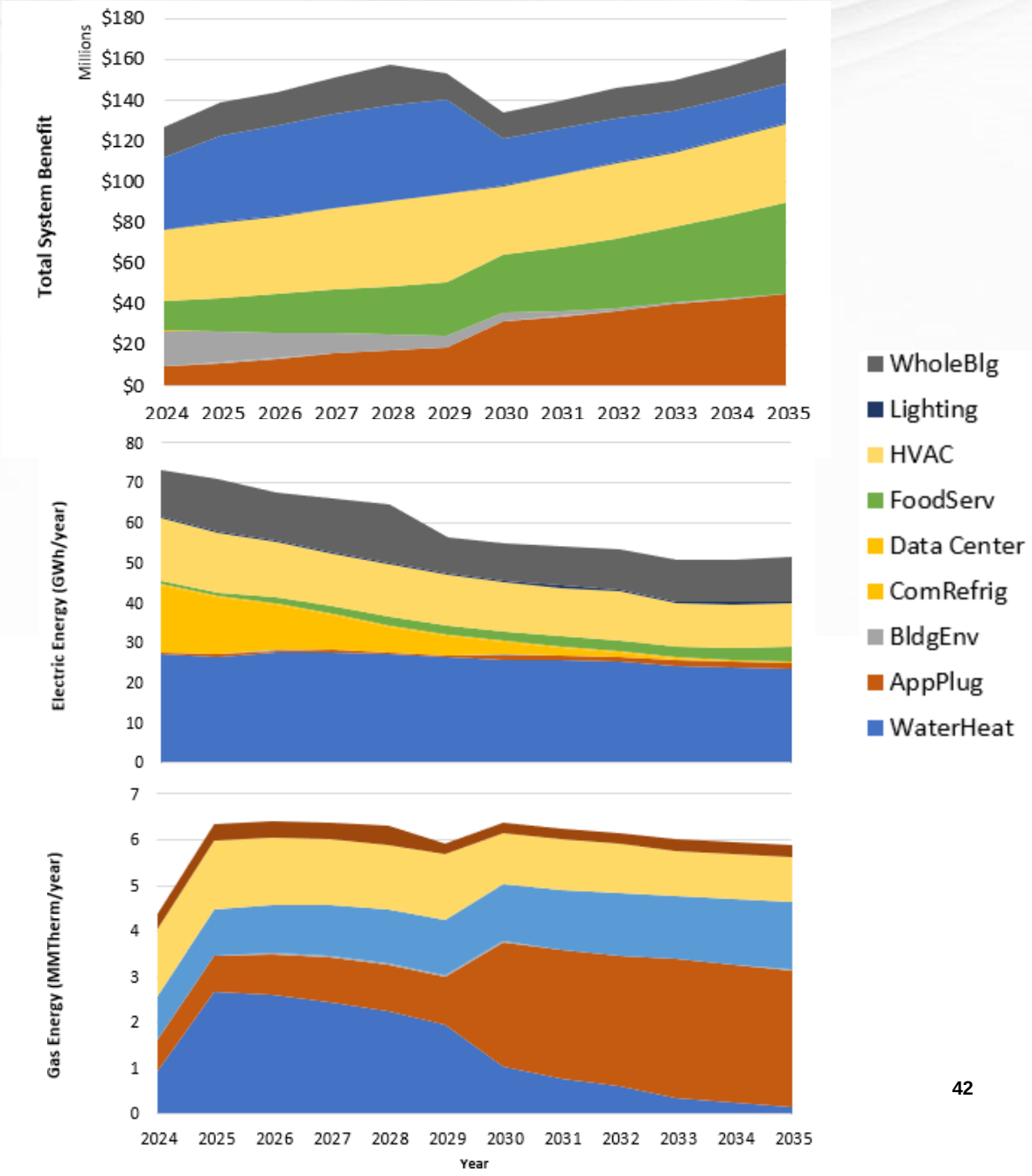
- HVAC end use represents 75% or greater of achievable TSB, gas, and electric impacts
- Electric impacts post-2030 result from the treatment of FS within the model post-NG appliance ban
- Achievable Appliance Plug Load (cooking) FS measure potential is negligible in Residential Sector



