MONTREAL PROTOCOL

ON SUBSTANCES THAT DEPLETE

THE OZONE LAYER

UNEP

REPORT OF THE
TECHNOLOGY AND ECONOMIC ASSESSMENT PANEL

OCTOBER 2017

VOLUME II

SUPPLEMENT TO THE MAY 2017
TEAP REPLENISHMENT TASK FORCE REPORT

"ASSESSMENT OF THE FUNDING REQUIREMENT FOR THE REPLENISHMENT OF THE MULTILATERAL FUND FOR THE PERIOD 2018-2020"

TEAP OCTOBER 2017 REPORT
VOLUME II

SUPPLEMENT TO THE MAY 2017 TEAP REPLENISHMENT TASK FORCE REPORT

"ASSESSMENT OF THE FUNDING REQUIREMENT FOR THE REPLENISHMENT OF THE MULTILATERAL FUND FOR THE PERIOD 2018-2020"

October 2017

Montreal Protocol
On Substances that Deplete the Ozone Layer

Report of the UNEP Technology and Economic Assessment Panel

Replenishment Task Force

October 2017

TEAP OCTOBER 2017 REPORT
VOLUME II

SUPPLEMENT TO THE MAY 2017 TEAP REPLENISHMENT TASK FORCE REPORT

"ASSESSMENT OF THE FUNDING REQUIREMENT FOR THE REPLENISHMENT OF THE MULTILATERAL FUND FOR THE PERIOD 2018-2020"

The text of this report is composed in Times New Roman.

Co-ordination:	**TEAP and its Replenishment Task Force**
Composition:	Lambert Kuijpers, Bella Maranion, Shiqiu Zhang
Layout:	Lambert Kuijpers
Reproduction:	UNON Nairobi
Date:	October 2017

Printed in Nairobi, Kenya, 2017

TEAP OCTOBER 2017 REPORT
VOLUME II
SUPPLEMENT TO THE MAY 2017 TEAP REPLENISHMENT TASK FORCE REPORT

"ASSESSMENT OF THE FUNDING REQUIREMENT FOR THE REPLENISHMENT OF THE MULTILATERAL FUND FOR THE PERIOD 2018-2020"

October 2017

DISCLAIMER

The United Nations Environment Programme (UNEP), the Technology and Economic Assessment Panel (TEAP) co-chairs and members, the Technical Options Committees chairs, co-chairs and members, the TEAP Task Forces co-chairs and members, and the companies and organisations that employ them do not endorse the performance, worker safety, or environmental acceptability of any of the technical and economic options discussed.

UNEP, the TEAP co-chairs and members, the Technical Options Committees chairs, co-chairs and members, and the Technology and Economic Assessment Panel Task Forces co-chairs and members, in furnishing or distributing the information that follows, do not make any warranty or representation, either express or implied, with respect to the accuracy, completeness, or utility; nor do they assume any liability of any kind whatsoever resulting from the use or reliance upon any information, material, or procedure contained herein.

ACKNOWLEDGEMENTS

The UNEP Technology and Economic Assessment Panel and the Replenishment Task Force co-chairs and members wish to express thanks to all who contributed from governments, both Article 5 and non-Article 5, to the Multilateral Fund Secretariat, to the Ozone Secretariat, to all Implementing Agencies, as well as to a large number of individuals involved in Protocol issues, without whose involvement this supplementary report to the original assessment would not have been possible.

The opinions expressed are those of the Panel and its Task Force and do not necessarily reflect the reviews of any sponsoring or supporting organisation.

FOREWORD

The October 2017 TEAP Report

The October 2017 TEAP Report consists of the following volumes:

Volume I: October 2017 TEAP Critical Use Nominations Report – Final Report

Volume II: Supplement to the May 2017 TEAP Replenishment Task Force Report

Volume III: TEAP Decision XXVIII/3 Working Group Report on Energy Efficiency

This is Volume II.

The UNEP Technology and Economic Assessment Panel (TEAP):

Bella Maranion , co-chair	USA	Kei-ichi Ohnishi	J
Marta Pizano, co-chair	COL	Fabio Polonara	I
Ashley Woodcock, co-chair	UK	Roberto Peixoto	BRA
Paulo Altoe	BRA	Ian Porter	AUS
Mohamed Besri	MOR	Helen Tope	AUS
Suely M. Carvalho	BRA	Rajendra Shende	IN
Adam Chattaway	UK	Dan Verdonik	USA
Marco Gonzalez	CR	Shiqiu Zhang	PRC
Sergey Kopylov	RF	Jianjun Zhnag	PRC

For this, the Replenishment Task Force under TEAP

Lambert Kuijpers, co-chair	NL	Sukumar Devotta	IND
Bella Maranion , co-chair	USA	Horace Nelson	JAM
Shiqiu Zhang, co-chair	PRC	Fabio Polonara	I
Paulo Altoe	BRA	Helen Tope	AUS
Suely M. Carvalho	BRA	Dan Verdonik	USA
Daniel Colbourne	UK	Helen Walter-Terrinoni	USA

Table of Contents

Executive Summary

- On the basis of the discussions in the Contact Group, the Open-ended Working Group at its thirty-ninth meeting (OEWG-39) requested the TEAP to elaborate on specific groups of elements in the form of a supplementary report to its May 2017 Replenishment Task Force (RTF) Report. The specific elements, for which elaboration was requested, are given in the report of OEWG-39 and are attached to this document as Annex 1.

- At the OEWG-39, the following overall questions were raised:
  - Elaboration on paragraph 3 of the Terms of Reference as expressed in decision XXVIII/5;
  - To present cost effectiveness figures in ODP-tonnes, metric tonnes and tonnes CO_2 equivalent;
  - To give a clearer distinction between costs associated with HCFC-related and HFC-related activities;
  - To present a scenario comparing previously approved projects with business plan estimates on an annual basis in relation to determining uncertainty for planned activities; and
  - To account for recent ExCom (ExCom-79) decisions.

  In addition, OEWG-39 requested specific elaboration on the following elements of the total funding requirement:
  - The funding components for HCFC Phase-out Management Plans;
  - The HCFC production phase-out;
  - Non-investment and supporting activities;
  - HFC phase-down enabling activities; and
  - HFC-23 mitigation.

- The above elements are elaborated and addressed in this Supplement Report. Based on certain requests from OEWG-39, below is a summary of elaborations for specific elements of the total funding requirement for the MLF for the triennium 2018-2020:

  1) Approved versus planned funding for HPMPs
  The average percentage of funding for approvals for all years from 2005 through 2016 equals 83.24% of the funding for planned activities from the Business Plan. This implies that the average funding agreed to by the Executive Committee for each activity was at a level that is 16.76% lower than the amount in the Business Plan. The RTF has also looked at the uncertainty of the average value. By taking all the differences between planned and approved funding for the years 2005-2016, an average deviation of 13.5% can be calculated for the uncertainty range. Using this value, a rescaling is applied, i.e., funding for (HPMP) activities is, in principle, approved, for a range of about 70-97% of the funding for planned activities.

  2) Accounting for ExCom-79 decisions on HPMP approvals[1]
  Funding decisions from ExCom-79 reduced the funding requirement for the planned activities for non-LVC countries from a total of US$ 97.1 to US$ 74.1 million for the triennium 2018-2020, a reduction of US$ 23.0 million, and of US$ 0.23 million for LVC

[1] Funding numbers in the text have been rounded up or down to make the text easier to read. Please refer to the tables for the actual numbers.

countries, by bringing the latter amount to the approved funding amount for 2017. Due to approvals, the funding requirement for approved HPMP activities for non-LVC countries increased from US$ 289.4 to US$ 296.2 million (i.e., a difference of US$ 6.8 million). It did not change for LVC countries, because the planned funding became approved funding for the year 2017, a year outside the 2018-2020 triennium.

Taking into account the decisions from ExCom-79 compared to the rescaled activities, the average total funding requirement for HPMPs (excluding any HPMPs stage III) in the triennium 2018-2020 has decreased by US$ 12.5 million from US$ 388.4 to US$ 375.9 million.

3) Deferring stage III HPMPs
Deferring HPMP stage III activities to the triennium 2021-2023 would reduce the funding requirement presented in the May 2017 report (US$ 0-70.95 million) to zero.

4) *Cost effectiveness values of HPMPs (including agency support costs)*
An average (country-weighted) cost effectiveness value has been calculated based on the ODP-tonnes approvals for a representative number of non-LVC countries (where the approvals usually concern one, or a mix of two or three HCFCs). This value is US$ 5.18 per kg ODS for non-LVC countries when including China, and US$ 5.79 per kg ODS when excluding China. The calculated cost effectiveness value of a representative sample of LVC countries is US$ 9.23 per kg ODS. In climate terms, the cost effectiveness value is US$ 3.75 t CO_2-eq. for non-LVC countries when including China, and US$ 5.05 t CO_2-eq. when excluding China. For a representative sample of LVC countries it is US$ 7.08 t CO_2-eq.

5) Various tranches for HCFC Production Phase-out Management Plans (HPPMPs)
In the May 2017 report, the RTF assumed equal funding tranches for the 14 years for the Chinese HPPMP in the period 2017-2030, leading to a funding requirement of US$ 65.62 million (US$ 21.87 million for each of the three years) for the triennium 2018-2020. This assumes a first tranche of US$ 21.87 in the year 2017. In considering two funding tranches for the Chinese HPPMP in the triennium 2018-2020, the total funding for the next triennium is estimated at US$ 47.15 or US$ 51.04 million, depending on when the approval decision would be taken and on how the funding tranches would be specified.

6) *Funding for the Compliance Assistance Programme (CAP) dependent on annual increase*
The CAP funding (including support costs) in the May 2017 report was estimated at US$ 34.8 million for the triennium 2018-2020, based on an annual 3% increase. CAP funding for the triennium 2018-2020 would be US$ 32.8 million with zero percent increase per annum, and US$ 36.9 million with 6% increase per annum, i.e., each 3% increase in CAP funding would add about US$ 2 million to the total funding requirement

- Based on the specific requests for scenarios from OEWG-39, the RTF estimated the cumulative impacts of the following scenarios to the total funding requirement for the period 2018-2020:
    - For HPMPs/HPPMPs:
        - Planned versus actual funding reduction
        - ExCom-79 decisions
        - Planned HPMPs exceeding 35% reduction target cancelled
    - For Non-Investment and Supporting Activities:
        - Deferring any further HCFC demonstration projects
        - Varying CAP increases

The financial implications of a number of changes for the total funding requirement range are given in the table below, starting with the total funding requirement determined in the May 2017 report. In a first instance certain activities are subtracted, resulting in a different total funding requirement range. This is followed by a number of steps or scenarios (1, 2, 3 and 4) for HPMP stage II activities (with the average value for HPMP funding and the decrease in comparison to the May 2017 HPMP funding also given in the table).

Sequential, cumulative impacts of requested funding scenarios from OEWG-39 to the May 2017 RTF report estimates	**HPMP funding (US$ million)** (reduction compared to May 2017 report)	**Range of total funding requirement (US$ million)**
Funding determined in the May 2017 report	**406.3**	**602.7-748.9**
Various changes compared to May 2017 report (no stage III, no demo HCFC, 2 tranches HPPMP)		**584.2-653.4**
1) Rescaling of planned activities as determined in the May 2017 report	**388.4** (17.9)	**568.7-632.8**
2) Impact of ExCom-79 on the (rescaled) funding as determined in the May 2017 report	**375.9** (30.4)	**558.9-617.8**
3) Maintain sets of planned activities for countries with approvals not achieving 35% reduction	**341.4** (64.9)	**529.0-578.5**
4) Additional planned activities for a precise 35% reduction for these countries (in row above)	**325.0** (81.3)	**514.7-560.0**

1 Introduction

1.1 The Process

Decision XXVIII/5 of the Twenty-eighth Meeting of the Parties requested the Technology and Economic Assessment Panel (TEAP) to prepare a report for submission to the 39th Meeting of the Open Ended Working Group (Bangkok, July 2017). Decision XXVIII/5 specified the issues the Panel should take into account and directed the TEAP, in undertaking this task, to consult widely with relevant persons and institutions and other relevant sources of information deemed useful. The TEAP established the Decision XXVIII/5 (Replenishment) Task Force to prepare the report on the 2018-2020 replenishment of the Multilateral Fund, in consultation with the full TEAP membership.

