MONTREAL PROTOCOL

ON SUBSTANCES THAT DEPLETE

THE OZONE LAYER

UNEP

Technology and Economic Assessment Panel

SUPPLEMENT TO THE MAY 2014 TEAP XXV/8 TASK FORCE (REPLENISHMENT) REPORT

"ASSESSMENT OF THE FUNDING REQUIREMENT FOR THE REPLENISHMENT OF THE MULTILATERAL FUND FOR THE PERIOD 2015-2017"

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

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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.

Table of Contents

Executive Summary

A supplementary report has been prepared by the XXV/8 Task Force on replenishment to address the issues presented in Annex II of the report of the 34th Meeting of the Open-ended Working Group. The investigations reported in the report have no impact on the overall replenishment requirement; it remains the same as indicated in the May 2014, XXV/8 Task Force report:

Total funding requirement for the Replenishment of the MLF (US$ million)	**2015-2017**	**2018-2020**	**2021-2023**
Case 1 (commitment based phase-out)	609.5	550.6	636.5
Case 2 (unfunded phase-out)	489.7	485.8	636.5

Case 1 and Case 2

Additional narrative and explanation concerning the Case 1 and Case 2 scenarios for determining the replenishment requirements of non-LVC countries to meet the 2020, 35% Protocol reduction target has been provided, as requested in paragraph 1 of Annex II. All consumption levels and reductions for non-LVC countries as studied in the May 2014 Task Force report have again been examined and the results provided in Chapter 3 of the May report remain valid. They are presented for information in the table below.

New commitments non-LVCs (for Stage II HPMPs only)(US$ million)	**2015-2017**	**2018-2020**	**Total**
Case 1 (commitment based phase-out)	334.0	180.3	514.3
Case 2 (unfunded phase-out)	214.4	115.5	329.9

Requests listed in paragraph 2 of Annex II

The Task Force studied the various requests listed under paragraph 2 in the Annex and grouped together a number of the requests dealing with similar issues. This report therefore does not deal with the issues in the same sequence as listed in paragraph 2: in particular:

- Funding examples have been presented using an extra funding disbursement schedule of an equal 25% of project costs for stage II HPMPs four years after projects approvals. However, this disbursement schedule is not consistent with normal project implementation modalities.
- A variation in the percentages of foam projects in the sectoral mix of stage II HPMPs will affect the funding levels for non-LVCs; these funding levels have been determined for the next two triennia (2015-2020). A 10% increase or decrease from a 50% foam percentage would imply a cost increase or decrease of about US$ 59 million and US$ 53 million respectively for Case 1, and of about US$ 38 million and US$ 33 million respectively for Case 2. For Case 1 and Case 2, and with varying percentages of foam in the ODS reductions addressed, the climate cost-effectiveness of stage II HPMPs in non-LVC countries varies only between US$ 4.88 and US$ 4.65 per tonne CO_2-eq. No change in the funding requirement is recommended.

- Additional descriptive information has been provided on the distribution of funding across the triennia and in particular whether part of the funding requirement for stage III HPMPs appears in the year 2020, i.e. in the second triennium, or in 2021, the third triennium. Four options are discussed, three of which appeared in the May 2014 report. The additional option splits the funding for the 2020 target equally across the first two triennia and adds the first year of potential Stage III HPMP funding into the second triennium (2020). While funding for the third triennium is indicative only, in a business-as-usual situation the phase-out quantities involved give rise to significantly higher levels of funding. Additional refinement of the options for equal distribution of consumption sector funding associated with the 2020 target appears in the addendum to this report. The refinement makes allowance for maintenance of the existing schedule of disbursements for funding approved stage I HPMPs.
- The report also gives (1) an analysis of the ODS amounts to be phased out in the first two triennia from existing commitments, (2) a commentary on the special needs of the servicing sector, (3) a further assessment of the impact on the funding assessment of multinationals and non-eligible enterprises, and (4) a further consideration of cost effectiveness values, including in the longer term. None of these issues has a significant additional effect on the funding assessment presented in the May 2014 Task Force report.

Requests listed in paragraph 3 of Annex II

The requests listed in paragraph 3 of Annex II are being dealt under high GWP issues in this report, as indicated below, except for the elaboration on avoiding high GWP alternatives, which was done in relation to the variation of the foam percentage in stage II HPMPs, a request made under paragraph 2 of Annex II. The costs derived in the May 2014 report of US$ 138 million for avoiding a certain amount (10,000 tonnes) of high-GWP alternatives remain valid.

- An initial broad estimate to conduct surveys of high GWP alternatives to ODS and to prepare projects has been prepared after consideration of the funding levels provided in Decision 71/42 for the preparation of stage II HPMP proposals. A total funding allocation of some US$ 10.45 million might be required. Such a survey could also address the current consumption of low GWP substances.

- The funding for stage II HPMPs (during the two triennia 2015-17 and 2018-20) depends to a large degree on the cost effectiveness values used. Assuming avoidance of 50% of high GWP alternatives in RAC conversions would be equal to avoiding 87.5-102.9 Mt CO_2-eq. for Case 1, to avoiding 57.5-67.8 Mt CO_2-eq. for Case 2. The climate cost effectiveness would be around 5.9 US$ per tonne CO_2 for both Case 1 and Case 2 (at a cost effectiveness of US$ 10.1/kg). Assuming avoidance of 100% of high GWP alternatives in RAC conversions obviously leads to an increase of the amounts expressed in Mt CO_2-eq. The climate cost effectiveness would then be around US$ 4.8 per tonne CO_2 for a cost effectiveness (RAC) of US$ 10.1/kg and US$ 5.5 per tonne CO_2 for a cost effectiveness (RAC) of US$ 13.35/kg.

- The production capacity for HFCs is estimated to grow by a factor of 2 in the next 5-10 years, principally to supply the HFCs required by new production lines not associated with conversion from production of HCFC-based equipment. The only practicable alternative might be to moderate the growth in production by supporting the maximum possible phase-in of low-GWP alternatives to high-GWP ODS alternatives (including HFCs). It is too early to attempt assessment of either the feasibility or costs of not-in-kind conversions.

Additional funding for swing plant production phase-out

Production in swing plants in all countries other than China reached a total of about 66,000 tonnes of HCFC-22 in the peak year 2009, lowering to around 40,000 tonnes in the year 2012. If funding was based on a production level of 50,000 tonnes per year, spread over 15 years at a cost of US$ 1-1.5/kg, this would imply adding US$ 9.5-14.5 million per triennium to the replenishment. Total funding for production phase-out (seen as new funding for the next two triennia, even when it is committed for 2015-16), as given in the May 2014 report (US$ 72.6 and 65.6 million for the next two triennia), would then increase to US$ 82.1-87.1 million and US$ 75.1-80.1 million for the first and the second triennium, respectively.

1 Introduction

1.1 The Process

Decision XXV/8 of the Twenty-fifth Meeting of the Parties requested the Technology and Economic Assessment Panel (TEAP) to prepare a report for submission to the OEWG-34 Meeting of the Parties (Paris, July 2014). A supplement report was to be presented at the MOP-26 Meeting (Paris, November 2014), to enable the 26th Meeting of the Parties to take a decision on the appropriate level of the 2015-2017 Replenishment of the Multilateral Fund. Decision XXV/8 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 XXV/8 (Replenishment) Task Force to prepare the report on the 2015-2017 replenishment of the Multilateral Fund, in consultation with the full TEAP membership.

The final TEAP replenishment report was published by UNEP in May 2014 as part of the TEAP Progress Report (i.e., Volume 6 of the May 2014 Progress Report).

1.2 The Contact Group on Replenishment

During the 34th meeting of the Open Ended Working Group, the TEAP Task Force presented its report on the Funding Requirement for the Replenishment of the Multilateral Fund for the triennium 2015-2017. After consideration of the report by the plenary, the co-chairs of the OEWG decided to set up a Contact Group to consider the report, and to possibly formulate 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 Ms. Marissa Gowrie (Trinidad and Tobago) and Mr. Paul Krajnik (Austria). The Contact Group held a number of sessions, which were attended by members of the TEAP XXV/8 Task Force (RTF) and by representatives of the Multilateral Fund Secretariat, as resource persons.

All members of the Contact Group expressed their satisfaction at the clarity and transparency of the TEAP Report and the presentations thereon. 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 they believed should be clarified and elaborated in a supplementary report.

On the basis of the discussions in the Contact Group, the Open-ended Working Group agreed to ask the TEAP to elaborate a specific group of issues in the form of a report supplementing its May 2014 Replenishment Report. The specific elements for which elaboration was requested, were given in the report of the 34st Meeting of the Open-ended Working Group; they are attached to this document as Annex 1.

1.3 Procedure for the completion of the Supplement Report

The TEAP XXV/8 Task Force has prepared this supplementary report to address the issues agreed by the 34st Meeting of the Open-ended Working Group. This report has been structured in such a way that specific groups of requests for further study could be dealt with in a few separate chapters.

This report was reviewed by the Task Force and the TEAP in the period 24-28 September 2014; all comments received were discussed before they were inserted. The report was subsequently submitted to the UNEP's Ozone Secretariat the end September 2014 for placing it on its web-site as an advance copy, and (with a few editorial changes and an Executive Summary inserted) my mid- October 2014 as the final copy.

2 Qualitative elaboration on Case 1 and Case 2

2.1 Additional clarification about Case 1 and 2

In paragraph 1(a) of the suggestions for elaboration in the supplementary report the TEAP is requested to "Add more narrative parts and explanations to chapters in the replenishment study which refer to consumption and case 1 and 2 scenarios". The following information is presented by the RTF to elaborate on the information provided in the replenishment study, and to clarify the reader's understanding of Cases 1 and 2 as originally set out in sections 4.4.1 and 4.4.2 of the TEAP Progress Report, Volume 6, XXV/8 Task Force Report, May 2014.

Cases 1 and 2 concern assessment of the new funding requirements[1] for the first and second triennia, 2015-2017 and 2018-2020, for the 57 non-LVC countries. The funding requirement for the 85 LVC countries is presented separately in the original report and is not associated with Cases 1 and 2.

