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EXECUTIVE COMMITTEE OF
THE MULTILATERAL FUND FOR THE
IMPLEMENTATION OF THE MONTREAL PROTOCOL
Eighty-third Meeting
Montreal, 27– 31 May 2019

**KEY ASPECTS RELATED TO HFC-23 BY-PRODUCT CONTROL TECHNOLOGIES
(DECISION 82/85)**

Background

1. At its 79th meeting, the Executive Committee *inter alia* considered possible cost-effective options for compensation for HCFC-22 swing plants to allow for compliance with the HFC-23 by-product control obligations of the Kigali Amendment, and requested relevant governments of Article 5 countries wishing to close HCFC-22 production swing plants to submit preliminary data to the 80th meeting (decision 79/47(c) and (d)). At the 80th meeting, the Committee considered document UNEP/OzL.Pro/ExCom/80/56, containing preliminary information submitted by the Government of Argentina in line with decision 79/47(d).
2. At its 81st meeting, the Executive Committee requested the Secretariat to contract an independent consultant to prepare a report for the 82nd meeting, providing information:
 - (a) On options and all costs and savings related to the control of HFC-23 by-product emissions in Argentina, based on the quantities of HCFC-22 and HFC-23 produced at the plant and information included in relevant past reports to the Executive Committee, including the option of shipping HFC-23 for off-site destruction;
 - (b) On estimates of fugitive emissions and options for monitoring, leak detection and control of HFC-23 by-product at the plant; and
 - (c) On the costs, technical feasibility, and logistical, legal and transaction issues associated with shipping HFC-23 for off-site destruction by means of a technology such as the fluor process described in document UNEP/OzL.Pro/ExCom/81/54.
3. The Executive Committee further requested the Government of Argentina to provide, on a voluntary basis, relevant information for the report referred to above (decision 81/68).
4. At its 82nd meeting, the Executive Committee *inter alia* decided:

- (c) To approve US \$75,000 for UNIDO to enable the agency to submit, at the 83rd meeting, a project proposal options that would enable the Government of Argentina to comply with the HFC-23 by-product control obligations under the Kigali Amendment, taking into account the information contained in document UNEP/OzL.Pro/ExCom/82/69, including data regarding costs and benefits and covering technical feasibility, economic viability and logistical, legal, and transactional issues in relation to the following:
- (i) Restarting the onsite incinerator at the HCFC-22 production swing plant FIASA, on the basis of three independent estimates of the costs of so doing, including the costs of incinerator operation, hazardous waste compliance, and cost of monitoring and verifying the destruction of the HFC-23 by-product;
 - (ii) Compensation for closure of the HCFC-22 swing plant FIASA by 1 January 2020 or upon ratification of the Kigali Amendment by the Government of Argentina, whichever was to come first;
 - (iii) Destroying HFC-23 by-product through irreversible transformation and other new conversion technologies and storage options for HFC-23 management;
 - (iv) Shipping HFC-23 for offsite destruction by means of a technology approved by the meeting of the Parties;
- (d) To consider each of the project proposal options, including the data provided as per sub-paragraph above, and to discuss the criteria for funding the activities related to the compliance obligations of Article 5 parties;
- (e) To request the Secretariat to contract an independent consultant to undertake a technical audit of FIASA to determine the costs of closure;
- (f) To approve US \$50,000 to enable the Secretariat to carry out the technical audit referred to in sub-paragraph (e) above; and
- (g) To consider applying the procedures set out in the present decision, and the criteria for funding the activities related to the compliance obligations of Article 5 parties, when agreed, with respect to HFC-23 controls in the other Article 5 parties (decision 82/85).

5. In line with decision 82/85, on behalf of the Government of Argentina, UNIDO has submitted project proposal options to control and phase out of HFC-23 emissions at Frio Industrias Argentinas (FIASA), at a total cost between US \$10,867,000, plus agency support costs of US \$760,690, and US \$59,667,000, plus agency support costs of US \$4,176,690, as originally submitted.¹

Scope of the document

6. The present document consists of the following two parts:

Part I: Project proposal for Argentina. It presents a description of the project proposal submitted by the Government, a summary of the independent technical audit² carried out by a consultant, and the Secretariat's comments.

¹ As per the letter of 21 March 2019 from the Ministry of Foreign Affairs and Worship of Argentina to UNIDO.

² For the selection of the consultant, the Secretariat advertised the vacancy on its website, the United Nations (UN) careers website, and the websites of the Society of Women Engineers and the American Association of Cost Engineers.

As both the proposal by UNIDO and the technical audit by the consultant contain information considered confidential, the present document summarizes both submissions, and presents the Secretariat's comments. Executive Committee members wishing to review the submissions may request them from the Secretariat on the understanding that the information and data contained therein is only for the evaluation of the project and not to be disclosed to a third party.

Part II: Policy issues related to control of HFC-23 by-product emissions. Identifies policy issues for which the Secretariat is seeking the Executive Committee guidance with respect to HFC-23 by-product emission controls in the Article 5 parties in line with decision 82/85(d) and (g), and presents a recommendation.

PART I. PROJECT PROPOSAL FOR ARGENTINA

Project description

7. The project proposal submitted by UNIDO presents options that would enable the Government of Argentina to comply with the HFC-23 by-product control obligations under the Kigali Amendment.

Report on HCFC consumption

8. The Government of Argentina reported a 2018 consumption of 198.42 ODP tonnes of HCFCs (i.e., 50 per cent below the baseline), and a production of HCFC-22 of 65.57 ODP tonnes (i.e., 71 per cent below the baseline and 35 per cent below the 2017 level). The 2014-2018 HCFC consumption and production is shown in Table 1.

