

**M**ontreal Protocol, the multilateral treaty to protect the ozone layer, has been a successful environmental agreement. But an impasse over restricting the use of extremely potent greenhouse gases marred the Protocol's 25th anniversary celebrations on September 16, 2012. These gases, called hydrofluorocarbons (HFCs), emerged as the coolant of choice after the Protocol banned ozone-depleting chemicals used in the refrigeration and air-conditioning sectors. While developed countries seek to amend the Montreal Protocol to control the use of HFCs, developing countries contend that the agreement does not and cannot have the mandate to regulate greenhouse gases. They say the amendment proposal is a ploy of rich nations to sell HFC replacement technologies and mint money.

Produced mostly in developed countries, HFCs replaced chlorofluorocarbons (CFCs) and hydrochlorofluorocarbons (HCFCs) that were phased out under the Montreal Protocol on Substances that Deplete the Ozone Layer. HFCs pose no harm to the ozone layer because, unlike CFCs and HCFCs, they do not contain chlorine that depletes the ozone layer. But HFCs are super-greenhouse gases with an extremely high global warming potential. This means they are capable of trapping enormous amounts of infrared radiations in the atmosphere and can cause a greenhouse effect a thousand times stronger than carbon dioxide.

#### **The debate: Developed countries want to discuss HFCs under Montreal Protocol, developing countries under climate negotiations**

It's been four years since the issue of bringing HFCs under the Protocol's ambit was raised. Developed countries say that since the rise in the emission of super-greenhouse gases is a consequence of the phasing out of CFCs and HCFCs under the Montreal Protocol, the same agreement should monitor them.



Developing countries like India, China and Brazil, however, say that the emission and regulation of greenhouse gases fall under the purview of the United Nations Framework Convention on Climate Change (UNFCCC) and HFCs already figure in the basket of six greenhouse gases under the Kyoto Protocol. Developed countries following the Kyoto Protocol report their HFC emission data to UNFCCC; parties to the Montreal Protocol have no such obligation. The Indian government maintains that HFCs should be discussed under UNFCCC as a matter of principle.

At the root of this argument is a doubt. Developing countries are apprehensive about the high cost of transition from HFCs to a safer option. A technology transfer mechanism is under discussion at UNFCCC. Developing countries feel that they have a better chance of devising a more economical option under UNFCCC than the Montreal Protocol. Besides, they say

they have been toeing the line of the developed world for years, but not anymore.

### **Questions: Where is the technology? How much will transition cost? Who will pay?**

In accordance with the provisions of the Montreal Protocol, developed countries began phasing CFCs out in the late 1980s. Developing countries were granted more time to phase out CFCs.

Once the phase-out began, developing countries were free of CFCs by 2010. But by this time the use of HCFCs increased sharply in these countries. In the fourth meeting of the Montreal Protocol in 1990, developed countries pledged to freeze the production and consumption of HCFCs by 2004, and phase them out completely by 2020. Developing countries consented to freeze them by 2013 and phase them out by 2030. This means that from next year onwards, developing countries are expected to move to gases with lesser impact on the ozone. And that should ideally be HFCs since they are the third generation gases already in use in developed nations.

But since HFCs have now been found to have a high global warming potential and their emissions are already on rise, developed countries maintain that developing countries should not use them as a replacement for HCFCs. In effect, they are asking developing nations to leapfrog to the next generation of coolants when they themselves continue to use HFCs. The argument is that unless HFCs are phased out along with HCFCs, the impact on global warming will be severe. But developing countries' answer to the

debate is a question—where are the alternatives to HFCs?

Although there are HFCs with a lower global warming potential, just a handful of companies, such as DuPont, Arkema, Honeywell and Daikin, in developed nations have the technical knowhow in that field.

According to a 2011 United Nations Environment Programme (UNEP) report, there is no one-size-fits-all alternative to HFCs. Even though technologies with low global warming potential are commercially available they cater to specific applications and geographic regions. There are certain barriers in their wider application. These products require regulatory approvals and new safety standards before commercialisation as they contain flammable or toxic gases like ammonia and propane. In most regions, except in Europe, low-global-warming-potential technologies are fairly minor players, says the report. With profits from the existing cooling systems booming and no effective regulation on HFCs, there is little incentive for countries or companies to bring new products in the market. But Indian firm Godrej claims to be the first company in the world to have started making and selling air conditioners that do not use the HFCs as coolants (*see box: Setting a precedent*).