In both Case 1 and Case 2, for each non-LVC country, the stage II HPMP funding requirement is based on the quantity of HCFCs that has to be phased out after the completion of Stage 1 HPMPs in order to meet the 2020, 35 per cent reduction step. Cases 1 and 2 represent alternative approaches for determining the proportion of this quantity of HCFCs that is eligible for funding according to the rules and policies of the Multilateral Fund as represented in decisions taken by the Executive Committee.

As background, it should be borne in mind that the total baseline consumption of all non-LVC countries is 32,779 ODP tonnes. Of this total, the largest consuming country has a baseline of 19,269 ODP tonnes, i.e. some 59% of the total. The next largest country has a consumption of 1,608 ODP tonnes, 4.9% of the total. The 10 largest consuming countries have a combined consumption of 27,639 ODP tonnes or in the order of 80-85% of the funding requirement under either Case 1 or Case 2. This indicates the extent to which the total replenishment requirement for stage II HPMPs is determined by the consumption of relatively few large consuming countries.

2.2 Case 1: commitment-based phase-out

The Agreement for stage I HPMPs concluded between each non-LVC country and the Executive Committee contains a table indicating the maximum level of HCFC consumption to which the country will limit itself by 2015 through implementation of the stage I HPMP[2]. For 16 non-LVC countries, including the largest consuming country, the maximum level of consumption committed to in the stage I HPMP by 2015 is equal to the Protocol requirement of a 10% reduction below the baseline. For these 16 countries, the additional phase-out requirement to be achieved by 2020 is the 35% reduction target minus the 10% reduction committed to in the stage I HPMP, that is, 25% of the baseline for each of the 16 countries.

[1] The existing funding requirement for stage 1 HPMPs falling within the 2015-2017 triennium is presented separately in the original report as "existing commitments".

[2] The 10% reduction step must be achieved by the end of 2014, but many countries have a final disbursement for stage I HPMPs in 2015.

Thirty-seven, often smaller-consuming, non-LVC countries have committed to a final level of consumption in their stage I HPMPs equivalent to a baseline reduction of between 15 and 42%; one non-LVC country has committed to a reduction of 86.4%. Three non-LVC countries do not currently have a stage I HPMP agreed commitment. For most of these countries, the phase-out required in their stage II HPMP will be the 35% reduction step minus the level of baseline reduction committed to, and achieved, in the Stage I HPMP of each country. Those countries that have committed to a phase-out of 35% or more in their stage I HPMPs will not require further funding for a stage II HPMP to achieve the 2020 reduction target.

To illustrate this, the stage I HPMP phase-out commitments of larger consuming non-LVC countries are indicated in Tables 2-2 and 2-3 presented below, together with the remaining percentage of baseline consumption that will be funded in their stage II HPMPs to achieve the 35% reduction step in 2020. The average level of phase-out committed to in stage I HPMPs by all non-LVC countries, weighted to take account of the relative consumption of each country is 15%. Thus the average level of additional phase-out required to meet the 2020 reduction target is 20%.

Case 1 is based on funding being made available under the rules of the Multilateral Fund to phase out the difference between the reduction in consumption planned for achievement in the Stage I HPMP and the level of consumption corresponding to the 2020, 35% reduction step. This additional phase-out requirement is used as the basis for calculating, separately for each relevant country, the total cost of a stage II HPMP to meet the 2020 HCFC phase-out target.

For information, the total quantities of each relevant HCFC for which phase-out funding would be provided under the Case 1 scenario and the CO_2 equivalents are presented in tabular form in Chapter 3 of this report in which the quantitative aspects of Cases 1 and 2 are discussed.

2.3 Case 2: unfunded phase-out

As well as indicating the final, reduced level of HCFC consumption to be achieved at the conclusion of a stage I HPMP, the project proposals, together with information provided to the Fund Secretariat, also provide detailed information to justify the costs requested in each HPMP submission. Included in this information is the estimated level of phase-out for each chemical to be funded in each sector. In most project proposals, the total phase-out to be achieved through investment activities is greater than the total reductions in consumption committed to in the relevant HPMP agreements.

As indicated above, the average phase-out to be achieved by all non-LVC countries in stage I HPMPs by 2015 is 15%. However the average of the level of phase-out for which funding was provided in all stage I HPMPs, also weighted to take account of the relative consumption of each country, is 23%. In Case 2, the assessment is made that funding from the Multilateral Fund is only eligible for reductions from the baseline additional to the 23% phase-out for which funding has already been provided.[3] Using this assessment, the funding for a stage II HPMP would be limited

[3] In Decision 35/57 the Executive Committee established the principle that funding for projects and

to that necessary to achieve further reductions to progress from the 23% phase-out already funded to the 2020 target of 35%. That is, funding for an additional phase out of 12% of the baseline. This can be compared to the Case 1 assessment in which the same country would have been eligible for funding for a level of additional phase-out equal to 20% of its baseline.

2.4 Implications of basing replenishment on Case 1 or Case 2

The assessment of the Task Force is that both Case 1 and Case 2 are consistent with the rules and policies of the Multilateral Fund as expressed in decisions of the Executive Committee. For this reason they were put forward as alternative options for consideration by the Parties.

Implications for the Fund

Continuing the example of a stage I HPMP containing the average commitment that upon completion, consumption would not exceed a 15% reduction in the baseline but for which funding had been provided to phase out 23% of the baseline, it can be seen that in Case 1 the stage II HPMP would be based on funding for additional reductions in consumption of 20%. Alternatively, in Case 2, the stage II HPMP would be based on funding for additional reductions in consumption of only 12%. Thus for this 'average' country the funding level under Case 1 will be some 60% greater than under and Case 2. This difference gives rise to the additional funding requirement of US$ 185 million for stage II HPMPs under Case 1, compared to Case 2 as indicated in Table 2-1 below.

New commitments non-LVCs (for Stage II HPMPs only)	**2015-2017** US$ million	**2018-2020** US$ million	**Total** US$ million
Case 1 (commitment based phase-out)	334.0	180.3	514.3
Case 2 (unfunded phase-out)	214.4	115.5	329.5

Table 2-1 Total funding for stage II HPMPs under Cases 1 and 2

Implications for individual Parties

The Task Force has not made assumptions as to why specific non-LVC countries submitted stage I HPMPs in which the total phase out funded in the project was greater than the total reductions from the baseline.

In general terms, reasons could include: a) uncertainty as to the effectiveness of project elements, and thus the maintenance of a contingency buffer of consumption reductions to reduce the risk of non-compliance, or; b) to make funding available for the phase-out of growth in consumption in the years 2011 and 2012 between the 2009-2010 baseline and the 2013 freeze.

activities should produce sustainable, permanent aggregate reductions in the consumption of a country. On this basis, if the combined requirement of the stage I and stage II HPMPs is to achieve a 35% reduction in the baseline by 2020, then the total phase-out eligible for funding under the two HPMPs will not exceed 35%. For instance, if a country has already received funding equivalent to a 17% reduction in its stage I HPMP, the additional funding for stage II would be limited to that required for a further reduction of 18%.

In either situation, using the 'average' example where a country had committed to a 15% baseline reduction and had received funding for phase-out equivalent to 23% of the baseline, under Case 1 total funding for that country to reach the 2020 target would be based on the funding already provided for the stage I HPMP plus funding for an additional phase out in stage II HPMPs equivalent to 20% of baseline consumption (the 35% reduction requirement minus the 15% already committed to in stage I). Thus for Case I, total funding would be provided for phase-out equal to 43% of the baseline consumption.

Under Case 2, total funding to achieve the 2020 target would be based on the funded phase-out of 23% in the stage I HPMP plus provision for additional phase-out of 12% in stage II, on the basis that stage II funding was required to fund reductions beyond the 23% already funded in stage I to reach the 2020 target of a 35% reduction. Under Case 2, total funding for stage I and stage II HPMPs would be provided for a phase-out equivalent to 35% of the baseline.

Certain selected non-LVC Countries (in descending order of consumption)	**Baseline (tonnes)**	**Case 1 Reduction committed in HPMP I (% baseline)**	**Case 1 Reduction to be funded in HPMP II (% baseline)**	**Case 1 HPMP II reductions (ODP tonnes)**
1	19269.0	10	25	4817.3
2	1608.2	10	25	402.1
4	1327.3	10	25	331.8
6	927.6	15	20	185.5
8	515.8	15	20	103.2
10	418.6	39	0	0.0
15	400.7	18	17	68.1
19	208.4	10	25	52.1
25	88.8	20	15	13.3
30	73.5	18	17	12.5
39	46.0	35	0	0.0
Average (all non-LVCs **weighted** for consumption)		15.02	19.98	
Group 1	**19269.0**			**4817.3**
Group 2 and 3	**13510.0**			**1941.7**
Total	**32779.0**			**6759.0**

Table 2-2 Some country examples for Case 1 showing, for each country, the agreed reduction percentage and the phase-out to be funded to achieve 35% reduction (in percentage of the baseline and in ODP tonnes)

Certain selected non-LVC Countries (in descending order of consumption)	**Baseline (tonnes)**	**Case 2 Reductions funded in HPMP I (% baseline)**	**Case 2 Reductions to be funded in HPMP II (% baseline)**	**Case 2 HPMP II reductions (ODP tonnes)**
1	19269.0	17.9	17.1	3295.0
2	1608.2	21.3	13.7	220.3
4	1327.3	16.6	18.4	244.2
6	927.6	23.8	11.2	103.9
8	515.8	20.3	14.7	75.8
10	418.6	57.1	0	0.0
15	400.7	26.6	8.4	33.7
19	208.4	43.5	0	0.0
25	88.8	35.8	0	0.0
30	73.5	27.2	7.8	5.7
39	46.0	38.7	0	0.0
Average (all non-LVCs **weighted** for consumption)		22.98	12.02	
Group 1	**19269.0**			**3295.0**
Group 2 and 3	**13510.0**			**1110.0**
Total	**32779.0**			**4405.0**

Table 2-3 Some country examples for Case 2 showing, for each country, the agreed reduction percentage and the phase-out to be funded to achieve 35% reduction (in percentage of the baseline and in ODP tonnes)

3 Quantitative elaboration on Case 1 and Case 2

3.1 Overall data and disbursement schedules

As explained in chapter 2.1, Case 1 and Case 2 involve different interpretations of the funding policies of the Multilateral Fund. Specific examples were provided of the reductions in baseline consumption on which funding for stage II HPMPs would be based under both Case 1 and Case 2 to achieve the 35% reduction step by 2020. In order to make specific calculations for Cases 1 and 2, as requested in the suggestions for elaboration for the supplement report, all consumption levels and reductions as studied in the May 2014 replenishment have again been examined.

