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INCREMENTAL OPERATING COSTS AND SAVINGS IN THE HALON PORTABLE FIRE EXTINGUISHER SUB-SECTOR

Background

1. At its Fifteenth Meeting, the Executive Committee approved two halon 1211 fire extinguisher conversion projects (Indonesia and China) considering capital costs and one year of operating savings, but noted that "approval did not constitute a precedent, and future projects would be guided by decisions of the Executive Committee relating to the study of incremental operating savings in the halon portable fire extinguishing sub-sector." The Executive Committee directed the Fund Secretariat to work with the implementing agencies to prepare a paper "to address the issue of incremental operating costs and savings in the halon portable fire extinguishing sub-sector, to prepare guidance for future projects in the sub-sector. The paper should consider inter alia the use of soft loans, changes to the duration of incremental costs, and the likely results of taking no action" (UNEP/OzL.Pro/ExCom/15/45, para.126). The Fund Secretariat prepared this paper with substantial input from the World Bank.

2. This paper reviews the fire extinguisher market, discusses the implications of the current policy, and then discusses the issues raised in proposals submitted in this sub-sector at the Fifteenth Meeting. The paper then presents arguments both against and for providing funding in this sub-sector which is followed by discussions concerning operationalizing sub-sector strategies and concessional loans, and changes in the duration of incremental operating costs/savings. The paper concludes by addressing the likely results of taking no action, reviewing the Parties guidance on providing an incentive for early phase-out, and recommending a set of decisions for the Executive Committee's consideration.

Fire extinguisher market

3. Halon 1211 is used primarily in the manufacturing and servicing of portable fire extinguishers. Data on consumption characteristics collected from major consumers of halon 1211 in Article 5 countries indicate that approximately 78 per cent of all halon 1211 consumed is used in the manufacturing of portable fire extinguishers with the remaining 22 per cent used in servicing, refilling, and a very limited number of fixed halon 1211 systems.

4. Data from Country Programmes and other data reported to UNEP indicate that annual consumption is 6,078 metric tonnes of halon 1211 in Article 5 countries. However, a close examination of this data indicates a likelihood of inadvertent under-reporting, and so for the purposes of this study, a bottom-up estimation of consumption was used.

5. A preliminary draft of the "Strategy for Phase Out of Halons in China", July 27, 1994, notes that there are 80 enterprises in China engaged in the manufacture of halon 1211 fire extinguishers with an average annual consumption of 35 metric tonnes per enterprise. Due to the disproportionably large number of small extinguisher enterprises in China, it is assumed that the average consumption per enterprise would be slightly higher for other countries (38 metric tonnes per enterprise).

6. Given field experience to-date, there are potentially more enterprises in Article 5 countries involved in fire extinguisher filling than represented by the consumption data. This could be explained either by the presence of a greater number of smaller fire extinguisher

enterprises, or greater overall consumption that reported to-date. Our research suggests the latter, and so for this paper, consumption is based on the following bottom-up analysis, rather than reported data.

7. To determine the maximum number of enterprises in this sub-sector, four categories of countries were assumed. The first category is countries where there are likely to be several fire extinguisher manufacturers (Brazil, China, India, and Mexico). Based on data from China mentioned above and consumption estimates divided by 38 metric tonnes per enterprise, it was estimated that these countries have 121 fire extinguisher enterprises. Remaining Article 5 countries were divided into three categories according to their gross domestic product (GDP). It was assumed that there are at least two fire extinguisher enterprises per country in the 22 countries classified in the high GDP range (GDP > US $20 billion) and at least one fire extinguisher enterprise in each of the 28 countries in the medium range (US $3.5 billion to US $20 billion GDP). It was also assumed that there are no fire extinguisher enterprises in the 38 countries with GDP below US $3.5 billion. Based on these assumptions, there are 193 fire extinguisher enterprises in Article 5 countries which represents the universe of enterprises that are candidates for support from the Multilateral Fund.

