

Technical Working Group Meeting

Proposed GWP Limit for New Stationary Air Conditioning Equipment

August 6, 2019

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California Air Resources Board

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Today's Presentation



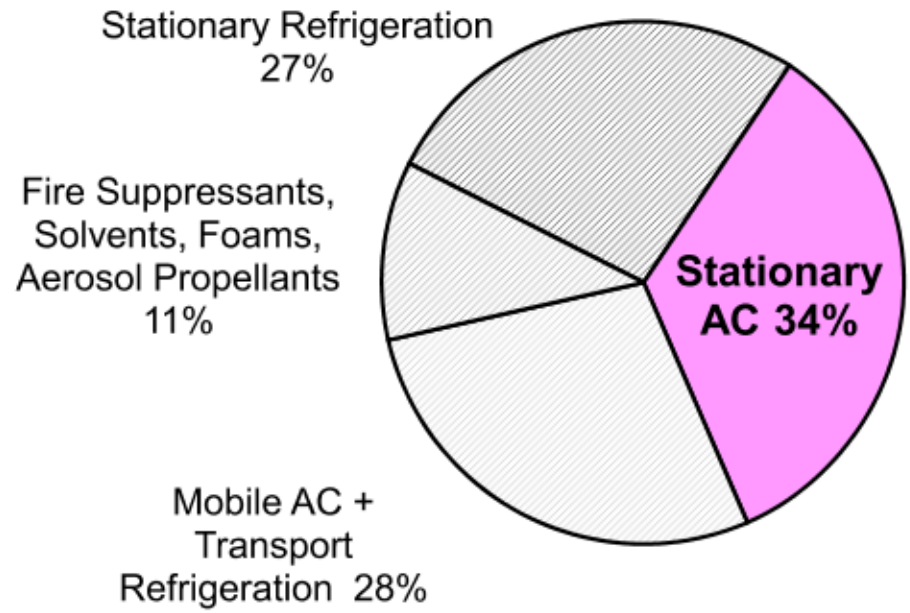
- Background
- Regulatory Proposal and Process
- Economic Analysis (SRIA)
- Enforcement Requirements
- Alternatives
- Next Steps
- Discussion

Background

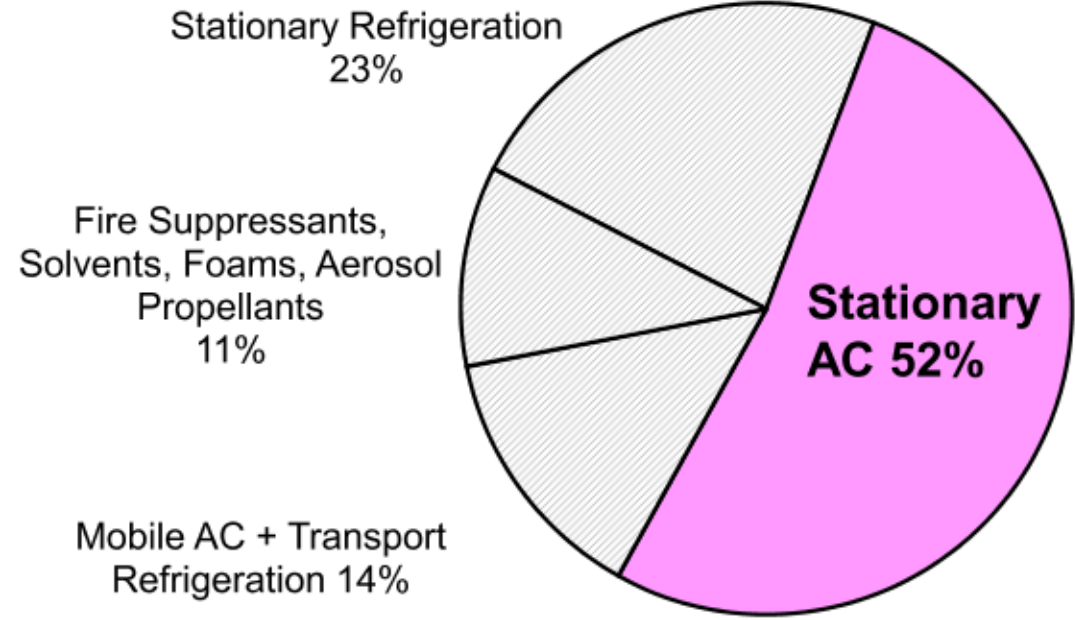
Hydrofluorocarbon (HFC) Emissions in California



