

Demand Analysis Working Group (DAWG)

Additional Achievable Energy Efficiency & Fuel Substitution (AAEE & AAFS)

November 15, 2022



Energy Assessments Division
Advanced Electrification Analysis Branch



2022 Scenario Definitions

November 15, 2022

Ingrid Neumann, Ph.D.

Energy Assessments Division, Advanced Electrification Analysis Branch



New Forecast Framework for 2022

New Name →	Baseline Forecast	Planning Forecast	Local Reliability Scenario
Current Name →	Mid Baseline Forecast	Mid-Mid	Mid-Low
Use Case →	<ul style="list-style-type: none"> Baseline Reference forecast 	<ul style="list-style-type: none"> Resource Adequacy CPUC IRP CAISO Flex CAISO Econ 	<ul style="list-style-type: none"> CAISO TPP CAISO Local CPUC DPP
Economic, Demographic, and Price Scenarios	Baseline (Mid)	Baseline (Mid)	Baseline (Mid)
AAEE Scenario	-	Mid (Scenario 3)	Low (Scenario 2)
AAFS Scenario	-	Mid (Scenario 3)	High (Scenario 4)
AATE Scenario	-	Mid (Scenario 3)	Mid (Scenario 3)
CARB SIP zero emission space and water heating equipment sales after 2030	-	-	Included

Developed every odd IEPR year, ie. 2021 AAEE & AAFS Scenarios



Scenario Development for 2021 AAEE

Lever	Mid - Very Low (Scenario 1)	Mid - Low (Scenario 2)	Mid - Mid (Scenario 3)	Mid - High (Scenario 4)	Mid - Very High (Scenario 5)	Mid - High Plus (Scenario 6)
Building Stock	2019 IEPR Mid-Case					
Retail Prices						

IOU Potential Program Savings

POU Potential Program Savings

Codes and Standards Savings

Beyond Utility Program Savings



Scenario Development for 2021 AAFS

				<i>actually more conservative planing scenarios ></i>	
		<i>less FS penetration</i>	<i>reference BAU</i>	<i>more FS penetration</i>	
Lever	Mid - Low (Scenario 2)	Mid - Mid (Scenario 3)	Mid - Mid Plus (Scenario 4)	Mid - High (Scenario 5)	Mid - High Plus (Scenario 6)
Building Stock	2019 IEPR Mid-Case				
Retail Prices					

IOU Potential Program Impacts

POU Potential Program Impacts

Codes and Standards Impacts

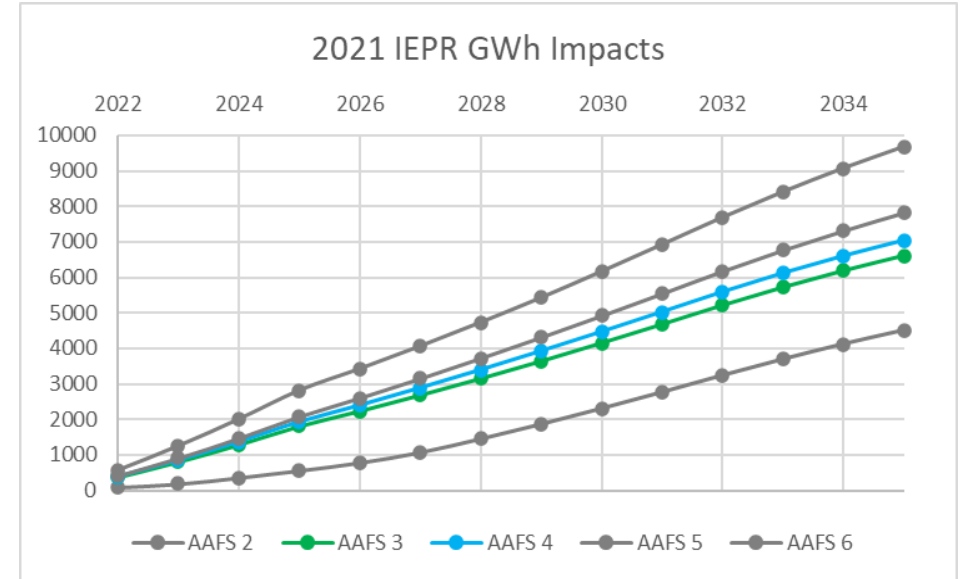
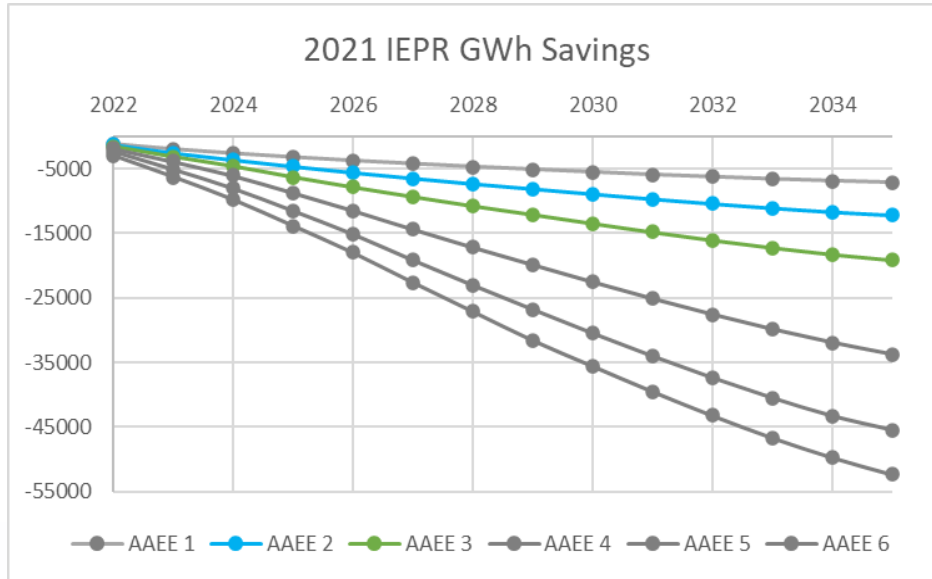
Beyond Utility Program Impacts



