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**Open-ended Working Group of the Parties to
the Montreal Protocol on Substances that
Deplete the Ozone Layer
Forty-second meeting**
Montreal, Canada, 13–17 July 2020*
Items 3, 5 and 7 of the provisional agenda**

Issues for discussion by and information for the attention of the Open-ended Working Group of the Parties to the Montreal Protocol at its forty-second meeting

Note by the Secretariat

Addendum

I. Introduction

1. The present addendum to the note by the Secretariat on issues for discussion by and information for the attention of the Open-ended Working Group of the Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer at its forty-second meeting (UNEP/OzL.Pro.WG.1/42/2) contains information that has become available since the preparation of that note. Section II sets out new information provided by the Technology and Economic Assessment Panel in its May 2020 report in relation to agenda items 3 and 7. It also includes updated information pertaining to the identification of gaps in the global coverage of atmospheric monitoring of controlled substances and options for enhancing such monitoring, to be addressed under agenda item 5.

2. The May 2020 report of the Technology and Economic Assessment Panel consists of three volumes:¹

- (a) Volume 1: Progress report of the Technology and Economic Assessment Panel;
- (b) Volume 2: Interim report of the Methyl Bromide Technical Options Committee – Evaluation of 2020 critical-use nominations for methyl bromide and related issues;
- (c) Volume 3: Replenishment task force report – Assessment of the funding requirement for the replenishment of the Multilateral Fund for the period 2021–2023.

* Some agenda items will be discussed online and others will be deferred to a later date.

** UNEP/OzL.Pro.WG.1/42/1.

¹ Available on the Ozone Secretariat meeting portal for the forty-second meeting of the Open-ended Working Group at <http://conf.montreal-protocol.org/meeting/oewg/oewg-42/presession/SitePages/Home.aspx>.

II. Summary of issues for discussion by the Open-ended Working Group at its forty-second meeting

3. The issues covered in the present addendum are provided below in the order in which the respective agenda items are listed in the provisional agenda of the meeting.

Agenda item 3

Replenishment of the Multilateral Fund for the Implementation of the Montreal Protocol for the period 2021–2023

4. Consistent with decision XXXI/1, the Technology and Economic Assessment Panel established a task force to prepare a report on the appropriate level of replenishment of the Multilateral Fund for the Implementation of the Montreal Protocol for the triennium 2021–2023 for submission to the Thirty-Second Meeting of the Parties. The task force report is available on the meeting portal of the Ozone Secretariat's website.² The executive summary of the report is set out in annex I to the present addendum, as received from the Panel, without formal editing by the Secretariat. Both the report and its executive summary, which is available in the six official languages of the United Nations, are also available on an online forum established by the Secretariat in connection with the three substantially identical online technical sessions to be held on 14, 15 and 16 July 2020, respectively, to discuss this agenda item. The online forum affords parties the opportunity to view the document and provide comments and raise questions for the Panel's consideration and follow up.³

5. The task force held informal discussions with representatives of more than 40 parties operating under paragraph 1 of Article 5 (Article 5 parties) and parties not so operating (non-Article 5 parties), and with the secretariat of the Multilateral Fund and its four implementing agencies (United Nations Development Programme, United Nations Environment Programme, United Nations Industrial Development Organization and the World Bank), as well as a couple of bilateral agencies. The discussions were based on a draft questionnaire developed by the task force and structured around specific paragraphs of decision XXXI/1.

6. In carrying out its calculations for the funding requirements in the triennium 2021–2023, the task force used as a basis the consolidated business plan of the Multilateral Fund for 2020–2022, relevant decisions of the Executive Committee of the Multilateral Fund at its eighty-fourth meeting, and information available through the Multilateral Fund secretariat. It also relied on existing cost guidelines. However, in the absence of cost guidelines for the hydrofluorocarbon (HFC) phase-down by the time of the finalization of the report, the task force developed its own model to estimate the funding required to phase down HFCs for the triennium 2021–2023, on the basis of the best available information, established practices, experiences in hydrochlorofluorocarbon (HCFC) phase-out implementation and available Executive Committee decisions.

7. Through a detailed analysis, the total funding requirement for the replenishment of the Multilateral Fund in the triennium 2021–2023 was estimated at between \$377 million and \$809 million. The funding requirements were calculated for a business-as-usual scenario and three additional scenarios based on different levels of ratification of the Kigali Amendment to the Montreal Protocol by Article 5 parties, as shown in table 1. The estimates were derived from calculations of the funding requirements for components related to the HCFC phase-out, the HFC phase-down, as well as institutional-strengthening and other standard activities (i.e., costs related to the implementing agencies, the Multilateral Fund secretariat and the Treasurer).

² Available from http://conf.montreal-protocol.org/meeting/oewg/oewg-42/presession/Background-Documents/TEAP_decision_XXXI-1_replenishment-task-force-report_may2020.pdf.

³ <https://online.ozone.unep.org/t/teap-replenishment-task-force-report-assessment-of-the-funding-requirements-for-the-replenishment-of-the-multilateral-fund-for-2021-2023/19>.

Table 1

Range of total funding requirements for the replenishment of the Multilateral Fund for the period 2021–2023 based on different scenarios as specified in the task force report

(United States dollars)

<i>Triennium 2021–2023</i>	<i>Low end with HFC BAU^a</i>	<i>Low end with HFC scenario 1^b</i>	<i>Low end with HFC scenario 2^c</i>	<i>High end with HFC scenario 3^d</i>
<i>HCFC activities</i>	249 203 000	249 203 000	249 203 000	367 548 000
<i>HFC activities</i>	16 144 000	64 600 000	288 400 000	321 000 000
<i>Institutional- strengthening and standard activities</i>	111 350 000	111 350 000	111 350 000	120 315 000
Grand total	376 697 000	425 153 000	648 953 000	808 863 000

^a Business-as-usual scenario, based on the consolidated business plan of the Multilateral Fund for the period 2020–2022 approved by the Executive Committee at its eighty-fourth meeting.

^b Based on 62 countries that had ratified the Kigali Amendment as at 3 April 2020.

^c Based on 62 countries that had ratified the Kigali Amendment as at 3 April 2020 as well as countries that had sent letters of intent to ratify to the secretariat of the Multilateral Fund -139 countries in total (see annex 9 of the task force report).

^d Based on the assumption that all countries ratify the Kigali Amendment in the triennium 2021–2023.

8. The task force provides in its report a detailed account of the calculations of the various components and the assumptions involved in addressing the provisions of decision XXXI/1. It also notes that estimates for funding destruction activities are not provided as there was no specific guidance on that issue in the terms of reference for the study. However, the task force includes some considerations pertaining to the destruction of controlled substances, noting that parties may wish to consider such issues for future trienniums.

9. While acknowledging the potentially significant impact the coronavirus disease (COVID-19) pandemic has had and will continue to have on the global and national economies, the task force indicates that its estimates have not taken into account the changing global scenario and the potential implications it may have for funding and project implementation under the Montreal Protocol, as it lacked sufficient information and guidance to do so. Some preliminary considerations of such potential impacts, however, are provided in annex 6 to the task force report.