The final TEAP Replenishment Report was published by UNEP in May 2017 as part of the TEAP Progress Report (i.e., Volume 4 of the May 2017 Progress Report). At the 39th Meeting of the Open Ended Working Group (Bangkok, July 2017), parties requested a Supplement Report to be presented at the MOP-29 Meeting (Montreal, November 2017), to enable the 29th Meeting of the Parties to take a final decision on the appropriate level of the 2018-2020 Replenishment of the Multilateral Fund (MLF).

1.2 The Contact Group on Replenishment

During the OEWG-39, the TEAP Replenishment Task Force (RTF) presented its report "Assessment of the Funding Requirement for the Replenishment of the Multilateral Fund for the period 2018-2020". A Contact Group was established to consider the report, and to formulate any additional requests for a supplementary study.

The Contact Group included representatives of many non-Article 5 and Article 5 Parties and was co-chaired by Mr. Davinder Lail (United Kingdom) and Mr. Augustin Guevara Sanchez (Mexico). The Contact Group held a number of sessions, which were attended by members of the TEAP RTF and by representatives of the MLF Secretariat, as resource persons.

During the discussions, the members of the Contact Group received clarification and additional information from TEAP Task Force members. The Contact Group then discussed a number of topics and agreed on a number of issues that it believed should be clarified and elaborated in a supplementary report.

On the basis of the discussions in the Contact Group, the OEWG-39 agreed to ask the TEAP to elaborate on a specific group of issues in a Supplement Report to its May 2017 RTF Report, to be presented at MOP-29. The specific elements, for which elaboration was requested, were given in the report of OEWG-39 and are given below (as well as in Annex 1 of this document):

Summary of suggestions for elaboration in the supplementary Technology and Economic Assessment Panel task force report

The Open-ended Working Group at its thirty-ninth meeting agrees to request the Technology and Economic Assessment Panel, in presenting its supplementary report to the Twenty-Ninth Meeting of the Parties:

(a) To discuss and present results related to the following overall questions:

1. Elaboration on paragraph 3 of the Terms of Reference as expressed in decision XXVIII/5: *"That the Technology and Economic Assessment Panel should provide indicative figures of the resources within the estimated funding required for phasing out HCFCs that could be associated with enabling Article 5 parties to encourage the use of low-GWP or zero-GWP alternatives and indicative figures for any additional resources that would be needed to further encourage the use of low-GWP or zero-GWP alternatives";*
2. To present cost effectiveness figures in MT, ODP-tonnes and CO_2 equivalent
3. To give a clearer distinction between costs associated with HCFC-related and HFC-related activities;
4. To present a scenario comparing previously approved projects with business plan estimates on an annual basis in relation to determining uncertainty for planned activities;
5. To account for recent ExCom decisions.

(b) To elaborate on the funding components for HPMPs (Chapter 3):

6. With scenarios considering:
    a. HPMP stage III implementation activities in particular according to existing commitments in the servicing sector;
    b. The deferring of stage III activities to the next triennium.
7. The deferring to the next triennium of non-LVC and LVC planned activities which are not necessary to meet the 35% phase-out target.

(c) To take into account the HCFC production phase-out (chapter 4):

8. Concerning the China HPPMP stage II plan and the related ExCom assumptions in the upcoming ExCom-80 meeting;
9. In case of different scenarios involving 2 tranches in the 2018-2020 triennium.

(d) Regarding the non-investment and supporting activities (chapter 5):

10. To give further thought on how to account for parties with an accelerated phase-out in the HPMP stage II implementation;
11. To give further thought on taking into account HPMPs stage III (for parties wishing to achieve the 67.5% and further reductions steps earlier);
12. To consider a scenario deferring stage III activities to the next triennium;
13. To consider (1) a scenario where there is no annual increase to CAP and (2) a scenario where there is an increase of more than 3% to CAP;
14. To consider a scenario where there are no HCFC demonstration projects;
15. To consider scenarios where HPMP stage III preparation activities in particular are undertaken according to existing commitments in the servicing sector.

(e) Regarding HFC phase-down enabling activities (chapter 6)

16. To further disaggregate the cost of enabling activities with respect to the different elements addressed.

(f) Regarding HFC-23 mitigation (chapter 7)

17. To develop a scenario involving the closure of HCFC-22 production plants to deal with HFC-23, with or without existing incineration facilities, taking into account (closure of) swing plants as one of the possible alternatives to control HFC-23 emissions.

1.3 Structure and procedure for the completion of the Supplement Report

The TEAP RTF has prepared this Supplement Report to address the specific questions agreed by the OEWG-39. This report has been structured in such a way that the questions have been sorted in specific groups, which are dealt with in the chapters of this report as outlined below:

Chapter 2	*Overall questions to the report*
Chapter 3	*Elaboration on the funding components for HCFC Phase-out Management Plans (HPMPs)*
Chapter 4	*Accounting for the HCFC Production Phase-out*
Chapter 5	*Non-investment and supporting activities*
Chapter 6	*HFC phasedown enabling activities*
Chapter 7	*HFC-23 mitigation*
Chapter 8	*Summary of funding amounts calculated for various scenarios*
Annex 1	*Summary of suggestions for elaboration in the supplementary Technology and Economic Assessment Panel Replenishment Task Force report*
Annex 2	*Calculation of planned amounts up to 35%*

After the report had been drafted it was reviewed by the RTF in the period 15-19 September 2017; the MLF Secretariat was also requested to review the report in this period, for the purpose of the consistency of the report with ExCom approvals, related data and business planning. A second order draft of the report was then sent out for TEAP review (21-26 September 2017). The final report was subsequently submitted to the UNEP's Ozone Secretariat during the last week of September 2017 for posting on its web site (first as an advance, then as a final version).

2 Overall questions to the report

This chapter discusses and presents results related to the following overall questions:

1. Elaboration on paragraph 3 of the Terms of Reference as expressed in decision XXVIII/5;
2. To present cost effectiveness figures in ODP-tonnes, metric tonnes and tonnes CO_2 equivalent;
3. To give a clearer distinction between costs associated with HCFC-related and HFC-related activities;
4. To present a schedule comparing previously approved projects with business plan estimates on an annual basis in relation to determining uncertainty for planned activities; and
5. To account for recent ExCom (ExCom-79) decisions[2].

2.1 Paragraph 3 in the Terms of Reference in Decision XXVIII/5

The TEAP RTF, in request (1), was asked to elaborate on paragraph 3 of the Terms of Reference as described in decision XXVIII/5, which says: "That the Technology and Economic Assessment Panel should provide indicative figures of the resources within the estimated funding required for phasing out HCFCs that could be associated with enabling Article 5 parties to encourage the use of low-GWP or zero-GWP alternatives and indicative figures for any additional resources that would be needed to further encourage the use of low-GWP or zero-GWP alternatives".

When dealing with HCFCs, the RTF has taken into account the approved and planned HPMP activities and the data published by the MLF Secretariat. In the case of approved activities, the RTF did not analyse the specific choice of alternatives in the scheduled conversion away from HCFCs, but rather, it only looked at the overall funding obligations for HPMPs after 2016 and specifically in the triennium 2018-2020. From information gained, a minor (small) percentage concerned conversion to hydrofluorocarbons (HFCs), e.g., HFC-245fa in foams, which is not significant from an overall impact point of view. There will also be certain small funding disbursements planned that are related to choices to non-low GWP alternatives in HPMPs stage I made in earlier years.

It would be very likely that significant investments have already been made by industry to convert manufacturing processes to the original agreed technologies. Therefore, the RTF did not analyse how a change of these earlier choices may have further encouraged the use of low-GWP alternatives.

The "Business Plan"[3] already accounts for a variety of decisions designed to encourage the use of low-and zero-GWP alternatives (e.g., decision 74/50 (b) (i) c, 74/50(c)(iii), 74/50(c)(iv), 74/50(c)(vii), decision 60/44(f)(iv), 60/44(f)(vii), decision 72/41, and other relevant decisions). Where it concerns planned activities, the RTF has studied the Business Plan; it is impossible to derive CE values on the

[2] Funding umbers in the text have been rounded up or down to make the text easier to read. Please refer to the tables for the actual numbers.

[3] "Adjusted business plan of the Multilateral Fund for 2017-2019 after the 77th meeting of the Executive Committee (29 Dec 2016)" (UNEP/OzL.Pro/ExCom/77/76)

basis of a certain portion of phase-out of one chemical in a HPMP (see section 2.2 for details). The RTF, therefore, was unable to quantify and provide indicative figures for additional resources that may be needed in the triennium 2018-2020. In principle one can say that further encouraging might mean that more non-investment type of support would be needed for certain countries (industries) regarding the choice for certain low or zero-GWP conversions, so that other (high-GWP) alternatives can be avoided. On the basis of the above, the RTF estimated a range of US$ 0-10 million for additional HPMP demonstration projects in the May 2017 RTF Report, and an estimated range of US$ 13.5-20.2 million in Chapter 6 of this report on HFC enabling activities which included a certain amount for demonstration projects.

2.2 Cost effectiveness figures in various units

Request 2 above says: "to present cost effectiveness figures in MT (tonnes), ODP-tonnes and tonnes CO_2 equivalent". When this request was formulated as such in the Contact Group, it was not defined exactly which cost effectiveness (CE) values it would concern, whether it would refer to HPMPs that have been approved, whether it would refer to planned activities as in the May report, or whether it would refer to an overall estimate.

The RTF has considered this request, noting that the May report, in fact, did not use the CE as a parameter for determining certain amounts of funding. In its May 2017 report, the RTF noted that the applicable CE values for the period 2017-2020 from HPMPs approved in principle varied substantially depending on the country and the specific activity. Furthermore, the CE value used in the Business Plan (where these funding values were based on CE values from approved HPMP activities) could be higher or lower once the planned activities were approved. Given sufficient funding information was available through the year 2020, the RTF did no further analysis on the CE values for the approved in principle and planned activities. Similarly, the overall funding requirements for the period 2018-2020 (combined with the amounts approved in principle or planned) provided sufficient information for estimating indicative funding for future triennia, i.e., 2021-23 and 2024-26.

Nevertheless, to respond to the request and for information purposes, the RTF took the approach of deriving overall, averaged, CE values from HPMPs stage I and stage II as approved for either non-LVC or LVC countries, noting that it is impossible to derive CE values on the basis of a certain portion of phase-out of one chemical in a HPMP. For this reason, CE values were derived for non-LVC and LVC countries from the HPMPs stage I and II, and averaged.

2.2.1 Non-LVC countries

A number of large size and smaller size non-LVC countries were analysed for funding approved in HPMP stages I and II. Table 2-1 presents the results for the CE values for a large number of non-LVC countries, all expressed in US$ per ODP-tonne (as in MLFS documents), US$ per kg, and US$ per t-CO_2-eq. The latter values have been determined using the direct effect of the GWP (using AR4 GWP values) for the HCFCs concerned (where any residual GWP of the alternative was not subtracted). CE values have been calculated on the basis of total funding, i.e., it includes agency support costs (where the support costs vary from 7.5% to a maximum of 13% for UNEP and particularly bilaterals). The mix of countries selected, however, results in good indicative values.

