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Science

# How supermarket freezers are heating the planet, and how they could change

Grocery chains under pressure to switch from HFCs to natural refrigerants to curb climate change

[Emily Chung](#) · CBC News · Posted: Jan 29, 2023 4:00 AM EST | Last Updated: February 27



Supermarket fridges and freezers leak powerful greenhouse gases called HFCs. Switching to 'natural

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waste, but those efforts could be negated by potent greenhouse gases leaking from supermarket fridges.

Refrigerants called hydrofluorocarbons or HFCs are widely used to keep food cold or frozen at grocery stores and during transport. (They're also used for other refrigeration applications, like ice rinks and air conditioners).

They were originally brought in to replace ozone-depleting refrigerants called chlorofluorocarbons (CFCs), which were banned in a [landmark 1987 agreement called the Montreal Protocol](#), in order to save the Earth's protective ozone layer.

But HFCs are themselves powerful greenhouse gases.

Typically, each tonne of HFCs can trap as much heat in the atmosphere as 1,400 to 4,000 tonnes of carbon dioxide over 100 years, depending on the type of HFC.

- **Do you have a question about climate change and what is being done about it? Send an email to [ask@cbc.ca](mailto:ask@cbc.ca)**

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Here's a look at why that's happening, what the solutions are, and how ordinary shoppers could make a difference.

## How do HFCs get from supermarkets into the atmosphere?

Supermarket fridges aren't like your fridge at home, which typically contains less than 200 grams of refrigerant. And it's in a sealed unit that's unlikely to leak, says Morgan Smith, spokesperson for the [North American Sustainable Refrigeration](#)

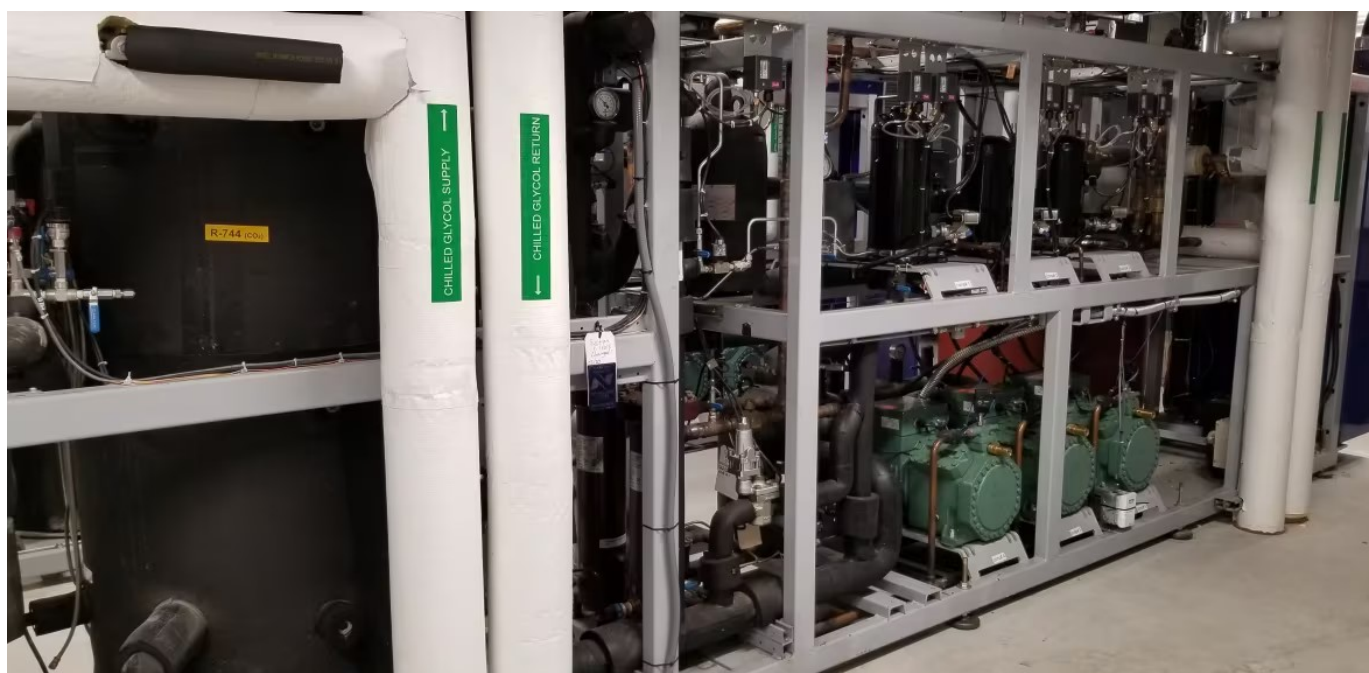
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Beneath and behind the cases of vegetables, dairy and frozen foods at a typical supermarket are kilometres of piping with thousands of valves, containing literally a tonne of refrigerant.