10. In accordance with its terms of reference, the task force also provides indicative funding requirement ranges for the subsequent two trienniums 2024–2026 and 2027–2029, shown in table 2 below. The range of funding estimates was based on the continuation of HCFC phase-out activities, following the same methodology as for the triennium 2021–2023; HFC activities according to scenario 3, where it is assumed that all countries ratify the Kigali Amendment according to two time frames: by 2023 and by 2025, following the same methodology as for the triennium 2021–2023; and institutional-strengthening and standard activities according to the methodology used in scenario 3.

Table 2

Indicative total funding requirement for the replenishment of the Multilateral Fund for the trienniums 2024–2026 and 2027–2029

(United States dollars)

<i>Triennium</i>	<i>Total funding requirement range</i>	
	<i>All countries ratify by 2023</i>	<i>All countries ratify by 2025</i>
2024–2026	942 000 000	801 000 000
2027–2029	861 000 000	1 063 000 000

11. The Open-ended Working Group may wish to consider the initial work of the replenishment task force. As is customary, parties may wish to request additional information to be included in a supplementary report to be prepared by the task force. Such elements will need to be discussed and agreed by the parties collectively by consensus before the task force prepares the supplementary report.

Agenda item 5

Identification of gaps in the global coverage of atmospheric monitoring of controlled substances and options for enhancing such monitoring (decision XXXI/3, para. 8)

12. As mentioned in the note by the Secretariat (UNEP/OzL.Pro.WG.1/42/2, paras. 14 to 16), in line with paragraph 8 of decision XXXI/3, the Scientific Assessment Panel, in cooperation with experts in atmospheric monitoring of substances controlled under the Montreal Protocol, prepared a paper entitled “Closing the gaps in top-down regional emissions quantification: needs and action plan” to serve as a basis for the discussion by the Ozone Research Managers at their eleventh meeting. Subsequently, the paper was revised based on comments provided by resource experts of the eleventh meeting of the Ozone Research Managers. The revised paper is posted on the portal of that meeting for consideration by the ozone research managers (UNEP/OzL/Conv.ResMgr/11/4/Rev.1).⁴ It is also posted as a background document on the portal of the forty-second meeting of the Open-ended Working Group for information purposes only, owing to its relevance to item 5 of the provisional agenda.

13. The eleventh meeting of the Ozone Research Managers has been postponed twice due to the COVID-19 pandemic and is currently scheduled to be held in Geneva from 14 to 16 April 2021. Given the interest of the parties on the issue addressed in paragraph 8 of decision XXXI/3 and after consulting the co-chairs of the eleventh meeting of the Ozone Research Managers and the Scientific Assessment Panel, arrangements have been made for two substantially identical intersessional online meetings to be held on 7 and 8 October 2020, respectively, in order to allow presentation of and discussions among ozone research managers on this issue, including the paper itself. Should any further input be received during the online meetings, the paper will be revised and shared with the parties at a later stage.

14. In brief, the paper notes that the recent finding of unexpected atmospheric emissions of the ozone-depleting substance trichlorofluoromethane (CFC-11) highlights the need to expand ways to find, quantify and attribute emissions of substances controlled under the Montreal Protocol. Such activities would enable the parties to take action at national, regional, and international levels to ensure compliance, thereby safeguarding the ozone layer and mitigating climate change. To address this issue, an envisioned approach is presented based on:

- (a) Atmospheric measurements at judiciously chosen locations using in situ instrumentation and collection and analyses of flask samples;
- (b) Ensuring calibration and transparency of the measured data;
- (c) Inverse emissions modelling.⁵

15. The main elements of a pathway to accomplish the above-mentioned goals are laid out in the paper, elaborating on the current capabilities and their limitations; filling the gaps in top-down regional emissions quantification; criteria for selecting new observing locations; benefits, costs and organizational structures; and options for initiatives to close the gaps.

Agenda item 7

Technology and Economic Assessment Panel 2020 report

16. The Technology and Economic Assessment Panel will present its findings and recommendations, as contained in volumes 1 and 2 of its May 2020 report, under item 7 of the provisional agenda. The Panel’s annual progress report (volume 1) comprises progress reports by its technical options committees, the Panel’s response to parties’ requests in two decisions (XXX/7 and XXXI/8) and other matters pertaining to membership and continued challenges.⁶ The interim report of the Methyl Bromide Technical Options Committee (volume 2) elaborates on the evaluation of 2020 critical-use nominations for methyl bromide and related issues.⁷

⁴ <http://conf.montreal-protocol.org/meeting/orm/11orm/presession/English/ORM11-4-Rev-1E.pdf>.

⁵ “Inverse modelling” is used to assess global or regional emissions from atmospheric observations. Such models trace measured variations in composition back to their source regions and account for atmospheric mixing. When combined with a statistical framework that accounts for uncertainties in the data and model, these simulations can be used to infer emissions from the observations.

⁶ <http://conf.montreal-protocol.org/meeting/owwg/owwg-42/presession/Background-Documents/TEAP-Progress-report-and-response-decXXXI-8-may2020.pdf>.

⁷ <http://conf.montreal-protocol.org/meeting/owwg/owwg-42/presession/Background-Documents/TEAP-CUN-interim-report-may2020.pdf>.

17. The key messages of the technical options committees' progress reports are reproduced in annex II to the present addendum as set out in the Panel's progress report without formal editing by the Secretariat. The remaining main issues are summarized in the following sections.

(a) **Nominations for critical-use exemptions for methyl bromide for 2021 and 2022**

18. As indicated in the note by the Secretariat (UNEP/OzL.Pro.WG.1/42/2, paras. 24 and 25), the Methyl Bromide Technical Options Committee evaluated a total of six nominations for critical-use exemptions that were submitted in 2020. Two Article 5 parties, Argentina and South Africa, submitted two nominations each for 2021, and two non-Article 5 parties, Australia and Canada, submitted one nomination each, for 2022 and 2021, respectively.

19. The total amount of methyl bromide nominated for 2021 and 2022 is 88.851 tonnes, of which the Committee has made an interim recommendation for authorization of a total 69.607 tonnes. Table 3 summarizes the nominations of the parties and the interim recommendations of the Committee, with brief comments in the footnotes to the table when the recommendations differ from the amounts nominated.

Table 3

Summary of the nominations for 2021 and 2022 critical-use exemptions for methyl bromide submitted in 2020 and the interim recommendations of the Methyl Bromide Technical Options Committee

(Metric tons)

<i>Party</i>	<i>Nomination for 2021</i>	<i>Interim recommendation for 2021</i>	<i>Nomination for 2022</i>	<i>Interim recommendation for 2022</i>
Non-Article 5 parties and sectors				
1. Australia				
Strawberry runners			28.98	[28.98]
2. Canada				
Strawberry runners	5.261	[5.017] ^a		
Subtotal	5.261	[5.017]	28.98	[28.98]
Article 5 parties and sectors				
3. Argentina				
Tomato	12.07	[6.96] ^b		
Strawberry fruit	7.54	[4.35] ^c		
4. South Africa				
Mills	1.0	[0.30] ^d		
Structures	34.0	[24.0] ^e		
Subtotal	54.61	[35.61]	28.98	[28.98]
Total	59.871	[40.627]	28.98	[28.98]

^a The nominated amount has been reduced by 4.6 per cent to account for generation 2A production of runner tips (a step-wise system producing propagation material that increases at each step) as the Methyl Bromide Technical Options Committee considers that facilities presently being constructed by the applicant will be available to use soil-less technologies by 2021.

