

EIA Briefing to the 38<sup>th</sup> Resumed OEWG and the 28<sup>th</sup> Meeting  
of the Parties to the Montreal Protocol  
October 8-14, 2016, Kigali, Rwanda

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# AVERTING CLIMATE CATASTROPHE

Our obligation to adopt an ambitious Kigali  
HFC amendment to the Montreal Protocol

April 2016:  
early sea-ice breakup in Beaufort Sea, Arctic



## ABOUT EIA

EIA is an independent campaigning organisation committed to bringing about change that protects the natural world from environmental crime and abuse. As part of our work, we have undertaken groundbreaking investigations into the illegal trade in ozone depleting substances (ODS) and have been closely involved in the international ozone and climate negotiations for well over a decade.

## ACKNOWLEDGEMENTS

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### FRONT AND BACK COVERS:

Images taken by the Operational Land Imager onboard Landsat 8. Source: U.S. Geological Survey (USGS) Landsat Missions Gallery; "Beaufort Sea Ice Experiences Unusually Early Breakup"; U.S. Department of the Interior / USGS and NASA.

## INTRODUCTION

As the 28th Meeting of the Parties to the Montreal Protocol (MoP28) gets underway in Kigali, Rwanda, the momentum to tackle dangerous climate change has never been greater.

One of the two thresholds to ratify the Paris Agreement has already been met and it is widely expected to come into force by the end of the year; a clear signal of the world's determination to stay well below 2°C and pursue efforts to limit temperature increase to 1.5°C.<sup>1</sup>

The Montreal Protocol has a golden opportunity and an obligation to contribute to this global commitment with concrete action to phase down hydrofluorocarbons (HFCs), the most destructive man-made greenhouse gases in circulation, and replace them with energy-efficient, climate-friendly alternatives.

Widely acknowledged as one of the most significant steps the world can take right now to deliver on Paris goals<sup>2</sup>, the right Kigali amendment can pass the first test of the Paris Agreement with flying colours, giving cynics a moment to pause and optimists an encouraging victory. More than that, it will provide a chance to put in place mechanisms to fundamentally transform the global cooling and refrigeration sector, one of the most important industrial sectors for developing and developed economies alike which makes a significant contribution to global greenhouse emissions.

Unlike the Paris Agreement, the Kigali amendment will be about getting down to the fine detail right from the start, something at which the Montreal Protocol has always excelled. To do this, it needs to build in concrete ambition for both developed and developing countries, reinforced by a solid financial package to enable effective implementation in all developing countries and additional support for those wishing to take even earlier action.

All Parties can contribute positively while representing their national interests: developing countries should demand early and ambitious action from developed countries, and developed countries should insist on a path to leapfrog to 'future proof' technologies rather than paying for unnecessary interim refrigerants which continue to negatively impact the climate system.

While negotiations focus on the broad outlines of the deal, the extensive technical and historical knowledge of the Montreal Protocol should be called upon to plan for implementation and incorporating the lessons of past phase-outs. Parties must ensure imports and exports are controlled with proper licensing, reporting, labelling and tracking mechanisms for all 22 known HFCs so that the commitments are not undermined by illegal trade. In addition, rules for spending money in the Multilateral Fund should be optimised for its new role in mitigating climate change in addition to ozone layer protection, and to maximise early leapfrogging to energy efficient, HFC-free technologies wherever possible.

As the Paris Climate Agreement is poised to come into force, this is the moment to conclude years of protracted discussions on HFCs and take immediate action. EIA calls on all Parties to the Montreal Protocol to adopt an ambitious Kigali amendment to phase down HFCs and, in so doing, offer hope that our world leaders are truly committed to avoiding catastrophic climate change.



**"The Montreal Protocol has an obligation to contribute to the Paris Agreement with concrete action to phase down hydrofluorocarbons (HFCs)."**

## OVERVIEW OF PROPOSED BASELINES AND FREEZE DATES

At the 38th Open-Ended Working Group (OEWG38) in July 2016, the Parties reached a general agreement on the methodology to formulate the HFC baseline, which will comprise an HFC component and a hydrochlorofluorocarbons (HCFC) component, both expressed in carbon-dioxide equivalence (CO<sub>2</sub>e). The HFC component will be determined by averaging actual HFC consumption over three consecutive years, while the HCFC component will be expressed as a percentage of the HCFC baseline or actual consumption.<sup>3</sup>

On this basis, over 130 Parties proposed a range of years for the HFC component of the baseline for A5 Parties, non-A5 Parties or both, along with freeze dates or a first step in lieu of a freeze. These were summarised in Annex VI of the report of the 3rd Extraordinary Meeting of the Parties (ExMoP3); however, the HCFC component of the baseline, which can have a significant impact on the baseline level, remained unspecified.<sup>4</sup> In addition to the proposals listed in the ExMOP3 report, a proposal for a non-A5

schedule was made in plenary by Mexico on behalf of Pacific Island States, Latin American like-minded states (Nicaragua, El Salvador, Guatemala, Venezuela, Chile, Colombia, Honduras, Costa Rica, Mexico, Dominican Republic, Haiti, Panama, Peru and Paraguay) and the African Group (hereinafter jointly referred to as ISLAAG, which represents more than 80 A5 Parties). ISLAAG proposed a baseline of HFC consumption over 2011-13, with zero HCFC component and a freeze in 2019.