Table 2-1 CE values for a number of non-LVC countries in US$ per ODP-kg, per kg and per t-CO_2-eq. The average CE values are calculated on a weighted basis, with and without taking into account the HPMPs for China

ARGENTINA	Funding	ODP-t	tonnes	kt CO2 eq	US$/ODP-kg	US$/kg	US$/t CO2
Phase I	11597593	83.53	1300.91	2118.31	138.843	8.915	5.475
	Funding	ODP-t		kt CO2 eq			
Phase II	10652124	115.19	1447.59	1937.05	92.474	7.359	5.499
Combined	**22249717**	**198.72**	**2748.50**	**4055.36**	**111.965**	**8.095**	**5.486**
BRAZIL	Funding	ODP-t	tonnes	kt CO2 eq	US$/ODP-kg	US$/kg	US$/t CO2
Phase I	21027388	220.3	2470.91	2807.36	95.449	8.510	7.490
	Funding	ODP-t		kt CO2 eq			
Phase II	38815539	464.06	5702.00	7352.65	83.643	6.807	5.279
Combined	**59842927**	**684.36**	**8172.91**	**10160.02**	**87.444**	**7.322**	**5.890**
CHINA	Funding	ODP-t	tonnes	kt CO2 eq	US$/ODP-kg	US$/kg	US$/t CO2
Phase I	289831680	3445.6	46463.74	69403.89	84.116	6.238	4.176
	Funding	ODP-t		kt CO2 eq			
Phase II	533883629	8714.65	118662.22	178213.73	61.263	4.499	2.996
Combined	**823715309**	**12160.25**	**165125.97**	**247617.61**	**67.738**	**4.988**	**3.327**
INDIA	Funding	ODP-t	tonnes	kt CO2 eq	US$/ODP-kg	US$/kg	US$/t CO2
Phase I	22969344	341.77	3391.00	3074.76	67.207	6.774	7.470
	Funding	ODP-t		kt CO2 eq			
Phase II	48315260	769.49	8190.55	8531.69	62.789	5.899	5.663
Combined	**71284604**	**1111.26**	**11581.55**	**11606.45**	**64.148**	**6.155**	**6.142**
EGYPT	Funding	ODP-t	tonnes	kt CO2 eq	US$/ODP-kg	US$/kg	US$/t CO2
Phase I	9164414	174	1637.55	1308.15	52.669	5.596	7.006
	Funding	ODP-t		kt CO2 eq			
Phase II	11786341	146.97	2080.24	3298.47	80.196	5.666	3.573
Combined	**20950755**	**320.97**	**3717.78**	**4606.62**	**65.273**	**5.635**	**4.548**
INDONESIA	Funding	ODP-t	tonnes	kt CO2 eq	US$/ODP-kg	US$/kg	US$/t CO2
Phase I	13378896	135	1637.27	2076.72	99.103	8.171	6.442
	Funding	ODP-t		kt CO2 eq			
Phase II	8883314	84.33	1145.09	1651.44	105.340	7.758	5.379
Combined	**22262210**	**219.33**	**2782.36**	**3728.16**	**101.501**	**8.001**	**5.971**
IRAN	Funding	ODP-t	tonnes	kt CO2 eq	US$/ODP-kg	US$/kg	US$/t CO2
Phase I	10869327	101.3	1271.82	1683.54	107.298	8.546	6.456
	Funding	ODP-t		kt CO2 eq			
Phase II	12279535	225.47	2697.64	3361.75	54.462	4.552	3.653
Combined	**23148862**	**326.77**	**3969.45**	**5045.29**	**70.841**	**6.427**	**4.969**
MEXICO	Funding	ODP-t	tonnes	kt CO2 eq	US$/ODP-kg	US$/kg	US$/t CO2
Phase I	19421177	417.3	4019.09	3403.08	46.540	4.832	5.707
	Phase II	ODP-t		kt CO2 eq			
Phase II	11786341	560.53	6590.19	6915.58	21.027	1.788	1.704
Combined	**31207518**	**977.83**	**10609.28**	**10318.66**	**31.915**	**2.942**	**3.024**
LEBANON	Funding	ODP-t	tonnes	kt CO2 eq	US$/ODP-kg	US$/kg	US$/t CO2
Phase I	2682242	20	226.36	260.78	134.112	11.849	10.286
	Funding	ODP-t		kt CO2 eq			
Phase II	4498093	41.16	544.45	764.22	109.283	8.262	5.886
Combined	**7180335**	**61.16**	**770.82**	**1025.00**	**117.402**	**9.315**	**7.005**
PERU	Funding	ODP-t	tonnes	kt CO2 eq	US$/ODP-kg	US$/kg	US$/t CO2
	310111	**3.74**	**51.73**	**75.97**	**82.917**	**5.995**	**4.082**
TOGO	Funding	ODP-t	tonnes	kt CO2 eq			
	692650	**7**	**127.27**	**230.36**	**98.950**	**5.442**	**3.007**

ALL NON-LVC CTRS	funding	ODP-tonnes	tonnes	kt CO2 eq	US$/ODP-kg	US$/kg	US$/t CO2
Total	**1082844998**	**16071.39**	**209657.62**	**298469.49**	**67.377**	**5.183**	**3.747**
ALL MINUS CHINA	funding	ODP-tonnes	tonnes	kt CO2 eq	US$/ODP-kg	US$/kg	US$/t CO2
Total	**259129689**	**3911.14**	**44531.65**	**50851.88**	**66.254**	**5.786**	**5.053**

The following observations can be made from Table 2-1:

- For a number of non-LVC countries the various types of CE values have been determined for HPMP stage I and HPMP stage II, as well as the average CE values for HPMP stages I and II combined. The range of CE values varies from US$ 1.78 to 11.85 per kg or US$ 1.70 to 10.29 per tonne of CO_2-eq.It can be observed that the range for the CE values is very wide, which is related to the very different levels of HCFC consumption in the various non-LVC countries.

- In estimating the CE values, it was not possible to differentiate for the individual HCFCs per country (as contained in HPMP plans), for which reason it is difficult to derive CE values for each specific chemical, in particular for HCFC-141b, -142b and -22.

- The final rows in the table give the determined average CE values for all the non-LVC countries together on a weighted basis (i.e., the amount of ODP tonnes for each country as a proportion of the overall total was used to apply weighting ratios). In this case, one row shows the average CE values for stages I and II HPMPs for all non-LVC countries including China, and the final row the average CE values for all non-LVC countries excluding China.

- A preliminary average CE value for non-LVC countries is around US$ 67.4 per ODP-kg, US$ 5.18 per kg and 3.75 per t CO_2-eq. Excluding China yields slightly different values the CE per ODP-kg and per kg, a much higher value for the CE per t CO_2-eq., i.e., US$ 66.3 per ODP-kg (a small decrease), US$ 5.79 per kg and US$ 5.05 per t CO_2-eq., which is about a 12% increase in US$ per kg and a 35% increase in US$ per t CO_2-eq. The reason for the difference is the differences in GWPs for the different HCFC chemicals in the “country mix” per kg.

2.2.2 LVC countries

A number of LVC countries were analysed concerning the funding approved in HPMPs stage I (and for some, also in HPMPs stage II).

Table 2-2 presents the results for a large number of these LVC countries, as well as the average, weighted CE value for the stages I (and II) of HPMPs expressed in US$ per ODP-kg, US$ per kg, and US$ per t CO_2-eq. CE values have been calculated on the basis of total funding, i.e., it includes agency support costs (which vary from 7.6% to a maximum of 13% for UNEP and in particular for bilateral projects). The mix of countries selected provides good, indicative values.

Table 2-2 CE values for a number of LVC countries in US$ per ODP-kg, per kg and per t CO_2-eq., as well as the average calculated on an ODP tonnes weighted basis

COST EFFECTIVENESS LVCs (with agency support costs included)							
ANGOLA	**Funding**	**ODP-t**	**tonnes**	**kt CO2 eq**	**US$/ODP-kg**	**US$/kg**	**US$/t CO2**
Phase I	191840	1.59	28.91	52.33	120.654	6.636	3.666
	Funding						
Phase II	967280	9.18	166.91	302.11	105.368	5.795	3.202
Combined	**1159120**	**10.77**	**195.82**	**354.43**	**107.898**	**5.934**	**3.279**
ARMENIA	**Funding**	**ODP-t**	**tonnes**	**kt CO2 eq**	**US$/ODP-kg**	**US$/kg**	**US$/t CO2**
Phase I	649121	2.23	33.00	51.54	291.086	19.670	12.594
	Funding						
Phase II	238196	3.26	59.27	107.28	73.066	4.019	2.220
Combined	**887317**	**5.49**	**92.27**	**158.83**	**232.559**	**15.469**	**9.809**
CAMBODIA		**ODP-t**	**tonnes**	**kt CO2 eq**	**US$/ODP-kg**	**US$/kg**	**US$/t CO2**
Phase I	**1772250**	**15**	**272.73**	**493.64**	**118.150**	**6.498**	**3.590**
COSTA RICA							
Phase I	**1240037**	**18.93**	**205.97**	**214.65**	**65.506**	**6.020**	**5.777**
CUBA							
Phase I	**1878592**	**19.26**	**205.18**	**214.05**	**97.539**	**9.156**	**8.776**
JAMAICA							
Phase I	**708844**	**8.13**	**114.82**	**172.02**	**87.189**	**6.174**	**4.121**
MALDIVES	**Phase I**						
Phase I	**1219900**	**3.7**	**67.27**	**121.76**	**329.703**	**18.134**	**10.019**
MONGOLIA	**Phase I**						
Phase I	**413580**	**1**	**18.18**	**32.91**	**413.580**	**22.747**	**12.567**
RWANDA	**Phase I**						
Phase I	**312000**	**1.44**	**26.27**	**41.78**	**216.667**	**11.875**	**7.468**
SERBIA	**Phase I**						
Phase I	**1050408**	**2.94**	**53.45**	**96.75**	**357.282**	**19.650**	**10.857**
SWAZILAND	**Phase I**						
Phase I	**955344**	**6.19**	**61.64**	**56.33**	**154.337**	**15.500**	**16.961**
UGANDA	**Phase I**						
Phase I	**182685**	**0.07**	**1.27**	**2.30**	**2609.786**	**143.538**	**79.303**

	Funding	**ODP-t**	**tonnes**	**kt CO2 eq**	**US$/ODP-kg**	**US$/kg**	**US$/t CO2**
Total		**92.92**	**1314.88**	**1959.45**	**130.999**	**9.229**	**7.079**

The following observations can be made from Table 2-2:

- For a number of LVC countries the various types of CEs have been determined for HPMP stage I (and HPMP stage II in two cases). The range of the CE values varies from US$ 5.93 to 143.54 per kg or US$ 3.28 to 79.30 per t CO_2-eq. It can be observed that there is a very wide range for the CE values, which is directly related to the HCFC consumption in LVC countries that can range from a few tonnes to 360 tonnes.

- The final row derives the average CE values for all the LVC countries considered on a weighted basis (i.e., based on the amount of ODP tonnes approved for a country). The average CE values calculated for these LVC countries are US$ 131 per ODP-kg, US$ 9.23 per kg and US$ 7.08 per t CO_2-eq.

2.2.3 *Different way of determining CE values*

In the above method, CE values have been derived on the basis of averaging, using the amounts of ODP tonnes approved. However, CE values can also be derived using the amounts of funding approved for a country, which would give (quite) different results because funding is a "negotiated derivative" of the ODP tonnes approved for an HPMP.

Table 2-3 shows the results, where the ODP weighted results have been taken from Tables 2-1 and 2-2. CE values increase by 3-12% for non-LVC countries, by 45% in the case of LVC countries compared to the earlier method of determining CE values. Due to the fact that the funding weighted results are somewhat sensitive to other factors that are not related to the percentage reduction approved in ODP tonnes, these values also seem to be suitable for determining CE values while considering the HPMPs approved so far for non-LVC countries. For LVC countries, the weighted CE value derived is about 30% higher (i.e., higher costs per unit phased out), however, it is difficult for the RTF to derive recommendations for LVC countries taking into account the funding guidance given for LVC countries of specific sizes (see also Table 2-5).