Commercial - EE Equipment

Scenario 2: Reference IRA and FS

- Key non-behavioral end use drivers of TSB for Commercial EE Are HVAC, Water Heating, and Food Service
- Refrigeration measures provide significant electric EE potential through 2028-2029, but decline in outer years as increasing avoided costs drive down cost effectiveness
- Appliance Plug Load potential grows post 2030 due to high impact measure (Ozone Laundry Retrofit) becoming cost effective in additional building types

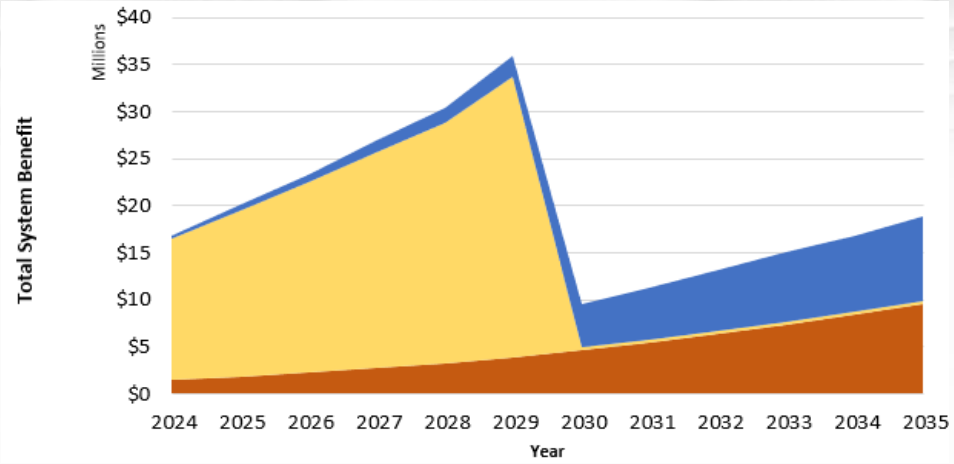


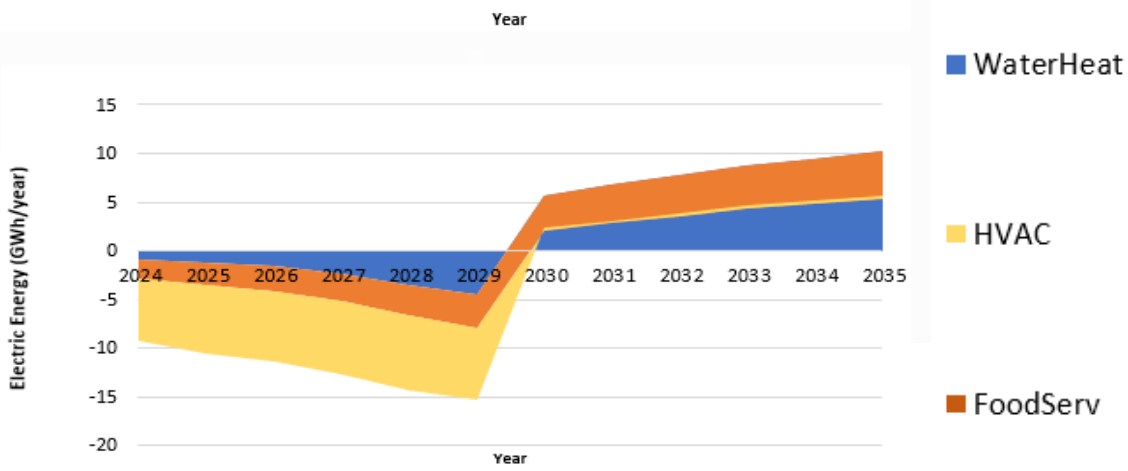
Negative gas savings are due to the lighting interactive effects. AppPlug end use has positive savings that overlaps on the figure with the negative lighting savings.