Taken together with data on HFC and HCFC consumption provided by the Technology and Economic Assessment Panel (TEAP), the first control measure of the various proposals can be calculated and compared against business-as-usual (BAU) consumption (See Tables 1 & 2).<sup>5</sup>

Although the HCFC component has not been specified in the latest proposals from OEWG38 (with the exception of the ISLAAG non-A5 proposal), it is generally expected that the HCFC component will be a percentage of the HCFC baseline or a percentage of HCFC consumption in preceding years. It can therefore be calculated using existing data (see Table 3).<sup>8</sup>

**TABLE 1:** Proposed baselines and first control measures in Non-A5 Parties.<sup>6</sup>

NON-A5 PARTIES - PROPOSED BASELINES AND FREEZES (MtCO <sub>2</sub> e)							
PROPOSAL	BASELINE	Baseline Components			First Control Measure		BAU at First Control Measure
		HFC	HCFC	Total	Percentage + Date	Total	
North America	HFC 2011-2013 + 75% HCFC 2011-2013	488	69	557	90% in 2019	501	456
Island States	HFC 2011-2013 + 10% HCFC Baseline	488	65	553	85% in 2017	470	486
European Union	HFC 2009-2012 + 45% HCFC 2009-2012	448	103	551	85% in 2019	468	456
India	HFC 2013-2015 + 25% HCFC Baseline	525	163	687	100% in 2016	687	502
EU + JUSSCANNZ	HFC 2011-2013 + Not Specified	488	Not Specified	488 + ?	90% in 2019	439.2 + ?	456
Belarus, Russian Federation	HFC 2009-2013 + Not Specified	462	Not Specified	462 + ?	100% in 2020	462 + ?	444
ISLAAG	HFC 2011-2013	488	0	488	100% in 2019	488	456

Island States = Kiribati, Marshall Islands, Mauritius, Micronesia, Palau, Philippines, Samoa and Solomon Islands.

JUSSCANNZ = Japan, US, Switzerland, Canada, Australia, Norway, New Zealand.

ISLAAG = Pacific Island States, Latin American like-minded states (Nicaragua, El Salvador, Guatemala, Venezuela, Chile, Colombia, Honduras, Costa Rica, Mexico, Dominican Republic, Haiti, Panama, Peru and Paraguay) and the African Group

**TABLE 2:** Proposed baselines and freeze in A5 Parties.<sup>7</sup>

A5 PARTIES - PROPOSED BASELINES AND FREEZES (MtCO <sub>2e</sub> )							
PROPOSAL	BASELINE	Baseline Components			First Control Measure		BAU at First Control Measure
		HFC	HCFC	Total	Percentage + Date	Total	
North America	HFC 2011-2013 + 50% HCFC 2011-2013	417	417	834	100% in 2021	834	1161
Island States	HFC 2015-2017 + 65% HCFC Baseline	711	567	1278	85% in 2020	1086	1047
India	HFC 2028-2030 + 32.5% HCFC Baseline	2134	283	2417	100% in 2031	2417	2381
GCC	HFC 2024-2026 + Not Specified	1620	Not Specified	1620 + ?	100% in 2028	1620 + ?	2004
China, Pakistan	HFC 2019-2025 + Not Specified	1278	Not Specified	1278 + ?	100% in 2025 or 2026	1275 + ?	1615 or 1745
India	HFC 2028-2030 + Not Specified	2134	Not Specified	2134 + ?	100% in 2031	2134 + ?	2381
ISLAAG, EU + JUSSCANNZ	HFC 2017-2019 + Not Specified	878	Not Specified	878 + ?	100% in 2021	878 + ?	1161
Malaysia, Indonesia, Brazil, Argentina, English-speaking Caribbean, Cuba	HFC 2021-2023 + Not Specified	1274	Not Specified	1274 + ?	100% in 2025	1274 + ?	1615
Iran	HFC 2024-2027 + Not Specified	1684	Not Specified	1684 + ?	100% in 2029	1684 + ?	2134

GCC = Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, United Arab Emirates

**TABLE 3:** CO<sub>2e</sub> value of the HCFC component based on different percentages of the HCFC baseline.<sup>9</sup>

CALCULATING THE IMPACT OF THE HCFC COMPONENT (MtCO <sub>2e</sub> )		
HCFC COMPONENT (% of HCFC Baseline)	NON-A5 PARTIES	A5 PARTIES
Baseline (100%)	651	872
5%	33	44
10%	65	87
15%	98	131
20%	130	174
25%	163	218
30%	195	261
35%	228	305
40%	260	349
45%	293	392
50%	325	436
55%	358	479
60%	390	523
65%	423	567

## AMBITIOUS BASELINE AND FREEZE IN NON-A5 PARTIES

Most non-A5 Parties are already taking action to reduce HFC consumption. For example, under the EU F-Gas Regulation, the 28 Member States of the European Union (EU) are already committed to a far quicker phase-down than the most ambitious HFC amendment proposal submitted to the Montreal Protocol.