Year 2018



Year 2030 BAU



Majority of Emissions from AC Sector

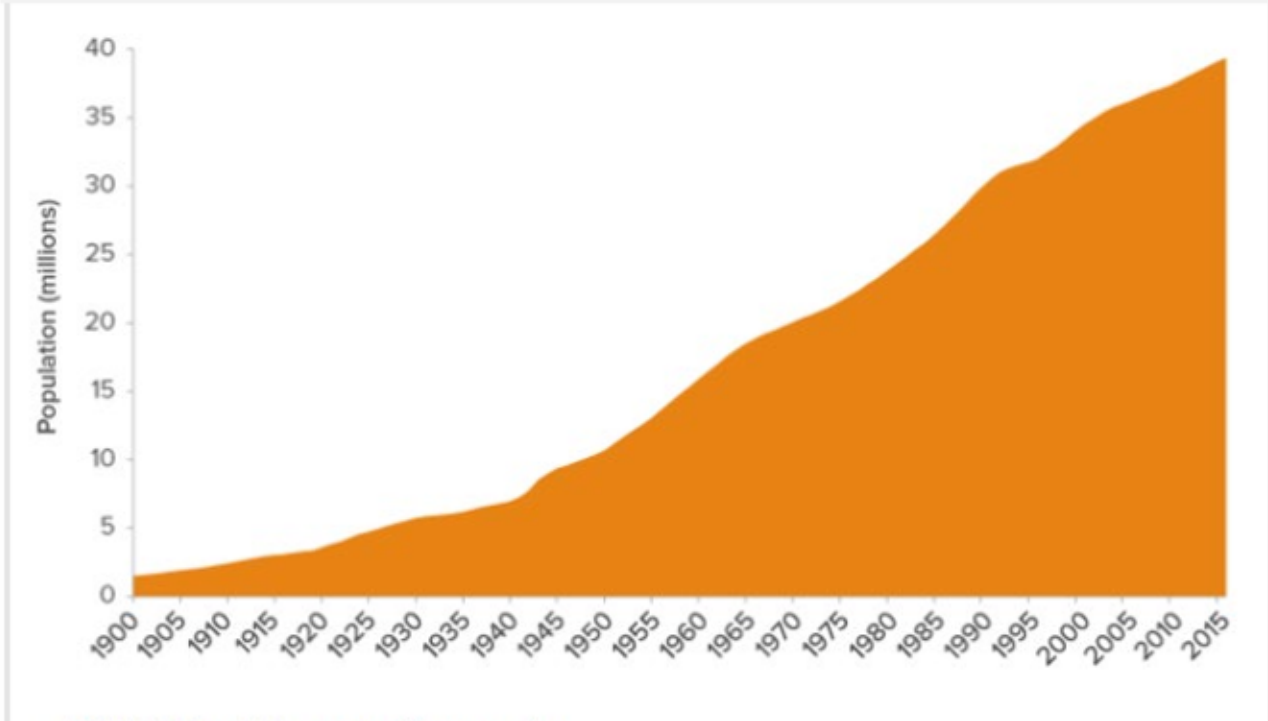
[Source: CARB, 2018]