Table 1. HCFC consumption and production in Argentina in ODP tonnes (2014-2018 Article 7 data)

HCFC	2014	2015	2016	2017	2018*	Baseline
HCFC-22	159.73	167.38	127.89	135.52	109.36	267.3
HCFC-123	1.56	2.23	2.22	3.25	0.87	1.5
HCFC-124	0.63	0.85	0.46	0.17	0.00	1.0
HCFC-141b	104.69	107.66	91.25	105.41	83.90	113.4
HCFC-142b	9.48	17.31	7.23	3.94	4.28	17.5
Total consumption	276.09	295.42	229.05	248.29	198.42	400.7
Total HCFC-22 production	125.73	134.53	95.84	100.27	65.57	224.54

*Country programme data submitted on 1 April 2019.

9. At the 79th meeting, the Secretariat reported that the low levels of HCFC consumption in recent years have been largely due to a slow-down of the economy, as well as exchange-rate control measures that have prevented some importers from fulfilling their entire quota. These circumstances, which are not related to the need for HCFC in the local market, were expected to revert to their previous status in the near future, with a potential increase in the consumption of HCFCs.³ Since then, Argentina has suffered an economic crisis, resulting in a devaluation of the Argentina Peso by approximately 60 per cent relative to other currencies (e.g., Chinese Yuan, American dollar, Euro).

Applicants were reviewed by a panel comprising three Secretariat staff, and the contract for the selected applicant was issued in February 2019.

³ UNEP/OzL.Pro/ExCom/79/27

Status of the ODS production sector

10. FIASA was established in 1986 and produced CFC-11 and CFC-12 until 2007, when its swing plant was converted to producing HCFC-22.⁴ Since then, it has been the sole HCFC producer in Argentina and produces HCFC-22 solely for domestic ODS use.

11. FIASA implemented a Clean Development Mechanism (CDM) project to control HFC-23 by-product emissions from 15 October 2007 to 14 October 2013. On 15 October 2007 FIASA commissioned a new thermal oxidation incineration system purchased from SGL Carbon Group of Meitingen, Germany. FIASA also installed a 40 metric tonnes (mt) cryogenic tank to store HFC-23 and to improve the control of the HFC-23 feed to the incinerator. In October 2013, after the termination of the CDM project, the incinerator was shut down and has remained idle since then; the pipe for the HFC-23 stream (consisting of about 93 per cent of HFC-23 and the balance mainly of HCFC-22) was severed; and the HFC-23 stream was and continues to be vented to the atmosphere.

12. Aside from installing the incinerator and replacing a distillation tower, all other infrastructure and major capital equipment at FIASA remain unchanged since then; the 33-year old reactors are still in use.

Project proposal options

13. UNIDO submitted the following three options for addressing emissions of HCF-23 by-product:⁵

Option 1: Closure of the HCFC-22 production at FIASA

Option 2: Restarting the incinerator at FIASA

Option 3: Off-site destruction of HFC-23 by-product

14. For each option, several scenarios were presented based on technical feasibility (availability of proven technology), regulatory framework (national and international regulations concerning production, treatment, handling, storage, transportation and transboundary movement of HFC-23), and timeliness (whether the option could be implemented by 1 January 2020), as outlined below.

15. UNIDO also provided a legal assessment of the proposed control options (the full assessment is available upon request by members of the Executive Committee).

16. No proposals were submitted for destroying HFC-23 by-product through irreversible transformation and other new conversion technologies, and storage options for HFC-23 management, as requested in decision 82/85(c)(iii), given the lack of data on such options. However, the proposal included a discussion of possible conversion of the line to produce HFC-32.⁶ This option was not further elaborated as currently there is no market for HFC-32 in Argentina, such a conversion may not be sustainable in the long-term, sufficient information on the process and production technology was not available, and the possible investment costs required for such a conversion. In addition, the submission discussed the possible uses of HFC-23 as a feedstock and for controlled uses; the former are of limited commercial and technical

⁴ The Executive Committee approved US \$10,600,000 for the phase-out and closure of the entire CFC production capacity in Argentina.

⁵ For the purpose of the present document, the options have been presented in this order to facilitate the review of the options, as relevant information in one option is used in other options.

⁶ As explained in UNEP/OzL.Pro/ExCom/83/11/Add.1, production of HFC-32 uses anhydrous hydrogen fluoride (AHF) and dichloromethane (i.e., methylene chloride) as raw materials, while production of HCFC-22 uses AHF and trichloromethane (i.e., chloroform).

maturity, and the latter was not considered viable given the investments needed to process the HFC-23 stream to meet the quality requirements for such controlled uses.

Legal assessment of control options

17. National law N° 24.051 regulates generation, handling, transport, treatment and final disposal of hazardous waste. In particular, Article 2 of the Law defines hazardous waste, and Articles 14 and 33 define a hazardous waste generator and hazardous waste treatment facilities.⁷ In the province of San Luis, where FIASA is located, Decree N° 2092 regulates the application of the National law N° 24.051; Annex V of Decree No. 2092 regulates the limits for gaseous emissions, but it does not include limits for the releases of HFC-23. For this reason, before the implementation of the incineration system, the HFC-23 emissions produced as a result of the production of HCFC-22 was not controlled. Therefore, HFC-23 emissions produced since FIASA put the incinerator on hold, were not controlled either.

18. All of the country's hazardous waste laws and regulations would apply to the generation, treatment, storage, transportation, and transboundary movement of HFC-23 by-product for destruction. The responsibility for any damages caused by the HFC-23 until its proven elimination lies with the generator. Even if the waste was handed over for transportation, storage, treatment or destruction to another entity, the generator of waste remains jointly liable for any damages, even if it was caused by another enterprise.

