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Docket Number:	19-DECARB-01
Project Title:	Decarbonization
TN #:	232239
Document Title:	Presentation - Staff Workshop on the Fuel Substitution Analysis Tool (FSSAT)
Description:	N/A
Filer:	Aida Escala
Organization:	California Energy Commission
Submitter Role:	Commission Staff
Submission Date:	2/27/2020 8:54:27 AM
Docketed Date:	2/27/2020

California Energy Commission

February 27, 2020

Staff Workshop on the Fuel Substitution Analysis Tool (FSSAT)

Webinar

February 27, 2020

Webinar Agenda

Time	Topic	Speaker(s)
10:00-10:10	Introduction/Background	Nicholas Janusch, CEC
10:10-10:40	Fuel Substitution Scenario Analysis Tool (FSSAT)	John Aquino, Guidehouse
10:40-10:55	*Question and Answer*	
10:55-11:15	GHG Emission Reduction Potential from Commercial Refrigeration	Aanchal Kohli, CARB
11:15-11:20	*Question and Answer*	
11:20-11:35	Additional Analysis for AB 3232	Nicholas Janusch and Ingrid Neumann, CEC
11:35-11:50	*Question and Answer*	
11:50-12:00	Next Steps	Brian Samuelson, CEC

Housekeeping

- This Webex webinar is being **recorded**. The slides are available on the docket **[19-DECARB-01]** and the recording will be posted in a few days
- All Webex webinar participants are muted
- Please use the *raise hand* feature if you have a question or comment and we will select you; please state your name and affiliation
- We will respond to typed comments if time permits
- Written comments must be submitted to the Docket Unit by **5:00 p.m.** on **March 13, 2020.**
- AB 3232 staff contacts
  - Heriberto Rosales, Heriberto.Rosales@energy.ca.gov
  - Nicholas Janusch, Ph.D., Nicholas.Janusch@energy.ca.gov

Background: AB 3232

- **Assembly Bill (AB) 3232** (Friedman, Chapter 373, Statutes of 2018)
  - The Energy Commission is required to

    "[A]ssess the potential for the state to reduce the emissions of greenhouse gases in the state's residential and commercial building stock by at least 40 percent below 1990 levels by January 1, 2030"
- Today's webinar is the second of six public workshops for the Energy Commission's Building Decarbonization Assessment

  (Schedule of future workshops presented in **Next Steps** slides)
- Goals of this workshop
  1. Introduce FSSAT for stakeholders
  2. Share the status of our analysis
  3. Provide stakeholders feedback opportunity

Guidehouse

Fuel Substitution Scenario Analysis Tool (FSSAT)

Fuel Substitution Analysis to Support AB 3232
Staff Workshop

February 27th, 2020

FSSAT Key Tasks and Scope

Key Tasks

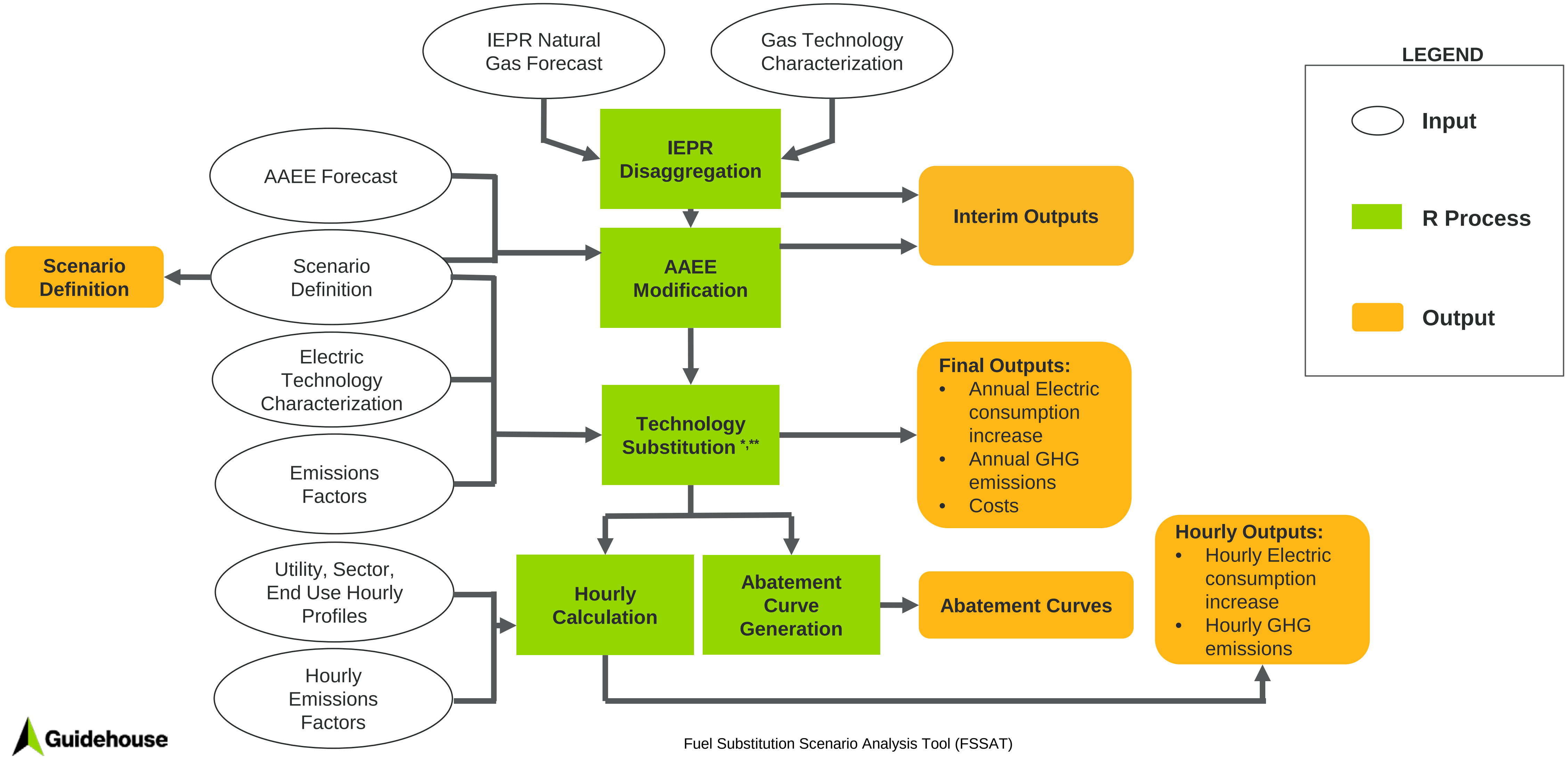
Calculates and outputs fuel substitution scenarios:

- Natural gas consumption reduction
- Electric stock, consumption, and hourly demand added
- GHG emissions forecast and marginal abatement curves
- Costs incurred by the consumer

Tool Scope

- Provides flexibility of inputs at the utility, sector, end-use, building type, climate zone, technology, and replacement type level of disaggregation
- Incorporates AAEE savings in IEPR natural gas forecast
- Allows electricity substitution of natural gas technologies
- Calculates emissions for end user natural gas combustion, electricity generation, gas leakage, and refrigerant leakages.
- Calculates forecast independent of consumer behavior

FSSAT Key Inputs, Processes, and Outputs



Global Inputs

Data Set	Data Description
IEPR Natural Gas Demand Forecast	Natural gas consumption at the utility, sector, and end-use level through 2030.
AAEE Forecast	Energy efficiency savings at the forecast climate zone, sector, and end use level through 2030.
Utility To Climate Zone Mappings	Mapping between gas utility, electric utility, forecast climate zone, and building climate zone.
Emissions Factor Forecast	Emissions factors for all emitting point sources.
Utility Rates Forecast	Electricity and natural gas retail rates by sector and utility through 2030 to calculate user fuel costs.
Building Stock Forecast	Building forecast at the utility and IEPR-defined building type level through 2030 (demolition rate included).

User Inputs

Name	Description
Scenario Parameters	Set the target for 2030 fuel substitution activity for calculating adoption by replacement type, efficiency level, sector, and utility.
Replacement Map	Map existing (gas) technology to one or more electric replacement technologies.
Adoption Scheme	Map adoption curves defined in adoption curves input tab to replacement technologies.
Adoption Curves	Input the rate of technology change from gas to electric year-over-year. Currently, use assumptions in lieu of any program experiences.
R Input	Feed into the FSSAT R script. The other input tabs (for example, scenario parameters, replacement map, adoption scheme, and adoption curves) feed into here. The user may override inputs at line by line on this tab.
Refrigerant Inputs	Input percent refrigerant leakage and charge size by electric technology.
Natural Gas Leakage Emissions Inputs	Input percent leakage as a function of natural gas consumption.
Panel Costs	Input facility-level cost inputs—for example, an electrical panel upgrade.
Buildings with AC Proportions	Input for proportion of residential buildings with existing air conditioning units at the gas utility, building climate zone, building type, and sector levels.
Characterized Inputs	
Natural Gas Technology Characterization *	Technology-level consumption, costs, saturation, and density by utility, sector, end-use, building type, building climate zone, and efficiency level.
Fuel Substitution Technology Characterization *	Technology level efficiency and cost characterization.

* Although the characterization is completed as a default input, it is expected that the user will regularly update characterization as updates or new technology characterizations become available.

Technology Characterization Key Metrics

Technology characterization differentiated, as applicable by sector, end use, climate zone, building type, and replacement type.

Metrics	Description	Notes:
Energy Use	• Annual gas consumption (therms) • Annual electric consumption (kWh), as applicable	Electric consumption is calculated using **the baseline gas technology consumption** and the expected **coefficient of performance** of the mapped electric technology.
Technology Costs	• Equipment cost • Installation cost	Costs from variety of sources and years according to best available data. Costs are scaled to the same year using the Producer Price Index.
Market Information	• Density— the quantity of technology group in a territory. • Saturation— the proportion of technologies and given efficiency levels within a technology group.	Densities and Saturations are pulled from the 2019 Potential & Goals Study.
Other Items	• Technology lifetime	Gas technologies based on DEER and current default assumptions for electric technologies 15 years. No decay in consumption performance over time.
Technology Performance Metrics	• Efficiency or performance values such as HSPF, SEER, EER, COP, and EF	COPs are based on a sample of manufacturer ratings and scaled according to climate zone.