^b The nominated amount has been reduced by 42.3 per cent, based on a lower dosage rate (reduced from 26.0 to 15.0 g/m²) for the adoption of barrier films (e.g., totally impermeable film for the treated area, which is 58 per cent of the 80 ha nominated (80 ha x 58 per cent x 15 g/m²), in accordance with the Methyl Bromide Technical Options Committee's standard presumptions.

^c The recommended amount, which represents a 42.3 per cent reduction from the amount nominated, is based on the adoption of barrier films (e.g., virtually impermeable films, totally impermeable films) for the nominated areas. This includes 1.523 tons for Mar del Plata (17.5 ha x 58 per cent x 15 g/m²) and 2.827 tons for Lules (32.5 ha x 58 per cent x 15 g/m²). The dosage rate of 15 g/m² is based on the use of barrier films and row treatments that make up 58 per cent of the field area.

^d The recommended amount is the same as the approved amount of the critical-use exemption for 2020 and represents a 70 per cent reduction from the nomination sought by the party for use in 2021 for pest control in grit mills. The reduction is based on a lower number of fumigations with an amount of methyl bromide sufficient for one fumigation per year per mill at 24 g/m³. Even though this rate exceeds the Methyl Bromide Technical Options Committee's standard presumption of 20 g/m³, it is the lowest registered dosage. The recommendation is only supported as a further transitional measure to allow time for the adoption and optimization of alternatives in an integrated pest management system, with phase-in of phosphine or an alternative whole-site fumigant, such as sulfuryl fluoride, if desired, in these small, old mills.

^e The recommended amount represents a 29.4 per cent reduction of the nominated amount for 2020 as the Methyl Bromide Technical Options Committee considers that sulfuryl fluoride is a suitable alternative for nearly all the circumstances of this nomination and can be transitioned in three years. In 2020 a transition of 10 per cent is considered possible and a further 30 per cent transition by 2021, resulting in a total 40 per cent reduction of the amount nominated in 2019. Further validation may be required during this time to determine the efficacy of sulfuryl fluoride for control of wood-boring beetles, particularly their eggs.

20. In addition to the interim recommendations on parties' critical-use nominations, the report of the Methyl Bromide Technical Options Committee recalls the reporting requirements under relevant decisions and includes information on trends in methyl bromide critical-use nominations and exemptions for all nominating parties to date, as well as on the reported accounting frameworks for critical uses and stocks of methyl bromide, and on the submission of national management strategies for the phase-out of critical uses of methyl bromide.

21. Based on the accounting framework information received from the nominating parties in 2020, the total stocks of methyl bromide at the end of 2019 were approximately 21.66 tonnes. The Methyl Bromide Technical Options Committee reiterates in its report, however, that the accounting information does not show accurately the total stocks of methyl bromide held globally for controlled uses by Article 5 parties, as some parties have no formal mechanism to account accurately either for such stocks or for stocks used in quarantine and pre-shipment applications, and there is no requirement for parties under the Montreal Protocol to report pre-2015 stocks. According to the Committee, such stocks may be substantial (greater than 1,500 tonnes).

22. With regard to the submission of national management strategies for the phase-out of critical uses of methyl bromide, the Methyl Bromide Technical Options Committee reports that no detailed management plans were received from Argentina and South Africa, but notes the progress made by those parties in reducing their nominated amounts.

23. The nominating parties and the Methyl Bromide Technical Options Committee are expected to hold further bilateral online discussions on the interim recommendations and additional information that may be provided to the Committee for its final evaluation and recommendations. The final report of the Committee will be available prior to the Thirty-Second Meeting of the Parties.

24. The interim report of the Methyl Bromide Technical Options Committee is also available on the online forum established by the Ozone Secretariat to enable parties to view the document, and provide comments and raise questions for the Committee's consideration and follow up.⁸

25. The Open-ended Working Group may wish to consider the report and interim recommendations of the Methyl Bromide Technical Options Committee and propose a way forward.

(b) Future availability of halons and their alternatives (decision XXX/7)

26. As mentioned in the note by the Secretariat (UNEP/OzL.Pro.WG.1/42/2, paras. 26 to 28), in decision XXX/7 the parties requested the Technology and Economic Assessment Panel, through its Halons Technical Options Committee, to continue engaging with the International Maritime Organization (IMO) and the International Civil Aviation Organization (ICAO) to better assess future amounts of halons available to support civil aviation and to identify relevant alternatives already available or in development. The parties also requested the Committee to identify ways to enhance the recovery of halons from the breaking of ships and identify specific needs for halons, other sources of recoverable halons, and opportunities for recycling halons in Article 5 and non-Article 5 parties. The Panel was further requested to submit a report on halon availability to the parties in advance of the forty-second meeting of the Open-ended Working Group. The requested report is included in the Panel's 2020 progress report (volume 1) and is summarized in the following paragraphs.

1. Engagement with the International Maritime Organization and the International Civil Aviation Organization

27. The Halons Technical Options Committee reports that, in March 2020, two of its three co-chairs met with IMO to discuss how to make timely progress to meet the timelines of decision XXX/7. While IMO itself does not keep track of the information requested in the decision, it showed a willingness to assist in finding ways to collect the information. In particular, IMO has agreed to publish an article, to be authored by the co-chairs of the Halons Technical Options Committee, that will lay out the need for halon 1301 and explain why it is a very valuable commodity that needs to be recovered carefully during shipbreaking activities. IMO will disseminate the article, targeting entities that perform or are knowledgeable about shipbreaking activities, processes and procedures. The Committee will also provide written advice to IMO regarding safe handling practices for halons and other pressurized fire protection cylinders to ensure that they are removed, stored and recovered safely, with minimal emissions to the atmosphere. Similarly, IMO has agreed to disseminate that information to its member States and other relevant organizations to raise awareness of the need to carefully handle halon 1301 (and other gaseous, halogenated fire protection agents) during shipbreaking activities.

⁸ <https://online.ozone.unep.org/t/teap-mbtoc-report-on-evaluation-of-critical-use-nominations-for-methyl-bromide-interim-report/22>.

28. In addition, the Halons Technical Options Committee plans to continue working with IMO to update its understanding of the current state of use or retrofit of halons, high-global-warming-potential-HFC and alternative gaseous, halogenated fire protection alternatives for both existing (retrofit applications) and new ship builds. Furthermore, the Committee has specifically asked for the assistance of IMO staff in identifying experts in shipbreaking activities and fire protection alternatives to serve as Committee members.

29. With regard to its engagement with ICAO, the Halons Technical Options Committee reports on its continued coordination with the organization to advance the understanding of halon emissions from the civil aviation sector. ICAO reconvened the informal industry working group previously established⁹ to discuss how to collect better information on halon 1301 emissions from the civil aviation sector. Following the poor results from a questionnaire that had been sent by ICAO to all States with civil aviation halon 1301 service providers, the working group decided that a detailed study would be necessary by a funded consultant and agreed to develop the terms of reference for the study and evaluate the proposals received. Even though industry has now placed these plans on hold owing to COVID-19, ICAO has agreed to continue to work with the Committee on getting these issues onto the agenda for its 2022 General Assembly meeting.