To address domestic HFC emissions, early and ambitious action is needed in other non-A5 Parties as well as to incentivise sufficient investment in market transformation (technological innovation, supply chains, scale of production) in order to reduce hardware costs and increase market penetration of low global warming potential (GWP) technologies in advance of the phase-down in A5 Parties.

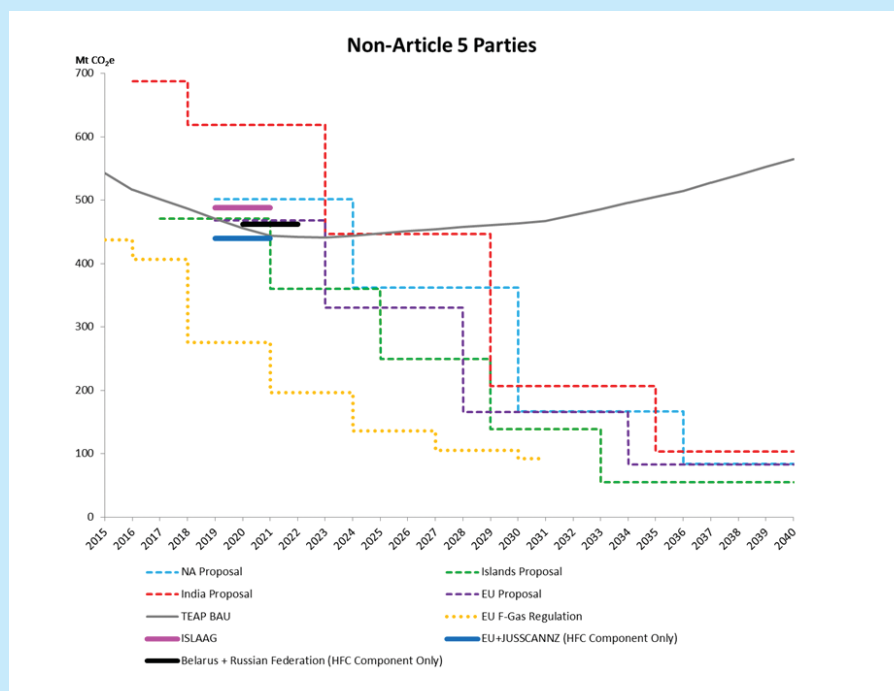
The Parties have already converged on a non-A5 baseline averaged over three consecutive years somewhere between 2009 and 2015 (see Table 1 showing the four amendment proposals and three additional baseline proposals from OEWG38). The proposal from the EU and JUSSCANNZ (Japan, the US, Switzerland, Canada, Australia, Norway and New Zealand) is potentially the most ambitious due to the 90 per cent first reduction step; however, it depends

if an HCFC component is added to the baseline. For example, an HCFC component of just five per cent of the HCFC baseline added to the EU/JUSSCANNZ proposal would bring the baseline to 521 MtCO<sub>2</sub>e and the first control measure (90 per cent of the baseline in 2019) to 468.9 MtCO<sub>2</sub>e. BAU HFC consumption in 2019 is estimated to be 456 MtCO<sub>2</sub>e – which would be less than the baseline and therefore not a reduction in real terms.

It should be noted that the TEAP BAU for non-A5 Parties already includes the impact of the EU F-Gas Regulation and some US legislation, which leads to a conspicuous reduction in non-A5 HFC consumption from 2015-20. Since these measures are now included in BAU, the total emissions reductions from any phase-down schedule are lower than they would have been in their absence.

However, given that non-A5 Parties have already completed 90 per cent of the HCFC phase-out with 100 per cent phase-out due by 2020, there is no technical rationale for including an HCFC component in the non-A5 baseline. Regardless of the years chosen, according to TEAP's BAU data the HFC component in almost all the proposals is already higher than the expected HFC consumption at the first control measure. There is therefore no justification for adding any significant

FIGURE 1: Comparison of Non-A5 Proposals to BAU.<sup>10</sup>



HCFC component to the baseline for non-A5 Parties. Only the Island States proposal and the EU/JUSSCANNZ proposal (with no additional HCFC component in the baseline) represent additional reduction in HFC consumption below TEAP BAU at the first control measure, as seen in Figure 1.

With TEAP data available to calculate the HFC and HCFC components, it is clear that the Parties should exclude an HCFC component from the Non-A5 baseline if the first control measure is to represent real HFC reductions. Non-A5 Parties must offer ambitious reductions if they want to demand more ambition from A5 Parties and will be judged by their commitment to quickly reduce HFC consumption below BAU.

## AMBITIOUS BASELINE AND FREEZE IN A5 PARTIES

Six separate proposals for the A5 baseline (HFC component) and freeze (100 per cent) were tabled at OEWG38 (see Table 2). The baseline years for the HFC component ranged from 2017-30, with the freeze taking place anywhere between 2021 and 2031.

The design of the baseline for A5 Parties raises special considerations. The HFC component of the baseline must be designed to promote leapfrogging and prevent baseline manipulation, while the HCFC component should be designed to account for a certain amount of growth in HFCs as HCFCs are phased out. To achieve these policy objectives, Parties should select baseline years for the HFC component which are as

early as possible, with protections to safeguard against stockpiling, and an HCFC component that takes into account at which stage of the HCFC phase-out A5 Parties have reached when the first control measure comes into effect.