Gas Technology Characterization Environment

Residential

End Use	Natural Gas Technologies
Space Heating	Furnace *
	Condensing Furnace
Water Heating	Gas Storage Water Heater *
	Condensing Gas Storage Water Heater
	Instantaneous Gas Water Heater
Laundry	Gas Clothes Dryer *

* Characterized at multiple efficiency levels

Commercial

End Use	Natural Gas Technologies
Space Heating	Furnace *
	Condensing Furnace
	Boiler *
	Condensing Boiler
Water Heating	Gas Storage Water Heater *
	Condensing Gas Storage Water Heater
	Instantaneous Gas Water Heater
	Gas Water Heating Boiler *
	Condensing Gas Water Heating Boiler
Cooking	Convection Oven *
	Steamer *
	Fryer *
Laundry	Gas Clothes Dryer *

* Characterized at multiple efficiency levels

Electric Technology Characterization Environment

Residential

End Use	Electric Technologies Reviewed	Electric Technologies Included **
Space Heating	Standard and High Efficiency Packaged/Split Heat Pump	X
	Standard and High Efficiency Variable Capacity Heat Pump	X
	Radiant Heating	
	Space and Water Heating Combination Systems	
	Packaged Terminal Heat Pump	X
	Layered Envelope Improvements *	X
Water Heating	Small Electric Water Heater (0.86, 0.88 and 0.93 EF)	X
	Tankless Resistance Water Heater	X
	Heat Pump Water Heater (>= 2.0 EF)	X
	Solar Water Heater	
	Space and Water Heating Combination Systems	
Cooking	Electric Cooktop (Resistance)	X
	Electric Range (Resistance)	X
	Electric Cooktop (Induction Heating)	X
Laundry	Heat pump clothes dryer	X

Commercial

End Use	Electric Technologies Reviewed	Electric Technologies Included **
Space Heating	Standard and High Efficiency Variable Capacity Heat Pump	X
	Geothermal Heat Pump	
	Standard and High Efficiency Packaged Rooftop Unit Heat Pump	X
	Standard and High Efficiency Split System Heat Pump	X
	Variable Refrigerant Flow Systems	
	Packaged Terminal Heat Pump (PTHP)	X
	Layered Envelope Improvement *	
Water Heating	Tankless Electric resistance water heater	X
	Electric Resistance Water Heater (0.86, 0.88 and 0.93 EF)	X
	Heat Pump Water Heater	X
	Pool heating equipment	
Cooking	Electric Fryer/Broiler	X
	Electric Stove	
	Electric Oven	X
	Electric Overhead Broiler	
	Electric Griddles	
	Combination Oven	
Laundry	Electric Dryer	

*Layered envelope improvements indicate separate technology characterization for each specified space heating technology operating in a building with an improved envelope.
**Technologies prioritized based on expected level of impact. The FSSAT framework allows for the addition of electric technologies.

Characterization Segmentation and Mapping

Characterized End Uses*

Sector	End Use	Description
Residential	HVAC	Heating and ventilation heat loss for space conditioning.
Residential	WaterHeat	Energy for heating domestic hot water.
Residential	AppPlug	Residential appliances including oven, cooktop, clothes dryer.
Commercial	HVAC	Heating and ventilation heat loss for space conditioning.
Commercial	WaterHeat	Energy for heating hot water.
Commercial	FoodServ	Appliances used for food service including fryers, griddle, and oven.
Commercial	AppPlug	Clothes dryers.

Utility Consumption Mapping**

Electricity	Natural Gas
PG&E	PG&E
SMUD	PG&E
Other	PG&E
SCE	SoCalGas
LADWP	SoCalGas
Other	SoCalGas
SDG&E	SDG&E

* Characterized technologies are further segmented by technology type, efficiency level, building climate zone, forecast climate zone, and building type. This level of segmentation results in the ability for users to apply highly granularized fuel substitution schemes.

** The Guidehouse team used zip code level consumption data for gas and electric utilities to relate electrified gas consumption to the appropriate electric utility.

Gas Characterization Sources

Sources	Description
2012 California Lighting & Appl. Saturation Survey (CLASS)	Residential baseline study of 1,987 homes across California.
2012 Commercial Saturation Survey (CSS)	Baseline study of 1,439 commercial buildings across California.
2009 Residential Appliance Saturation Study (RASS)	Residential end-use saturations for 24,000 households in California. Planned study update in 2020.
2014 Northwest Energy Efficiency Alliance: • Residential Building Stock Assessment (RBSA) • Comm. Building Stock Assessment (CBSA)	RBSA and CBSA survey residential and commercial building stock, respectively, across the Northwest states (Idaho, Montana, Oregon, Washington).
2009 US DOE:* • Res. Energy Consumption Survey (RECS) • Comm. Bldg. Energy Cons. Survey (CBECS)	RECS and CBECS are surveys of residential and commercial building stock in the US by region. Used West regional data only. Next update is pending for the 2018 CBECS.
Environmental Protection Agency 2003-2016 ENERGY STAR Shipment Database	Unit shipment data of ENERGY STAR-certified products collected to evaluate market penetration and performance.

*Updates for RECs in 2015 and CBECS in 2012 may not have included the data points used for the PG study. The PG study used only 2009 datasets.

Energy & Technology Outputs

Name	Units	Description
IEPR Natural Gas Forecast	MM therms	The IEPR natural gas forecast at the building and forecast climate zone levels disaggregated to the technology level.
AAEE Modified Natural Gas Forecast	MM therms	IEPR natural gas forecast reduced by AAEE expected savings over the forecast period.
Revised NG Forecast	MM therms	The AAEE-modified IEPR natural gas forecast after a given fuel substitution scheme is applied.
Added Stock	Unit Basis	Electric technology stock added due to fuel substitution. Units vary based on technology (ex. appliance unit, tonnage, etc.)
Added Electric Cons. (ReplGas)	kWh	Electric consumption increases due to fuel substitution (without additional space cooling loads).
Added Electric Cons. (AC)	kWh	Electric consumption increases due to fuel substitution (additional space cooling only).

Cost Outputs*

Name	Description
Added Tech. Cost (Split)	Fuel substitution technology cost expected due to fuel substitution split by cost type: • Equipment cost (capital costs of the specific technology) • Installation cost (cost of labor and additional equipment including writing costs where pertinent) • Overhead and profit cost (additional costs to reflect contractor profit margins)
Added Tech. Cost (Total)	Total technology cost expected due to fuel substitution.
Added Tech. Cost (Inc Total)	Total technology incremental cost expected due to fuel substitution.
Fuel Costs (Split)	Fuel costs split into natural gas costs mitigated and electric costs added due to fuel substitution.
Fuel Costs (Net)	Net fuel costs of added electricity and reduced natural gas.
Panel Costs	Aggregate costs of panel upgrades at the utility, sector, building type, and building climate zone levels (not quantified per household but at dollar per full sector single family/multifamily homes basis)

* Costs do not include electric or gas supply-side infrastructure costs.

Emissions & Abatement Curve Outputs

Name	Units	Description
HFC Emissions (FS)*	kg CO2e	Additional HFC emissions from refrigerant leakage due to fuel substitution.
HFC Emissions (Non-FS)	mTCO2e	Expected HFC emissions from refrigerant leakage independent of fuel substitution.
NG Leakage Emissions	kg CO2e	Emissions from natural gas leaks downstream of the commercial and residential meter.
NG Emissions Avoided	kg CO2e	Direct emissions from combustion of natural gas consumption.
Electric Emissions Added	kg CO2e	Indirect generation emissions from additional electric consumption due to fuel substitution.
Total Emissions Added	kg CO2e	The net aggregate emissions added due to fuel substitution.
Emissions Reduction Cost	Various	This tab includes cumulative avoided emissions, cumulative net present cost incremental to the gas technology replacement cost, and cumulative cost per metric ton avoided ($/mTCO2e).

*Cases in which a heat pump replaces a furnace in a home with existing air conditioning, net refrigerant emissions added is assumed to be zero.

Emissions avoided due to fuel substitution.

Emissions added due to fuel substitution.

