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Updates on Energy Efficiency and Fuel Substitution

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IEPR Commissioner Workshop on Energy Demand Forecast Load Modifier Scenario Updates

August 26, 2025



Additional Achievable Energy Efficiency (AAEE) and PiCS Additional Achievable Fuel Substitution (AAFS)

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August 26, 2025



Acronyms, Initialisms, and Abbreviations

AAEE – Additional Achievable Energy Efficiency

AAEE – Additional Achievable Energy Efficiency

A&A – Additions and Alterations

CCA – Community Choice Aggregator

CEC – California Energy Commission

CMUA – California Municipal Utility Association

DOE – Department of Energy

EBD – Equitable Building Decarbonization

HPWH – Heat Pump Water Heater

IOU – Investor-Owned Utility

IRA - Inflation Reduction Act

GHG – Greenhouse Gases

LI – Low Income

NC – New Construction

PiCS – Programs and incremental Codes and Standards

POU – Publicly Owned Utility

REN – Regional Energy Network

Res - Residential

T20 – Title 20 California Appliance Standards Code

T24 – Title 24 California Building Standards Code

TECH- Technology and Equipment for Clean Heating

WBs - Workbooks

ZE - Zero-Emission



How Do AAEE & AAFS Modify Demand?

Additional Achievable EE savings and FS impacts capture a range of incremental market potential impacts beyond what is included in the baseline demand forecast, but they are within the range of what is reasonably expected to occur

AAFS {	Load Modifier	Modeled by	Gas Consumption	Electricity Consumption
	PiCS AAFS	EE/FS PiCS WBs		
	ZE AAFS	FSSAT		
	AAEE	EE/FS PiCS WBs		



How Do AAEE & AAFS Modify Demand?

Additional Achievable EE savings and FS impacts capture a range of incremental market potential impacts beyond what is included in the baseline demand forecast, but they are within the range of what is reasonably expected to occur

- Both **AAEE** and **AAFS** reduce gas consumption

		Gas Consumption	Electricity Consumption
AAFS {	PiCS AAFS	Decreases ↓	
	ZE AAFS	Decreases ↓	
	AAEE	Decreases ↓	



How Do AAEE & AAFS Modify Demand?

Additional Achievable EE savings and FS impacts capture a range of incremental market potential impacts beyond what is included in the baseline demand forecast, but they are within the range of what is reasonably expected to occur

- Both **AAEE** and **AAFS** reduce gas consumption
- While **AAEE** also reduces electricity consumption, **AAFS increases electricity consumption**
- Thus, AAEE has “savings” and AAFS has “impacts”

		Load Modifier	Modeled by	Gas Consumption	Electricity Consumption
AAFS {	PiCS AAFS	EE/FS PiCS WBs	Decreases ↓	Increases ↑	
	ZE AAFS	FSSAT	Decreases ↓	Increases ↑	
	AAEE	EE/FS PiCS WBs	Decreases ↓	Decreases ↓	



How Can AAEE & AAFS Coordinate?

AAFS

Order of Operations	Load Modifier	Gas Consumption	Electricity Consumption	Dual or Separate Impacts?
1	PiCS AAFS	↓	↑	
2	ZE AAFS	↓	↑	
3	AAEE	↓	↓	

- Need to consider which combinations of AAEE and AAFS scenarios are compatible with each other given total gas displacement potential and program funding sources



How Can AAEE & AAFS Coordinate?

AAFS {	Order of Operations	Load Modifier	Gas Consumption	Electricity Consumption	Dual or Separate Impacts?
	1	PiCS AAFS	↓	↑	
	2	ZE AAFS	↓	↑	
	3	AAEE	↓	↓	Savings can be Separated

- Need to consider which combinations of AAEE and AAFS scenarios are compatible with each other given total gas displacement potential and program funding sources
- **AAEE scenarios** can be separated by fuel (electricity vs. gas)



How Can AAEE & AAFS Coordinate?