In the May report, non-LVC countries that had consumption in both servicing and manufacturing were grouped into various classes on the basis of the ratios of their consumption in refrigeration/AC and servicing. An overall cost-effectiveness was determined on the basis of these ratios for representative groups of non-LVC countries. The suggestions for elaboration include requests to examine the impact on funding of changes in the percentage foam, or changes in specific cost effectiveness factors for refrigeration and AC. For this reason all non-LVC countries have again been studied and the specific amounts for HCFC-141b foam, HCFC-142b (HCFC-22) XPS foam, refrigeration manufacturing and servicing as addressed in the May report have been calculated.

To do this, phase-out quantities to be funded under Cases 1 and 2 to meet the 35% reduction step in each non-LVC were calculated in metric tonnes from information regarding specific country usage profiles, using estimates made by the Task Force for a division of reductions in consumption between foam blowing agent uses and refrigeration and AC manufacturing and servicing uses. These estimates were combined for each country and converted to ODP tonnes.

This leads to two tables with specific HCFC amounts (in both ODP and metric tonnes) for Case 1 and Case 2. When combined with the average cost effectiveness values for the various groups of non-LVC as given in the May 2014 report, these figures will indicate the total funding required for stage II HPMPs for Case 1 and Case 2 for the next two triennia. Tables 3-1 and 3-2 are presented below.

Case 1	**ODP tonnes**	**Tonnes**	**CE**	**Funding (US$ million)**
HCFC-141b	4458.2	40529.1	5.49	222.50
HCFC-142b	294.2	4526.6	3.62	16.39
HCFC-22 XPS	124.5	2263.3	3.62	8.19
HCFC-22 RAC manufacture	1079.8	19632.7	10.1	198.29
HCFC-22 RAC servicing	802.3	14587.3	4.5	65.64
(percentage foams in total)	(72.2)	(58.0)		
Total	6759.0	81539.0		511.0

Table 3-1 Sectoral HCFC amounts addressed in Case 1 showing funding requirements for the first two triennia (calculated using an average CE)

Case 2	ODP tonnes	Tonnes	CE	Funding (US$ million)
HCFC-141b	2896.5	26331.6	5.49	144.56
HCFC-142b	210.4	3236.8	3.62	11.72
HCFC-22 XPS	89.0	1618.4	3.62	5.86
HCFC-22 RAC manufacture	685.8	12469.1	10.1	125.94
HCFC-22 RAC servicing	523.3	9514.5	4.5	42.82
(percentage foams in total)	(72.6)	(58.7)		
Total	4405.0	53170.5		330.9

Table 3-2 Sectoral HCFC amounts addressed in Case 2 showing funding requirements for the first two triennia (calculated using an average CE)

It can be seen that the estimate of consumption in the foam sector (in metric tonnes) compared to refrigeration and AC in both Case 1 and Case 2 is not 50%, but higher, namely 58 and 58.7%. This is due to specific assumptions per country, where in certain cases (arising from the country profile) more foam than R/AC has to be addressed. In some other countries an approximate 50% division between the two can be maintained. However, these are generally countries with much lower levels of consumption, in particular much lower than the consumption of the 10 highest consuming non-LVC countries.

Table 6-3 in the May 2014 report presents the amounts for different disbursement schedules for Case 1, Table 6-4 in that report does the same for Case 2. The tables have been reproduced below, with the addition of one more disbursement schedule (25-25-25-25%).

Most of the schedules presented in the May report did not have much front-loading: this last schedule has none. It should however be commented that this kind of disbursement schedule is unworkable in practice. It is not represented in most approved projects because most of the procurement activity typically takes place in the first and second years and funding in the final year, at the completion of the project, is normally not more than 10%. However, the equal disbursement schedule is presented here in response specifically to the request in paragraph 2(g) of the suggestions for elaboration. In each table, columns 2 and 3 indicate the funding needed specifically for stage II HPMPs in the first two triennia.

Funding requirement US$ millions	2015-2017	2018-2020 Stage II HPMPs	2020 Stage III HPMPs	2018-2020 Total (Stage II plus Stage III HPMPs)	2021-2023
Case 1					
Disbursement schedule (%)					
1. 40-25-25-10	**334.0**	**180.2**	**141.2**	**321.4**	**441.1**
2. 50-20-20-10	359.6	154.4	141.2	295.7	441.1
3. 30-30-30-10	308.4	205.9	141.2	347.2	441.1
4. 25-25-25-25	257.1	257.1	141.2	398.3	441.1

Table 3-3 Various disbursement schedules and impact on funding for Case 1

Column 4 indicates the funding assessed as being required in 2020 for stage III HPMPs to meet the 2025 Protocol reduction step (same as in May 2014 report and the same for both Cases 1 and 2).

Assuming that equal numbers of projects are approved in certain years (e.g. 2015 and 2017), row 4 in Table 3-3 shows equal amounts of funding for the stage II HPMPs in the next two triennia for Case 1 (where the same can be seen in Table 3-4 for Case 2). However, when a certain portion of the funding estimated to be required for stage III HPMPs is added (which funding would address the 2025 Protocol 67.5% reduction step) the amount required in the second triennium is much higher even for the "no front-loading" examples. The total amount of funding for stage II HPMPs (the sum of the first two triennia) for Case 1 is equal to US$ 514.2 million, more or less the same amount as calculated via the addition of tonnes (and an average cost effectiveness, which may cause small differences) in Table 3-1 for Case 1.

Funding requirement US$ millions	**2015-2017**	**2018-2020 Stage II HPMPs**	**2020 Stage III HPMPs**	**2018-2020 Total (Stage II plus Stage III HPMPs)**	**2021-2023 (left for stage III)**
Case 2					
Disbursement schedule (%)					
1. 40-25-25-10	**214.4**	**115.4**	**141.2**	**256.6**	**441.1**
2. 50-20-20-10	230.9	98.9	141.2	240.1	441.1
3. 30-30-30-10	197.9	131.9	141.2	273.1	441.1
4. 25-25-25-25	164.9	164.9	141.2	306.1	441.1

Table 3-4 Various disbursement schedules and impact on funding for Case 2

As in the table above for Case 1, the assumption of equal numbers of projects approved in 2015 and 2017 leads to equal amounts of funding for the stage II HPMPs in the next two triennia as shown in Table 3-4 for Case 2. Again, when funding required for stage III HPMPs is added, the amount required in the second triennium is much higher, even with "no front-loading" (rows 3 and 4). The total amount of funding for stage II HPMPs (the sum of the first two triennia) equals US$ 329.8 million, roughly the same amount as calculated via the addition of tonnes (and an average cost effectiveness, causing small differences) in Table 3-2 for Case 2.

3.2 Variation of the foam and refrigeration/AC percentage in the total

In paragraph 2(d) of the suggestions for elaboration by the Task Force there is a request to estimate the financial implications of varying the percentage of the foam sector in the stage II HPMPs from 50 to 60%. This can be done by varying the parameters in the spreadsheet calculations without changing the total phase-out that need to be addressed to achieve the 35% reduction in the baseline in ODP tonnes by 2020. It has been assumed by the Task Force that the change in percentage refers to the sectoral consumption in metric tonnes, consistent with the original analysis. Since the original analysis was based on a contribution by the foam sector of almost 60 percent (for both Cases 1 and 2), the Task Force has examined the financial implications of varying the foam percentage, down to 50% and 40% of the total amounts in metric tonnes.

Table 3-5 shows the amounts in tonnes and the total funding amount calculated in US$ million for 58, 50 and 40% of foam blowing chemicals in the total amount of HCFCs, for Case 1. All the various foams percentage cases assume a disbursement ratio of 40-25-25-10% for the stage II HPMP funding.

Case 1	Amount (tonnes)	Funding (MUS$)	Amount (tonnes)	Funding (MUS$)	Amount (tonnes)	Funding (MUS$)
HCFC-141b	40529.1	222.50	36638.3	201.14	31207.4	171.33
HCFC-142b	4526.6	16.39	4092.0	14.81	3485.5	12.62
HCFC-22 XPS	2263.3	8.19	2046.0	7.41	1742.7	6.31
HCFC-22 RAC manufacture	19632.7	198.29	24516.5	247.62	31333.4	316.47
HCFC-22 RAC servicing	14587.3	65.64	18215.9	81.97	23281.0	104.76
(percentage foams in total)	**(58.0)**		**(50.0)**		**(40.0)**	
Total	**81539.0**	**511.0**	**85508.8**	**553.0**	**55910.9**	**611.5**

Table 3-5 Amounts (tonnes) and total funding requirement (for two triennia) for 58, 50 and 40% of foam blowing chemicals in the total amount of HCFCs, Case 1

A 10% increase or decrease from a 50% foam percentage would imply a cost decrease by about US$ 53 million (corrected for the 58.0%) and an increase by US$ 59 million, respectively, for Case 1.

Table 3-6 shows the amounts in tonnes and the total funding amount calculated in US$ million for 58.6, 50 and 40% foam blowing chemicals in the total amount of HCFCs, for Case 2. All the various foams percentage cases assume a disbursement ratio of 40-25-25-10% for the stage II HPMP funding.