8. The main alternatives to halon 1211 fire extinguishers are ABC multi-purpose dry powder and carbon-dioxide (CO_2) fire extinguishers. Existing halon 1211 production equipment can largely be used in the manufacture of both alternatives considered in this analysis. ABC dry powder fire extinguishers require different nozzles and hoses as long as cartridge filling equipment is not chosen by the enterprise which would require new cartridge filling equipment and different cylinders. The typical capital cost of conversion from halon 1211 to ABC dry powder is from US $50,000 (if ABC powder fire extinguisher filling currently exists) to US $200,000 where there is no existing capacity for ABC powder fire extinguisher filling.

9. Since fire extinguisher manufacturers in industrialized countries do not manufacture cylinders for CO_2 fire extinguishers, the same is assumed for developing countries. CO_2 filling equipment and the use of larger and heavier cylinders would be required for the conversion from halon 1211 fire extinguisher manufacturing. The typical capital costs for conversion to CO_2 fire extinguishers is US $80,000 for an average-sized enterprise where there is no existing capacity, but there would be no additional capital costs if an enterprise had an existing capacity for CO_2 fire extinguisher filling.

10. ABC powder fire extinguishers (production cost for typical size is US $43/unit) are less expensive to produce than halon 1211 fire extinguishers (US $75 for the same size unit). ABC fire extinguishers are expected to be used as halon replacements in 85 per cent of cases in Article 5 countries. For some applications, ABC powder is a much better fire extinguishing agent than halon 1211 but it is inappropriate in other applications because it can cause secondary damage and can leave a rusty residue that must be removed to avoid corrosion. ABC powder cannot provide protection against re-ignition, has no cooling effect, can compact, and can create temporary loss of visibility. Carbon-dioxide fire extinguishers (US $105 for the same size unit) are more expensive than halon 1211 fire extinguishers and are expected to be used as halon replacements in the remaining 15 per cent of cases for electrical fires and applications that require penetration and a clean agent.

Implications of current policy

11. The Parties main guidance on funding projects comes from the Indicative List of Categories of Incremental Costs which requires that operating savings should be considered in the determination of grants under the Multilateral Fund (UNEP/OzL.Pro.4/15, Annex VIII, para. 1c). The Indicative List also authorizes the Executive Committee to take decisions on incremental costs not included in the List and to determine the transition period for operating costs and savings (Ibid, para. 2).

12. The Committee's guidance for the calculation of operating costs and savings requires that up to four years of operating costs/savings may be considered as outlined and defined in document (UNEP/OzL.Pro/ExCom/10/39) and its Annexes (UNEP/OzL.Pro/ExCom/10/40, para. 171). Projects in this sub-sector would likely not be eligible for a grant from the Fund if over one year of operating savings is considered since the conversion from halon 1211 to ABC dry powder has relatively low capital costs and significant operating savings. By analysing a simplified representation of current halon 1211 fire extinguisher enterprises in Article 5 countries and likely phase-out paths, it is apparent that all phase-out projects in this sub-sector would have negative incremental costs (Table 1).

Table 1: Incremental Costs for Projected Halon Phase-out Paths

Halon Phase-out Path (HPP)	Baseline situation	Post-phase-out situation	Fraction of enterprises	Overall incremental costs using current policy (US $)
HPP-1	halon only	ABC	25%	(500,800)
HPP-2	halon only	ABC, CO_2	15%	(227,100)
HPP-3	halon, ABC dry powder	ABC	25%	(650,800)
HPP-4	halon, ABC dry powder	ABC, CO_2	20%	(163,500)
HPP-5	halon, ABC dry powder, CO_2	ABC, CO_2	15%	(288,900)

13. The Parties also indicated that incremental costs could be provided either through grants or concessional loans. The Executive Committee further clarified when to use grants and concessional loans at its Third and Thirteenth Meetings. At its Third Meeting, the Committee approved its Implementation Guidelines. The Implementation Guidelines specify that although assistance for investment projects shall generally be provided in the form of grants, financing may take the form of highly concessional loans where the investment project has a short payback period (i.e., 1-2 years).

14. At its Thirteenth Meeting, the Executive Committee decided that only incremental costs should be financed with grants. Projects with incremental operating savings might be funded through concessional loans from resources provided by the Fund or from other funding sources.

The Committee recommended that projects with incremental operating savings could be financed as part of an overall sector-wide phase-out strategy for each country (UNEP/OzL.Pro/ExCom/13/47, para. 176).

