



DEMAND ANALYSIS WORKING GROUP (DAWG)

Alternative Additional Achievable Fuel Substitution Scenario (“AAFS 2.5”)

March 20, 2024

Advanced Electrification Analysis Branch
Energy Assessments Division
California Energy Commission



Welcome





Today's Agenda

Topic	Time	Facilitator(s)
Welcome and Introductions	9:00 to 9:05	Nicholas Janusch, CEC
Alternative Additional Achievable Fuel Substitution Scenario ("AAFS 2.5")		
<ul style="list-style-type: none">•Background and proposed characterization of AAFS 2.5 scenario•Preliminary results of AAFS 2.5 and comparisons to 2023 IEPR load modifiers•Discussion and next steps	9:05 to 10:10	Nicholas Janusch, CEC & Ethan Cooper, CEC
Status of 2024 California Gas Report	10:10 to 10:20	Eduardo Martinez, SoCalGas
Overview of PG&E's methodology for developing their building electrification forecasts	10:20 to 10:40	Jon Bradshaw, PG&E
Open Discussion	10:40 to 11:00	Nicholas Janusch, CEC



Protocol for questions and comments

Please send any written comments to Nicholas Janusch (nicholas.janusch@energy.ca.gov) by **April 3, 2024**.



Alternative Additional Achievable Fuel Substitution Scenario (“AAFS 2.5”)

Background and proposed characterization of AAFS 2.5 scenario

Nicholas Janusch, Ph.D.
Acting Supervisor, Efficiency Analysis Unit
Advanced Electrification Branch
Energy Assessments Division



Presentation outline

1. Motivation for alternative AAFS (“AAFS 2.5”)
2. Timeline and purpose of AAFS 2.5 and this DAWG meeting
3. AAFS 2.5 scenario characterization
4. AAFS 2.5 preliminary results
5. Discussion



Background and Motivation

- 2023 IEPR CED Forecast: Six AAFS scenarios, with four including the zero-emission appliance standard scenarios
- Proposed 2023 IEPR Report: Staff recommend against the use of the [AAEE and AAFS] scenarios created for this IEPR for gas system planning (p.108).
 - Uncertainty around pace of building electrification
 - Risks to gas system reliability
 - The scenarios that exclude CARB's concept for a zero-emission appliance standard are overly conservative
- → Direction is to model an acceptable scenario between AAFS 2 and AAFS 3. Alternative scenario ("AAFS 2.5") would be included in 2024 IEPR Update.



Zero-Emission Appliance Standards: Uncertainties

- Regulatory uncertainty:
 - Regional regulatory differences
 - Regulatory timelines
 - Scope of sectors and fuel type
- Adoption and compliance uncertainty:
 - Adoption rate and behavioral responses
 - Compliance rate
 - Readiness
 - Manufacturer capacity
 - Grid capacity
 - Impacts to the gas and electric systems





AAFS 2.5 Timeline/Schedule

Month	AAFS 2.5 Schedule	2024 CGR Schedule	Other Proceedings
January	<ul style="list-style-type: none"> 1/31 Meeting w/ CARB 	<ul style="list-style-type: none"> 1/17 Kickoff meeting 	
February	<ul style="list-style-type: none"> Collaborate and finalize revised AAFS scenario with CARB 		<ul style="list-style-type: none"> 2/28 CARB Public Workshop: Zero-Emission Space and Water Heater Standards
March	<ul style="list-style-type: none"> March 20th DAWG Meeting, 9:00-11:00 a.m. Receive Comments (due April 3rd) 	<ul style="list-style-type: none"> 3/15 Finalized (Fuel Substitution) Assumptions 	
April	<ul style="list-style-type: none"> Receive Comments/Finalize Revisions 	<ul style="list-style-type: none"> 4/19 Preliminary Forecast 	
May	<ul style="list-style-type: none"> Present at the May 29th Reliability Workshop (Might present at an earlier workshop) Post AAFS 2.5 to IEPR Docket 	<ul style="list-style-type: none"> 5/20 Final Gas Demand Forecast 	<ul style="list-style-type: none"> 5/3 South Coast AQMD Rule 1146.2 Public Hearing
June/July		<ul style="list-style-type: none"> 6/7 Final Edits Due 6/24 PDF Finalized 7/1 Report Filed with CPUC 	
Fall 2024	<ul style="list-style-type: none"> Incorporate AAFS 2.5 for 2024 IEPR Update 		



Summary:

Use and purpose of AAFS 2.5

1. CEC staff will present and docket scenario at the **May 29th Reliability CEC Workshop**
2. This scenario can be compared to **2024 California Gas Report**
3. Could be used as a scenario for **CPUC's Order Instituting Rulemaking [R.20-01-007]** to Establish Policies, Processes, and Rules to Ensure Safe and Reliable Gas System in California and Perform Long-Term Gas Planning
4. Will be part of **2024 IEPR Update**



CEC Staff's Objectives for Today

1. Request comment and conversation on three discussion questions
 1. Elicit reaction to AAFS 2.5 characterization
 2. Elicit feedback and evidence-based recommendations for revising AAFS 2.5 scenario characterization
 3. Elicit discussion on the gas system implications of a AAFS 2.5 scenario or a scenario with rapid technological transformation
2. Keep discussion focused primarily on gas system impacts



AAFS 2.5 Scenario Characterization





Summary of AAFS 2.5 Scenario Characterization

- **AAFS 2.5** assumes programmatic **AAEE 3** and programmatic **AAFS 3**
- Same assumption that an evenly-mix of electric technologies replace gas appliances on burnout
- **AAFS 2.5** uses an updated version of FSSAT that includes updated residential technology characterization (RASS 2019).
- Collaborated with CARB staff on AAFS 2.5 characterization
 - Revised characterization of local AQMDs Zero-Emission Appliance Standards (ZEAS)
 - Revised characterization on replace on burnout (ROB) adoption rates

