Proposed Prohibitions on High-GWP HFCs in New Refrigeration and Air-conditioning

January 30, 2020
For Remote Attendees:

Please email your questions to:

Auditorium@CalEPA.ca.gov
Why HFC reductions? Part of Comprehensive GHG Emissions Reductions Goals in CA, from All Sources

Total GHG Million Metric Tonnes CO₂-equivalents (MMTCO₂e)

- **Business as usual Emissions**
  - Assembly Bill 32 Requirement
  - Emissions to be reduced by 2020

- **Senate Bill 32 Requirement**
  - Additional reductions by 2030

- **Carbon Neutral by 2045 – Zero Net GHG Emissions**
SB 1383 Requires a 40% reduction in HFCs

HFC Emissions in California 2000-2030 (BAU)

Emissions in MMTCO₂ₑ

SB 1383 Requires a 40% reduction in HFCs

HFC Emissions in California 2000-2030 (BAU)

- SB 1383 HFC Emissions Goal
- 40% below 2013 levels by 2030
SB 1383 Requires a 40% reduction in HFCs

HFC Emissions in California 2000-2030 (BAU)

- Emissions in MMTCO$_2$e
- Reducing goal means that HFC emissions must be cut in half from current levels
- SB 1383 HFC Emissions Goal: 40% below 2013 levels by 2030
Four HFC Reductions Strategies in California: All four are needed to meet SB 1383 reductions goal

BAU in 2030
30 MMTCO$_2$e

Reductions: SB 1013 (California SNAP)

Reductions: CARB Refrigerant Management Program

Reductions: Global HFC Phasedown

Emissions Goal
10 MMTCO$_2$e by 2030

Additional Reductions Needed
Administrative Updates to HFC Regulation

- **Initial HFC Regulation**
  - Adopted March 2018

- **California SNAP**
  - Administrative Update to California SNAP Regulation now includes SB 1013 prohibitions January 2020 (Section 100)

- **SB 1013**
  - Signed September 2018

- **Refrigeration, Foams**

- **Aerosols, Chillers, Cold Storage, Additional Foams, Refrigerator**
Admin Updates to HFC Regulation (cont.)

- March 2018 requirements have not changed.
- SB 1013 requirements have not changed.
- They are now one regulation in one place.
- Proposed regulations (to be discussed today), will be added to the ‘California SNAP’ regulation.
Questions?

Webinar: email questions to:
Auditorium@CalEPA.ca.gov

Draft regulation text:

https://ww2.arb.ca.gov/our-work/programs/hfc-reduction-measures/meetings-workshops
Public Workshop

Proposed GWP Limit for New Stationary Air Conditioning Equipment

January 30, 2020

Greenhouse Gas Reduction Strategy Section
Research Division
California Air Resources Board
kathryn.kynett@arb.ca.gov
Phone: (916) 323-8598
Today’s Presentation

• Background
• Draft Regulatory Text
• Next Steps and Anticipated Timelines
• Discussion
HFC Emissions in California

Year 2018:
- 28% Mobile AC + Refrigeration
- 34% Stationary AC
- 27% Stationary Refrigeration
- 11% Other

Year 2030 (Projected):
- 15% Mobile AC + Refrigeration
- 46% Stationary AC
- 28% Stationary Refrigeration
- 11% Other

[Source: CARB F-Gas Inventory, 2017]
Effective January 1, 2023, new air conditioning systems must use a refrigerant with a global warming potential (GWP) value < 750
Background
How does California fit in with Policies Driving Refrigerant Changes in AC Globally?

- California (Sector Specific HFC Bans + Equip. Limits)
- EU (Phasedown + Equip. Limits)
- China (Subsidies)
- Japan (Equip. Limits)
- India (Leapfrogging to EE + low-GWP)
- Australia (Import Quota)
- Canada (Sector Specific HFC Bans)
- Japan (Equip. Limits)
### Status of <750 GWP Alternatives

<table>
<thead>
<tr>
<th>Category</th>
<th>Global Status</th>
<th>California Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room AC (window/wall + portable)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ductless split systems</td>
<td></td>
<td></td>
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<tr>
<td>Ducted split + package systems</td>
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<td></td>
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<tr>
<td>Small VRV/VRF</td>
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<td></td>
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<tr>
<td>Larger VRV/VRF</td>
<td></td>
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</tr>
</tbody>
</table>

- 🍃 commercially available
- 🍃 Product under development or pending codes/standards updates

[Source: Adapted from “The Future of Air Conditioning for Buildings, 2016]
R-410A Refrigerant Alternatives <750 GWP

100-Yr GWP Value

- R-22: 1,810
- R-410A: 2,088
- A2Ls: ~460 - 700
- R-466A: 733
- R-290: 4

750 Limit

1100-Year GWP Values are from the 4th IPCC Assessment Report (AR4)

- Gray: Being phased out under the Montreal Protocol
- Blue: Refrigerants under 750 GWP
How are refrigerants evaluated?