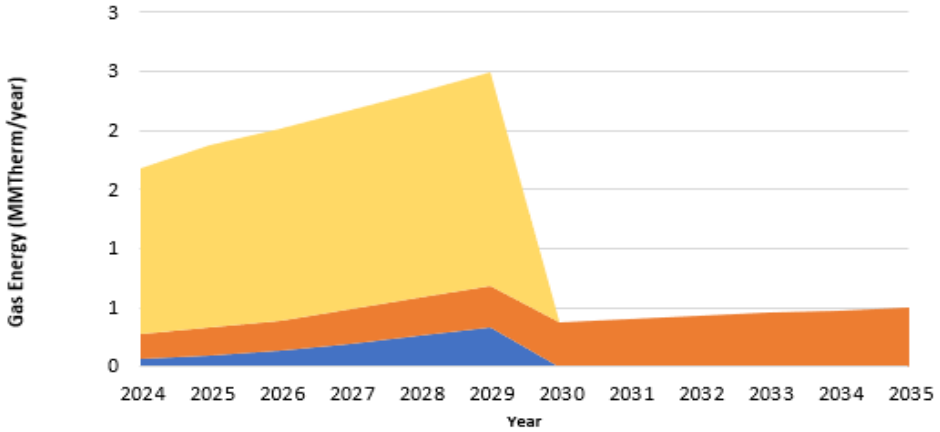
Commercial – FS Equipment

Scenario 2: Reference IRA and FS

- TSB and energy potential are driven by Water Heating, HVAC, and Food Service end uses
- Gas appliance ban 2030 eliminates nearly all FS potential for HVAC end use. Water Heating electric impact reflects the treatment within the PG model





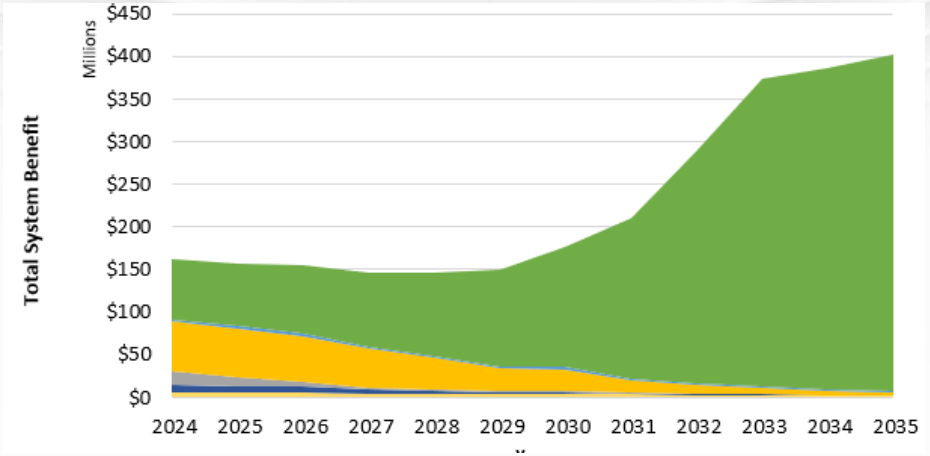


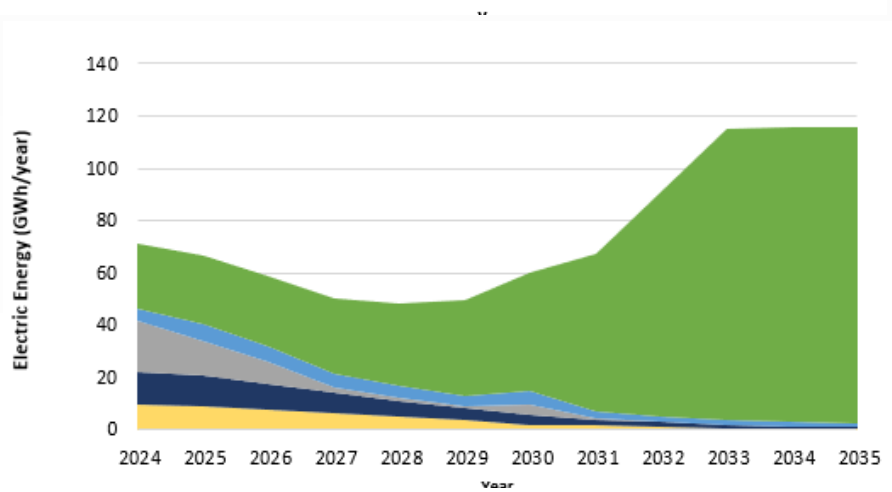
Negative gas savings are due to the lighting interactive effects. AppPlug end use has positive savings that overlaps on the figure with the negative lighting savings.

