Senate Bill 1206 Assessment Report: Request for Information

Issue Date:	August 30, 2023
Response Due:	October 30, 2023
To:	All Interested Parties
From:	California Air Resources Board (CARB)
Subject:	Senate Bill 1206 Assessment Report for Transitioning Hydrofluorocarbons (HFCs) to Ultra-Low Global Warming Potential (GWP) and/or No-GWP Alternatives

Introduction and Overview

Through this Request for Information (RFI), the California Air Resources Board (CARB) is requesting input from all interested parties for an assessment report that will specify how to transition California's economy, by sector, away from hydrofluorocarbons (HFCs) and to ultra-low global warming potential (GWP) and/or no-GWP alternatives no later than 2035 through maximizing recovery and reclamation of high-GWP HFCs and the adoption of ultra-low-GWP and/or no-GWP alternatives, as directed by California Senate Bill (SB) 1206.[1] Per SB 1206, "ultra-low GWP" is defined as having a GWP value less than ten.

Background

Climate change is one of the most serious environmental threats facing the world today, and California is already experiencing dire impacts. Communities across California are impacted by climate change, air pollution, and an increased frequency and severity of extreme weather events such as heat, drought, and wildfires that are associated with a changing climate.[2] California first committed to act on climate change 17 years ago with the passage of Assembly Bill (AB) 32,[3] the California Global Warming Solutions Act of 2006, a watershed moment in California's history. By requiring sharp reductions of greenhouse gas (GHG) emissions, California set the stage for its transition to a sustainable, low-carbon future. To further the goals of AB 32, the Legislature enacted SB 32[4] in 2016, which requires that California GHG

[1] SB 1206 (Skinner, Stats. 2022, Ch. 884); Health & Saf. Code § 39735, 39736.
[2] 2022 Scoping Plan for Achieving Carbon Neutrality. CARB. (December 2022).
[3] AB 32 (Núñez, Stats. 2006, Ch. 488); Health & Saf. Code § 38500 et seq.
[4] SB 32 (Pavley, Stats. 2016, Ch. 249); Health & Saf. Code § 38566.

emissions are reduced to 40 percent below 1990 levels by 2030. More recently, AB 1279[5] requires California to achieve carbon neutrality no later than 2045.

HFCs are one group of GHGs addressed in AB 32 and SB 32 and will play an important role in achieving carbon neutrality. HFCs are synthetic gases used primarily as refrigerants in refrigeration and air conditioning (AC) equipment and are also used in various other non-refrigerant applications such as aerosol propellants, foam blowing agents, solvents, and fire suppressants. HFCs are the fastest growing GHGs in California[6] besides being among the most potent GHGs emitted today. HFC use is rapidly increasing as they replace their ozone depleting predecessors, which are being phased out globally per the Montreal Protocol.[7] HFCs are not harmful to the ozone layer, however they are short-lived climate pollutants (SLCPs). Even though they remain in the atmosphere for a much shorter time than carbon dioxide (CO_2), their relative climate forcing (how effectively they heat the atmosphere and quantified with a GWP value) can be hundreds to thousands of times greater than CO_2, which has a GWP of one. Thus, acting now to reduce SLCP emissions can have an almost immediate beneficial impact on climate change and public health.

California has been a leader in addressing HFC emissions. Following the passage of AB 32, CARB adopted a regulation in 2009 creating the Refrigeration Management Program.[8] Recognizing the importance of reducing HFC emissions, in 2016, the Legislature enacted SB 1383[9] to specifically mandate a 40 percent reduction in HFC emissions below 2013 levels by 2030, and mandated reductions of other SLCPs. In addition, after the Significant New Alternative Policy (SNAP)[10] Rules 20[11] and 21[12] were partially vacated by the D.C. Circuit Court of Appeals,[13] California adopted them in 2018 through SB 1013.[14] Then in 2020, CARB set GWP limits for new refrigeration systems and AC equipment, and adopted requirements for existing refrigeration

[5] AB 1279 (Muratsuchi, Stats. 2022, Ch. 337); Health & Saf. Code § 38562.2.
[6] Short-Lived Climate Pollutant Reduction Strategy. California Air Resources Board. (March 2017).
[7] United Nations Environment Programme (UNEP, 1987). Montreal Protocol on Substances that Deplete the Ozone Layer.
[8] Management of High Global Warming Potential Refrigerants for Stationary Sources, Cal. Code Regs., tit. 17, § 95380 et seq.
[9] SB 1383 (Lara, Stats. 2016, Ch. 395); Health & Saf. Code § 39730.5.
[10] 42 U.S.C. § 7671k; 40 C.F.R. Pt. 82, Subpt. G.
[11] 40 C.F.R. Pt. 82, Subpt. G, App. U; 80 Fed. Reg. 42870-01 (July 20, 2015); 81 Fed. Reg. 86778-01 (Dec. 1, 2016).
[12] 40 C.F.R. Pt. 82, Subpt. G, App. V; 81 Fed. Reg. 86778-01 (Dec. 1, 2016).
[13] *Mexichem Fluor, Inc. v. Environmental Protection Agency* (D.C. Cir. 2017) 866 F. 3d 451 (Mexichem I) and *Mexichem Fluor, Inc. v. Environmental Protection Agency* (D.C. Cir. 2019) Case No. 17-1024 (Mexichem II) (collectively the *"Mexichem decisions"*).
[14] SB 1013 (Lara, Stats. 2018, Ch. 375); Health & Saf. Code § 39734.