- Product and Application Safety Standards
- U.S. EPA SNAP
- California Building Code
Regulatory Text
§ 95374. List of Prohibited Substances.
Part of Table 3 in the draft regulatory text

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<tr>
<td>Air-conditioning</td>
<td></td>
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<tr>
<td>Air-conditioning equipment</td>
<td>Air-conditioning equipment (new), residential and non-residential</td>
<td>Refrigerants with a GWP of 750 or greater</td>
<td>Prohibited as of January 1, 2023</td>
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</tbody>
</table>
§95377. Requirements Applicable to Table 3 of Section 95374(c).

(a) Prohibitions. No person shall sell, lease, rent, install, use, or enter into commerce in the State of California, any end-use equipment or product manufactured after the effective date, that does not comply with Table 3 of section 95374(c) of this
AC Equipment Categories

residential + non-residential

Room AC + Dehumidifiers
- portable
- window and through-the-wall
- packaged terminal AC (PTAC)
- packaged terminal HP (PTHP)
- dehumidifiers

Ducted/Ductless
- smaller ductless, ducted split and packaged systems used in residences
- ductless and ducted systems used in commercial/nonresidential applications

GWP <750 beginning 2023
§ 95373. Definitions.

“Air-conditioning Equipment” or “Air-conditioning System” means equipment that cools enclosed spaces in residential or non-residential settings, including room air conditioning such as window units, packaged terminal air conditioners (PTAC), packaged terminal heat pumps (PTHP), and portable air conditioners; central air conditioners (i.e., ducted); non-ducted systems (both mini and multi splits); packaged rooftop units; water-source and ground-source heat pumps; and other products. Air-conditioning also includes computer room and data center cooling. Chillers are defined separately from “air-conditioning equipment.”
§ 95373. Definitions.

“New Air-conditioning Equipment” means any air-conditioning equipment that is first installed using new or used components, or a new condensing unit in an existing system, or a new evaporator unit in an existing system.
Requirements that Support Enforcement

- Recordkeeping (manufacturers)
- Labeling: date, refrigerant type + amount
Recordkeeping Requirements

§95377. Requirements Applicable to Table 3

Recordkeeping: Any person who manufactures new AC equipment shall maintain for five years and make available, upon request:

- Contact details of purchaser (name, address, telephone, email).
- Model and serial number of the equipment and / or components where applicable.
- Date of manufacture of the equipment.
- Date of sale of the equipment.
- The refrigerant type(s) the equipment is designed to use.
- The refrigerant and full charge capacity of the equipment, where available.
Labeling Requirements

§95377. Requirements Applicable to Table 3

Labeling: Display a label on the equipment that clearly and visibly indicates:

- The type of refrigerant.
- The refrigerant charge size in ounces, pounds, or kilograms; and
- The date of manufacture, indicating at a minimum, the four digit year of manufacture in standard format.
- Existing labels meeting these requirements may be used.
Next Steps
Next Steps and Anticipated Timelines

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Rulemaking Overview

Stakeholder Meetings and Public Workshops
2017 – 2020

Staff present regulatory concepts
Solicit stakeholder input

45-day Comment Period
June 2020

Staff publishes proposal, costs and impacts in the “Initial Statement of Reasons” (ISOR or staff report)

Public may submit written or verbal comments on staff proposal to Board

Board Hearing
July 2020

Staff present proposal to Board
Board may accept proposal or direct staff to make changes
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
Proposed Regulatory Language for Refrigeration Equipment

January 30, 2020
Today’s Presentation

• Background on Rulemaking Development
• Updated Proposed Rules for Refrigeration Equipment
• Draft Regulatory Text
• Next Steps and Anticipated Timelines
Background on Rulemaking Development
Original Proposal

