

ET Summit 2023

Presented by



Tackling the Climate Impacts of Refrigerants

Preventing up to 0.5C of Warming This Century



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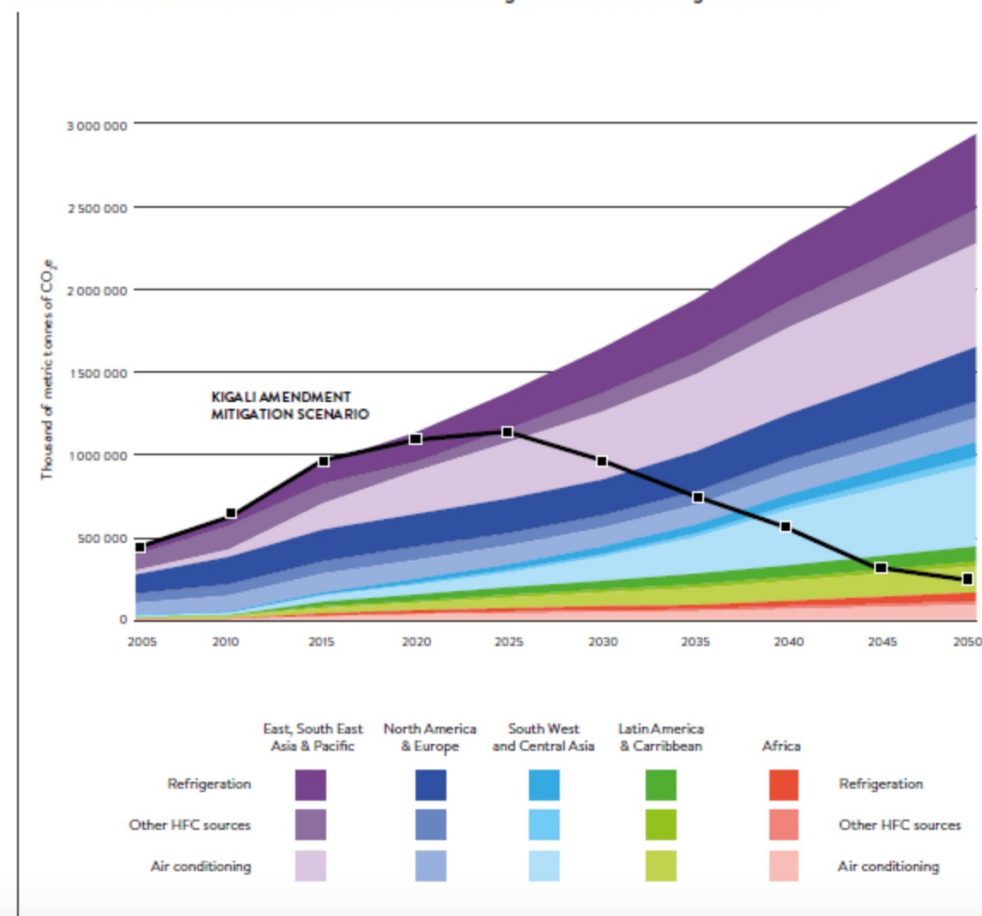
Environmental Investigation Agency – US

Why refrigerants/HFCs?

- Massive preventable climate impact: Up to .5C toward goal to limit warming to 1.5C
- ‘Super Pollutants’: Potent global warming potentials 100s to 1000s x CO2
- Short-lived climate pollutants: fast results in reducing atmospheric warming, avoid climate tipping points
- Rapidly increasing global demand for cooling/heating
- Long lifetime of equipment using HFCs means we must act now

HFC EMISSIONS TRENDS

Evolution of HFC emissions from main sources and Kigali amendment mitigation scenario



Source: IIASA GAINS, 2017

Progress Under Kigali Amendment & US AIM Act

American Innovation and Manufacturing Act of 2020 (AIM Act)