2. Identification of ways to estimate the amount of halons from the breaking of ships

30. In early 2020, the co-chairs of the Halons Technical Options Committee appointed a new member from the shipbreaking industry with a view to quantifying the amounts of halons from shipbreaking more accurately so that the Committee would be in a position to better estimate the likely run-out date. Unfortunately, the provision of such information, which had started in February 2020, was hampered by shipyards closure owing to the COVID-19 pandemic. Once the situation eases, this effort will recommence.

31. In addition, the Halons Technical Options Committee has begun liaising with a non-governmental organization specializing in recording shipbreaking activity around the world. It is anticipated that, in the future, the information provided by that organization will assist to estimate the amount of halon 1301 recovered from the shipbreaking industry globally. Similarly, the Committee will provide advice to that organization on safe handling practices for halon cylinders and other pressurized cylinders.

3. Implications of COVID-19 for future work

32. The Halons Technical Options Committee reports that the global response to the COVID-19 pandemic is projected to have a lasting impact on the halon 1301 sector. In civil aviation, airframe manufacturers have lowered their production rates, forecasting that growth rates will not return to pre-COVID-19 levels for at least five years. Additionally, airlines appear to have accelerated the decommissioning of older, less efficient aircraft and it is not currently known whether those aircraft will be broken and the halon recovered and reclaimed for reuse, or whether they will eventually be returned to service.

33. In merchant shipping, the use of halon 1301 may be reduced temporarily and resume as economies improve. On the other hand, it is possible that there will be an increase in the decommissioning and breaking of older ships that were fitted with halon 1301 for fire protection. In other sectors, such as the oil and gas, military and telecommunications sectors, the impacts of the pandemic on halon 1301 uses and/or emissions are also expected to be short-term.

34. The economic downturn caused by COVID-19 has had, and will continue to have, a huge impact on the halon 1301 sector. As a consequence, all the previous projections on halon 1301 reported by the Committee to parties on annual global emissions, installed amounts in civil aviation,

⁹ In response to decision XXIX/8, on future availability of halons and their alternatives, the Halons Technical Options Committee reported in its 2018 progress report that ICAO had established an informal working group, including one Committee co-chair and one Technology and Economic Assessment Panel co-chair, to determine the uses and emissions of halon 1301 within civil aviation fire protection systems. The working group had prepared a survey that ICAO sent officially to all States with civil aviation halon 1301 service providers with a view to deriving a more accurate estimate of the amount of halon 1301 emitted annually by civil aviation worldwide.

amounts recoverable from decommissioned civil aircraft or quantities expected from shipbreaking are now questionable.¹⁰

35. The Committee notes that it plans to work cooperatively with ICAO, IMO, civil aviation and maritime and merchant shipping non-governmental organizations, other halon 1301 sector experts, the Scientific Assessment Panel and potentially the Environmental Effects Assessment Panel to gather new data and information to rebuild the modelling and estimates for the current and projected halon 1301 market in terms of uses, installed base and annual emissions. Recognizing that this is a significant task and will take time, the Committee notes that it plans to carry out that work and report the outcome to the parties as part of its upcoming 2022 quadrennial assessment.

(c) Any other issues

1. Emergency use of methyl bromide reported by Canada

36. In correspondence dated 30 March 2020, the Government of Canada notified the Ozone Secretariat that it expected to consume a quantity of methyl bromide not exceeding 1.764 tonnes for an emergency use in 2020. That amount was part of the amount of 5.261 tonnes for use in pre-plant soil fumigation of strawberry runners granted to Canada in 2019 by decision XXXI/4, which was not used in that year due to unfavourable local weather conditions. The party noted that the total quantity of methyl bromide used for 2019 and 2020 for critical and emergency uses would not exceed the total quantity of methyl bromide that had been approved by the parties for critical use for those years.

37. In accordance with decision IX/7, the Secretariat and the Technology and Economic Assessment Panel have evaluated that use. In volume 2 of the Panel's May 2020 report, the Methyl Bromide Technical Options Committee reports that it has no issue with the request by Canada, which could be considered as much a scheduling issue regarding the use of authorized critical use of methyl bromide amounts in the following season due to unfavourable weather conditions, as an emergency use as specified in decision IX/7.

2. Response to decision XXXI/8 entitled "Terms of reference of the Technology and Economic Assessment Panel and its technical options committees and temporary subsidiary bodies – procedures relevant to nominations"

38. In decision XXXI/8, the Technology and Economic Panel was requested to provide, as part of its annual progress report, a summary outlining the procedures that the Panel and its technical options committees have undertaken to ensure adherence to the Panel's terms of reference through clear and transparent procedures, including full consultations with the focal points, in line with the terms of reference, regarding: (a) nomination processes, taking into account the matrix of needed expertise and already available expertise; (b) proposed nominations and appointment decisions; (c) termination of appointments; and (d) replacements. The Panel's response, set out in section 8.1 of its progress report, includes references to the relevant provisions of its terms of reference and the document that had been prepared by the Ozone Secretariat in 2019, in consultation with the Panel, in response to decision XXX/15 on review of the terms of reference, composition, balance, fields of expertise and workload of the Technology and Economic Assessment Panel. A summary of the Panel's response is provided in the following paragraphs.

39. On the nomination processes, the Panel notes its continued effort to identify appropriate expertise and qualified candidates who are interested and available to serve. In doing so, it considers the current pool of experts, the potential loss of expertise through attrition or lack of support, and the need for specific and cross-cutting expertise within the technical options committees and the Panel itself. Identified needs are communicated to the parties through the Panel's annual progress reports which include updated information on the membership of the Panel and its technical options committees¹¹ and the matrix of needed expertise, also available on the Ozone Secretariat's website. A standard form for nominations of experts to the Panel, technical options committees or temporary subsidiary bodies has been finalized and is available on the Secretariat's website.¹²

¹⁰ In its 2018 quadrennial assessment report, the Halons Technical Options Committee had reported that increasing demand for ongoing, enduring fire-fighting uses, such as in civil aviation, oil and gas facilities, nuclear facilities and military installed base and reserves, would soon exceed supply from stockpiles. For users without access to significant stockpiles, halon 1301 supplies could run out well before the previously estimated 2032–2054 time frame.

¹¹ See annex 1 to the Panel's May 2020 progress report.

¹² <https://ozone.unep.org/sites/default/files/TEAP%20Nomination%20Form%20final.docx>.

40. Nominations for appointment or reappointment of experts to technical options committee can be made at any time throughout the year and are considered by the co-chairs of the relevant committee in consultation with the co-chairs of the Panel and the relevant national focal points. In determining whether to accept or decline a nomination submitted by a party, consideration is given to the expertise of the nominee, the expertise needed by the relevant committee, the balance between experts from Article 5 and non-Article 5 parties on the committee, as well as geographical and gender balance. The needed expertise may, however, outweigh the other considerations. The need to maintain a reasonable size and balance, to avoid duplication of expertise and to ensure that expertise gaps are filled means that nominations may sometimes be declined or that their consideration may be deferred.

