Hydrofluorocarbons (HFCs) *Key Messages*

Simultaneously phasing down the use of HFCs and introducing super-efficiency appliances

Implementing HFC measures can almost completely eliminate one of seven greenhouse gases in the Kyoto basket, avoid the climate impacts of HFCs before they grow any larger, and achieve further benefits by catalyzing improvements in appliance energy efficiency.

HFC: A Fast-Growing Climate Threat

HFCs are factory-made chemicals primarily produced for use in refrigeration, air conditioning, insulating foams, and aerosol propellants, with minor uses as solvents and for fire protection.

HFCs are very powerful greenhouse gases, trapping thousands of times more heat in the atmosphere per unit of mass than CO_2.

HFCs were first commercialized in the early 1990s, and have caused only 1% of total global warming to date; however, production, consumption, and emissions of these gases are ***growing at a rate of 8–15% per year*** and are the fastest growing climate pollutants in many countries including the U.S., EU, Australia, China, and India.

Without fast targeted policies to control HFCs their forcing will increase as much as thirty-fold by 2050 and will add:

- up to **0.1°C** of warming by mid-century, and
- will increase five-fold up to **0.5°C** by 2100.

In addition to direct emissions, by 2050, the unchecked growth of HFC production and use will produce up to 64 $GtCO_2$-eq of HFCs trapped in millions of "HFC banks."

One of the Biggest and Fastest Actions for Climate

The reduction of HFC emissions through a phase-down under the Montreal Protocol and parallel measures at a national level (see Table 1) would reduce the climate forcing of HFCs in 2050 to below their current forcing today.

This would **effectively eliminate a climate threat before it develops.** Climate friendly alternatives are already available in every major sectors, and are expected to be available for all sectors by 2025.

A fast phasedown of HFCs can to prevent up to 8.8 Gt CO_2 *per year* in emissions by 2050. The proposed phasedown will avoid up to 0.5˚C of warming by 2100.

A more ambitious strategy of completely eliminating the use of high-GWP HFCs by 2020, would avoid emissions equivalent up to 200 Gt CO2-eq by 2050. This is more than 10% of the climate mitigation needed to stay below the 2°C guardrail for limiting warming above pre-industrial levels.

Catalysing Energy Efficiency and Sustainable Development Benefits

In addition to the direct climate benefits from HFC mitigation, transitioning away from HFCs can catalyze additional climate benefits through improvements in the energy efficiency of the refrigerators, air conditioners, and other products and equipment that use HFC refrigerants.

Previous phase-outs of refrigerants have catalyzed improvements in the energy efficiency of air conditioners and other appliances using the refrigerants, by 30-60% in some sectors.

A 30% improvement in the technical energy efficiency of mini-split room air conditioning in parallel with a transition to low-GWP refrigerants has the potential to significantly reduce peak-load energy demand equal to 544–1,270 gigawatts (GW) of electricity by 2050.

This would avoid (or free up for other uses) an amount of electricity equal to the production of up to 1,587 medium-sized peak-load coal power plants by 2030, and up to 2,540 by 2050, which would avoid an additional 100 billion tonnes of CO_2-equivalent emissions.

Country	Avoided Power Plants in 2050
Brazil	92-216
Chile	2-4
China	310-720
Colombia	10-24
Egypt	20-46
India	219-511
Indonesia	60-140
Mexico	11-26
Pakistan	18-42
Saudi Arabia	5-12
Thailand	14-30
UAE	2-6
Vietnam	15-36
Global	1090-2540

Reductions in fuel emissions have substantial benefits to air quality, human health, fuel security. Agricultural yields and ecosystem integrity are also protected from damage by ground level ozone and other toxic air pollutants.

CLIMATE & CLEAN AIR COALITION
TO REDUCE SHORT-LIVED CLIMATE POLLUTANTS

HFC Measures	
General	○ Phase Down HFCs in all sectors under the Montreal Protocol
Industry & services	○ Implementation of good practices including leakage control, improved components, and end-of-life recovery; ○ Training of servicing technicians; ○ Technology conversion to lower-GWP or not-in-kind alternatives; ○ Reduce the charge size and improve energy efficiency; ○ Ban imports of products containing high-GWP HFCs, unless essential; ○ Retrofit/replacement of refrigerants with lower GWP alternatives provided the equipment allows this can be done safely and without jeopardizing energy efficiency.

Main Takeaways

- Fast action to cut HFCs can avoid up to 100 to 200 billion tonnes of CO_2-equivalent emissions by 2050, and avoid up to 0.5°C of warming by the end of the century.
- A phasedown can be achieved quickly because low-GWP alternatives exist in almost every sector.
- Phasing down HFC while improving AC efficiency can save enough energy to avoid building up to 2,500 medium-size peak power plants by 2050.

Take Action with the CCAC HFC Initiative

The CCAC HFC Initiative is working to ensure rapid delivery of climate and clean air benefits by mobilize efforts of the private sector, civil society, international organizations, and governments to:

- Promote the development, commercialization, and adoption of climate-friendly alternatives to high-GWP HFCs for all relevant industry sectors
- Build international awareness and support for approaches to curb HFC growth, such as a global phase-down of HFC consumption and production under the Montreal Protocol and commitments/pledges by CCAC partners
- Encourage national, regional and global policies or approaches to reduce reliance on high-GWP HFCs and support the uptake of climate-friendly alternatives
- Overcome barriers that limit the widespread introduction of these climate-friendly technologies and practices, including those related to the establishment of standards
- Encourage the responsible management of existing equipment and better designs for future equipment in order to minimize leaks.

WITH THE COMBINATION OF STRONG SCIENCE, HIGH LEVEL POLITICAL WILL, AND A RANGE OF COST-EFFECTIVE MEASURES, THE CCAC ENCOURAGES FAST ACTION TO ACHIEVE REAL AND MULTIPLE BENEFITS.