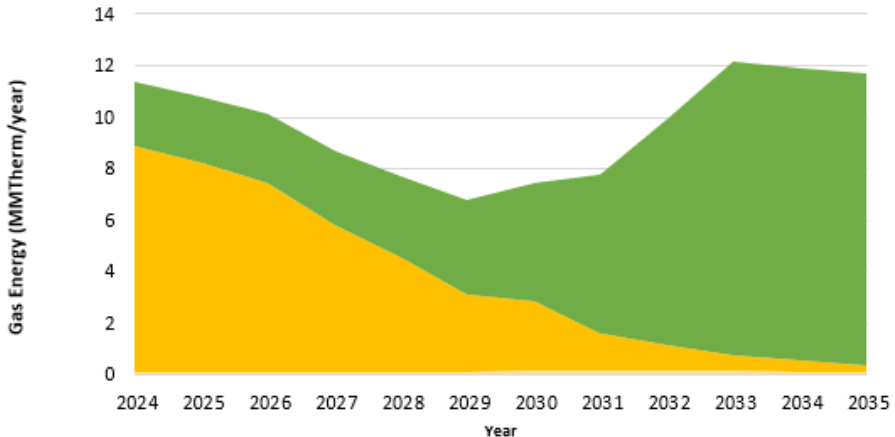
Ind/Ag – EE Equipment

Scenario 2: Reference IRA and FS

- Whole Building (Generic Custom and Emerging Technology) drive achievable TSB and electric EE
- Process heating measures represent the majority of gas EE potential through 2029. Potential decreases over the study period as key measures' (Heat Recovery and Boiler Controls) cost effectiveness decreases







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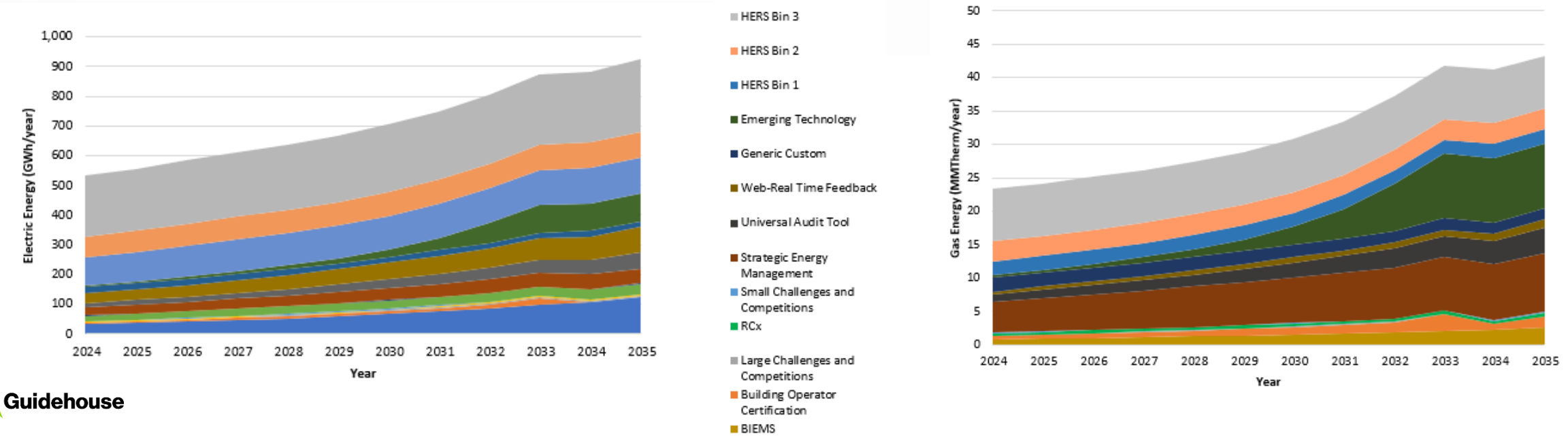
BROs

Savings grow as participation increases over time

- **Residential**: Home Energy Reports (HERs) presents the greatest statewide potential for electric, gas, and peak demand.
- **Commercial**: BIEMS and Building Operator Certification drive potential for sector
- **Industrial/Agricultural**: Industrial sector Strategic Energy Management is a bigger contributor to gas savings than it is for electric savings



Policy Discussion

Policy Questions

- Ruling on 4/17/23 issued a set of questions for stakeholders to respond to
- This is an opportunity to ask clarifying questions
- Feedback can also be provided – though parties should file formal comments for your recommendations to be considered

Policy Questions - Scenarios

The P&G Study forecasted savings using the following scenarios.