41. In addressing the termination of appointments and replacements, the Panel cites the relevant provisions in the terms of reference, and notes that they are followed as described.

2. Organizational matters

42. In its May 2020 progress report, the Technology and Economic Assessment Panel elaborates on organizational issues related to each of its technical options committees, including the specific expertise needed. Information on the status of the membership of the Technology and Economic Assessment Panel and its technical options committees as at May 2020 is included in annex 1 to the progress report.

43. Table 4, below, lists the co-chairs and members of the Technology and Economic Assessment Panel whose membership expires at the end of 2020 and whose reappointment requires a decision by the Meeting of the Parties. The members of the technical options committees whose membership expires at the end of 2020 and whose reappointment does not require a decision by the Meeting of the Parties are listed in annex III to the present addendum.

44. Nominations or renominations to technical options committees and temporary subsidiary bodies and appointments or reappointments can be made at any time. The Panel has clarified that new appointments to technical options committees are to start from the date of appointment by the committee's co-chairs and are to end on 31 December of the fourth year of membership.

Table 4

Members of the Technology and Economic Assessment Panel whose membership expires at the end of 2020 and whose reappointment requires a decision by the Meeting of the Parties

<i>Name</i>	<i>Position</i>	<i>Country</i>
Bella Maranion	TEAP co-chair	United States of America
Paulo Altoé	FTOC co-chair	Brazil
Adam Chattaway	HTOC co-chair	United Kingdom of Great Britain and Northern Ireland
Daniel Verdonik	HTOC co-chair	United States of America
Marco Gonzalez	TEAP senior expert	Costa Rica
Rajendra Shende	TEAP senior expert	India
Sidi Menad Si-Ahmed	TEAP senior expert	Algeria

Abbreviations: FTOC – Flexible and Rigid Foams Technical Options Committee; HTOC – Halons Technical Options Committee; TEAP – Technology and Economic Assessment Panel.

45. The parties may wish to consider nominating or renominating co-chairs and members, using the nomination form available on the Secretariat's website, and appointing or reappointing them. Prior to doing so, however, the parties are urged to follow the terms of reference for the Panel as set out in the annex to decision XXIV/8,¹³ consult the Panel's co-chairs and refer to the matrix of needed expertise, in line with decisions XXX/16 and XXXI/8. The matrix of needed expertise for 2020, set out in annex 2 to the Panel's May 2020 progress report, is reproduced in annex IV to the present addendum and is posted on the Ozone Secretariat's website.¹⁴

3. Continuing challenges

46. The May 2020 progress report outlines the continuing challenges faced by the Technology and Economic Assessment Panel and its technical options committees. One of those challenges is the identification of candidates with technical expertise, relevant experience and time. A useful approach

¹³ <https://ozone.unep.org/node/1953>.

¹⁴ See <https://ozone.unep.org/science/assessment/teap/teap-expertise-required>.

taken by the Panel and its technical options committees is to appoint new experts in the required technical areas to contribute to task forces, where they can demonstrate their experience, knowledge, ability to communicate and write, and capacity to contribute to and work towards consensus. The technical options committees are also challenged by attrition through the retirement of members and consequent loss of expertise. For Panel and committee members alike, the overall workload remains challenging to manage in the context of a separate full-time occupation.

47. The Panel also mentions the additional challenges it faced due to the COVID-19 pandemic, which resulted in its usual annual face-to-face meeting being conducted virtually by means of short online sessions spread over a two-week period. Although those sessions, facilitated by the Ozone Secretariat, generally ran smoothly, additional and unusual hurdles could not be avoided. Notwithstanding the difficulties, the Panel managed to provide its outputs as close as possible to the usual deadlines.

48. The Panel once again suggests that it would be helpful for it and the parties to consider, at the time of making decisions requesting specific work, the overall annual workload, the deadlines for delivery and the support provided to the Panel.¹⁵ Welcoming the opportunity to further engage with the parties to address its challenges, the Panel reaffirms its commitment to continue serving the needs of the parties.

¹⁵ Information on the reports that are expected to be produced by the Panel annually until 2030 can be accessed through an interactive online tool available on the Secretariat's website at: <https://ozone.unep.org/teap-reports>.

Annex I

Report by the Technology and Economic Assessment Panel (May 2020) Volume 3

Assessment of the funding requirement for the replenishment of the Multilateral Fund for the period 2021-2023

Executive Summary

Decision XXXI/1 of the Thirty-First Meeting of the Parties (MOP-31) provided the terms of reference (TOR) for the work of the Technology and Economic Assessment Panel (TEAP) to prepare a report on the appropriate level of the replenishment of the Multilateral Fund (MLF) for the triennium 2021-2023. The parties requested the TEAP to prepare a report for submission to the Thirty-Second Meeting of the Parties (MOP-32), and to present it to the Open-ended Working Group (OEWG) at its 42nd meeting (OEWG-42), to enable MOP-32 to take a decision.

The TEAP established a Replenishment Task Force (RTF), with members from TEAP, its Technical Options Committees (TOCs), and other outside experts. In December 2019, some RTF members attended the 84th meeting of the Executive Committee of the MLF (ExCom-84) to conduct informal discussions with ExCom members, Implementing and Bilateral Agencies present at that meeting.

The RTF calculated the funding requirements based on the “Consolidated Business Plan of the Multilateral Fund for 2020-2022,”¹ relevant decisions of the Executive Committee at its 84th meeting, and information available through the MLF Secretariat. The RTF relied on existing cost guidelines under the MLF and, where these remained under discussion in the Executive Committee (i.e., cost implications of parallel or integrated implementation of HCFC phase-out, cost guidelines for hydrofluorocarbon (HFC) phase-down activities and review of Institutional Strengthening), the RTF noted these limitations in its estimates. Since funding guidelines to phase down HFCs are still under discussion, the RTF relied on existing cost guidelines under the MLF, where available.

The RTF’s work began in late 2019 and continued in early 2020 through a fast-changing global landscape as the world’s attention turned to addressing the novel coronavirus (COVID-19) pandemic. While acknowledging the potentially significant impact the pandemic will have on world economies now and in the future, the RTF estimates of the funding requirements for the replenishment of the MLF in the 2021-2023 triennium have not taken into account the changing global scenario and the potential implications for funding and project implementation under the Montreal Protocol, as it lacked sufficient information and guidance to do so. Annex 6 provides some preliminary considerations of these potential impacts to relevant sectors.

HCFC Phase-out

The estimate for the HCFC phase-out funding requirement for the 2021-2023 triennium and beyond is based on Article 5 (A5) parties meeting the upcoming reduction targets. The RTF calculated the incremental reductions needed each year by A5 parties in order to meet the upcoming HCFC reduction targets under the Montreal Protocol based on their baseline, starting points, cumulative reductions, and remaining eligible tonnage, and the estimated costs for activities in the HCFC consumption and production sectors which include the following:

- HCFC consumption sector funding estimates include:
 - Funding for approved HCFC Phase-out Management Plans (HPMPs);
 - Funding for project preparation costs;
 - Funding for planned HPMPs;
 - Estimated funding for additional HPMPs that will be needed if reduction targets are to be reached;
 - Funding for verification, and
 - Funding for technical assistance, if any.