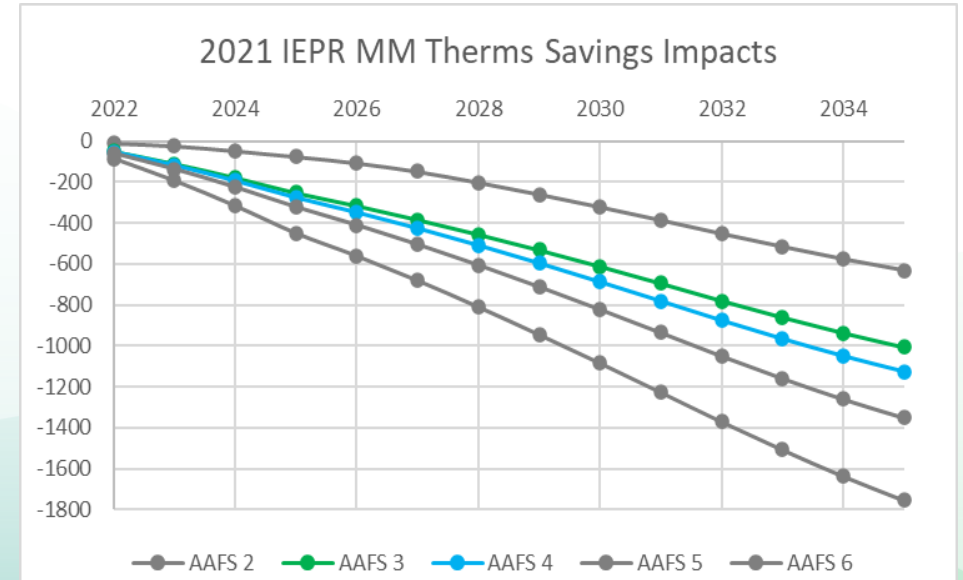
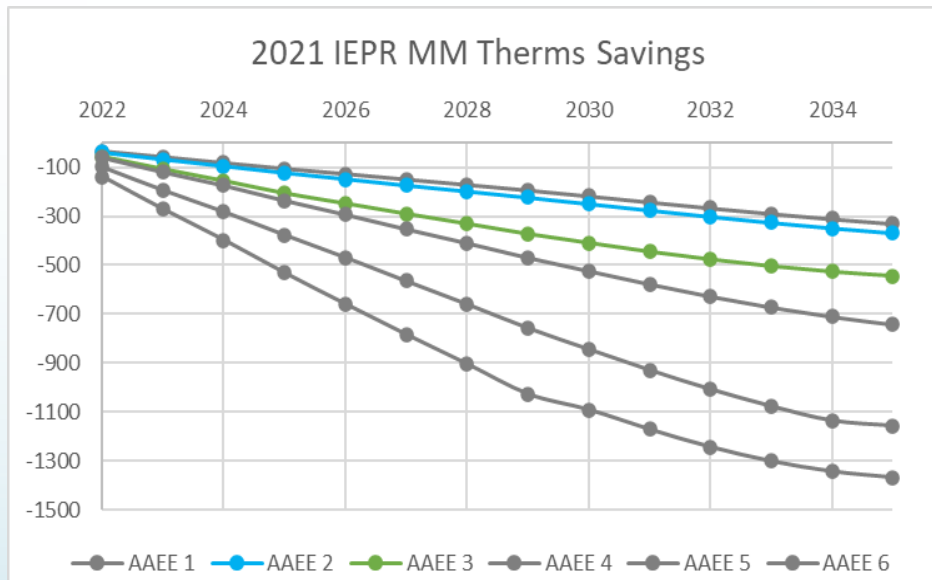
Statewide Spectrum of 2021 AAEE & AAFS Scenarios

Green are Planning Forecast Components Blue are components of the Local Reliability Scenario

- While AAEE reduces electricity consumption, AAFS adds an incremental amount



- Both AAEE and AAFS reduce gas consumption





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CARB SIP zero emission space and water heating equipment sales after 2030

New modeling for 2022; added to AAFS 4 for update Included



FSSAT Results for the CARB 2022 State SIP Strategy: Zero-Emission Space and Water Heater Measure

November 15, 2022

Ethan Cooper

Energy Assessments Division, Advanced Electrification Analysis Branch



2022 State Strategy for the State Implementation Plan (2022 State SIP Strategy)

- **Proposed action:**

Beginning in 2030, 100 percent of new space and water heaters (for either new construction or existing buildings) sold in California would need to meet the zero-emission standard.

- Measure adopted by CARB Board September 22, 2022.
 - Rulemaking process starting in 2023.
 - Expected regulatory board hearing in 2025.



New Forecast Framework: Local Reliability Scenario

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Fuel Substitution Scenario Analysis Tool

- Fuel Substitution Scenario Analysis Tool (FSSAT) used for:
 - AB 3232 California Building Decarbonization Assessment
 - Demand Scenarios project
- FSSAT is a “what if” policy analysis tool examining the cost, energy, and greenhouse gas impacts of different fuel substitution scenarios given different levels of additional achievable energy efficiency (AAEE) and fuel substitution (AAFS) assumptions.



FSSAT Characterization of 2022 State SIP Strategy

- FSSAT assumptions of Local Reliability Scenario:
 - 2021 IEPR Natural Gas Forecast
 - AAFS Scenario 4
 - AAEE Scenario 2
 - 2022 State SIP strategy
 - In consultation with CARB staff, used the following adoption assumptions for FSSAT for the residential and commercial sectors:

FSSAT 2022 State SIP Strategy Replacement Assumptions for Residential and Commercial HVAC and Water Heating Electric Appliances

Building Type	Territory*	2020-25	2026	2027	2028	2029	2030-35
New Construction	All AQMDs	0%	100%	100%	100%	100%	100%
Existing Buildings (replace on burnout)	All AQMDs besides BAAQMD	0%	20%	40%	60%	80%	100%
Existing Buildings (replace on burnout)	BAAQMD	0%	25%	50%	75%	100%	100%

*AQMD stands for Air Quality Management District, and BAAQMD stands for Bay Area Air Quality Management District.



FSSAT Technology Assumptions

- The Local Reliability Scenario uses the same technology sets and efficiency-weighting assumptions that were in the Demand Scenarios project and the AB 3232 California Building Decarbonization Assessment.



FSSAT Technology Assumptions

- The Local Reliability Scenario uses the same technology sets and efficiency-weighting assumptions that were in the Demand Scenarios project and the AB 3232 California Building Decarbonization Assessment.
 - Technology sets are the same
 - HVAC: heat pump technologies.
 - Water heating: both heat pumps and electric resistance technologies.