Load Shapes used in Hourly Analysis

ADM Load Shapes*

- Developed using a hybrid approach to load shape development
- Methodology employs a combination of end use metering and prototypical building modeling
  - AMI load data is also used and disaggregated to an end use level
- Delivered via Hourly Electric Load Model (HELM) 2.0 model

2017 Navigant AAEE Load Shapes**

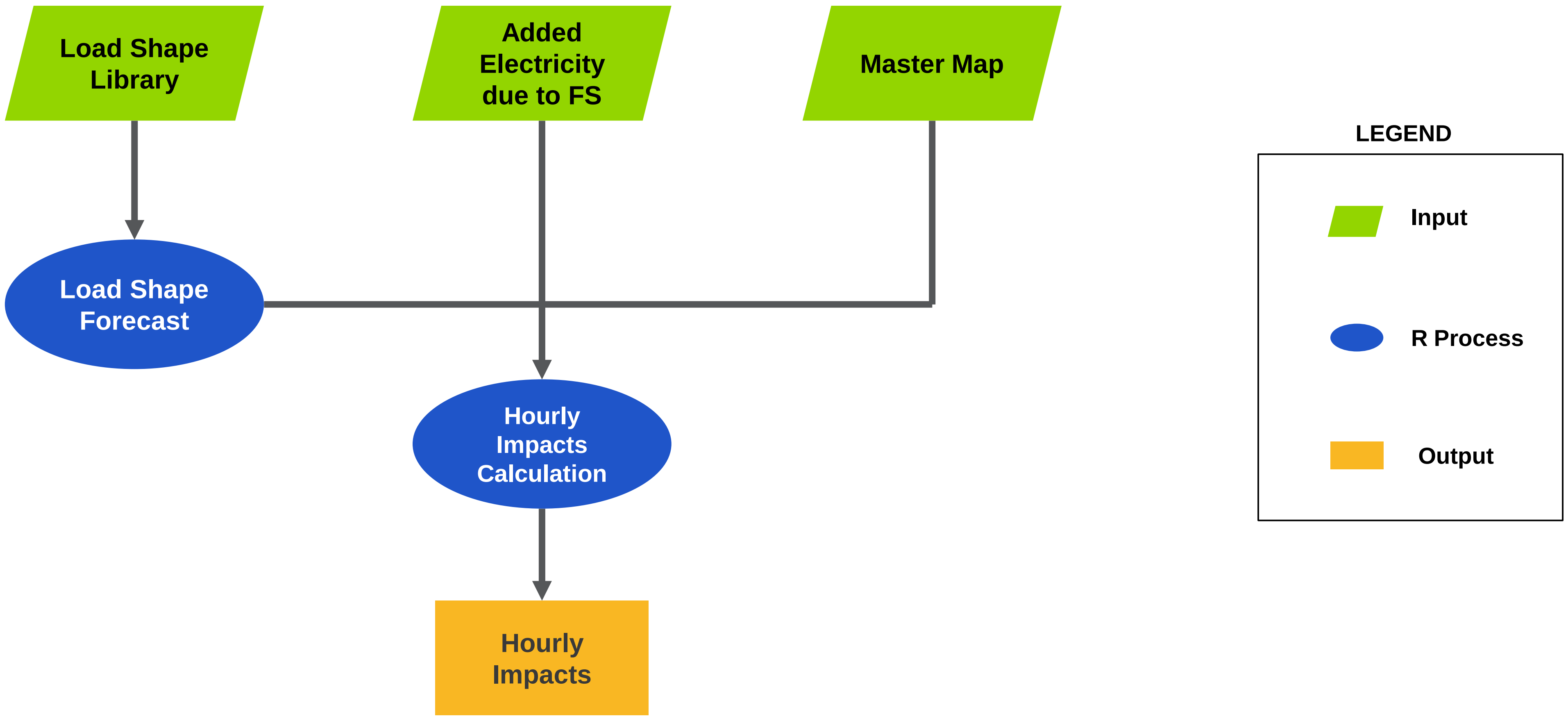
- Where possible, Guidehouse sourced California-specific load shapes to build library represented of key sectors and end uses
- Where California-specific data was not available, Guidehouse leveraged additional secondary resources to fill gaps using load shapes from other state

California Building Energy Code Compliance (CBECC) Modeling

- The Guidehouse team uses the CBECC-Res and CBECC-Com modeling software to develop annual 8760 load shapes for residential and commercial heat pumps
- The team developed load shapes representative of heat pump performance in the territories of the five major California utilities (PG&E, SCE, SDG&E, LADWP, and SMUD).

* ADM Associates 2019. *California Investor-Owned Utility Electricity Load Shapes* delivered to the CEC. https://ww2.energy.ca.gov/2019publications/CEC-500-2019-046/CEC-500-2019-046.pdf
** Navigant 2017. *AAEE Load Shape Analysis to Support CEC Demand Forecast* delivered to the CEC. https://efiling.energy.ca.gov/getdocument.aspx?tn=222431

Hourly Analysis Key Inputs, Processes, and Outputs



AB 3232 FSSAT Workshop
Commercial Refrigeration

February 27, 2020

Aanchal Kohli, D. Env.
Air Resources Engineer
F-Gas Reduction Strategy Section
California Air Resources Board

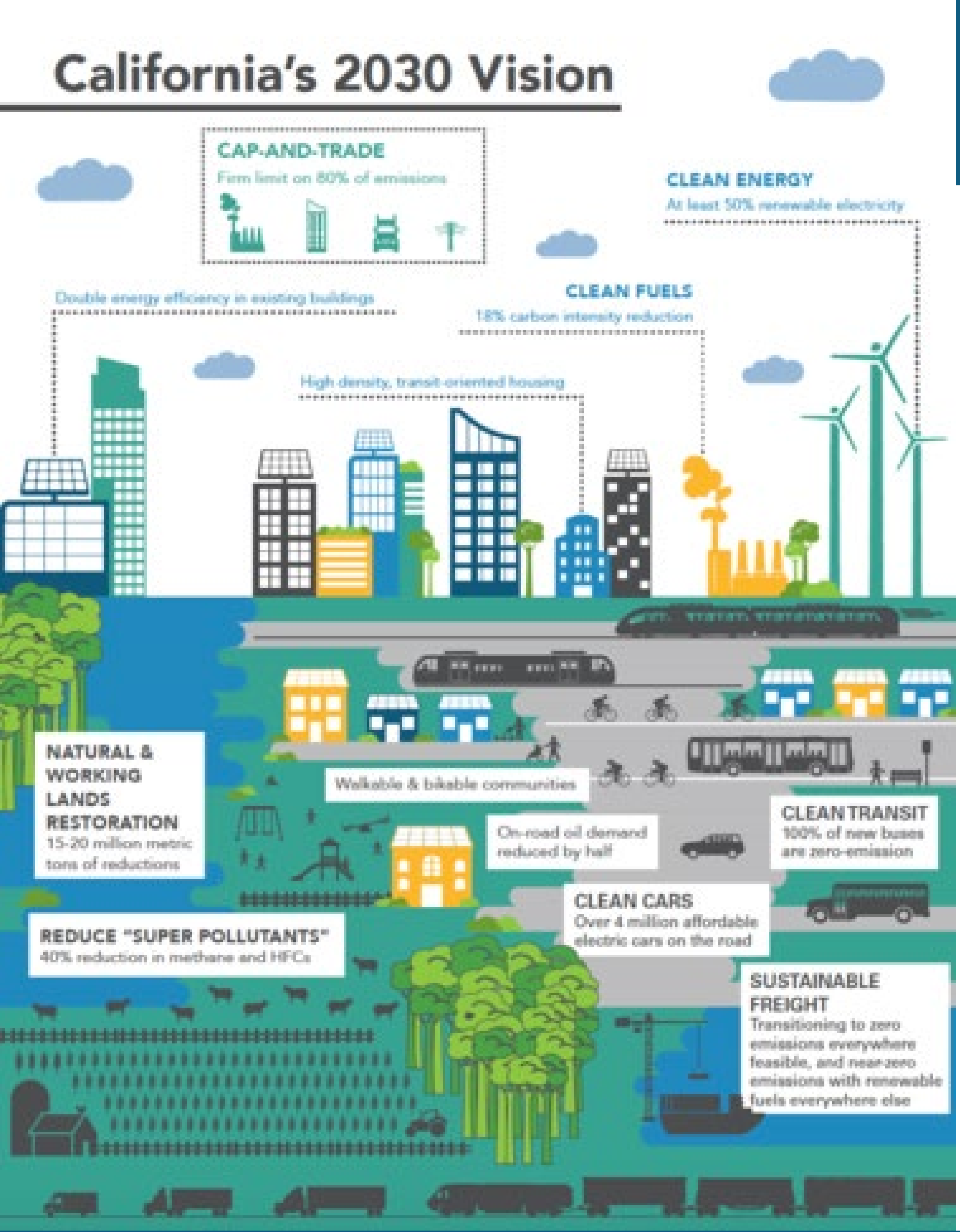
Agenda

- HFC Emissions and Mandates
- Current HFC Regulations
- HFC Inventory
- Refrigerant Management Program
- Proposed HFC Regulations
- Future Work

HFCs are Powerful Greenhouse Gases

Pound for pound, HFC blend R-404A is 3,922 times more potent than CO_2

two tanks R-22 = one tank R-404A = annual fuel for 14 cars



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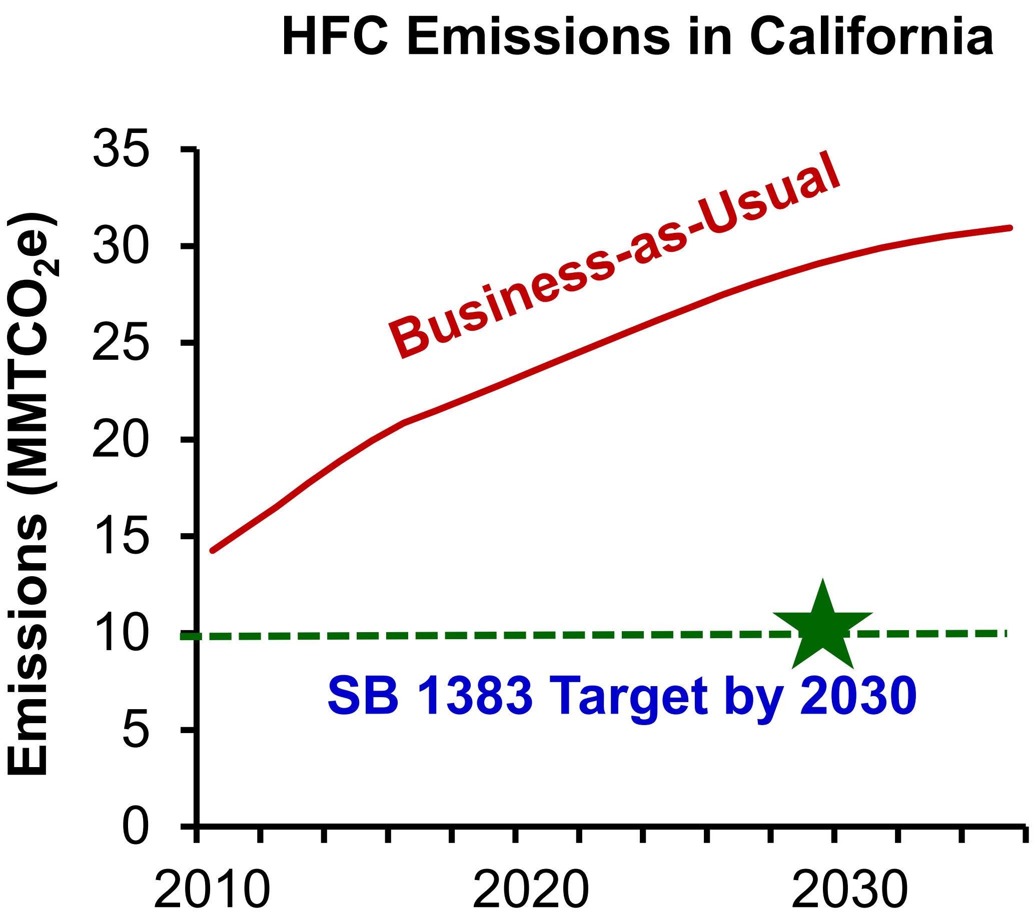
Pathway to Achieve 40% Reduction Target by 2030 – Seven Key Pillars:

- More Clean Cars and Trucks,
- Cleaner Fuels,
- Cleaner Industry and Electricity,
- Increased Renewable Energy,
- Smart Community Planning,
- Improved Agriculture and Forests, and
- **Reduce Super-Pollutants (methane, black carbon, hydrofluorocarbons).**

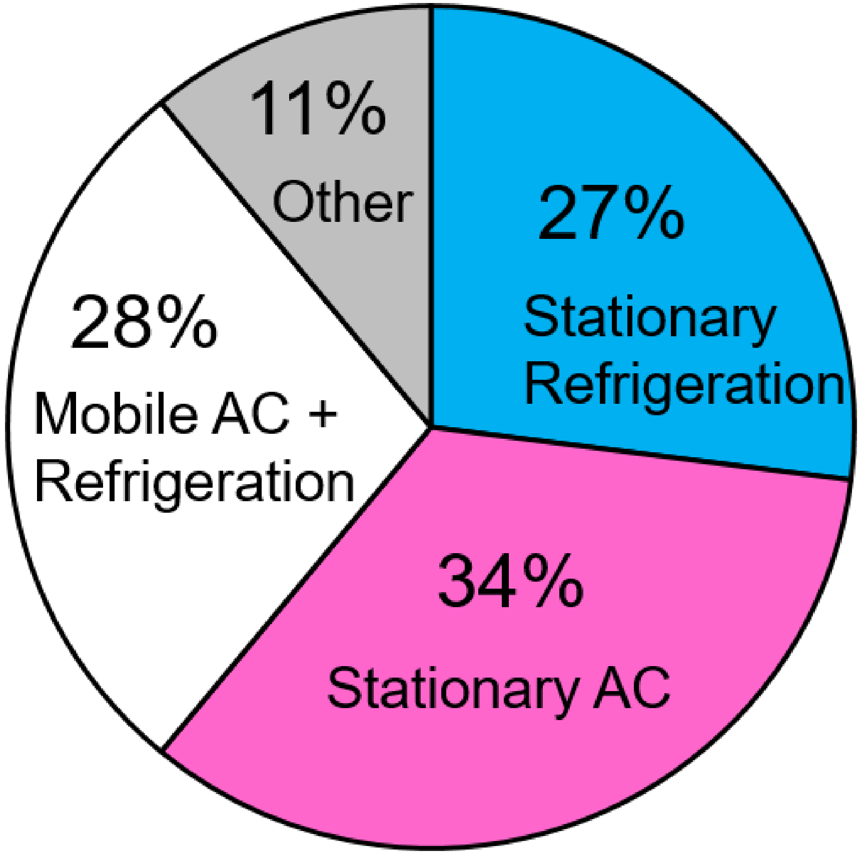
HFCs are Fastest Growing GHGs in CA

- **Currently 4% of CA GHG emissions** (Increasing to 10% by 2030 under BAU)
- **SB 1383 reduction goal: 40% below 2013 levels by 2030** (one-half of today's HFC emissions)

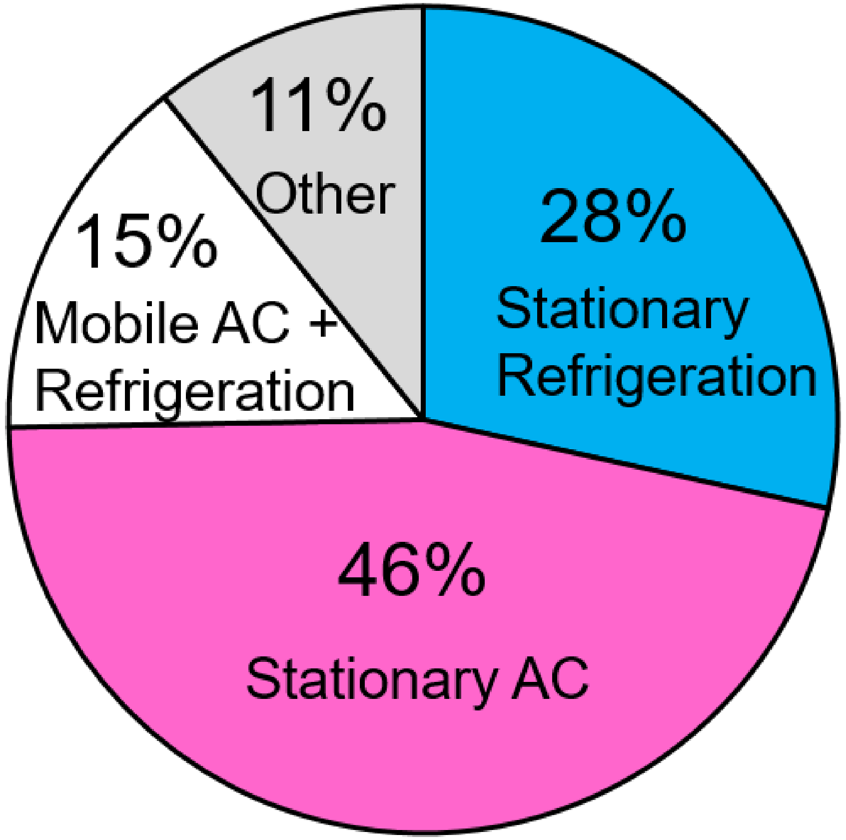


Source: CARB F-gas Inventory (2018)

HFC Emission Sources in CA



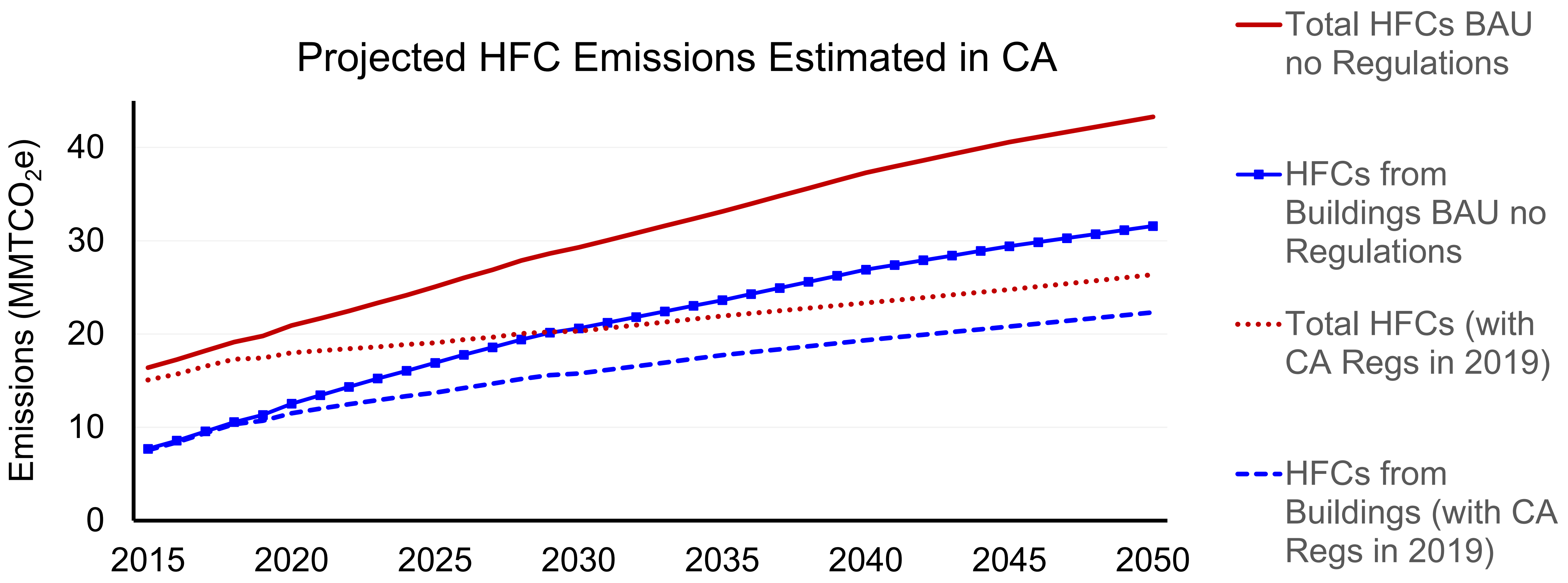
Year 2018



Year 2030 (Projected)

Source: CARB F-gas Inventory (2018)

