



Summary Report

Roundtable Discussion on Phasing Down HFCs in India: Road to the HFC Amendment to the Montreal Protocol

Date: 26 September 2016 | 11:00 AM – 2:00 PM | Venue: Teesta Conference Hall
Ministry of Environment, Forest and Climate Change, Govt. of India,
Indira Paryavaran Bhawan, New Delhi

1. Background

India's built environment is projected to grow fivefold between 2005 and 2030, and vehicular density is projected to more than triple by 2030. As rapid economic growth results in rising standards of living, use of air conditioning in buildings and vehicles is expanding rapidly. With the Montreal Protocol phasing out use of ozone depleting substances, Indian industry is in the process of substituting hydrochlorofluorocarbons (HCFCs) used in refrigeration, air conditioning, foams, solvents and other sectors with hydrofluorocarbons (HFCs). HFCs do not affect the ozone layer, but have significant global warming potential over ten thousand times greater than carbon dioxide.

Global markets are already shifting away from HFCs. European Union, Japan, United States, China, the state of California, and a number of other countries and regions are taking steps to phase down their use. Products using alternative technologies are already available in Indian markets. Nearly a million room air conditioning units using low- or mid-GWP refrigerants (HC-290 and HFC-32) have been sold in India till date, and India's automobile manufacturing companies have been amongst the first in developing countries to test vehicles using low global warming refrigerants (HFO-1234yf and HFC-152a) in order to cater to international export markets. Other domestic sectors such as foams are also switching to HFC alternatives such as hydrocarbons and hydrofluoroolefins (HFOs).

In June 2016, Indian Prime Minister Modi and U.S. President Obama pledged to work for a Montreal Protocol HFC amendment this year with "an ambitious phasedown schedule" for all countries and "increased financial support" from developed countries to the Protocol's Multilateral Fund (MLF) to help developing countries with implementation. At the latest round of discussions held during the Third Extraordinary Meeting of the Parties to the Montreal Protocol at Vienna, Austria in July 2016, significant progress was made toward coming to an international agreement to phase out HFCs. However, the final agreement on an amendment to the Montreal Protocol is yet to be negotiated at the upcoming 28th Meeting of the Parties to the Montreal Protocol in Kigali, Rwanda in early October. Countries will begin negotiations next

week by discussing baseline and freeze years for Article 5 Parties, before moving on to discussions on other important issues relating to financing, technology transfer and phase down steps for developed and developing countries.

To help address these questions, the Ministry of Environment, Forest and Climate Change together with knowledge partners the Council on Energy, Environment and Water (CEEW) and Natural Resource Defense Council (NRDC) convened a roundtable discussion on 26 September 2016 in New Delhi. The purpose of the discussion was to engage stakeholders from across industry groups, international experts, and seek their input on challenges in phasing down high-GWP HFCs specifically in the context of the Indian economy, its growth, and challenges for specific sectors.

2. Welcome Address and Initial Remarks

The discussion began with a short welcome note by Mr M.K. Singh, Joint Secretary, Ministry of Environment Forests and Climate Change (MoEFCC), Government of India. Mr Singh set out the agenda for the discussion and gave a short history of the negotiations. He summarised the various amendment proposals under negotiation and distinguished other developing countries' proposals from the Indian proposal. He said that apart from China and India, no other developing country has production capacity for refrigerants, and therefore, their proposals are not applicable to India with its unique characteristics. He added that although China is a producer, a majority of its refrigerant use is for appliances exported to Europe and other markets; it would therefore not be economically hit by an early freeze year.

Mr. Singh emphasized that though it is clear that an HFC phase down is inevitable, the question that remains is how much time and “carbon space” India can negotiate for its industry. In order to decide on a phasedown schedule, India’s negotiators will consider the economic burden of the transition in relation to climate benefits. He also acknowledged the positive role played by the MLF’s response to India’s concerns and the positive spirit of the negotiations. He concluded his remarks by stressing on demanding India’s fair share of the carbon space, and that India would negotiate for even greater ambitiousness in phase down schedule for developed countries, to further help drive down cost and ease the transition by developing countries.

3. Session 1: Amendment proposals and HFC negotiations

India’s HFC emissions and mitigation cost

Dr Vaibhav Chaturvedi, Research Fellow at CEEW made the case for why the issue of HFCs is significant, both for the climate debate and for India. He spoke about the paucity of data about India’s HFC’s emissions and took the group through CEEW’s research in modelling India’s long-term HFC emissions from different sectors. He also detailed the challenges ahead

for India if an HFC phaseout amendment is passed: the huge economic burden (USD 34 billion in case of the North American proposal), patent issues and the need for India-focused research and development (R&D). There is a strong case to be made for differentiating India from other developing countries as it has a significant refrigerant production capacity and economic growth expectations are also high for the next 15-20 years. Dr. Chaturvedi emphasized that all the proposals together present a trade-off between economy wide cost and environmental mitigation, and the Indian government needs to make a decision on this trade-off.