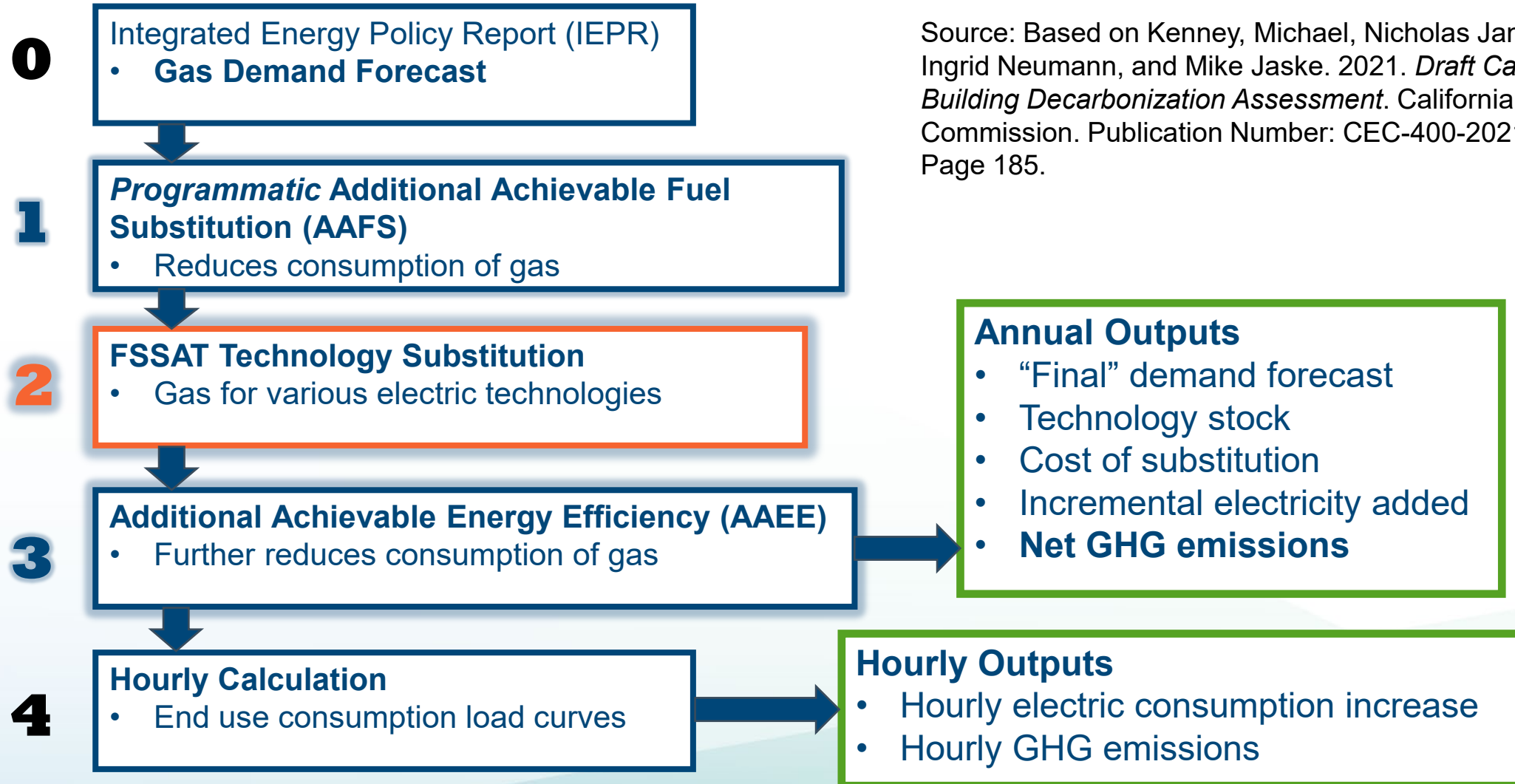


AAFS 2.5 Scenario Zero-Emission Appliance Standard (ZEAS) Characterization

Agency	Board Hearing Date	Zero Emission Appliance Standard	FSSAT revisions made to AAFS 2.5 Characterization compared to 2023 IEPR AAFS Scenario 3
Bay Area AQMD	March 16, 2023	Amendments to Rule 9-4 and Rule 9-6: Space Heaters	No change - ZEAS for replace on burnout (ROB) beginning in 2029 for residential & commercial space heaters
Bay Area AQMD	March 16, 2023	Amendments to Rule 9-4 and Rule 9-6: Water Heaters	Revised - ZEAS beginning in 2027 for ROB only residential water heaters
South Coast AQMD	April 5, May 3rd, 2024	Rule 1146.2 – Large Water Heaters and Small Boilers and Process Heaters	Added - ZEAS beginning in 2029 for ROB for commercial water heaters
Statewide	2025	New Construction	No change - 100% adoption for residential in 2026, and 2029 for commercial
CARB	2025	Replace on Burnout	Revised - ROB adoption rate grows and plateaus at 50 percent in 2030



Modeling electrification: Fuel Substitution Scenario Analysis Tool (FSSAT) main processes flow chart



Source: Based on Kenney, Michael, Nicholas Janusch, Ingrid Neumann, and Mike Jaske. 2021. *Draft California Building Decarbonization Assessment*. California Energy Commission. Publication Number: CEC-400-2021-006-SD. Page 185.



Zero-Emission Appliance Standards Replacement Assumptions for AAFS 2.5

Territory	Replacement Type	AAFS 2.5 Scenario	2020-25	2026	2027	2028	2029	2030-40
Statewide	Comm. New Construction	No change	0%	0%	0%	0%	100%	100%
Statewide	Res. New Construction	No Change	0%	100%	100%	100%	100%	100%
BAAQMD	Replace on Burnout: Space Heating	No Change	0%	25%	50%	75%	100%	100%
BAAQMD	Replace on Burnout: Res. Water Heating	Revised						
SCAQMD	Replace on Burnout: Comm. Water Heating	Revised						
Rest of State	Replace on Burnout	AAFS 3						
Rest of State	Replace on Burnout	Alt 1						
Rest of State	Replace on Burnout	Alt 2: AAFS 2.5						
Rest of State	Replace on Burnout	Alt 3						



