



COOLING INDIA WITH LESS WARMING

Highlighted Resources and Briefing Materials for a Global HFC Phasedown under the Montreal Protocol

Countries around the world are working towards a global agreement under Montreal Protocol to phase down hydrofluorocarbons (HFCs) – super-potent greenhouse gases. All countries now support a global agreement. Developed nations have also promised financial to support market transitions. Building on the momentum of constructive discussions since 2014, countries are working in good-faith to achieve a strong amendment that fosters economic growth while protecting the planet from the worst impact of climate change.

HFCs – used mostly in air conditioning and refrigeration, for making insulating foams, and in some aerosol products – pack thousands of times the heat-trapping punch of carbon dioxide. Though accounting for only 1-2 percent of total warming now, HFCs are the fastest growing climate pollutants because of the skyrocketing demand for air conditioning in developing markets. According to

research by world-renowned scientists, HFCs could raise global temperatures by as much as 0.5°C by 2100 if growth continues on its current course.

Addressing HFCs under Montreal Protocol is essential to protecting the planet from climate change, and would work toward global efforts to meet the 1.5°C target in the Paris Agreement. Early action on HFCs—phasing down their use and replacing them with safer alternatives— is especially crucial considering the devastating impacts of climate change on vulnerable communities from massive flooding to deadly heat waves in India and other nations.

In advance of the Montreal Protocol meetings, this fact sheet provides key resources for the discussions. It provides summaries and links to highlighted analysis, research papers, issue briefs, factsheets and recent blog posts.

Business Case Analysis

Cooling India with Less Warming: The Business Case for Phasing Down HFCs in Room and Vehicle Air Conditioners

<https://www.nrdc.org/sites/default/files/air-conditioner-efficiency-IP.pdf>



India's rapid expansion in room and vehicle air conditioning could strain the country's electric grid, require increased fuel import, and magnify impacts of global warming as a consequence of carbon dioxide and refrigerant greenhouse gas emissions. Indian companies can turn impending challenges into business advantages and national opportunities while reducing climate change, improving air quality, and making air conditioning in India more energy efficient and cheaper to operate.

This issue brief highlights the economic case for Indian industry to “leapfrog” and phase down the use HFCs. Indian room AC industry is phasing out HCFCs and simultaneously upgrading energy efficiency. Appliance manufacturers are currently considering switching to R-410A, R-32 or R-290, of which R-410A has the highest global warming potential. Indian mobile ACs currently uses HFC-134a, and an amendment will pave the way for transition to HFO-1234yf. Indian automobile manufacturers indicate their readiness to be able to switch to low-GWP alternatives, but are looking for lower long-term cost of supply of refrigerants.



NATURAL RESOURCES DEFENSE COUNCIL

Frequently Asked Questions: The Business Case for Phasing Down HFCs

<https://www.nrdc.org/sites/default/files/air-conditioner-efficiency-FS.pdf>



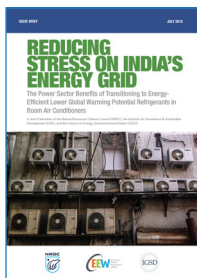
Markets around the world are shifting away from potent heat-trapping HFCs with high global warming potential (GWP) toward more climate-friendly alternatives such as the hydrocarbon (HC), HC-290, and the hydrofluorocarbon (HFC), HFC-32. Indian companies have an opportunity to start adopting these more sustainable alternatives now with financing from the Montreal Protocol Multilateral Fund, avoid higher costs of transitioning later and gain greater access to domestic and foreign markets that are moving away from high-GWP HFCs.

This factsheet seeks to answer the key most frequently asked questions in making the business case for Indian companies to phase down the use of high GWP HFCs. The frequently asked questions (FAQs) are based on several business, government, and civil society discussions in India on an HFC phase-down and their alternatives for room and vehicle air conditioners. Shifting to lower-GWP alternatives from high-GWP HFCs is an opportunity to save energy through improved efficiency, reduce emissions, and stay competitive with international market trends, while potentially having the costs of transition covered by the Multilateral Fund of the Montreal Protocol.

Policy Analysis

Reducing Stress on India's Energy Grid: The Power Sector Benefits of Transitioning to Energy-Efficient Lower Global Warming Potential Refrigerants in Room Air Conditioners

<https://www.nrdc.org/sites/default/files/india-energy-grid-alternative-refrigerants-IB.pdf>



India is one of the fastest growing major economies in the world. Given the rising middle class and increasing temperatures in an already hot and humid climate, the commercial and residential sectors are expanding the use of room air conditioning (AC) units. This expansion stresses the electricity grid and power sector, particularly during peak hours for electricity demand. Energy efficiency is also a low cost way to achieve the Modi government's goals to increase access.

A switch to lower-GWP room ACs with additional energy efficiency improvements could offer an

immediate savings of up to 15%, contributing to reductions of 31-38% in the global warming footprint of India's room AC sector. Studies estimate that energy consumption from room ACs in emerging economies, such as India, could be significantly and cost effectively improved by up to 40% by enhancing efficiency. Making the switch to more energy-efficient lower-GWP refrigerants could help India realize energy savings in the amount of 60 GW at peak demand by 2030, potentially avoiding the construction of more than 100 mid-sized coal-fired power plants.