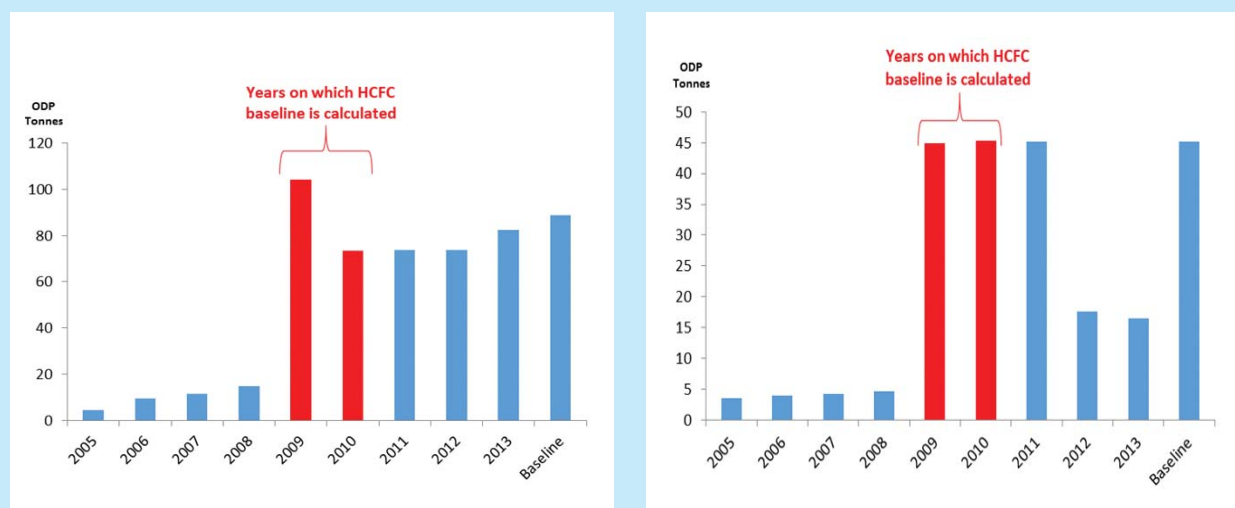
### HFC Component of the Baseline for A5 Parties

In the face of rapid growth in the consumption and production of HFCs in developing countries and uncertainty over reported data, establishing an early baseline is critical to capturing the best climate benefits over time and guarding against baseline ‘inflation’.

A5 Parties are committed to a 35 per cent reduction in HCFCs by 2020, therefore setting the HFC baseline beyond 2020 would discourage leapfrogging in the second stage HCFC phase-out management plans (HPMPs) which are currently being developed to meet the 2020 target. The Parties should thus converge on 2017-19 for the HFC component, as proposed by ISLAAG and EU+JUSSCANNZ, in order to encourage leapfrogging in the next HCFC phase-out step in 2020.

An early baseline also guards to some extent against deliberate inflation of the baseline, which is believed to have occurred in both the CFC and HCFC phase-outs. Examination of historic CFC and HCFC data shows multiple examples of a rapid increase in consumption just prior to and during the baseline-setting years in some A5 Parties, which could indicate deliberate inflation of the baseline (for example see Figure 2).<sup>11</sup>

**FIGURE 2:** Examples of apparent baseline inflation in two A5 Parties during the baseline setting years of the accelerated HCFC phase-out.<sup>11</sup>



Recent experience in the EU also underscores the threat of stockpiling prior to the first control measure. The EU F-Gas Regulation was formally adopted in April 2014, mandating an HFC phase-down starting in January 2015, based on an historical baseline – meaning producers and importers had little time before restrictions on HFC consumption went into effect. Despite this, in 2014 the volume of HFCs placed on the market increased by 61 per cent from the previous year.<sup>12</sup> Dependent on when the baseline and first control measure are set, Parties could consider additional measures to discourage stockpiling, e.g. a provision capping the permissible growth in HFC consumption in the years prior to the first control measure to a percentage growth of actual HFC consumption in preceding years or to a percentage of gross domestic product (GDP).

### HCFC Component of the Baseline for A5 Parties

It is clear that the A5 baseline should contain an HCFC component since A5 Parties are in the first stages of the HCFC phase-out and it is inevitable that some proportion of current HCFC consumption will transition to HFCs.

The proportion of the allowable HCFC consumption to be added to the baseline is an important policy decision because it reflects the expected proportion of transitions to low-GWP technologies during the HCFC phase-out. For example, if Parties take 100 per cent of the HCFCs they are allowed at the time of the first control measure (e.g. 65 per cent of the HCFC baseline in 2021), this assumes that HCFCs being phased out are transitioning to HFCs with an equivalent overall GWP. This is unrealistic given the availability of low-GWP alternative technologies to both HCFCs and HFCs. Parties should agree on a percentage of the HCFC

baseline which assumes a significant amount of leapfrogging, which increases over time.