Zero-Emission Appliance Standards Replacement Assumptions for AAFS 2.5

Territory	Replacement Type	AAFS 2.5 Scenario	2020-25	2026	2027	2028	2029	2030-40
Statewide	Comm. New Construction	No change	0%	0%	0%	0%	100%	100%
Statewide	Res. New Construction	No Change	0%	100%	100%	100%	100%	100%
BAAQMD	Replace on Burnout: Space Heating	No Change	0%	25%	50%	75%	100%	100%
BAAQMD	Replace on Burnout: Res. Water Heating	Revised	0%	50%	100%	100%	100%	100%
SCAQMD	Replace on Burnout: Comm. Water Heating	Revised	0%	25%	50%	75%	100%	100%
Rest of State	Replace on Burnout	AAFS 3						
Rest of State	Replace on Burnout	Alt 1						
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Zero-Emission Appliance Standards Replacement Assumptions for AAFS 2.5

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Statewide	Res. New Construction	No Change	0%	100%	100%	100%	100%	100%
BAAQMD	Replace on Burnout: Space Heating	No Change	0%	25%	50%	75%	100%	100%
BAAQMD	Replace on Burnout: Res. Water Heating	Revised	0%	50%	100%	100%	100%	100%
SCAQMD	Replace on Burnout: Comm. Water Heating	Revised	0%	25%	50%	75%	100%	100%
Rest of State	Replace on Burnout	AAFS 3	0%	10%	30%	50%	70%	100%
Rest of State	Replace on Burnout	Alt 1	0%	10%	20%	30%	40%	Linear to 100% 2035
Rest of State	Replace on Burnout	Alt 2: AAFS 2.5	0%	10%	20%	30%	40%	50%
Rest of State	Replace on Burnout	Alt 3	0%	0%	0%	0%	0%	0%



Discussion Question (1 of 3)

- What is your reaction to the following AAFS 2.5 Scenario Characterization Assumptions?
 - Programmatic AAEE and AAFS Scenario 3 assumptions
 - Local Air Districts ZEAS assumptions
 - Statewide new construction assumptions
 - CARB ZEAS replace on burnout assumptions

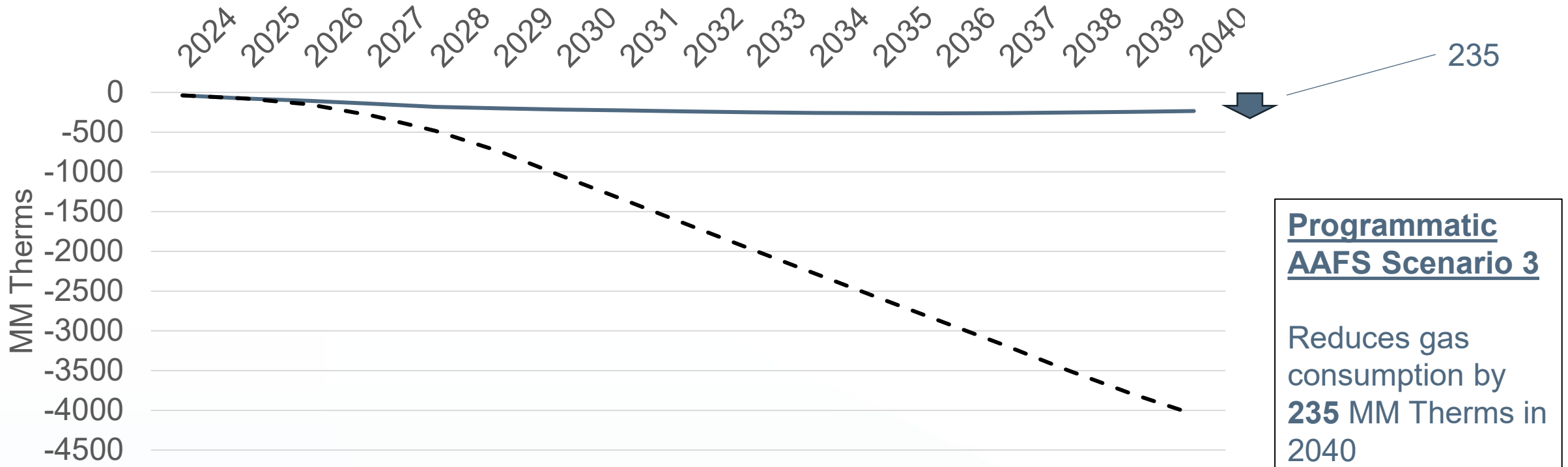


AAFS 2.5 Scenario Preliminary Results

Ethan Cooper
Efficiency Analysis Unit,
Advanced Electrification Branch
Energy Assessments Division



AAFS 2.5 Preliminary Results: Impacts to Gas Savings

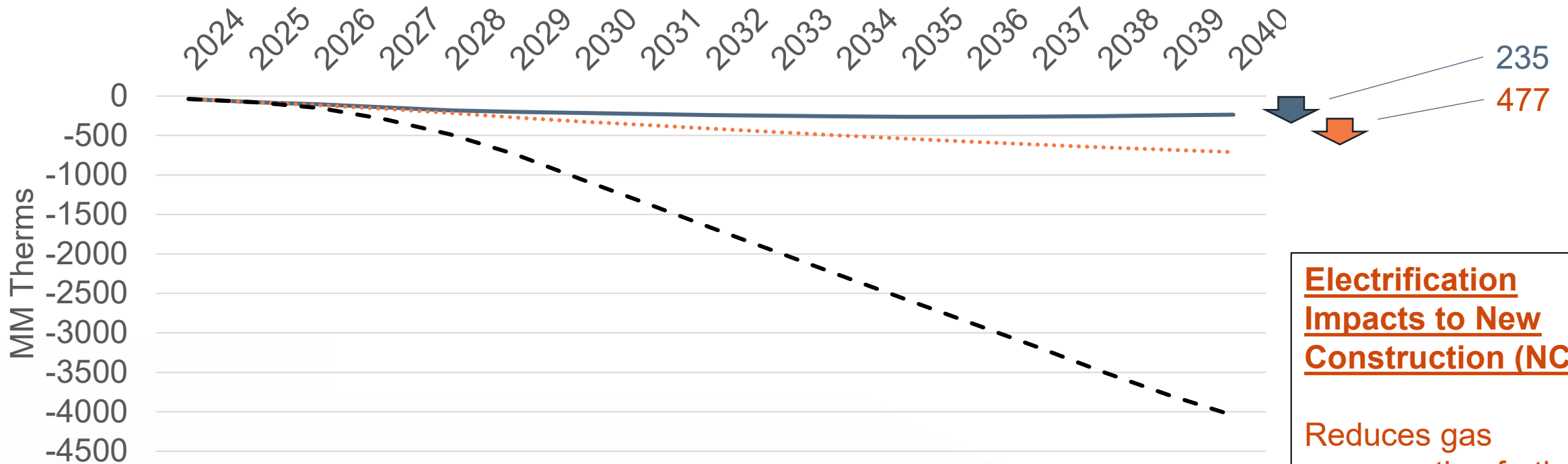


— AAFS 2.5 (Programmatic AAFS 3)