Case 2	Metric Tonnes	Funding (MUS$)	Metric Tonnes	funding (MUS$)	Metric Tonnes	Funding (MUS$)
HCFC-141b	26331.6	144.56	23645.8	129.82	20117.4	110.44
HCFC-142b	3236.8	11.72	2906.7	10.52	2472.9	8.95
HCFC-22 XPS	1618.4	5.86	1453.3	5.26	1236.5	4.48
HCFC-22 RAC manufacture	12469.1	125.94	15824.7	159.83	20240.3	204.43
HCFC-22 RAC servicing	9514.5	42.82	12080.4	54.36	15451.1	69.53
(percentage foams in total)	**(58.7)**		**(50.0)**		**(40.0)**	
Total	**53170.5**	**330.9**	**55910.9**	**359.8**	**59518.2**	**397.8**

Table 3-6 Amounts (tonnes) and total funding requirement (for two triennia) for 58.7, 50 and 40% of foam blowing chemicals in the total amount of HCFCs, Case 2

A 10% increase or decrease from a 50% foam percentage would imply a cost decrease by about US$ 33 million (corrected for the 58.7%) and an increase by US$ 38 million, respectively, for Case 2.

The range of 60% to 40% for the proportion of foam blowing agents in the total amount of HCFCs to be addressed seems to cover all realistic percentages. The Task Force therefore decided not to investigate additional percentages.

3.3 Variation of the foam and refrigeration/AC percentage and impact on "climate cost effectiveness"

From the amounts calculated above, in metric tonnes, one can also calculate the quantities in tonnes and in tonnes of CO_2-eq. avoided, assuming that all the replacements for the HCFCs addressed have a certain average GWP. Complete zero GWP conversion would be the ideal case, which cannot be realised at present. However, for insight, Tables 3-7 and 3-8 (below) both assume complete avoidance of replacement substances having any GWP and show the amounts in tonnes and in tonnes of CO_2-eq. avoided. Table 3-9 presents similar estimates for the more practical situation in which there is partial replacement with zero GWP substances.

Table 3-7 shows the figures for complete GWP avoidance in Case 1 and for various foam percentages in the total. Based on the total amount of funding and the total amount avoided one can define a cost per tonne CO_2-eq. For Case 1 the climate cost effectiveness then equals US$ 4.88, 4.79 and 4.69 per tonne CO_2-eq. for 58, 50 and 40% foam HCFCs in the total. The cost effectiveness does not vary significantly with changing percentages because, while it will be more costly to phase-out refrigeration and AC, the GWP of the HCFC-22 being phased-out is more than twice as high as the GWP of HCFC-141b.

Case 1	HCFC quantity (tonnes)	In Mt CO_2-eq Avoided	HCFC quantity (tonnes)	In Mt CO_2-eq avoided	HCFC quantity (tonnes)	In Mt CO_2-eq avoided
HCFC-141b	40529.1	31.61	36638.3	28.58	31207.4	24.34
HCFC-142b	4526.6	8.96	4092.0	8.10	3485.5	6.90
HCFC-22 XPS	2263.3	3.98	2046.0	3.60	1742.7	3.07
HCFC-22 RAC manufacture	19632.7	34.55	24516.5	43.15	31333.4	55.15
HCFC-22 RAC servicing	14587.3	25.67	18215.9	32.06	23281.0	40.97
(percentage of foams in total)	(58.7)		(50.0)		(40.0)	
Total	**81539.0**	**104.8**	**85508.8**	**115.5**	**55910.9**	**130.4**

Table 3-7 Amounts of HCFCs for various foam percentages, Case 1 (for two triennia), as well as the amounts of Mt CO_2 avoided per chemical and totals

Case 2	HCFC quantity (tonnes)	In Mt CO_2-eq Avoided	HCFC quantity (tonnes)	In Mt CO_2-eq avoided	HCFC quantity (tonnes)	In Mt CO_2-eq avoided
HCFC-141b	26331.6	20.54	23645.8	18.44	20117.4	15.69
HCFC-142b	3236.8	6.41	2906.7	5.76	2472.9	4.90
HCFC-22 XPS	1618.4	2.85	1453.3	2.56	1236.5	2.18
HCFC-22 RAC manufacture	12469.1	21.95	15824.7	27.85	20240.3	35.62
HCFC-22 RAC servicing	9514.5	16.75	12080.4	21.26	15451.1	27.19
(percentage foams in total)	(58.7)		(50.0)		(40.0)	
Total	**53170.5**	**68.5**	**55910.9**	**75.9**	**59518.2**	**85.6**

Table 3-8 Amounts of HCFCs for various foam percentages, Case 2 (for two triennia), as well as the amounts of Mt CO_2 avoided per chemical and totals

Table 3-8 shows the amounts in tonnes and in tonnes of CO_2-eq. avoided for Case 2 and various foam percentages in the total. For Case 2 the climate cost effectiveness is US$ 4.83, 4.74 and 4.65 per tonne CO_2-eq. for 58.6, 50 and 40% foam. Table 3-8 also assumes the ideal case of HCFC alternatives with no GWP. The fact that the climate cost effectiveness is not much different from Case 1 is due to the fact that there is a linear relationship between funding and tonnes CO_2 avoided, Case 1 and 2.

Studying the specific manufacturing operation part for refrigeration and AC

As mentioned above, the assumption that all HCFCs can be replaced by zero GWP compounds in all sectors is too optimistic given the cost-effectiveness factors used (and the resulting funding level for the two triennia). However the assumption can be considered as realistic for the foam sector and for a part of the refrigeration and AC sector. In the manufacturing sector, for a cost effectiveness of US$ 10.1/ kg as used in the May 2014 report, (on the basis of the actual values from projects), manufacturing would be expected to change from HCFCs to a mix of high-GWP HFCs, HFC-32 and HCs. Assuming one third of conversions would go to each of the alternatives, half the amount of HCFC-22 (expressed in tonnes per CO_2-eq.) would be avoided. With this information the climate cost effectiveness can again be easily calculated, since the funding amounts (for the two triennia) remain the same. Values are given in Table 3-9.

Case 1	100% avoided in RAC manufacture						50% avoided in RAC man		
	CE US$ 10.1/kg			CE US$ 13.35/kg			CE US$ 10.1/kg		
Foam %	Costs (M US$)	Mt CO_2	US$/ t CO_2	Costs (M US$)	Mt CO_2	US$/ t CO_2	Costs (M US$)	Mt CO_2	US$/ t CO_2
F=58%	511.0	104.8	4.88	575.0	104.8	5.49	511.0	87.5	5.84
F=50%	553.0	115.5	4.79	632.9	115.5	5.48	553.0	93.9	5.89
F=40%	611.5	130.4	4.69	713.6	130.4	5.47	611.5	102.9	5.94
Case 2									
Foam %	Costs (M US$)	Mt CO_2	US$/ t CO_2	Costs (M US$)	Mt CO_2	US$/ t CO_2	Costs (M US$)	Mt CO_2	US$/ t CO_2
F=58%	330.9	68.5	4.83	371.5	68.5	5.42	330.9	57.5	5.75
F=50%	359.8	75.9	4.74	411.4	75.9	5.42	359.8	61.9	5.81
F=40%	397.9	85.6	4.65	463.8	85.6	5.42	397.9	67.8	5.87

Table 3-9 Funding requirement for (a) 100% avoidance of high GWP alternatives and two CE values and (b) 50% avoidance of high GWP alternatives for one CE value, for three different foam percentages. The amounts avoided in Mt CO_2-eq. are given, as well as the effectiveness (US$/t CO_2-eq.). This for both Case 1 and 2

Assuming it was technically feasible to replace all HCFCs in refrigeration and AC manufacturing with zero GWP compounds (e.g. hydrocarbons) the cost effectiveness might change from US$ 10.1 to around US$ 13.35 (or even higher). The amount of Mt CO_2-eq. avoided would be the same as in Tables 3-7 and 3-8 above. Results for the funding required are given in Table 3-9 above. From Table 3-9 it will be clear that the degree of avoidance of high-GWP substances, as well as the cost effectiveness of converting to low-GWP alternatives, can be varied to produce alternative scenarios. For instance, increasing the cost effectiveness for zero GWP conversions in R/AC manufacture by about 30% would increase the total stage II HPMP funding by US$ 65-100 million, dependent on the foam percentage applied (still within the CE threshold if the CE for commercial applied was applied to AC). This implies an amount of US$ 32-50 million per triennium, if equally distributed. One would phase out more tonnes CO_2-eq. at these higher costs, with a climate cost effectiveness of US$ 5.4-5.5 per tonne CO_2-eq., compared to a climate cost effectiveness of US$ 4.65-4.85 per tonne CO_2-eq., if the conversion cost-effectiveness could be reduced by some 30%.

If only half the high-GWP consumption in R/AC manufacture was replaced by zero-GWP conversions at the "conservative" value of US$ 10.1/kg, the funding would remain the same (as given), the amounts avoided would decrease and the climate cost effectiveness would be in the range US$ 5.75-5.90 per tonne CO_2-eq. It will be clear from the above that, for a variety of parameters, the climate cost-effectiveness does not change much and remains in the range of US$ 5.4-5.9 per tonne CO_2-eq. This is due to the fact that, in all the practical variations, for both Case 1 and 2, a large amount of foams is converted to zero GWP substances, forming a sort of "base load".

In regard to the foam sector, paragraph 2(d) of the suggestions for elaboration, indicates that SME foam operations, in particular, could be more costly. If the majority of foam conversions in stage II HPMPs were to take place in SME operations at a 20% higher cost (20% higher CE values), one could recalculate the foam part of Table 3-9, in which the avoidance of 100% and 50% of high-GWP replacements was examined.

Table 3-10 Funding requirement (two triennia) for three different foam percentages at 20% higher cost for foams than in Table 3-9, as well as effectiveness (in Mt CO_2-eq.), for Case 1 and 2

Case 1	**100% avoided in RAC man**			**50% avoided in RAC man**		
	(CE foam = CE+20%) (US$ million)			**(CE foam = CE +20%) (US$ million)**		
(Foam%)	**Costs M US$**	**Mt CO_2**	**US$/t CO_2**	**Costs M US$**	**Mt CO_2**	**US$/t CO_2**
F=58%	**558.9**	**104.8**	**5.33**	**558.9**	**87.5**	**6.39**
F=50%	**596.2**	**115.5**	**5.16**	**596.2**	**93.9**	**6.35**
F=40%	**648.3**	**130.4**	**4.97**	**648.3**	**102.9**	**6.30**
Case 2						
	Costs M US$	**Mt CO_2**	**US$/t CO_2**	**Costs M US$**	**Mt CO_2**	**US$/t CO_2**
F=58%	**362.2**	**68.5**	**5.29**	**362.2**	**57.5**	**6.30**
F=50%	**387.9**	**75.9**	**5.11**	**387.9**	**61.9**	**6.26**
F=40%	**421.7**	**85.6**	**4.93**	**421.7**	**67.8**	**6.22**

Different numbers for the funding and for climate cost effectiveness can be calculated (the amount of Mt CO_2-eq. avoided would remain the same). This is given in Table 3-10 above.