Issues

15. The consideration of project proposals in this sub-sector has raised several issues including: the use of financial profit projections as incremental costs, the use of company product mix projections, double-counting, methodology for calculating operating costs/savings, and the introduction of expanded capacity.

16. The Executive Committee resolved the issue of using financial profits projections in the calculation of incremental costs at its Thirteenth Meeting. The Committee decided that "the loss of profit is not considered an eligible incremental operating cost" (UNEP/OzL.Pro/ExCom/13/47, page 24). Consequently, financial profit projections cannot be a justification for the calculation of incremental costs. The projection of potential profit or loss is very difficult for any industrial sector on a global basis. Arguments for and against the potential for profit are advanced later in the paper to assess the need for a financial incentive for the phase-out in this sub-sector.

17. At the Fifteenth Meeting, an initial project proposal requested operating savings calculated on the basis of a company's conversion from halon 1211 to 50 per cent ABC dry powder and 50 per cent CO_2. Since conversion to filling with ABC dry powder yields operating savings and that of CO_2 incurs incremental operating costs, a projected greater use of CO_2 would negate savings generated from the conversion to the use of ABC dry powder. The peculiarities of the substitutes for this sub-sector mean that market distortions could result if grants are awarded on an enterprise basis. For example, enterprises converting to CO_2 would receive higher grants than those who switched to ABC. Also, for companies currently producing the same range of products (i.e., baseline production includes both halon and ABC, or only halon), assuming that ABC was used as the primary substitute for halon, those enterprises with larger halon consumption would be eligible for less grant support.

18. To avoid potential inequities, and reduce the incentive to convert unnecessarily to CO_2, sub-sector phase-out strategies could be a requirement for funding as adopted by the Committee from the paper, Funding Projects with Net Incremental Savings (UNEP/OzL.Pro/ExCom/13/47, para. 176). Conversion to a product mix of 85 per cent ABC powder and 15 per cent CO_2 could be established in a sub-sector strategy which would reflect both the existing manufacturing of these types of fire extinguishers as well as the substitutes selected for halon 1211. To ensure the full sub-sector phase-out, the government should provide assurances that the use of halon 1211 in this sub-sector should be subsequently prohibited.

19. Since the Fund supports the conversion of production facilities from halon 1211 to ABC dry powder, the potential for double-counting exists when the Fund-supported ABC dry powder producers sell ABC powder to ABC powder fire extinguisher enterprises. The price of ABC dry powder should not include the costs of the conversion of production facilities to ABC dry powder that was provided by the Fund. Agreements should be reached with converted

production facilities to determine the chemical costs that should be used in the calculation of ABC powder fire extinguisher costs to avoid double-counting.

20. Operating cost/savings calculations in this sub-sector have been based on two different approaches: a lump sum cost estimate by fire extinguisher type and a "materials balance" method. While a lump sum cost per fire extinguisher method does present baseline and with-project costs, it is not sufficiently transparent to determine if an expanded capacity to produce fire extinguishers is included in the estimates.

21. It should be noted that as in all sectors, halon 1211 fire extinguisher enterprises are only eligible for the incremental costs of conversion of existing manufacturing capacity; the Fund is not intended to finance the expansion of capacity, or the incremental operating costs for product quantities greater than current amounts. To ensure that this guideline is followed, experience teaches that project preparation must include a careful inventory of existing equipment, actual operating cost expenses and current levels of production.

22. For the proposals that have been submitted using the materials balance method, baseline and with-project operating costs are presented including the cost for chemicals, steel, paint, welding, materials, labour, electricity, and maintenance. From this presentation, reviewers were able to determine if the operating cost request inadvertently included an expansion of capacity which is not an eligible incremental cost. An expansion of capacity may also occur in the request for capital costs. To avoid expanded capacity in capital costs, an inventory of existing equipment and capacities should be listed along with an indication of the use of existing equipment in converted operations and/or the required replacement equipment.

Arguments against funding in this sub-sector

23. The main arguments against providing funding in this sub-sector are the current guidelines, funding projects with incremental savings when there are limited funds for projects with incremental costs, implications to other sectors, possible windfall profits, and the possibility of phase-out without Fund assistance due to changes in suppliers and regulatory actions.

