THE FUTURE OF REFRIGERATION

Global action intensifies on HFC phase-down.

By Shane Brennan

Government representatives from around the world gathered in Bangkok, Thailand, for the annual Meeting of the Parties to the Montreal Protocol in July 2025. The focus: assessing global progress in phasing down hydrofluorocarbons (HFCs) and planning next steps. The GCCA participated, hosting an education session and engaging with officials about the implications of policy decisions on the cold chain.

Nearly 40 years have passed since the 1987 Montreal Protocol was adopted to eliminate chlorofluorocarbons (CFCs), which were causing significant depletion of the ozone layer. That agreement was a landmark success in coordinated global environmental action. CFCs have now been mostly eliminated and replaced by HFCs or natural refrigerants such as carbon dioxide, ammonia, and propane.

However, HFCs – while ozone-friendly – have high global warming potential (GWP). GWP compares the climate impact of a gas to carbon dioxide (CO_2), which has a GWP of 1. Some older HFCs had GWPs exceeding 4,000, while newer versions in widespread use – such as in refrigerated transportation – still often have GWPs around 2,000.

The industry continues to innovate, with lower-GWP HFCs and natural refrigerants gaining traction.

To address the climate risks associated with HFCs, the Kigali Amendment to the Montreal Protocol was adopted in 2016, setting a binding timetable for phase-downs. This amendment is now the centerpiece of international collaboration on refrigerants.

Global Obligations and National Regulations

Global negotiations can feel far removed from day-to-day cold chain operations, but these meetings shape the legal and commercial frameworks companies must navigate. They also offer valuable opportunities to engage directly with regulators, clarify practical impacts, and advocate for balanced approaches that maintain safety, performance, and environmental integrity.

Implementation approaches vary widely. Most countries pursue two core strategies:

- *Quota systems*: Restricting the availability of high-GWP refrigerants to encourage adoption of low-GWP alternatives.
- *Product bans*: Prohibiting the sale of equipment that uses high-GWP refrigerants. These pose the greatest challenges to cold chain operations.

While the frameworks are similar, they vary significantly in the details, and as parties met in Bangkok, much of the focus was on sharing ideas and experience.

Phase-Down Obligations Under the Kigali Amendment

GROUP	EXAMPLES OF COUNTRIES	BASELINE YEARS	INITIAL REDUCTION	FINAL TARGET	FINAL YEAR
Group 1 (A5 - I)	China, Brazil, South Africa	2020 –2022	10% by 2029	80% reduction from baseline	2045
Group 2 (A5 - II)	India, Pakistan, Iran, Saudi Arabia	2024 –2026	10% by 2032	85% reduction from baseline	2047
Non-A5 (Developed)	U.S., EU, Canada, Japan, Australia	2011–2013	10% by 2019	85% reduction from baseline	2036
Optional/ Non-Parties	Countries yet to ratify or opting out	N/A	None	Voluntary or pending	N/A

National Implementation: A Comparative Overview

POLICY AREA	UNITED STATES	EUROPEAN UNION	CHINA
Lead Authority	EPA – AIM Act	European Commission – F-Gas Regulation	Ministry of Ecology and Environment (MEE)
Baseline Years	2011–2013	2009–2012	2020–2022
Reduction Target	85% by 2036	95% by 2050; 79% by 2030	80% by 2045
Regulatory Instruments	Quota system, sector bans, labeling, reporting	Quota system, product bans, labeling, pre-charged controls	Quota licensing, refrigerant catalog
Sector-Specific Provisions	Transport refrigeration not restricted	Transport review deferred to 2027	Alternative pathways in development
Key Legal Tools	AIM Act of 2020	EU 517/2014; updated 2024	HFC Control Plan 2022
Industry Concerns	Warehouse classification, tech readiness	Fast bans outpace tech readiness	Balancing cooling demand and tech change
Enforcement & Penalties	EPA enforcement, civil penalties	National enforcement, fines	Licensing and registration penalties
Innovation Support	EPA and DOE grants	EU Innovation Fund, Horizon Europe	Gov't R&D and pilots
Rules for Industrial and Commercial Refrigeration	EPA rules under the AIM Act restrict refrigerants with GWP >150 in new systems, but current implementation is under review and a petition has been submitted to reclassify cold storage.	The EU F-Gas Regulation bans placing on the market new commercial refrigeration equipment with refrigerants >150 GWP, effective in most categories. Industrial systems face phased restrictions.	China uses a licensing system for new industrial/commercial equipment. Specific bans are less detailed, but regulatory guidance encourages adoption of low-GWP and natural refrigerants.

Making the Case for Proportionate Implementation

Effective climate action must align with technical realities. In refrigerated transportation, finding alternatives to high-GWP HFCs remains difficult. Systems for mid- and large-capacity vehicles must meet stringent safety, size, and performance standards. While low-GWP technologies exist in prototype form, they are not yet commercially viable at scale.

Recognizing this, the U.S. Environmental Protection Agency (EPA) has not restricted higher-GWP refrigerants in truck refrigeration. Similarly, the European Union deferred a potential ban in transport refrigeration until 2027 to allow more time for innovation. GCCA's education session in Bangkok focused on anticipating this 2027 deadline, educating country representatives about the realistic implications of an unrealistic timeline for banning vital technologies.

China has so far focused on foundational market mechanisms, prioritizing emissions tracking and data accuracy over product-specific restrictions.

Cold storage facilities face similar pressures. A recent industry petition in the United States challenged the EPA's classification of warehouse systems under the same rule as commercial and retail refrigeration. GCCA supported the petition, specifically calling for cold storage operations to be categorized as an industrial use alongside food processing facilities and not alongside commercial/retail refrigeration. This is necessary to avoid unintended supply chain consequences.

Balancing Progress and Practicality

Global climate regulations are intensifying, and implementation is accelerating. For cold chain operators, the challenge is to meet these evolving expectations while safeguarding food safety, product integrity, and operational reliability.

Policy frameworks must allow time for technological maturation and provide investment certainty. The pace of phase-down should follow the innovation curve, especially in safety-sensitive and high-performance sectors like refrigerated transportation and industrial warehousing.

GCCA continues to advocate for practical, science-based, and industry-informed implementation of refrigerant regulations. Engagement with global regulators is essential to ensure that compliance pathways are realistic, proportionate, and aligned with industry capability.

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