Stationary Refrigeration: New equipment containing more than 50 lbs. of refrigerant, GWP < 150, starting January 1, 2022

All new equipment would be subject to this, irrespective of whether installed in new facilities / remodels / existing facilities
Affected Sectors for Stationary Refrigeration

- Commercial Refrigeration
- Industrial Process Refrigeration
- Cold Storage

Currently subject to RMP
## Refrigeration Technologies GWP < 150

<table>
<thead>
<tr>
<th>End-Use Sector</th>
<th>Low-GWP Options Currently Available</th>
</tr>
</thead>
</table>
| **Retail Food Refrigeration (e.g., Supermarkets and grocery stores)** | • Transcritical CO₂  
• Ammonia/CO₂ cascade  
• Propane/CO₂ cascade  
• Micro-distributed Propane systems  
• HFO/CO₂ or HFOs-based systems |
| **Industrial Process Refrigeration and Cold Storage** | *Majority already use ammonia others: Transcritical CO₂, NH₃/CO₂, Low-charge ammonia, HFO-based systems* |

80+ supermarkets in California using low-GWP refrigerants in 2019
Stakeholder Input to CARB about GWP < 150

- GWP < 150 feasible in new construction and remodels
- Currently, in existing facilities:
  - GWP < 150 is expensive and logistically challenging

Original Image Source: Kysor Warren
Challenge: Feasibility of GWP < 150 in Existing Facilities

• Only 1 – 2% new facilities + remodels annually

• Most of the new systems will go into existing facilities

• Existing facilities / stores have the highest potential for emissions and reductions

Source: CARB Refrigerant Management Program, 2018
How can Existing Facilities Reduce their Emissions?

HFC emissions (in CO$_2$ equivalents) =

System charge $\times$ Refrigerant GWP $\times$ Leak Rate

Ways to guarantee emissions reductions:

- GWP reduction
- Charge reduction (verification can be complicated)

(Leak rates factored under RMP)
End-User Input to CARB

CARB Proposed HFC Reduction Measure

New Systems <150 GWP (in new construction / remodels / existing facilities)

Hurdles

In Existing Stores <150 GWP
Cost, Logistics, Capital cost threshold

End-User Alternative Proposals

- New Systems <150 GWP in New Construction / Remodels
- Existing Stores Option 1: Prescribed Retrofits
- Existing Stores Option 2: GHGp Reduction
- CARB “Hybrid” Option
- Existing Stores Option 3: Weighted GWP Reduction
Option 1 for Existing Facilities

Prescribed Retrofits to GWP < 1,400

• Existing systems retrofit to GWP < 1,400 by 2030
• Certainty of emissions reductions, straightforward implementation
• Lacks flexibility – potentially every system (above 50 pounds) using high-GWP refrigerants would be affected
Option 2 for Existing Facilities

Greenhouse Gas Emission Potential (GHGp) Reduction

• GHGp = \( \Sigma (\text{Charge} \times \text{GWP}) \)

• Reduce GHGp by 55% below 2018 baseline by 2030
• A per-company target, not per-system or per-store
• Flexible – don’t have to convert / retrofit every single store or system
• Credit for charge and GWP reduction

Potential Challenges

• Tracking and reporting each company’s baseline (sales, transfers etc.)
• Charge reduction – verification is difficult, needs additional recordkeeping / reporting
• No credit for “nominal” charge reduction; must accompany significant changes
Option 3 for Existing Facilities

Weighted-Average GWP Reduction

- **Weighted-Average GWP** = \( \frac{\Sigma (\text{charge} \times \text{GWP})}{\Sigma \text{charge}} \)

- Target: Weighted GWP of each company < 1,400 by 2030
- Fixed target, no need for tracking company baselines
- Fixed target but still per-company, not per system
- Flexible – don’t have to convert / retrofit every store or system
- Rewards conversion to lower and low-GWP refrigerants in existing stores
Updated Proposed Rules for Stationary Refrigeration
I. New equipment in newly constructed facilities / major remodels, GWP < 150

II. For existing retail food facilities – Two compliance pathways:
   (1) weighted-average GWP reduction, (2) GHGp reduction

   • Flexibility to plan over 8 – 10 years
   • Prepares sector for future HFC phase-down / sales ban
Draft Regulatory Text

In the draft regulatory text -

• Existing CA SNAP / SB 1013 prohibitions are listed in Tables 1 and 2.
• New requirements are listed in Tables 3 and 4.
I. New Refrigeration Equipment
§ 95374. List of Prohibited Substances.