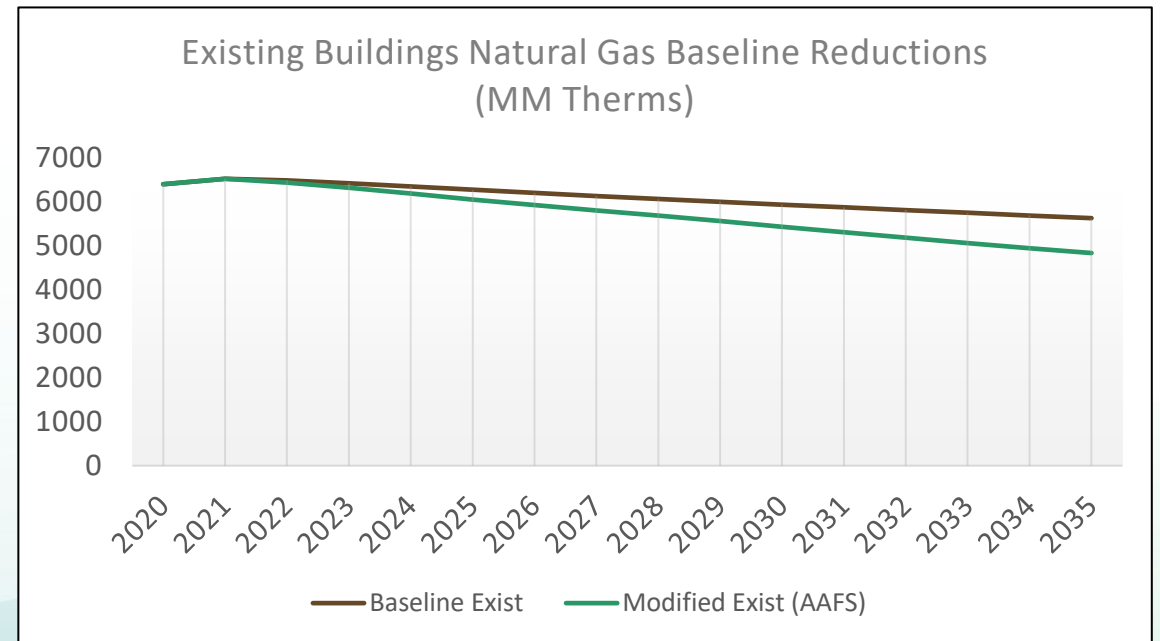
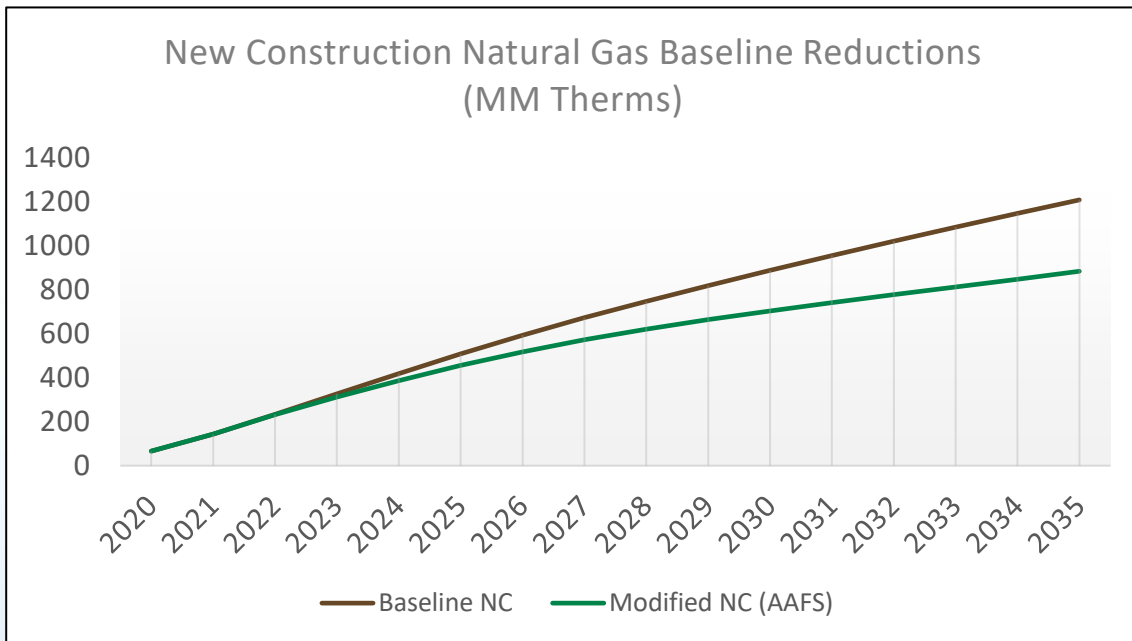
FSSAT Technology Assumptions

- The Local Reliability Scenario uses the same technology sets and efficiency-weighting assumptions that were in the Demand Scenarios project and the AB 3232 California Building Decarbonization Assessment.
 - Technology sets are the same
 - HVAC: heat pump technologies.
 - Water heating: both heat pumps and electric resistance technologies.
 - Efficiency-weighting of the sets are the same
 - HVAC and water heating: higher adoption priority for high-efficiency appliances.