The HCFC component should also reflect where the A5 Parties are in the HCFC phase-out when the first control measures take effect, i.e. the HCFC component should be higher if the control measures begin earlier and lower if control measures begin later. For example, if A5 Parties agree to control measures during the 2020-24 timeframe, when allowable HCFC consumption is 65 per cent of the HCFC phase-out baseline, Parties should have some CO<sub>2e</sub> proportion (which denotes expected leapfrogging) of that 65 per cent HCFC consumption in the new HFC baseline to account for expected transitions from HCFCs to HFCs. If the first control measure is during the 2025-29 timeframe, when allowable HCFC consumption is 32.5 per cent under the HCFC phase-out, the Parties should agree some proportion of 32.5 per cent of the HCFC phase-out baseline, given that 32.5 per cent of HCFC consumption will already have transitioned (see Table 4).

Given the increased availability of low-GWP technologies over time, and the greater capacity to leapfrog a greater portion of HCFC consumption, the proportion of the allowable HCFC component to be included in the baseline should be reduced over time. For example, if HFC controls begin in 2021, it might be realistic to assume A5 Parties are achieving a 50 per cent transition from HCFCs to non-HFC technologies and therefore add 32.5 per cent of the HCFC baseline to the HFC baseline. If the freeze is as late as 2025, it is realistic to assume a lower transition from HCFCs to HFCs, e.g. 30 per cent, which would then require the addition of just 9.75 per cent of the HCFC baseline.

**TABLE 4:** Potential HCFC component dependent on first control measure in A5 Schedule

HFC BASELINE	FIRST CONTROL MEASURE	HCFC PHASE-OUT AT FIRST CONTROL MEASURE	HCFC COMPONENT (% OF THE HCFC BASELINE)			
			100% transition to equivalent HFCs (CO <sub>2e</sub> )	70% transition to equivalent HFCs (CO <sub>2e</sub> )	50% transition to equivalent HFCs (CO <sub>2e</sub> )	30% transition to equivalent HFCs (CO <sub>2e</sub> )
2017-2019	2021	65%	65%	45.00%	32.50%	19.50%
2021-2023	2025	32.50%	32.50%	22.75%	16.25%	9.75%
2028-2030	2031	Complete	0	0	0	0



## Baseline and Freeze Proposals for A5 Parties

Ultimately, the most important consideration is the date when A5 Parties freeze HFC consumption, departing from the pattern of expected significant HFC growth. Multiple proposals have been made for A5 Parties, which have been compared to TEAP BAU in Figure 3. Note, however, that many of the proposals are yet to have an HCFC component added to the baseline, which would move them closer to BAU.

The vast majority of the Parties appear to be converging on two tracks – an ambitious schedule starting around 2021 and a less ambitious schedule from around 2025, with the outliers being just India, Iran and the Gulf States (GCC). An ambitious HFC phase-down has multiple benefits for A5 Parties, including significant financial benefits, avoidance of another transition in the near future by making a smart transition today and significant domestic CO<sub>2</sub>e reductions which will help meet commitments under the Paris Agreement. Regardless of the final agreed phase-down, Parties should ensure that those A5 Parties who want to take earlier action are fully supported, both technically and financially.

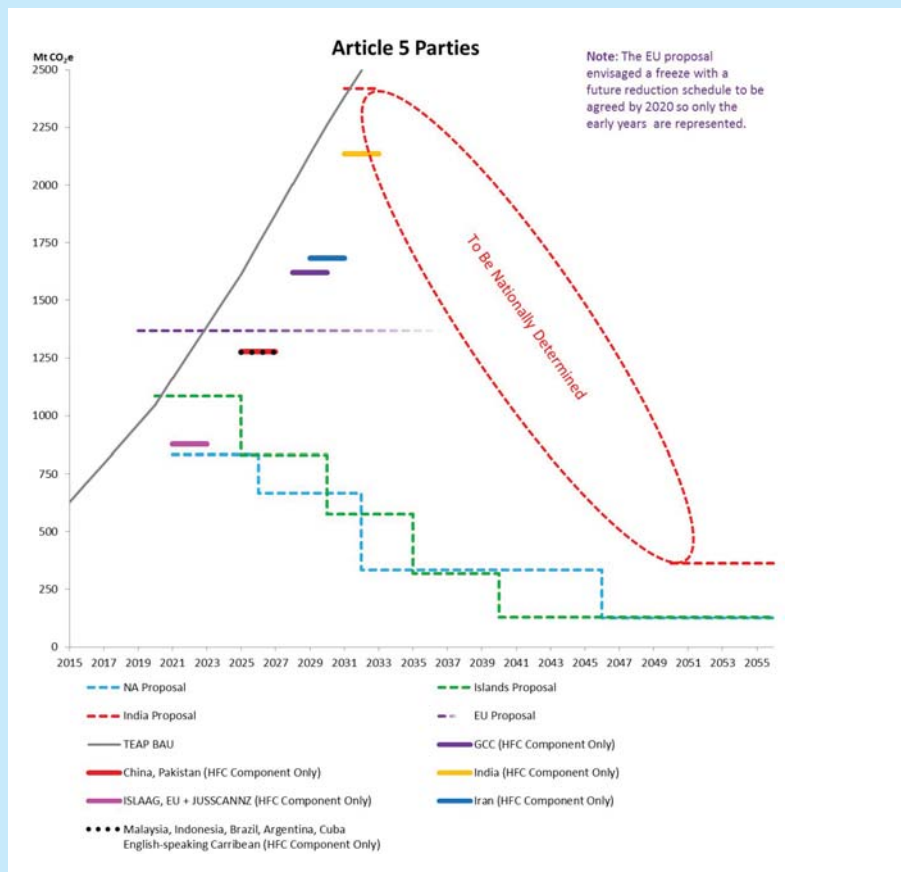
## PHASE-DOWN SCHEDULES

Following agreement on baselines and freezes, Parties must still agree on phase-down schedules.