### **Rise in HFC emissions: Could offset the benefits of Montreal Protocol**

Unlike many developed countries, EU has legislation to control the use of HFCs, which it calls the Fluorinated Gases Regulation or the F-gas Regulation. But a report by the Environment Investigation Agency, a non-profit

### **Setting a precedent: Godrej, by using propane instead of HFCs**

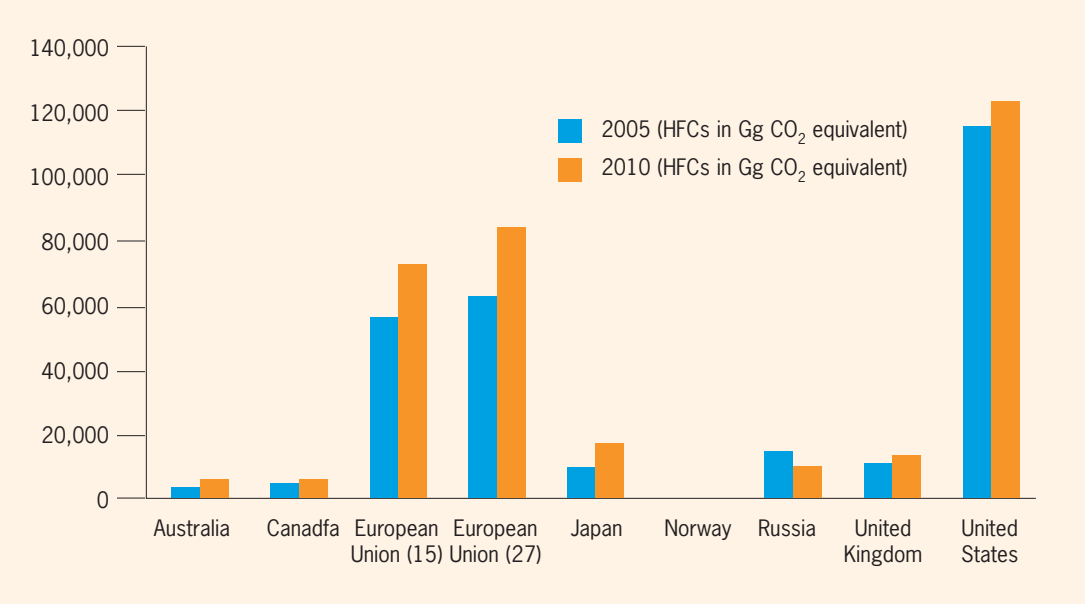
Godrej is the first company to commercialise green air-conditioners that use propane and not HFCs. In mid-2010, the Ozone cell of the Union Ministry of Environment and Forests and Godrej collaborated with GIZ, which helps the German government with services on international cooperation and sustainable development, to develop an environment-friendly technology for air-conditioning.

After deliberations, they zeroed in on propane, a gas that neither impacts ozone negatively nor is a super greenhouse gas, like HFC. In April 2012, Godrej went commercial with its non-HFC air-conditioners. Marketed under Godrej Eon Green Balance Series, the air-conditioners use a propane gas-based technology called R290, which has zero ozone-depleting potential and a global warming potential of three. The warming potential of a gas

depends on its atmospheric lifetime, which is the duration after which the gas naturally disintegrates. Those with a shorter lifespan are less hazardous. For instance, HFC-134a has a lifetime of about 13 years and its global warming potential is 1,370. In contrast, HFC-1234yf, with a lifetime of about 10 days, has a global warming potential of four.

The product has currently been introduced in the premium range of air-conditioners and the technology will be up-scaled for all its air conditioners. Godrej is also among the first companies to make green refrigerators, using hydrocarbon. The company claims their products conform to the EN378 standard, the European standard for the design and construction of refrigeration systems, and hence their products are safe.

Graph 1: HFC emissions increasing in the developed world

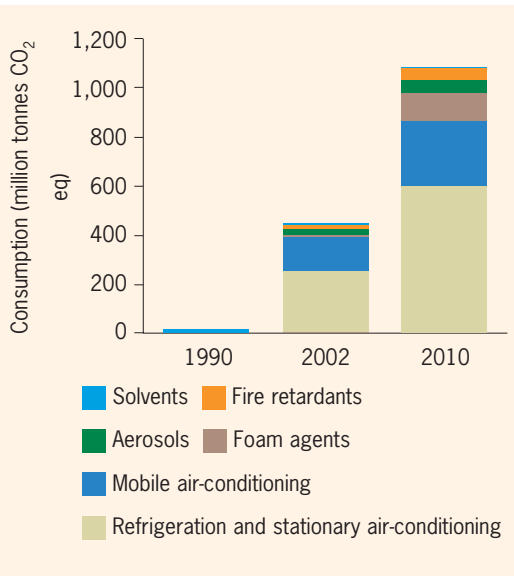


Source: compiled from data submitted by Annex I countries to United Nations Framework Convention on Climate Change on HFC emissions.

in the UK, says that while EU has almost completed the phase out of HCFCs, its HFC emissions have risen by 28 per cent, and might rise to 82 per cent by 2050, even with the full implementation of the F-gas Regulation. The regulation, clearly, is not sufficient to address the HFC emissions. Studies indicate that if the increase continues in its present pattern, it would offset the benefits of Montreal Protocol.