- - 2023 IEPR AAFS 3 (Prog. + NC Electrification + Full ROB ZEAS)



AAFS 2.5 Preliminary Results: Impacts to Gas Savings



- AAFS 2.5 (Programmatic AAFS 3)
- AAFS 2.5 (Prog. + New Construction Electrification)
- - 2023 IEPR AAFS 3 (Prog. + NC Electrification + Full ROB ZEAS)

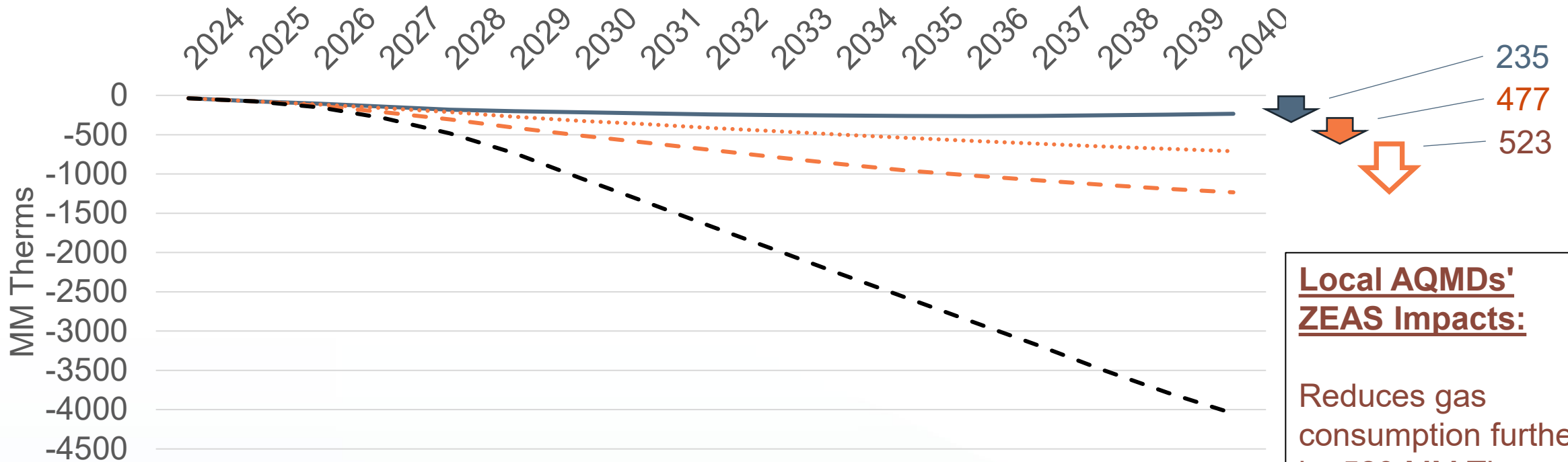
Electrification Impacts to New Construction (NC):

Reduces gas consumption further by 477 MM Therms 2040

→ **712 MM Therms Total Impact**



AAFS 2.5 Preliminary Results: Impacts to Gas Savings



- AAFS 2.5 (Programmatic AAFS 3)
- AAFS 2.5 (Prog. + New Construction Electrification)
- - AAFS 2.5 (Prog. + NC Electrification + AQMD ZEAS)
- - 2023 IEPR AAFS 3 (Prog. + NC Electrification + Full ROB ZEAS)

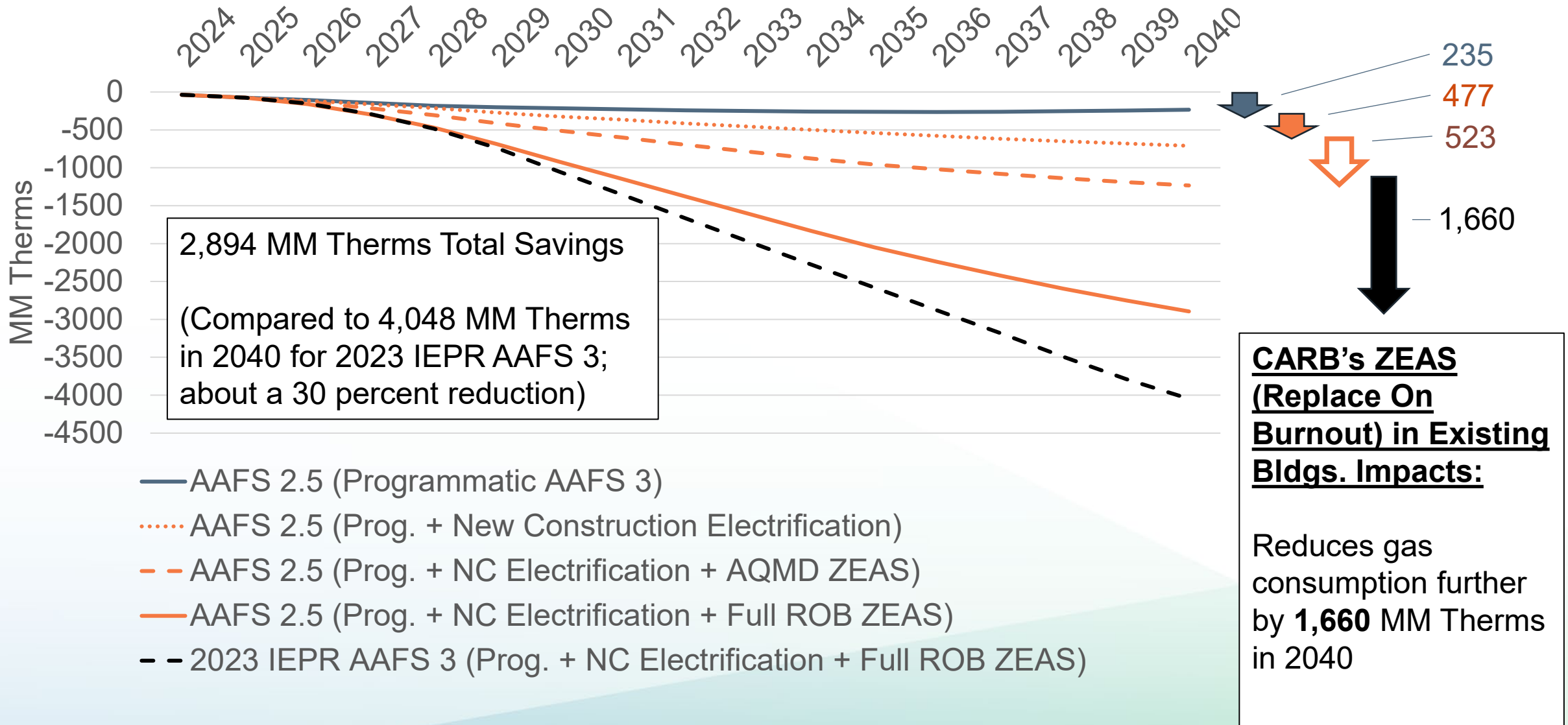
Local AQMDs' ZEAS Impacts:

Reduces gas consumption further by 523 MM Therms 2040

→ **1,235 MM Therms Total Impact**



AAFS 2.5 Preliminary Results: Impacts to Gas Savings





Discussion Question (2 of 3)

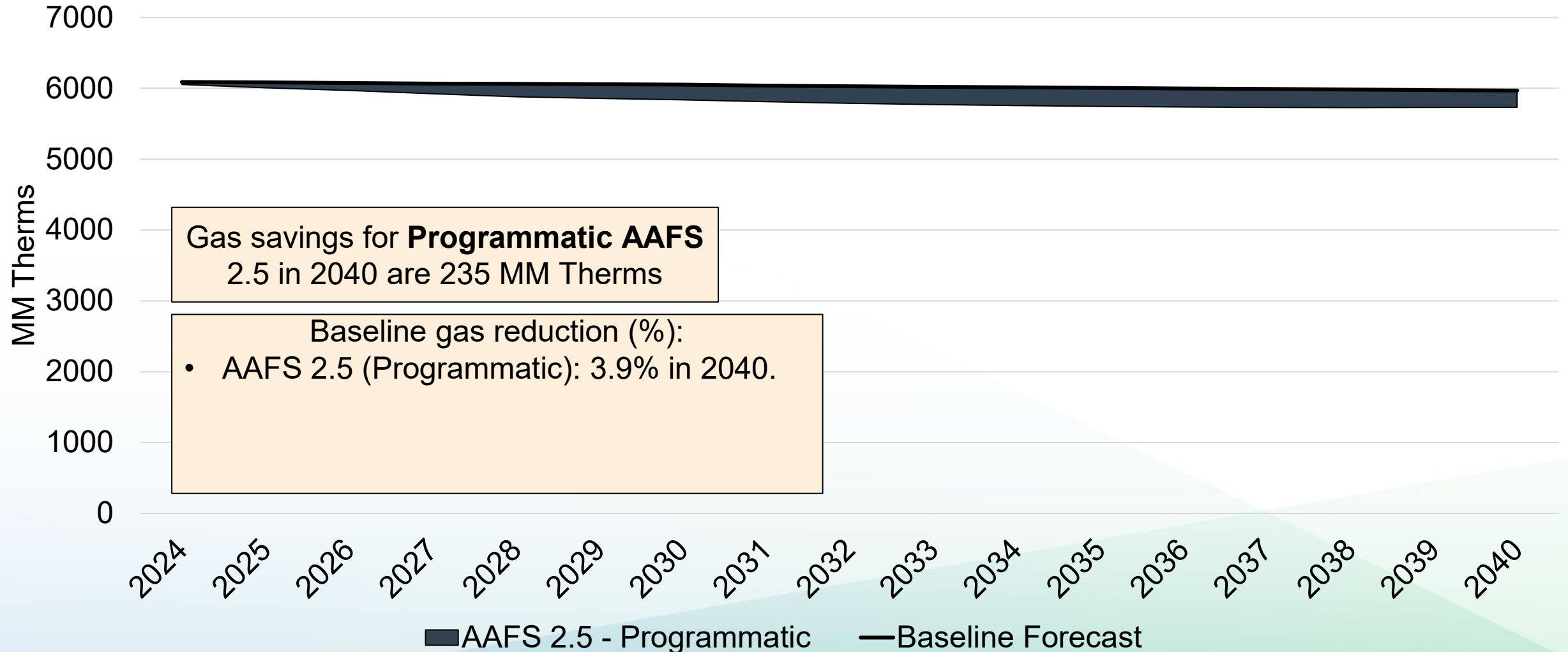
AAFS 2.5 Savings Components	AAFS 2.5 Characterization	Savings Impacts in MM Therms (Percent of total)
Programmatic	Programmatic AAFS 3	235 (8%)
New Construction	<ul style="list-style-type: none">• 100% Res. in 2026;• 100% Comm. in 2029	477 (16%)
AQMD [ROB] ZEAS	<ul style="list-style-type: none">• BAAQMD: WH (Res.) in 2027, SH (Res & Comm 2029)• SCAQMD: WH (Comm.) in 2029	523 (18%)
ROB CARB ZEAS	50% plateau beginning in 2030	1,660 (57%)

- Are there alternative policies or adoption curves that could or should be used for AAFS 2.5?
 - Local Air Districts' ZEAS assumptions
 - New Construction assumptions
 - CARB ZEAS replace on burnout assumptions