¹ UNEP/OzL.Pro/ExCom/84/26

- HCFC production sector funding estimates include:
 - Funding for project preparation, and
 - Funding for approved HCFC Production Phase-out Management Plans (HPPMPs), including verification.

HFC Phase-down

The RTF undertook a number of steps including conversions between units [ozone depletion potential (ODP), Global Warming Potential (GWP), metric tonnes, kilograms, and MMTCO₂eq)] to calculate the total estimated funding for an HFC phase-down. To avoid confusion with HPMPs, the RTF refers to HFC phase-down projects as “Kigali HFC Phase-down Management Plans” or “KPMPs”.

Estimated funding requirement for the HFC consumption and production sectors include the following:

- HFC consumption sector funding estimates include:
 - Funding for KPMPs – approved, project preparation, planned, and estimated;
 - Funding for stand-alone projects;
 - Funding for ratification assistance;
 - Funding for verification, if any; and
 - Funding for early activities to avoid growth of high-GWP HFCs.
- HFC production sector funding estimates include:
 - Funding for HFC production sector preparation;
 - Funding for “Kigali HFC Production Phase-down Management Plans” or “KPPMPs,” if any; and
 - Funding for HFC-23 mitigation.

Decision XXXI/1, paragraph 2(g) requested the TEAP to consider “three scenarios representing different potential levels of ratification of the Kigali Amendment when estimating the funding requirement for the phase-down of HFCs”. The RTF estimated funding requirement for HFC phase-down in the 2021-2023 triennium includes a business-as-usual (BAU) scenario, which is based on the 2020-2022 MLF Consolidated Business Plan (BP) approved at ExCom-84. As of 3rd April 2020, 62 A5 parties had ratified the Kigali Amendment and 139 A5 parties had submitted letters of intent to ratify to the MLF Secretariat. So the RTF also considered the following scenarios for HFC in the 2021-2023 triennium based on different potential levels of ratification:

Scenario 1: Countries that have ratified;

Scenario 2: Countries that have ratified plus countries with Letters of Intent sent to the MLF Secretariat as per criterion on “enabling activities funding”; and

Scenario 3: All countries ratify.

For this triennium, the RTF responded to parties’ request to take into account the special needs of low-volume consuming (LVC) countries and took a bottom-up approach for the servicing sector funding calculations. The RTF examined the activities gaps and needs expressed by LVCs during informal consultations with RTF members during ExCom-84. The RTF also took into consideration the potential to integrate HPMPs and KPMPs for servicing sector activities in LVCs based on the concept of “maintain and build” described in the report. RTF has broken down the needs of LVCs by sector and defined by the period when both HPMP and KPMP are implemented in parallel. The RTF estimated the funding requirement for HFC phase-down in the 2021-2023 triennium based on the methodology with compliance targets, and in addition the “maintain and build” activities in the servicing sector.

In the absence of HFC guidelines on Cost Effectiveness (CE) values, the RTF considered available CE values for HCFCs, for the servicing and other sectors for all non-LVC countries in both Group 1 and Group 2 categories under the Kigali Amendment.

Following the TOR, the RTF also provided estimated funding needs to support a limited number of stand-alone projects transitioning out of HFCs in accordance with paragraph 4 of decision XXX/5.

The RTF has also included estimated figures for early activities to avoid growth of high-GWP HFCs. Those early activities include giving priority in the 2021-2023 triennium for a) investment projects in high-growth sectors, especially manufacturing sectors (“close the tap” concept), and b) a variety of end-user activities and schemes to transform the market for energy-efficient and lower GWP products. While it is clear that servicing/end-user sector activities generate HFC waste during replacement and

other activities including refrigerant recovery, and therefore the RTF discusses the need for support for destruction in future triennia.

While the adjusted MLF Business Plan 2020-2022 did not contain estimates for HFC production sector preparation, the RTF estimated a range from zero to US\$ 2 million based on potentially funding production sector audits in a small number of countries. The RTF estimated no funding requirement in this triennium for KPPMPs.

In order to prepare for operation of a few facilities (not currently in operation) to incinerate and mitigate HFC-23, the RTF estimated the mitigation investment and operating costs for the 2021-2023 triennium to only include Mexico and Argentina. The HFC-23 mitigation preparation costs include Venezuela and DPR Korea in the high end of the estimate. The total funding requirement for the 2021-2023 triennium for the HFC-23 mitigation is estimated to range from US\$ 6.4 million to US\$ 26.3 million.

Institutional Strengthening & Standard Activities

The estimated funding requirement also includes institutional strengthening (IS) and standard activities. In the absence of policy related to the “Review of Institutional Strengthening” funding to be considered at the ExCom-85 meeting, the RTF considered, a) a BAU business-as-usual scenario or BAU, based on figures presented in the 2020-2022 MLF Consolidated BP and b) a scenario that follows the level of increase of funding used at the previous IS review (28%). The RTF also considered other scenarios with increases from the BAU levels of 50% and 100%. The last two hypothetical scenarios were not considered in the final funding requirement table, but presented for parties’ information on a range of potential funding levels for all 4 scenarios. Ratification scenarios were not taken into consideration for IS calculations.

The estimated funding requirement for Standard Activities, such as UNEP Compliance Assistance Programme (CAP), Core Unit of UNDP, UNIDO and the World Bank, MLF Secretariat and Treasurer, were based on the BAU scenario.

The total estimated funding requirement for the replenishment of the MLF in the 2021-2023 triennium is **US\$ 377-809 million** as presented in Tables ES-1 and ES-2 below.

Table ES-1. Range of Total Funding Requirement Based on Different Scenarios (US\$)

2021-2023 TRIENNIUM	LOW END WITH HFC BAU	LOW END WITH HFC SCENARIO 1	LOW END WITH HFC SCENARIO 2	HIGH END WITH HFC SCENARIO 3
SUBTOTAL – HCFC Activities	\$ 249,203,000	\$ 249,203,000	\$ 249,203,000	\$ 367,548,000
SUBTOTAL - HFC Activities	\$ 16,144,000	\$ 64,600,000	\$ 288,400,000	\$ 321,000,000
SUBTOTAL – IS & Standard Activities	\$ 111,350,000	\$ 111,350,000	\$ 111,350,000	\$ 120,315,000
GRAND TOTAL	\$ 376,697,000	\$ 425,153,000	\$ 648,953,000	\$ 808,863,000

Table ES-2. Total funding requirement for the replenishment of the MLF 2021-2023 (US\$)

