

North American Sustainable Refrigeration Council (NASRC)

NASRC is the action-oriented environmental nonprofit contributing to the most impactful solution to climate change. We're a powerful network of supermarket industry stakeholders working together to remove the barriers preventing the adoption of climate-friendly natural refrigerants. Together, we're driving the solutions supermarkets need to feasibly adopt natural refrigerants.

The Problem

Hydrofluorocarbon (HFC) Refrigerants Are Super-Polluting Greenhouse Gases

- Hydrofluorocarbon refrigerants (HFCs) are commonly used in refrigeration and are considered super greenhouse gases.
- The potency of a greenhouse gas is evaluated using a measure called [Global Warming Potential \(GWP\)](#), which compares the amount of heat a greenhouse gas traps in the atmosphere to that trapped by an equivalent amount of carbon dioxide (CO₂). While CO₂ has a GWP of 1, many HFC refrigerants have GWPs [in the thousands](#).
- In 2017 refrigerant management was named the [#1 global climate solution](#) by *Project Drawdown*, which assessed 100 data-driven solutions to reverse global warming.
- HFCs have been identified as the [fastest growing](#) source of greenhouse gas emissions globally, and scientists have estimated that HFC emissions could contribute to a rise in global temperatures [up to 0.5°C](#) by 2100.
- Short-lived climate pollutants - including HFC refrigerants, Black Carbon, Methane, and Tropospheric Ozone - are responsible for [up to 45% of current warming](#) globally and are exponentially more impactful in the near-term than other greenhouse gases.
- It is not possible to achieve the [2050 carbon neutrality goals](#) outlined by the Paris Climate Agreement without addressing HFCs.

Supermarkets Are the Most Impactful, Cost-Effective Opportunity to Reduce HFC Emissions

- HFC refrigerants become a problem when they are released into the atmosphere, which only happens when they are leaked or disposed of improperly. Roughly [60% of HFC emissions](#) are a result of leaks from refrigeration and air conditioning.
- Commercial refrigeration contributes more HFC emissions than any other source ([about 36%](#)).
- Supermarket refrigeration systems are connected by miles of piping and countless joints, making them prone to high leak rates. The average supermarket leaks about [25% of its total refrigerant charge annually](#).
- Together, the roughly [38,000 supermarket](#) locations in the United States emit over 152 billion pounds (76 million tons) of CO₂ equivalent emissions annually solely from refrigeration leaks. That is approximately equal to the emissions from burning [nearly 76 billion pounds of coal](#).
- HFCs account for [65% of an average supermarket's direct greenhouse gas emissions](#) (scope 1), and as a result are critical to reducing the overall carbon footprint.
- A supermarket's [Total Equivalent Warming Impact](#) (TEWI) is the sum of the direct refrigerant emissions and the indirect emissions from energy use, so energy use must also be considered in total carbon footprint reduction strategies.
- Supermarkets are also more electricity-intensive than any other commercial building type, and their largest electricity load is typically their refrigeration system, using over [40% of their total energy](#).
- The average supermarket refrigeration system emits over [3 million pounds](#) of CO₂ equivalent indirect emissions from energy use and annually. However, this is still less than the direct emissions from refrigerant leaks, which average 3.4 million pounds of CO₂ equivalent emissions annually per store.
- Reducing the TEWI of supermarket refrigeration systems has the potential to contribute significantly to state and federal decarbonization goals.

The Drivers

Refrigerant Regulations Are Driving Refrigerant Selection

- In 1987, all UN member countries adopted the [Montreal Protocol](#) to phase down the production and consumption of commonly used chlorofluorocarbon (CFC) refrigerants and other "ozone depleting substances." As a result, HFC refrigerants [became widely adopted in the 1980s](#). Thus, we unintentionally traded one environmental disaster for another.
- Since HFC refrigerants were identified as potent greenhouse gases, new regulations have emerged globally, including:
 - The [Kigali Amendment](#) to the Montreal Protocol, which established a timeline for the mandated phase-down of HFCs for developed and developing nations (2016). The US has not ratified the amendment, the Biden Administration has issued an [executive order](#) preparing to seek senate consent for ratification.