- Which scenario is most appropriate?
- Alternative recommendations?

Levers → Scenario ↓	C-E Test	C-E Threshold	IRA Tax Credits	Incentive Levels Capped	Fuel Substitution	Program Engagement
1: No IRA	TRC	0.85	None	EE 50% FS 75%	Reference	Reference
2: Reference IRA and FS	TRC	0.85	Conservative	EE 50% FS 75%	Reference	Reference
3: Reference IRA and Aggressive FS	TRC	0.85	Conservative	EE 75% FS 90%	Aggressive	Reference
4: Aggressive IRA and Reference FS	TRC	0.85	Aggressive	EE 50% FS 75%	Reference	Reference

Policy Questions – Inflation Reduction Act

- Should a scenario that includes the impact of the IRA be selected for the energy efficiency goals? If so, which IRA scenario should be used and why?
- What are the pros and cons of adopting the IRA Reference scenario?
- What are the pros and cons of adopting the IRA Aggressive scenario?
- What policy or implementation implications (e.g., design/scope of evaluation studies) would need to be considered if a scenario inclusive of the IRA is chosen for energy efficiency goals?

Policy Questions – Fuel Substitution

- Which fuel substitution sensitivity level is most appropriate to inform goals?
- What are the pros and cons of adopting the Reference FS scenario?
- What are the pros and cons of adopting the Aggressive FS scenario?
- Does the methodology the study uses reasonably estimate FS infrastructure costs?
- Do you agree with how the PGS modeled fuel substitution infrastructure upgrades?

Policy Questions – Partial Natural Gan Appliance Ban

- Do you agree with the way the 2023 Potential and Goals Study modeled the impact of the CARB SIP natural gas appliance ban policy decision?
- Should future cycles of the study model regionally specific, more aggressive policy decisions such as the BAAQMD's 2027 implementation?

Policy Questions - Data Assumptions and Methodology

- Do you agree with our assumptions?
- If not, what other publicly available data should we be using, or what methodology should we have used?

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 formal, filed in the R13-11-005 proceeding.
- Study-related comments are due May 8
- Reply comments are due May 18.

Formal comments may only be filed by parties to the R13-11-005 proceeding. For information about becoming a party to a CPUC proceeding, visit www.cpuc.ca.gov/Party_to_a_Proceeding.

Open Questions and Discussion

Stay Informed

CPUC's 2023 Energy Efficiency Potential & Goals Webpage:

https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/demand-side-management/energy-efficiency/energy-efficiency-potential-and-goals-studies/2023-potential-and-goals-study

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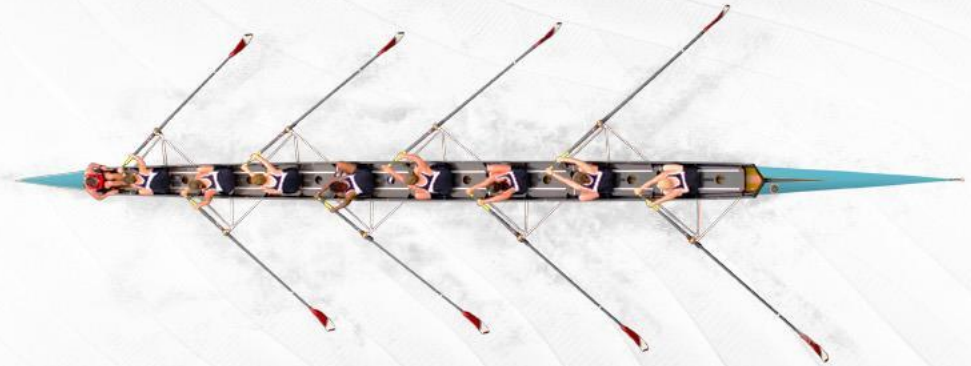

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