For a fixed cost-effectiveness of US$ 10.1 per kg in R/AC manufacture (either via 100% or 50% of high GWP substances avoided), an increase in the foam costs (lower cost-effectiveness) of 20% would increase the funding requirement by US$ 37-47 million in Case 1 and by US$ 24-31 million in Case 2, spread across the next two triennia. This implies that increasing the foam costs by 20% implies an increase of US$ 27-42 million per triennium (Case 2 and Case 1 are determining the range here). The climate cost effectiveness increases to US$ 5.0-5.3 per tonne CO_2-eq. for 100% high GWP avoided in R/AC manufacture and to US$ 6.2-6.4 per tonne CO_2-eq. for 50% high GWP avoided in R/AC manufacture.

All the funding requirements above apply to a reduction of 35% of the baseline via either Case 1 or Case 2 assumptions, which means that the funding applies to the two next triennia, and can be disbursed via schedules to be decided (see above). In this way, the material presented in chapter 1-2 above has already given some quantitative answers to the requests 2(a), 2(d), 2(g), 2(i), and 2(j) in the suggestions for elaboration.

4 Requests other than those related to Case 1 and Case 2

4.1 Distribution of funding

In request 1(b) of the suggestions for elaboration, the Task Force is asked to: "highlight more clearly the scenario that divides funding related to the 2020 target applicable to HCFC consumption equally between the 2015-2017 and 2018-2020 replenishments as specified in paragraph 2(d) of Decision XXV/8". The relevant paragraph specifies in particular that the HCFC funding applicable to the 2020 target for consumption and production be divided: "…. in an appropriate manner including but not limited to one scenario that divides the funding related to the 2020 target applicable to HCFC consumption equally between the 2015-2017 and 2018-2020 replenishments". It is noted that the terms of reference for the May 2014 report and the suggestions for elaboration do not request assessment of options that exclude from the 2018-2020 triennium funding elements other than those related to the 2020 reduction target, for instance potential stage III HPMPs that address the 2025 reduction target.

The Task Force considered the original request in its May 2014 report in the following terms. The 2020 target for consumption is to be achieved through completion of stage I HPMPs and funding of new commitments for stage II HPMPs. There is less certainty about assessment of production funding and its disbursements as they apply to the 2020 target. However the 2(d) request continues by saying that one should look at scenarios that divide the funding for HCFC consumption equally between the next two replenishments, without specific reference to production.

For this reason, the Task Force, in its May 2014 report, considered equalisation of HCFC consumption funding only, for Case 1 and Case 2 scenarios. Two equalisation options were presented: in the first instance, total consumption sector funding that included funding for the commencement of stage III HPMPs to address the 2025 target (required in 2020) was split between the first two triennia; in the second instance an option in which the funding for stage III HPMPs would be deferred until the third triennium in 2021. In the second option, consumption sector funding divided equally between the first and second triennia was restricted to elements associated with the 2020 target only.

Funding for stage III HPMPs in 2020 was included in the Task Force's base case because it reflects the actual timing of HPMP preparation and approvals for stage I and potentially stage II HPMPs. Also because it takes account of the higher level of annual reductions in consumption that must be achieved in the period 2020-2024 to achieve a 67% reduction in the baseline by 2025.

"Dividing the HCFC consumption funding applicable to the 2020 target equally" also implies that one has to take into account the funding approved for stage I HPMPs that will remain to be disbursed in 2015 or later. The disbursement of such existing commitments will take place far more in the first 2015-2017 triennium than in the second. Therefore an equal distribution of HCFC consumption funding would shift part of the new HCFC funding for stage II HPMPs to the second triennium 2018-2020. This may present significant practical problems, for instance, disbursements

for procurement of material, that comprise a significant proportion of total project funding, would normally be needed upfront rather than in later years.
An additional equalisation option is presented in this supplementary report. In this option the consumption sector funding for stage II HPMPs to meet the 2020 reduction target is divided equally between the first and second triennium, however the second triennium also contains consumption sector funding (in the year 2020) assessed as being required for stage III HPMPs to meet the 2025 target.

Tables 4-1 to 4-4 below have been composed from the information in the May report. They present assessments of the total funding required across three triennia with no equalization of distribution (Table 4-1) and with three options associated with equalization in the first two triennia. In Tables 4-1 and 4-2, the funding of US$ 141.2 million assessed by the Task Force as being required in 2020 for stage III HPMPs for non-LVCs as well as the US$ 30.35 million for LVCs applicable to the 2025 target, has been deferred until the triennium 2021-2023 so that funding in the first two triennia is only directed towards the 2020 target. .

In Table 4-3 this stage III HPMP funding has been included in the second triennium, consistent with the base case presented in the May report. Thus Table 4-3 shows equal distribution of funding for the 2020 target across the first two triennia with the addition of the first year of funding for the 2025 target in the final year of the second triennium,. i.e. year 2020.

Table 4-4 contains the first equalization option presented in the May 2014 report in which the 2020 funding for stage III HPMPs is combined with other consumption sector funding and divided equally between the first two triennia.

Funding requirement	**2015-2017**	**2018-2020**	**2021-2023**
1. Production sector	72.562	65.622	65.622
2. IS, PRP, DP* and supporting activities	108.403	113.852	105.220
3a. Existing obligations LVCs and non-LVCs (see Table 6-1)	90.06	15.01	0.30
3b. Pre-blended polyols	4.32	4.32	
3c. New commitments LVCs			54.63
3. Subtotal	**94.4**	**19.33**	**54.93**
New commitments non-LVCs			
4. Case 1** (commitment based phase-out)	334.1	180.3	582.3
5. Case 2 (unfunded phase-out)	214.4	115.5	582.3
6. Total funding requirement Case 1	**609.5**	**379.1**	**808.1**
7. Total funding requirement Case 2	**489.7**	**314.2**	**808.1**

* (DP) Demonstration Projects
**Some small adjustments had to be made to the total numbers for Case 1, compared with Table 10-2 in the May report

Table 4-1 Components of the funding requirements in the next three triennia), showing the total funding requirements for Case 1 and Case 2 and with stage III HPMP funding deferred until 2021.

Table 4-1 indicates the total funding requirements for three triennia with no equal distribution of funding requirements for stage II HPMPs to meet the 2020 target between triennia, and with all requirements for funding stage III HPMPs deferred to 2021 or later.

Funding requirement	**2015-2017**	**2018-2020**	**2021-2023**
1. Production sector	72.562	65.622	65.622
2. IS, PRP, DP and supporting activities	108.403	113.852	105.220
3a. Existing obligations LVCs and non-LVCs (see Table 6-1)	(90.6) moved to line 4	(15.01) moved to line 4	0.30
3b. Pre-blended polyols	4.32	4.32	
3c. New commitments LVCs			54.63
3. Subtotal	**4.32**	**4.32**	**54.93**
New commitments non-LVCs			
4. Case 1** (commitment based phase-out)	309.7	309.7	582.3
5. Case 2 (unfunded phase-out)	217.5	217.5	582.3
6. Total funding requirement Case 1	**495.0**	**493.5**	**808.1**
7. Total funding requirement Case 2	**402.8**	**401.3**	**808.1**

**Some small adjustments had to be made to the total numbers for Case 1, compared with Table 10-2 in the May report

Table 4-2 Components of the funding requirements as in Table 4-1 with an equal distribution of HPMP stage I/II funding over the next two triennia (related to the 2020 target), and with stage III HPMP funding deferred until 2021 (as originally presented in the May report)

Funding requirement	**2015-2017**	**2018-2020**	**2021-2023**
1. Production sector	72.562	65.622	65.622
2. IS, PRP, DP and supporting activities	108.403	113.852	105.220
3a. Existing obligations LVCs and non-LVCs (see Table 6-1)	(90.6)	(15.01)	0.30
3b. Pre-blended polyols	4.32	4.32	
3c. New commitments LVCs		(below) (30.35)	24.28
3. Subtotal	**4.32**	**4.32**	**24.58**
New commitments non-LVCs			
4. Case 1** (commitment based phase-out)	309.7	309.7	
5. Case 2 (unfunded phase-out)	217.5	217.5	
New commitments non-LVCs for 2020 and for non-LVCs and LVCs for a certain part for the 2025 target (funded in 2020)		141.2 30.35	441.1
6. Total funding requirement Case 1	**495.0**	**665.1**	**636.5**
7. Total funding requirement Case 2	**402.8**	**572.8**	**636.5**

**Some small adjustments had to be made to the total numbers for Case 1, compared with Table 10-2 in the May report

Table 4-3 Components of the funding requirements as in Table 4-2, showing the total funding requirements for Case 1 and Case 2, with an equal distribution of HPMP stage I/II funding for the next two triennia (related to the 2020 target), and with initial funding for stage III HPMPs provided in the second triennium (2020).

Table 4-2 indicates the total funding requirements for three triennia with equal distribution of funding requirements for stage II HPMPs to meet the 2020 target between the first two triennia, and with all requirements for funding stage III HPMPs deferred to 2021 or later.

In order to distribute the funding for HCFC consumption equally, the table has been transformed as follows. The first two triennia in row 3a are combined with rows 4 or 5 (for Cases 1 and 2, respectively), and divided equally, after which the total funding requirements are calculated.

In this option the total funding requirement in the first triennium is unchanged from the amount in Table 4-2, however the total requirement in the second triennium is increased by about $170 million to account for initial funding of possible stage III HPMPs in 2020. The funding requirement in the third triennium is reduced by the same amount.

The May 2014 report also showed a table where US$ 141.2 million for non-LVCs plus US$ 30.35 million for LVCs were brought from the 2021-2023 triennium to the second one (or to the year 2020) and the total stage II and stage III HPMP requirement distributed evenly. This table is reproduced below.