"It's so large and so complex, with so many different points of connection that those systems are inherently leaky, and so they leak about 25 per cent of their refrigerant charge every year," said Smith.



A typical grocery store refrigeration system contains large quantities of refrigerants and kilometres of pipes, along with valves and compressors with many points of connection that could potentially leak. In this system at Longo's in Stouffville, Ont., the refrigerant is CO2 (tank at left), but in many others, it is an HFC with a very high global warming potential. (Emily Chung/CBC)

That's something another non-profit group called the Environmental Investigation Agency has captured on video using infrared cameras and HFC detectors in U.S. grocery stores. It also measured levels of HFCs in the store using chemical

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U.S. alone, it calculated supermarket HFC leaks cause as much global warming as burning 22 million tonnes of coal.



Three chemical detectors show readings of HFCs at a Gristedes grocery store in New York during a survey by the Environmental Investigation Agency and 350NYC in 2022. (Environmental Investigation Agency)

## How big a deal are these emissions really?

HFCs are such a big problem for climate change that Canada and 196 other countries have signed an international agreement, [the Kigali Amendment to the Montreal Protocol](#), to reduce HFC consumption 85 per cent by 2036, relative to 2011 to 2013.

Shelie Miller, a professor who studies the environmental impact of the food system at the University of Michigan, says emissions from refrigerants may be relatively small compared to the food system emissions overall and major categories such as food waste.

"But that's also just because the food system has such a big impact," she said.

On the other hand, targeting HFCs in supermarkets can be very effective at curbing emissions.

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than 50 years in the atmosphere, compared to hundreds of years for CO<sub>2</sub>. Since a typical refrigeration system lasts about 30 years, decisions made now about what refrigerant to use can affect global emissions for decades.

"We need to be thinking about the sources and the hubs of where emissions are happening. And so our grocery stores are a great way to target our overall food system and reduce emissions."

### ***WATCH | How the Environmental Investigation Agency measured HFCs:***

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[Project Drawdown](#) is a U.S.-based nonprofit organization focused on identifying and supporting the most effective climate solutions. It has consistently listed preventing refrigerant leaks and replacing HFCs with more climate friendly refrigerants [among its top climate solutions](#), capable of reducing CO<sub>2</sub> emissions by more than 100 billion tonnes by 2050.

## **What can be used for refrigeration in place of HFCs?**

The main alternatives are called "natural" refrigerants because they are all chemicals found in nature. They include:

- CO<sub>2</sub>.
- Ammonia.
- Propane.

While CO<sub>2</sub> is a greenhouse gas, its global warming potential is so much lower than that of HFCs. And propane, while it's a fossil fuel, is not burned when used in refrigeration. In fact, all three of these chemicals are considered refrigerants with ultra low global warming potential.

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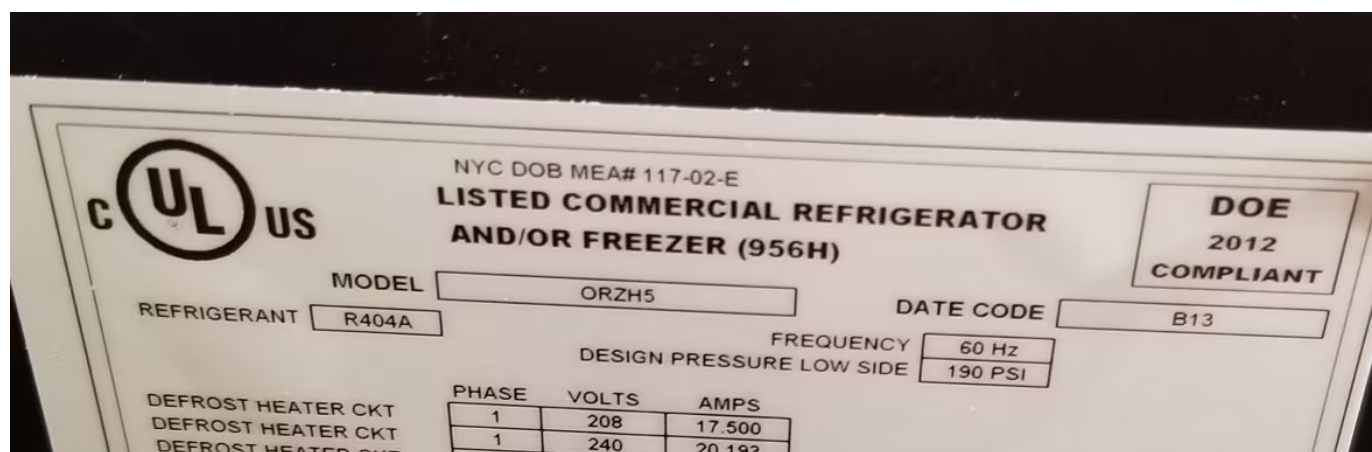
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there were [340 commercial CO2 refrigeration installations](#) in Canada as of May 2020. That was far fewer than Japan, with 6,500 and Europe with 29,000, and growing more slowly than every other region in the world listed, including the U.S., Australia and New Zealand.

