



FREQUENTLY ASKED QUESTIONS ABOUT REGULATING HYDROFLUOROCARBONS UNDER THE MONTREAL PROTOCOL (ABBREVIATED VERSION)

INTRODUCTION

Strengthening the Montreal Protocol on Substances that Deplete the Ozone Layer (“Montreal Protocol”) to regulate hydrofluorocarbons (“HFCs”) will provide fast-action climate mitigation to complement long-term efforts to reduce greenhouse gas (“GHG”) emissions under the United Nations Framework Convention on Climate Change (“UNFCCC”). Fast-action to reduce HFC emissions is necessary to avoid tipping points for abrupt, irreversible, and catastrophic climate changes and other “dangerous anthropogenic interference with the climate system.”¹

QUESTION 1: What are HFCs?

HFCs are powerful GHGs primarily produced for use as substitutes for ozone-depleting substances (“ODSs”) in refrigeration, air-conditioning, insulating foams, aerosols, solvents, and fire protection.² One important exception is HFC-23, which is the only HFC that is not produced for use as a product itself, but as an unintentional byproduct of the HCFC-22 production process.³ Overall, HFCs have high global warming potentials (“GWPs”) and short atmospheric lifetimes. Over the last decade, HFC use and emissions have increased dramatically as ODSs controlled under the Montreal Protocol—such as chlorofluorocarbons (“CFCs”) and hydrochlorofluorocarbons (“HCFCs”)—have been phased-out.⁴ Unlike the three largest contributors to climate change—carbon dioxide (“CO₂”), nitrous oxide (“N₂O”), and methane (“CH₄”)—HFCs do not exist in the natural environment and there are no natural cycles to absorb HFC emissions. Their longevity is constrained only by their atmospheric lifetimes. Eliminating atmospheric concentrations of HFCs, therefore, is entirely within our control and requires HFC emission reductions from man-made sources.

QUESTION 2: What is the expected contribution from HFCs to climate change?

HFC emissions are projected to increase significantly in the coming decades. The two principal drivers are: (i) sustained growth in refrigeration and air-conditioning products as developing countries increase their demand under improving economic conditions;⁵ and (ii) the CFC phase-out and accelerated HCFC phase-out under the Montreal Protocol that are forcing all countries to transition away from ODSs to substitutes not regulated under the Montreal Protocol—often high-

GWP HFCs.⁶ In the absence of regulation, aggregate HFC emissions will comprise a significant percentage of the overall climate problem. In the near-term, HFC emission projections increase exponentially after 2013 and far exceed previous estimates after 2025.⁷ In 2015, global HFC emissions under business-as-usual (“BAU”) scenarios will reach 1.2 Gt CO₂-eq. – a roughly 300% increase.⁸ And a recent update of emissions data for several sectors reveals that global HFC emissions in 2015 are likely to be approximately 1.4 Gt CO₂-eq.⁹ By 2040, HFC emissions are expected to reach 4.2-6.9 Gt CO₂-eq. per year and, in 2050, HFC emissions will reach 5.5–8.8 Gt CO₂-eq. per year, which is equivalent to 9-19% of projected global CO₂ emissions under BAU scenarios and 28-45% under a CO₂ stabilization scenario of 450 parts per million.¹⁰ Notably, HFC emissions in developing countries are predicted to be up to 800% greater than in developed countries.¹¹

QUESTION 3: What are the climate-mitigation benefits of phasing down HFCs?

Reducing HFC emissions through a production and consumption phase-down offers policymakers a win-win opportunity to achieve substantial climate mitigation now and avert significant climate impacts in the future while doing so in the most cost-effective manner. A proposed amendment submitted by the Federated States of Micronesia and Mauritius serves as a blueprint for capturing these significant climate mitigation opportunities.¹² Imposing a HFC consumption freeze in 2014 for developed countries and 2024 for developing countries followed by an annual decrease in consumption of 2% or 4%, with a maximum reduction of 80%, yields cumulative emission reductions of 59-97 Gt CO₂-eq. and 70-113 Gt CO₂-eq., respectively, during the 2013-2050 period versus BAU scenarios.¹³

QUESTION 4: Are existing international regulations adequate to control HFC emissions?