Increasing Demand for AC in California



Population Growth

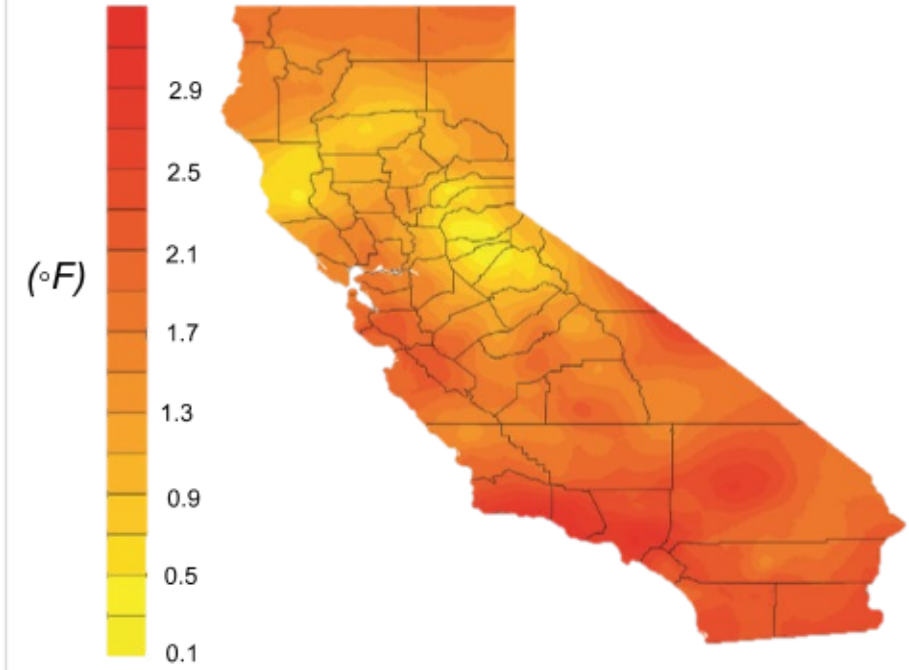
California has experienced rapid population growth



SOURCE: California Department of Finance estimates.

Climate Change

Observed Change in Annual Temperatures (1986-2016 compared to 1901-1960)



Proposed GWP Limit on Stationary Air Conditioning Equipment

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

Effective January 1, 2024, new chillers must use a refrigerant with a GWP value < 750 (consistent with SB 1013)

Status of <750 GWP Alternatives



Category	Global Status	California Status
window/wall + portable	●	●
packaged terminal	●	◐
ductless split systems	●	◐
ducted split + package systems	◐	◐
VRV/VRF	●	◐