Table 2-3 Average CE values for non-LVC and LVC countries in US$ per ODP-kg, per kg and per t CO_2-eq., weighted on the basis of ODP tonnes approved and on the basis of the funding amounts approved.

ALL NON-LVC COUNTRIES	funding	tonnes	kt CO2 eq	US$/ODP-kg	US$/kg	US$/t CO2
Total	1082844998	209657.62	298469.49	67.377	5.183	3.747
Total (funding wtd.)				69.534	5.334	3.827
ALL NON-LVC MINUS CHINA	funding	tonnes	kt CO2 eq	US$/ODP-kg	US$/kg	US$/t CO2
Total	259129689	44531.65	50851.88	66.254	5.918	5.094
Total (funding wtd.)				75.241	6.431	5.417
LVC COUNTRIES	funding	tonnes	kt CO2 eq	US$/ODP-kg	US$/kg	US$/t CO2
Total ODP-t wtd		1314.88	1959.45	130.999	9.229	7.079
Total Fund wtd	11780077			212.854	13.418	9.107

2.2.4 *Determining CE values on the basis of including or excluding agency support costs*

In principle, once CE values started to be derived in the 1990s on a project- by-project basis, they were derived without considering agency support costs. In the above analysis, CE values have been derived on the basis of averaging, using as a basis the amounts of ODP tonnes per country. The CE values were all determined including agency support costs. However, one can also average using the various amounts of funding approved for countries, while excluding agency support costs. This would be expected to give roughly 7-13% lower cost effectiveness values (as per the percentage agency support costs).

Table 2-4 shows the results for CE values excluding agency support costs (where the ODP weighted results have been taken from Tables 2-1 and 2-2). By excluding agency support costs, the CE values decrease by 3-12% for non-LVC countries, and by 45% in the case of LVC countries, compared with CE values derived on an ODP weighted basis and including agency support costs.

Table 2-4 Average CE values for non-LVC and LVC countries in US$ per ODP-kg, per kg and per t CO_2-eq., for the two cases (1) with and (2) without agency support costs

ALL NON-LVC COUNTRIES		funding	tonnes	kt CO2 eq	US$/ODP-kg	US$/kg	US$/t CO2
Total	with support costs	1082844998	208988.94	297942.2699	67.377	5.183	3.747
	w/o support costs	1010975606			62.741	4.826	3.489
ALL NON LVC MINUS CHINA		funding	tonnes	kt CO2 eq	US$/ODP-kg	US$/kg	US$/t CO2
Total	with support costs	548961369	43862.976	50324.65751	66.254	5.918	5.094
	w/o support costs	477091977			61.205	5.467	4.706
ALL LVC		funding	tonnes	kt CO2 eq	US$/ODP-kg	US$/kg	US$/t CO2
Total	with support	11780077	1314.88	1959.45	130.999	9.229	7.079
Total	w/o support	10816046			120.261	8.489	6.524

In Table 2-4 results are presented for both non-LVC (including and excluding China) and LVC countries. One can see that the cost effectiveness values decrease by 7-8% for non-LVC countries, by about 8% for LVC countries (i.e., lower costs per ODP-kg, per kg etc.). These are percentages that can be expected on the basis of the percentages support for the different implementing agencies as well as the (percentage) involvement of various agencies in the different HPMPs.

2.2.5 Determining CE values on the basis of amounts determined for various LVC country sizes by the ExCom

It is interesting also to look at the (ExCom guidance for) CE values, excluding agency support costs, as used by the ExCom for the various sizes of LVC countries, which can be added together (multiplied by the number of countries in each consumption class, see Table 2-5) and averaged.

Since the values per country in t CO_2-eq. are lacking from the available information, only values in US$ per ODP kg and per kg can be derived. The value of US$ 9.72 per kg is 14% higher than the value derived on the basis of a number of LVC countries, but this will be due to the higher percentage of very low volume LVCs (consumption is generally in the order of a few tons only) in the total in Table 2-5.

Table 2-5 CE values for LVC countries in US$ per ODP-kg and per kg based on the ExCom guidance numbers for the different sizes of LVC countries, multiplied by the number of countries and averaged (values from ExCom 74/50)

Consumption (mt)	Funding total phase-out	Number of countries	Total funding	Total baseline (HCFC-22) (mt)	CE ($/kg)	CE ($/ODP kg
>0 <15	587,500	21	12,337,500	97.81	126.13	2,293.30
15 <40	750,000	16	12,000,000	419.44	28.61	520.17
40 <80	800,000	14	11,200,000	910.91	12.30	223.55
80 <120	900,000	11	9,900,000	1,100.48	9.00	163.57
120 <160	950,000	9	8,550,000	1,280.19	6.68	121.43
160 <200	1,000,000	3	3,000,000	567.21	5.29	96.16
200 <320	1,600,000	12	19,200,000	3,157.95	6.08	110.54
320 <360	1,800,000	2	3,600,000	677.71	5.31	96.58
Total			**79,787,500**	**8,211.71**	**9.72**	**176.66**

In conclusion, the average rounded CE values vary between US$ 5.2 and 5.9 per kg for non-LVCs, and between US$ 9.3 and 9.7 per kg for LVC countries. Translated into climate terms (not contained in Table 2-5), they vary between US$ 3.8 and 5.1 per t CO_2-eq. for non-LVC countries, and are about US$ 7.0 per t CO_2-eq. for LVC countries.

It should be emphasized that the CE value is dependent on specific country circumstances and for specific stages of the phase-out process. This implies that the considerations on CE as given above have relative value for the future. As HPMPs focus more and more on dealing with refrigeration and AC servicing only, the more that CE values (at least for non-LVC countries) will settle in the range of US$ 3.5-5.1 per kg (based on the ExCom established value of US$ 4.8 per kg for servicing as per ExCom decision 74/50), and dependent on the specific country circumstances.

2.3 Distinction between costs associated with HCFC and HFC related activities

At OEWG-39, parties requested that the RTF give a clearer distinction between costs associated with HCFC-related and HFC-related activities in its supplementary report.

In its May 2017 report, the RTF attempted to make clear by the organisation of the chapters within its report the distinction between HCFC- and HFC-related activities related to the various components that make up the total funding requirement for the 2018-2020 triennium as follows:

- Funding for HCFC consumption phase-out activities;
- Funding for HCFC production phase-out;
- Funding for non-investment components and supporting activities;
- Funding for HFC phasedown enabling activities; and
- Funding for HFC-23 mitigation activities.

The above funding components were then discussed in separate chapters in the May 2017 report. Chapter 5 of that report, "Funding requirements for non-investment and supporting activities for the 2018-2020 replenishment period and beyond," specifically focused on HCFC-related activities, noting that HFC-related activities (e.g., project preparation, demonstration projects, supporting activities) for the 2018-2020 triennium and future triennia, 2021-2023 and 2024-2026, would be considered in Chapter 6 on HFC enabling activities.

Chapter 6 provided a range of funding for HFC activities in the 2018-2020 triennium for:

- Non-investment projects including:
  1) project preparation requests for HFC management plans/national strategies, and
  2) demonstration projects for countries aiming to fast-track the phase-down of HFCs; and
- Investment projects that encourage the use of low-GWP or zero-GWP alternatives.

Chapter 9, "Indicative funding requirements for 2021-2023 and 2024-2026," provides funding estimates after 2020 for HCFC- and HFC-related activities, following essentially the same funding components used for the triennium 2018-2020. However, given that cost guidelines for HFC phasedown activities are still to be developed by the ExCom, the funding requirements for HFC phasedown remain uncertain. Therefore, the RTF did not include estimated costs for related activities in the next two triennia 2021-2023 and 2024-2026. Examples of probable funding considerations for HFC phasedown in future triennia include:

- strengthening of the regional networks and NOUs in the development of their institutional framework for future ratification, implementation, and compliance of the Kigali Amendment;
- funding for additional implementing agencies' support to Article 5 countries regarding the phasedown of HFCs while HPMPs are still under implementation; and
- funding for any additional meetings or related work to support the ExCom's activities related to the Kigali Amendment.

2.4 Schedule comparing previously approved activities with business plan estimates

At OEWG-39, parties requested the RTF in its supplementary report "to present a schedule comparing previously approved projects with business plan estimates on an annual basis in relation to determining uncertainty for planned activities." In order to respond to this request, the RTF obtained information from the MLF Secretariat on the total approved funding for specific activities in a certain year, as well as the total planned funding for these activities in the Business Plan.

This information was available for each year from 2016 going back to 2000. From the numbers obtained in this way, ratios can be calculated between the funded or approved amounts and "planned for funding" amounts for these activities, and these ratios can be averaged per period of three years (e.g., 2014-2016, 2011-2013 etc. through 2002-2004) to provide a comparison. The various results are shown in Table 2-6.

Table 2-6 Values for approved and planned activities, ratio of approvals and planned activities and percentages per three year periods (US$)

Year	Business Plan	Approvals	Difference	%approvals	Cumulative
2016	175,906,212	134,886,955	41,019,257	77%	
2015	172,925,384	185,521,702	-12,596,318	107%	
2014	150,349,262	109,636,438	40,712,824	73%	**2014-2016**
2014-2016	**499,180,858**	**430,045,095**	**69,135,763**	**86.15%**	**86.15%**
2013	163,058,422	143,350,645	19,707,777	88%	
2012	158,193,207	118,099,916	40,093,291	75%	
2011	251,685,220	227,553,662	24,131,558	90%	**2011-2016**
2011-2013	**572,936,849**	**489,004,223**	**83,932,626**	**85.35%**	**85.72%**
2010	205,296,416	103,360,124	101,936,292	50%	
2009	106,014,427	87,689,407	18,325,020	83%	
2008	145,296,562	142,226,527	3,070,035	98%	**2008-2016**
2008-2010	**456,607,405**	**333,276,058**	**123,331,347**	**72.99%**	**81.92%**
2007	171,419,512	135,794,742	35,624,770	79%	
2006	161,412,541	136,961,591	24,450,950	85%	
2005	226,796,158	213,353,085	13,443,073	94%	**2005-2016**
2005-2007	**559,628,211**	**486,109,418**	**73,518,793**	**86.86%**	**82.33%**
2004	221,409,010	186,227,602	35,181,408	84%	
2003	226,732,762	173,814,977	52,917,785	77%	
2002	195,635,529	185,628,199	10,007,330	95%	**2002-2016**
2002-2004	**643,777,301**	**545,670,778**	**98,106,523**	**84.76%**	**83.24%**
2001	166,859,265	144,052,417	22,806,848	86%	
2000	131,542,713	125,740,663	5,802,050	96%	

The average percentage of approved funding compared to the planned funding for all years from 2005 through 2016 is 83.24% (see Table 2-6). This implies that, overall and on average, the approved funding for activities is about 17% less than the amounts estimated in the Business Plan. The RTF has also looked at the uncertainty in this average value. By taking all the differences in planned and approved funding for activities for the years 2005-2016, an average deviation of 13.5% can be calculated . Using the latter value, the range of percentages difference in the approved, in principle, funding for activities as compared to the funding for planned activities is between about 70% and 97%. This range will be used in the calculations described in section 3.2 below.

2.5 Taking into account recent ExCom decisions

At OEWG-39, parties requested the RTF in its supplementary report to account for recent ExCom decisions. During the 79th meeting of the ExCom in July in Bangkok, a number of HPMPs stage II were approved for Argentina, Egypt and Angola, with funding tranches approved for the first two countries in the period from 2017 until a year in the triennium after 2020. The May 2017 RTF report estimated the total funding requirement for HPMPs (see Table 3.5 in that report), excluding HPMP stage III funding for the period 2018-2020. Both the May 2017 estimate and the updated estimate based on the decisions made at ExCom-79 are provided in Table 2-7 below. While the estimations for the funding requirement for 2017 have also been determined, only estimations related to the 2018-2020 triennium have been further studied and are analysed below.