Benefits of an early transition

Bhaskar Deol, from NRDC made a presentation on the benefits of an early transition from HFCs for India. He discussed two significant developments from the preceding weeks: an announcement by 500 global companies (including Indian companies like Godrej) who support an early phasedown of HFCs and also announcements by major governments and philanthropies about the creation of \$80 million of funding support, immediately available to developing countries to get started with an early phasedown. He also stressed on the gains to be made from an early phasedown—such as energy efficiency gains, helping India meet its Nationally Determined Contributions targets in the climate change negotiations and the environmental benefits compared to costs.

Funding for energy efficiency

Stephen Anderson, Director of Research at the Institute for Governance & Sustainable Development (IGSD) addressed the gathering by remarking on India's positive contributions to the Montreal Protocol negotiations. He also stressed on how the upcoming negotiations could be an opportunity for India because of the energy efficiency gains and funding available for transition. However, he acknowledged that in the past, the MLF had been unable to dispense funds to Parties desirous of making a transition, due to lumpiness of funding requirement by companies having to be balanced against periodic replenishments of the MLF. Mr. Andersen emphasised that India should push for a better system of funding for companies so that they can take advantage of efficiency improvements.

Concerns of the Indian industry

Industry association representatives delivered brief statements at the gathering: overall, they voiced support for India's proposed amendment with a late freeze date.

- Representatives of Refrigeration and Air-Conditioning Manufacturers Associations (RAMA) noted that safety and flammability issues could not be overlooked by appliance manufacturers, and had to be balanced with low-GWP alternatives. They also

said that India's consumption of HFCs had not yet peaked, unlike developed countries who would not be burdened by an HFC phasedown. Furthermore, growth in the air-conditioning sector had stagnated in recent years—a phasedown schedule in the future may impact the industry during its projected growth phase.

- Representatives of Refrigerants Gas Manufacturing Association (REGMA) added that since India had recently made the transition for HFCs, a transition away from HFCs would impact investments already made. Further, since refrigerant manufacturers do not yet have the capability to manufacture large quantities of low GWP refrigerants, India would essentially surrender this market to Chinese companies. They concluded that any phasedown schedule should be practical and supported by funding from the MLF.
- Representatives from Maruti Suzuki echoed these remarks and added that due to the upcoming Euro VI regulations, further regulations on refrigerants would make it hard for car manufacturers to adapt. Furthermore, the cost of alternatives and the lack of drop-in solutions would make it hard to make changes to system design.
- Representatives from the Confederation of Indian Industries also added that incentives for scaling up potential alternatives were important.
- Representatives from the Indian Polyurethane Association (IPUA) also raised concerns about the cost of the alternatives for small and medium enterprises, who would find it difficult to sustain their businesses even after receiving funding from the MLF.
- On a different note, a representative from All India Air-Conditioning and Refrigeration Association (AIACRA) noted that the service sector cannot be ignored—responsible as it is for a substantial percentage of refrigerant consumption. He voiced concern over how the phaseout of R410A might impact this sector in light of the fact that training for servicing R410A equipment was still incomplete, even though this refrigerant is in the market. He believed that despite being an important stakeholder, the servicing sector was not being kept abreast of coming changes.
- The lack of suitable and cost-effective alternative refrigerants due to lack of testing in high ambient temperature regions, patents and suitable drop-in solutions were also highlighted as issues likely to impact India's choice of phasedown schedule.

Highlights from the keynote address by Hon'ble Minister of Environment, Forest and Climate Change, Shri Anil Madhav Dave

The keynote address was delivered by the Minister of State (Independent Charge) of the MoEFCC, Mr Anil Madhav Dave. Mr Dave began by assuring the gathering that the MoEFCC would take into consideration the views of all stakeholders. He said that Indian government wants to reach an agreement to amend Montreal Protocol this year, and will keep national interest at the heart of any decision in the international sphere.

The Minister stressed that the response to climate change was the Gandhian way of life and that controlling carbon emissions would be impossible in absence of a sustainable lifestyle. He

emphasized the need for more efforts towards indigenous research and development to find technical solutions to support the manufacturing sector. He suggested that companies use their corporate social responsibility corpus toward supporting R&D efforts, as this would go a long way in fulfilling the government's Make in India initiative. He also pointed to the importance of demand-side management policies like buildings with lesser cooling needs and reducing consumption by end-users. Finally, Mr Dave highlighted the importance of funding, and mentioned that funding should be given in advance to developing economies for supporting their transition.

Remarks by Mr R.R. Rashmi, Special Secretary, MoEFCC

Mr R.R. Rashmi, Special Secretary, MoEFCC, summed up the Minister's speech for the group by reassuring the group that the debate was not about the "what" and "why" of HFC phasedown, but "how?" He added that while it was clear that India needs to do everything possible to address climate change, national interest was also important. He added that since the cost of the transition would be very high, either India would have to wait for patents on alternatives to expire or the MLF would have to factor patent licensing costs into the funding mechanism. Flexibility in the choice of technologies needs to be an important consideration. On the funding aspects, Mr Rashmi asked for more information on the proposed coalition on energy efficiency, and whether it would work independently or with governments, and how it would align with the Multilateral Fund. He added that substantial investment would be required for domestic R&D and the global process needs to take this into account.