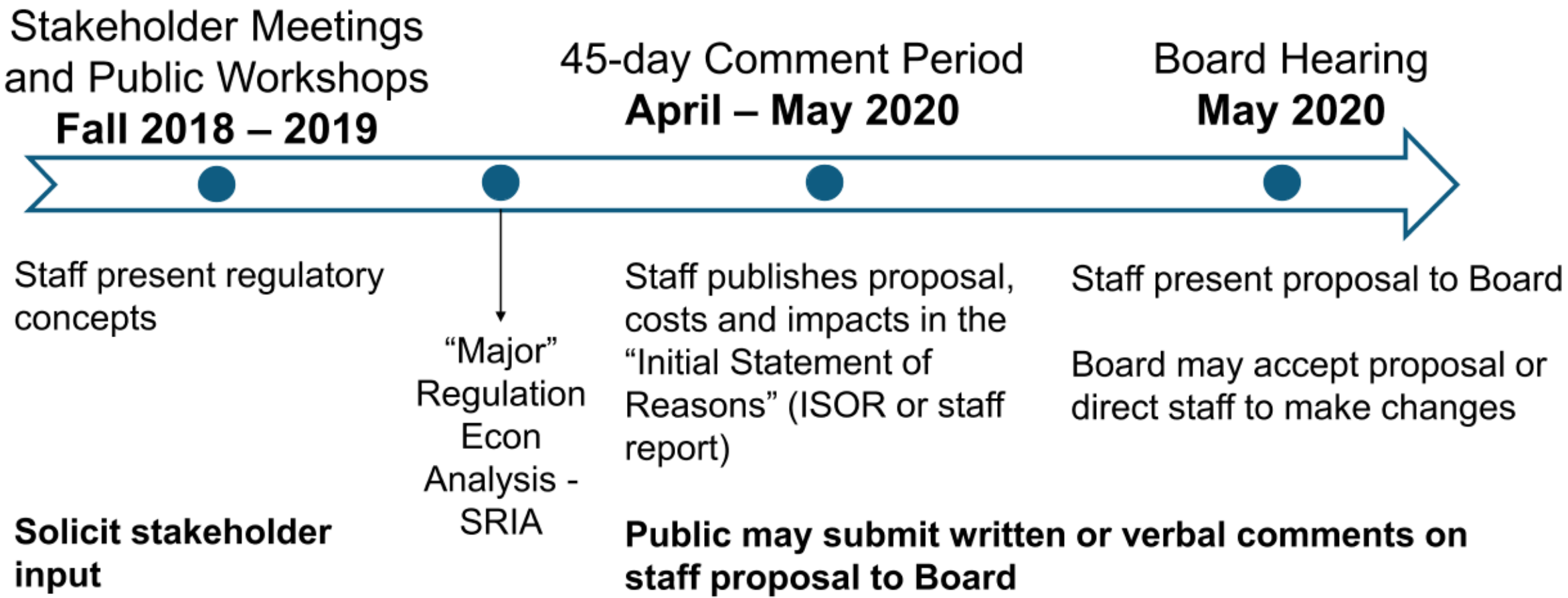
● commercially available

◐ Product under development or pending codes/standards updates

[Source: Adapted from "The Future of Air Conditioning for Buildings, 2016"]

Regulatory Process Overview

Rulemaking Overview



Economic Analysis: Standardized Regulatory Impact Assessment (SRIA)

- Required if estimated economic impact exceeds \$50 million, i.e., “major” regulation
 - Costs and benefits to businesses, individuals, and the environment
 - Macroeconomic impacts (jobs, investment, income) in California
 - Fiscal impacts
 - Costs and benefits for regulatory alternatives

CARB seeks and considers information given by stakeholders and interested parties