19. Argentina does not regulate gaseous emissions such as HFC-23 under its hazardous waste legislation. However, when a gaseous hazardous waste is captured in a container, the substance is classified as hazardous waste. Thus, any option that includes the placing of HFC-23 by-product in any tank (i.e., a cryogenic tank for storage, or an isotank to transport HFC-23 for off-site destruction), would require FIASA to register as a generator of hazardous waste. Operation of the on-site incinerator would further require FIASA to register as a hazardous waste treatment facility. Transportation of hazardous waste also requires a license. As yet, no license has been issued by the federal or by the provincial authorities to any entity to transport HFC-23 or used hazardous waste containers in the country.

20. UNIDO highlighted that registering as hazardous waste generator and treatment facility is a complex procedure whose duration is uncertain, and no authority can oblige an entity to undertake such registration. Moreover, the following challenges were identified:

- (a) FIASA would need to register as a hazardous waste generator;
- (b) For Option 2, FIASA would also need to register as a hazardous waste treatment facility;
- (c) For Option 3, FIASA would also need to register as a transporter of hazardous waste, or find an enterprise that is registered, and register as an exporter of hazardous waste. In addition, FIASA would need to apply for permits to transport hazardous waste in both the San Luis and the Buenos Aires provinces; and
- (d) For Option 3, as Argentina is a signatory of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (Basel Convention), and the Government of Argentina considers that HFC-23 for destruction would fall within category y45 of Annex I of the Convention and, therefore, would be a hazardous waste, permission would have to be received from the country where HFC-23 would be destroyed and any transit countries through which the waste would be shipped.

⁷ A hazardous waste is every waste that can cause damage, directly or indirectly, to living beings or pollute the soil, water, atmosphere or environment in general. The provisions also apply to those hazardous residues that may constitute inputs for other industrial processes. A generator is every natural or legal person that, as a result of their actions or any process, operation or activity, produce waste qualified as hazardous in the terms of Article 2 of the law.

Option 1: Closure of the HCFC-22 production at FIASA

21. Compensation would be provided to FIASA for the closure of the production facility by 1 January 2020 or upon ratification of the Kigali Amendment by the Government of Argentina, whichever comes first.

22. In order to forecast future sales and production from 2020 through 2029, UNIDO developed the four scenarios shown in Table 2 based on different levels of HCFC-22 production between 2020 and 2030 and different levels of the price of HCFC-22 during that period.

Table 2. Scenarios to forecast HCFC-22 production and sales over the 2020-2030 period

Scenario	HCFC-22 sales volume	HCFC-22 sales prices*
A Option 1	2,600 mt from 2020 to 2024 1,300 mt from 2025 to 2029	US \$3/kg above 2018 price for 2020; annual increase of US \$1/yr thereafter
B Option 1	2,000 mt from 2020 to 2024 1,300 mt from 2025 to 2029	US \$3/kg above 2018 price for 2020; annual increase of US \$1/yr thereafter
C Option 1	2,000 mt from 2020 to 2024 1,300 mt from 2025 to 2029	US \$2/kg above 2018 price for the entire period
D Option 1	2,000 mt from 2020 to 2024 1,300 mt from 2025 to 2029	US \$0.50/kg above 2018 price for 2020; annual increase of US \$0.50/yr thereafter

* The market price of HCFC-22 charged by FIASA in 2018 is confidential.

23. Variable costs for HCFC-22 production were determined based on the 2014-2018 average price (US \$/mt) and consumption factor of raw materials⁸ (mt/mt of HCFC-22 produced), and those normalized variable costs were then projected by the quantity of HCFC-22 produced. Production of HCFC-22 results in the generation of hydrogen chloride (HCl) and sulphuric acid, which FIASA sells; revenue from those sales, and the cost of packaging (i.e., cylinders/isotanks), were based on 2014-2018 average revenues and costs.

24. Fixed costs (e.g., labour; electricity, gas and water, maintenance, and plant overhead) were based on the 2014-2018 average cost paid by FIASA during those years.

25. The net profit per year was determined based on the above assumptions, after taking into account the applicable tax rate, and the sales volume and HCFC-22 price assumed under each scenario. The net present value (NPV) of each scenario shown in Table 3 was determined using a 10 per cent discount rate, a typical cost of capital in developing countries, and taking into account the severance for staff of US \$1,189,000.

Table 3. NPV of lost profits over the 2020-2030 period

Scenario Option 1	NPV (US \$)
A Option 1	59,667,000
B Option 1	46,299,000
C Option 1	16,780,000
D Option 1	18,086,000

⁸ Anhydrous hydrogen fluoride, chloroform, sodium carbonate, sodium sulphite, antimony chloride, sulphuric acid and chlorine

Option 2: Restarting the incinerator at FIASA

26. For the preparation of the project proposal, UNIDO hired SGL Carbon, the manufacturer of the incinerator, to provide an estimate of the cost to refurbish the incinerator before restarting it for on-site destruction of HFC-23.

27. Based on a site visit, SGL Carbon assessed that more than 80 per cent of the incinerator's components would need to be replaced, including the final vent gas scrubber; the exotic metal burner; HF acid recycle and liquid recycle pumps; valves and fittings; field instrumentation, ignition and control panel; repair and revamp material for piping; and spare parts for 10 years of operation. Also included are an optional polytetrafluoroethylene (PTFE)-final vent gas scrubber, new zeolite for the pressure-swing absorption (PSA) oxygen generator, estimated additional construction costs based on safety and structural materials, and installation and commissioning; delivery to Buenos Aires and port clearance and transport to FIASA; and contingencies.

28. UNIDO also included annual independent verifications (US \$20,000/yr) and severance for the four operators of the incinerator in 2030.⁹ The total estimated cost for restarting the HFC-23 incinerator at FIASA is shown in Table 4.