Funding requirement	**2015-2017**	**2018-2020**	**2021-2023**
1. Production sector	72.562	65.622	65.622
2. IS, PRP, DP and supporting activities	108.403	113.852	105.220
3a. Existing obligations LVCs and non-LVCs (see Table 6-1 in May report)	(90.6)	(15.01)	0.30
3b. Pre-blended polyols	(4.32)	(4.32)	
3c. New commitments LVCs		(30.35)	24.28
3. Subtotal			**24.58**
New commitments non-LVCs for 2020 and for non-LVCs and LVCs for a certain part for the 2025 target (funded in 2020)			
4. Case 1 (commitment based phase-out)	399.8	399.8	441.1
5. Case 2 (unfunded phase-out)	307.6	307.6	441.1
6. Total funding requirement Case 1	**580.8**	**579.3**	**636.5**
7. Total funding requirement Case 2	**488.5**	**487.1**	**636.5**

Table 4-4 Components of the funding requirements as in Table 4-1, showing the total funding requirements for Case 1 and Case 2, with an equal distribution across the first and second triennia of both HPMP stage I/II funding and initial funding for stage III HPMPs (as originally presented in the May report)

This would increase the funding requirement by about US$ 90 million for each of the triennia (for each of both Case 1 and Case 2).

The three options above that make provision for equalisation of consumption sector funding associated with the 2020 target (Tables 4-2, 4-3 and 4-4), provide for equalization of *all* 2020 target consumption sector funding, i.e. both new commitments and existing obligations. Additional analysis that makes provision for retaining current disbursement schedules for all approved stage I HPMPs, while equalising funding for new (stage II) HPMPs, is provided in the addendum to this document.

4.2 Funding of existing HPMP agreements in the next two triennia

One of the requests for elaboration was to look at the funding from existing commitments that will be disbursed in the next two triennia, and to calculate the ODS amounts involved.

For non-LVC countries these funding tranches are not directly related to the phase-out of certain ODS, they can be part of the disbursements over a certain period for a project that is supposed to be completed in 2015 or 2016; all stage I HPMPs were approved and commenced in or before 2014. Rather than trying to simulate a certain amount of ODS directly linked to this funding, it would be better to look at the existing commitments for the next two triennia as already given in Table 6-1 in the May 2014 report (US$ 79.9 and 10.4 million, respectively). For the non-LVCs, Table 4-4 below first gives the amount of tonnes to be addressed in the next two triennia following the Case 1 approach (58.6% foams) as given in section 2-2. Based on the agreed funding amounts per triennium for stage I HPMPs for the next two triennia, it calculates the amount of ODS that it would represent (the cost-effectiveness values used in this Case 2 are the historic ones, and they apply to the funding as approved before 2014), where the disbursements continue during the next two triennia. This yields the values, as given in Table 4-5 below.

Substance	HCFC phase-out funded under **Case 1** (tonnes) (58.6% foam) **2015-2020**	**2015-2017**, non-LVC amount (tonnes)	**2018-2020**, non-LVC amount (tonnes)
HCFC-141b	26331.6	6360.7	829.2
HCFC-142b (XPS)	3236.8	781.9	101.9
HCFC-22 (XPS)	1618.4	390.9	51.0
HCFC-22 (RAC manufacture)	12469.1	3012.0	392.7
HCFC-22 (RAC servicing)	9514.5	2298.3	299.6
Total	**53170.5**	**12843.9**	**1674.4**

Table 4-5 Total phase-out amounts, in tonnes, for the various subsectors addressed in Case 1 for the next two triennia, as well as the amounts in tonnes that can be considered as stage I HPMP tonnes in each of the next two triennia.

In summary, funding for these phase-out quantities was approved before 2015, but can be seen as effective tonnes for phase-out in the next two triennia (due to the fact that funding disbursements for these tonnes will take place during the next two triennia). This is not an exact way to make comparisons, since the amounts that are assumed for stage I HPMPs (in the next two triennia) cannot literally be compared in

this manner, however, it gives a good impression. The ODS phase-out quantities funded under the Case 1 scenario for the next two triennia are about three times as large as the quantities to be phased-out through existing commitments during the next two triennia (as is the level of funding, since there is a linear relationship). In the case of the LVC (and VLVC) countries, funding has been committed, has been disbursed before 2015 and will be disbursed during 2015-2020 (a very small part will be disbursed after the year 2020 for reductions greater than 35%. The funding is targeted at achieving a 35% reduction from baseline for all LVC countries, has no specific cost-effectiveness and cannot be directly linked to a certain amount of ODS to be phased-out.

The funding that will be disbursed during the period 2015-2020 (US$ 10.1 and 4.6 million for the next two triennia) could be considered as contributing directly to the 25% reduction from baseline between 2015 and 2020 (although this cannot be supported by practical evidence). Since for LVCs there is no real value for cost-effectiveness and the funding is only in some way related to the phase-out, one could take the LVC (total) baseline ODP consumption as a starting point.

The total LVC baseline is calculated as 455.7 ODP tonnes, where 25% of this amount, assuming it would concern refrigerant HCFC-22, would be equal to 2070 ODS tonnes. 69% of the committed LVC funding during 2015-2020 will be disbursed during the first (2015-2017) triennium, which would then be equal to 1425 tonnes. The remainder, being 645 tonnes, would then apply to the 2018-2020 triennium via the calculation of the percentage funding to be disbursed during this second triennium. While several LVCs have a significant level of consumption in HCFC-141b used for foam blowing, the total is not large enough to have a significant impact on the above numbers.

As a last comment, it is now clear that more or less one third of non-LVC funding during 2015-2020 applies to existing commitments, and so one third of the amount of tonnes for Case 1 can be seen as to be phased out under HPMP stage I, however, he extent to which these values can be useful in achieving a better understanding of the HPMP stage II funding commitments during the next two triennia is not yet clear to the Task Force.

4.3 Special needs for the servicing sector, in particular in LVCs and VLVCs

In paragraph 2(f), further elaboration is requested about the special needs of the servicing sector and capacity building in stage II HPMPs, in particular for LVC and VLVC countries, considering the importance of the servicing sector for achieving the 2020 target and the phase-in of environmental friendly technologies in the R/AC sectors.

In Decisions 58/47 and 59/46 of the Executive Committee the funding of LVCs and VLVCs was investigated, which led to Decision 60/44 in which the various amounts of funding for different sizes of LVCs were established for stage I HPMPs, HPMPs that would result in a 35% reduction from the baseline. Section 4.1 above elaborated on the amount of funding that has been agreed and will be disbursed to LVC and VLVC countries through the year 2020 to achieve this goal.

LVCs are all net importers of technologies in products, furthermore, they are dependent on commercial activities, in particular R/AC technologies. These technologies will be imported and provided to the wholesalers and customers in these countries. The technologies that are being imported are HFC based (R-410A, R404A, HFC-134a), and the products that use these will have to be serviced. Furthermore retrofitting takes place in these countries to hydrocarbons for a number of product types. This is all covered by service technicians, whose training is funded under the provisions of Decision 60/44.

Taken into account the above, if low GWP flammable technologies are imported, training will be required to deal with the usual safety issues concerning the handling of these substances. It is however, difficult for the Task Force to estimate what that would mean regarding any increase in funding (and when) compared to the funding already available under Decision 60/44.

As mentioned above (chapter 4), the funding committed for LVCs during 2015-2020 is in the order of US$ 14.7 million. If increases in the order of 10-20% were considered, the level of replenishment over a triennium would increase by some US$ 1-1.5 million per triennium.

Given that the funding to achieve the 35% reduction has been agreed and will be disbursed following an agreed schedule, the Task Force's mandate cannot include a recommendation to change these disbursements: this would be for the Executive Committee to consider.

4.4 Multinationals and non-eligible enterprises

In request 2(b), information is sought about the impact on funding for the next two triennia of multinationals and non-eligible enterprises (cut-off date being September 2007). Additionally, in paragraph 2(j), information is sought about the impact of SME operations on the funding level for stage II HPMPs.

In the foam sector, it is likely that most large operations (including those having multinational components) have been addressed in the stage I HPMPs (20-40% of national operations), the remainder of the phase-out in the foam sector (in stage II HPMPs) will likely concern more and more SME operations. It may be that certain SMEs will not be eligible due to the starting date of their operation, however, in many cases it will be difficult to precisely investigate which SMEs or which part of the manufacturing operation has been established after the cut-off date of September 2007. Furthermore, with regulations lacking it is also difficult to determine which SMEs have been established for specific HCFC manufacturing operations, and their precise consumption, past and current. It is also likely that in the conversion of foam SMEs in the future, a clustering of the SME operations will be considered in umbrella projects, as well as an increased conversion to pre-blended polyols supplied by system houses (which may be based on hydrocarbon or other low GWP technologies), which may have the consequence that cost effectiveness values will not significantly change from current practice (this is supported by certain projects already approved e.g. for Brazil, Mexico and the Philippines). Indications are that system house projects are likely to increase as implementing agencies start addressing the SME sector, but may decrease again later as the main groups of SMEs

are addressed, with the latter stages of stage II HPMPs needing to sweep up remaining small or isolated SMEs.

Noting that the use of flammable substances at SMEs gives rise to serious safety risks (with several micro enterprises already planned to be converted) it is anticipated that the preferred options will be CO_2 (water) and HFOs, i.e., HFO/water blown foam. Actual cost effectiveness figures -from calculations might be around 20% higher than those contemplated in Decision 60/44. This Decision mentions the threshold of US$ 9.79/kg for capital and operating costs together, however, the amount for operating costs is very much increasing when applying HFOs or HFO/water mixtures, without necessarily increasing to higher than the US$ 9.79 threshold over time. It needs to be seen how far the application of these (HFO) technologies will be possible, given the current cost effectiveness limit on operating costs of US $ 1.60/kg, which is significantly lower than current estimates (US$ 7 to US$ 10 per kilogram).