However, Jeffrey Gingras, president of Evapco LMP, a Laval, Que.-based company that makes CO2 refrigeration systems, said he's seen an exponential growth in installations in the past three years, and did a record 125 installations in supermarkets, about half of them in Canada, in 2022.

The Environmental Investigation Agency has been building a [global map](#) of refrigerants used in supermarkets since it launched its [Climate-Friendly Supermarkets](#) project in 2019.

Two Canadian community groups, [Drawdown Toronto](#) and Drawdown B.C., have helped coordinate submissions to the map in their regions, and have added about 250 stores to the map. (Note: I volunteered for Drawdown Toronto while on leave from CBC News and added one store. You can read more about that in our [What On Earth newsletter](#).)



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This is a refrigerator label from the inside of a supermarket fridge, showing the type of refrigerant used. In this case, it's an HFC called R404A, with a global warming potential close to 4,000 times that of CO2. (Emily Chung/CBC)

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That was enough for the EIA to issue its first ever [scorecard on Canadian supermarkets](#) last fall.

It reported on the five largest food retailers in Canada: Costco, Loblaws, Metro, Sobeys and Walmart.

- **WHAT ON EARTH?** [Is your supermarket 'climate-friendly'? Here's how to tell](#)

The best-performing was Sobeys, which had the highest percentage of stores using ultra-low global warming potential refrigerants (nine per cent), was the only listed company that publicly reports its refrigerant leak rate (seven per cent) and has committed to transition to climate-friendly refrigerants for all new stores and renovation projects starting in 2024.

Some stores have also reported taking their own actions on HFCs, including Loblaws, which ranked third in the report and told CBC News that it has cut its greenhouse gas emissions by 30 per cent "in a large part" because of its strategy to reduce refrigerant leaks: using less refrigerant, detecting leaks early and reducing the emissions intensity of the refrigerants it uses.

Walmart Canada, which came fourth in the report, told CBC News in an email that it is installing natural refrigerants in all new stores and during major remodels with new grocery departments, and will switch all stores running on HFC refrigerants to more environmentally friendly options. It did not give a timeline, but said its global operations are aiming for zero emissions by 2040.

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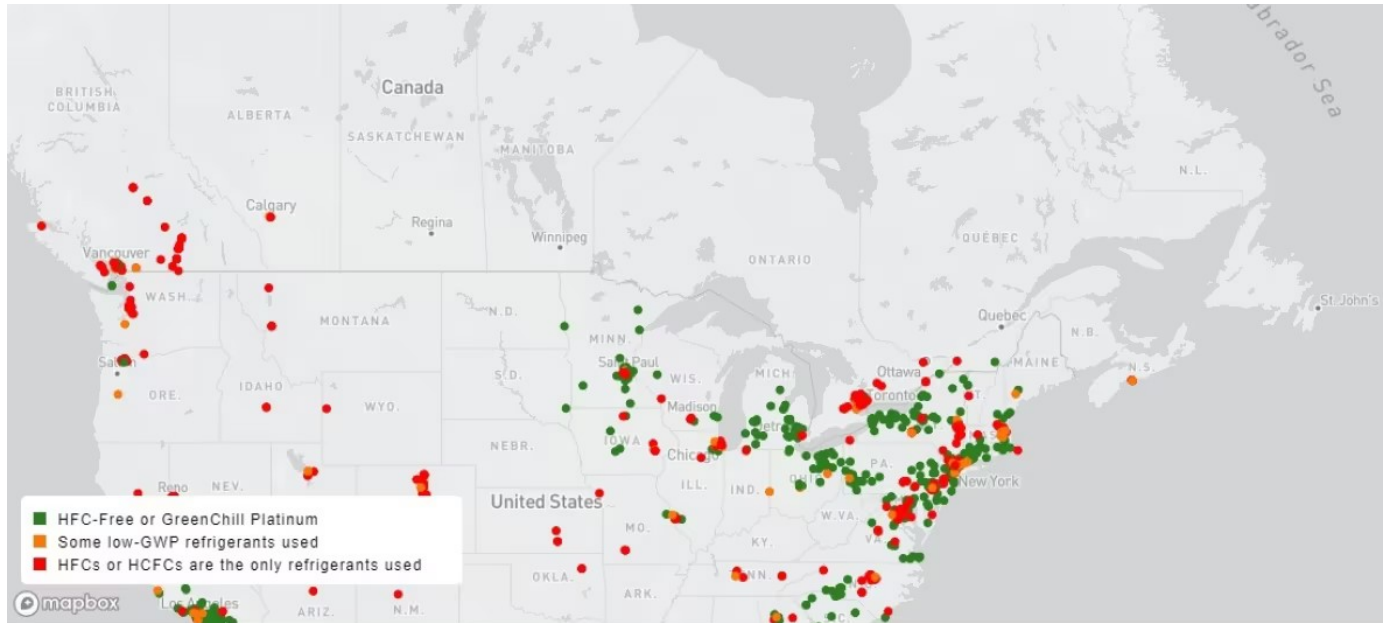
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be because no Canadian supermarket chains have not submitted their own data, unlike in other countries, and there isn't much information.