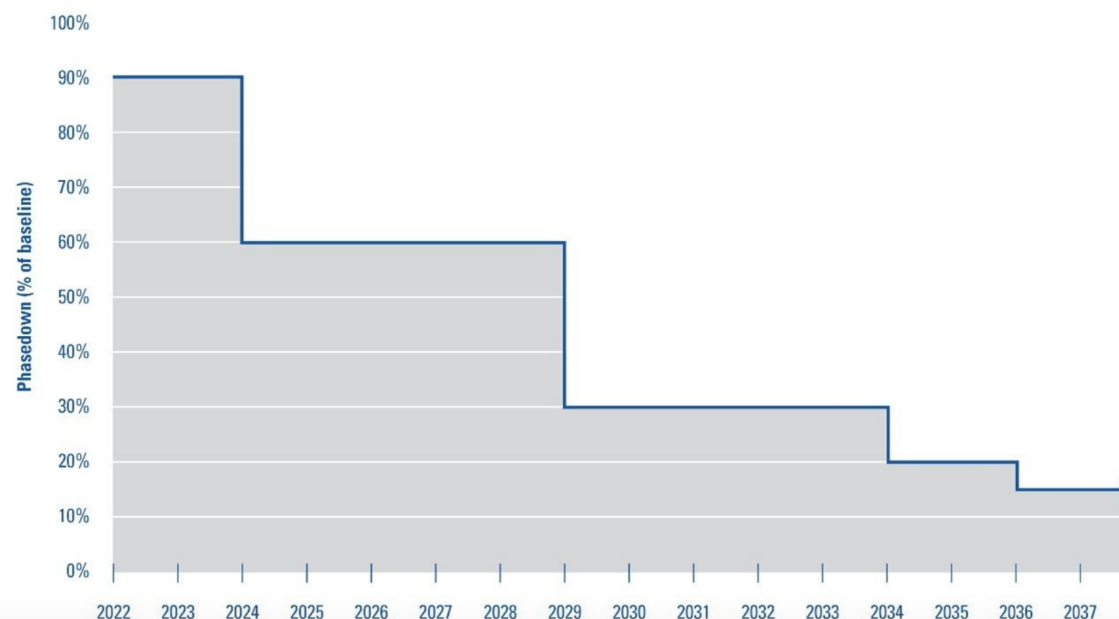
3 Pillars for EPA Regulations:

- Allowance system: limits production/imports
- Technology Transition Regulations: Restrict HFC Use
- Lifecycle Management: Reduce leaks and increase end-of-life recovery + reclamation

Petitions can be submitted to accelerate/enact additional restrictions

US HFC phase-down 85% by 2036

The following illustrates the HFC production and consumption phasedown schedule as outlined in the AIM Act.



GWP Limits for New Equipment

Equipment	Current Common Refrigerant/100yr GWP	California GWP	Date	EPA GWP (proposed/not final)	Date (proposed/not final)
Commercial Refrigeration (Supermarket Systems and Remote Condensing Units)	407 = ~2,000 404A = ~4,000	150 (>50lbs)	1/1/2022	150 (>200lbs) 300 (<200lbs) 300 (cascade)	1/12025
Self-Contained/Stand-alone Refrigeration Units & Vending Machines	134a = 1,400	N/A	N/A	150	1/1/2025
Cold Storage/Industrial Process Refrigeration	404A = ~4,000	150 (>50lbs)	1/1/2022	150 (>200lbs) 300 (<200lbs)	1/12025
Ice Rinks	Ammonia = 0 513A/C = ~600	150	1/1/2024	150	1/1/2025
Stationary AC/Heat Pumps - Room/Wall/Window Units - VRF - Other	410A = ~2,000	750	-1/1/2023 -1/1/2025 -1/1/2026	700	1/1/2025 (all but VRF) 1/1/2026 (VRF)

- Note: Above shows select equipment types. For full equipment list, see; EPA [Fact Sheet](#). CARB [Final Regulation Order](#).
- Petitions from EIA, other NGOs, states, industry. EPA Final rule expected Fall 2023