Table 4. Estimate for restarting the HFC-23 incinerator at FIASA

Description	Cost (US \$)
Capital cost	
SGL incinerator refurbishment	916,959
Final vent gas scrubber addition	18,810
Delivery to Buenos Aires port and to FIASA	30,000
SGL installation/commissioning supervision	75,240
FIASA construction	102,600
Contingency (10%)	114,361
Zeolite for oxygen generator (1,800 kg at US\$31/kg)	55,800
Building to house cryogenic tank*	100,000
Total capital cost	1,413,770
Other costs	
Severance for incinerator staff	210,000
Monitoring and verification	200,000
Total other costs	410,000
Total costs	1,823,770

* The cost is provided by UNIDO as a non-binding estimate taking into consideration the scope of work

29. Incremental operating costs (IOCs) were calculated based on the following assumptions:

- (a) HCFC-22 production would be 2,000 mt/yr for the period 2020-2024,¹⁰ and 1,300 mt/yr¹¹ for the period 2025-2029, after which production would cease;
- (b) Annual quantities of HFC-23 by-product were based on the historic by-product generation rate of 3.24 per cent;

⁹ In accordance with Argentina's laws and regulations, workers who are laid off are provided compensation according to the number of years the employee has worked for the enterprise.

¹⁰ The 2014-2018 average HCFC-22 production was 1,898 mt/yr.

¹¹ Under the Montreal Protocol, Argentina's 2025 production target is 1,327 mt/yr.

- (c) Nitrogen costs were based on an annual contract amount; other raw material costs (e.g., natural gas, de-ionized and potable water, electricity, and oxygen) were estimated based on average consumption factors from 2008-2012, when the incinerator was in operation under the CDM project, and the 2018 price for each raw material;
- (d) Revenue from the sale of dilute (50 per cent) HF (HF50)¹² collected by FIASA was estimated based on the 2008-2012 average amount of HF50 generated per mt of HFC-23 incinerated and an estimated 2019 sales price of US \$30/mt;
- (e) Annual maintenance and overhead cost were assumed at 5 and 0.4 per cent, respectively, of the incinerator cost (approximately US \$3 million); and
- (f) Labour costs were based on annual salary of four operators to run the incinerator.

30. Noting that SGL Carbon estimated that the incinerator might be commissioned by 1 June 2020, and that sufficient time would be required for FIASA to register as a hazardous waste generator and treatment facility, the following three scenarios under Option 2 were proposed:

Table 5. Scenarios for the refurbishment of the incinerator at FIASA

Scenario	Description	Advantage	Disadvantage
A Option 2	FIASA stores the HFC-23 by-product on-site in its cryogenic tank as of 1 January 2020 and starts incineration in June 2020	No modification of the HCFC-22 operations are needed	The need of FIASA to register as a hazardous waste generator and treatment facility
B Option 2	FIASA produces an additional 1,000 mt of HCFC-22 in 2019, stops production until the incinerator is recommissioned in June 2020. Additional costs (US \$650,000) for storage of HCFC-22 on-site; labour, cost of capital in 2019, and loss of HCl sales in 2020	Additional six months to register as hazardous waste generator and treatment facility	Additional costs, the possible need for additional production quota; additional emissions of HFC-23 in 2019
C Option 2	FIASA stops production of HCFC-22 as of 1 January 2020, and is compensated for lost profit (US \$2,698,000) associated with 1,000 mt of HCFC-22 and loss of HCl sales (US \$266,000) until the incinerator is recommissioned in June 2020 and FIASA resumes production	Additional six months to register as hazardous waste generator and treatment facility	Additional costs

¹² Each molecule of HFC-23 that is incinerated generates three molecules of HF (UNEP/OzL.Pro/ExCom/79/48).

31. On that basis, the costs to refurbish and operate the incinerator are summarized in Table 6:

Table 6. Cost of the three scenarios to refurbish and operate the incinerator

Description	Costs (US \$)		
	Scenario A Option 2	Scenario B Option 2	Scenario C Option 2
Incinerator refurbishment (Table 4)	1,824,000	1,824,000	1,824,000
HCFC-22 storage tank rental (50 isotanks)	-	225,000	-
Working capital increase	-	99,000	-
Cost of additional labour	-	60,000	-
Loss of HCl sales	-	266,000	260,000
Compensation 1,000 mt of HCFC-22 sales	-	-	2,698,000
Incremental operating costs	1,929,000	1,904,000	1,904,000
Total	3,753,000	4,378,000	6,686,000

32. UNIDO considered that the total cost to restart the incinerator should also include the lost profits from the production reduction required under the Montreal Protocol for 2025-2029. Those lost profits are estimated based on the methodology used, the four scenarios for closure of the production facility (Option 1 described above), and a 10 per cent discount rate to determine the NPV of those lost profits from the 2025-2029 production reduction. The lost profits requested as part of the funding for the three scenarios in Option 2 are shown in Table 7.

Table 7. Total cost to refurbish and operate the incinerator, including lost profits (US \$)

Description	Scenarios for closure (Table 2)			
	A Option 1	B Option 1	C Option 1	D Option 1
Scenario A Option 2				
Incineration costs	3,753,000	3,753,000	3,753,000	3,753,000
NPV loss profit (2025-2029)	29,073,000	15,655,000	7,115,000	9,262,000
Total	32,826,000	19,408,000	10,868,000	13,015,000
Cost-effectiveness*	61.40	36.30	20.33	24.35
Scenario B Option 2				
Costs incinerator (one off)	4,378,000	4,378,000	4,378,000	4,378,000
NPV loss profit (2025-2029)	29,073,000	15,655,000	7,115,000	9,262,000
Total	33,451,000	20,033,000	11,493,000	13,640,000
Cost-effectiveness*	62.57	37.47	21.50	25.51
Scenario C Option 2				
Costs incinerator (one off)	6,686,000	6,686,000	6,686,000	6,686,000
NPV loss profit (2025-2029)	29,073,000	15,655,000	7,115,000	9,262,000
Total	35,759,000	22,341,000	13,801,000	15,948,000
Cost-effectiveness*	66.90	41.80	25.83	29.84

* US \$/kg HFC-23 destroyed

Option 3: Off-site destruction of HCFC-23 by-product

33. For the off-site destruction option, UNIDO considered potential destruction facilities in Argentina. It was noted that the enterprise "Cementos Avellaneda,"¹³ located close to FIASA, has a cement kiln, which is not included in the destruction technologies for HFC-23 approved by the Parties to the Montreal Protocol.