systems in the food retail sector.[15] SB 1206, adopted in 2022, prohibits the sale of newly produced high-GWP HFCs beginning January 1, 2025 on a phased-in timeline. Starting 2025, 2030 and 2033, newly produced HFCs with a GWP greater than 2200, 1500 and 750 respectively are prohibited. SB 1206 also requires the use of reclaimed HFCs to promote the recovery of HFCs, thereby preventing the release or leakage of high-GWP HFCs and complementing the federal HFC phasedown implemented through the American Innovation and Manufacturing (AIM) Act.[16]

Despite current rules, California's long-term climate mandates will require CARB to take further actions to reduce HFC emissions to meet long-term climate mandates. This RFI will help inform CARB staff in their completion of an assessment report specifying how to transition California's economy, by sector, away from HFCs and to ultra-low- and/or no-GWP alternatives no later than 2035 as directed by SB 1206.

Request for Comment

Through this RFI, CARB invites all interested parties to comment on the development of an assessment report specifying how to transition California's economy, by sector, away from HFCs and to ultra-low-GWP and/or no-GWP alternatives no later than 2035, as directed by California SB 1206.

Responders do not need to address every question. Please identify the question(s) you are responding to by **question number** when submitting your comments.

CARB requests responses by **October 30, 2023**. Please submit responses and comments via CARB's public docket located here.

RFI Disclaimer

CARB will not be responding to submitted comments. Respondents are advised not to include any confidential or proprietary information in responses to this RFI as they may be disclosed or be subject to the California Public Records Act.

[15] Prohibitions on Use of Certain Hydrofluorocarbons in Stationary Refrigeration, Stationary Air-Conditioning, and Other End-Uses, Cal. Code Regs., tit. 17, §§ 95371, et seq.
[16] American Innovation and Manufacturing Act. 42 U.S.C. § 7675

The RFI questions are divided into 10 sections, split by primary HFC sectors, and cover the requirements of the SB 1206 Assessment Report:

Section 1: Commercial and Industrial Stationary Refrigeration (Retail Food, Cold Storage, Industrial Process Refrigeration, and Ice Rinks)

CARB's regulations, and the United States Environmental Protection Agency's (US EPA) proposed regulations,[17] will facilitate a transition to refrigerants with a GWP less than 150, or 300, in new equipment depending on system size, particularly in new facilities. Some technological solutions that comply with these regulations are ultra-low-GWP and are readily available for new facilities, although market adoption is slow. However, installing them in existing facilities will require market transformation.[18]

Below are questions regarding transitioning small- and large-sized refrigeration systems to ultra-low GWP or no-GWP refrigerant technologies:

1. What potential technological solutions are available for existing facilities and how can their adoption be accelerated?
2. What incentives are needed to transition existing refrigeration facilities and what GWP limit should be set for technologies supported through incentives?
3. What safety testing and safety standard updates, if any, are needed for the transition to ultra-low GWP or no-GWP alternatives in this sector?
4. What barriers exist in bringing technologies such as ejectors, CO_2 condensing units and others, to the California market, particularly for smaller refrigeration systems such as those found in convenience stores?

Section 2: Stationary Air Conditioning & Space Conditioning Heat Pumps

As temperatures rise due to climate change and building electrification advances, the demand for refrigerant-containing heat pumps for space conditioning and associated refrigerant use will increase over the next decades. Existing State and proposed federal regulations will limit refrigerant GWPs below 750 and 700 respectively for space conditioning applications in the short-term, but this is not likely to be enough for a net-zero future. Currently, there are very limited commercially available technologies using ultra-low-GWP and/or no-GWP alternatives in this sector particularly in the US market (despite their availability elsewhere globally) and additional innovation is needed to bring about this transition.

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[17] US EPA, Office of Air and Radiation (Dec 2022). Technology Transitions Restrictions on the Use of Certain Hydrofluorocarbons under Subsection (i) of the AIM Act. Proposed Rule.
[18] CARB Staff Report: Initial Statement of Reasons for Proposed Amendments to the Prohibitions on use of Certain Hydrofluorocarbons in Stationary Refrigeration, Chillers, Aerosol-Propellants, and Foam End-Uses Regulation (Oct. 20, 2020).