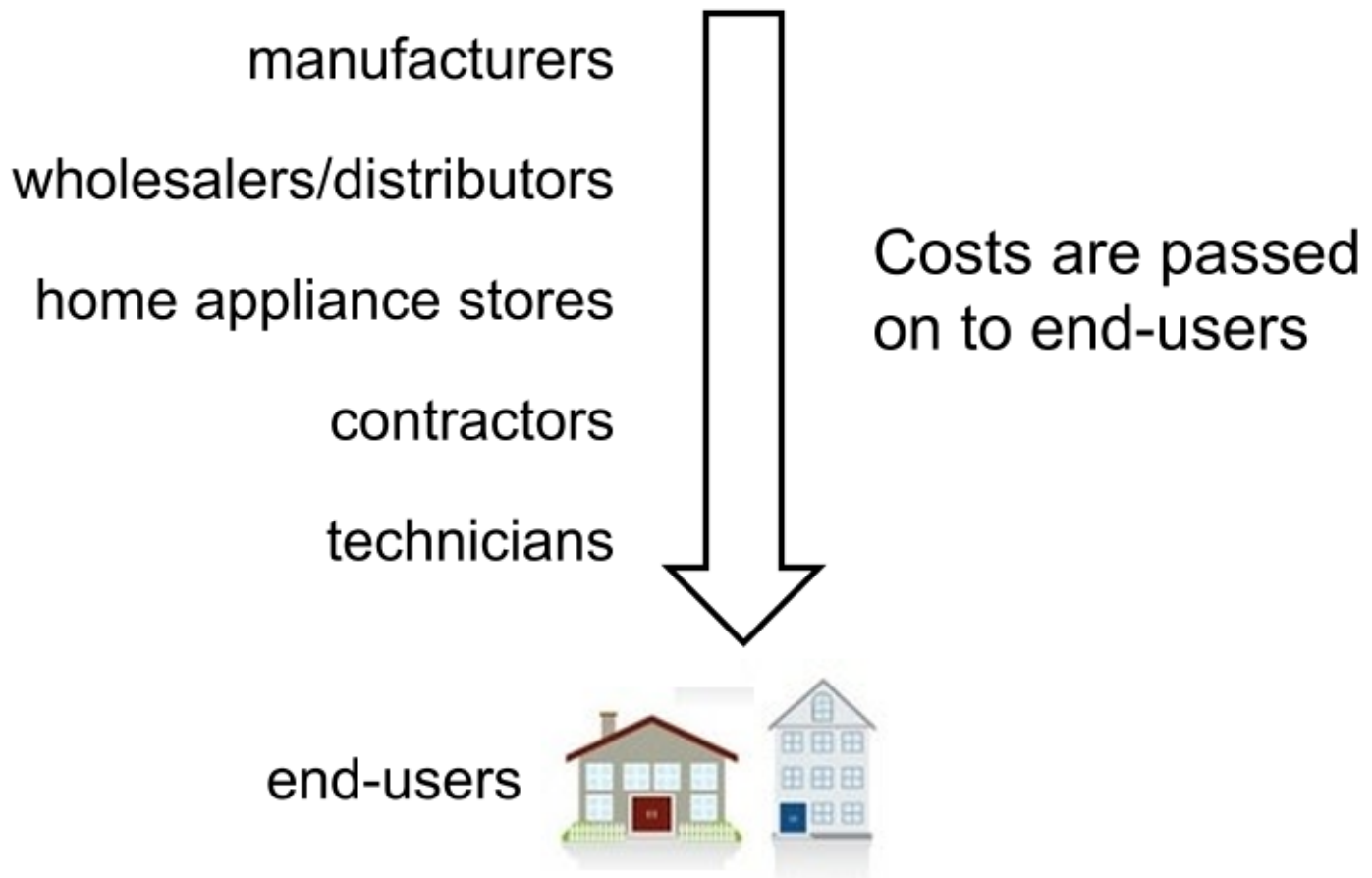
- Baseline costs – costs of traditional AC systems (first + ongoing)
- Added costs – how much more does it cost for < 750 GWP equipment compared to baseline?
- Growth rates of affected equipment

Economic Analysis (SRIA)

Preliminary Analysis and Input Requested

- a. Affected Entities
- a. Cost by Equipment Category
- b. California AC Market
- c. Component Replacements (Existing Systems)

SRIA – Who is affected by the proposed regulation?



AC Equipment Categories



small self-contained AC + dehumidifiers



portable



window and through-the-wall



packaged terminal AC (PTAC)
packaged terminal HP (PTHP)



dehumidifiers

residential + commercial (ducted/ductless)



split and packaged AC/HP
<65,000 BTUH (Residential)



split and packaged AC/HP
≥65,000 BTUH (Commercial)