Natural Gas Impacts

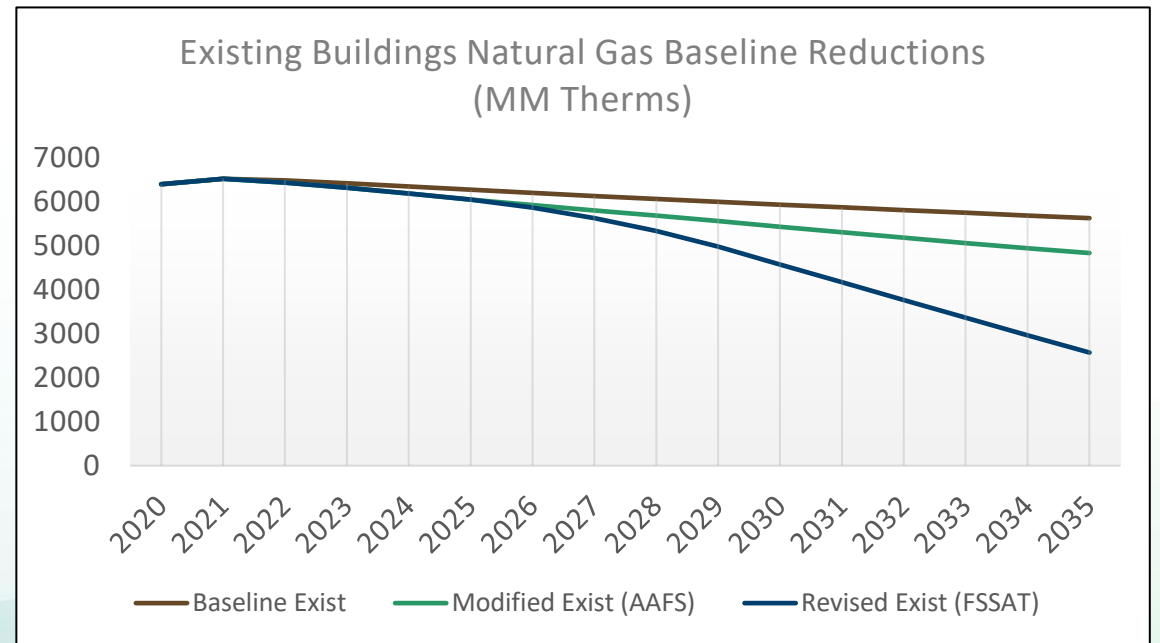
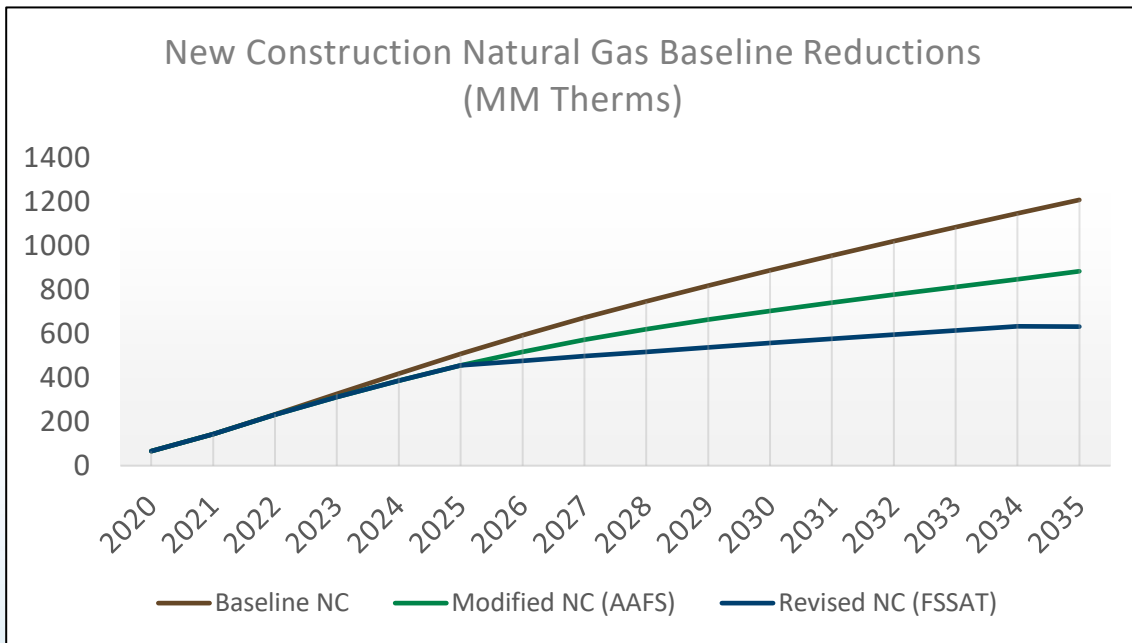
- By 2035, the SIP strategy (FSSAT) provides around 2,511 MM Therms in gas savings, almost twice the amount of savings seen for AAEE + AAFS.
 - For new construction buildings, AAFS provides the most gas savings.
 - For existing buildings, FSSAT provides the most gas savings.





Natural Gas Impacts

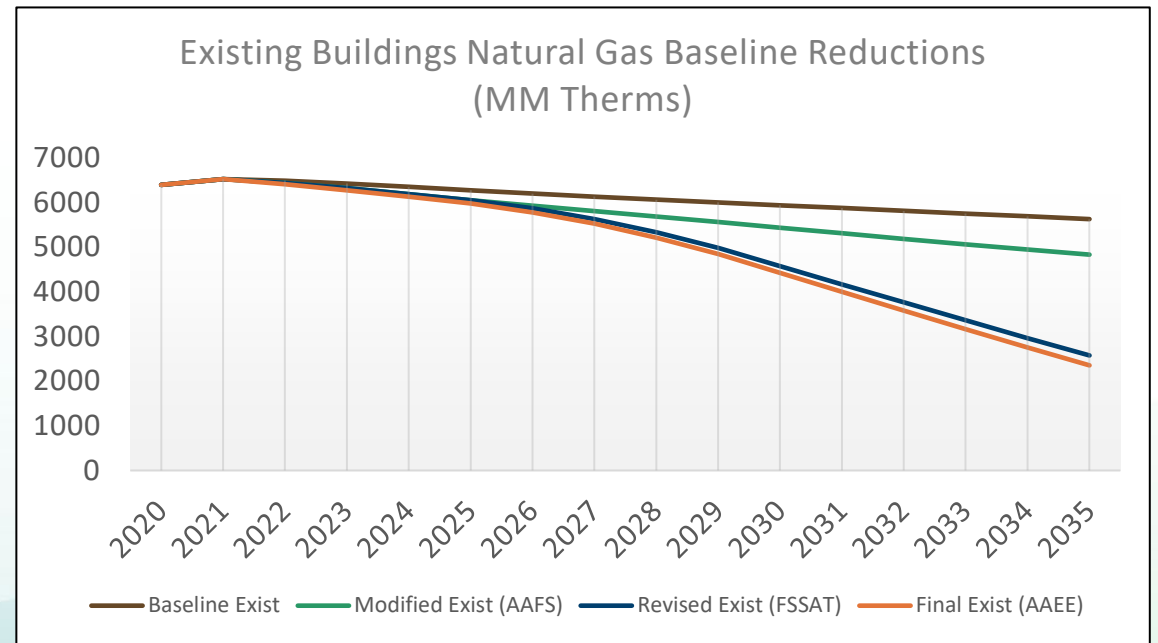
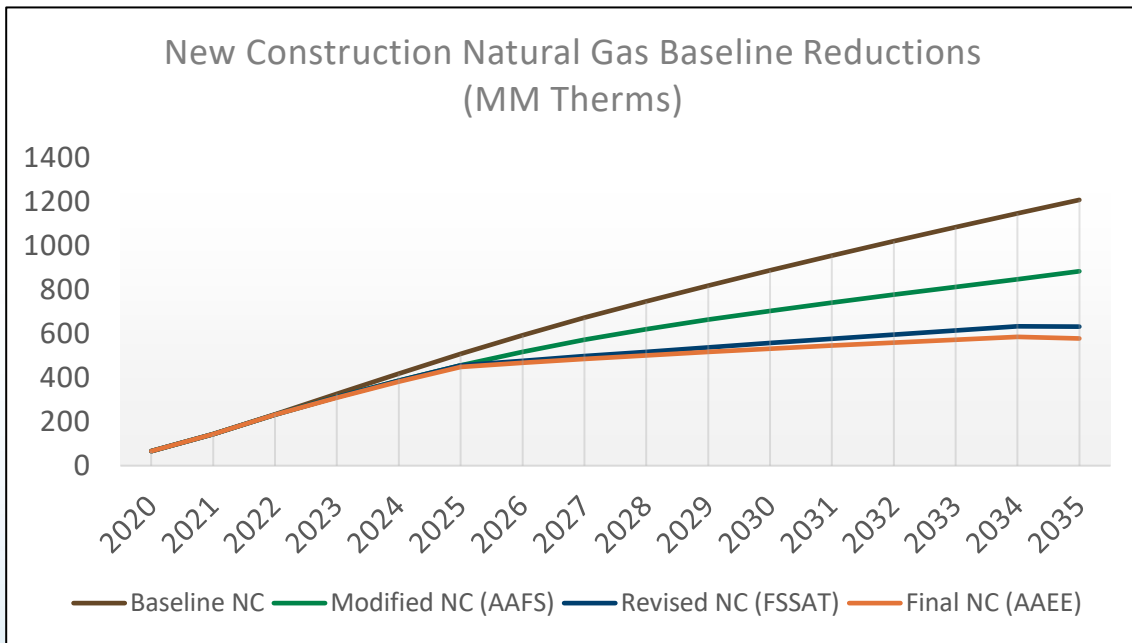
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Natural Gas Impacts