Building HFC Emissions

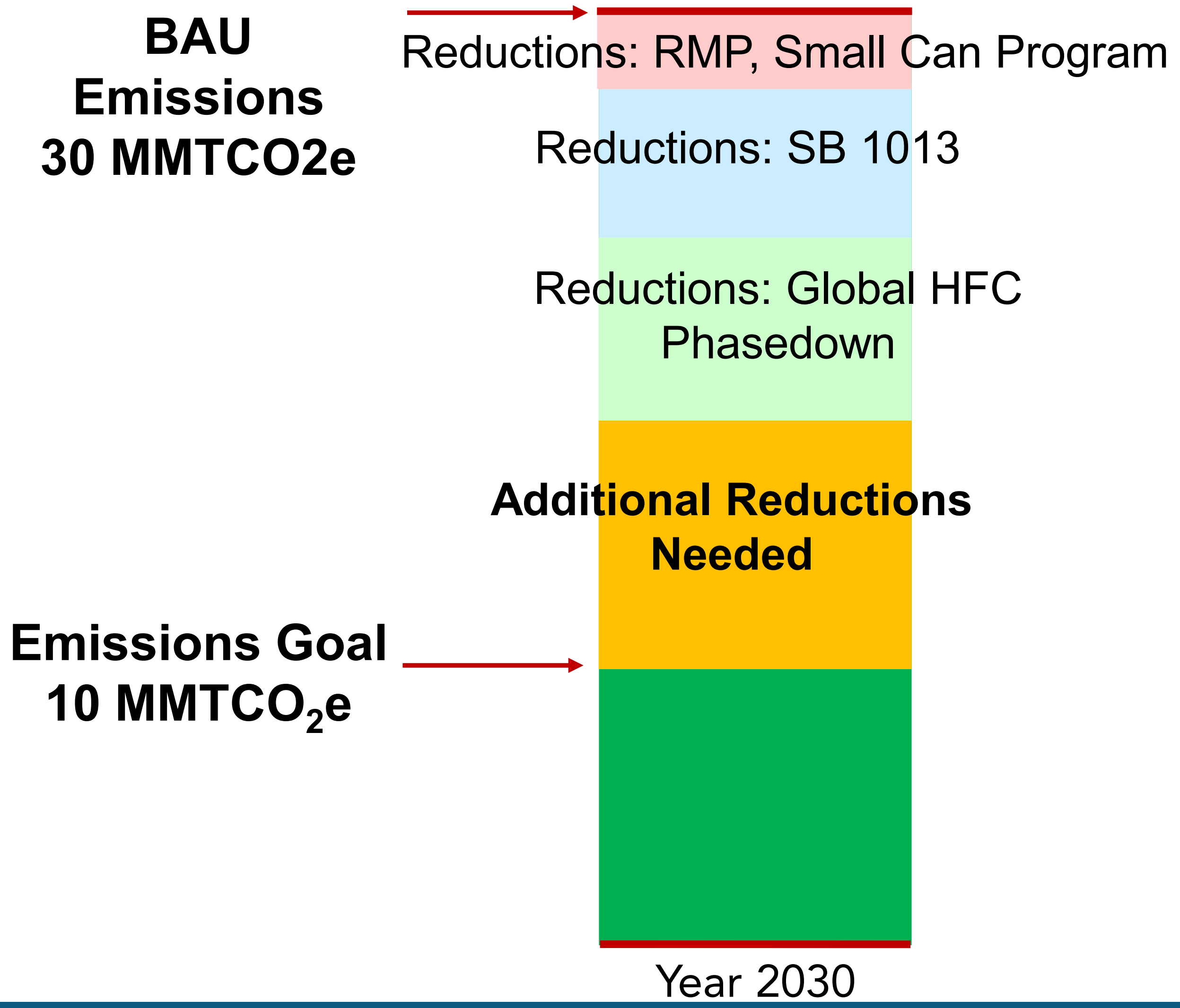


Source: CARB F-gas Inventory (2018)

SB 1383 and HFC Reductions Strategies

<u>Current Measures</u>

- Refrigerant Management Program
- Small Can Program
- SB 1013 / California Cooling Act
- Global HFC Phasedown (on hold)
- Motor Vehicle AC Measures



CARB HFC Inventory

- Bottom-up state-specific inventory
- Commercial refrigeration data sources
  - Research studies by CARB and others
  - U.S. EPA
  - Refrigerant Management Program (RMP)
- Data collected
  - System charge (amount of refrigerant)
  - Type of refrigerant
  - Annual and end-of-life leak rates

Environmental Science & Technology
Article
pubs.acs.org/est

High-Global Warming Potential F-gas Emissions in California: Comparison of Ambient-Based versus Inventory-Based Estimates, and Implications of Refined Estimates

Glenn Gallagher,*,† Tao Zhan,† Ying-Kuang Hsu,† Pamela Gupta,† James Pederso
Donald R. Blake,‡ Barbara Barletta,‡ Simone Meinardi,‡ Paul Ashford,§ Arnie Vett
Rayan Slim,⊥ Lionel Palandre,⊥ Denis Clodic,⊥ Pamela Mathis,¶ Mark Wagner,¶ J
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Supporting Information

ABSTRACT: To provide information for greenhouse gas reduction policies, the California Air Resources Board (CARB) inventories annual emissions of high-global-warming potential (GWP) fluorinated gases, the fastest growing sector of greenhouse gas (GHG) emissions globally. Baseline 2008 F-gas emissions estimates for selected chlorofluorocarbons (CFC-12), hydrochlorofluorocarbons (HCFC-22), and hydrofluorocarbons (HFC-134a) made with an inventory-based methodology were compared

California Environmental Protection Agency
Air Resources Board

2015 Edition

California's
High Global Warming Potential Gases
Emission Inventory

Emission Inventory Methodology and
Technical Support Document

State of California
Air Resources Board
Air Quality Planning and Science Division

April 2016

1

Refrigerant Management Program (RMP)

- Facilities with refrigeration system (> 50 pounds) must register with CARB
- Commercial refrigeration, industrial process refrigeration and cold storage warehouses
- Periodic leak inspections, prompt leak repairs, best practices


Refrigerants used in RMP Facilities

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~30,000 registered refrigeration systems in **~6500** facilities

Refrigerant Type	Percentage of Systems	GWP
R-22 (HCFC)	33%	1,810
R-404A	25%	3,922
R-507A	11%	3,985
R-407A	9%	2,107
R-134a	6%	1,430
R-408A (HCFC)	4%	3,432
Others	13%	1,905

Additional Proposed HFC Measures

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Stationary Air-conditioning

Effective January 1, 2023, new air conditioning systems must use a refrigerant with a global warming potential (GWP) value < 750

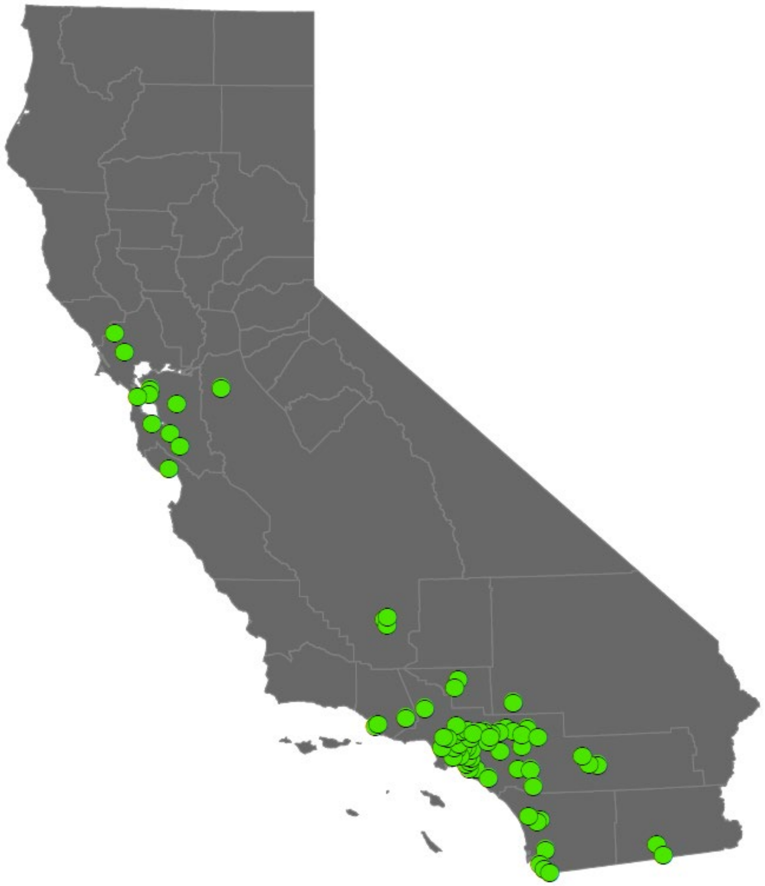
Stationary Refrigeration

New and Remolded Faculties: Effective January 1, 2022, refrigeration equipment containing more than 50 lbs. of refrigerant must use a refrigerant with a GWP < 150

Existing Facilities: proposing two flexible per-company options to bring average GWP down