24. The current guidelines would not provide grant funding except through a sector-wide distribution of incremental costs. There are sufficient savings generated by projects in this sub-sector to cover the costs of conversion within two years and would therefore only qualify for concessional loans (see Table 2).

25. The lack of available funds raises another concern that the Committee could be funding projects with net incremental savings instead of projects with net incremental costs. Providing grant funding would represent an additional financial commitment which does not currently exist in an environment where there are insufficient funds to meet current projected needs.

26. Incremental operating savings may occur in projects from several ODS (ozone depleting substance) consumption sectors. It is projected that savings will begin to affect all industrial sectors as the price of ODS increases and that of the alternatives decreases. Accordingly, if the Committee finds an exception to existing guidelines for this sub-sector in order to provide grants, this could lead to similar actions eventually in all ODS sectors.

27. Another concern expressed about funding projects with net incremental savings is that in cases where a complete phase-out is dependent upon one or a few manufacturers, similar or significantly higher levels of profits could be extracted in the conversion from halon 1211. This potential results from the fact that ABC powder fire extinguishers cost less to produce while the market is accustomed to paying more for halon fire extinguishers. For example, if the profit from the sale of a US $80 halon fire extinguisher is US $7, an ABC fire extinguisher with a production cost of US $43 would only need to cost US $50 per fire extinguisher to maintain the same profit level assuming the same level of demand. The consumer, who no longer has the option of purchasing a halon fire extinguisher, would have a price incentive to purchase the still less expensive ABC powder fire extinguisher while the manufacturer would be able to maintain, or even increase, the unit profit level. In certain situations, the level of profit could be substantially increased if the same price is charged for ABC powder fire extinguishers as had previously been charged for halon 1211 fire extinguishers.

28. Also, a grant incentive may not be necessary since the phase-out may occur due to market decisions and/or regulatory actions by Article 5 countries. For example, fire extinguisher producers in Article 5 countries that do not produce halons may switch from halon 1211 as a result of the cessation of halon 1211 production in their non-Article 5 suppliers.

Arguments for funding in this sub-sector

29. The main arguments in favour of providing funding in this sub-sector are that a significant amount of ODS would be phased out at a fraction of the Fund's three-year budget, the projects are cost-effective, the sector is unique, the phase-out of this sector will reduce production needs, and conversion to the lower costing alternatives may reduce enterprises' profit which would serve as a disincentive to early phase-out.

30. The halon fire extinguisher sub-sector constitutes approximately seven per cent of the 1993 ODP use in Article 5 countries. A complete phase-out and conversion to proven technologies could be achieved for an estimated capital cost of about US $28 million. This amount of funding accounts for less than 6 per cent of the 1994-1996 Fund budget but would phase-out more than 25 per cent of the phase-out projected in the Three-year plan and budget. If this sub-sector is targeted, significant phase-out could be achieved in a very short period of time.

31. Halon fire extinguisher conversion projects are highly cost-effective. This is due to the low capital costs for conversion and the realization of operating savings. A phase-out considering only the capital costs in this sub-sector would result in a unit abatement cost of just US $0.21 per ODP (ozone depleting potential) kilogram per year.

32. Another argument advanced for providing funding is that this sub-sector is unique and deserves special attention. The chemical used in fire extinguishers is the main constituent of the product. In other sectors, the chemical is only a minor component of the end product. Unlike most other sectors, the alternatives to halon 1211 have been available in most markets for a long time. This means that the pricing structure and demand characteristics have been well-established and there is possible resistance to change, unless the entire sub-sector is phased out.

33. Two Article 5 countries produce halon 1211. At present, China and India have a combined production capacity of 7,100 tonnes of halon 1211 and are currently producing 4,500-5,000 tonnes. In the absence of technical and financial assistance to halon extinguisher enterprises, halon fire extinguisher production in halon 1211 producing countries could continue until 2010. The conversion of halon 1211 fire extinguisher enterprises should reduce demand for halon 1211 production as long as a country commits to an equivalent level of production reduction; however, demand reductions from the phase-out of the halon 1211 fire extinguisher sub-sector might not automatically reduce supply as demand could conceivably be shifted to other halon 1211 uses and/or to exports of virgin halon.