Part of Table 3 in the draft regulatory text

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<tr>
<td>Refrigeration Equipment</td>
<td>Refrigeration equipment (new), non-residential, containing more than 50 pounds refrigerant</td>
<td>Refrigerants with a GWP of 150 or greater</td>
<td>Prohibited as of January 1, 2022</td>
</tr>
</tbody>
</table>

- Chillers and Ice Rinks have separate GWP limits (covered later)
§ 95373. Definitions (This definition applies to Table 3 only)

“New Refrigeration Equipment”: Any refrigeration equipment that is first installed using new or used components or a combination of new and used components in the following:

(A) New construction; or

(B) In an existing facility not previously used for retail food, commercial, cold storage, or industrial refrigeration; or

(C) In an existing facility, replacement of 75 percent or more of: compressors, condensers, and connected evaporator loads.

**Question: Does (C) adequately cover “major remodels”?**
Labeling: Display a label on the equipment that clearly and visibly indicates:

- The type of refrigerant.
- The refrigerant charge size in ounces, pounds, or kilograms; and
- The date of manufacture, indicating at a minimum, the four digit year of manufacture in standard format.
- Existing labels meeting these requirements may be used.

**Question:** Do existing labels meet the above requirements?
Recordkeeping: Any person who manufactures new motor-bearing refrigeration equipment shall maintain for five years and make available, upon request:

- Contact details of purchaser (name, address, telephone, email).
- Model and serial number of the equipment and/or components where applicable.
- Date of manufacture of the equipment.
- Date of sale of the equipment.
- The refrigerant type(s) the equipment is designed to use.
- The refrigerant and full charge capacity of the equipment, where available.

Similar requirements as under the original 2018 “CA SNAP” regulation (Section § 95375)
II. Existing Retail Food Facilities
Requirements for Existing Retail Food Facilities

§ 95374. Table 4: Compliance Requirements for Companies with Retail Food Facilities.

<table>
<thead>
<tr>
<th>Retail Food Facilities</th>
<th>Requirement</th>
<th>Effective Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Companies owning or operating 20 or more retail food facilities</td>
<td>Attain a company-wide weighted-average GWP of 2,500 or a 25% reduction in GHGp below 2018 levels</td>
<td>January 1, 2026</td>
</tr>
<tr>
<td></td>
<td>Attain a company-wide weighted-average GWP of 1,400 or a 55% reduction in GHGp below 2018 levels</td>
<td>January 1, 2030</td>
</tr>
<tr>
<td>Companies owning or operating fewer than 20 retail food facilities</td>
<td>Attain a company-wide weighted-average GWP of 1,400 or a 55% reduction in GHGp below 2018 levels</td>
<td>January 1, 2030</td>
</tr>
</tbody>
</table>

Weighted-average GWP and GHGp calculated based on refrigeration systems > 50 pounds of refrigerant only
§ 95373. Definitions.

“Company” means all businesses, affiliates, brands, subsidiaries, or franchises, owned under the same parent company.

“Retail Food Facility” means a facility that sells food and uses at least one retail food refrigeration equipment or refrigeration system with more than 50 pounds of a refrigerant with a GWP of 150 or greater. Retail food facility includes supermarkets, grocery stores, convenience stores, restaurants and other food service establishments.

Retail food facilities subject to CARB’s RMP will be subject to these requirements.
Weighted-Average GWP and GHGp - Definitions

§ 95373. Definitions.

- **Weighted-Average GWP**
  \[
  \text{Weighted-Average GWP} = \frac{\sum (\text{charge} \times \text{GWP})}{\sum \text{charge}}
  \]

- **GHGp**
  \[
  \text{GHGp} = \sum (\text{Charge} \times \text{GWP})
  \]

- **Baseline Greenhouse Gas Potential** or **Baseline GHGp** means the greenhouse gas potential (GHGp) of a company’s retail food facilities in calendar year 2018.

The ‘Baseline GHGp’ will be revised when any of the following occur:

(A) Retail food facilities that are sold, transferred, or closed will be removed from the baseline GHGp.