- The [European Fluorinated-Gas Regulations](#) (2015), which limited the sale of HFCs, prohibited the use of HFCs in certain new equipment, and mandated service and maintenance practices to reduce leaks. These regulations will ultimately reduce HFC emissions by two-thirds by 2030 compared with 2014 levels.
- In the US, the Federal government took initial steps to phaseout high-GWP HFCs, but their efforts were put on hold:
 - The U.S. EPA’s Significant New Alternatives Policy (SNAP) program [moved HFCs from the acceptable list to the unacceptable list](#) and added new low-GWP alternatives to the acceptable list under SNAP Rule 20 and 21 (2015).
 - However, in a 2017 court case, the U.S. Court of Appeals for the District of Columbia ruled that the EPA did not have the authority to regulate HFC refrigerants, and SNAP Rules 20 and 21 were [overturned](#) (2017).
- In the absence of Federal action, States began to take action to phasedown HFCs:
 - The [U.S. Climate Alliance](#) was formed by a coalition of states committed to reducing greenhouse gas emissions consistent with the goals of the Paris Agreement, which included addressing HFCs. Most states have focused on adopting the EPA SNAP Rules [20](#) and [21](#).
 - California has gone beyond other states. In addition to adopting the SNAP Rules into law, the state also established more [stringent regulations](#) that will prohibit refrigerants with a GWP above 150 in new facilities starting in 2022 and set specific GWP reduction targets that supermarkets must meet across their existing facilities by 2030.
- In December of 2020, the US signed the [American Innovation and Manufacturing](#) (AIM) Act into law, which:
 - Established an 85% phase-down of the production & consumption of HFCs by 2036 that mirrors the Kigali Amendment
 - Authorized the EPA to both restore SNAP prohibitions and to establish new refrigerant management requirements.

The Solution

Natural Refrigerants Are a Climate-Friendly and Future-Proof Solution

- Natural refrigerants, including ammonia, carbon dioxide, and hydrocarbons, are climate-friendly alternatives to HFC refrigerants, with [zero or near-zero GWP](#) and no ozone-depleting potential (ODP). Due to their negligible impact on the environment, natural refrigerants are exempt under [Section 608](#) of the Clean Air Act.
- Natural refrigerants were the original refrigerants and, due to their [long, well-understood history of use](#), they are considered future-proof from both an environmental and regulatory standpoint.
- In addition to guaranteeing permanent emission reductions, natural refrigerants have the [potential](#) to reduce energy, gas, and water consumption.

Unique Market Barriers Have Prevented Natural Refrigerants from Becoming a Feasible Option for Supermarkets

- Of the 38,000 supermarket locations in the US, less than 2% of existing stores use natural refrigerants exclusively.
- In existing facilities, which represent the opportunity for emission reductions, natural refrigerants are not a “drop-in” solution and require a full system replacement, creating a tremendous logistical and financial barrier.
- Even in new facilities, natural refrigerant technologies have not yet reached economies of scale and are still associated with high upfront cost premiums compared to HFC technologies (see [financial fact sheet](#) for more information).
- Average supermarket profit margins are [roughly 1%](#), so many smaller companies do not have the means to overcome the financial barriers of natural refrigerant technologies.
- The availability of service technicians trained to handle natural refrigerants is limited, and service contractors often do not have an incentive to get training if their customers are not using natural refrigerants.
- Gaps in technology solutions to modularly transition existing stores have limited options for supermarkets.
- With so few installations, there is a shortage of credible data on the true energy performance and other ongoing costs of these technologies, creating uncertainty for supermarkets and utility partners.

NASRC Is Partnering with The Industry to Drive Solutions to Natural Refrigerant Barriers

- NASRC is working in partnership with over [130 industry stakeholders](#) and more than 38,000 food retail locations to tackle the barriers and pave the way for natural refrigerants. Together we’re driving solutions to:
 - Coordinate [funding](#) to offset the upfront cost premiums of natural refrigerant technologies;
 - Accelerate natural refrigerant [training](#) for contractors & service technicians to ensure qualified workforce;
 - Facilitate the introduction of new technologies to support the transition in the US market;
 - Advise government agencies on [policy](#) & technical applications to support the transition to natural refrigerants;
 - Contribute to industry [best practices, standards, and codes](#) that support natural refrigerants;
 - Lead solutions-oriented [events](#), workshops, and trainings to accelerate our mission; and
 - Connect key stakeholders and [share knowledge](#) to advance natural refrigerants.