34. Although profits to a company are not used in the determination of incremental costs, the potential for the loss of profits exists in this sub-sector under competitive market conditions. The potential for loss of profits exists due largely to the fact that current price for ABC powder is less than that of halon 1211. Information obtained from project preparation efforts indicate that there is less profit for ABC powder than halon 1211 and this loss is not offset by the higher profit for CO_2 fire extinguishers (CO_2 fire extinguishers are expected to be in lower demand than ABC fire extinguishers). Without grant or concessional loan support, the inevitable decision to convert might occur later as opposed to earlier under these circumstances.

Operationalizing sub-sector strategies and concessional loans

35. At its Thirteenth Meeting, the Committee agreed that projects with net incremental savings should be supported with concessional loans or through a grant provided for sector-wide phase-out (UNEP/OzL.Pro/ExCom/13/47). While the preparation of a strategy to phase-out the sub-sector will be important in minimizing market distortions as elaborated above, a sub-sector strategy would not provide grant support to any enterprises if more than one year of operating savings is deducted from capital costs (see Table 2). With savings limited to one year or less, incremental costs could be generated that could be distributed among all enterprises through a sub-sector strategy.

36. A concessional loan (or soft loan) may be included as part of a concessional financing package which may also contain a grant element. The issue of the use of concessional loans was addressed in UNEP/OzL.Pro/ExCom/7/26. In theory, concessional loans could be provided in different ways. The Fund's resources could be used as working capital for an implementing agency to make a loan. As suggested in the Committee's decision on funding net incremental savings, the Fund could also provide the costs of project preparation and all or some of the interest costs for servicing a loan provided from non-Fund resources such as the resources of implementing agencies, regional development banks or other lending institutions.

37. The use of limited Fund resources as working capital for a loan would tie-up funds and prevent their use for eligible grant funding of projects with net incremental costs. The provision of the costs of servicing of a loan could provide an incentive for an enterprise to convert to ozone friendly options; however, the enterprise would have to pay for most of the costs of conversion. The main problem with offering concessional loans as a viable funding option has been that, thus far, it is not clear that the Fund's implementing agencies have the capacity through their ozone trust funds to administer concessional loans. The World Bank is in the best

position to provide loans from non-Fund sources. It should be noted that UNDP, UNIDO and the World Bank have indicated that their trust fund rules preclude the provision of concessional loans.

Changes in the duration of incremental operating costs/savings

38. The Indicative List authorizes the Executive Committee to determine the duration of incremental operating costs/savings. As mentioned above, document (UNEP/OzL.Pro/ExCom/10/39) and its Annexes suggest an operating cost/savings duration of up to four years. In other sub-sectors, the Committee has shown a willingness to re-define the duration of incremental operating costs/savings. For example, at the Fifteenth Meeting, the Committee decided to allow three options for the calculation of incremental operating costs in the refrigeration sub-sector with one option setting the operating cost/savings duration at one year and another option setting it at six months. Also at the Fifteenth Meeting, the Executive Committee approved two projects for four fire extinguisher refilling conversions for which the operating cost/savings duration was set at one year.

39. If operating savings/costs for halon 1211 conversion projects are considered for any period greater than one year, incremental costs would result in negative amounts. If the savings are considered for one year, instead of four years, about 40 per cent of enterprises would be eligible for assistance. If the duration for which consideration of savings is further reduced to six months, most enterprises (about 75 per cent) would be eligible for some support.

40. Table 2 projects the impact on the Fund for various durations of incremental savings consideration. The table is based on capital costs ranging from US $50,000 for the simplest conversion (HPP-3 where an enterprise has existing ABC production capacity) to $270,000 (HPP-2 where only halon fire extinguisher manufacturing is converted to both ABC powder and CO_2 manufacturing). If six months of operating savings are taken into account, the cost to the Fund would be about US $16 million, and if one year were considered, the estimated impact on the Fund would be about US $5.5 million.