Refrigeration Technologies GWP < 150

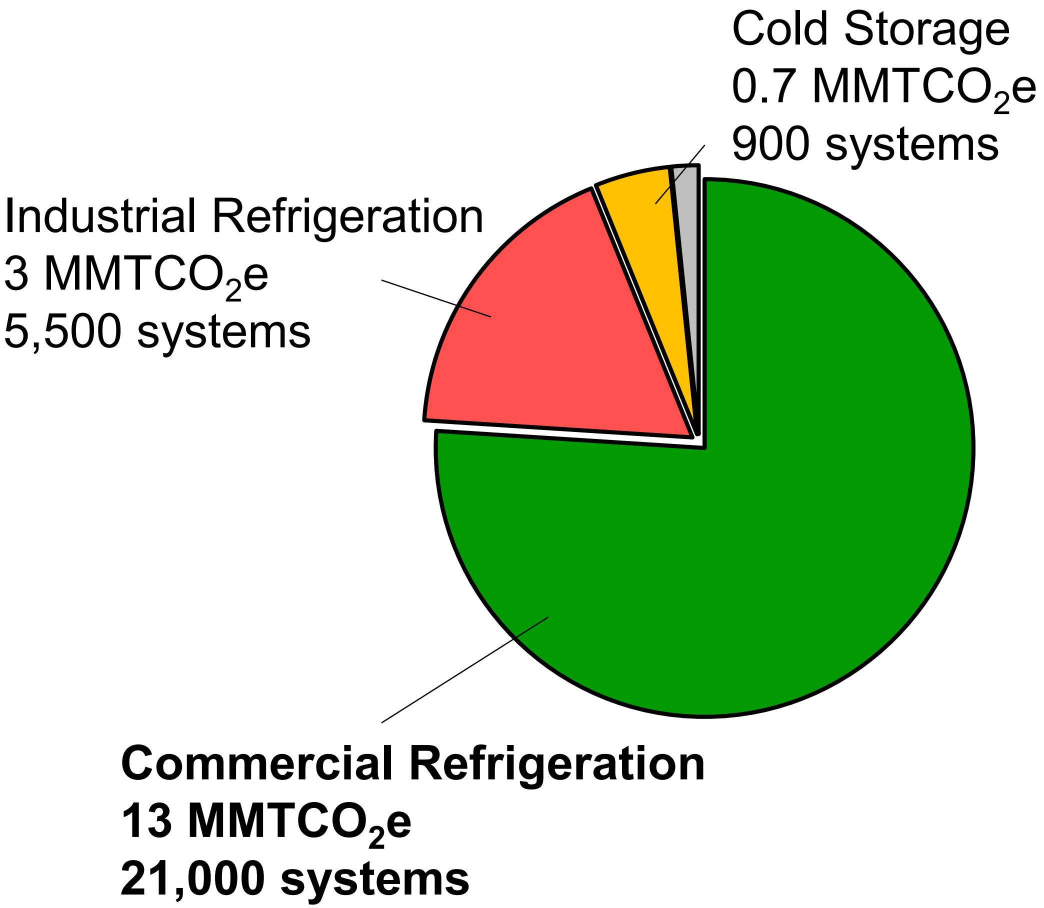
End-Use Sector	Low-GWP Options Currently Available
Retail Food Refrigeration (e.g., Supermarkets and grocery stores)	• Transcritical CO_2 • Ammonia/CO_2 cascade • Propane/CO_2 cascade • Micro-distributed Propane systems • HFO/CO_2 or HFOs-based systems
Industrial Process Refrigeration and Cold Storage	*Majority already use ammonia* others: Transcritical CO_2, NH_3/CO_2 , Low-charge ammonia, HFO-based systems



80+ supermarkets in California using low-GWP refrigerants in 2019

Reducing Existing Banks of HFCs

- Only 1 – 2% new facilities + remodels annually
- Existing facilities / stores have the highest potential for emissions and reductions
- ~350,000 Non-RMP (< 50 lbs.) systems with average refrigerant GWP of ~3000



Source: CARB Refrigerant Management Program, 2018

Challenges to Reducing HFCs

- Even with current and proposed regulations, additional measures needed to meet SB 1383 targets
- New sources of HFCs from building electrification
- Low recycling and reclamation rates
- Technician certification and training, poor installation and maintenance practices
- Lack of energy efficiency standards for commercial refrigeration
- Leak rates due to extensive piping and thin piping/components
- Higher upfront cost of low-GWP technologies → need for incentives

Contact Information

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California Energy Commission

February 27, 2020

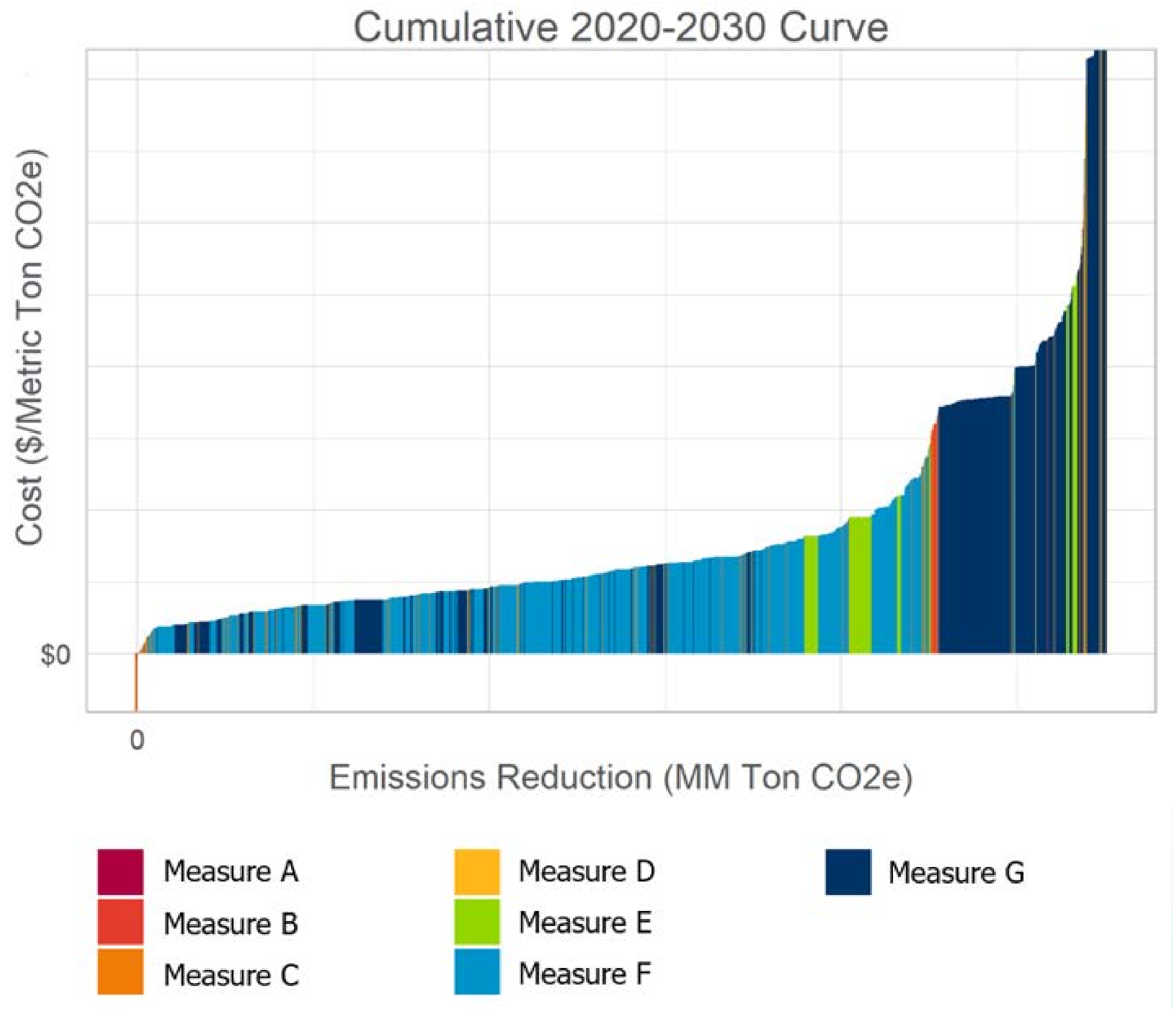
Additional Analysis for AB 3232

Staff Workshop on the Fuel Substitution Analysis Tool (FSSAT)

Nicholas Janusch, Ph.D. and Ingrid Neumann, Ph.D.
February 27th, 2020
Energy Assessments Division
California Energy Commission

Marginal Abatement Cost Curves

- Example output from FSSAT: ***Disaggregated measure-level***
  - Illustrative chart mapping the cost per metric ton of reducing CO_2e; these are called ***marginal abatement cost curves***
- Measures the incremental costs of reducing GHG emissions as compared to natural gas consumption; can be reported as:
  - Cumulative reduction 2020-2030
  - Reduction in 2030 emissions
- User has the ability to aggregate and group strategies by measure, end use, etc.