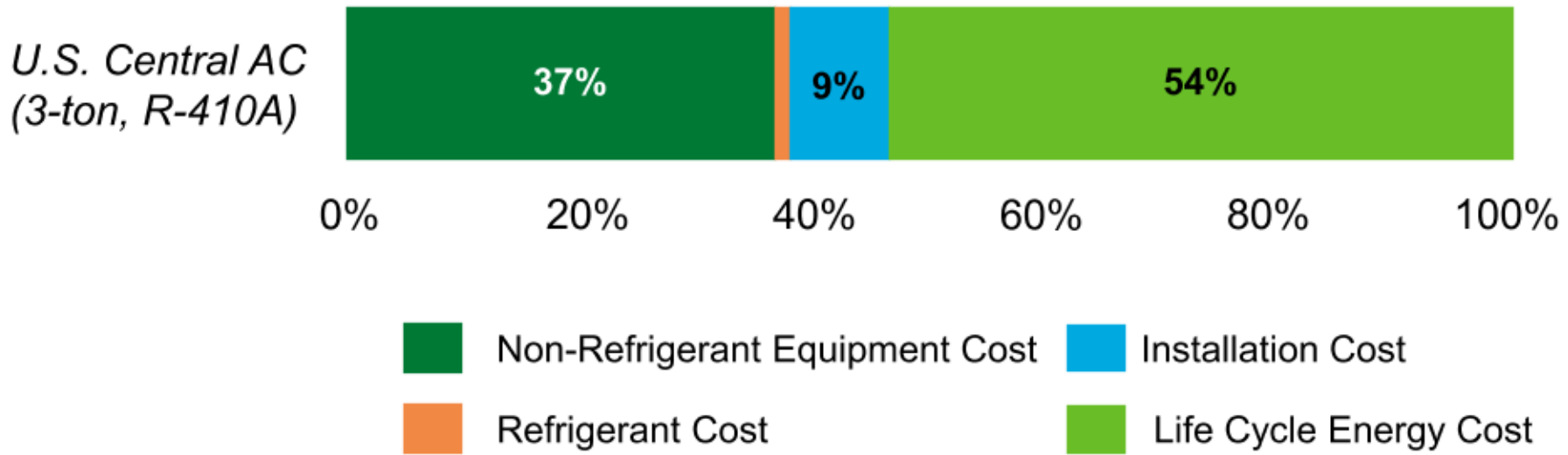
chillers
(Commercial)

- 1. Are we capturing all the equipment types that would be affected by the proposed regulation?
- 2. What is the best way to distinguish residential versus commercial equipment? Capacity?

What added costs are associated with a refrigerant change?

- Factory changes
 - Design changes
 - Performance optimization
 - Certify new products
 - Additional safety features (sensors for A2Ls)
 - Transportation costs
 - Technician training
 - Different tools
- Specific to California market
- AC costs come down over time (learning curve)

Residential Life Cycle AC Cost Breakdown



Room AC + Dehumidifiers

Preliminary Cost Estimates (stakeholder input/reports)



small self-contained AC + dehumidifiers



portable



window and through-the-wall



packaged terminal AC (PTAC)
packaged terminal HP (PTHP)



dehumidifiers

1. How many self-contained AC + dehumidifiers are shipped to California?
2. Some units are sold with R-32 at no added cost. What % of the market is now R-32?
3. What alternatives refrigerants are being considered for PTHP and dehumidifiers?



R32
REFRIGERANT
R32's GWP is 68% lower than R410A's (GWP Global Warming Potential)

R-32 available today (GWP <750)

Residential AC

Preliminary Cost Estimates (stakeholder input/reports)



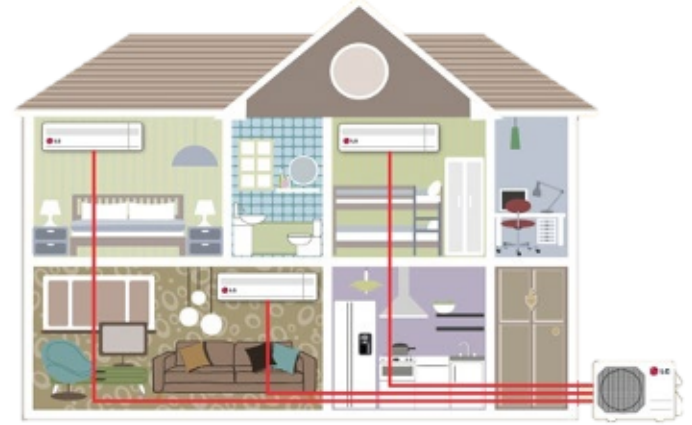
packaged systems



split systems (ducted)



split systems (ductless)



	Baseline (Avg.)	Added Cost
Equipment	\$4,000	5-15%
Installation	\$3,200	0-10%
Maintenance/Repairs	?	0-10%

Commercial AC

Preliminary Cost Estimates (stakeholder input/reports)

Small – Medium (<50 lb.)