Vote of Thanks

The vote of thanks was delivered by Dr Arunabha Ghosh, CEO, CEEW. Dr Ghosh mentioned the four ongoing international negotiations on climate: United Nations Framework Convention on Climate Change (UNFCCC), the Montreal Protocol, the International Civil Aviation Organisation (ICAO) and the International Solar Alliance (ISA) and how each negotiation may impact the others. He observed that while on the surface there was an incoherence between the negotiations, ultimately the underlying motivations were the same. He also emphasized the importance of resolving patent issues, increasing R&D, financial decisions and market signals in arriving at a viable amendment on HFCs. Dr Ghosh thanked the Minister, the Special Secretary, the Joint Secretary, the co-organisers and all the representatives from industries and other organisations for their participation and expressed his hope that the group would arrive at some consensus.

Session 2: Opportunities and challenges for the commercial air-conditioning sector

The second session of the discussion focused on “*Commercial air-conditioning sector—Opportunities and challenges*”. Presenters Prof. R.S. Agarwal and Prof. M.P. Maiya laid out the different alternatives that exist for the sector. Prof Agarwal emphasized the trade-off between global warming potential and flammability on the one hand and efficiency and volumetric capacity on the other hand when researching alternatives. Furthermore, since there were many types of commercial air-conditioners, each sub-sector has its own challenges, issues and alternatives. Prof. Agarwal agreed with the broad conclusion that some sub-sectors with the commercial air-conditioning domain are more ready than others for a transition as these have technical alternatives available and cost is not a challenge for these sub-sectors, e.g. centrifugal chillers. Variable refrigerant flow (VRF) technology is one sub-sector where technically viable alternatives are not available as per the available information. In discussions, an industry participant announced that their company was in the process of launching equipment using a mid-GWP refrigerant in the VRF segment.

Prof. Maiya discussed natural refrigerants as a possible alternative in light of the cost and possible toxicity issues with many refrigerants currently on the market. He outlined the options available, and some of the applications where they have been tested. While many may not be viable for high ambient temperature climates, he opined that options like ammonia and water have not been sufficiently explored and would be ripe areas for research. He also informed the participants about the progress on research on testing CO₂ as a refrigerant for commercial refrigeration. He agreed with the industry representatives that if research proves that specific natural refrigerant alternatives are technically not feasible for Indian temperature conditions or are costly, these should not be adopted. Prof. Maiya made the case for an alternative way for defining the GWP, and emphasized that the definition or acceptable standard for an alternative refrigerant should take into account the charge size and weight-adjust GWP per tonne of cooling capacity.

Session 3: The cost of alternatives to high GWP refrigerants

The third session was on “*The cost of alternatives: What can stakeholders expect?*” with a presentation by Mr Kapil Singhal, of B.P. Refcool. He referred to the previous experience of transitioning away from CFC-12 (used in mobile air-conditioning) and how the shift to HFC 134a was smooth though the refrigerant was far more expensive. He stated that from previous experience, it is clear that the transition to non-HFCs will happen in a similar fashion. Mr Singhal informed the participants that even though HFO-1234yf is not currently manufactured in India, 32 tonnes have been imported, likely for export vehicles. He said that once manufacturing in India begins, costs can be expected to reduce significantly. While transitions are challenging, the change to HFOs is particularly so. He noted that one of the biggest challenges will be correctly equipping service centres. Servicing of HFO-1234yf in the field requires a new set of equipment which will have to be imported, at least initially, and service

centres will require additional equipment, with a cost estimated at ₹5-8 lakhs per service bay. Thus the cost of the refrigerant is not the only cost that experts should consider; upfront cost of investing in servicing equipment for moving towards an alternative refrigerant would also have to be considered.

Session 4: Research and Development for India specific refrigerants

The final session focused on “*Research and Development of India-specific alternatives*” with a presentation by Mr Sangeet Kapoor, Technical Chief (Climate Control) at Tata Motors. Mr Kapoor focused largely on R&D in the mobile air-conditioning sector and the alternatives currently being pursued by automobile manufacturers around the world. Though the overwhelming choice by manufacturers is HFO-1234yf, some have selected CO₂ (R-744) and other options. He opined that cost increases to manufacturers have been due to availability of refrigerant, patent issues and capital expenditure. That said, he stressed that if it has been done before, it can be done again. He concluded his presentation by showcasing a refrigerant system currently being tested by Tata, using HFC-152a (a low-GWP refrigerant) that is used in a secondary cooling system. Unlike HFO-1234yf, it is not a drop-in solution but is much cheaper and has no issues related to availability. He also said that Tata Motors is keen on participating in any future R&D ventures in the future.

There are major opportunities for R&D open to research institutes and Indian companies, especially in the area of high ambient temperature region testing. Many Indian industries are already testing alternatives in various sectors. However, more financial support and regulatory incentives may be needed to support such initiatives.

The event concluded with remarks by Mr Singh who assured the group that their feedback would be given due regard and thanked everyone for their contribution.