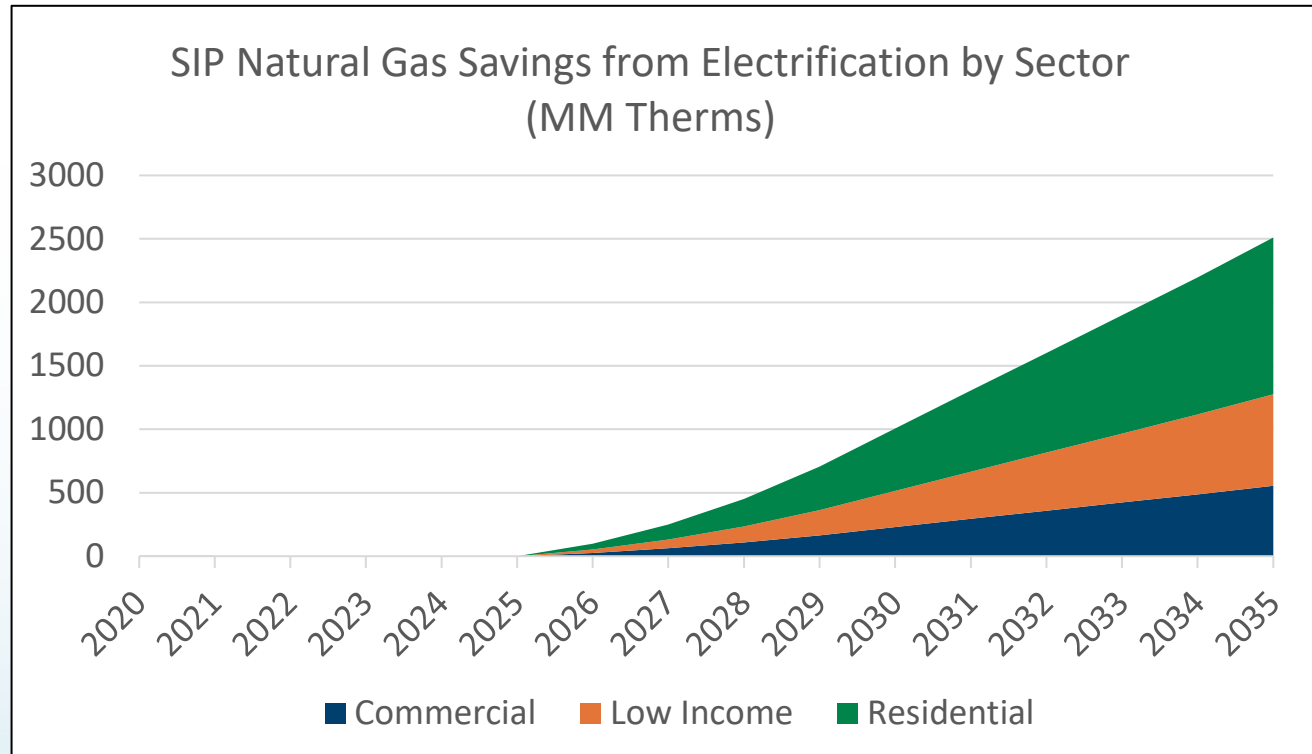
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Natural Gas Impacts - Sector