65,000 – 185,000 BTUH
(5 to 15 Ton)

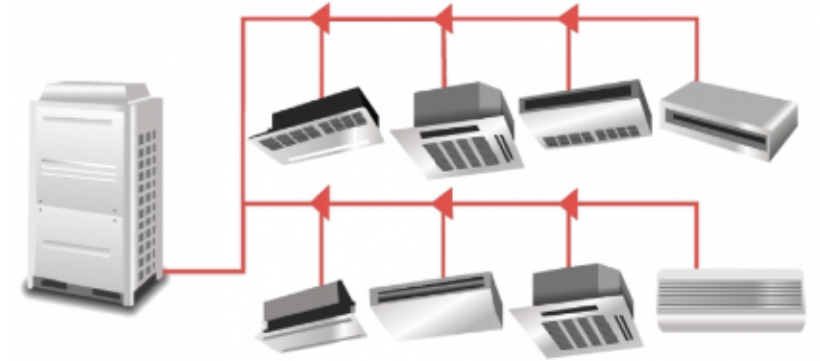
Large (50 lb. +)



185,000 BTUH+
(16 to 60 Ton)

	Baseline (Avg.)	Added Cost	Baseline (Avg.)	Added Cost
Equipment	\$9,000	5-15%	\$25,000	5-15%
Installation	\$7,200	0-10%	\$20,200	0-10%
Maintenance/ Repairs	?	0-10%	?	0-10%

Variable Refrigerant Flow/Volume (VRF/VRV) Preliminary Cost Estimates (stakeholder input/reports)



	R-410A	Added Cost
Equipment	\$30,000	5-15%
Installation	\$24,000	0-10%
Maintenance/Repairs	?	0-10%

- 1. How much more energy efficient are these systems?**
- 2. How much do these systems leak?**

California Market Characterization – How many units?



In 2018...



14 million homes
100,000 new homes



54% existing homes have a central AC
100% new homes install a central AC
system lifetime: 15 years



7.6 million existing systems
504,000 system replacements
100,000 new systems



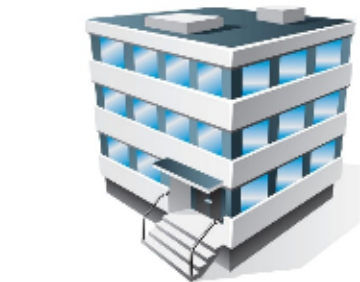
AHRI Shipment Data: 640,000 units (8% of U.S. Sales)
37,000 units (12% of U.S. Sales)