Marginal Abatement Cost Curves

- Example output from FSSAT: **Technology level aggregation**
  - Illustrative chart mapping the cost per metric ton of reducing CO_2e; these are called ***marginal abatement cost curves***
- Measures the incremental costs of reducing GHG emissions as compared to natural gas consumption; can be reported as:
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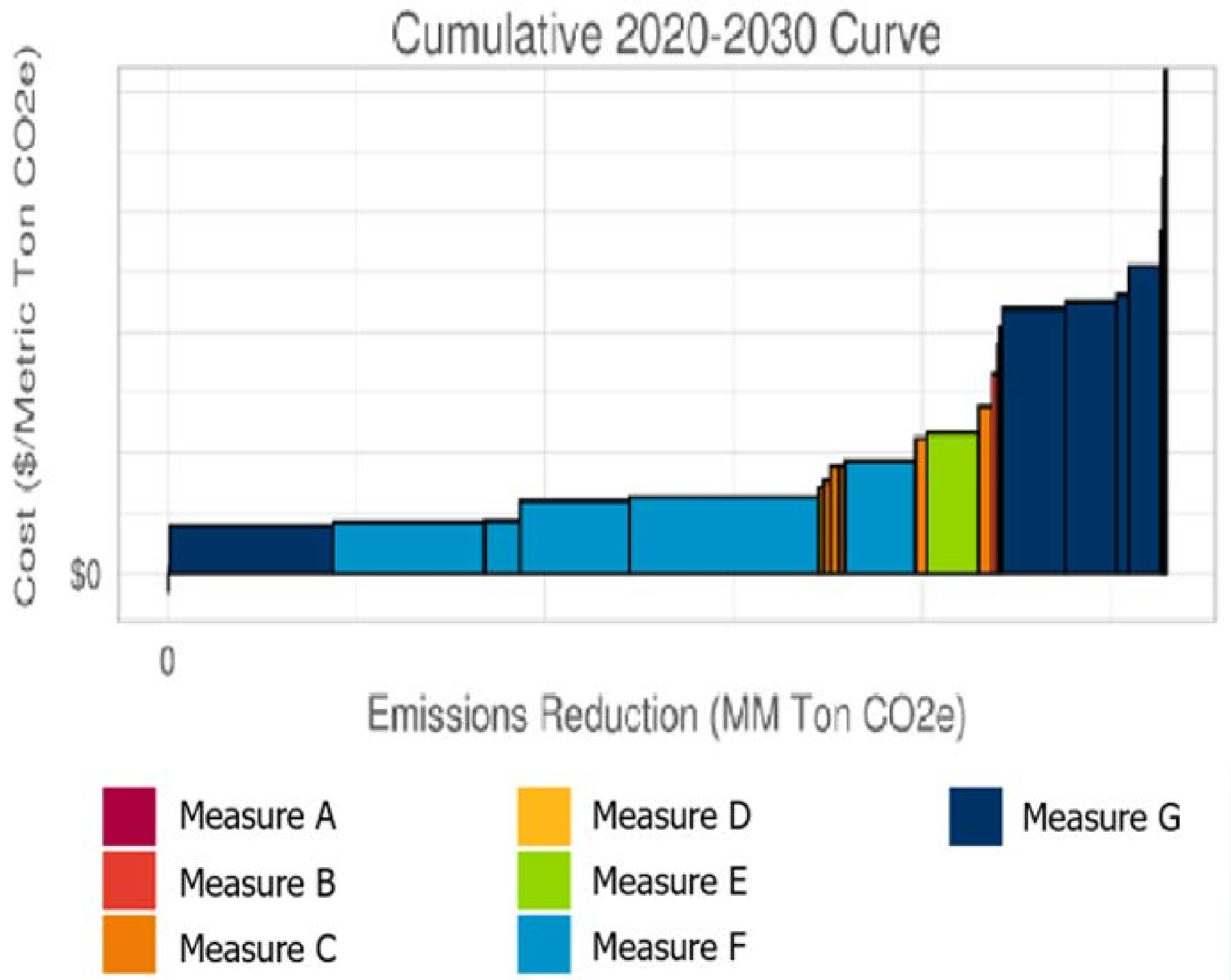
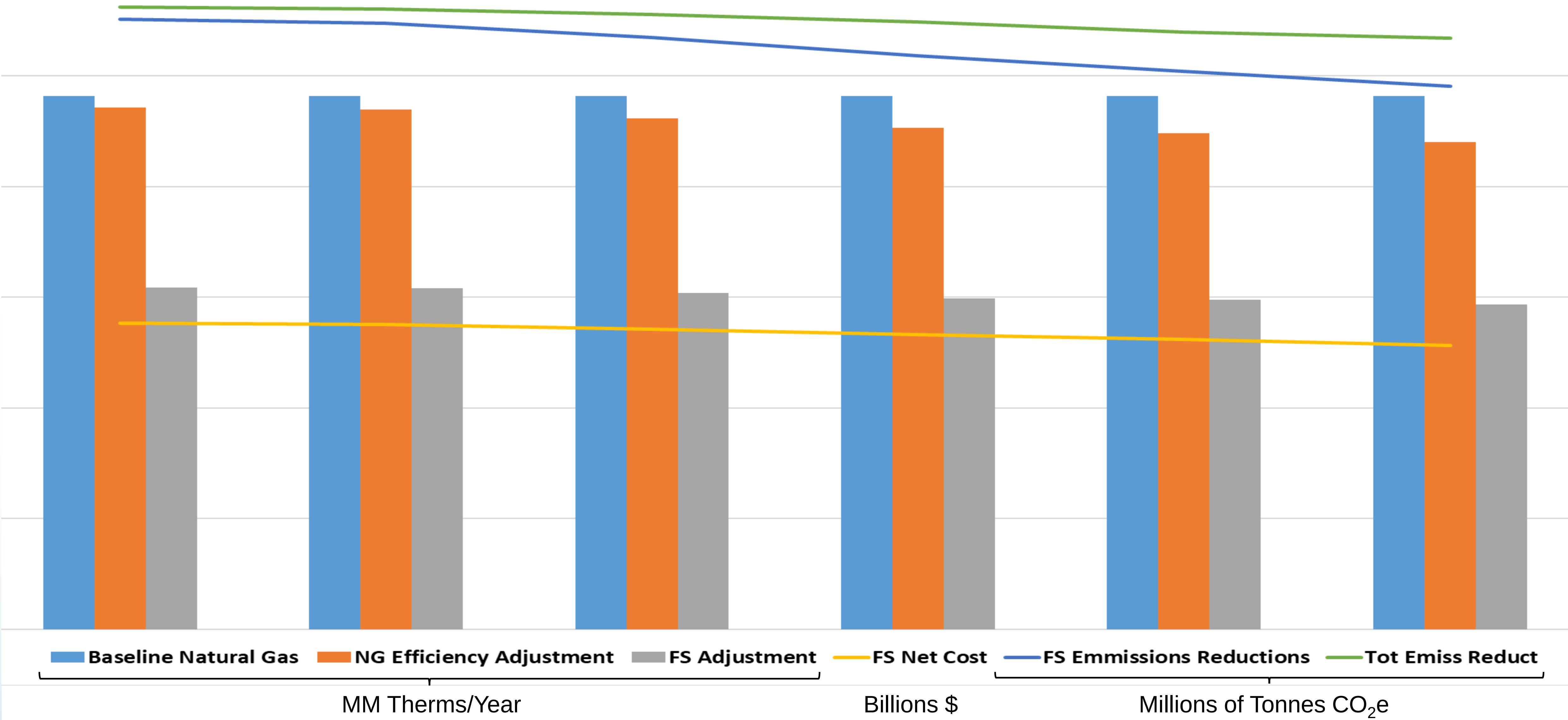


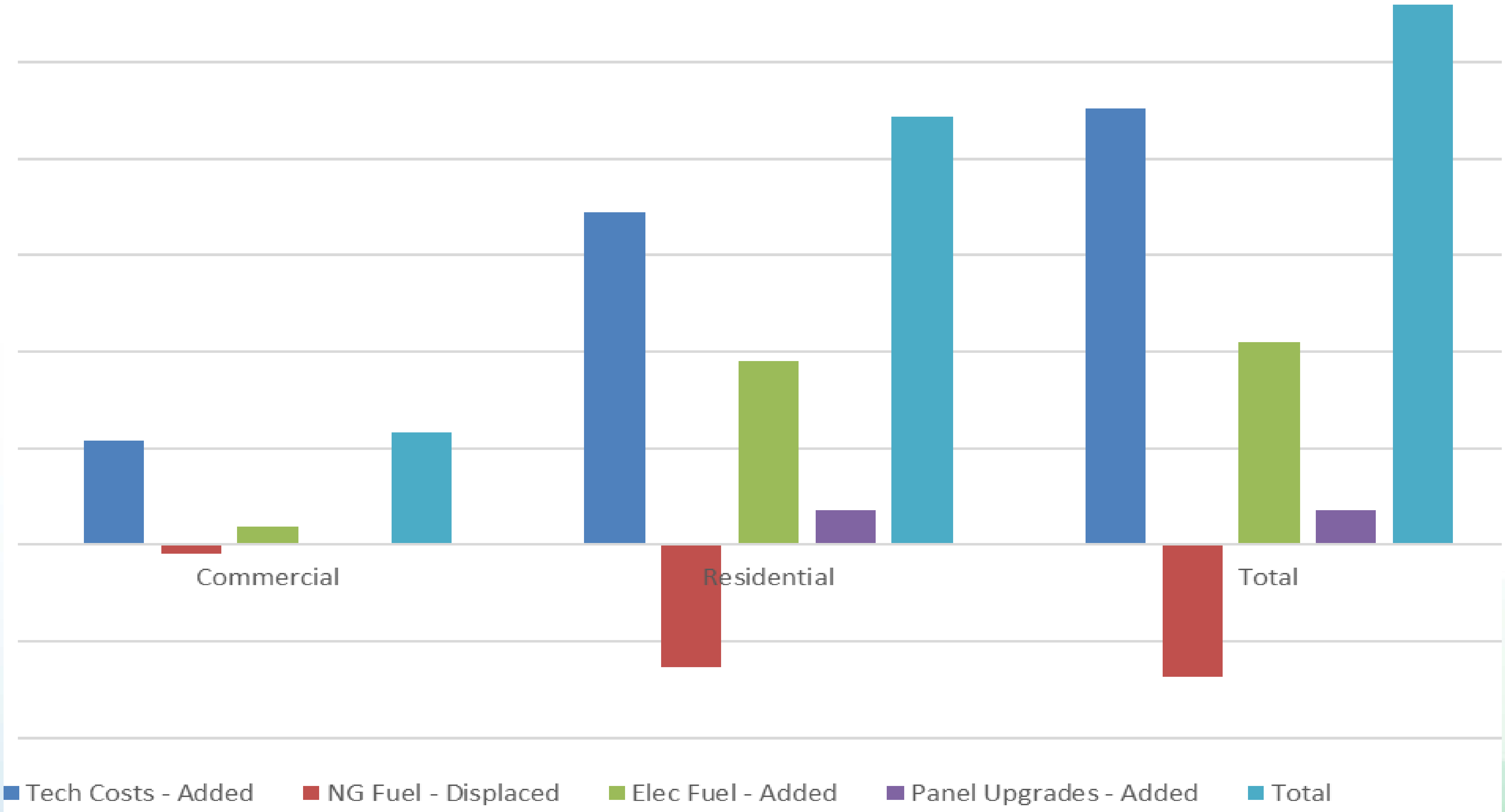
CEC staff preliminary analysis of FSSAT

- CEC staff has explored FS analysis using a draft version of FSSAT
- Staff modified different input assumptions to understand sensitivities and trends in the final outputs
- Inputs
  - baseline gas efficiency
  - percentage replace on burnout (%ROB)
  - percentage early retirement (%RET)
  - technology cost
- Outputs
  - cumulative emission reductions
  - marginal abatement cost (MAC) curves