2021-2023 Triennium	LOW END		HIGH END	
HCFC Consumption Sector				
HCFC Approved HPMPs	\$ 113,098,000		\$ 113,098,000	
HCFC Prep Costs	\$ 1,954,000		\$ 1,954,000	
HCFC Planned HPMPs	\$ 36,914,000		\$ 36,914,000	
HCFC RTF Estimated HPMPs	\$ 24,313,000		\$ 135,077,000	
HCFC Verification	\$ 1,766,000		\$ 1,766,000	
HCFC Technical Assistance	\$ -		\$ 1,000,000	
Subtotal – HCFC Consumption Sector	\$ 178,045,000		\$ 289,809,000	
HCFC Production Sector				
HCFC Production Sector Prep	\$ -		\$ -	
HCFC Production Sector HPPMPs	\$ 71,158,000		\$ 77,739,000	
Subtotal – HCFC Production Sector	\$ 71,158,000		\$ 77,739,000	
2021-2023 Triennium	BAU / Business Planning	SCENARIO 1: RATIFIED	SCENARIO 2: RATIFIED + LETTERS OF INTENT	SCENARIO 3: ALL COUNTRIES
HFC Consumption Sector				
HFC Approved KPMPs	\$ -	\$ -	\$ -	\$ -
HFC Prep Costs	\$ 2,454,000	\$ 2,500,000	\$ 27,500,000	\$ 29,500,000
HFC Planned KPMPs	\$ 7,290,000	\$ 7,300,000	\$ 7,300,000	\$ 7,300,000
HFC RTF Estimated KPMPs	\$ -	\$ 23,300,000	\$165,300,000	\$174,000,000
HFC Stand Alone Projects	\$ -	\$ 14,000,000	\$ 14,000,000	\$ 14,000,000
HFC Ratification Assistance	\$ -	\$ 1,100,000	\$ 2,900,000	\$ 2,900,000
HFC Verification	\$ -	\$ -	\$ -	\$ -
HFC Early Activities to Avoid Growth	\$ -	\$ 10,000,000	\$ 65,000,000	\$ 65,000,000
Subtotal – HFC Consumption Sector	\$ 9,744,000	\$ 58,200,000	\$282,000,000	\$292,700,000
2021-2023 Triennium	LOW END		HIGH END	
HFC Production Sector				
HFC Production Sector Prep	\$ -		\$ 2,000,000	
HFC Production Sector KPPMP	\$ -		\$ -	
HFC Production Sector Verification	\$ -		\$ -	
HFC-23 Mitigation Prep	\$ -		\$ 200,000	
HFC-23 Mitigation	\$ 6,400,000		\$ 26,100,000	
Subtotal – HFC Production Sector	\$ 6,400,000		\$ 28,300,000	
2021-2023 Triennium	LOW END		HIGH END	
Institutional Strengthening and Standard Activities				
Institutional Strengthening	\$ 31,457,000		\$ 40,422,000	
UNEP Compliance Assistance Programme	\$ 36,383,000		\$ 36,383,000	
UNDP, UNIDO, World Bank Core Unit	\$ 18,153,000		\$ 18,153,000	
MLF Secretariat Costs	\$ 23,857,000		\$ 23,857,000	
Treasurer	\$ 1,500,000		\$ 1,500,000	
Subtotal - IS & Standard Activities	\$ 111,350,000		\$ 120,315,000	

Annex II

Report by the Technology and Economic Assessment Panel (May 2020) Volume 1

Technology and Economic Assessment Panel May 2020 Progress Report

Key messages

TEAP presents the main findings of the 2020 Progress Report, as key messages from each of the TOC specifically relating to their sectors of work as follows:

Flexible and Rigid Foams Technical Options Committee (FTOC)

Although the cost of hydrochlorofluorocarbons (HCFCs) was approximately 20-30% of the cost of high- global warming potential (GWP) hydrofluorocarbons (HFCs), HCFC price is increasing as they are phased out globally. The low price of some high-GWP HFCs, particularly HFC-365mfc which is banned in some non-Article 5 (non-A5) parties, is leading to an increase in market share, which is slowing the conversion to low-GWP blowing agents.

Hydrocarbon is reportedly being tested as a blowing agent for spray foam by at least one company. FTOC is seeking additional details on the safety measures being taken to address potential fire and explosion risk.

The import of ozone depleting foam blowing agents is controlled or under license, and more parties are controlling the import of polyols containing HCFC-141b or other ozone depleting substances (ODS).

Halons Technical Options Committee (HTOC)

HTOC has identified several issues affecting the availability and quality of recovered halon from the civil aviation sector. To address these issues parties may wish to consider:

- Re-emphasising the need to allow for open trade of recovered, recycled and/or reclaimed halons in bulk containers or in prefilled fire protection components needed to support legacy halon uses, including civil aviation components required to allow aircraft to operate under international airworthiness requirements; and
- Emphasising the importance of effective and complete recovery of halons to those parties with ship-breaking activities to minimise halon losses,

Many personnel who are responsible for managing fire protection agents controlled by the Montreal Protocol, are not experienced with the issues surrounding the use, recovery, recycling, reclamation and banking of these agents. To address these issues parties may wish to consider:

- Supporting programmes to mitigate the loss in institutional memory of fire protection agents controlled under the Montreal Protocol; and
- Supporting awareness programmes to address recovery, recycling, reclamation and banking of HCFCs and also HFC fire protection agents, under the Kigali Amendment.

Although research and development (R&D) continues, especially in regard to civil aviation applications, the certification timescales are long and it will still be several years before any of the fire extinguishing agent currently being evaluated will be in service on aircraft.

Methyl Bromide Technical Options Committee (MBTOC)

Data reported under Article 7 show that since 2005, about 2,950 tonnes of the methyl bromide (MB) production for controlled uses has not been accounted for as consumption for controlled uses. Quantities of MB sought by parties for controlled uses under the critical use exemption are declining and small (89 t), however substantial stocks (approximately 1,500 t) appear to be in use for controlled uses; the exact amount is unknown.

MB consumption in both Article 5 (A5) and non-A5 parties has increased, despite some parties no longer using MB for quarantine and pre-shipment (QPS), and QPS uses are now the major anthropogenic contributor of methyl bromide to the stratosphere. MBTOC continues to be concerned

in this continuing upward trend and its implications on emissions and continues to consider opportunities to reduce emissions (e.g., recapture/recycle of MB).

From 2015 to the end of 2018, global QPS consumption increased by 25% to 11,090 t. This increase in QPS consumption coincided with an increase of MB concentration in the atmosphere from 2015-2017, although more recent MB concentrations in the atmosphere (2019-2020) appear to be in decline.

MBTOC considers accurate reporting and correct determination of QPS categories of use will be important to assist the future development and adoption of alternatives around the world. The implementation/feasibility/economics of re-capture/ recycling of MB used for QPS in different sectors and regions would reduce emissions whilst still using MB, and would contribute to ozone layer protection.

Medical and Chemical Technical Options Committee (MCTOC)

Two pharmaceutical companies have announced they are developing new metered-dose inhaler (MDI) formulations containing propellants, hydrofluoroolefin (HFO)-1234ze(E) and HFC-152a.

Recent scientific papers conclude atmospheric-derived emissions and emissions trends of chlorofluorocarbon (CFC)-113 and CFC-113a are higher than expected based on reported production for feedstock uses. A comprehensive understanding of the production and use of CFC-113 and CFC-113a as a feedstock or as an intermediate would contribute to a better understanding of global and regional emissions. Parties may wish to consider reviewing their CFC-113/113a production to manufacture chemicals to ensure that feedstock production of CFC-113/113a is being fully captured in Article 7 data reporting, noting that in situ production of intermediates is not required to be reported as production for feedstock uses.