No. Although several drivers of HFC proliferation are controlled under the Montreal Protocol, HFCs themselves are not. Instead, they have been included among the six GHGs targeted for emission reductions under the Kyoto Protocol to the UNFCCC (“Kyoto Protocol”).¹⁴ The Kyoto Protocol has proven ineffective at controlling rising HFC emissions largely because it cannot address HFC production and consumption—something that the Montreal Protocol is uniquely qualified to do. This leads the existing ozone and climate regimes to work, at times, at cross-purposes and is creating regulatory loopholes that undermine international efforts to protect the climate system.

For purposes of regulatory approaches, HFCs are divided into two general categories: (i) HFCs that are produced as products themselves, which will constitute 75% of total HFC CO₂-eq. emissions in 2015; and (ii) HFC-23, produced as an unintentional byproduct of HCFC-22 production, which constituted the remaining 25% of total HFC CO₂-eq. emissions in 2015 and decrease as a proportion of total HFC emissions thereafter.¹⁵ While this distinction is important, certain features of HFC governance apply to both categories. First, it is far more cost-effective to reduce HFC production and consumption upstream than to control emissions downstream.¹⁶ Second, the Kyoto Protocol does not place binding emissions limitation or reduction targets on developing countries —nor is it likely its successor treaty will either¹⁷—which is problematic because future growth in HFC production, consumption, and emissions will occur primarily in

developing countries.¹⁸ Third, trading short-lived HFC emission reductions in exchange for long-lived CO₂ emissions under a cap-and-trade scheme provides short-term cooling but commits the planet to long-term warming under current methodologies for calculating CO₂ equivalence based on 100-year GWP.¹⁹

QUESTION 5: Why should we use the Montreal Protocol to phase-down HFC production, consumption, and emissions?

For the simple reason that it provides the fastest, most cost-effective means of reducing HFC emissions. The Montreal Protocol benefits from unique structural advantages, decades-long industry expertise, and cost-effective implementation tools. Further, the HFC proliferation in industrial and commercial products is a direct result of Montreal Protocol's regulation of ODSs, creating potentially conflicting environmental mandates that can only be addressed by bringing these substances under the same regulatory authority.

The Montreal Protocol enjoys several advantages that will allow it to quickly adopt and implement effective regulations for HFCs. The treaty has near-universal ratification; there are 194 Parties to the Montreal Protocol. It provides differentiated reduction commitments for both developed and developing countries based on the principle of common but differentiated responsibilities. Yet all the Parties to the Montreal Protocol have reduction commitments under the treaty, including developing countries, which accept the same reduction commitments as their developed-country counterparts but with a grace period negotiated among the Parties.²⁰ There exists a fully-functioning and effective financial-transfer mechanism—the Multilateral Fund for the Implementation of the Montreal Protocol (“MLF”)—that can assist developing countries in phasing down high-GWP HFCs by providing financing for the incremental costs of compliance with its control measures. It also has an effective technology-transfer mechanism, enforceable compliance mechanisms, and is supported by real-time scientific and technical assessments that facilitate rapid regulatory responses through “adjustments.” Together, these tools have resulted in unrivaled environmental compliance with the commitments and obligations established under the Montreal Protocol.

QUESTION 6: Can the Montreal Protocol, an ozone treaty, be used to regulate a GHG that is not an ODS?

Yes. The Montreal Protocol can lawfully regulate HFCs to harmonize the regulation of the chemicals and sectors it covers to ensure that activities aimed at protecting the ozone layer do not inadvertently result in “adverse effects” to the environment.²¹ Here, the regulation and phase-out of CFCs and HCFCs under the Montreal Protocol is driving rising production, consumption, and emissions of HFCs. In addition, through the MLF, developed countries have funded projects in developing countries aimed at replacing CFCs and HCFCs with high-GWP HFCs to assist them in complying with their Montreal-Protocol-mandated obligations but, in the process, are creating an enduring market for HFCs. With respect to HFC-23, it is produced as an unintentional byproduct during the production of HCFC-22, an ODS whose production is authorized by the Montreal Protocol.²² The undeniable causal connection between activities undertaken pursuant to the Montreal Protocol and HFC proliferation creates a special relationship and obligation on

the Montreal Protocol to minimize the adverse environmental effects of HFCs on the climate system. This is a more than an adequate nexus to allow the Montreal Protocol to regulate of HFCs.

QUESTION 7: How will the Montreal Protocol interface with the UNFCCC, Kyoto Protocol, and the post-2012 climate regime?