(B) Acquired retail food facilities will be added to the baseline GHGp using their 2018 GHGp levels, and the current GHGp of acquired stores will be used to calculate the current GHGp.
§95378. Requirements Applicable to Table 4

- **Choosing a Compliance Requirement for Retail Food Facilities.**
  - Weighted-average GWP Reduction by default.
  - Opt-in for GHGp Reduction by March 1, 2022, via R3

- One-time registration for GWP < 150 facilities (systems > 50 pounds)
  - No implementation fee
  - Same system details as given currently under CARB’s RMP

(RMP: Refrigerant Management Program)
Starting 2022, annually report company’s weighted-average GWP or GHGp if opted-in, along with RMP annual reports
- Via R3, by March 1 of the following calendar year

NOTE: Additional reporting requirements for verification of charge reduction are being considered.
Recordkeeping Requirements for Retail Food Facilities

§95378. Requirements Applicable to Table 4

- Records showing your GHGp / weighted-average GWP calculations for each year (spreadsheets etc.)

- When any changes are made to GWP of the refrigerant and / or charge of a system, keep records:
  - Full charge, before and after
  - Means by which full charge was determined, before and after
  - Type of refrigerant, before and after
  - Amount of refrigerant removed, amount stored / sent, where it was sent
  - Date of system retirement / removal
  - For retired systems - amount of refrigerant removed, where it was sent afterwards
  - The records must include documentation such as, invoices, receipts, records of shipments, plans, or work details, that are generated from a third party, such as a service technician or refrigerant reclamer.
III. Chillers
"Chiller" means a water or heat transfer fluid chilling equipment package custom built in place, or a factory-made and prefabricated assembly of one (1) or more compressors, condensers and evaporators, with interconnections and accessories including controls, designed for the purpose of cooling or heating water or a heat transfer fluid. A chiller is a machine specifically designed to make use of a vapor compression refrigeration cycle or absorption refrigeration cycle to transfer heat from a cold water or heat transfer fluid circulating system to the air, a heat transfer fluid, or other heat exchange media. Chillers can be water-cooled, air-cooled, or evaporatively cooled. Chillers include rotary chillers, centrifugal chillers, and positive displacement chillers, including reciprocating, scroll, and screw chillers. For the purpose of this regulation, “chiller” includes those used for comfort cooling, or space and area cooling, or industrial process cooling.
§ 95374. List of Prohibited Substances.
Part of Table 3 in the draft regulatory text

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<tbody>
<tr>
<td>Chillers – Air conditioning, Industrial Process Cooling</td>
<td>Chillers (new) designed for minimum evaporator temperature &gt; -15 °F (-26 °C)</td>
<td>Refrigerants with a GWP of 750 or greater</td>
<td>Prohibited as of January 1, 2024</td>
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<tr>
<td>Chillers</td>
<td>Chillers (new) designed for minimum evaporator temperature -15 °F (-26 °C) through -58 °F (-50 °C)</td>
<td>Refrigerants with a GWP of 2200 or greater</td>
<td>Prohibited as of January 1, 2024</td>
</tr>
</tbody>
</table>
§ 95373. Definitions.

“New Chiller” or “New Chiller Equipment” means any of the following:

(A) First installed using new or used components, or a combination of new or used components; or

(B) Modified such that:
   (i) The capacity is increased through the addition of motor-bearing components, including evaporators, compressors, or condensers, or
   (ii) The system has experienced replacements of motor-bearing components in full or exceeding 50 percent of the capital cost of replacing all the motor-bearing components in the entire chiller system.
## § 95374. List of Prohibited Substances.

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<td>Ice Rinks</td>
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<td>Ice Rinks</td>
<td>Refrigeration Equipment (new) and Chillers (new) used in Ice Rinks</td>
<td>Refrigerants with a GWP of 750 or greater</td>
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Next Steps and Anticipated Timelines
## Next Steps and Anticipated Timelines

### Stationary Refrigeration Equipment

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Please provide feedback on the draft regulatory text by Friday, February 21st by emailing us at HFCReduction@arb.ca.gov
New Refrigeration Equipment
• Definition of “New Refrigeration Equipment” part (C) adequately cover “major remodels”?
• Do existing labels meet the labeling requirements?

Existing Retail Food Facilities
• Reporting requirements to verify charge reductions

Any other topics?
Thank you for listening!

CARB welcomes your feedback.
Feedback and Questions – Contact Us

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