The HFC emissions are projected to reach 5.5–8.8 giga tonnes of carbon dioxide equivalent per year (GtCO<sub>2</sub>-eq/yr) by 2050 (Carbon dioxide equivalent per year is the measure of a quantity that describes the amount of carbon dioxide that would have the same global warming ability as a given mixture and amount of a greenhouse gas when measured over a specific timescale). In comparison, emissions of ozone-depleting substances peaked at 9.4 GtCO<sub>2</sub>-eq/yr in 1988 and could have reached 15-18 GtCO<sub>2</sub>-eq/yr in 2010 in the absence of Montreal Protocol.

Graph 2: Global HFCs consumption



Source: “HFCs: A Critical Link in Protecting Climate and the Ozone Layer”, a report by United Nations Environment Programme (2011)

### Ozone depletion and global warming linked: Bad news for the US

A recent study by Harvard University published in *Science* found that the US is under serious risk of ozone loss. During intense summer storms in the country, water vapour is thrust into an otherwise dry lower stratosphere. This water vapour reacts with the chlorine and bromine that have appeared in the atmosphere as a result of the widespread use of CFCs in the past. The products of these reactions damage the stratospheric ozone. While the use of CFCs has now declined, the chlorine and bromine released in the stratosphere might take decades to deplete.

More global warming would lead to more storms, and they will increase the risk of ozone loss, the study found. The news has come as a jolt to the US, which has been evading action on climate change and has maintained that it will not commit to any legally binding emission reduction target till emerging economies like India and China do so. Researchers also pointed out that a similar condition could exist over other mid-latitude regions.

While the scientific community continues to issue repeated warnings over environmental degradation, nations stay stuck in policy quicksand.



The UNEP report states that the current contribution of HFCs to climate change is less than one per cent. The problem, however, is that the emissions of the ones with longer lifespan are on the rise due to their extensive use in developed countries. Therefore, the argument returns: while developed world itself is using HFCs why should it burden

developing countries with a new technology regime that is not even in place?

While the debate appears endless, research has linked global warming to ozone depletion, prompting the need for urgent action to check the levels of HFCs (*see box: Ozone depletion and global warming linked*).





## What is happening in negotiations: Stalemate in Montreal Protocol

Proposals to amend the Montreal Protocol to regulate production and use of HFCs have been tabled by Micronesia, and Canada, Mexico and the United States, since 2009 at the Meeting of Parties under Montreal Protocol. But developing countries have consistently argued against the inclusion of HFCs under Montreal Protocol based upon questions regarding the legality of action on HFCs by the Montreal Protocol, lack of information on alternatives, and concerns about costs. At the thirty-second meeting of the open-ended working group (OEWG) of the parties to the Montreal Protocol held in July 2012, the stalemate over amending Montreal Protocol to include HFCs remained. Countries took the following positions at the meeting:

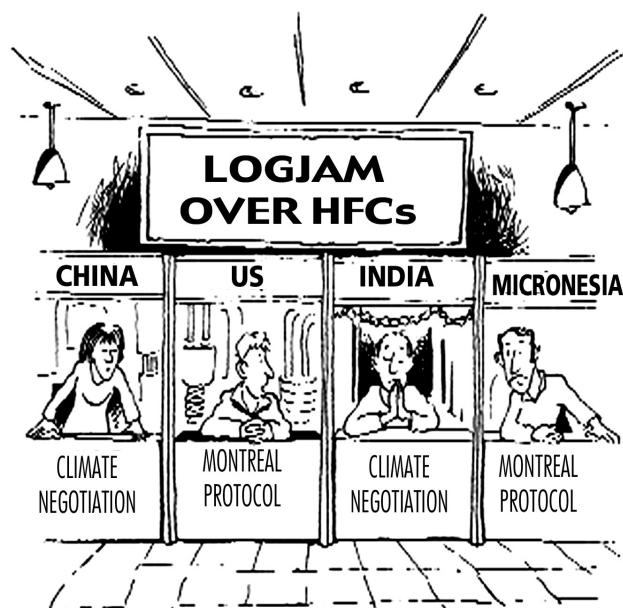
**US:** justified its proposal to amend the Montreal Protocol by drawing attention to the UN Conference on Sustainable Development (Rio+20) outcome document that recognizes “the phase-out of ODS is resulting in a rapid increase in the use and release of high-GWP HFCs to the environment” and supports “a gradual phase-down in the consumption and production of HFCs”