"I actually have a hunch that Canada is not very far behind," she said.



Ordinary shoppers can add local grocery stores to the Environmental Investigation Agency's map of supermarket refrigerants. (Environmental Investigation Agency)

## Why aren't HFCs getting ditched faster?

Morgan Smith of the North American Sustainable Refrigeration Council said making the switch to natural refrigerants isn't easy. They may require different training and equipment: ammonia is toxic, propane is flammable, and CO2 operates under very high pressures.

Smith said CO2 tends to be the natural refrigerant of choice for most supermarkets because it's non-toxic and its systems work a lot like HFC

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system is still running, Smith said. Otherwise, you might have to shut down the store during the retrofit, which is difficult for both customers and the store operator.

For smaller stores, one option is to switch to individual fridges similar to your home fridge, with propane refrigerant in a sealed unit, Smith said.

### ***WATCH | Supermarkets face pressure to reduce invisible climate pollution:***



#### **A greener way to cool grocery store fridges and freezers**

7 months ago | 2:16

Supermarket fridges and freezers are a significant source of carbon emissions. Now, there is a push to switch to refrigeration powered by carbon dioxide as a greener alternative. One Ontario supermarket chain is already making the change in many of its stores.

Michael Zabaneh of the Retail Council of Canada said refrigerant projects are quite expensive for supermarkets.

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However, he said most large grocery chains are aware of the problems with HFCs and customer and investor pressure to reduce greenhouse gas emissions, and are taking action.

The Environmental Investigation Agency's Mahapatra acknowledged that retrofitting older stores is expensive and challenging. However, she says grocery chains should be making all new stores use natural refrigerants.

"There is no excuse for any supermarket today to build a new store that still contains HFCs. That is just simply foolish," she said, noting that international agreements to phase out HFCs will eventually force companies to change the systems anyway.

## What is the government doing about this?

The federal government will start to offer [carbon offset credits for projects that cut refrigerant emissions](#), including those in supermarkets, [Environment and Climate Change Canada announced on Feb. 24](#). Companies will be able to apply to get credits for projects that started as far back as January 1, 2017, and sell those to other companies that want them in order to meet their own climate obligations.

- **OPINION** [Federal carbon-offset proposal will likely give illusion of progress, even as it increases emissions](#)
- [What working together to save the ozone layer tells us about climate action today](#)

[Federal regulations](#) have also been brought in to comply with the Kigali

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Gingras said the Quebec government did offer incentives for a period of time starting 2014 that made natural refrigerant systems competitive with HFCs, and those did lead to a widespread conversion of supermarkets in the province. However, he hasn't heard of anything similar in other provinces.

## Is there a role for ordinary shoppers?

Avipsa Mahapatra says grocery store customers can make a difference by adding their local stores to the [climate-friendly supermarket map](#), being more aware and putting pressure on grocery store chains, especially when it comes to new supermarkets.

"So if it's a new store that is being built in your community, it is our job as ... residents of that community, to make sure that it is not an HFC store."

Morgan Smith at the North American Sustainable Refrigeration Council also thinks the public can make a difference: "The more people that are aware of this topic, the more resources and support there are to actually enable this transition."

### Clarifications

- When this story was first published on Jan. 29, 2023, Environment and Climate Change Canada had said the refrigerant offsets would come into effect in the "next few months." The government officially announced the launch of the offsets on Feb. 24, 2023, and the story was updated on Feb. 27 to reflect that.

*Feb 27, 2023 9:28 AM ET*

### Corrections

- A previous version of this story said that home refrigerators contain about five kilograms of refrigerant.

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