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Fast HFC Phase-Down Could Avoid 200 Billion Tonnes of CO_2–eq by 2050

Fast action under Montreal Protocol can eliminate climate threat from one of the six main greenhouse gases

Washington, DC, 12 May 2014 – A fast phase-down of factory-made HFCs could avoid the equivalent of as much as 200 billion tonnes of CO_2 ($GtCO_2$-eq) by 2050, according to a study published today in *Atmospheric Chemistry and* Physics, by Guus Velders, Susan Solomon, and John Daniel, *Growth of climate change commitments from HFC banks and emissions.*

The HFC reductions could be achieved quickly and inexpensively with a leap-frogging strategy where countries currently phasing-out hydroclorofluorocarbon (HCFCs) under the Montreal Protocol leap frog over HFCs and use already available climate-friendly alternatives. President Obama has made the phase down of HFCs under the Montreal Protocol a central part of his Climate Action Plan. In pursuit of this goal, the U.S., Mexico, and Canada filed a proposed amendment last week to phase down HFCs under the Montreal Protocol. A similar proposal is expected this week from the Federated States of Micronesia.

Alternatives already exist to replace climate-damaging HFCs for most industry sectors, including natural refrigerants such as CO_2, and hydrocarbons, and many more are in the development pipeline. Many of these alternatives have comparable or better energy efficiency than the gases that they are replacing, providing additional climate benefits from reduced energy use, and cost savings to consumers. Traditionally, the re-engineering that accompanies the switch to new alternatives has produced improvements in energy efficiency of air conditioners and refrigeration of 30% to 60%.

According to Velders, Solomon, and Daniel, "If…HFC production were to be phased out in 2020 …, not only could about 91–146 GtCO2-eq of cumulative emission be avoided from 2020 to 2050, but an additional bank of about 39–64 GtCO2- eq could also be avoided in 2050." Banks include chemicals contained in existing refrigeration and air conditioning equipment, chemical stockpiles, foams, and other products, which are slowly released into the atmosphere over a decade or more. For comparison annual CO_2 emissions in 2050 are projected to be between 12 and 75 Gt per year, depending on the success with various mitigation strategies.

"A phase down of HFCs through a leap frogging strategy would quickly and effectively eliminate the climate threat from one of the six main greenhouse gases," said Durwood Zaelke, President of the Institute for Governance & Sustainable Development. "HFCs are the fastest growing greenhouse gases in many countries including the U.S., E.U., China, and India." Between 2006 and 2010 global HFC emissions grew at a rate of 10-15% per year, and according to recent U.S. EPA estimates, HFCs were the only category of greenhouse gases in the U.S. that increased in 2012. The growth in HFCs is being driven by the previous phase-out of chlorofluorocarbons (CFCs) and the ongoing phase-out of HCFCs under the Montreal Protocol.

To-date over a hundred countries support phasing down HFC production and consumption, including the G20 heads of State and the more than 100 heads of State signing the Rio+20 declaration. In 2013 the presidents of the U.S. and China agreed to work together to phase down HFCs using the expertise and institutions of the Montreal Protocol to phase down production and consumption, leaving accounting and reporting in the UN Framework Convention on Climate Change. HFCs were also an important part of the UN Secretary General's Abu Dhabi Ascent earlier this month.

While today HFCs have caused less than 1% of total global warming, previous estimates have projected that without fast action the climate forcing of HFC will increase as much as thirty-fold by 2050, adding as much as 0.5ºC of additional warming by the end of the century. This new study shows that "[e]arlier phaseouts of HFCs would yield benefits for climate protection that are about 40% larger than estimates based on concentrations and radiative forcing in 2050 alone, due to the added impact of avoided banks."

In 2009 Velders lead another effort that projected that the climate impact of uncontrolled HFC emissions would grow from *de minimis* levels of today, where they represent about 1% of total forcing, to the as much as 16% of CO_2 values in 2050. The new study shows that when forcing from HFC banks is included, the annual rate of increase in radiative forcing by HFCs in 2050 could be half of the annual increase from CO_2.

The study authors also note that an early-phase down under the Montreal Protocol would be more cost effective than waiting and having to collect and destroy HFCs slowly leaking from banks, pointing out that "HFC banks are dispersed across the globe to a much greater extent than are the HFC production facilities." Comparatively, the completed phase-out of the production and consumption of CFCs and on-going phase-out of HCFCs has been achieved at a cost to the public of less than a dollar per equivalent tonne of CO_2. The Montreal Protocol Technology and Economic Assessment Panel (TEAP) has estimated that destroying currently existing banks of ODSs could cost as much as $19 per equivalent tonne of CO_2.

"When it comes to HFCs an ounce of prevention is truly worth a pound of cure," stated Zaelke. "The message should be clear. Immediately, phasing down high-GWP HFCs is the biggest, fastest, and cheapest climate mitigation opportunity available to the world today. This is a unique opportunity for fast climate mitigation to completely eliminate a climate threat before it even happens. Just imagine what we could have done if we had similar forewarning at the beginning of the industrial revolution."

The abstract follows:

> **"Abstract.** Chlorofluorocarbons (CFCs) are the primary cause of ozone depletion, and they also contribute to global climate change. With the global phaseout of CFCs and the coming phaseout of hydrochlorofluorocarbons (HCFCs), the substi- tute hydrofluorocarbons (HFCs) are increasingly used. While CFCs were originally used mainly in applications such as spray cans and were released within a year after production, concern about the ozone layer led to reductions in rapid- release applications, and the relative importance of slower- release applications grew. HFCs are now mainly used in refrigerators and air conditioners (AC) and are released over years to a decade after production. Their containment in such equipment represents banks, which are building up as production grows. A key finding of our work is that the increases of HFC banks represent a substantial unseen commitment to further radiative forcing of climate change also after production of the chemicals ceases. We show that earlier phaseouts of HFCs would provide greater benefits for climate protection than previously recognized, due to the avoided buildup of the banks. If, for example, HFC production were to be phased out in 2020 instead of 2050, not only could about 91–146GtCO2-eq of cumulative emission be avoided from 2020 to 2050, but an additional bank of about 39–64 GtCO2- eq could also be avoided in 2050. Choices of later phaseout dates lead to larger commitments to climate change unless growing banks of HFCs from millions of dispersed locations are collected and destroyed."

IGSD's *HFC Primer* is here.