In Table 2-7, the upper and lower value of the funding range for the planned activities has been given, which is the value determined +/- 15% uncertainty,

consistent with the procedure in the May 2017 RTF report. The range of total HPMP funding requirements is also given in Table 2-7, using the uncertainty in the funding for planned activities.

Table 2-7 (a) (b) HPMP funding values calculated without ExCom decisions taken at ExCom-79 (May 2017 report, see first table (a)) and with the decisions taken at ExCom-79 (see second table (b))

Status May 2017 (US$ million)					
			2018-20		**2017**
		min		**max**	
Non-LVCs	approved		289.408		84.003
Non-LVCs	planned	82.534	97.099	111.664	13.507
Non-LVCs	total	371.942	386.507	401.072	97.510
LVCs	approved		6.132		2.727
LVCs	planned		10.023		0.890
LVCs	total		16.155		3.617
Extra amount countries			1.904		
HPMP verification			1.766		
Total (range)		391.767	**406.332**	420.897	101.127

Uncertainty applied of +/- 14.565 US$ million

Status after ExCom July 2017 (US$ million)					
			2018-20		**2017**
		min		**max**	
Non-LVCs	approved		296.239		91.046
Non-LVCs	planned	63.007	74.126	85.245	9.439
Non-LVCs	total	359.246	370.365	381.484	100.485
LVCs	approved		6.132		3.209
LVCs	planned		9.797		0.649
LVCs	total		15.929		3.617
Extra amount countries			1.904		
HPMP verification			1.766		
Total (range)		378.845	**389.964**	401.083	101.127

Uncertainty applied of +/- 11.119 US$ million

Funding decisions from ExCom-79 reduced the funding for the planned activities for non-LVC countries from a total of US$ 97.1 million to US$ 74.1 million for the triennium 2018-2020, a reduction of US$ 23.0 million.

For the LVC countries, decisions from ExCom-79 reduced the funding for planned activities by US$ 0.23 million for after 2017, by moving this planned funding amount into the approved funding for the year 2017.

The above means that by taking into account the decisions from ExCom-79, the total funding requirement for HPMPs (excluding any HPMPs stage III) in the triennium 2018-2020 has decreased from an estimated range of US$ 391.8-420.9 million to US$ 378.9-401.1 million (total averages are given in Table 2-7 as well), a decrease of US$ 12.9 to 19.8 million, or US$ 16.4 million on average.

As discussed in section 2.4 above, approved funding for activities has historically been lower than the planned funding for the same activities. The impact of this on the overall funding (including on the status after ExCom-79 as given in Table 2-7) is further considered in section 3.2 below. This (rescaling) will also have consequences for the reduction of the funding for HPMP activities as a result of ExCom-79 decisions.

3 Elaboration on the funding components for HPMPs

This chapter elaborates on the funding components for HPMPs, in particular:

1. With scenarios considering
    a. HPMP stage III implementation activities in particular according to existing commitments in the servicing sector;
    b. The deferral of stage III activities to the next triennium; and
2. The deferral to the next triennium of non-LVC and LVC planned activities to the next triennium, not necessary to meet the 35% phase-out target.

3.1 Scenarios considering HPMP stage III

At OEWG-39, parties requested that the TEAP RTF in its supplementary report consider scenarios and potential impacts to the funding components for HPMPs stage III implementation activities, in particular according to existing commitments in the servicing sector.

In many non-LVC countries the only activities still to be funded after HPMP stage II relate to the servicing sector. Existing commitments could be considered as keeping equipment running during its normal lifetime. Stage II HPMPs have been approved to achieve a reduction in consumption from about 10-15% to around 67.5% of the baseline consumption (the latter reduction percentage being the one for 2025), and to even higher percentage than 80% for a number of countries. However, the servicing of equipment using HCFC-22 still to be funded varies from 10% to more than 50% of a country's consumption of HCFC-22. Assuming that funding of servicing would have a CE of US$ 4.8 per kg (as per current ExCom guidance, excluding agency support costs, i.e., at least US$ 5.1 per kg including agency support costs) this would in principle cost about the same as the approved HPMPs stages I and II at a CE of US$ 5.2 per kg about the same (including agency support costs). Therefore, parties may wish to consider further investigating the phase-down of servicing activities, and whether these activities could be performed at a different, lower, CE value in the future than the one currently prescribed of US$ 4.8 per kg (taking into account that the CE for the servicing sector increased from US$ 4.5 to US$ 4.8 per kg for stage II HPMPs).

3.2 Scenarios considering the deferral of stage III activities

OEWG-39 requested the TEAP RTF "to elaborate on the funding components for HPMPs with scenarios considering the deferring of stage III activities to the next triennium."

In the May 2017 report, the RTF considered a few HPMP stage III activities as they were given in the Consolidated Business Plan for the triennium 2018-2020. It concerns an amount of US$ 136,000 for Armenia and Moldova for a first part of a stage III HPMP, as well as an amount for 2020 for China of US$ 70.8 million. In both cases the remainder of the HPMP stage III funding was expected to be approved after 2020, i.e., US$ 295,000 for Armenia and Moldova, and US$ 283.2 million for China. The HPMP stage III planned funding was presented in the May 2017 RTF report as a range between zero to US$ 70.95 million, and not as a fixed amount. This amount does not appear in the consideration of funding scenarios described in section 3.3 below.

Deferral of HPMP stage III activities to the triennium 2021-2023 would lower the high end of the range of the funding requirement from US$ 70.95 million to zero.

3.3 Deferral of planned activities not needed for 35% reduction to the next triennium

In order to calculate the impact on the estimated funding requirements in the 2018-2020 triennium of deferring planned activities that are not necessary to meet the phase-out target of a 35% reduction from baseline, i.e., that would yield larger reductions than 35%, the RTF decided on the following approaches:

1. To re-calculate the funding amount required during the triennium 2018-2020 for the planned activities, taking into account the reduction percentage and the uncertainty range as determined in section 2.4. In a first instance, this means that the total HPMP funding requirement calculated in the May 2017 report will change. The impact of ExCom-79 decisions on the HPMP funding as given in section 2.5 (Table 2-7) will also further change by applying the uncertainty range to estimate actual funding requirements (see section 3.3.1).

2. To calculate the impact of the decisions on HPMP funding taken at ExCom-79. As mentioned, a first description can be found in section 2.5 (a decrease of US$ 12.9 to 19.8 million, i.e., US$ 16.4 million averaged, was calculated for the funding requirement for HPMPs in the next triennium, compared to the funding calculated in the May 2017 report).

3. Taking the "after ExCom-79" HPMP funding requirement (as under (2)), calculations have been made to estimate the deferral of the "activities not needed for a 35% reduction to the next triennium". A two-step approach was followed:
    a. In a first instance, all planned activities for countries that already had approved activities resulting in a 35% reduction or more were removed from the calculation. Here one should take into account that the 35% reduction should be achieved by 1 January 2020 and that, under normal circumstances, funding for higher reductions could take place in the year 2020. However, the request is to calculate what it means to defer all the activities (interpreted in this report to refer to "funding") not needed for the 35% reduction to the next triennium. The planned activities (including the funding requirement) for individual countries that had no approved reduction percentage of 35% were kept as a whole (for all years, 2017 through 2020) even when the total of these planned activities would result in a reduction (much) higher than 35%, assuming that the whole of these planned activities could not be simply split in parts (section 3.3.3).
    b. In a second instance, for the countries with the planned activities as considered in the first step, the RTF determined the amount of ODP tonnes that would strictly be needed to achieve the 35% reduction. The ODP tonnes for the planned activities, which would result in a certain reduction after the 2018-2020 triennium include the ODP tonnes planned for 2017. Taking the reduction percentage following the planned activities and the consumption reduction percentage of 35%, the necessary funding requirement for achieving exactly 35% was calculated by determining the part of the planned 2017-2020 funding requirement using the ratio of reduction percentages (section 3.3.4).

The steps described under 3(a) and 3(b) are demonstrated in Annex 2, using the approved and planned reduction percentages (and funding) for a number of non-LVC countries, which show the procedure followed in individual country "cases".

3.3.1 Recalculating the HPMP funding requirement

Table 3-1 Funding for HPMPs as calculated in the May 2017 report (Table 3-5 in that report and Table 2-7 (a) in the present report); small differences in funding distribution between non-LVCs and LVCs)

Status May 2017 (US$ million)					
			2018-20		**2017**
		min		**max**	
Non-LVCs	approved		289.408		84.003
Non-LVCs	planned	82.534	97.099	111.664	13.507
Non-LVCs	total	371.942	386.507	401.072	97.510
LVCs	approved		6.132		2.727
LVCs	planned		10.023		0.890
LVCs	total		16.155		3.617
Extra amount countries			1.904		
HPMP verification			1.766		
Total (range)		391.767	**406.332**	420.897	101.127

Uncertainty applied of +/- 14.565 US$ million

Table 3-2 Funding for HPMPs as calculated in the May 2017 report, incorporating reduction percentages for the funding for planned activities

May 2017 with difference approach for planned funding					
(US$ million)			**2018-20**		**2017**
		min		**max**	
Non-LVCs	approved		289.408		84.003
Non-LVCs	planned	69.911	80.835	91.758	11.245
Non-LVCs	total	359.319	370.243	381.166	95.248
LVCs	approved		6.132		2.727
LVCs	planned	7.217	8.345	9.472	0.741
LVCs	total	13.349	14.477	15.604	3.468
Extra amount countries			1.904		
HPMP verification			1.766		
Total (range)		376.338	**388.389**	400.440	98.716

Uncertainty applied of +/- 12.051 US$ million

Table 3-1 lists the funding estimates as given in the May 2017 report. It gives a range for the planned activities around the amount of US$ 97.1 million. Table 3-2 gives the planned activities for both non-LVC and LVC countries, taking into account the ratio in funding between approved and planned activities as derived in section 2-4.

The funding for planned activities for non-LVC countries decreases by about US$ 16 million, and decreases for the planned activities for LVC countries by about US$ 1.7 million compared with the May 2017 report. As a result, the total funding

requirement for HPMP activities is calculated about US$ 18 million lower than in the May 2017 report.

3.3.2 Impact of ExCom-79 decisions

Table 3-3 Funding for HPMPs, including the reduction in funding for planned activities (Table 3-2), and incorporating the impact of ExCom-79 decisions

Status after ExCom July 2017 (US$ million)					
			2018-20		**2017**
		min		**max**	
Non-LVCs	approved		296.238		91.046
Non-LVCs	planned	53.370	61.710	70.049	7.858
Non-LVCs	total	349.608	357.948	366.287	98.904
LVCs	approved		6.132		3.209
LVCs	planned	7.054	8.157	9.258	0.540
LVCs	total	13.186	14.289	15.390	3.749
Extra amount countries			1.904		
HPMP verification			1.766		
Total (range)		366.465	**375.906**	385.347	102.653

Uncertainty applied of +/- 9.941 US$ million

In section 2.5, the impact on HPMP funding of ExCom-79 decisions has been calculated compared to the May 2017 report. Table 3-3 gives comparable results but also including the modified approach with the reduced funding for planned activities as given in section 3.3.1. The planned activities funding requirement for both non-LVC and LVC countries is decreased, as can be concluded from a comparison of Table 3-2 and 3-3. The non-LVC approved activities are increased by about US$ 7 million due to the approvals at ExCom-79. The overall result is that the total HPMP funding requirement is about US$ 13 million lower than in section 3.3.1 (with no ExCom-79 approvals) (Note: the total in Table 3-3 is about US$ 30.4 million lower than the HPMP total funding requirement in the May 2017 report, Table 3-1).