34. As no other approved destruction facilities were found in Argentina (e.g., rotary kiln), the project proposed to export the HFC-23 by-product for destruction at a rotary kiln in Europe. Off-site destruction would require the purchase of two 9 mt-capacity isotanks (US 250,000-US \$300,000/tank) (as no enterprise

¹³ This option has been discussed in document UNEP/OzL.Pro/ExCom/82/69.

was found willing to lease the isotanks); and a compressor (US \$20,000) to transfer the HFC-23 from the cryogenic storage tank into the isotanks.

35. UNIDO received two quotes for the destruction of HFC-23 from registered rotary kiln destruction facilities in Europe; the lowest was from a facility in Denmark with a price of destruction of €4.90/kg (US \$5.59/kg). The roundtrip transportation cost was estimated at US \$17,000/tank. As used hazardous waste tanks are prohibited from import under Argentinian law, a new isotank would need to be purchased for each shipment, resulting in a total cost of US \$17.4 million.

36. For reference, UNIDO presented the costs of off-site destruction if it were feasible to return the used isotank to Argentina on the following basis: two isotanks (US \$600,000); compressor (US \$20,000); production of HCFC-22 and generation of HFC-23 by-product as under Option 2,¹⁴ resulting in 30 shipments of the two isotank carriers (US \$135,000) and incineration at the facility in Denmark (US \$100,620); permits for environmental compliance (US \$3,000/yr); and monitoring and verification (US \$8,400/yr), resulting in a total cost of US \$4,770,000 (US \$8.92/kg of HFC-23 destroyed). In presenting this option, UNIDO emphasized that the import of used isotanks was not permitted into the country; that the purchase of new isotanks for each shipment would add US \$17.4 million to the total cost; and, therefore, suggested not to further consider this option.

Technical audit

37. In order to estimate the costs of closure, the independent consultant used the same methodology as used in previous technical audits for the CFC and HCFC production sector, which starts from gathering plant data for the following cost elements: representative production capacity; estimated capital investment; feedstock costs; energy/utility costs; by-product credits; operating costs; maintenance labour and materials costs; and plant indirect and overhead costs. The contribution of each element per mt of HCFC-22 produced is used to determine the marginal profit margin, after taking into account capacity utilization, and the applicable tax rate. The independent consultant then considered macroeconomic indicators and the estimated remaining useful plant life to determine the lost profits.

38. A discount rate is required to determine the NPV of the lost profits. In most cases, the bank benchmark interest rate is a reasonable surrogate for a discount rate. However, the 2016-2018 benchmark interest rate in Argentina varied between 19.9 to 35.5 per cent, with an average of 26.2 per cent. Such a discount rate might be high given that it would be used for plant closure, and therefore the independent consultant considered a weighted average cost of capital (WACC) approach to be more fair, resulting in a discount rate of 17.7 per cent.

39. To determine compensation for closure, the independent consultant used the standard methodology that had been used in other countries: compensation is based on compensation to workers, in accordance with the laws and regulations applicable in the country in question, and the NPV of future lost profits based on the average production cost margin for the three years preceding the project and the predicted future production.

Findings

40. FIASA's HCFC-22 plant is old, fully depreciated, and has low production capacity by international standards. Its 2016-2018 average cost of production (i.e., cost for FIASA to produce 1 kg of HCFC-22) was almost double the price at which HCFC-22 is available internationally; production has been declining, dropping from 1,823 mt in 2017 to 1,192 mt in 2018, and it is expected to continue for the next five years. The plant remains profitable mainly because it operates in an insulated market, allowing the facility to

¹⁴ HCFC-22 production of 2,000 mt/yr for 2020-2024 and 1,300 mt/yr for 2025-2029, with a by-product generation rate of 3.24 per cent.

command a price approximately 2.8 times international prices. The price FIASA has been able to command in Argentina has fallen slightly since 2016. Assuming the price at which FIASA is able to sell HCFC-22 does not fall further from the 2018 price, the remaining useful life of the plant could be about four years; and less than that if domestic prices drop further.

41. In accordance with Argentina's laws and regulations, workers who are laid off are provided compensation according to the number of years the employee has worked for the enterprise. Based on the years of service of the employees at FIASA and their salaries, and assuming the HCFC-22 production line were to close on 1 January 2020, the compensation to workers would be US \$1,189,083.

42. The NPV present value of FIASA's 2020-2023 after income tax lost profits is US \$3,867,270. The total compensation for closure would therefore be US \$5,056,353.