The threshold question is jurisdictional. At present, no international agreement regulates HFC production and consumption. Policymakers can decide to limit Montreal-Protocol jurisdiction to HFC production and consumption to complement HFC emissions regulation under the UNFCCC and Kyoto Protocol. Alternatively, policymakers can grant complete or plenary jurisdiction over HFCs to the Montreal Protocol, removing HFCs entirely from the basket of GHGs regulated under the UNFCCC, Kyoto Protocol, and post-2012 climate regime resulting from the agreed outcome of negotiations under the UNFCCC (hereinafter “Agreed Outcome”). From an environmental perspective, the latter is the preferred outcome.

UNFCCC. Providing partial or plenary Montreal-Protocol jurisdiction to control HFC production, consumption, and/or emissions will neither upset the operation of the UNFCCC nor hinder the achievement of its ultimate objective. In fact, it will facilitate a simpler, more politically-expedient means of solving this piece of the climate puzzle utilizing an existing international institution as envisioned in Article 7(2)(l) of the UNFCCC.²³ Moreover, a regulatory phase-down of HFCs under the Montreal Protocol is fully consistent with UNFCCC Article 3 principles and best achieves UNFCCC Article 2’s ultimate objective to ensure “stabilization of [GHG] concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.”²⁴ And since the “soft” commitments under UNFCCC Article 4 apply to “all [GHGs] not controlled by the Montreal Protocol,” bringing all sources of HFC emissions squarely under Montreal-Protocol control will cleanly sever—i.e., disaggreate—HFCs from UNFCCC’s basket of GHGs.²⁵

Kyoto Protocol. The Kyoto Protocol would be, likewise, unaffected by any level of Montreal-Protocol jurisdiction. The first commitment period under the Kyoto Protocol extends from 2008–2012. An HFC phase-down beginning in 2013 would have no discernible impact on the operation of the Kyoto Protocol. Nor would adopting a schedule for an HFC phase-down beginning before 2013 have any discernible impact. The reporting requirements of Articles 5 and 7 of the Kyoto Protocol could be supplanted or supplemented by reporting requirements under the Montreal Protocol which could be required to be communicated back to the UNFCCC and the Parties. Further, these reporting requirements will not be affected until the Montreal Protocol takes “control” of HFCs—in 2012 or later—and any changes deemed appropriate or necessary to allow these articles to continue to support Kyoto-Protocol objectives could be accomplished in advance of that date.²⁶ Concerns that countries would fail to receive credit for reductions otherwise achieved are moot because, under Article 3 and Annexes I and A of the Kyoto Protocol, parties are permitted to take advantage of any HFC emissions reductions—without limitation—regardless of the international body that mandates them.²⁷

Agreed Outcome. A decision to grant plenary jurisdiction over HFC emissions to the Montreal Protocol would have little impact, if any, on the Agreed Outcome. On the contrary, it should be considered one of the key indicators of success in Copenhagen. It would be fully consistent with the ultimate objective and principles of UNFCCC Articles 2 and 3.²⁸ The responsibility for replacing the commitments and reporting requirements of UNFCCC Article 4 would be assumed by the Montreal Protocol,²⁹ which has an unparalleled track record of successfully reporting, monitoring, verifying, and ensuring compliance with the phase-down schedule for the ODSs and GHGs used in the sectors it regulates.³⁰ And, importantly, an amendment to the Montreal Protocol regulating HFCs is already well underway with a formal decision by the Parties to the Montreal Protocol to seek coordination,³¹ a proposed amendment to the Montreal Protocol seeking jurisdiction,³² and an UNFCCC submission proposing that Copenhagen include a specific “international emission reduction arrangement for HFC emissions.”³³

* IGSD (www.igsd.org) welcomes any questions, comments, or insights readers may have regarding this document. Please send all correspondence to Pete M. Grabel (pgrabel@igsd.org) or Tim R. Grabel (tgrabel@igsd.org).

¹ See Timothy Lenton et al., *Tipping elements in the Earth’s climate system*, 105 PROC. OF THE NAT’L ACAD. OF SCI. 1786-93 (2008); see also V. Ramanathan & Y. Feng, *On avoiding dangerous anthropogenic interference with the climate system: Formidable challenges ahead*, 105 PROC. OF THE NAT’L ACAD. OF SCI. 14245-50 (2008).