To develop a better understanding of CFC-113/113a emissions, the activity of in situ production of controlled substances as intermediates to manufacture chemicals may need to be accounted. Parties may wish to consider how best to account for production of controlled substances as intermediates in the absence of reported data.

HFC-23 is a by-product from the production of HCFC-22. According to a recent scientific paper, global HFC-23 emissions derived from atmospheric measurements were historically at their highest level in 2018, in contrast to expected emissions of HFC-23 by-product, primarily from reported HCFC-22 production, that were much lower. The paper concludes that the discrepancy makes it possible that planned reductions in HFC-23 emissions may not have been fully realised or there may be substantial unreported production of HCFC-22, both or either of which would result in unaccounted for HFC-23 by-product emissions.

Refrigeration, Air Conditioning and Heat Pumps Technical Options Committee (RTOC)

Since the publication of the RTOC 2018 Assessment Report, only one new single-component refrigerant and eight new refrigerant blends have been classified following the the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) Standard 34. The new single-component refrigerant is trifluoro-iodomethane, IFC-131I, which has been assigned safety class A1 in ASHRAE Standard 34 (class A1 refers to fluids that do not propagate the flame and have low chronic toxicity). However, concerns about its chemical stability and (low) chronic toxicity remain. IFC-131I can be applied in blends to make them non-flammable (such as R-466A).

The use of refrigerants with lower GWP, namely ammonia (R-717), carbon dioxide (R-744), hydrocarbons (HCs) and HFOs continues to steadily increase in the various refrigeration, air conditioning and heat pump (RACHP) sectors.

There has been significant progress with the development of safety standards to support the transition towards lower GWP alternative refrigerants, that are mostly flammable.

The International Electrotechnical Commission (IEC) 60335-2-89 standard (commercial refrigeration) was revised to include larger charges for flammable refrigerants (up to 500 g given certain boundary conditions) and is currently being transferred to national standards.

The IEC 60335-2-40 standard (air conditioning – heat pumps) is the subject of substantial work, particularly in relation to increasing the equipment's charge for refrigerants with varying degrees of flammability (A3, A2 and A2L).

Improving energy efficiency during the transition to lower GWP refrigerants for the HFC phase-down is a major opportunity for A 5 parties to reduce energy demand while minimising the long-term need to service and maintain equipment that contains high-GWP HFCs.

Not in Kind (NIK) technologies continue to represent a niche market, and this will probably remain the same in the near future. Furthermore, many NIK technologies are still in the R&D stage. Nevertheless, some interesting developments are ongoing.

For high-ambient temperature (HAT) regions, the October 2019 PRAHA-II report on prototype optimization and risk assessment “at HAT working practices” concluded that alternative lower GWP refrigerants are viable and can be competitive to currently used refrigerants.

Annex III

Members of the Technology and Economic Assessment Panel technical options committees^a whose membership expires at the end of 2020 and whose reappointment does not require a decision by the Meeting of the Parties

<i>Name</i>	<i>Position</i>	<i>Country</i>
Members of technical options committees		
Roy Chowdhury	FTOC member	Australia
Joseph Costa	FTOC member	United States
Rick Duncan	FTOC member	United States
Ilhan Karaağaç	FTOC member	Turkey
Simon Lee	FTOC member	United States
Guolian Wu	FTOC member	United States
Carlos Grandi	HTOC member	Brazil
Laura Green	HTOC member	United States
Elvira Nigido	HTOC member	Australia
Erik Pedersen	HTOC member	Denmark
R.P. Singh	HTOC member	India
Donald Thomson	HTOC member	Canada
Mitsuru Yagi	HTOC member	Japan
Ayze Ozdem	MBTOC member	Turkey
Rosalind James	MBTOC member	United States
Kathleen Hoffmann	MCTOC member	United States
Ryan Hulse	MCTOC member	United States
Andrew Lindley	MCTOC member	United Kingdom
John G. Owens	MCTOC member	United States
Yizhong You	MCTOC member	China
Ray Gluckman	RTOC member	United Kingdom
Lambert Kuijpers	RTOC member	The Netherlands
Hiroichi Yamaguchi	RTOC member	Japan

^a The five technical options committees are: Flexible and Rigid Foams Technical Options Committee (FTOC), Halons Technical Options Committee (HTOC), Methyl Bromide Technical Options Committee (MBTOC), Medical and Chemicals Technical Options Committee (MCTOC), and Refrigeration, Air-Conditioning and Heat Pumps Technical Options Committee (RTOC).

Annex IV

Matrix of needed expertise by the Technology and Economic Assessment Panel as of May 2020

Body	Required Expertise	A5/ Non-A5
Foams TOC	<ul style="list-style-type: none"> Extruded polystyrene production in India and China Polyurethane system house technical experts from southern (especially from small and medium enterprises). Foam chemistry experts globally and expertise in building science related to energy efficiency 	<p>Africa, the Middle East, or Mexico</p> <p>A5 or non-A5</p>
Halons TOC	<ul style="list-style-type: none"> Fire protection applications in civil aviation, especially maintenance, repair and overhaul activities. General civil aviation fire protection applications in A5 parties, in particular in South East Asia Knowledge of halons, HCFCs and high-GWP HFC agent use, their alternatives, and their market penetration in A5 parties in Central and South America, South East Asia (including China), and Africa (particularly central and south Africa) Banking and supplies of halon and alternatives in A5 parties, particularly in Africa and South America Expanding its knowledge of ship breaking activities from A5 or non-A5 parties particularly on actual quantities of halons recovered from shipbreaking activities, quantities of use of high-GWP HFCs and better knowledge of the anticipated lifetimes of merchant ships 	<p>A5 / non-A5</p> <p>A5</p> <p>A5</p> <p>A5</p> <p>A5 or non-A5</p>
Methyl Bromide TOC	<ul style="list-style-type: none"> Nursery industries, especially the issues affecting the strawberry runner industries globally. QPS uses of MB and their alternatives 	<p>A5 or non-A5</p> <p>A5</p>
Medical and Chemical TOC	<ul style="list-style-type: none"> Destruction technologies, including knowledge of the variety of available technologies Metered dose inhalers, including pharmaceutical industry, especially R&D of new propellants, and medical experts in asthma and chronic obstructive pulmonary disease Aerosols, including development of new propellants and new aerosol products and components 	<p>A5 and/or non-A5</p> <p>A5 and/or non-A5</p> <p>A5 and/or non-A5</p>
Refrigeration TOC	<ul style="list-style-type: none"> RACHP expert with knowledge of the specific requirements of his/her geographical area Expert on energy macro-economics aspects related to RAC equipment to provide national, regional, and international analysis related to equipment energy efficiency, energy consumption, and market trends. 	<p>A5, sub-Saharan Africa</p> <p>A5 or non-A5</p>
Senior Experts	<ul style="list-style-type: none"> Expert in the analysis and assessment (including modeling) of factors, including energy efficiency and regional economics, for forecasting the market penetration and potential future disposition of HCFCs, HFCs, and alternatives 	<p>A5 or non-A5</p>