Table 2: Additional Costs to the Multilateral Fund from Funding Projects in the Fire Extinguisher Filling Sub-Sector on the Basis of Capital Costs and Alternative Durations of Operating Savings*

(Grant Funding in US $Million)

Halon Phase-out Path (HPP)	Capital costs only	With 6 months of incremental operating savings	With 1 year of incremental operating savings	With 2 years of incremental operating savings	With 3 years of incremental operating savings
HPP-1	9.650	4.801	0	0	0
HPP-2	7.817	5.753	3.689	0	0
HPP-3	2.413	0	0	0	0
HPP-4	5.018	3.394	1.769	0	0
HPP-5	3.474	1.777	0.079	0	0
TOTAL GRANT	28.371	15.724	5.537	0	0
Capital Cost Coverage	1.00	0.55	0.20	0	0

* Negative costs to the Fund are represented as zero costs.

Likely results of taking no action

41. Although there are decisions allowing and encouraging the use of concessional loans as an incentive for enterprises in Article 5 countries to phase-out their use of controlled substances, even if the Committee were to initiate a concessional loan mechanism, experience with the Fund to date indicates that it would likely take two to three years for such a mechanism to be up and running. Due to the lack of either a loan or grant incentive for conversion, potential operating savings may not be sufficient to drive early phase-out of halon in fire extinguisher production. Instead, phase-out would only occur following the imposition of regulatory requirements by Article 5 governments, joint commitment by all fire extinguisher enterprises, diminishing halon 1211 supplies, or some other financial incentives (e.g., through emergence of a new, less expensive but profitable halon 1211 substitute).

42. In the absence of government or industrial initiatives, halon 1211 fire extinguishers will continue to be produced until such time as enterprises determine that it is necessary to phase out due to the imposition of the controls of the Protocol. For non-halon producing countries, phase-out would eventually occur because there are not sufficient quantities of halon 1211 available from suppliers or halon banking to continue to produce halon 1211 fire extinguishers. Without partial grant funding, it is likely that the supply of halon 1211 in producer countries will enable fire extinguisher enterprises to continue to provide halon 1211 fire extinguishers through the phase-out and grace periods.

Incentive for early phase-out

43. The Indicative List provides the Executive Committee with a mechanism for encouraging an early phase-out. One of the principles is that "the funding of incremental costs is intended as an incentive for early adoption of ozone protecting technologies. In this respect the Executive Committee shall agree which time scales for payment of incremental costs are appropriate in each sector" (UNEP/OzL.Pro.4/15, Annex VIII, para. 1d). Therefore, the Executive Committee may establish a time frame for the phase-out of the entire sub-sector. Providing a time frame for phase-out of this sub-sector would encourage agencies, governments and enterprises to act as expeditiously as possible. It would also target a cost-effective sub-sector strategy which would result in substantial ODS reductions. The effectiveness of the phase-out time frame could be assessed as the target date approaches.

Recommendations

44. The following recommendations address the issues raised in the paper:

1. To avoid unintentional market distortions, projects should be submitted to phase out the country's entire fire extinguisher sub-sector and the funding distributed among all manufacturers in the sub-sector. However, for countries with more than five halon extinguisher enterprises, the projects could be submitted in groups of enterprises that are likely to be competitive for the same market within the country.

2. To ensure that the project objectives are fulfilled, the government should provide assurances that the use of halon 1211 in the sub-sector covered by the project should be prohibited through import bans or commitments to reduced halon production, or both.

3. Agreements should be reached with upstream substitute producers whose conversion was supported by the Fund to determine the appropriate input prices for substitutes used by downstream manufacturers to avoid double-counting.

4. To standardize project proposals and to facilitate an expeditious review, baseline and with-project capital and operating costs should be presented in project proposals.

5. The World Bank should be asked to prepare a study on how to set up a concessional loans mechanism; i.e., what options are available given current implementing agencies and their procedures, what steps would be required to put the mechanism in place, and to what extent could the Bank use its resources or the resources from other sources for phase-out in Article 5 countries.

6. The duration for considering operating costs/savings in the halon 1211 fire extinguisher filling sub-sector should be one year, similar to projects that have already been approved in this sub-sector.

7. Implementing agencies should be requested to develop and submit projects to phase out the entire halon fire extinguisher sub-sector in Article 5 countries within the next three years.

8. Projects in this sub-sector should be considered under these guidelines until the Executive Committee's first meeting in 1998 at which time the effectiveness of this policy should be assessed.