Secretariat's comments

Option 1: Closure of HCFC-22 production at FIASA

43. The Secretariat noted the following:

- (a) Since 2013, FIASA has always utilized less than 50 per cent of its production capacity; in 2018, it used less than 24 per cent of its capacity;
- (b) Since 2013, FIASA has always used less than 67 per cent of its production quota; in 2018, it used approximately 32 per cent of its quota;
- (c) In 2014, FIASA's HCFC-22 production line operated on 283 days of the year; in 2018, it operated on 150 days of the year. Fixed costs, such as labour, are essentially independent of the number of days of operation and the extent of capacity utilization. For reference, HCFC-22 lines in other Article 5 countries may operate on more than 340 days of the year and at 100 per cent or even higher than the line's capacity;
- (d) FIASA's marginal cost of production will continue to increase with decreasing production as fixed costs will remain constant;
- (e) FIASA's HCFC-22 price is above the international market price. It is almost triple the import price in Brazil and, as noted by the independent consultant, 2.8 times the price at U.S. ports of entry;
- (f) Demand for HCFC-22 in Argentina continues to decline given the continued implementation of the stage II of the HCFC phase-out management plan (HPMP), as well as the conversion of the country's air-conditioning manufacturing sector to R-410A;¹⁵
- (g) In 2018, consumption of HCFCs in Argentina fell by 26 per cent from 2017 consumption. The reduction in production at FIASA accounted for 98 per cent of that drop; and
- (h) Based on the international market price of HCFC-22 and the marginal cost of production calculated both by UNIDO and the independent technical consultant, at current production levels, FIASA would generate more profit by importing HCFC-22 than producing it. However, according to the Government, an enterprise could not exchange production for import quotas and, therefore, this option is not available to FIASA.

¹⁵ UNEP/OzL.Pro/ExCom/61/28 and decision 61/34.

44. In line with the assessment provided by the independent technical audit, the Secretariat considered that production at FIASA would cease by 1 January 2024. Rather than use the 2016-2018 average benchmark interest rate (i.e., 26.2 per cent), as in other production sector closure projects, the Secretariat considered it more fair to use the WACC discount rate (i.e., 17.7 per cent) suggested by the independent consultant in determining the NPV of the control options. Accordingly, the Secretariat proposed to use the cost of closure as determined by the independent consultant (i.e., US \$5,056,353). The Government of Argentina did not agree with the assessment that FIASA would close by 2024, nor did it agree with the use of a discount rate of 17.7 per cent and the proposed level of compensation. As further explained in the section on policy issues related to control of HFC-23 by-product emissions, the Secretariat considers that guidance from the Executive Committee will be needed to determine the eligible incremental costs of the project.

Option 2: Restarting the incinerator

45. During the period FIASA was generating credits under the CDM project,¹⁶ FIASA used the cryogenic tank both as a buffer for the smooth operation of its incinerator, and as storage when the incinerator was not operating. UNIDO clarified that FIASA registered as a hazardous waste generator and treatment facility in 2004; however, it would have to re-register if it re-starts the incinerator. Given the previously successful registration of the enterprise, the Secretariat did not further consider Scenarios B and C of Option 2.

46. Regarding the need to construct a containment building for the cryogenic tank, estimated at US \$100,000, which was not required when FIASA was generating CERs under the CDM project, UNIDO clarified that since the Decree N°. 2092 was established in 2006, after FIASA's registration as a hazardous waste generator and treatment facility in 2004, the facility to contain the tank was requested. However, the Secretariat notes that FIASA only generated CERs after Decree N°. 2092 was established. Moreover, annual registration fees must be provided by registered hazardous waste generators and treatment facilities; it is unclear if FIASA did so after its registration in 2004.

47. The Secretariat noted with appreciation the options presented by UNIDO, and the multiple scenarios considered under each option. However, some elements requested by the Executive Committee were not included. In particular, three independent estimates of the costs of restarting the onsite incinerator were requested (decision 82/85(c)(i)). UNIDO identified two other enterprises currently providing HFC-23 incinerator technology; however, FIASA's incinerator uses proprietary technology and equipment, and the other enterprises would not be able to provide the necessary technological and operational safety guarantee for refurbishment of the incinerator. Quotes from those enterprises would therefore amount to a bid for an entirely new incinerator, which would be costlier than the refurbishment option.

48. The Secretariat considers that UNIDO undertook best efforts to secure additional independent estimates; that the estimate provided is well-documented and robust; and the concern expressed on the need for a technological and operational safety guarantee. Recalling that at the 82nd meeting¹⁷ FIASA and the independent consultant had estimated the costs to refurbish the incinerator at US \$897,840, the Secretariat considered the following minor costs adjustments to the proposal:

- (a) Some equipment included in the refurbishment quote (i.e., HF acid recycle pump, liquid recycle pump, manual valves and fittings, and the piping repair and revamp materials) may be purchased locally at a lower cost. In addition, spare parts for only four years would be

¹⁶ The total certified emission reduction credits (CERs) generated by FIASA under the CDM was 7,306,549 mt-CO₂eq. At US \$5/mt-CO₂, this represents a revenue of approximately US \$36.5 million.

¹⁷ UNEP/OzL.Pro/ExCom/82/69

needed rather than 10 years. Accordingly, the Secretariat estimated the cost at 95 per cent of that submitted (i.e., US \$871,111);

- (b) Installation, commissioning and start-up includes two weeks for an on-site SGL supervisor fitter and supervisor engineer. Given the substantial difference between the daily labor rate proposed and that permitted under United Nations rules (approximately a factor of three higher) and that business class travel was included, those costs were adjusted by 14 per cent;
- (c) The zeolite for the PSA oxygen generator can be purchased or the oxygen gas can be purchased, but purchasing both is not necessary. As the Secretariat included the cost of oxygen gas in its calculation of IOCs, the 1.8 mt of zeolite is not incremental;
- (d) The optional (PTFE-lined) final vent gas scrubber is not incremental as the refurbishment quote already includes a (rubber-lined) final vent gas scrubber;
- (e) Reduced additional FIASA construction costs and cost for the construction of an enclosure for the cryogenic tank to US \$51,300 and US \$50,000, respectively; and
- (f) One-time registration as a hazardous waste generator and treatment facility, based on the costs for such registration indicated in the legal assessment (US \$235).