For non-A5 Parties, the imperative is clear: early and ambitious phase-down steps are needed to accelerate the uptake and scale of production of low-GWP technologies to enable A5 Parties to follow. For example, Parties could follow the EU F-Gas Regulation model, which was developed based on a comprehensive examination of the technical, economic and social implications of phasing down HFCs and is acknowledged as the strongest HFC legislation in the world. The EU F-Gas Regulation mandates reductions of 37 per cent and 55 per cent within the first three and six years of the freeze, respectively.

While A5 schedules are partially contingent on commitments taken on by non-A5 Parties, there are also independent reasons to move quickly. Given where A5 Parties currently are in the HCFC phase-out, there is a unique and narrow window of opportunity to leapfrog HFCs to low-GWP technologies.

FIGURE 3: Comparison of A5 proposals with TEAP BAU.<sup>13</sup>



Low-GWP solutions are available, in particular those relying on natural refrigerants, but they are competing with a slew of new 'lower-GWP' HFCs blends which on the surface are attractive as drop-in alternatives to high-GWP HFCs but still have significant GWPs.

A weak HFC phase-down schedule does not provide adequate incentives for a smart, one-time transition to truly low-GWP alternatives that will be more cost-effective for developing countries in the long term. A5 Parties who do not make a smart transition now will be required to undertake a double transition in the future, which comes with additional costs and disruption to their economies. This can be avoided with a well-funded, early and ambitious freeze which will thereafter make future phase-down steps easier and cheaper to meet by avoiding an unnecessary HFC phase-in.

## IMPORTANCE OF A COMPLETE ANNEX F

Once agreements on baselines, freezes and schedules are reached, a critical issue to ensure these commitments are met is the inclusion of a complete Annex F – one that lists all known HFCs, including unsaturated HFCs (also referred to as HFOs). Only the Island States proposal currently contains a complete Annex F. The proposals by North America, India and the EU have all omitted unsaturated HFCs, although it should be noted they were included in the original North American proposal in 2010.<sup>14</sup> This oversight will result in predictable problems with monitoring, compliance and illegal trade since unsaturated HFCs, which are only offered by a small number of companies which already report under the Montreal

### BELOW:

Indonesia CFC seizure inspection 2004.



Protocol, have been identified by TEAP as key components in 36 of the 40 HFC blends and are also being proposed as substitutes in pure form in certain applications.<sup>15</sup>

Two important provisions are triggered once a fluorochemical is listed as a controlled substance – Parties must report on production, imports and exports under Article 7 and, secondly, Parties must establish a licensing system for imports and exports under Article 4B. Taken together, these provisions provide the basis for tracking and monitoring the country-by-country production and consumption as well as the global trade of the fluorochemical concerned.

The Montreal Protocol adopted in 1989 did not contain obligations for Parties to establish and maintain a licensing system. Not long after, however, as control measures for ozone-depleting substances began to come into effect, Parties agreed on the need to monitor and regulate trade through import and export licenses. In particular, in 1995 the Parties agreed to incorporate a “licensing system, including a ban on unlicensed imports and exports.”<sup>16</sup> Thereafter, at the Ninth Meeting of the Parties in 1997, Parties amended the Montreal Protocol to require a licensing system under Article 4B.<sup>17</sup>

The Parties have identified the objectives for a licensing system as to: (i) assist collection of sufficient information to facilitate compliance with relevant reporting requirements under Article 7; (ii) assist in the prevention of illegal traffic of controlled substances, including through notification and regular reporting by exporting countries to importing countries and allowing cross-checking of information between exporting and importing countries; and (iii) facilitate the efficient notification, reporting and cross-checking of information.<sup>18</sup> Under the Montreal Protocol, licensing and reporting are two different types of activities which serve different, though sometimes overlapping, objectives.<sup>19</sup>

Adopting an incomplete Annex F will cause problems which threaten the integrity of the HFC phase-down. It would create a significant void in information about country production and global trade – particularly for the vast majority of mid-GWP blends that have been proposed for use – that will make it difficult to monitor and track the plethora of HFC blends and nearly impossible to identify discrepancies

which are early indicators of illegal activity. Based on historical patterns of illegal trade in CFCs and HCFCs, it will clearly encourage mislabelling of HFCs or ozone depleting substances (ODS) as unsaturated HFCs to avoid licensing and controls on production and consumption. For example, HFC-1234yf is being used to replace HFC-134a in mobile air-conditioning in many new vehicles. There is a growing concern that HFC-134a, which is much less expensive, will be substituted for HFC-1234yf during servicing. Without reporting and licensing on HFC-1234yf, there is the potential for significant undetected illegal trade in HFC-134a.