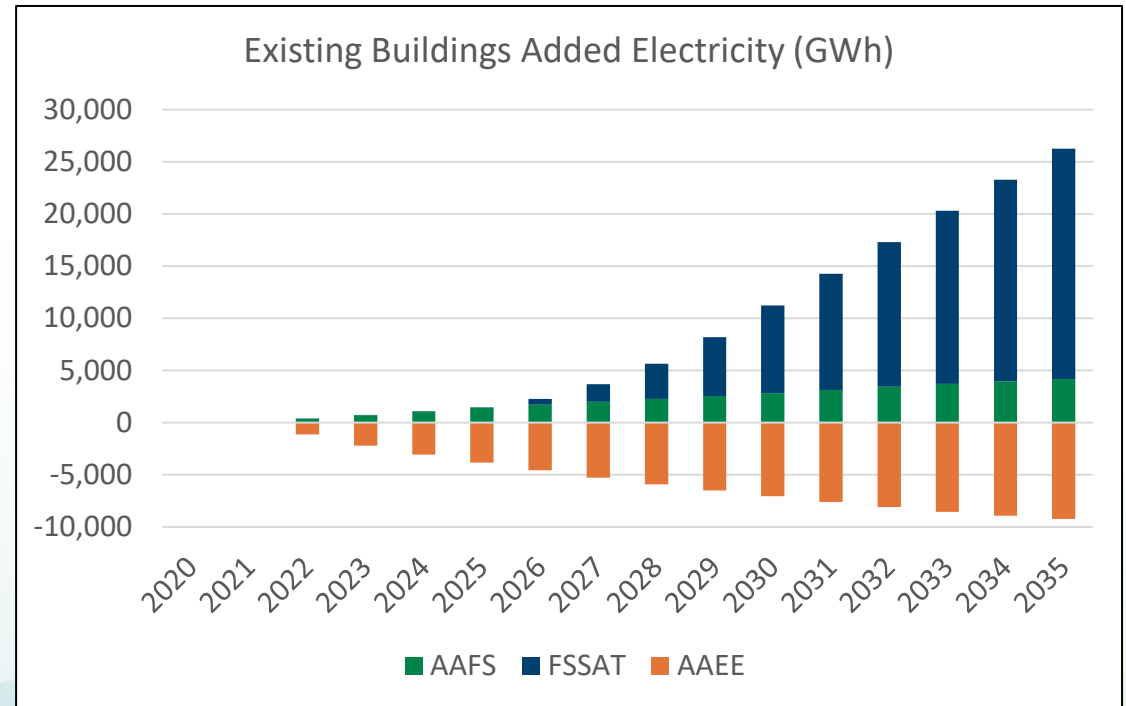
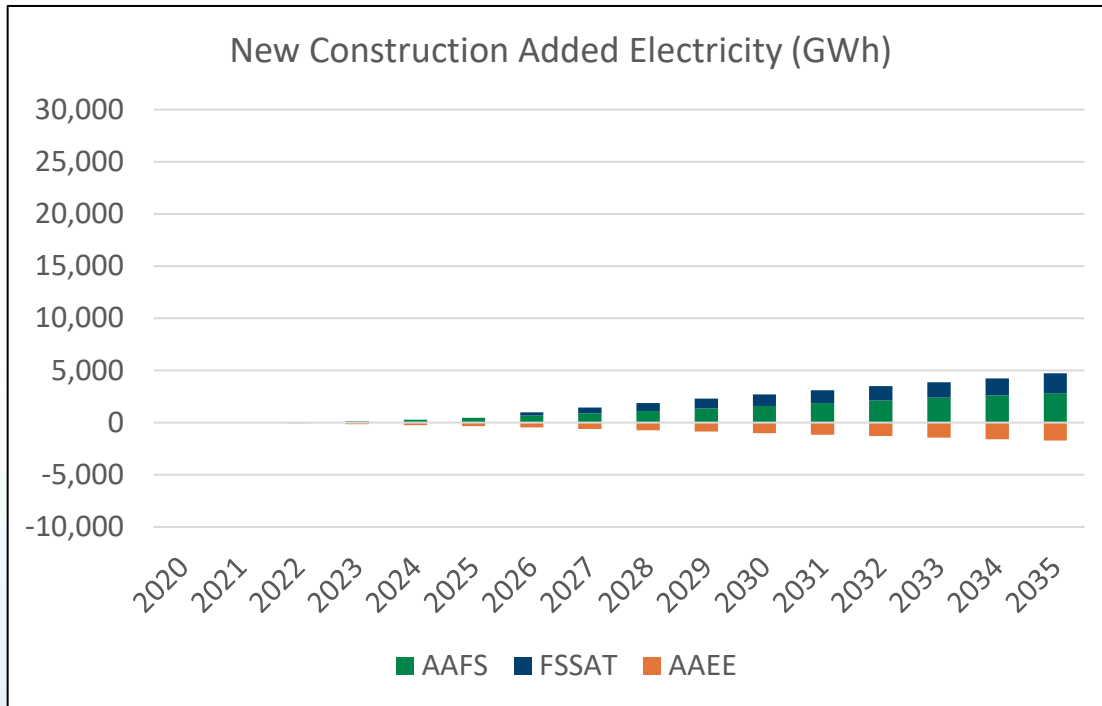
- When split by sector, the SIP Strategy (FSSAT) achieved most of its natural gas reductions from the residential sector.
 - Natural gas savings in 2035:
 - Residential sector - 1,236 MM Therms; Low-income sector - 720 MM Therms; Commercial sector - 555 MM Therms.