² See IPCC AND TEAP, IPCC/TEAP SPECIAL REPORT ON SAFEGUARDING THE OZONE LAYER AND THE GLOBAL CLIMATE SYSTEM: ISSUES RELATED TO HYDROFLUOROCARBONS AND PERFLUOROCARBONS (2005) [hereinafter IPCC/TEAP 2005 SPECIAL REPORT], at *Summary for Policymakers* at 4.

³ *Id.* at *Technical Summary* at 77; see also generally ENVIRONMENTAL INVESTIGATION AGENCY, TURNING UP THE HEAT: LINKAGES BETWEEN OZONE LAYER DEPLETION AND CLIMATE CHANGE: THE URGENT CASE OF HCFCs AND HFCs (2006), <http://www.eia-global.org/PDF/Report--TurningUpHeat--Climate--Aug06.pdf> (last visited June 21, 2009).

⁴ See Montreal Protocol on Substances that Deplete the Ozone Layer, *opened for signature* Sept. 16, 1987, 26 I.L.M. 1550 (1989) (as amended 32 I.L.M. 84) (1992) [hereinafter Montreal Protocol] at Arts. 2A and 2F.; see also *supra* note 2, IPCC/TEAP 2005 SPECIAL REPORT at *Summary for Policymakers* at 4, 8; see also TEAP, ASSESSMENT OF ALTERNATIVES TO HCFCs AND HFCs AND UPDATE OF THE 2005 SUPPLEMENT REPORT DATA (2009) [hereinafter TEAP 2009 HFC REPORT].

⁵ See *supra* note 2, IPCC/TEAP 2005 SPECIAL REPORT at 415.

⁶ See *supra* note 4, Montreal Protocol at Arts. 2A and 2F; see also Montreal Protocol, Report of the Nineteenth Meeting of the Parties to the Montreal Protocol, Montreal, Canada (2007) [hereinafter Report of the 19th MOP], at Decision XIX/6 (accelerating the phase-out of HCFCs).

⁷ See Velders et al., *The large contribution of projected HFC emissions to future climate forcing, Early Edition*, PROC. NAT’L. ACAD. SCI. (22 June 2009) [hereinafter Velders et al. 2009], <http://www.pnas.org/content/early/2009/06/19/0902817106>.

⁸ See *supra* note 2, IPCC/TEAP 2005 SPECIAL REPORT at 413; see also *supra* note 4, TEAP DECISION XX/8 REPORT at 10 (figures in table are rounded to the nearest tenth).

⁹ *Id.*

¹⁰ See *supra* note 7, Velders et al. 2009 at 1.

¹¹ *Id.*

¹² See Proposed Amendment to the Montreal Protocol (submitted by the Federated States of Micronesia and Mauritius) [hereinafter 2009 HFC Amendment], http://ozone.unep.org/Meeting_Documents/oewg/29oewg/OEWG-29-8E.pdf (last visited June 22, 2009).

¹³ See *supra* note 7, Velders et al. 2009 at 4.

¹⁴ See Kyoto Protocol to the United Nations Framework Convention on Climate Change, *opened for signature* March 16, 1998, U.N. Doc FCCC/CP/1997/7/Add.1, 37 I.L.M. 22 (1998) [hereinafter Kyoto Protocol] at Annex A.; see also *supra* note 4.

¹⁵ See *supra* note 2, IPCC/TEAP 2005 SPECIAL REPORT at 396, 413; see also *supra* note 4, TEAP DECISION XX/8 REPORT at 10. The accelerated phase-out of HCFCs agreed to in 2007 will dramatically reduce the amount of

HCFC-22 produced for use in products in the coming years and decades. HCFC-22 produced for use in products is responsible for 60% of all HFC-23 byproduct emissions.

¹⁶ Compare Montreal Protocol, Report of the Eighth Meeting of the Conference of the Parties to the Vienna Convention for the Protection of the Ozone Layer and Twentieth Meeting of the Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer, Doha, Qatar [hereinafter Report of the 20th MOP] at Annex VI, Doha Declaration and Velders, et al., *The importance of the Montreal Protocol in protecting climate*, 104 PROC. NAT'L. ACAD. SCI. 4814-19, (20 March 2007) (stating that US\$ 2.4 billion has been spent to phase-out ODSs in developing countries preventing 135 Gt CO₂-eq. emissions from 1990-2010) with Carbon Finance, *Cost-effectiveness of CDM Projects*, Nov. 18, 2008, <http://www.carbon-financeonline.com/index.cfm?section=cdmjianalysis&action=view&id=11663> (last visited June 22, 2009) and UNFCCC, CDM Project Activities, Project Search (last accessed June 22, 2009), <http://cdm.unfccc.int/Projects/projsearch.html> (showing that US\$ 6.9 billion will have been spent to reduce 0.45 Gt CO₂-eq. HFC-23 emissions from 2008-2012 under the CDM).