5. There are limited ultra-low-GWP and/or no-GWP technologies for this sector. How can technological innovation be encouraged?
6. What types of ultra-low GWP technologies for this sector are available in other markets globally, but not in the US? What do you see as the primary market barriers to the adoption of these technologies in the US?
7. How can centralized ducted AC systems be transitioned to ultra-low GWP or no-GWP technologies?
8. Many other countries don't use centralized air conditioning systems. Do you have recommendations for creating a market for small self-contained modular heat pump technology (vs. central systems) in California?
9. Do you have recommendations for creating a market for secondary loop/indirect cooling systems in California, particularly for residential and light commercial applications?
10. What are the benefits of and potential for expanding the use of integrated heat pump technology (units that prove space conditioning and water heating and/or other uses) in California?
11. What mechanisms, policies, and or incentives can be used to increase recovery and reuse of high-GWP HFCs from existing AC or HP systems, particularly in the residential sector?
12. What type of safety testing and safety standard updates are needed for the transition to ultra-low GWP (such as hydrocarbons) and/or no-GWP alternatives?

Section 3: Non-Space Conditioning Heat Pumps (Water Heaters, Clothes Dryers, Pool and Spa Heaters)

California's building decarbonization efforts and carbon neutrality goals will lead to an increased use of refrigerant-containing heat pump technologies as the State transitions away from fossil fuels. Ultra-low-GWP and/or no-GWP refrigerants in heat pumps need to be adopted as quickly as possible to preserve the emission benefits of building electrification.

Below are questions related to non-space conditioning heat pumps used in residential, commercial, and industrial applications:

13. There are limited ultra-low-GWP and/or no-GWP technologies for these equipment types. What can be done to spur technological innovation?
14. What technological, financial, or building code barriers exist in adopting non-space conditioning heat pumps?

Section 4: Motor Vehicle Air Conditioning (MVAC)

This section pertains to MVAC, also referred to as mobile air conditioning, which provides passenger comfort cooling/heating for light-duty, medium-duty, and heavy-

duty vehicles like passenger cars, trucks, and buses, as well as off-road vehicles, trains, and airplanes.

The US EPA's proposed Technology Transition rule under the AIM Act set a GWP limit for most MVAC sectors.[17] New light-duty vehicles are already transitioning to ultra-low GWP alternatives; the most common refrigerant in new light-duty vehicle MVAC systems is HFO-1234yf.[19] CARB is seeking to understand how soon other MVAC market segments can fully undergo similar transitions. Ultra-low-GWP and/or no-GWP alternative refrigerant technologies are being researched and developed, and are not yet commercially available in the U.S. market.

15. What emerging ultra-low-GWP and no-GWP technologies show promise in integrating passenger comfort cooling and heating systems as well as thermal management for batteries and other vehicle systems and components for electric vehicles, and what barriers exist for their commercialization?
16. What barriers exist for the transition of medium-duty, heavy-duty, and off-road vehicles to ultra-low-GWP and/or no-GWP alternatives?
17. What are the opportunities and barriers for transitioning MVAC systems in existing light-duty, medium-duty, heavy-duty, and off-road vehicles to ultra-low-GWP and/or no-GWP alternatives?
18. What are the opportunities and barriers for transitioning the MVAC systems in new light-duty, medium-duty, heavy-duty, and off-road vehicles to ultra-low-GWP and no-GWP alternatives?
19. What type of safety testing and safety standard updates are needed to transition to ultra-low GWP and/or no-GWP alternatives?

Section 5: Transport Refrigeration

This section pertains to transport refrigeration systems including those found in refrigerated trucks and trailers, domestic shipping containers, intermodal refrigerated shipping containers and refrigeration units on board shipping vessels.

High-GWP refrigerants are commonly used in this sector. CARB amended the Airborne Toxic Control Measure regulation for transport refrigeration units (TRUs) in 2022, such that newly manufactured truck TRUs, trailer TRUs, and domestic shipping container TRUs must use refrigerants with a GWP less than 2200 or no refrigerant at all effective December 31, 2022.[20] In addition, the US EPA's Technology Transition rule is proposing a GWP limit of 700 for intermodal container transport refrigeration.[17]

[19] United States Environmental Protection Agency, (December 2022, EPA-420-R-22-029). The 2022 EPA Automotive Trends Report.
[20] Airborne Toxic Control Measure for In-Use Diesel-Fueled Transport Refrigeration Units (TRU) and TRU Generator Sets, and Facilities Where TRUs Operate, Cal. Code Regs., tit. 13, § 2477.

20. What are the opportunities and barriers for transitioning existing TRUs to ultra-low-GWP and/or no-GWP alternatives?
21. What are the opportunities and barriers for transitioning new TRUs to ultra-low-GWP and/or no-GWP alternatives?
22. How can end-of-life refrigerant recovery from existing systems be increased?
23. How can high-GWP refrigerant leakage be decreased in existing systems?