Electricity System Impacts

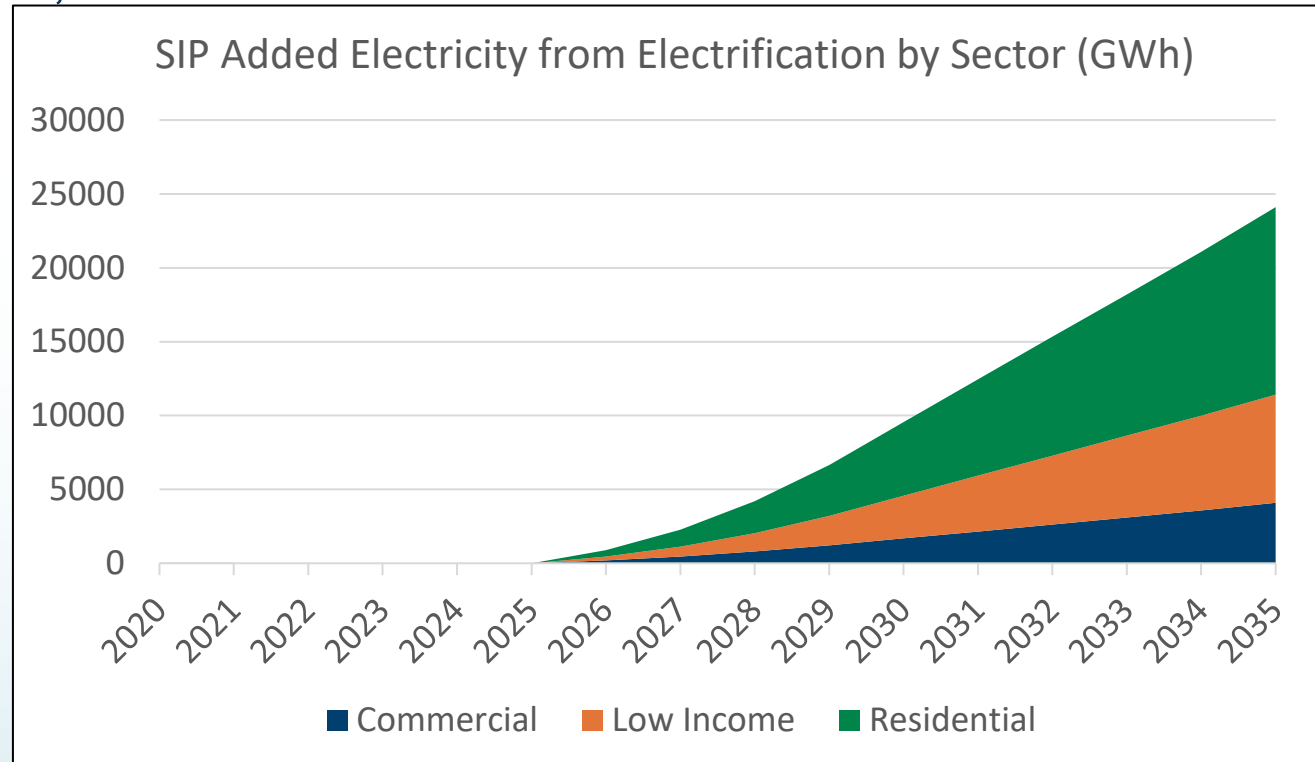
- By 2035, added electricity for the SIP Strategy (FSSAT) was around 24,123 GWh, which is three times greater than the added electricity from AAFS.
 - This difference is partly due to the variety of eligible electric replacement technologies in FSSAT (each with different levels of efficiency).





Electricity System Impacts -Sector

- When split by sector, most of the added electricity from the SIP Strategy (FSSAT) was occurring in the residential sector.
 - Added electricity in 2035:
 - Residential sector - 12,698 GWh; Low-income sector - 7,346 GWh; Commercial sector - 4,079 GWh.





Next Year

- For the 2023 IEPR, CEC staff will work in consultation with CARB to provide modeling and technology assumption updates for the FSSAT tool, particularly with improving the modeling of low-income households.



Thank you

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Updated AAEE & AAFS Results

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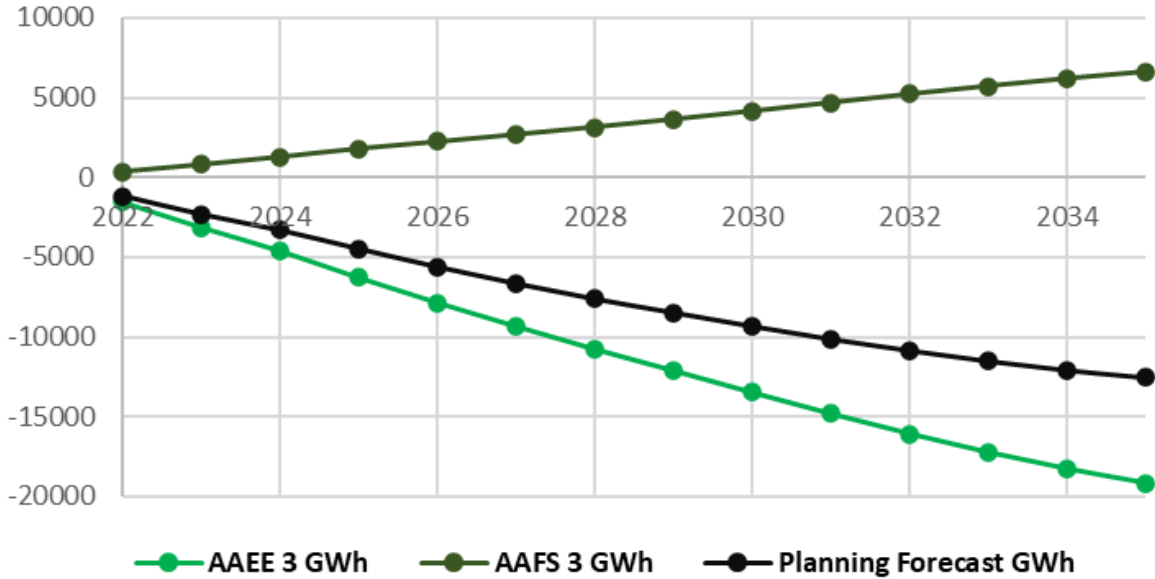
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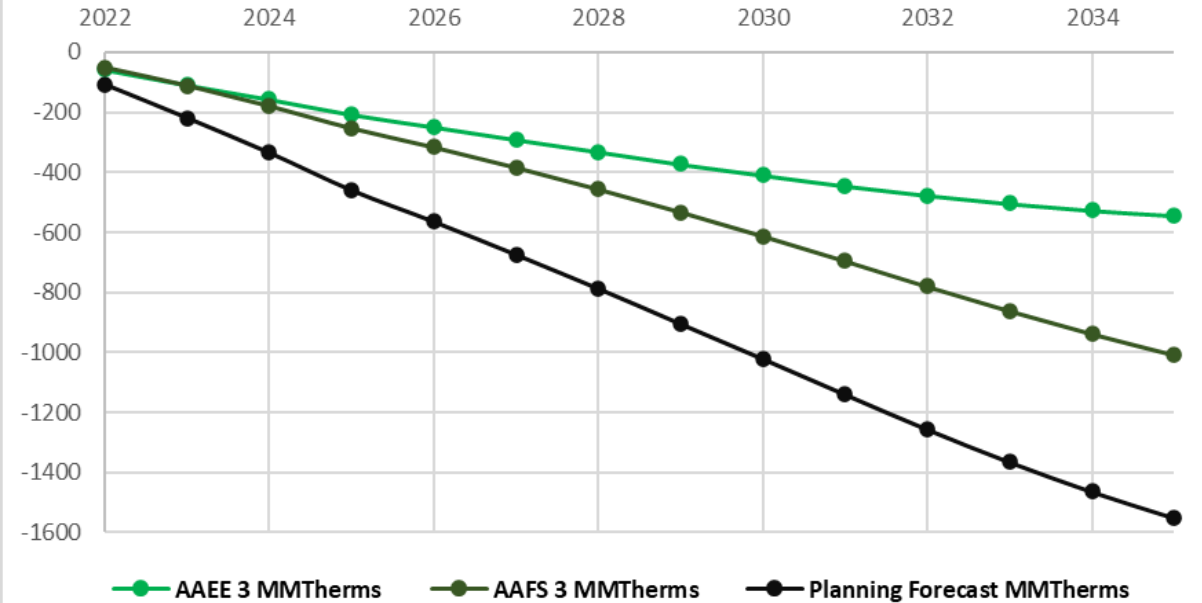
2022 Planning Forecast