49. The revised incremental costs for refurbishing the incinerator are presented in Table 8.

Table 8. Incremental capital costs for the refurbishment of the incinerator

Description	Proposal (US \$)	Secretariat (US \$)
Capital cost		
SGL incinerator refurbishment	916,959	871,111
Final vent gas scrubber addition	18,810	0
Delivery to Buenos Aires port and to FIASA	30,000	30,000
SGL installation/commissioning supervision	75,240	64,467
FIASA construction	102,600	51,300
Contingency (10%)	114,361	101,688
Zeolite for oxygen generator)	55,800	0
Building to house cryogenic tank	100,000	50,000
Total capital cost	1,413,770	1,168,566
Other costs		
Severance for incinerator staff	210,000	0
Monitoring and verification	200,000	0
Registration as hazardous waste generator and operator		235
Total other costs	410,000	235
Total costs	1,823,770	1,168,801

50. The Secretariat noted that every year for which data is available (i.e., 2008-2013), revenue from the sale of HF50 is higher than the cost of natural gas, electricity, water and oxygen purchased to operate the incinerator. However, FIASA submitted documentation showing a reduction by a factor of almost 20 in the 2019 price of HF50. While it is possible that the price of HF50 will recover in the coming years, thereby again resulting in savings, the determination of incremental costs is based on the most recent data rather than on forecast prices. The Executive Committee may wish to note that in other Article 5 countries, the costs to operate an incinerator may be substantially reduced by the sale of HF.

51. The Secretariat based its assessment of the IOCs on the following:

- (a) UNIDO based its IOCs on an annual production of 2,000 mt of HCFC-22 for 2020-2024.

Noting the consumption and production trends in Argentina (as shown in Table 1), the production forecast of 2,000 mt is very high. In line with the decision in paragraph 32(b) of document UNEP/OzL.Pro/ExCom/16/20, the Secretariat considers the average of the three years immediately preceding project preparation (1,586 mt/yr) to be an appropriate basis for the level of production for 2020-2023. Production is considered to cease on 1 January 2024, in line with the results of the technical audit;

- (b) Consistent with UNIDO's proposal, a by-product generation rate of 3.24 per cent, which results in an annual HFC-23 by-product generation of 51.4 mt/yr;
- (c) Based on the annual quantities of HFC-23 by-product generated and the capacity of the incinerator (613 mt/yr), the incinerator would need to be operated 31 days per year. Accordingly, the total incinerator fixed costs (i.e., operating labor, nitrogen, maintenance, and overhead) are estimated at two months of the annual costs proposed by UNIDO;
- (d) Costs of raw materials and utilities were calculated as follows: for natural gas, electricity and HF50, normalized consumption based on the values included in the audited reports submitted under the CDM project,¹⁸ and the 2018 price of raw materials as submitted by UNIDO; normalized consumption and 2018 price for water and oxygen as submitted by UNIDO;
- (e) Costs related to the Government's monitoring of HFC-23 destruction at US \$4,167/yr¹⁹ for 2020 through 2022, at which point the stage II of the HPMP will be completed, and at US \$10,000 for 2023; and
- (f) Annual registration fees as a hazardous waste generator and treatment facility, as described in the legal assessment (US \$3,960/yr).

52. The revised IOCs are presented in Table 9.

Table 9. Costs to operate the refurbished incinerator (US \$)

Description	2020	2021	2022	2023
Variable costs*	66,840	66,840	66,840	66,840
Government monitoring	4,167	4,167	4,167	10,000
Annual registration fees	3,960	3,960	3,960	3,960
IOCs	74,967	74,967	74,967	80,800

* Variable costs include the costs of natural gas, water, electricity, oxygen gas, labor, nitrogen, maintenance, plant overhead, and revenue from the sale of 50 per cent HF.

53. UNIDO included the lost profits associated with the 2025 and 2030 control measures in its assessment of the costs to refurbish the incinerator. The Secretariat did not include those costs, nor did it do so for the option of off-site destruction (described below), as those lost profits are currently not eligible at HCFC-22 production swing plants.

54. Executive Committee members have expressed varying views on the duration for which funding to operate an HFC-23 incinerator should be provided. As explained in Part II of the present document on policy issues related to control of HFC-23 by-product emissions, the Executive Committee may wish to provide guidance on this matter. For reference, four years of IOCs would be US \$1,474,501, with annual funding tranches as specified in Table 10

¹⁸ See UNEP/OzL.Pro/ExCom/79/48

¹⁹ Paragraph 28 of document UNEP/OzL.Pro/ExCom/82/69

Table 10. Funding to refurbish and operate the incinerator assuming IOCs are provided for four years

Year	2019	2020	2021	2022	2023	Total
Funding (US \$)	1,168,801	74,967	74,967	74,967	80,800	1,474,501

55. Executive Committee members have expressed an openness to providing flexibility to Argentina should the country decide to choose closure as a means of complying with the HFC-23 by-product obligations under the Kigali Amendment, on the understanding that the funding level would be determined based on the most cost-effective approach. Accordingly, as an alternative to a multi-year agreement with multiple tranches, a single funding tranche (i.e., the equivalent of a lump-sum payment) could be considered, on the understanding that the HCFC-22 production line at FIASA would stop production by 1 January 2020 and would be dismantled, that key equipment would be destroyed, and that this would be documented in line with the guidelines for verification of ODS production. Such a lump-sum would be based on the NPV of the tranches above, depending on the number of years to be included, as determined by the Executive Committee, as shown in Table 11.

Table 11. “Lump-sum payment” to refurbish and operate the incinerator as a function of the number of years of IOCs are provided

Number of years of IOC	NPV (US \$)
1	1,222,907
2	1,268,872
3	1,307,921
4	1,343,677

56. UNIDO included an annual cost of US \$20,000 for independent verifications as part of the project costs in its proposal. However, the Secretariat considers that, in line with the current practice in the production sector, those costs should be considered as part of the agency support costs.