Section 6: Recovery and Reclamation

SB 1206 prohibits the sale of bulk, newly produced, i.e., non-reclaimed, high-GWP HFCs through a phase-out schedule, complementing the US EPA's phasedown on the production of HFCs through the AIM Act. Recovery and reclamation of existing HFCs will be an important step as industries transition to ultra-low and/or no-GWP alternatives.

24. Despite venting prohibitions, refrigerant recovery rates are low, especially in the residential sector. What practices and processes can be put in place to ensure proper recovery?
25. What incentives can be provided to technicians for investing their time and effort to properly recover HFCs from equipment, especially from the residential sector?
26. What are some of the barriers that technicians face in transporting recovered HFCs to reclamation facilities and how can those barriers be addressed?
27. Are there emerging reclamation technologies that show promise in addressing potential barriers, such as reclaiming contaminated or blended HFCs, or cost-effective reclamation on a small scale?
28. When is it appropriate to destroy HFCs?
29. How can the State enable financial and/or regulatory mechanisms, like extended producer responsibility schemes or other fees, to improve the recovery and reclamation of HFC refrigerants? Are there successful examples from international markets that can be applied in California?

Section 7: Workforce Training

Additional training for AC and refrigeration technicians is needed to better handle existing systems that use fluorinated refrigerants and to adapt to new technologies that utilize ultra-low and/or no-GWP alternative refrigerants.

30. How can workforce training for technicians, particularly AC technicians, be improved to reduce leakage and increase HFC recovery?
31. How can technicians be held accountable for better refrigerant management?
32. What workforce training will be required for technicians to transition to ultra-low GWP and/or no-GWP alternatives?

33. How can the necessary training become more available and accessible for technicians?
34. What is the role of the State, equipment manufacturers, and/or other industry stakeholders in providing and standardizing training and best practices, and how could this be enhanced?

Section 8: Other Non-Refrigerant HFC Sources (Fire Protection, Aerosol Propellants, Foams, Solvents, MDI)

This section pertains to non-refrigerant HFC end-uses, such as fire protection, aerosol propellants, foams, solvents, and metered dose inhalers (MDI).

The proposed US EPA rule[17] would place a GWP limit of 150 on some aerosol products and foam blowing end-uses, and a GWP limit of zero on other foam blowing end-uses. These proposed restrictions would not apply to products that have received an application specific HFC allowance under subsection (e)(4)(B) of the AIM Act.[16]

35. Are there emerging technologies for non-refrigerant HFC end-uses (including products with application-specific allowances) that show promise in addressing the transition to ultra-low GWP or no-GWP alternatives?

Section 9: Not-In-Kind and Passive Cooling Technologies

In the future, there is a potential role for not-in-kind cooling and heating technologies that do not rely on vapor compression or traditional refrigerants. Not-in-kind technologies are market disruptive/alternative technologies that are different from the commercially dominant technology. Some emerging not-in-kind technologies for heating/cooling sector include thermoacoustic, thermoelectric, thermotunneling, magnetic, Stirling cycle, pulse tube, Malone cycle, absorption, and adsorption refrigeration, as well as compressor driven metal hydride heat pumps.[21] Passive cooling technologies have been around for millennia and are making a resurgence; they rely on architectural, natural, non-mechanical, and other techniques to provide thermal comfort through little to no energy consumption and do not use refrigerants.

36. Which not-in-kind technologies are nearest to commercialization? What barriers exist for commercializing them and how can those barriers be addressed?

[21] Pradeep Bansal, Edward Vineyard, Omar Abdelaziz, (2012). 'Status of not-in-kind refrigeration technologies for household space conditioning, water heating and food refrigeration', International Journal of Sustainable Built Environment.

37. How can incentives or other mechanisms drive the commercialization of not-in-kind technologies and the broader adoption of passive cooling technologies?

Section 10: Overarching Questions

38. What factors around PFAS (per- and polyfluoroalkyl substances) should be considered as California transitions to ultra-low- and/or no-GWP alternatives?
39. What types of ultra-low GWP and/or no-GWP pilot or demonstration projects from other regions or countries could be implemented in California? Please be specific as to types of equipment/applications.
40. Are there additional control measures for refrigerant management, such as requirements for maintenance, servicing, and leak detection/repair, that could support California's climate goals?
41. Do you have any suggestions for legislative, or regulatory changes that are needed to transition away from HFCs and to ultra-low GWP and/or no-GWP alternatives?
42. Do you have any other comments that would support the SB 1206 assessment report?

Thank you for your time and consideration of this RFI. Your expertise and input is valued. If you have questions about this RFI or how to submit your comments, please email the HFC team at HFCReduction@arb.ca.gov.