3.3.3 Planned approach for countries that have no approvals to achieve 35% reduction

The request to elaborate on the impact of planned funding, and specifically on the amount of planned funding necessary to achieve a 35% reduction from baseline by those countries that had not yet received approvals for funding to achieve 35% or more reduction from the baseline, involved two calculation steps, eventually resulting in the estimated funding to achieve a precise 35% reduction.

All the planned activities for non-LVC countries assumed to have already achieved the 35% reduction or more with the activities approved for them, have been removed from the calculations. The complete set of planned activities was maintained in case activities for a non-LVC country were approved at a value < 35%; this reduces the originally estimated non-LVC amount by about US$ 34.3 million. There is no impact on the planned activities for LVC countries, because planned activities in totality are needed here to achieve the 35% reduction. Also, as can be seen in table 3-4, the funding requirement for approved activities for both non-LVC and LVC countries does not change compared to Table 3-3.

As mentioned, the result is that the total HPMP funding requirement, compared to the funding requirement given in section 3.3.2 is lower again by about US$ 34

million (Note: the total funding requirement for HPMP activities is now about US$ 65 million lower compared to the requirement as determined in the May 2017 report).

Table 3-4 Funding for HPMPs with only planned activities for countries that would not achieve 35% reduction with their approved activities after ExCom-79

Status after ExcCom July 2017 **Only for Plans with <35% reduction, sets of activities (US$ million)**				
			2018-20	
		min		**max**
Non-LVCs	approved		296.238	
Non-LVCs	planned	23.703	27.407	31.110
Non-LVCs	total	319.941	323.645	327.348
LVCs	approved		6.132	
LVCs	planned	7.054	7.922	8.992
LVCs	total	13.186	14.054	15.124
Extra amount countries			1.904	
HPMP verification			1.766	
Total (range)		336.594	**341.368**	346.142

Uncertainty applied of +/- 4.474 US$ million

3.3.4 Funding strictly needed for countries that have not enough approvals to reach the 35% reduction

The funding requirement for planned activities can be further decreased, although not significantly, if the value for the planned activities, considered in section 3.3.3, is changed in such a way that for the countries "selected" in section 3.3.3, the total planned funding for the years 2017 and the triennium 2018-2020 (which is assumed to yield a certain reduction percentage larger than 35% by 2020) is reduced in such a manner that it exactly results in a 35% reduction below baseline. As mentioned above, this is done by calculating the percentage difference between approved activities and "approved plus planned" activities and reducing this percentage to result in a 35% reduction from "the approved percentage". When performing the calculation, it is important to take into account possible planned funding for the year 2017 because this funding directly contributes to the total reduction.

The planned funding for non-LVC countries is thereby reduced, and this by a further amount of US$ 8.6 million. Compared to the reduction achieved going from the cases in section 3.3.2 to 3.3.3 this is a lower amount, because it only concerns a limited number of non-LVC countries, where only a certain part of the planned activities is removed.

In the case of LVC countries, the impact is substantial, relative to the importance of a typical HPMP for these countries. This is because HPMPs for many LVC countries were maintained (they were not removed) by the RTF in the calculations presented in section 3.3.3, because they would not be able to achieve the full 35% for compliance with the existing approved HPMP activity. That is to say, most of them almost achieve the 35% reduction target by 2020. As described in that section, these countries are supposed to get a total package of activities that would often achieve much more than a 35% reduction. It is assumed that an activity (a project) cannot be split into separate (small) amounts. Where this has been done (based on

calculations) in this section, it is likely that an implementation of this approach will, in practice, be difficult to realise.

Table 3-5 Funding for HPMPs with only planned activities for countries that would not achieve 35% reduction with their approved activities, and that would (with the funding given in the table) achieve an exact 35% reduction

Status after ExCom July 2017 **Only for Plans with <35% reduction, activities up to 35% (US$ million)**				
			2018-20	
		min	**avrg**	**max**
Non-LVCs	approved		296.238	
Non-LVCs	planned	16.249	18.788	21.327
Non-LVCs	total	312.487	315.026	317.565
LVCs	approved		6.132	
LVCs	planned	0.051	0.164	0.277
LVCs	total	6.183	6.296	6.409
Extra amount countries			1.904	
HPMP verification			1.766	
Total (range)		322.340	**324.992**	327.644

Uncertainty applied of +/- 2.562 million

In this way, for both non-LVC and LVC countries, a further reduction in the HPMP funding requirement for 2018-2020, compared to the case described in section 3.3.3, is possible. This at about US$ 16.4 million, and at about US$ 51 million compared to the "after ExCom-79" case given in section 3.3.2 (Note: The total funding requirement for HPMP activities is now about US$ 81 million lower compared to the requirement as determined in the May 2017 report).

The upper and lower values of the ranges from Tables 2-7 (a) and (b) and Tables 3-1, 3-2, 3-3, 3-4 and 3-5 are once more given in the graphs in Figure 3-1. The ranges in Table 2-7 are based upon the 15% uncertainty in planned activities for non-LVC countries only, as assumed in the May 2017 RTF report (given by the first two curves in Fig. 3-1). Once the planned activities as well as their uncertainty ranges are rescaled using the data from Table 2-6, the values for the total funding requirement decrease as shown by the two lower curves in Fig. 3-1 (please note that here the values for the May 2017 case are related to the rescaled planned activities). In these cases, the uncertainty range changes (to about 13.5% in HPMP activities, this now for *both* the HPMP activities for non-LVC and for LVC countries).

Where the difference between the upper and lower value of the uncertainty range in the May 2017 and "after ExCom-79" rescaled activities are still substantial, they become much smaller in the cases "towards" the 35% reduction (first for a set of activities, then for some activities to only achieve the precise 35% reduction). The range is rather small in the last case, where it relates to a precise 35% reduction for non-LVC and LVC countries that would then still need additional activities.

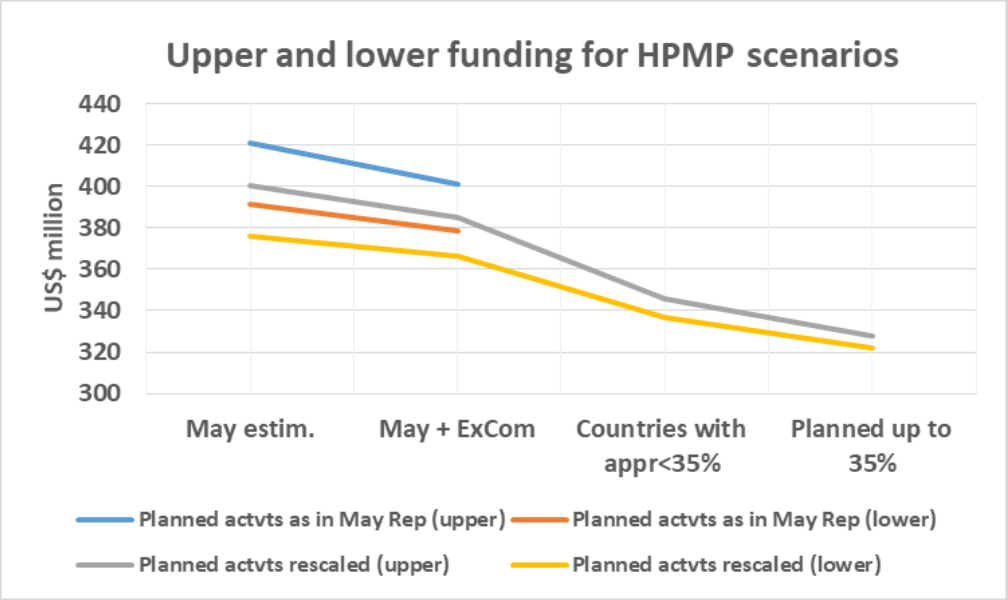

Fig. 3-1 Upper and lower values for the funding requirement range for HPMP activities (starting (based on) with the original May 2017 report HPMP funding range) for the May 2017 and July 2017 cases described in chapter 2, and the cases based on the rescaling of planned activities described in sections 3.3.1 through 3.3.4

4 Accounting for the HCFC production phase-out

This chapter takes into account the HCFC production phase-out management plans (HPPMPs), in particular:

1. Concerning the China HPPMP Stage II plan and the related ExCom assumptions in the upcoming ExCom-80 meeting; and
2. In case of a different scenario involving 2 tranches in the 2018-2020 triennium.

4.1 China HPPMP stage II plan and related assumptions in the upcoming ExCom-80 meeting

It is difficult to forecast whether a decision will be taken at ExCom-80 on the funding of the China HPPMP stage II plan. The impact of possible decisions cannot be calculated until then (ExCom-80, November 2017, Montreal).

4.2 Various tranches in the 2018-2020 triennium

The second request with regard to the HCFC production phase-out was to look at the possibility of two tranches in the next triennium (2018-2020). This question cannot be answered in a very straightforward way.

In the May 2017 report the RTF assumed equal tranches for the 4 years in the period 2017-2020, consistent with the business plan, and leading to a funding requirement of (3 times US$ 21.874 million) US$ 65.6 million. It also assumed a first tranche of a similar size in the year 2017.

If the China HPPMP stage II plan would be approved at ExCom-80, then there could likely be one tranche in 2017 (the case described in the May 2017 RTF report). In that case, there would be one tranche in 2017 as well as two tranches in the triennium 2018-2020, e.g., in years 2018 and 2020. Assuming tranches every year after 2020, this would imply a total of 13 tranches. In this case, each tranche would be US$ 23.6 million (including agency support costs), which would total at US$ 47.2 million for the next triennium.

It could also be that the China HPPMP stage II plan would be approved in 2017, or in 2018, and that only two tranches would be approved in the next triennium 2018-2020, implying no funding tranche in the year 2017. In this case, there could be 12 funding tranches until 2030, each at US$ 25.5 million (including agency support costs). This would then imply a total funding for the China HPPMP stage II plan at US$ 51.0 million for the next triennium.

In response to the request to consider two funding tranches for the China HPPMP stage II plan in the triennium 2018-2020, depending on when the approval decision would be taken and on how the funding tranches would be specified, the total funding for the next triennium is estimated at US$ 47.2 or 51.0 million (these values have also been used in the overview table in chapter 8).

5 Non-investment and supporting activities

This chapter further considers the non-investment and supporting activities, in particular:

1. To give further thought on how to account for parties with an accelerated phase-out in the HPMP stage II implementation;
2. To give further thought on taking into account HPMPs stage III (for parties wishing to achieve the 67.5% and further reductions steps earlier);
3. To consider a scenario deferring stage III activities to the next triennium;
4. To consider (1) a scenario where there is no annual increase to CAP and (2) a scenario where there is an increase of more than 3% to CAP;
5. To consider a scenario where there are no HCFC demonstration projects;
6. To consider scenarios where HPMP stage III preparation activities in particular are undertaken according to existing commitments in the servicing sector.

5.1 How to account for parties with an accelerated phase-out in HPMP stage II implementation

Request (1) as given above asks to give thoughts on how to account for parties with an accelerated phase-out in the HPMP stage II implementation. Accelerated implementation could always be possible; however, if it could be applied to consider the accelerated approval of a next HPMP stage III plan will very much depend on when and how the next activities can be initiated in case of accelerated progress of the HPMP II and/or undertaken together with those ongoing under the stage II HPMP. This issue has been dealt with in the relevant chapter in the May 2017 report, and there is not much that one can say that can be covered under non-investment and supporting activities here.

5.2. Taking into account HPMPs stage III to achieve early reduction steps

Suggestion (2) given above asks to give further thoughts on taking into account stage III HPMPs. If stage III HPMPs would start early, that is to say, in the years 2019 or 2020, project preparation would have to be done in 2018 or 2019. In principle, that project preparation funding has already been taken into account in the total funding requirement for non-investment and supporting activities for the triennium 2018-2020 as presented in the May 2017 report.