**Micronesia:** highlighted that the proposal has been tabled for four years, that the increase in HFC consumption and production was caused by the phase-out of HCFCs under the Protocol, and that it would be “immoral” to pass the problem to the UNFCCC

**Cameroon, Costa Rica, the Former Yugoslav Republic of Macedonia, Guinea, Japan, Kenya, Australia, New Zealand, Nigeria, Norway, Saint Lucia, Senegal, Morocco, Colombia, Serbia and Dominican Republic:** supported establishing a contact group under this agenda item

**EU:** supported the amendment proposals, stating Kyoto Protocol deals with emissions, but Montreal Protocol deals with issues of production and consumption, and the two bodies could act in a complementary manner  
**Cuba:** did not support amending the proposal under the Protocol, and said the issue of HFCs should be taken up under the UNFCCC in collaboration with the Montreal Protocol, resulting in synergies between the two instruments.

**South Africa:** stressed the Rio+20 outcome document does not specify which convention should address HFCs, and suggested considering voluntary HFC phase-down.



**Brazil:** preferred HFCs be addressed by Annex 1 parties under the UNFCCC, explaining the amendment proposals are inadequate. Brazil urged delegates who have been most vocal on this issue to show similar enthusiasm during discussions at UNFCCC meetings.

**India:** preferred addressing HFCs under the UNFCCC, stating parties to the Montreal Protocol can move away from high-GWP alternatives without the proposed amendments. It raised procedural concerns regarding the establishment of a contact group. India also expressed concern over the number of times the proposed amendments have been presented to the parties even though these proposals deal with issues outside the Protocol's ambit.

**China:** stressed that HFCs are controlled under the UNFCCC's Kyoto Protocol and should not be discussed under the Montreal Protocol, and cautioned against undermining the legal jurisdiction of the UNFCCC

**Argentina:** said no to HFCs being discussed under Montreal Protocol

**Bahrain:** stressed that HFCs are not ODS; an HFC phase down is currently not technically or financially feasible; and more studies need to be carried out on alternatives to HFCs.

**Malaysia:** said the discussion should be held under UNFCCC and opposed the formation of a contact group

**Bahrain and Iraq:** opposed the formation of a contact group

**Outcome:** OEWG 32 agreed to forward the amendment proposals to the next meeting of parties.

## HFC-23: A money-minting, humanmade evil

HFC-23 is a potent greenhouse gas, generated during the manufacturing of coolant HCFC-22. The gas has a limited industrial use in extremely low temperature refrigeration and speciality fire suppressants. There are 19 HCFC-22 production facilities in developing countries that capture and destroy HFC-23. These are financed by carbon emission reduction credits under the Kyoto Protocol's Clean Development Mechanism (CDM).

But the financial aid is about to stop. Effective from 2013, the EU has banned the use of HFC-23 credits. Since the CDM programme started, 46 per cent of the credits were awarded to the 19 factories, 11 of which are in China and four in India. The remaining are spread across Argentina, Mexico, South Korea and Russia.

The West realised that its decision to buy carbon credits, which the developing countries obtained by destroying HFC-23, had boomeranged. The economics is simple: developing countries had an incentive for destroying HFC-23 as this earned them a very high number of carbon credits. Under the UNFCCC

methodology, carbon dioxide, released by smokestacks and vehicles, is given a value of 1. Other industrial gases are assigned values relative to that, based on their warming effect and how long they linger. For instance, methane is valued at 21, nitrous oxide at 310 and so on. HFC-23 is near the top of the list, at 11,700. The carbon credits earned by destroying one tonne of HFC-23 stand at 11,700 as opposed to one carbon credit earned by destroying one tonne of carbon dioxide. This has driven plants in the developing world to increase the production of HCFC-22.

Is the ban going to help reduce HFC-23 emissions? There is little hope as atmospheric concentrations of HCFC-22 continue to rise, likely due to its production in facilities not covered by the Kyoto Protocol's CDM projects. Data indicates that over 90 per cent of annual HFC-23 emissions originate from non-CDM HCFC-22 production facilities in China. This, in turn, contributes to a rise in HFC-23 levels in the atmosphere. Besides, the destruction technology is cheap. There is rising demand that these should be destroyed through domestic legislation.

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