AAFS {	Order of Operations	Load Modifier	Gas Consumption	Electricity Consumption	Dual or Separate Impacts?
	1	PiCS AAFS			Dual Gas and Electric Impacts
	2	ZE AAFS			Dual Gas and Electric Impacts
	3	AAEE			Savings can be Separated

- Need to consider which combinations of AAEE and AAFS scenarios are compatible with each other given total gas displacement potential and program funding sources
- **AAEE scenarios** can be separated by fuel (electricity vs. gas)
- **AAFS scenarios** are necessarily coupled

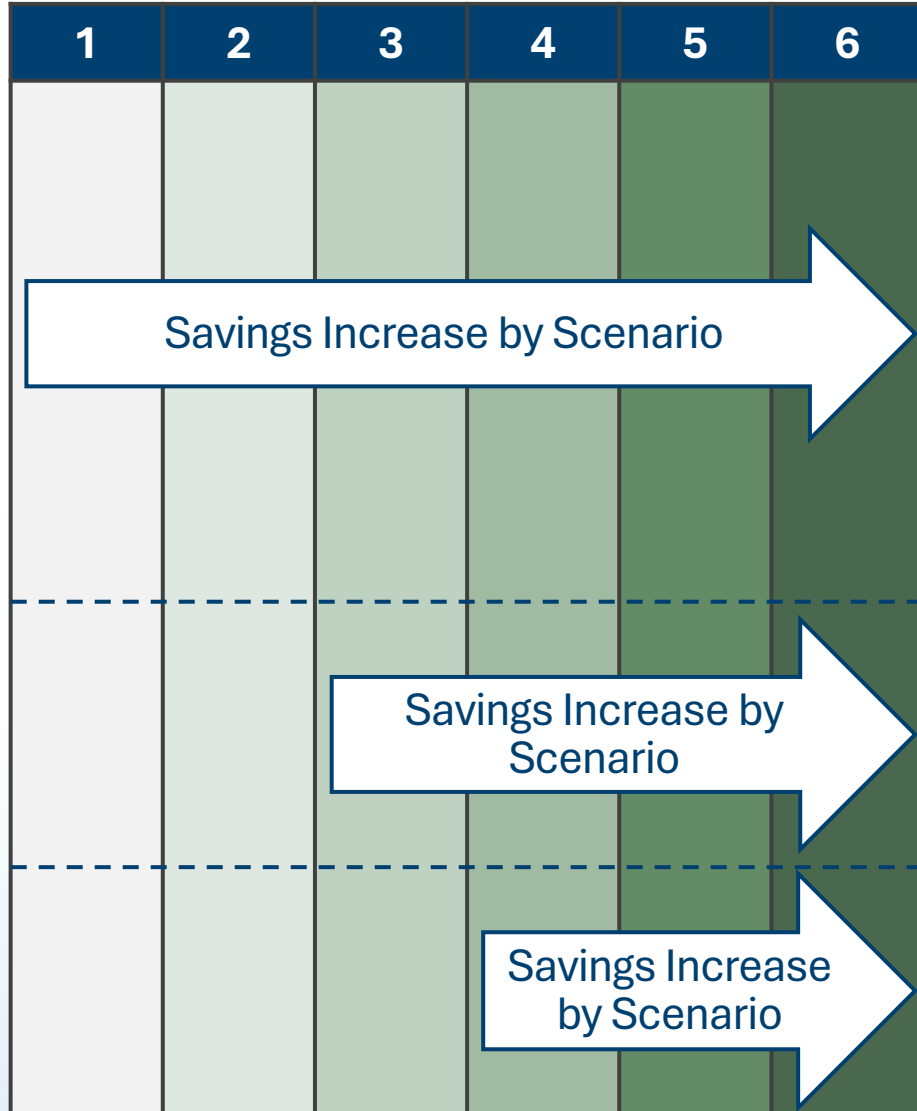


Shifting Building Energy Efficiency and Electrification Policy Landscape

T24 CA Building Standards	▪ Assembly Bill 130 (Committee on Budget, Chapter 22, Statutes of 2025)
T20 CA and Federal Appliance Standards	▪ 17 Measures on DOE list to rescind ▪ 9 may be Federally preempted
IOU and POU Program based Electrification 2030 and beyond	▪ CARB Delaying zero-emission space and water heater standard board hearing until after 2025 (CARB SIP) ▪ Currently IOU and POU electrification programs cease after 2030 for water heating and HVAC (IOU sensitivity run for no ZE water & space heating)
Federal IRA funding	▪ Funding sunset in 2025 rather than original 2034 end date (H.R.1 One Big Beautiful Bill Act 119th Congress 2025-2026)