Residential and Commercial Baseline Gas Forecast – AAFS 2.5 Scenario

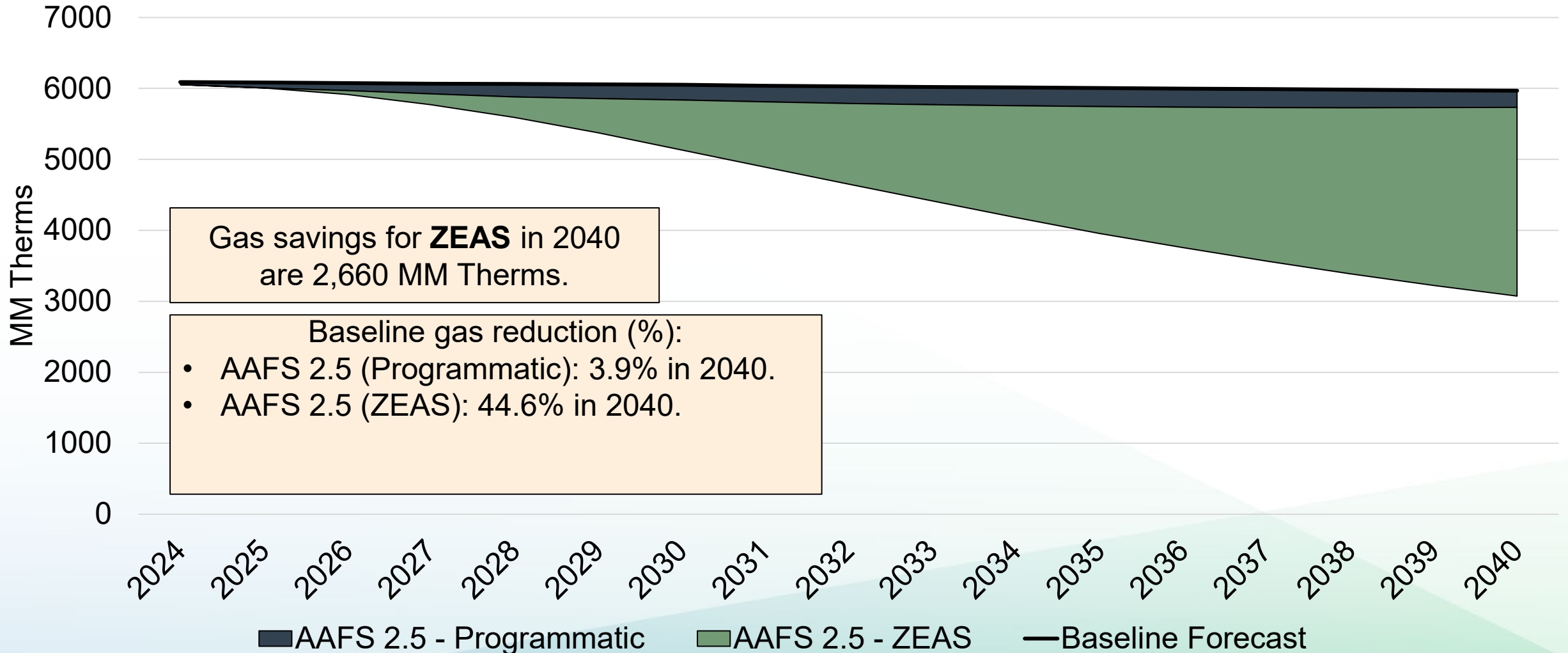
AAFS 2.5 Scenario - AAEE and AAFS Gas Savings





Residential and Commercial Baseline Gas Forecast – AAFS 2.5 Scenario

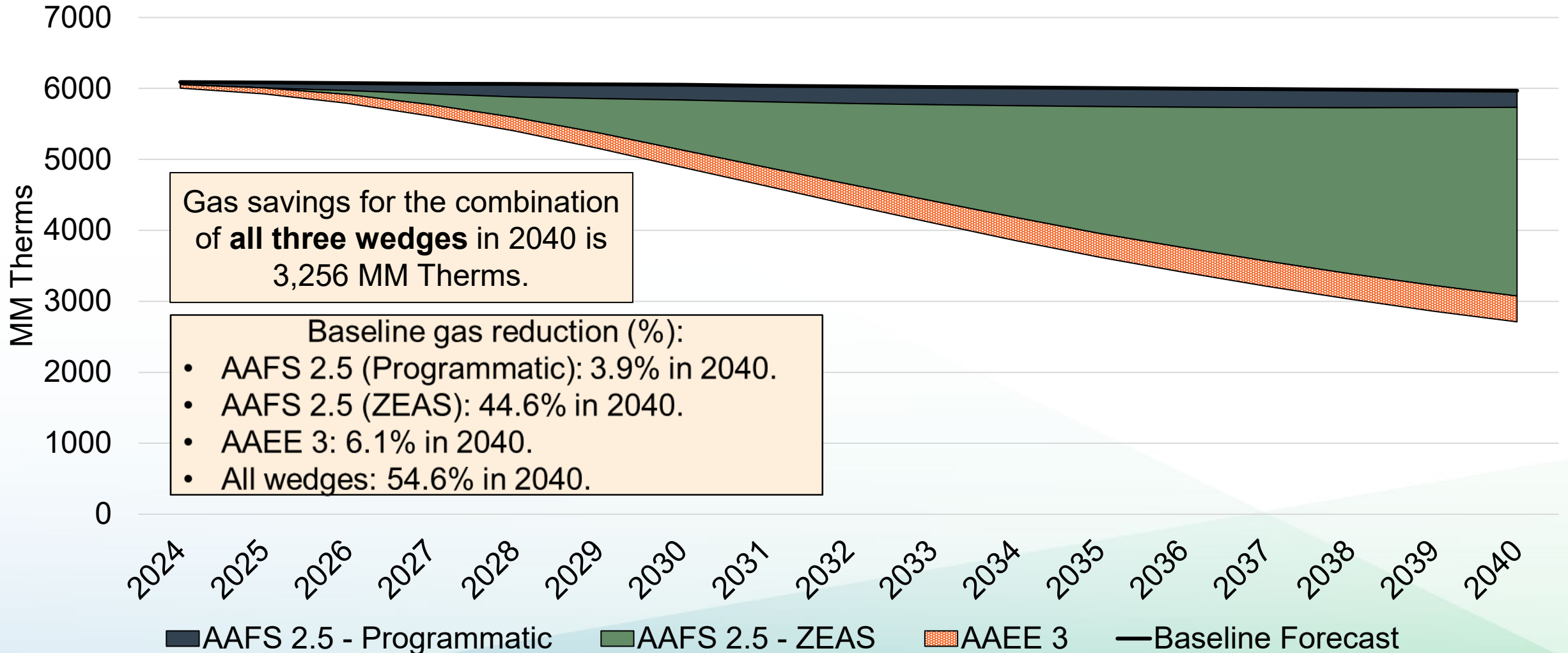
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Residential and Commercial Baseline Gas Forecast – AAFS 2.5 Scenario