CEC staff preliminary analysis of FSSAT
variation with baseline gas efficiency

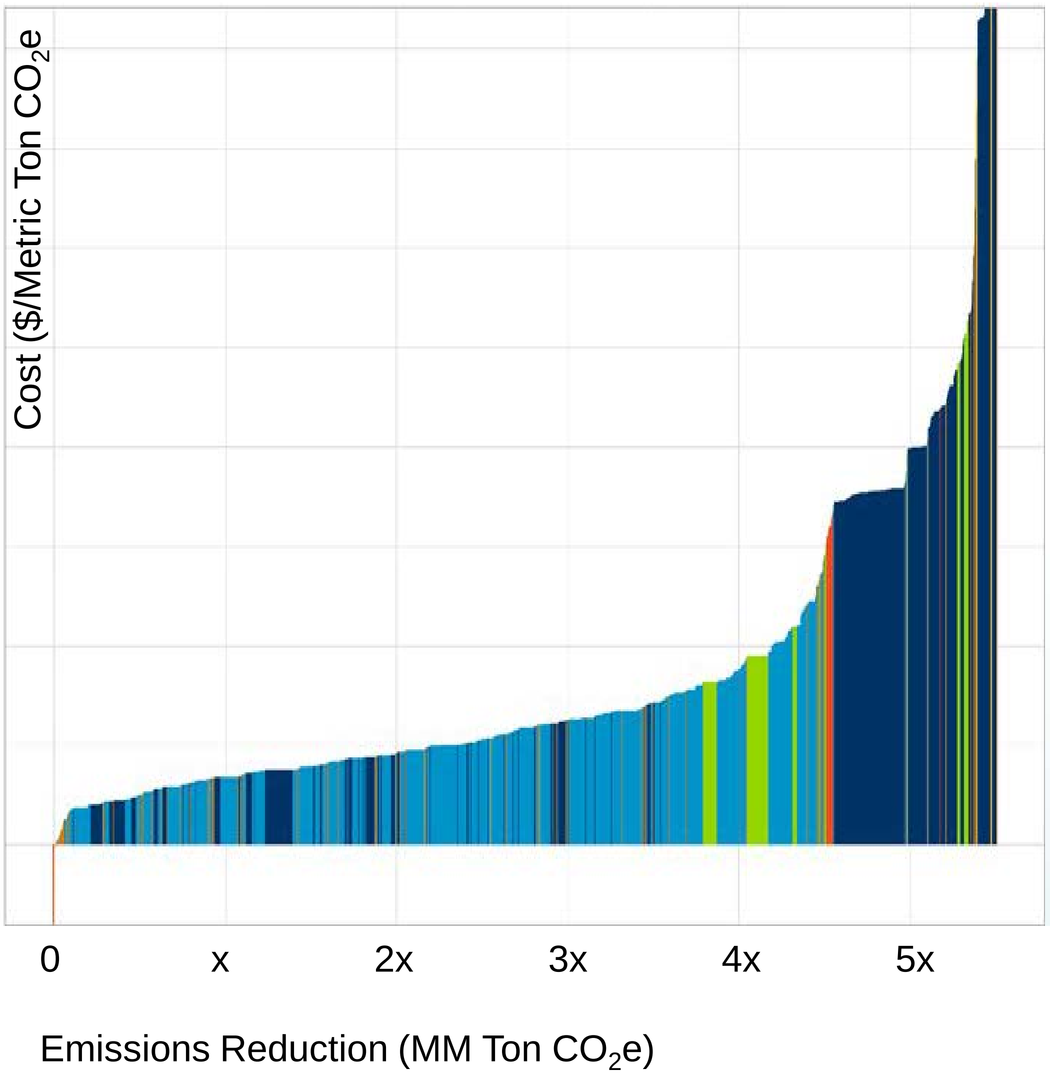


CEC staff preliminary analysis of FSSAT relative costs by sector

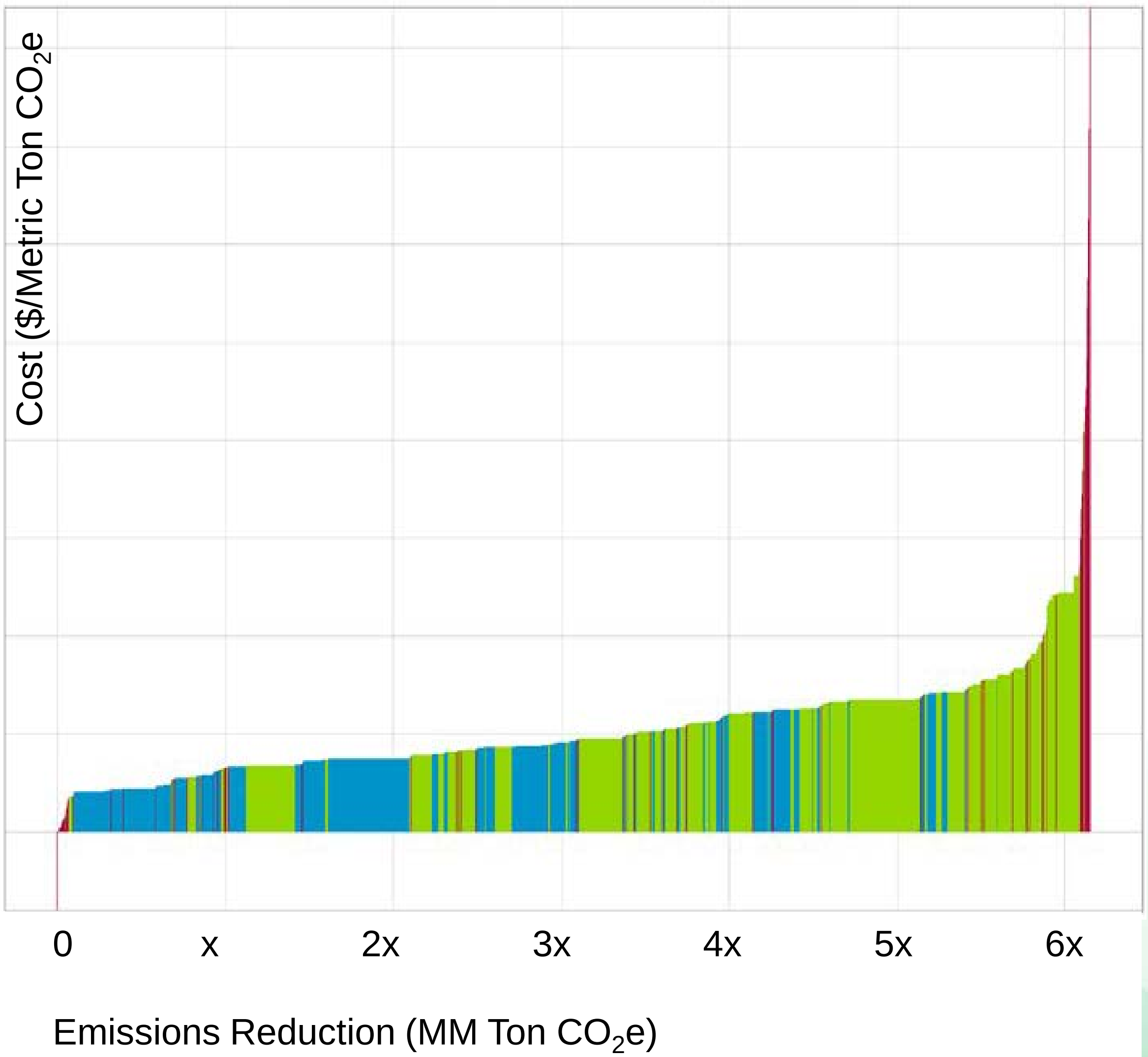


CEC staff preliminary analysis of FSSAT
residential 100% ROB MAC curves

Cumulative 2020-2030 Curve - **all available technologies**



Cumulative 2020-2030 Curve – **only most efficient HP technologies**



Additional Analysis

- Developing future year electric generation emission factors
- Scenario analysis by adjusting FSSAT natural gas emission factors to quantify the GHG emission reduction potential of different penetration rates of renewable natural gas (RNG)
- Quantifying GHG emission reduction opportunities not included in FSSAT and counted in the AB 3232 baseline
    - FSSAT does not estimate GHG reduction potential from ***electric*** energy efficiency measures
    - As such, CEC staff will conduct analysis to complement FSSAT outputs for
        - Electric energy efficiency strategies
        - Load flexibility/future load management standards
        - Strategies in other sectors using existing literature

Questions?

California Energy Commission

Fuel Substitution Analysis to Support AB 3232 Staff Workshop

Next Steps

- Commissioner Workshop on Opportunities and Challenges of Decarbonizing Buildings
- Date: April 15th (Date subject to change)
- Location: Sacramento
- General topics/issues:
    - Impacts on building owners and residents related to energy costs; rates; cost of housing; health
    - Challenges and opportunities for multifamily and high-rise buildings, and commercial buildings

Next Steps

- AB 3232 Scenarios and Analysis
- Date: Late April (Date subject to change)
- Location: Sacramento
- General topics/issues:
  - Proposed fuel substitution scenarios and analysis

Next Steps

- Second Commissioner Workshop on Opportunities and Challenges of Decarbonizing Buildings
- Date: May 1st (Date subject to change)
- Location: Los Angeles
- General topics/issues:
    - Natural Gas (NG) forecasting data through 2030; electrification impacts to end uses and buildings; Renewable Natural Gas displacement potential of NG; Grid reliability

Next Steps

- Commissioner Workshop on Draft Building Decarbonization (AB 3232) Assessment
- Date: September (Date subject to change)
- Location: Sacramento
- General topics/issues:
    - Summary of report findings followed by public comment.

Written Comments

- Written comments:
  - Written comments must be submitted to the Docket Unit by 5:00 p.m. on March 13, 2020. Written comments will also be accepted at the webinar; however, the California Energy Commission may not have time to review them before the conclusion of the meeting.

Thank You!