Listing a chemical as a controlled substance does not automatically subject it to control measures on production and consumption. For example, despite falling within the definition of “controlled substance”, feedstocks are explicitly excluded from control measures to phase out CFCs and HCFCs. The same could be applied to unsaturated HFCs.

## HFC-23 BY-PRODUCT DESTRUCTION

HCFC-22 production results in the by-production of HFC-23, a highly potent greenhouse gas with a GWP of 14,800.<sup>20</sup> While HCFCs are being phased out for emissive uses, their use as a feedstock has grown significantly in recent years, from 242,651 MT in 2002 to 711,729 MT in 2014, of which 70 per cent is HCFC-22.<sup>21</sup> HCFC-22 is a feedstock for the production of HFC-32, HFC-1234yf, HFC-227ea and HFC-125, chemicals which TEAP identified as key components in 39 of the 40 HFC blends.<sup>22</sup> Additionally, HCFC-22 is used as a feedstock in other applications; for example, the World Bank estimates that about 40 per cent of total HCFC-22 feedstock is for the production of Teflon.<sup>23</sup>

The North American proposal estimates that HFC-23 by-product controls can cost-effectively avoid 12.6 Gt CO<sub>2</sub>e by 2050 through destruction technologies that are to be approved by Parties.<sup>24</sup> Emissions of HFC-23 will continue to be a concern as long as HCFC-22 is used as a feedstock and the Parties must ensure that provisions requiring HFC-23 by-product destruction in the Island States, North American and EU proposals carry forward into the final agreement.

**“Failure to include all HFCs in the agreement will result in problems with monitoring, compliance and illegal trade.”**

“Phasing down HFCs is very cost-effective compared to other options available and early action brings greater climate benefits at lower cost.”

## CLIMATE BENEFITS AND FINANCIAL CONSIDERATIONS

The TEAP report *On the Climate Benefits and Costs of Reducing Hydrofluorocarbons under the Dubai Pathway* provides basic estimates of the climate benefit and financial implications of the amendment proposals.<sup>25</sup> The results demonstrate clearly that tackling HFCs is one of the most, if not the most, cost-effective climate mitigation action available now.

TEAP has calculated climate benefit as the reduction in HFC consumption below BAU. Differences in the climate benefit between the proposals primarily relate to the impact of the A5 schedules. The Island States proposal is the most ambitious overall, closely followed by the NA proposal. In terms of equity, the Island States proposal is more balanced, capturing greater climate benefits from non-A5 Parties than the NA proposal (see Figure 4). As previously mentioned, the climate benefit of the non-A5 proposals is underestimated, given that the impact of new progressive legislation recently agreed (e.g the EU F-Gas Regulation) is already included in the BAU. This should be taken into consideration in calculating the climate benefit of the final agreed phase-down schedule.

TEAP also estimates the financial implications of the proposals, which are calculated on the basis of the installed manufacturing capacity at the point where the A5 reduction schedule is

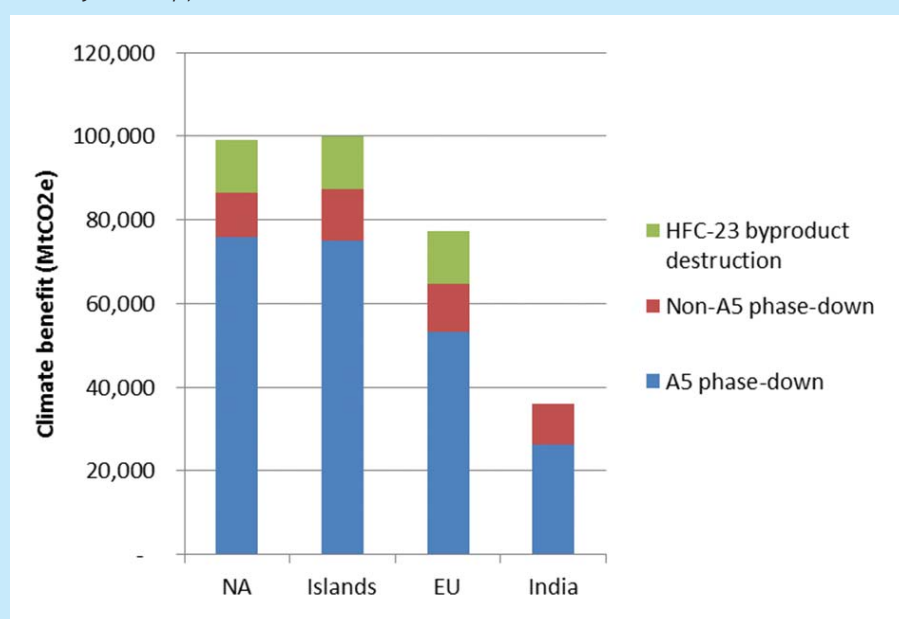
lower than BAU. The costs cover production, manufacturing and servicing but do not include other activities, such as preparatory surveys, institutional strengthening, capacity-building and training.

While the NA and Island States proposals have similar overall climate benefits through 2050, TEAP estimates that the Island States proposal will cost \$1.11-2.2 billion more than the NA proposal, the result of the NA proposal anticipating earlier reductions in A5 Parties.