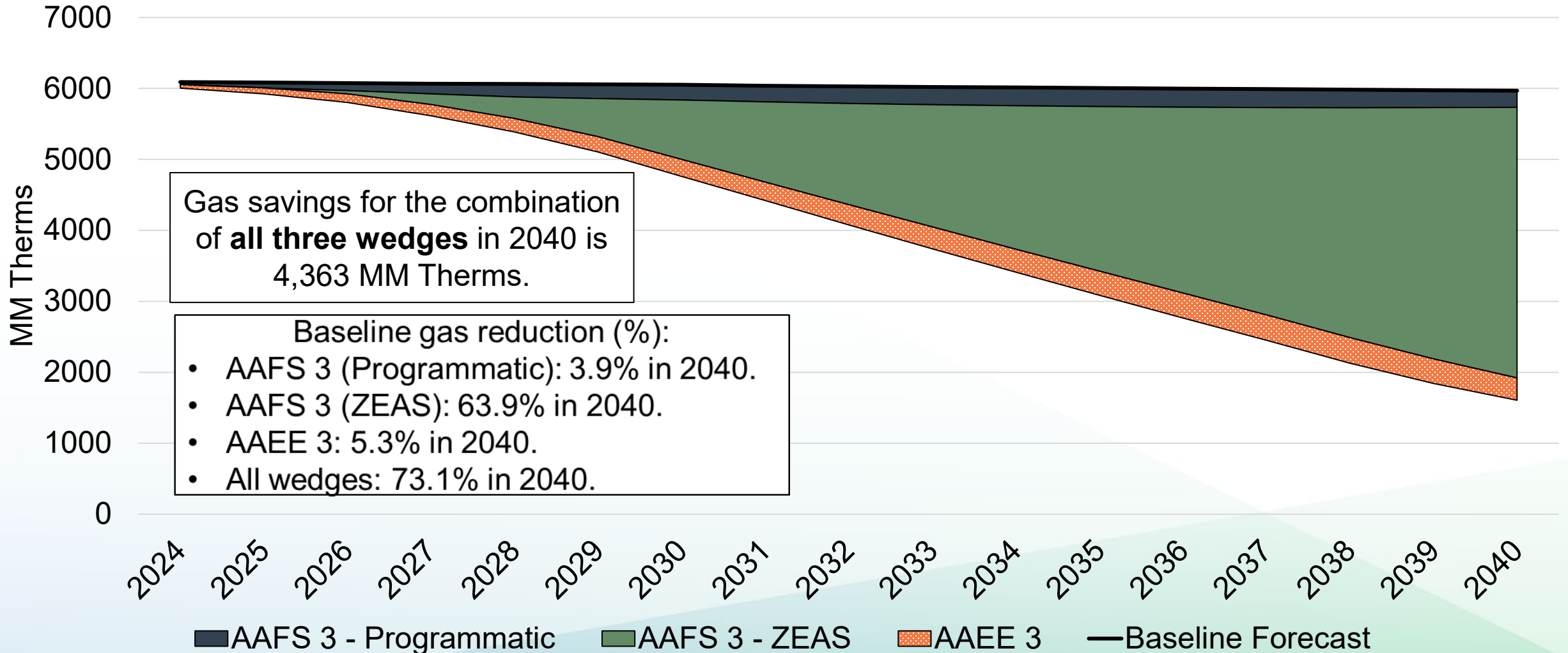
AAFS 2.5 Scenario - AAEE and AAFS Gas Savings





Residential and Commercial Baseline Gas Forecast – Planning Scenario

Planning Scenario - AAEE and AAFS Gas Savings





Discussion Question (3 of 3)

- Please describe the real-world gas system reliability and decommissioning implications with these preliminary results?



Questions or comments?

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AAFS 2.5 Next Steps

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Questions from CEC staff

- AAFS 2.5 Characterization Assumptions
 - Programmatic AAEE and AAFS Scenario 3 assumptions
 - Local Air Districts ZEAS assumptions
 - New construction assumptions
 - CARB ZEAS replace on burnout assumptions
- Are there alternative policies or adoption curves that could be used for AAFS 2.5?
- Please describe the real-world gas system reliability and decommissioning implications with these preliminary results?



