Detailed EIA response to Chemours advertorial "F-gas solutions are critical to achieving our biggest environmental goals"

Text in grey is from the article.

"F-gases are the superior alternatives for thermal management as they offer a unique combination of sustainability, safety and performance in critical applications."

Factcheck #1 - **F-gases are NOT sustainable**

Most hydrofluorocarbons (HFCs) have very high global warming impacts. For example, the most widely used HFC blend, HFC-410A has a global warming potential (GWP) of 2088 over a 100-year period and 4,400 over a 20-year period. Even so-called 'lower-GWP' HFCs, which are promoted as climate-friendly alternatives, have a real impact on our climate. For example, HFC-32 has a GWP of 771 over a 100-year period, but as it is a short-lived chemical with a lifetime of less than five years, its 20-year GWP – which is 2,690 – is more relevant to the damage HFC-32 emissions will cause in this critical decade of climate action.[1] Rapidly reducing the use of all HFCs will cut the rate of warming in the near-term and could help avoid dangerous climate tipping points. This is why they are being phased down globally under the Kigali Amendment to the Montreal Protocol.

Chemours and other F-gas producers are promoting the use of hydrofluoroolefins (HFOs), fourth generation F-gases, as low-GWP alternatives to HFCs. However, HFOs are far from climate or environmentally friendly:

- **Some HFOs are classified as PFAS** and due to concerns over soil and water contamination some European Member States are proposing that the use of some HFCs and HFOs be restricted.[2] In addition, trifluoroacetic acid, also a PFAS, is a degradation product of HFO-1234yf and HFC-134a. Montreal Protocol experts have warned that high TFA yields from HFOs may be of "may be of considerable environmental relevance in view of the expected future HFO production expansion.[3]
- **HFOs are complex chemicals whose production requires a cocktail of polluting inputs**. For example, HCFC-22 is used as a feedstock in the production of several HFCs and HFOs. HCFC-22 production is associated with by-product emissions of one of the most polluting HFCs in the world, HFC-23, which has a GWP of 15,100. In fact, Chemours' HCFC-22 production facility in Louisville, US is named and shamed as one of the nation's worst industrial greenhouse gas emitters in 2021, due to HFC-23 emissions equivalent to 2.66 million tonnes of carbon dioxide (CO_2).[4]
- **HFOs are energy and resource intensive**. HFO-1234yf produces at least 13.5kg of carbon dioxide equivalent (CO_2e) emissions per single kilogram of refrigerant produced.[5] This means a system using 35kg of refrigerant would have associated manufacturing emissions of at least half a tonne of CO_2e. In contrast,

ammonia produces 1kg CO_2e of emissions for every 1kg manufactured[6] and refrigerant grade CO_2e produces 0.5 kg CO_2e for every 1kg manufactured.[7]

- **HFOs are prohibitively expensive, posing equity issues and potentially fuelling illegal trade in HFCs**. As of 2017, the market price for bulk quantity HFO-1234yf was approximately 10 times higher than HFC-134a.[8] While the price differential is now likely less extreme, enterprises in developing countries have noted ongoing affordability issues concerning HFOs. The high cost of HFOs may drive illegal trade in HFCs, as there is a risk that HFCs could be dropped into HFO systems during servicing.

Factcheck #2 - **F-gases do not offer superior performance**

It is widely understood that the energy efficiency of cooling and heating systems is predominantly determined by product design and choice of components. Dr. Omar Abdelaziz Co-chair of the Montreal Protocol's Refrigeration, Air Conditioning and Heat Pumps Technical Options Committee (RTOC) notes "Reducing GWP depends on Refrigerant Choice. Improving energy efficiency depends on design choice"[9]

"some have suggested that so-called 'natural refrigerants' — but in reality, industrial gases including propane, ammonia and CO2, among others — are a superior alternative to F-gases from a climate and performance perspective, even suggesting that F-gases should be subject to further regulation or outright bans. However, the facts simply don't bear this out. For example, the European Commission stated in its own assessment that propane is not a viable replacement due to safety concerns. Using propane also means extending our dependence on fossil fuels and, in general, leads to lower energy efficiency".

Factcheck #3 - **This is not true. The European Commission notes that propane and other natural refrigerants ARE viable replacements to F-gases**

- The European Commission's impact assessment states "today there are suitable alternatives to the use of F-gases with a very low climate impact in most sectors and applications. These include the so-called *natural alternatives* such as hydrocarbons (e.g. propane, butane, cyclopentane), ammonia, CO_2 or water."[10] The Commission's report may have referred to some specific equipment types where propane is not currently viable, but different architectures can fulfil the same applications using natural refrigerants.

Factcheck #4 - **F-gases are already subject to regulation and outright bans, and the European Commission has proposed more ambitious measures**

- HFCs are being phased down globally under the Kigali Amendment to the Montreal Protocol, agreed in 2016, due to their significant climate impact.
- The European Commission has proposed a ban on the use of F-gases with GWP of 150 or more in self-contained systems such as heat pumps from 2025 and in smaller split systems from 2027. Chemours appears to be misquoting the European Commission's own impact assessment and using misinformation to

undermine The European Commissions' conclusions surrounding the need to further regulate and ban F-gases.