One clear omission in the cost calculations is the failure to factor in any decrease in the price of new technologies as they gain market share over time. This is unfortunate, since timing and ambition in non-A5 Parties will impact technology-transfer costs for A5 Parties. Earlier and more ambitious action in non-A5 Parties actually lowers costs for A5 Parties, while delayed non-A5 action increases them. This failure to account for timing and ambition in non-A5 Parties inflates the costs of the Island States proposal, which envisages earlier and more ambitious action by non-A5 Parties than the NA proposal.

While full costs are not included, it is very clear from the estimates that phasing down HFCs is very cost-effective (\$0.05-\$0.54/CO<sub>2</sub>e tonne) compared to other climate abatement options available today and that early action brings greater climate benefits at lower cost (see Table 5).

**FIGURE 4:** Cumulative climate benefit (MtCO<sub>2</sub>e) to 2050 of the four amendment proposals, including HFC-23 by-product destruction.<sup>26</sup>



**TABLE 5:** Climate benefit and Costs of A5 Proposals through 2050.<sup>27</sup>

A5 PROPOSALS	NA	ISLANDS	EU	INDIA
Climate benefit (MtCO <sub>2</sub> e)	75,850	74,980	53,260	26,130
Lower cost (\$ million)	3,440	4,550	5,580	9,330
Higher cost (\$ million)	5,250	6,950	8,540	14,220
Cost (\$/CO <sub>2</sub> e tonne) - lower	0.05	0.06	0.10	0.36
Cost (\$/CO <sub>2</sub> e tonne) - higher	0.07	0.09	0.16	0.54

### Enabling Activities and Early Action Funding

While sufficient funding over the long term is critical to ensure that the ambition of the HFC amendment is realised, significant additional funding for institutional strengthening and other enabling activities such as capacity-building, demonstration projects and training for handling HFC alternatives will be required in the short-term to maximise avoidance of HFCs through the HCFC phase-out and prepare for HFC reduction targets.

The importance of adequate funding for a wide range of activities has been recognised by all Parties during negotiations and is reflected in the *Vienna Solutions for Challenges on Funding Issues and Flexibility of Implementation*.<sup>28</sup> EIA encourages Parties to follow through on these commitments and ensure that sufficient funding is available for enabling activities and project preparation, in particular to ensure that countries wishing to take early action are fully funded. Given the benefits of leapfrogging, these investments will pay dividends in the long-term.

To this end, Parties should adopt a decision at MoP28 directing TEAP to provide cost calculations in its upcoming replenishment report for all cost categories to ensure adequate funding is included in the next replenishment triennium.

### Energy Efficiency

Addressing energy efficiency alongside HFCs could significantly increase the CO<sub>2</sub>e emissions savings resulting from an HFC phase-down.<sup>29</sup> It will also reduce the operating costs and stress on energy grids in developing countries. This was explicitly recognised in the Vienna solutions, where Parties agreed to “request the ExCom to develop cost guidance associated with maintaining and/or enhancing energy efficiency of low-GWP or zero-GWP replacement technologies and equipment, when phasing down HFCs”.<sup>30</sup>



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A5 Parties are entering a critical stage of the accelerated HCFC phase-out, in which most projects will address the rapidly expanding refrigeration and air-conditioning (RAC) sector and where significant energy efficiency gains can be made. While the primary purpose of Multilateral Fund (MLF) projects should continue to be the phase-out of ODS and HFCs, Parties should explore ways to enhance the energy efficiency of appliances within investment projects and enabling activities, including the consideration of cost-effective technology upgrades and financial support for the establishment of minimum energy efficiency requirements.

It is vital that the MLF operationalises the agreement to finance the maintenance and enhancement of energy efficiency as soon as possible. Parties should give TEAP a mandate to explore the costs of a variety of energy-efficiency upgrade options within its upcoming replenishment report and request the MLF to undertake the necessary research and preparation activities to develop cost guidance.

**ABOVE:**  
High-level segment 3rd  
Extraordinary MoP in Vienna,  
July 2016.

# RECOMMENDATIONS

EIA calls on the Parties to MoP28 to agree an ambitious amendment to the Montreal Protocol to phase down HFCs, including:

- an ambitious HFC phase-down for non-A5 Parties, with a first reduction step in 2019 that cuts HFC consumption below the BAU scenario. For example, a baseline based on average HFC consumption in 2011-13 (and no HCFC component), with a 10 per cent reduction in 2019;
- an ambitious baseline and freeze (by 2021) in A5 Parties, with baseline dates for the HFC component set in the near-term future (e.g. 2017-19) to avoid incentivising HFC growth and a mechanism to provide support to those A5 Parties that seek earlier action;
- adequate financial support to A5 Parties, based on concrete figures provided by TEAP outlining the necessary funding for agreed-upon incremental costs and enabling activities listed in the *Vienna Solutions for Challenges on Funding Issues and Flexibility of Implementation*;
- a complete Annex F which includes all 22 known HFCs, with mandatory licensing and reporting to prevent illegal trade and support compliance;
- a mechanism to ensure the destruction of all HFC-23 by-product.

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