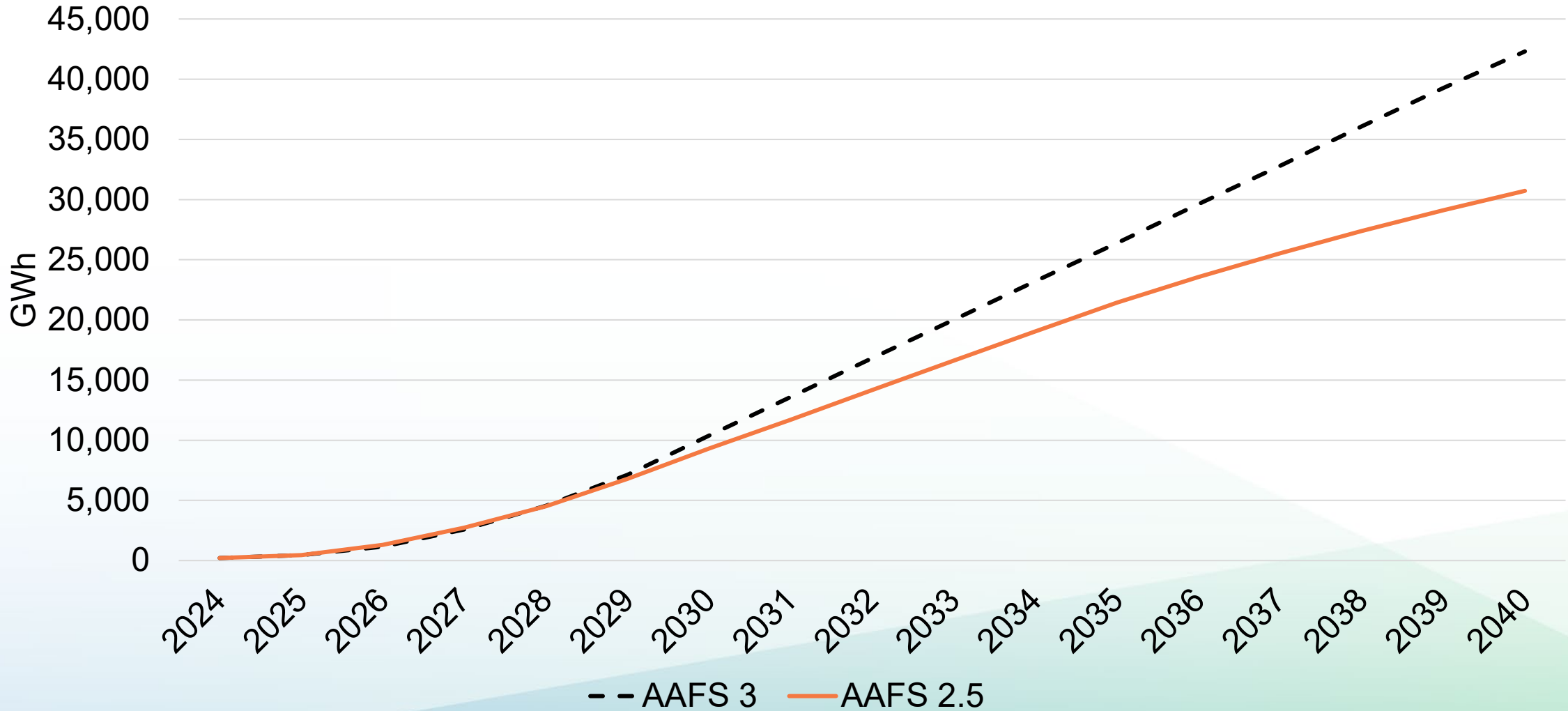
Thank you

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Preliminary Electricity Impacts of AAFS 2.5 vs 2023 IEPR AAFS 3

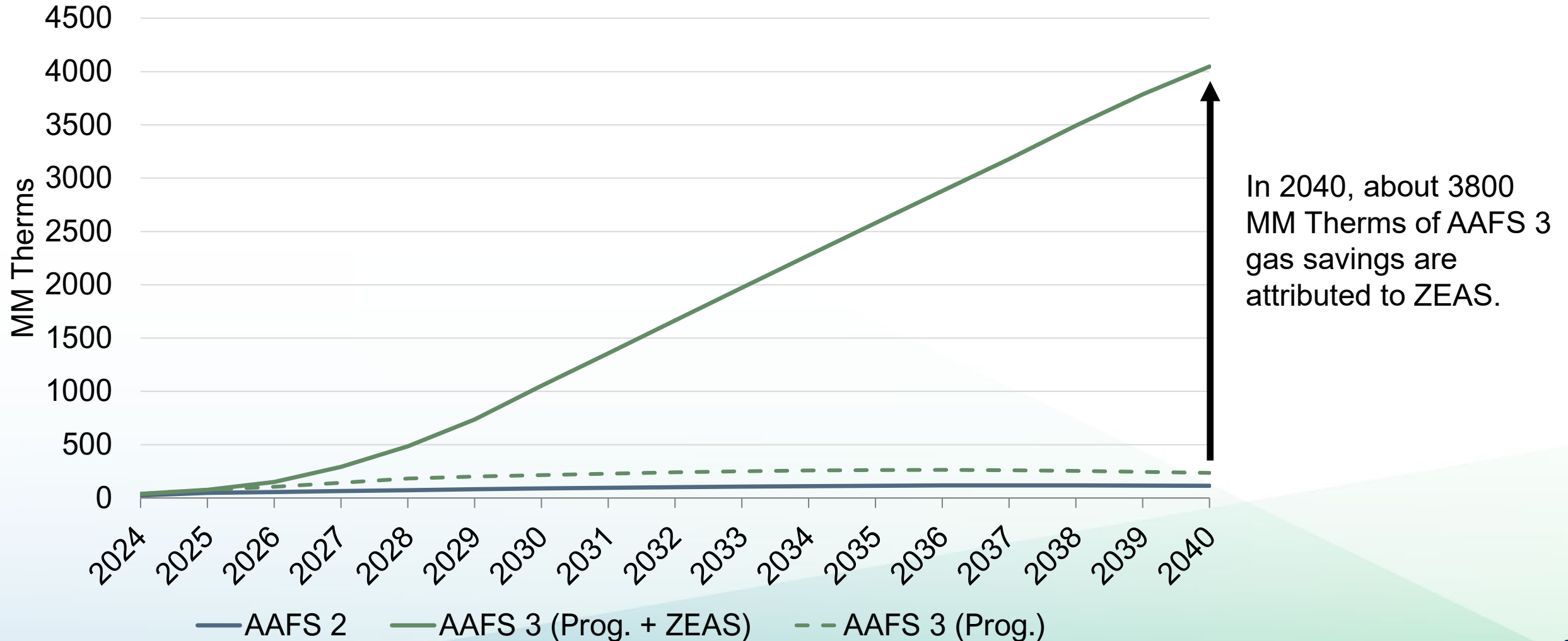
Electricity Impacts - AAFS 2.5 vs 2023 IEPR AAFS 3





AAFS 2 vs AAFS 3 (Programmatic and ZEAS Impacts)

Gas Savings from Various AAFS Scenarios





2025 check-in on progress and readiness

As stated in their [March 2023 Final Staff Report](#), Bay Area AQMD requires interim reports and implementation working groups (first interim report due January 1, 2025, for water heaters and boilers below 75,000 BTU/hr):

*“The proposed amendments include the addition of an interim report to be brought to the Board of Directors by the Air Pollution Control Officer (APCO) **two years prior to the compliance date for the zero NOx standard.** Staff intends for this report to provide information to the Board and the public about the accessibility of zero NOx appliances to Bay Area residents and to allow the Board of Directors an opportunity to take any necessary action in response to this information. **Contents of this report would include information on technology development, market availability of zero NOx space heating appliances, potential costs of compliance, infrastructure readiness, and availability of incentive programs to decrease these costs.**”*