Amending the Montreal Protocol: Summary of Amendment Proposals

<http://conf.montreal-protocol.org/meeting/oewg/oewg-35/pubs/Observer%20Publications/NRDC%20-%20Amending%20the%20Montreal%20Protocol%20Lowres.pdf>



The Montreal Protocol on Substances that Deplete the Ozone Layer (Montreal Protocol) is a highly effective treaty that can assist major emerging economies such as India, China, Thailand and Indonesia in transitioning to ozone safe, low global warming potential, energy efficient alternatives to HFCs. Amending the Montreal Protocol to include a phase down of HFC emissions will benefit the planet as well as the countries that produce and consume products that use HFCs—this includes the Protocol's Article 5 Parties such as India, China, Thailand, and others. Amending the Protocol now would have the benefit of aligning a phase down of HFCs with the accelerated phase out of

hydrochlorofluorocarbons (HCFCs) currently underway.

This paper discusses key aspects of proposed amendments for phasing down HFCs under the Montreal Protocol, including the North American proposal, Micronesian proposal, and the European Union discussion paper. It also discusses key features that could be included in a proposal to phase down HFCs under the Montreal Protocol, including control measures, grace periods, financial assistance from the Multilateral Fund, intellectual property rights, and safety.

Industry Analysis

Air Conditioners with Hydrocarbon Refrigerant: Saving Energy While Saving Money

<http://ceew.in/pdf/ceew-nrdc-godrej-profile-5nov14.pdf>



This profile highlights the commercially viable, energy efficient propane (HC-290) based room air conditioners manufactured and sold by Godrej & Boyce in India. The R-290 AC makes the case that ACs in the Indian market can be built using climate friendly refrigerant alternatives that protect the ozone layer, and at the same time make air conditioning more energy efficient and less costly to operate.

Godrej has sold over 100,000 units of R290 ACs making a strong case for hydrocarbons, that are already used extensively in domestic refrigerators. The Godrej R- 290 AC, developed in collaboration with German development agency GIZ, and India's Ministry of Environment and Forests' Ozone Cell, complies with international safety standards and safe for ACs with capacity less than 1.5 tonnes.

Efficient Air Conditioning for the Next Decade

<http://ceew.in/pdf/ceew-nrdc-daikin-profile-5nov14.pdf>



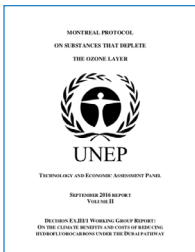
This profile highlights energy efficient room air conditioners that use HFC-32, a chemical with a GWP of that is two-thirds lower than the longer-established refrigerant option HFC-410A. Daikin, reporting sales of over three million ACs in Japan, and over a million in India, is in the process of adopting HFC-32 for its entire line of room ACs. Basic patents for manufacturing HFC-32 have long expired, guaranteeing competitive pricing that makes wider adoption easier.

Room AC's using HFC-32 can provide significant energy savings. Studies estimate that by 2050, a switch could reduce greenhouse gas emissions from room ACs in India's residential sector by 31%, of which 15% would result from energy efficiency induced reduction in fossil fuels burned to generate electricity, and the remainder from reduced global warming caused by the direct emissions of the refrigerant into the atmosphere.

International Analysis

Climate Benefits and Costs of Reducing Hydrofluorocarbons Under Dubai Pathway

http://conf.montreal-protocol.org/meeting/mop/mop-28/presession/Background%20Documents%20are%20available%20in%20English%20only/TEAP_ExIII-1_Report_Sept-2016.pdf



The TEAP analysis presents the climate benefits and costs of phasing down HFCs under Montreal Protocol for developed (Non-Article 5) and developing (Article 5) countries up to 2050. The analysis finds that earlier freeze dates combined with adequate lower baseline values provide larger climate benefits. It offers cost estimates for manufacturing conversion, for servicing and for HFC production phase-down. Although costs are dependent on the baseline levels selected,

the report finds that they are lower the earlier the freeze date sets in.

For non-Article 5, the four amendment proposals yield a total reduction in HFC consumption in the range of 10,000-12,500 Mt CO₂-eq., compared to BAU. For Article 5, it finds a total reduction in HFC consumption varies widely from 26,000-76,000 Mt CO₂-eq. The Indian proposal achieves the least reduction, equivalent to only one-third the climate benefit of the most aggressive proposal.

Primer on HFCs: Fast action under the Montreal Protocol can limit growth of hydrofluorocarbons (HFCs), prevent 100 to 200 billion tonnes of CO₂-eq by 2050, and avoid up to 0.5 °C of warming by 2100

<http://www.igsd.org/primers/hfc/>



In November 2015, the Dubai Meeting of Parties to the Montreal Protocol agreed to a roadmap to work to an amendment in 2016. In December 2015, Parties to Climate Convention (COP21) meeting in Paris agreed to an ambitious goal of limiting global warming to "well below 2°C above pre-industrial levels," aiming for 1.5°C.