100% of new buildings have an AC
System lifetime 15 years

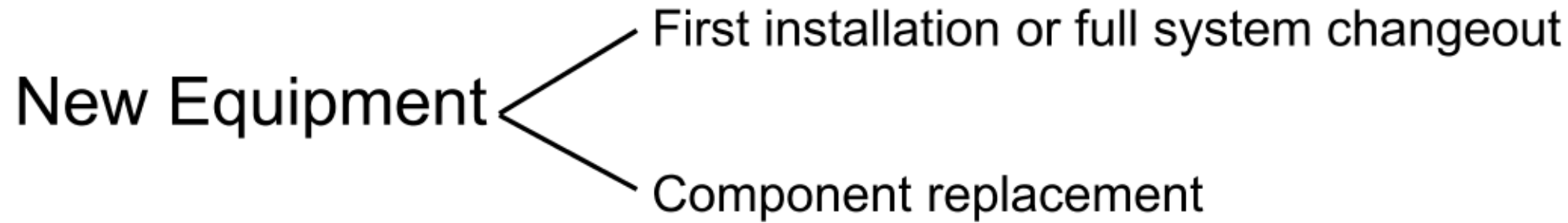


900,000 existing systems
60,000 system replacements
10,000 new systems

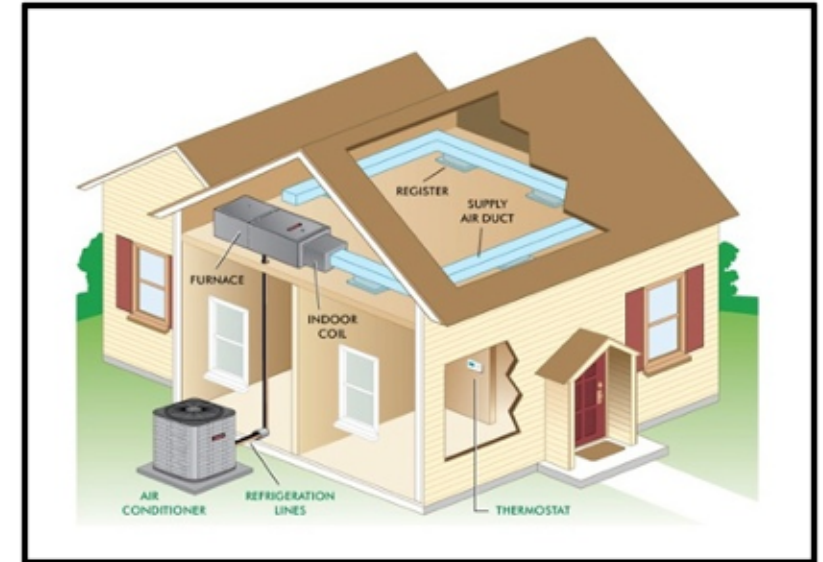


>700,000 commercial and other
nonresidential buildings

...proposed regulation takes effect in 2023



1. What portion of shipments are for full system changeouts versus single component replacements?
2. How can we allow for component replacement?



Enforcement Requirements (Stakeholder Input Requested)

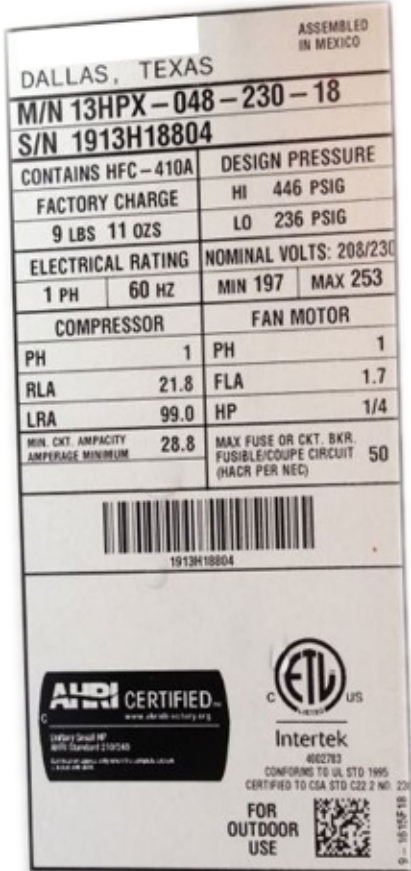
Enforcement Requirements



- Recordkeeping (manufacturers/distributors)
- Date and refrigerant type included on label



Dates can currently be encoded, what would the impact be of a requirement to use a format that clearly indicates the year?



Enforcement Requirements



Residential Central AC

New Construction Market



Typical Distribution Chain

Replacement Market



Typical Distribution Chain



Direct-to-Dealer Distribution Chain

Do other types of equipment also use these distribution pathways?

[Source: U.S. Department of Energy, Technical Support Document, 2016]

Regulatory Alternatives (Stakeholder Input Requested)

Stakeholder Input Requested

Next Steps

Next Steps and Anticipated Timelines

Stationary AC Equipment	
Public workshops and Stakeholder meetings	1 st workshop: October 2018
	Technical Working Group: March 6, 2019
	Technical Working Group: August 6, 2019
	2 nd Workshop: Fall 2019
45-Day Notice	March/April 2020
Board Meeting	May 2020
Regulation Effective Date	January 1, 2023

To consider your input on the cost data in our economic analysis, we need your feedback by **September 1**

Feedback and Questions – Contact Us

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For more information, please visit:
<https://ww2.arb.ca.gov/our-work/programs/stationary-hydrofluorocarbon-reduction-measures>



Discussion