AAEE Modeled in 2023



← AAEE Scenarios

- IOU energy efficiency programs
- POU energy efficiency programs
- CCA/RENs
- Title 24 Res and Non-Res NC and A&A
- Building Initiative for Low-Emissions Development (BUILD)
- Local Government Ordinances
- Greenhouse Gas Reduction Fund LI Weatherization
- Energy Conservation Assistance Act (ECAA) Financing
- Property Assessed Clean Energy (PACE) Financing

- Federal Appliance Standards
- Home Efficiency Rebates (HOMES) IRA Incentive Program
- Energy Asset Rating
- Smart Meter Data Analytics

- Title 20 State Appliance Standards
- Industrial and Agricultural Potential
- Clean Energy Reliability Investment Plan (CERIP)
- Conservation Voltage Reduction



Significant Considerations for 2025 AAEE Modeling

New 2025 CMUA Potential Study

AB 130 Pause on New Residential Standards for 2028 Cycle

17 Measures on DOE list to rescind

IRA funding eliminated end of 2025 rather than 2034

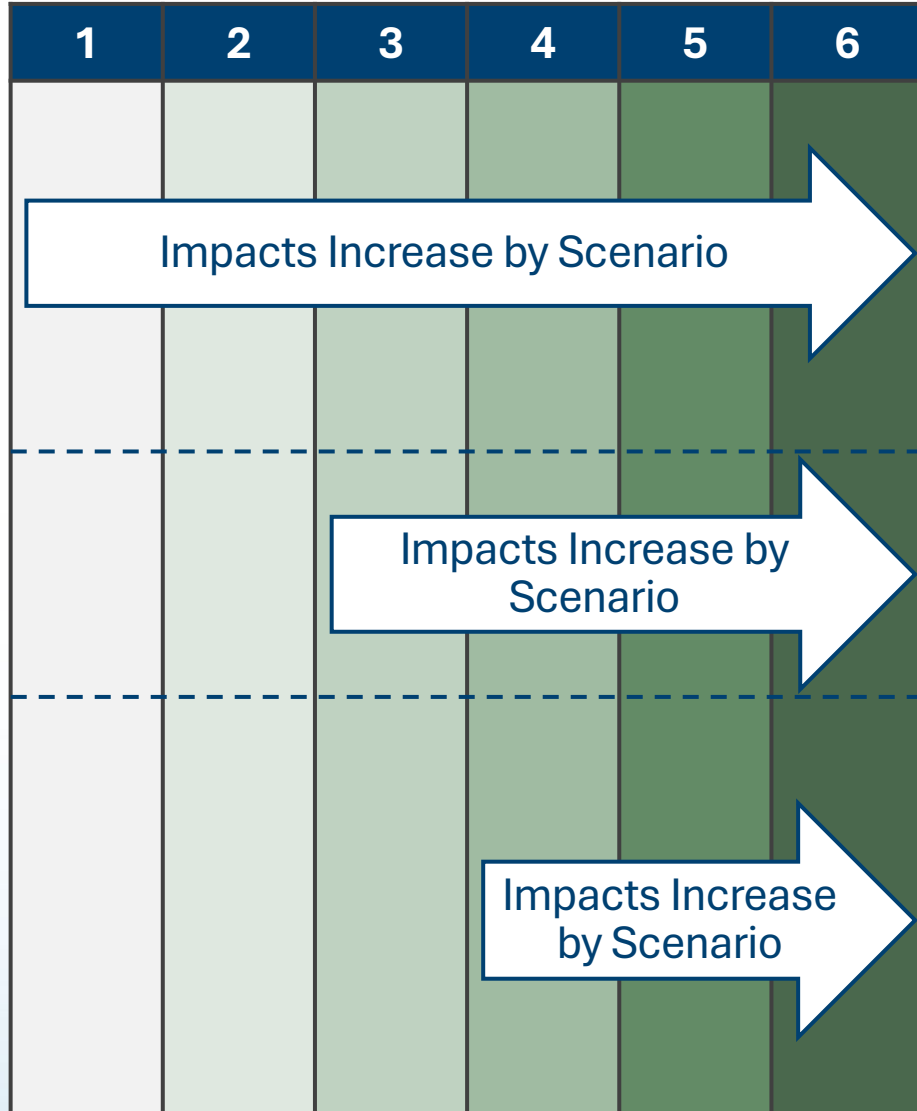
- IOU energy efficiency programs
- **POU energy efficiency programs**
- CCA/RENs
- **Title 24 Res and Non-Res NC and A&A**
- **Building Initiative for Low-Emissions Development (BUILD)**
- **Local Government Ordinances**
- Greenhouse Gas Reduction Fund LI Weatherization
- Energy Conservation Assistance Act (ECAA) Financing
- Property Assessed Clean Energy (PACE) Financing