Taking into account:

- the fact that multinational operations do not need to be considered for the foam sector;
- the practical challenges in enforcing the cut-off date when attempting to assess the eligibility of SME conversions (which could mean that 10-30% of SME operations might not be eligible in principle);
- the fact that conversion via the clustering of enterprises and conversion to preblended polyols may be achievable within the current overall cost effectiveness levels;
- the fact that conversion of SMEs to water blown HFO operations may have the consequence that the cost effectiveness could increase by about 20%,

the Task Force concludes that, overall, the best solution would be to maintain the existing average cost effectiveness for (small) foam operations in the stage II HPMPs (noting that some SMEs would be ineligible via the cut-off date criterion). On this basis the existing (May 2014) funding calculations for the foam sector remain valid.

In the case of mass or high levels of production in the refrigeration and AC sector, the ineligibility of certain companies certainly plays a role. It may concern newly established companies or new production lines that have been added in existing facilities. It is, however, difficult to estimate what percentage of the R/AC, in particular AC, manufacture it would concern. Certain preliminary investigations in China, where more than two thirds of the Article 5 refrigeration and AC manufacture takes place, indicates that new HCFC facilities may have been established in the years after 2007, but that most of the new companies established in the period 2009-2013 did not use HCFCs at all, but, rather, started production with HFCs.

Of course, if certain SMEs, normally involved in on site commercial refrigeration assembly, would have to change to certain non-high-GWP (flammable) substitutes, it would increase costs. However, this kind of operation is currently considered as servicing practice under the Multilateral Fund; it would require a re-investigation how these activities could be addressed differently, which the Task Force at this stage does not consider as its mandate.

It is also likely that, in regard to the 35% total HCFC reduction via stage II HPMPs (in foams, refrigeration manufacture and servicing) most countries, through the relevant implementing agencies, will present conversion plans for facilities that they believe will be eligible. The Task Force therefore does not see a reason to adjust the numbers as presented in the May 2014 report.

Multinational operations take place in large scale, mass production in commercial refrigeration and in stationary and mobile air conditioning. Mobile air conditioners have been converted to HFC-134a and do not have to be taken into account. Furthermore, as already mentioned above, commercial refrigeration does not have to be considered here, since it has either been converted to HFCs, or consists of on-site assembly of units, which is normally not a multinational operation. The only HCFC operation that remains is stationary air conditioning. In the case of China, the largest HCFC-22 AC equipment producing country, the share of multinationals is believed to be relatively small (preliminary information from China). It will therefore be a relatively small number of large producing countries where multinational operations would have to be taken into account. Some of the multinational parts of companies have already been considered in stage I HPMPs (where only the conversion of the non-multinational part was funded). For the calculation of the funding for stage II HPMPs, the following needs to be considered: (i) in some of the Article 5 countries where multinational operations take place, there was no need to address a further phase-down, since the 35% reduction had already occurred under the stage I HPMP, (ii) in some other countries, a large reduction had taken place, and most of the remaining HCFC consumption to be phased down was calculated for the foam sector, and (iii) in countries with smaller multinational percentages, it was assumed that only non-multinational enterprises would be addressed in the 35% reduction of the baseline HCFC consumption via stage II HPMPs. The Task Force therefore does not see a reason to adjust the numbers as presented in the May 2014 report.

4.5 Further analysis of average levels of phase-down in Case 1 and Case 2 scenarios

Paragraph 2(h) mentions …. ”further analysis of the situation in the Case 1 and Case 2 scenarios, in particular, of data submitted by Article 5 parties that have requested phase-II funding, and estimate the average phase-down level achieved and the level of funding already disbursed…..”.

In section 2.1 and 2.2, the Case 1 and Case 2 scenarios have been extensively analysed. That analysis starts from the information included in the project proposals and agreements approved by the Executive Committee, where the HCFC consumption addressed in the project documents is deducted from the baseline consumption.

At this moment in time, it is not possible to estimate the level of phase-down achieved to date through implementation of stage I HPMPs. This data will only be reported by Parties after the event, through annual data reporting under Article 7, in Country Programme reports and in HPMP verification reports. Currently, available data would be that reported for the year 2013 during which consumption should not have exceeded respective countries’ baselines. .

It is possible to report on the funding disbursed in the years 2011, 2012, 2013, and partly 2014. There is, however, no direct relation between disbursement and the ODS amounts that have been phased out in certain years and this phase-out is not a determinant of funding for stage II HPMPs, except in the event that HCFC consumption was to drop significantly below the levels of reductions forecast in the stage I HPMP agreements.

Case 1 and Case 2 scenarios have been calculated on the basis of assumed completion of stage I HPMPs, with consumption limits as contained in the relevant agreements and what would be needed in the phase thereafter to achieve a 35% reduction from baseline level.

4.6 Cost effectiveness considerations

Disaggregation of CE values

Request 2(e) addresses cost effectiveness values in the refrigeration and air conditioning and commercial refrigeration sector. The May 2014 report does not specifically address commercial refrigeration since the commercial refrigeration sector (apart from some operations in the ICR sector in China) is assumed to be dealing with on-site assembly of medium size to large size commercial refrigeration equipment. This activity is reported (and addressed in HPMPs) under servicing at a cost effectiveness of US$ 4.5/kg.

Manufacturing in AC has been reported in the May 2014 report at a value of US$ 10.1/kg for the historic "approved mix of refrigerants". In the case of low GWP conversions (which are again addressed in request 2(i)) a cost effectiveness of US$ 13.35/kg has been used in the calculations as reported in the May 21014 report.

The amounts of HCFCs and the related funding, using the various cost effectiveness factors, has been extensively reported in section 2.2 and does not need further elaboration here.

CE values in the longer term

In the case of refrigeration and AC, mainly AC, few SMEs are involved. The main conversion takes place in large size manufacture to new technologies. So, the CE will increase from stage I to stage II, when a larger amount of low GWP flammable refrigerants will be introduced. It is difficult to estimate in how far the cost effectiveness will increase (higher costs per kg converted) if low GWP blends are introduced; this will mainly depend on the price of the blends. The capital cost is not expected to increase compared to the application of flammable hydrocarbons. The upper end of the cost effectiveness range mentioned in the May 2014 report for projects with flammable refrigerants (US$ 10.6-16.1/kg) is not expected to change much. A small decrease may occur in the course of the period until 2020, related to a possible refrigerant cost-price development.

In the case of foams, there are already many mature operations for low-GWP or zero-GWP options. No significant changes can be expected in the future. However, if other chemicals take a significant part of the market (e.g., HFC-(HFO-)1233zd) the price may be higher and can be expected to remain higher compared to today's

prices. The cost effectiveness may be 10-30% higher than today's threshold for polyurethane, not taking into account the 25% premium on the threshold value. The magnitude of any change in the cost effectiveness of XPS foam is still uncertain. CE values were reported in the May 2014 report, see also the results of calculations in section 2.2.

The Task Force considers that current replacement technologies (hydrocarbons, unsaturated HFCs/HFOs, water and in some niches methyl formate and methylal) are well defined and cover most of the market applications. It can also be assumed that prices for unsaturated HFCs/HFOs will stabilise at a certain level higher than the current prices of HFCs for foams (i.e., HFC-245fa and HFC-365mfc). Following this reasoning, the Task Force does not expect real changes occur in the cost effectiveness for foam conversions during the next two triennia.

5 Avoiding high-GWP ODS alternatives

5.1 Surveys

In paragraph 3a of the suggestions for elaboration an estimate of the funding needed to conduct surveys of high GWP alternatives to ODS and to prepare projects is requested.

The Task Force assumes that these surveys will be conducted once, possibly at short notice. The Task Force is also aware that several (HFC) surveys have already been conducted, others are already being conducted via various other initiatives. It is, however, somewhat difficult to make an estimate of the funding required to conduct surveys for all Article 5 countries on high GWP ODS alternatives. In the first instance it would be necessary to arrive at estimates of the consumption of high-GWP ODS alternatives by the various Article 5 countries.

The Task Force has studied the funding levels provided in Decision 71/42 for the preparation of stage II HPMP proposals. The approved funding levels are given in Table 5-1[4],[5].

Funding (US$)	**Country HCFC consumption (ODP tonnes)**	**Total funding (US$ million) (number of countries)**
30,000	0-5	1.5 (50)
40,000	5.1-10	1.12 (28)
60,000	10.1-50	2.04 (34)
70,000	50.1-100	1.12 (16)
90,000	100.1-1,500	2.07 (23)
To be decided on a Case by case basis	> 1,500	0.50 (1)
Total funding		**8.35**

Table 5-1 Funding levels decided for HPMP stage II project preparation projects, dependent on country consumption levels (Decision 71/42). Subtotals and the total are given in the right column.

The Task Force calculated the total amount of funding required by multiplying the number of countries (at the baseline ODP level) with the funding level decided. For the largest consuming country (at a level of almost 20,000 ODP tonnes) a level of US$ 500,000 was assumed. The total funding required for the project preparation funding for stage II HPMPs would then be US$ 8.35 million.

Assuming that similar efforts per country would be required in the case of a survey of potential alternatives to high-GWP ODS, the amount of funding would be of the same order. It would not matter so much what the consumption in metric tonnes would be; generally it would be between 10-20 times the consumption in ODS

[4] Funding levels are consistent with some surveys undertaken or with some surveys being undertaken by some Implementing Agencies at present

[5] Combination of stage II project preparation projects related to HCFCs with some survey type of investigation on high-GWP alternatives might work out to be cost effective

tonnes. Additional effort may be required to find all the sources of use of high-GWP ODS alternatives (although it would involve the same type of industries and enterprises as for the stage II HPMPs). Furthermore, it could also be useful to study the consumption of low-GWP alternatives in this same survey. With this in mind, the Task Force has assumed a 25% increase compared to the stage II HPMP funding, which implies a total of US$ 10.45 million.

This amount could be disbursed in one year, or two years, however, it is thought to be inadequate to spread this amount over more triennia as suggested in request 3(b).

5.2. Amounts of high GWP alternatives avoided in the next two triennia

In section 2.2, the results of calculations have been given for the situation where certain amounts of HCFCs were replaced by zero GWP alternatives; this automatically gives the amount of tonnes avoided. On the basis of GWPs for the various substances, as well as the quantities in tonnes, the amounts of tonnes CO_2-eq. were calculated, as well as a climate cost effectiveness. This was done for both Cases 1 and 2 for the next two triennia.