5.3 Deferring HPMPs stage III to the 2021-2023 triennium

If stage III HPMP activities would be deferred to the next triennium, it could or would likely be that project preparation would nonetheless have to be done in the 2018-2020 triennium. Where it concerns this timing and project preparation funding, the RTF does not see any difference with the scenario for project preparation funding at US$ 4.35 million for the 2018-2020 triennium presented in the May 2017 report.

5.4 The funding for CAP with various annual increases

The CAP funding in the May 2017 report has been estimated at US$ 34.799 million including support costs for the triennium 2018-2020. It implies funding at US$ 11.9 million for 2020, US$ 11.6 million for 2019 and US$ 11.3 million for 2018 (as a starting point, the funding for CAP in 2017 at US$ 10.93 million was taken).

Assuming a value for 2017 of US$ 10.93 million, the following can be calculated as CAP funding for the triennium 2018-2020:

a. 0% increase per year: US$ 32.8 million
b. 3% increase per year: *US$ 34.8 million (as in May 2017 report)*
c. 4.5% increase per year: US$ 35.8 million
d. 6% increase per year: US$ 36.9 million

(i.e., about US$ 2 million difference for the next triennium per 3% increase per year).

5.5 No HCFC demonstration projects

The May 2017 RTF report assumes funding for HCFC demonstration projects in the range of zero to US$ 10 million for the triennium 2018-2020. In case no funding would be required for HCFC demonstration projects, the upper range of the funding requirement for 2018-2020 as presented in the May 2017 RTF report would be reduced by US$ 10 million to zero.

5.6 HPMP stage III project preparation activities

HPMP stage III project preparation activities were estimated at US$ 4.35 million in the May 2017 RTF report. In all HPMP stage III projects the emphasis would be on servicing. It is difficult to give concrete indications why the project preparation funding should be increased or decreased if the emphasis would have to be more on the servicing sector.

6 HFC phase-down enabling activities

This chapter further considers the HFC phase-down enabling activities, in particular, the request by parties at OEWG-39 for the TEAP RTF in its supplementary report to "further disaggregate the cost of enabling activities with respect to the different elements addressed."

Paragraph 4 of Decision XXVIII/5 requested TEAP to take into account the "need for additional resources to enable Article 5 parties to carry out initial activities related to the phase-down of HFCs listed under Annex F and controlled under Article 2J." Decision XXVIII/2 requested the Executive Committee to develop, within two years of the adoption of the Kigali Amendment, guidelines for financing the phase-down of HFC consumption and production in Article 5 parties; paragraph 20 of that decision further requested the Executive Committee to include the following enabling activities to be funded in relation to the HFC phase-down:

(a) Capacity-building and training for the handling of hydrofluorocarbon alternatives in the servicing, manufacturing and production sectors;

(b) Institutional strengthening;

(c) Article 4B licensing;

(d) Reporting;

(e) Demonstration projects; and

(f) Development of national strategies;

Chapter 6 of the May 2017 RTF report defined initial, enabling activities as those outlined above. In providing the range of funding for HFC phasedown enabling activities in the 2018-2020 triennium, the RTF based its estimate primarily on project preparation, including preparation of proposals for demonstration projects, in this early period. The range of funding was estimated as follows:

Table 6-1 Funding for HFC phase-down enabling activities (US$ million)

HFC phase-down enabling activities	**2018-2020**
Non-investment projects (including project preparation and demonstration projects)	13.5-20.2
Investment projects	8.0-24.0
Total	**21.5-44.2**

Since the HFC phase-down funding guidelines were still being discussed and developed by the ExCom during the preparation of the May 2017 Task Force report, the RTF took the approach of considering two categories of funding for HFC phase-down enabling activities: 1) non-investment projects and 2) investment projects. The RTF considered that in the period 2018-2020, the primary funding for enabling activities for non-investment projects would be project preparation, including preparation of proposals for potential demonstration projects, as well as those activities identified in decision 79/46. Specifically, decision 79/46(b)(ii) states:

Enabling activities could consist of, but were not limited to:

a. Activities to facilitate and support the early ratification of the Kigali Amendment;

b. Initial activities identified in paragraph 20 of decision XXVIII/2,including country-specific activities aimed at initiating supporting institutional arrangements, the review of licensing systems, data reporting on HFC consumption and production, and demonstration of non-investment activities, and excluding institutional strengthening, as addressed in decision 78/4(b);

c. National strategies that contained the activities in sub-paragraphs a. and b. above.

The range of funding for non-investment projects were derived using two approaches:

1) Funding for project preparation and HFC stand-alone investment projects based on HCFC stage I HPMPs during 2008-2016: Over 400 project preparation activities for HCFC phase-out have been funded under the MLF giving a total of US $40.4 million (including agency support costs) over the period 2008-2016 or an average of about US$ 4.5 million per year.

   This provides the lower end of the range at US$13.5 million for the three-year period 2018-2020 for primarily project preparation including preparation of demonstration project proposals.

2) Funding per Article 5 party depending on its HCFC baseline and historical funding: The RTF considered the document from ExCom-78 (UNEP/OzL.Pro/ExCom/78/10) describing possible funding modalities for enabling activities to be implemented in Article 5 countries based on HCFC baseline and historical funding as indicators of the effort needed for HFC phase-down enabling activities; based on calculated funding levels, Article 5 countries would be able to prepare HPMPs that included: a description of ODS regulations including the licensing system; HCFC consumption data by substance and sector, and the estimated baseline for compliance and starting point for aggregate reduction in HCFC consumption, the HCFC overarching strategy for the period 2013 (the freeze year) to 2030 and the strategy and phase-out plan for stage I of the HPMP including specific activities.

   Based on this proposal, the estimated indicative level of funding for enabling activities in Article 5 countries at a total of US$ 20.2 million, which provides the upper end of the range provided for non-investment projects of US$ 20.2 million, again primarily for project preparation including preparation for demonstration project proposals.

7 HFC-23 mitigation

This chapter further considers HFC-23 mitigation, in particular, the request from parties at OEWG-39 for the RTF in its supplementary report to develop a scenario involving the closure of HCFC-22 production plants, with or without existing incineration facilities in order to deal with HFC-23 emissions. It specifically mentions to take into account the closure of HCFC-22 swing plants as one of the possible alternatives to control HFC-23 emissions.

In the May 2017 RTF report, it was analysed which HCFC-22 plants were equipped with incineration facilities, which plants were not, and what the funding would be to equip all plants with incineration facilities, for a range of operational costs (US$ per kg of HFC-23 mitigated). This analysis made clear which amounts could be covered with existing incineration plants and where plants would have to be installed. The installing of new plants was actually not a major issue, it would only concern a few countries (a few countries where an incineration plant would have value to be installed, also facilities where the collection and storage and incineration elsewhere would "do the job"). The analysis also mentioned an incineration plant in Argentina (installed under the CDM), which had not been in operation lately, but could be brought back to operation again, which would involve a certain amount of funding.

If one considers the fact that all HCFC production plants are equipped with incineration equipment, a closure of certain plants, with the decreasing needs for the production of HCFC-22, rather than a continuing operation with the funding by the MLF of operational costs for mitigating HFC-23 emissions, might make sense. However, it is difficult for the RTF to judge where plants, i.e., HCFC-22 production capacity, would be not needed, taking into account the fact that HCFC-22 production plants may be used for a decreasing amount of HCFC-22 production for dispersive uses, however, may continue to be used switching to HCFC-22 production for feedstock, which demand is definitely not decreasing at present, globally. Certain Article 5 countries may consider rescheduling their total HCFC-22 production capacity, and may even be considering a transfer of production rights from one country to another, however, the RTF lacks enough insight in national plans how to deal with this matter in the near future.

It may certainly be so, in the case of anticipated over-capacity of production for dispersive uses, and not enough needs for the production of feedstock material in the foreseeable future, that one may consider closure. This would also involve closure and avoidance of operational costs for incineration facilities. In the case of a 5,000 tonnes HCFC-22 production plant it may concern compensation for closure in the order of US$ 4-6 million, to be paid during 1-2 years, where continuing mitigation of HFC-23 emissions (assumed at 3% of the HCFC-22 output) would imply operational cost funding in the order of US$ 0.2-0.3 million per year (dependent on the type of facility and the HFC-23 emissions profile). In this case, considering the closure of the plant at the assumed compensation funding could be comparable to the costs for e.g. 15 years of mitigation. The main issue therefore will be how long a production plant would be assumed to remain in operation (and the agreed closure funding at some moment in time) versus the (total) HFC-23 mitigation costs. It is too difficult for the RTF to derive any meaningful recommendations or conclusions at the moment here.

The request asks to consider the closure of HCFC-22 swing production plants as a means to deal with the avoidance of HFC-23 mitigation costs. In principle this

request seems reasonable, however, it needs to be emphasized that funding for the closure of HCFC-22 swing plants is currently not eligible under the HCFC guidelines. However, the ExCom decided to consider possible cost-effective options for compensation for HCFC-22 swing plants to allow for compliance with the HFC-23 by-product control obligations of the Kigali Amendment (decision 79/47(c)). The RTF notes that the ExCom has not yet provided any guidance on the possible cost-effective options for compensation it would consider, nor an associated level of funding. It may seem logical for a few swing plants (those not equipped with incineration facilities) to consider the closure option. However, it may be difficult to balance between compensation costs for closure and the installation and operation of an incineration unit. It will depend on how long a country would see its swing plant operate, and also depend on which (so far not agreed) level of compensation costs would be adequate in order to financially balance that with the installation and operation of an incineration unit. The RTF, as mentioned, is not able to take into account all the variables, together with the existing non-decision on the funding of the closure of swing plants to derive any useful recommendation here.

This request may have to be deferred to reporting in a subsequent year, when more data on the various ways of operation of all HCFC-22 production plants might be available. This would include the way of operating HFC-23 incineration facilities, where one should also consider the likely venting of HFC-23 during on/off cycles of the incineration facility. This leads to the conclusion that certain amounts of HFC-23 will be vented (on the order of 0.1-0.2% of HCFC-22 quantities produced, or 3-7% of the HFC-23 generated), provided that no sophisticated collection means are applied during these on/off cycles.

8 Summary of funding amounts calculated for various items

Table 8-1 below summarizes the impacts to certain elements of the total funding requirement under the MLF for the triennium 2018-2020 based on the requests from OEWG-39. These are shown compared to the May 2017 RTF Report estimates.