- **Federal Appliance Standards**
- **Home Efficiency Rebates (HOMES) IRA Incentive Program**
- Energy Asset Rating
- Smart Meter Data Analytics

- **Title 20 State Appliance Standards**
- Industrial and Agricultural Potential
- Clean Energy Reliability Investment Plan (CERIP)
- Conservation Voltage Reduction



PiCS AAFS Modeled in 2023



← AAFS Scenarios

- IOU fuel substitution programs
- POU fuel substitution programs
- CCA/RENS
- **Title 24 Res and Non-Res NC and A&A**
- Targeted Electrification
- Affordable Housing and Sustainable Communities

- **TECH Clean California**
- California Electric Homes Program
- Wildfire and Natural Disaster Resiliency Rebuild

- **Equitable Building Decarbonization (EBD)**
 - IRA Incentive Program
 - CEC's EBD Program Direct Install & Tribal Direct Install
 - EBD Non-IOU TECH
- Food Production Investment Program
- Self-Generation Incentive Program HPWH
- Local Governments Challenge



Significant Considerations for 2025 PiCS AAFS Modeling

New 2025 CMUA Potential Study
(includes Electrification!)

AB 130 Pause on New
Residential Standards
for the 2028 Cycle

Higher IOU levels of
electrification than 2023

IRA funding eliminated end of
2025 rather than 2034
CA Budget Adjustments

- IOU fuel substitution programs
- POU fuel substitution programs
- CCA/RENs
- Title 24 Res and Non-Res NC and A&A
- Targeted Electrification
- Affordable Housing and Sustainable Communities

- TECH Clean California
- California Electric Homes Program
- Wildfire and Natural Disaster Resiliency Rebuild

- Equitable Building Decarbonization (EBD)
 - IRA Incentive Program
 - CEC's EBD Program Direct Install & Tribal Direct Install
 - EBD Non-IOU TECH
- Food Production Investment Program
- Self-Generation Incentive Program HPWH
- Local Governments Challenge

Thank You!

Questions? Comments?



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2025 IEPR Draft AAFS Scenario Characterizations – Zero-Emission Modeling

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August 26, 2025



Acronyms, Initialisms, and Abbreviations

AAEE – Additional Achievable Energy Efficiency

AAFS – Additional Achievable Fuel Substitution

AMI – Advanced Metering Infrastructure

AQMD – Air Quality Management District

CARB – California Air Resources Board

CEC – California Energy Commission

Com – Commercial

DOE – Department of Energy

FSSAT – Fuel Substitution Scenario Analysis Tool

HH – Households

IEPR – Integrated Energy Policy Report

NC – New Construction

PAR – Proposed Amended Rule

PG&E – Pacific Gas and Electric

PiCS – Programs and incremental Codes and Standards

Res – Residential

ROB – Replace on burnout

SCE – Southern California Edison

SDG&E – San Diego Gas and Electric

SH – Space Heating

SIP – State Implementation Plan

T24 – Title 24 California Building Standards Code

WH – Water Heating

ZE – Zero-emission



Shifting of Building Electrification Policy Landscape

ZE Modeling (FSSAT) Uncertainties

South Coast AQMD	▪ June 6: Rejected 7 to 5 PAR 1111 (Res & Comm SH) and 1121 (Res WH) ▪ July 18: Federal court upheld PAR 1146.2 (large water heaters, small boilers, and process heaters)
Bay Area Air District	▪ Looking at potential amendments to Rule 9-6 (Res & Comm WH) to address installation challenges
CARB	▪ Delaying zero-emission space and water heater standard board hearing until after 2025
Federal	▪ Effect of DOE energy efficiency standards for residential water heaters (Compliance required starting in 2029)