That same section also presented results of a calculation where only half the amount in tonnes of high GWP alternatives was avoided.

Paragraph 3(c) also mentions the assumption of "a certain threshold for high GWP alternatives to ODS". The Task Force has assumed that this would represent a cost effectiveness threshold for projects involving the avoidance of high-GWP alternatives to ODS. However, calculations have in principle been made applying the cost effectiveness factors as used in the May 2014 report. It should further be added that for AC manufacturing conversions no cost effectiveness threshold has been formally established.

5.3 Estimates of amounts to be phased down in the production sector

Assuming that the request in paragraph 3(d) refers to a phase-down in the HFC production sector, there are significant complications and challenges in addressing any such phase-down.

The HFC production sector in Article 5 countries started to develop in the decade from 2000-2010 and has seen rapid growth, to level of production of at least 200-300,000 tonnes by 2014. This is a rough estimate since production amounts are not required to be reported, production capacities have never been published, and the share in the HFC production facilities (which are mainly based in China) taken by multinationals is not known. As will be known, the Multilateral Fund operations are not at all related to any growth in the level of production of HFCs.

This production (and the related production capacity) is estimated to grow by a factor of 2 in the next 5-10 years, based on bottom-up calculations of the numbers of equipment and products in which HFCs are used. To calculate the production level of HFCs, one would not have to take into account ODS alternatives for HCFC-141b and HCFC-22/142b used in foam production. It will mainly be necessary to consider alternatives to HCFC-22 in refrigeration and AC that could be avoided. However,

this would only give rise to a maximum of about 15,000 tonnes of high-GWP chemicals that would otherwise be used as replacements for HCFC-22. While a certain percentage could be avoided in the next triennia, this will be a relatively small amount compared to the total production level. It should be noted here that the HFC production for new production lines will be far greater than the HFC production anticipated to be needed for conversion of HCFC production lines. If one would further take into account that HFC production to meet the requirements of new appliance production facilities is expected to sharply increase in Article 5 countries, it is actually not appropriate (or not needed) to consider any phase-down in the production sector. The best, or only practical, alternative might be to moderate the growth in production by supporting the maximum possible phase-in of low-GWP alternatives to high-GWP ODS alternatives (including HFCs).

5.4 Improvements in cost effectiveness over time

In request 3(d) improvements in cost effectiveness over time are mentioned. There can be several different interpretations of cost effectiveness. The most obvious example is the cost effectiveness to make the transition from high-GWP to low-GWP alternatives in refrigeration and AC manufacturing. In the May 2014 report a conversion of commercial refrigeration production from HFC-134a to hydrocarbons was considered at the same level as the conversion from CFC-12 to HFC-134a. The extent to which this cost effectiveness will change over time is not yet clear.

The technical solutions for a conversion from e.g. HFC blends in air conditioning manufacturing to low-GWP alternatives are also not clear at the moment. It may be that the conversion to low-GWP HFC blends in future may be relatively moderate in cost, however, this will depend significantly on the cost of the low GWP blends and the flammability issues that have to be addressed. It could therefore again be a cost effectiveness in the order of US$ 10 per kg.

In the case of a conversion from high-GWP to low-GWP substances such as hydrocarbons, it can be expected that the cost effectiveness would not be much different from the cost effectiveness for a conversion from HCFC-22 to hydrocarbons, in particular if high pressure HFC blends would need to be converted, but it is too early to give any estimates.

Request 3(e) also seeks information on market penetration of not-in-kind technologies. In this regard the Task Force notes that (a) consideration of not-in-kind technologies generally falls outside the TOR of the replenishment study and the expertise of the Task Force, and that (b) not-in-kind technologies are non-vapour compression technologies. The latter would include magneto-caloric, thermo-electric and other technologies of the same sort, the future market penetration of which cannot be estimated at this stage in their development, given the uncertainties in energy efficiencies to be expected as well as the cost levels. To some degree, it would also apply to absorption and adsorption technologies where, additionally, the scale of the operation will make a significant difference.

As well as not-in-kind technologies, the unconventional use of existing technologies may also be further developed. For instance, it would concern district heating or cooling, where better energy efficiency may be achieved using existing refrigerants

and where low GWP refrigerants, including ammonia, may offer significant potential. In the somewhat longer term, larger absorption units may become a viable alternative to normal chillers using the common vapor compression cycle

However, overall at the present time, while recognising that cost effectiveness will be important when considering the practical application of future alternatives, it is still far too early to attempt assessment of either the practicalities or costs of not-in-kind conversions.

6 Estimates for the funding for production phase-out with and without swing plants

So far, HCFC production funding has only been considered for China at a total cost of US$ 385 million, for the period until 2030 (during a period of 18 years). It means, that with a production level of about 500,000 tonnes in 2012, this can be translated to an amount of about US$ 0.8/kg (it also implies that the production capacity, the basis for the calculation of compensation for production closure, will be higher). Funding for this production sector in China was calculated to be US$ 72.6 million for the triennium 2015-2017 and US$ 65.6 million for the triennia thereafter.

Production in all countries other than China reached a total about 66,000 tonnes of HCFC-22 in the peak year 2009, and slightly more than 40,000 tonnes in the year 2012. This includes a production line in a facility in Mexico that would potentially be eligible for funding (that is currently being currently discussed at the Executive Committee level). One could assume that funding for this HCFC-22 production in other countries than China (all in swing plants) would be based on a level of 50,000 tonnes, and that funding would occur during a period of 15 years at a level of US$ 1-1.5 per kg (the latter value taken from the 2011 Replenishment Task Force report). If compared to the US$ 385 million level, the total amount for the HCFC-22 production outside China would then be US$ 48-72 million. Based upon a period of 15 years for funding this HCFC-22 production in swing plants, it would imply (adding) US$ 9.5-14.5 million per triennium. The funding level as mentioned for production phase-out in the May 2014 report (US$ 72.6 and 65.6 million for the next two triennia) would then increase to US$ 82.1-87.1 million and US$ 75.1-80.1 million for the first and the second triennium, respectively.

Annex 1

Summary of suggestions for elaboration in the supplementary Technology and Economic Assessment Panel task force report[6]

The Open-ended Working Group at its thirty-fourth meeting agrees:

1. To request the Technology and Economic Assessment Panel, in presenting its supplementary report to the Twenty-Sixth Meeting of the Parties, to:

(a) Add more narrative parts and explanations to chapters in the replenishment study which refer to consumption and case 1 and 2 scenarios;

(b) Highlight more clearly the scenario that divides funding related to the 2020 target applicable to HCFC consumption equally between the 2015-2017 and 2018-2020 replenishments as specified in paragraph 2(d) of Decision XXV/8.

2. To also request the Panel to update all of the funding requirements as presented in its May 2014 report taking into account:

(a) The differences between Case 1 and Case 2 scenarios in environmental terms considering the overall quantity of ODS (and corresponding ODP) phase-out to be achieved by Cases 1 and 2 with respect to 10% and 35% commitments taking into consideration the achieved phase out during the replenishment period 2012-2014;

(b) Based on the experience with CFCs and HCFCs to date, that a certain proportion of the phase-out to meet the 2020 target might occur in non-eligible enterprises, including multinationals and enterprises established after the 2007 cut-off date;

(c) The HPMP agreements between the Executive Committee and Article 5 parties and calculate the total value of tranches of phase I HPMPs that would be funded out of the 2015 - 2017 and 2018 – 2020 triennia and its related ODS reduction;

(d) Distribution between the RAC and foam sector activities at a 40:60 ratio compared with that of 50:50, taking into account national circumstances of Article 5 countries and bearing in mind specific needs for the conversion of SMEs including different cost effectiveness of alternatives.

(e) Disaggregate the cost-effectiveness values provided for refrigeration and air conditioning sector into: (i) AC manufacturing; (ii) commercial refrigeration manufacturing and (iii) refrigeration servicing and provide the quantities of each HCFC to be phased out in each sector under each case;

(f) To further elaborate on the special needs for the servicing sector and capacity building activities in stage II HPMP in accordance with paragraph 2f) of decision XXV/8, in particular for LVC and VLVC countries, considering the importance of the servicing sector for achieving the 2020 target and phase-in of the environmental friendly technologies in the RAC sectors for those Article 5 countries, in particular activities referred to in decision 72/41;

[6] The text of the present annex is presented as submitted, without formal editing.

(g) Additional assumptions for the disbursement scenarios that reflect less frontloading. In doing so the impact on LVC and VLVC projects should be taken into consideration;

(h) Further analysis of the situation in the Case 1 and case 2 scenarios, in particular, of data submitted by Article 5 parties that have requested phase-II funding, and estimate the average phase-down level achieved and the level of funding already disbursed;

(i) Projects where low-GWP technologies have been applied having resulted in increased project costs and estimate the average increase of funding needs reflecting the eligible project costs for those conversions;

(j) Costs associated with the conversion of small- and medium-size enterprises (SMEs) in stage II of HPMPs, taking into account lessons learned in all approved projects with new technologies, including from system-house projects, as well as conversion of large-size enterprises;

(k) Changes in cost effectiveness figures and their consequent impact on the next three replenishments.

3. As a separate element, in accordance with Para 3 of decision XXV/8, to request TEAP to:

(a) Include an estimate of the funding needed to conduct surveys of high GWP alternatives to ODS and project preparation funding, taking into account the availability of safe, environmentally friendly, technically proven and economically viable technologies ;

(b) Consider allocating the funding needed for this separate element according to a variety of schedules;

(c) Calculate the amounts of high-GWP alternatives to ODS avoided (in CO2 equivalent) for the relevant upcoming replenishment periods in Cases 1 and 2, assuming a certain threshold for high-GWP alternatives to ODS and calculate the cost-effectiveness in USD per tonne CO_2;

(d) Estimate the amounts to phase-down in the production sector and associated funds for that sector;

(e) Estimate the improvements in cost effectiveness over time including an estimate of the market penetration of not in kind technologies.

4. As a separate element, for the TEAP to estimate the funding for the production sector with and without swing plants.