This Primer describes how the Montreal Protocol, with further support from national and regional

laws and institutions, will quickly phase down HFC use. A fast phase down of HFCs under the Montreal Protocol would prevent 100 to 200 billion tonnes (Gt) of CO₂-equivalent (CO₂-eq) emissions by 2050, and avoid up to 0.5°C warming by 2100, using a treaty that requires developed countries to act first, provides implementation assistance to developing countries, and has the experience and expertise to ensure that reductions are fast, effective, and efficient.

Status of Legal Challenges: Patents Related to the Use of HFO-1234yf in Auto Air Conditioning

<http://www.c2es.org/docUploads/status-of-legal-challenges-07-2016.pdf>

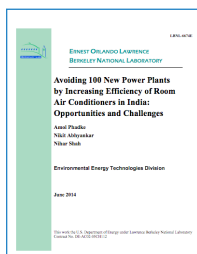


One of the challenges identified by Parties to the Montreal Protocol, relates to intellectual property rights. Because a large number of patents on low GWP chemical substitutes for HFCs have been led by a few transnational companies, a number of developing countries (Article 5 Parties) have raised concerns that these could impede their ability to meet HFC reduction goals, significantly increase the costs of doing so, or put their industries at a competitive disadvantage.

Numerous patents have been granted for methods for producing chemical substitutes (e.g. hydrofluoroolefins or HFOs), and for compositions using these substitutes in a number of industry sectors. The paper finds that nine patents, granted in United States, Japan and European Union, for use of HFO-1234yf in automobile air conditioning, are in various stages of challenges, with all patent-holder claims relevant to the use of HFO-1234yf in auto air conditioning canceled or rejected.

Avoiding 100 New Power Plants by Increasing Efficiency of Room Air Conditioners in India: Opportunities and Challenges

<http://eetd.lbl.gov/sites/all/files/lbnl-6674e.pdf>



Electricity demand for room ACs is growing very rapidly in emerging economies such as India. The paper estimates the electricity demand from room ACs in 2030 in India considering factors such as weather and income growth using market data on penetration of ACs in different income classes and climatic regions. The paper discusses the status of the current standards, labels, and incentive programs to improve the efficiency of room ACs in these markets and assess the potential for further large improvements in efficiency and find that

efficiency can be improved by over 40% cost effectively. The total potential energy savings from Room AC efficiency improvement in India using the best available technology will reach over 118 TWh in 2030; potential peak demand saving is found to be 60 GW by 2030. This is equivalent to avoiding 120 new coal fired power plants of 500 MW each. The paper also discusses policy options to complement, expand and improve the ongoing programs to capture this large potential.

Key Additional Resources & Blogs

Dr. Mario Molina & Dr. Patricia Espinoza: *Time to Seize the Climate's Low-Hanging Fruit*; Sep 2016

http://www.japantimes.co.jp/opinion/2016/09/12/commentary/world-commentary/time-seize-climates-low-hanging-fruit/#.V_IyTJN97eQ

Dr. Ajay Mathur: *Climate change: Here's why India needs to be at the forefront of effort to phase out HFCs*

<http://www.financialexpress.com/fe-columnist/climate-change-heres-why-india-needs-to-be-at-the-forefront-of-effort-to-phase-out-hfcs/383796/>

Anjali Jaiswal & Bhaskar Deol: *India's Role in Accelerating Strong Climate Action Through the Paris Agreement and Montreal Protocol*

<http://www.huffingtonpost.in/bhaskar-deol/indias-role-in-accelerating-strong-climate-action-through-the-p/>

Nehmat Kaur & Bhaskar Deol: *India's Initiative to Phase Out HFCs is a Step Toward Global Climate Leadership*; Sep 2016

<http://www.huffingtonpost.in/nehmat-kaur/indias-initiative-to-phase-out-hfcs-is-a-step-towards-global-cl/>

Nehmat Kaur: *Major HFCs Climate Opportunity Emerging for India*; Sep 2016

<https://www.nrdc.org/experts/nehmat-kaur/major-hfcs-climate-opportunity-emerging-india>

David Doniger: *Vienna HFC Talks: Progress, High Expectations, & Work Ahead*; Jul 2016

<https://www.nrdc.org/experts/david-doniger/vienna-hfc-talks-progress-high-expectations-work-ahead>

Summary of Amendment Proposals; Jun 2015

<https://www.nrdc.org/experts/david-doniger/progress-phasing-down-hfcs-countries-build-momentum-toward-deal-summary>

Bhaskar Deol: *From Paris to Montreal: The Year for Climate Action*; Jan 2016

<https://www.nrdc.org/experts/anjali-jaiswal/paris-montreal-year-climate-action>

David Doniger: *Countries Get Down to Business on Phasing Down HFCs*; Apr 2016

<https://www.nrdc.org/experts/david-doniger/countries-get-down-business-phasing-down-hfcs>

Patents and the Role of the Multilateral Fund

<http://www.c2es.org/publications/patents-role-multilateral-fund>



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