AAEE 3 & AAFS 3

Electricity Savings/Impacts



Gas Saved/Displaced



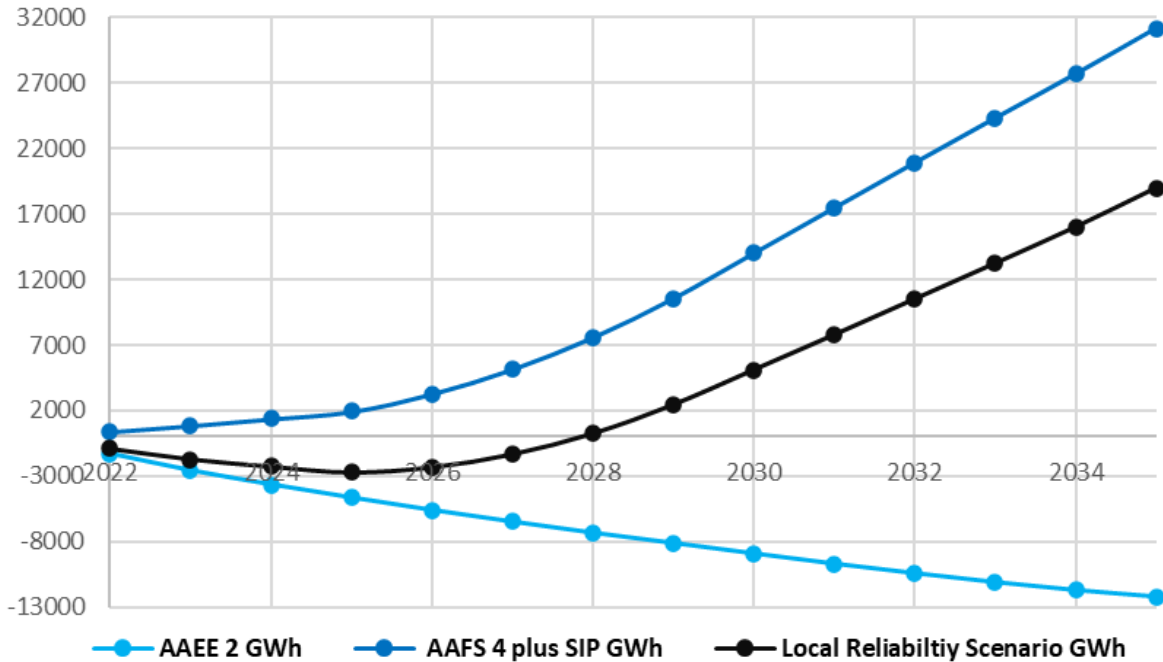
- Both AAEE and AAFS reduce gas consumption statewide
- While AAEE 3 also reduces electricity consumption, AAFS 3 adds an incremental amount; however, **the overall combined electricity consumption is still reduced**



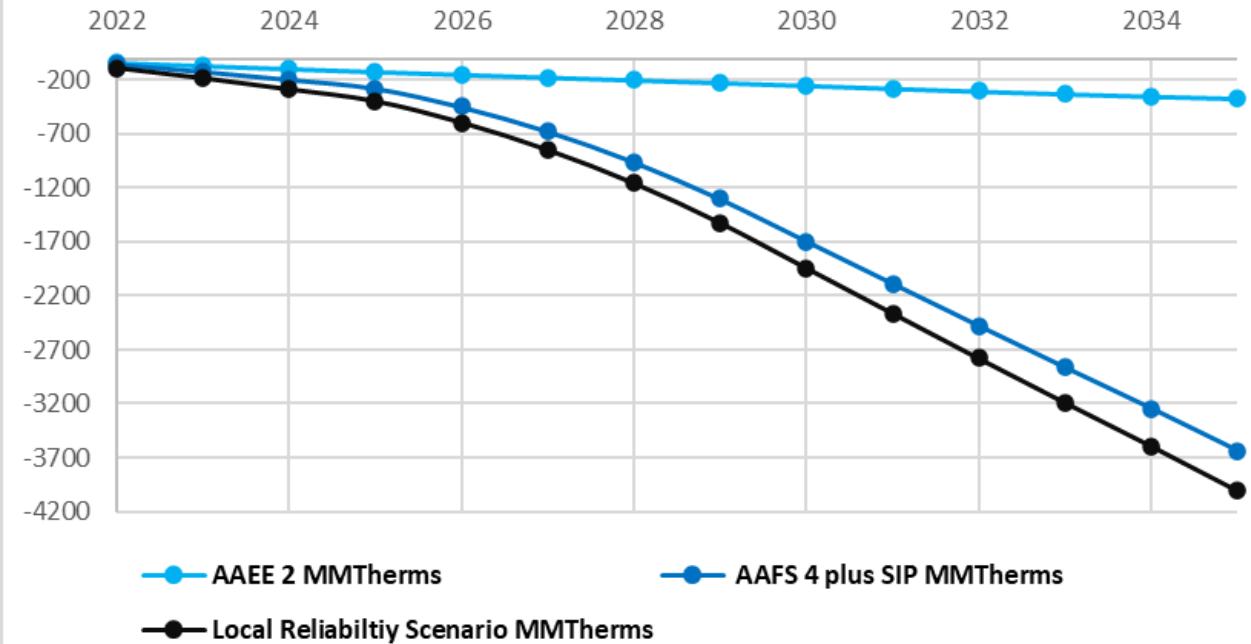
2022 Local Reliability Scenario

AAEE 2 & AAFS 4 plus SIP

Electricity Savings/Impacts



Gas Saved/Displaced



- Both AAEE and AAFS reduce gas consumption statewide
- While AAEE 2 also reduces electricity consumption, AAFS 4 plus SIP adds a larger incremental amount; therefore, the overall combined electricity consumption is increased in this scenario



Thank you

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