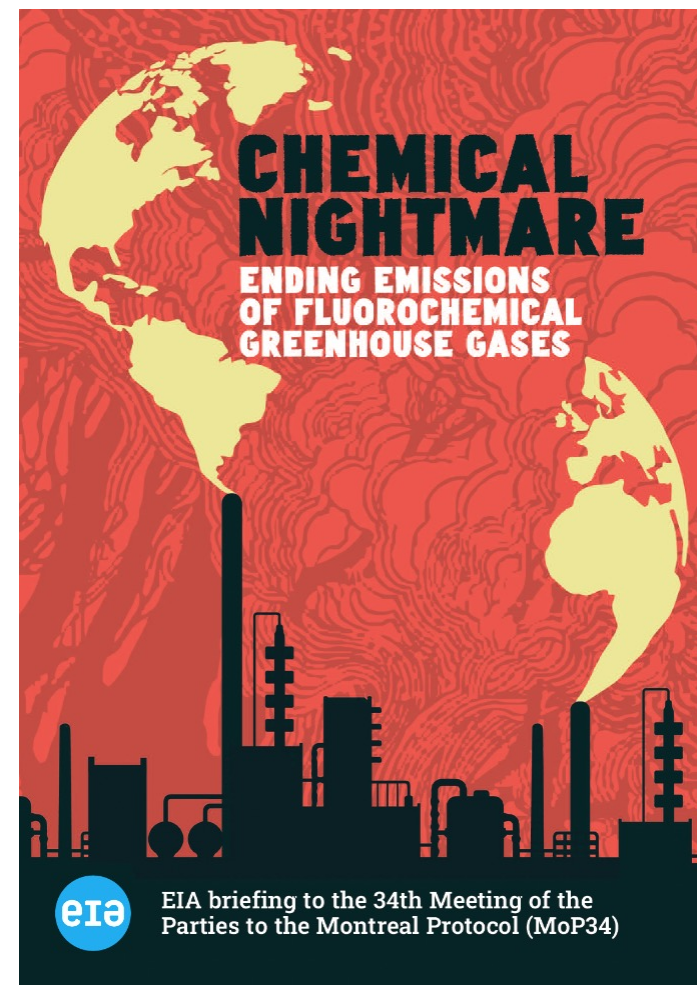
Problems with HFO Substitutes

Many HFCs and HFOs are PFAS or “Forever Chemicals”

- Concern with persistent breakdown products
- Trifluoroacetic Acid (TFA) levels rising in ice cores and bodies of water
- Up to 33-fold increase in TFA from HFO-1234yf over HFC-134a
- EU and some states looking at regulating HFCs and HFOs as PFAS

Production of HFCs and HFOs: Feedstock and by-product emissions

- Continued climate and toxic emissions from HFO production
- Emissions of various feedstocks or by-products during production: HFC-23, CTC, CFCs
- Scientists have found hundreds of millions metric tons CO₂e annually in emissions linked to fluorochemical production



Lifecycle Refrigerant Management

- Reduce leaks and increase end-of-Life (EOL) recovery of refrigerants
- <20% EOL recovery rate in the U.S.
- High EOL venting from appliances & residential/commercial AC
- Opportunities to incentivize/support better installation, maintenance, recovery, and reclamation/destruction.
- Require reclaimed refrigerant for new and existing equipment

Report from EIA, NRDC, IGSD: <https://us.eia.org/report/20221020-the-90-billion-ton-opportunity/>



Conclusions

- Ultra-Low GWP and PFAS-free alternatives exist for most applications and are energy efficient
- Need to be adopted in AC/heat pumps by 2030, at the latest to meet net-zero goals
- Scale up heat pumps now, but transition to alternatives ASAP and consider 'refrigerant efficiency' as well as GWP/substance
- Remove safety standard/code barriers for R-290 and other hydrocarbons in heat pump/ACs
- Reduce emissions from leaks and venting
- Increase recovery and reclamation + destruction
- Accelerate Kigali/AIM Act phase-down consistent with 1.5C



Thank you for listening!

EIA Resources:

- [Beyond Words: A Framework for Responsible Private Sector Action on Sustainable Cooling](#)
- [The 90 Billion Ton Opportunity: Lifecycle Refrigerant Management](#)
- [Chemical Nightmare: Ending emissions of fluorochemical greenhouse gases](#)
- [Fact Sheet on California SB1206](#)
- [EIA Supermarkets Map and Scorecard](#)

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