Expected changes compared to 2024 IEPR

- **South Coast AQMD and Bay Area Air District**
 - Remove **PAR 1111 and 1121** from all AAFS scenarios
 - Maintain same assumptions for **Rules 9-4 (Res & Comm SH) and 9-6** and **PAR 1146.2**
- **CARB**
 - Revert to 2030 compliance year for CARB zero-emission space and water heater standard
- **Federal**
 - Assume “highly-weighted” efficiency for all residential electric water heater replacements



2025 AAFS Proposed Scenario Characterizations

Programs and incremental Codes and Standards (PiCS)

AAFS PiCS Factors	AAFS 1	AAFS 2	AAFS 3	AAFS 4	AAFS 5	AAFS 6
AAFS Scenario	1	2	3	4	5	6
AAEE Gas Scenario	3	3	3	2	2	2
AAEE Elec Scenario	3	3	3	2	2	2

Fuel Substitution Scenario Analysis Tool (FSSAT)

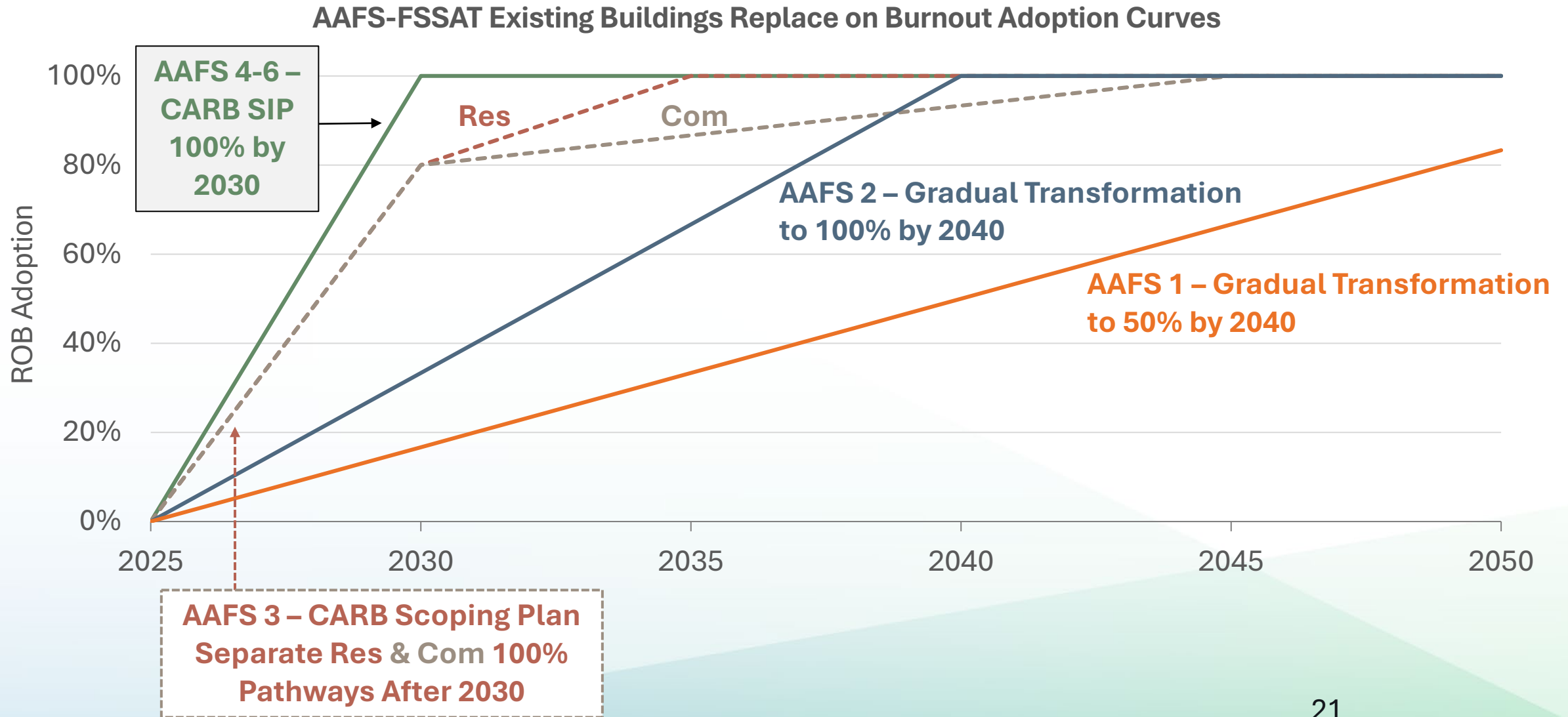
AAFS FSSAT Factors	AAFS 1	AAFS 2	AAFS 3	AAFS 4	AAFS 5	AAFS 6
End Uses	SH & WH	SH & WH	SH & WH	SH & WH	SH, WH, C, CD	SH, WH, C, CD
Substituted Fuel Types	Gas	Gas	Gas	Gas	Gas	Gas & RP
NC (Beyond PiCS T24)				100% in 2029	100% in 2029	100% in 2029
Statewide EB	GT 50% by 2040	GT 100% by 2040	CARB SP 100% Targets	SIP linear to 100% by 2030	SIP linear to 100% by 2030	SIP linear to 100% by 2030
Bay Area PAR 9-4 & 9-6		✓	✓	✓	✓	✓
South Coast PAR 1146.2		✓	✓	✓	✓	✓