Factcheck #5 - **Propane, in general, equals or exceeds efficiency of HFC and HFO technologies**

US based commercial refrigeration equipment manufacturer Hoshizaki America has moved away from F-gases to propane. Earlier this year the company director noted that propane systems reduce energy consumption by 11 per cent.[11] Other hydrocarbon refrigerants, such as isobutane, have become part of everyday life since they were adopted as climate-friendly alternatives to HFCs in domestic fridges in the 1990s. Montreal Protocol experts note that domestic fridges using isobutane have around 5% higher energy efficiency than systems using HFC.[12] Likewise, a review of domestic heat pumps in Europe shows that propane models have the highest efficiencies overall compared to HFC models.[13]

It [propane] also has a real-life impact on the amount of carbon in our atmosphere. Other options, such as ammonia, also present significant health risks — being corrosive to the skin, eyes and lungs. Exposure to a tiny amount is immediately dangerous to life and health, and it's also flammable in low concentrations by volume in air.

Factcheck #6 – **Safety of natural refrigerants can be ensured through equipment design and safe handling. F-gases also pose health risks if not properly handled**

Many F-gas blends promoted today are flammable. Although propane has a higher flammability classification (A3), reduced allowable charge sizes and a host of safety features required by product standards ensure that they do not pose safety hazards.

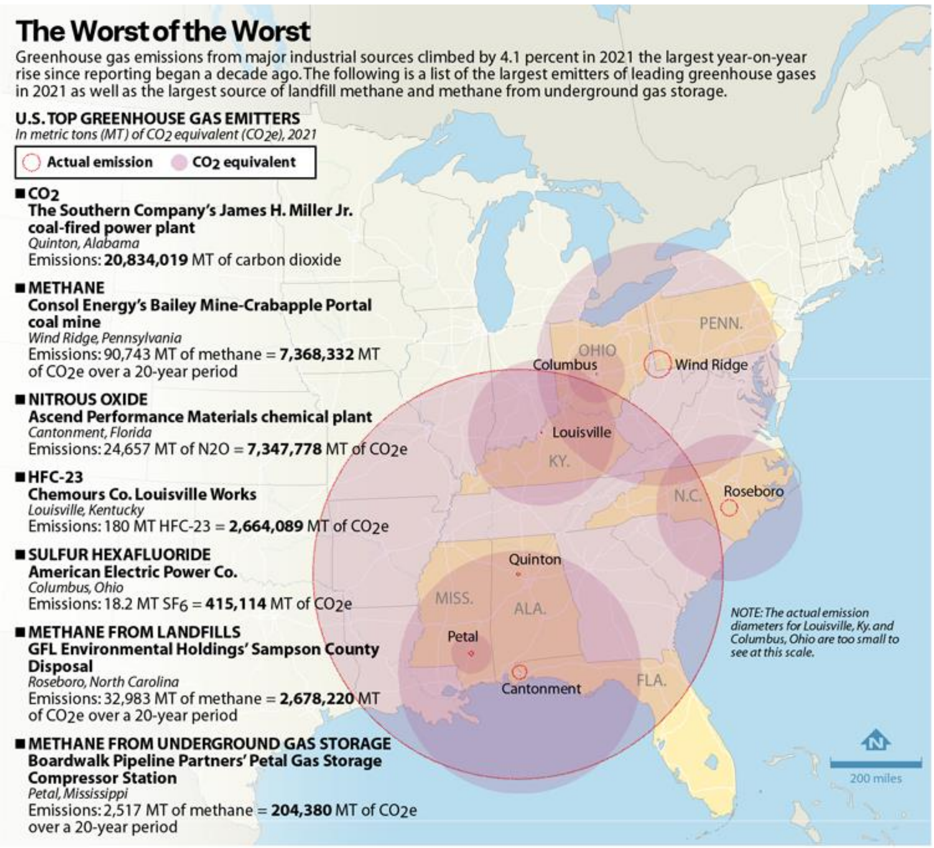
All refrigerants can pose safety concerns if not properly handled or due to accidents. HFCs can thermally decompose to corrosive hydrogen fluoride in case of fire. HF is a toxic and potentially lethal gas.[14] There are multiple examples of fatalities associated with HFC inhalation.[15]

The reality is that meeting the climate change challenge requires investment in upskilling the servicing and installation sector. This was recognised by the European Commission, when it proposed that technicians must are trained in the safe handling of natural refrigerants under the F-gas Regulation.

F-gases continue to underpin our modern world and improve our daily lives while also helping us to meet our climate and sustainability goals to secure a better tomorrow.

Factcheck #7 - **The contribution of F-gases to the modern world has been the hole in the ozone layer and 12 per cent of global warming experienced today.**

The first generation F-gases – the CFCs - created the hole in the ozone layer. Along with second generation F-gases, HCFCs, they are directly responsible for 12 per cent of global warming so far.[16] Current annual greenhouse gas emissions linked to the fluorochemical industry amount to almost three-quarters of a billion tonnes of CO_2-equivalent, according to data from recent scientific studies that draw attention to unexpected, unexplained or poorly understood emissions linked to industrial sources of various fluorochemical production.[17] The fourth generation HFOs are polluting our environment with PFAS and are no more climate-friendly than their predecessors. A 'better tomorrow' is a world that rapidly phases out global F-gas use and replaces them with sustainable future-proof replacements.



SOURCES: EPA; IPCC AR6 PAUL HORN / Inside Climate News

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