Even when there was no specific request by parties for cumulative impacts of possible measures to be calculated, the RTF used the specific scenarios below, with their impacts on funding, and shows the cumulative impacts to the total funding requirement estimated in the May 2017 RTF report in the table below:

- For HPMPs/HPPMPs:
  - Planned versus actual funding reduction
  - ExCom-79 decisions
  - Planned HPMPs exceeding 35% reduction target cancelled
- For Non-Investment and Supporting Activities:
  - Deferring any further HCFC demonstration projects
  - Varying CAP increases

Table 8-1 Various components of funding, and funding ranges for various HPMP scenarios plus total funding ranges including all the other elements (compared to the May 2017 report (first column)

ACTIVITIES (all amounts in US$ million)						
HPMP actvts	**May 2017**	**Removing elements as requested**	**Rescaling planned actvts**	**July 2017 impact**	**Certain planned HPMPs cancl'd**	**Strict need for 35% reduction**
Total range incl. HPMP stage III	391.8-491.9	391.8-421.0				
HPMPs I/II value	406.3	406.3	388.4	375.9	341.4	325.0
HPMP I/II range	391.8-420.9	391.8-420.9	376.3-400.4	366.5-385.3	336.6-346.1	322.3-327.6
	May 2017	**If no stage III**	**If no stage III**	**If no stage III**	**If no stage III**	**If no stage III**
HPMP stg III	0-70.95	0	0	0	0	0
	May 2017	**2 tranches**	**2 tranches**	**2 tranches**	**2 tranches**	**2 tranches**
HPPMPs (China)	67.2 (65.622)	48.8 (47.154) 52.6 (51.040)	48.8 (47.154) 52.6 (51.040)	48.8 (47.154) 52.6 (51.040)	48.8 (47.154) 52.6 (51.040)	48.8 (47.154) 52.6 (51.040)
	May 2017	**No demo HCFC**	**No demo HCFC**	**No demo HCFC**	**No demo HCFC**	**No demo HCFC**
Non-inv/sup	114.1-124.1	114.1	114.1	114.1	114.1	114.1
	May 2017					
HFC enabling	21.5-44.2	no change (21.5-44.2)	no change (21.5-44.2)	no change (21.5-44.2)	no change (21.5-44.2)	no change (21.5-44.2)
	May 2017					
HFC-23 mitigation	8.0-21.5	no change (8.0-21.5)	no change (8.0-21.5)	no change (8.0-21.5)	no change (8.0-21.5)	no change (8.0-21.5)
(CAP 3%)	**May 2017**		**Supplement**	**Supplement**	**Supplement**	**Supplement**
Total	**602.7-748.9**	**584.2-653.4**	**568.7-632.8**	**558.9-617.8**	**529.0-578.5**	**514.7-560.0**
(0% CAP change)	US$ 2.0 million lower numbers					
(6% CAP change)	US$ 2.1 million higher numbers					
CAP increase			0%	3%	4.5%	6%
Total supp (CAP)			112.1 (32.8)	114.1 (34.8)	115.1 (35.8)	116.2 (36.9)

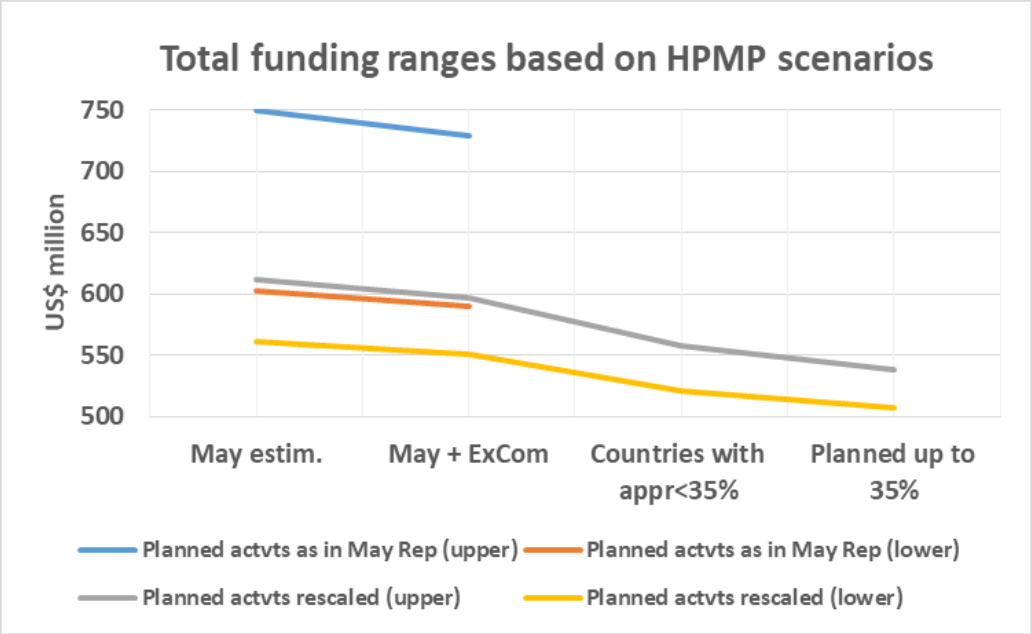

Fig. 8-1 Upper and lower total funding requirement, based on HPMP activities (as given in sections 3.3.1-3.3.4, Figure 3-1) plus all other activities as presented in Table 8-1

Annex 1

Summary of suggestions for elaboration in the supplementary Technology and Economic Assessment Panel task force report

The Open-ended Working Group at its thirty-ninth meeting agrees to request the Technology and Economic Assessment Panel, in presenting its supplementary report to the Twenty-Ninth Meeting of the Parties:

(a) To discuss and present results related to the following overall questions:

18. Elaboration on paragraph 3 of the Terms of Reference as expressed in decision XXVIII/5: *"That the Technology and Economic Assessment Panel should provide indicative figures of the resources within the estimated funding required for phasing out HCFCs that could be associated with enabling Article 5 parties to encourage the use of low-GWP or zero-GWP alternatives and indicative figures for any additional resources that would be needed to further encourage the use of low-GWP or zero-GWP alternatives";*
19. To present cost effectiveness figures in MT, ODP-tonnes and CO_2 equivalent
20. To give a clearer distinction between costs associated with HCFC-related and HFC-related activities;
21. To present a scenario comparing previously approved projects with business plan estimates on an annual basis in relation to determining uncertainty for planned activities;
22. To account for recent ExCom decisions.

(b) To elaborate on the funding components for HPMPs (Chapter 3):

23. With scenarios considering:
    a. HPMP stage III implementation activities in particular according to existing commitments in the servicing sector;
    b. The deferring of stage III activities to the next triennium.
24. The deferring to the next triennium of non-LVC and LVC planned activities which are not necessary to meet the 35% phase-out target.

(c) To take into account the HCFC production phase-out (chapter 4):

25. Concerning the China HPPMP stage II plan and the related ExCom assumptions in the upcoming ExCom-80 meeting;
26. In case of different scenarios involving 2 tranches in the 2018-2020 triennium.

(d) Regarding the non-investment and supporting activities (chapter 5):

27. To give further thought on how to account for parties with an accelerated phase-out in the HPMP stage II implementation;
28. To give further thought on taking into account HPMPs stage III (for parties wishing to achieve the 67.5% and further reductions steps earlier);
29. To consider a scenario deferring stage III activities to the next triennium;
30. To consider (1) a scenario where there is no annual increase to CAP and (2) a scenario where there is an increase of more than 3% to CAP;
31. To consider a scenario where there are no HCFC demonstration projects;
32. To consider scenarios where HPMP stage III preparation activities in particular are undertaken according to existing commitments in the servicing sector.

(e) Regarding HFC phase-down enabling activities (chapter 6)

33. To further disaggregate the cost of enabling activities with respect to the different elements addressed.

(f) Regarding HFC-23 mitigation (chapter 7)

34. To develop a scenario involving the closure of HCFC-22 production plants to deal with HFC-23, with or without existing incineration facilities, taking into account (closure of) swing plants as one of the possible alternatives to control HFC-23 emissions.

Annex 2 Calculation of planned amounts up to 35%

Table A2-1 Part of a table in which planned funding, percentages reduction by approved and planned activities are being used for further calculations. Column E shows approved reduction percentages (column F presents approved amounts in ODP tonnes; column S presents the approved reduction percentages after that the planned amounts have been added (column T shows the amounts including the planned amounts in ODP tonnes)

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
		ODP tonnes approved all (I and II - ExC 77)				Funding planned for HPMP II (all planned)					ODP tonnes BP plan (HPMP II planned)						Total	01/01/2021	
Country	Chem	Total	Appr	Perc app	ODP-t	2017	2018	2019	2020		Country	2017	2018	2019	2020	App 17-20	App total	Perc appr	ODP-t
Madagascar	HCFC-22	17.10	6.00	**35.09**	**6.00**	0	0	0	193,135		Madagascar				2.45	2.45	8.45	**49.42**	**8.45**
Mexico	HCFC-123	30.20	10.57	**35.00**							Mexico					0	10.57	**35.00**	
Mexico	HCFC-22	392.80	130.30	**33.17**				``			Mexico					0	130.3	**33.17**	
Mexico	HCFC-124	0.10	0.00	**0.00**							Mexico					0	0	**-**	
Mexico	HCFC-142b	1.00	0.00	**0.00**							Mexico					0	0	**-**	
Mexico	HCFC-141b	820.60	820.60	**100.00**							Mexico					0	820.6	**100.00**	
		1,244.70	961.47	**77.25**	**961.47**							0.00	0.00	0.00	0.00	0	961.47	**77.25**	**961.47**
Nigeria	HCFC-141b	149.60	79.50	**53.14**							Nigeria	31.63	8.43	11.58	8.43	60.07	139.57	**93.30**	
Nigeria	HCFC-22	248.50	10.60	**4.27**		3,313,296	1,238,942	3,099,296	1,199,494		Nigeria	17.1	7.1	17.1	6.7	48	58.6	**23.58**	
		398.10	79.50	**19.97**	**79.50**							48.73	15.53	28.68	15.13		198.17	**49.78**	**198.17**
Pakistan	HCFC-141b	138.50	130.39	**94.14**							Pakistan					0	130.39	**94.14**	
Pakistan	HCFC-22	108.90	21.69	**19.92**							Pakistan					0	21.69	**19.92**	
		247.40	152.08	**61.47**	**152.08**												152.08	**61.47**	**152.08**
Qatar	HCFC-142b	12.05	12.05	**100.00**							Qatar					0	12.05	**100.00**	
Qatar	HCFC-22	73.45	45.81	**62.37**							Qatar		5	5	1.8	11.8	57.61	**78.43**	
Qatar	HCFC-141b	0.57	0.00	**0.00**		0	477,381	477,381	168,087		Qatar					0	0	**-**	
		86.07	57.86	**67.22**	**57.86**							0.00	5.00	5.00	1.80	11.8	69.66	**80.93**	**69.66**
						0	0	0	569,311										
Senegal	HCFC-22	20.96	7.34	**35.02**	**7.34**						Senegal				5.98	5.98	13.32	**63.55**	**13.32**

Table A2-1 gives, for a number of non-LVC countries, the approved percentage reduction (column E), the approved amounts in ODP tonnes (column F, yellow), then the planned amounts (and funding for these), the percentages reduction with the planned amounts included (column S) and the total amounts involved (in ODP tonnes) (column T, yellow).

The request has been to calculate the funding for planned amounts that would only result in a 35% reduction in the next triennium (2018-2020); further reductions (and funding involved) would then be moved to the next triennium.

The procedure applied has been as follows:

1. For countries that already had an approved percentage of 35% or larger, the planned activities (if there were activities planned in the period 2017-2020) were cancelled.

2. For countries that had an approved percentage smaller than 35%, the planned activities for the period 2017-2020 as a whole were taken into account. This was done under the assumption that the planned activities had to be seen as one package, and could not be split into small parts.

3. In a second instance, for the countries with an approved percentage smaller than 35%, only a portion of the planned activities (in ODP tonnes) was taken, namely, such a part that would result in an exact 35% reduction number by 2020. Funding was then calculated for this part by multiplying the total funding 2017-2020 by the percentage (jn ODP tonnes) required to achieve the exact 35%, even when, in practice, this would not be possible.

In case of the non-LVC countries given in Table A2-1, this would imply the following steps in the process of calculating the 35% reduction in the 2018-2020 triennium:

- Madagascar: approved 35.09%, plus planned activities 49.42%. Here planned activities were cancelled.
- Mexico: approved 77.25%, planned 0%, nothing was changed
- Nigeria: approved 19.97%, plus planned activities 49.78%. In a first instance all planned activities were accepted. In a second instance only 15.03% was accepted, since that would lead to 35% reduction by 2020 (this would imply that a 15.03/29.81 part of the total planned funding was taken into account). It should be noted that the stage II HPMP has been submitted to ExCom-80.
- Pakistan: approved 61.47%, planned 0%, nothing was changed
- Qatar: approved 67.22%, plus planned activities 80.93%. Here planned activities were cancelled.
- Senegal: approved 35.02%, plus planned activities 63.55%. Since the approved percentage is 35% (or even a little bit larger) none of the planned activities had to be taken into consideration (The starting point for Senegal has been reduced and thus, the country is now an LVC country. Stage II could be submitted in the next triennium (as for any other LVC country)).