Table Abbreviations

C Cooking	GT Gradual Transformation Scenario	RP Residential Propane	SP Scoping Plan
CD Clothes Drying	NC New Construction	SH Space Heating	T24 Title 24
EB Existing Buildings	PAR Proposed Amended Rule	SIP State Implementation Plan	WH Water Heating



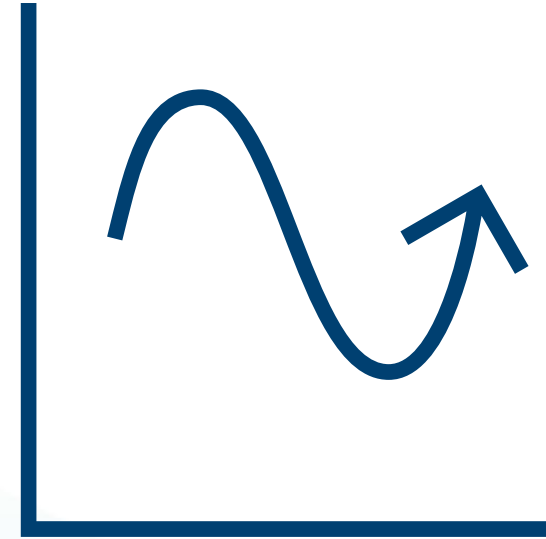
Proposed 2025 AAFS Scenario Replace-on-Burnout Adoption Curves





Notes on Additional Updates for FSSAT

- Plan to perform routine update of the major data inputs for FSSAT.
- Expected update to Commercial HVAC - Heat Pump heating load shapes
- Expected updates to the accounting of PiCS AAFS in FSSAT
- Plan to use similar [technology characterization assumptions](#) as used in the 2024 IEPR Update





Update on CEC's Heat Pump Tracking Efforts

- CEC staff currently has an unofficial estimate as of Q2 2025
- Increasing agency-wide efforts in tracking equipment, particularly heat pumps
 - Existing available data sources
 - [Energy Data Collection Phase 3](#) – Space Conditioning And Water Heating Equipment Data Tracking
 - AMI data
- Dashboard in development with planned quarterly updates
- Latest estimate in 2025 IEPR analysis



Thank You!



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Appendix



2023 AAEE and PiCS AAFS Workbooks

A detailed workbook of AAEE and AAFS PiCS characterizations is available here: [2023 AAEE & PiCS AAFS Scenario Characterization Workbook](#). TN# 262297. Docket Number 24-IEPR-03. March 21, 2025.

See slides “AAEE Modeled in 2023” and “PiCS AAFS Modeled in 2023”