¹⁷ See e.g. UNFCCC, AD HOC WORKING GROUP ON LONG-TERM COOPERATIVE ACTION UNDER THE CONVENTION, FCCC/AWGLCA/2009/8, NEGOTIATING TEXT (19 May 2009) at ¶¶ 5, 70-105; UNFCCC, AD HOC WORKING GROUP ON FURTHER COMMITMENTS FOR ANNEX I PARTIES UNDER THE KYOTO PROTOCOL, FCCC/KP/AWG/2009/8, NEGOTIATING TEXT (14 May 2009).

¹⁸ See *supra* note 7, Velders et al. 2009 at 1.

¹⁹ See, e.g., P. FORSTER & V. RAMASWAMY ET AL., IPCC, *Changes in Atmospheric Constituents and Radiative Forcing*, in CLIMATE CHANGE 2007: THE PHYSICAL SCIENCE BASIS, CONTRIBUTION OF WORKING GROUP I TO THE FOURTH ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE [hereinafter AR4 THE PHYSICAL SCIENCE BASIS] 212 (S. Solomon et al. eds., 2007) (the most prevalent HFCs have an atmospheric lifetime of 14, 29, or 52 years); UNFCCC, *Global Climate Projections*, in CLIMATE CHANGE 2007: THE PHYSICAL SCIENCE BASIS, CONTRIBUTION OF WORKING GROUP I TO THE FOURTH ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE 824 (M. Allen et al. eds., 2007) (stating the atmospheric lifetime of CO₂ cannot be defined but fall generally between the 500-1000 year timeframe).

²⁰ See, e.g., *supra* note 4, Montreal Protocol at Arts. 2, 2A, 2F, and 5.

²¹ See Vienna Convention for the Protection of the Ozone Layer, *opened for signature* Mar. 22, 1985, 1513 U.N.T.S. 293 [hereinafter "Ozone Convention"] at Art. 2(2)(b).

²² See *supra* note 4, Montreal Protocol at Art. 2F.

²³ United Nations Framework Convention on Climate Change, 31 I.L.M. 849 (9 May 1992) [hereinafter UNFCCC] at Art. 7(2)(1).

²⁴ *Id.* at Arts. 2-3.

²⁵ *Id.* at Art. 4.

²⁶ See *supra* note 12, 2009 HFC Amendment (setting a the first control schedule for HFCs in 2012).

²⁷ See *supra* note 14, Kyoto Protocol at Art. 3, Annex I, Annex A.

²⁸ See *supra* note 24, UNFCCC at Arts. 2, 3.

²⁹ See *id.* at Art. 4.

³⁰ See *supra* note 4, Montreal Protocol at Arts. 4-5 (restricting trade in ODSs with non-Parties and requiring the establishment of ODS licensing systems), Art. 7 (establishing reporting requirements), Art. 8 (authorizing sanctions to be developed by the Parties for non-compliance), Art. 10-10A (establishing a financial and technology transfer mechanism to assist developing countries achieve compliance). To date, sanctions for non-compliance with obligations under the Montreal Protocol have never been used and only threatened once.

³¹ See *supra* note 16, Report of the 20th MOP at Decision XX/8.

³² See *supra* note 12, 2009 HFC Amendment; see also Letter from Dan Reifsnyder, Deputy Assistant Secretary, Environment and Sustainable Development, United States Department of State, to Marco Gonzalez, Ozone Secretariat, United Nations Environment Programme (4 May 2009) at http://ozone.unep.org/Meeting_Documents/oweg/29oweg/letter_from_USA_on_HFCs.pdf (last visited Jun 22, 2009).

³³ UNFCCC, SUBMISSION BY THE CZECH REPUBLIC ON BEHALF OF THE EUROPEAN COMMUNITY AND ITS MEMBER STATES (28 Apr. 2009), ¶¶ 38, 45 (EU proposes that the Copenhagen agreement include an international emission reduction arrangement for HFC emissions because the accelerated phase-out of HCFCs will further add to a rapid increase in the use of HFCs).