57. Notwithstanding constructive discussions with UNIDO, which resulted in a narrowing of the difference between several of the proposed costs, an agreement on the total cost for the option to refurbish and operate the incinerator was not reached. As further explained in the section below on policy issues related to control of HFC-23 by-product emissions, the Secretariat considers that guidance from the Executive Committee will be needed to determine the eligible incremental costs of the option of restarting the incinerator.

Option 3: Off-site destruction

58. Off-site destruction is not a practicable alternative unless the used isotank can be reimported into the country. UNIDO clarified that the quality of a hazardous waste container that would prevent its reimportation into the country was not whether it was used, but whether it contained even traces of HFC-23. The Secretariat discussed with UNIDO whether a certificate issued by the destruction facility in Denmark, or an independent entity, would allow the reimportation of the used isotank. In addition to, or in lieu of, and noting that Decree No. 2092 provides for the Authority to “establish the obligations of each of the mentioned categories, *with the possibility to modify the general character of the amount of obligations to fulfil when it is technically reasonable and will take into account the situation of greater environmental risk for the classification*” (emphasis added), the Secretariat inquired if the Government of Argentina could grant an exemption to permit the reimportation of the isotank into Argentina, noting that such an exemption could provide an environmental benefit that would outweigh the risks associated with trace quantities of HFC-23 entering the country.

59. Regarding the former, UNIDO indicated that the customs authority would have the prerogative to test whether the isotank had traces of HFC-23, irrespective of a certificate, which would introduce substantial risks in the capability of the Government to ensure it can comply with its obligations under the Montreal Protocol; and that the destruction facility would be able to flush the isotank but not issue a

certificate. At the time of finalization of the present document, it was unclear whether an independent entity could provide such a certificate and, if so, at what cost.

60. Regarding the latter, UNIDO clarified that the flexibility provided is understood to require greater not lesser control, and that the objective of the law is relevant. In particular, the flexibility afforded under the Decree could not be used for an objective that is not the management of hazardous waste. Climate change is not covered by the scope of the legislation.

61. The Secretariat sought clarification as to why the quoted costs of incineration (US \$5.59/kg) were higher than the US \$2.45/kg at rotary kilns in Europe previously reported by UNIDO.²⁰ UNIDO highlighted that some countries in Europe (e.g., Poland) no longer allow the import of hazardous waste for destruction; and that hazardous waste destruction facilities in Europe appear to be running at close to full capacity, and it was therefore not easy to find a facility willing to provide a bid for the destruction of HFC-23 from Argentina.

62. As the Executive Committee requested a proposal for off-site destruction, the Secretariat undertook an assessment of the costs of that option, noting the following:

- (a) The viability of off-site destruction is dependent on the used isotank being permitted to re-enter the country;
- (b) It is unclear whether an independent entity could issue a certificate to demonstrate that no HFC-23 was detected as remaining in the tank; the costs of such a certificate are at present unknown and would be additional to the preliminary costs calculated by the Secretariat below;
- (c) Even with such a certificate, there is a risk the isotank could be held up at customs upon re-entry into Argentina, as customs would have the prerogative to undertake its own assessment that the isotank did not contain even traces of HFC-23; and
- (d) As a Party to the Basel Convention, Argentina would have to receive permission from Denmark and any transit countries through which the HFC-23 waste is shipped (i.e., the countries of intermediate ports, if any, before the waste was delivered to Denmark).²¹

63. Accordingly, the Secretariat calculated the cost of off-site destruction based on the costs submitted by UNIDO, except to adjust the cost of the isotanks (US \$460,000, based on the quote from the independent consultant at the 82nd meeting,²² rather than US \$600,000), and based on the same level of HCFC-22 production and HFC-23 by-product generation as proposed by the Secretariat under the option of restarting the incinerator (i.e., 1,586 mt/yr for 2020-2023, and then closure; 3.24 per cent HFC-23 by-product generation rate), as shown in Table 12.

Table 12. Off-site destruction costs including four-year IOCs (US \$)

Description	2019	2020	2021	2022	2023
Incineration		283,682	283,682	283,682	283,682
Shipping		102,000	102,000	102,000	102,000
Legal and inspection costs for permits		3,000	3,000	3,000	3,000
Monitoring		8,400	8,400	8,400	8,400
Isotanks and compressor	480,000				
Total annual tranche	480,000	397,082	397,082	397,082	397,082

²⁰ UNEP/OzL.Pro/ExCom/82/21.

²¹ UNEP/OzL.Pro/ExCom/82/69

²² UNEP/OzL.Pro/ExCom/82/69

64. Should the Executive Committee wish to consider a lump-sum payment, on the understanding that the HCFC-22 production line at FIASA would stop production by 1 January 2020 and would be dismantled, that key equipment would be destroyed and documented, the NPV of the tranches above, depending on the number of years to be included, are presented in Table 13.

Table 13. “Lump-sum payment” for off-site destruction of HFC-23 as a function of the number of years IOCs are provided

Number of years of IOC	NPV (US \$)
1	817,339
2	1,103,925
3	1,347,392
4	1,554,228

65. The Secretariat considers the following observations relevant:

- (a) The NPV of four years of off-site destruction is higher than the NPV of four years of refurbishing and operating the incinerator;
- (b) Absent an exemption from the Government of Argentina to ensure that the used isotank can be reimported into the country, the option of off-site destruction would introduce substantial, and perhaps unacceptable, risks relative to the option of restarting the incinerator; and
- (c) If the mid-point of the cost of incineration in Europe as reported in document UNEP/OzL.Pro/ExCom/82/21 and that submitted by UNIDO were to be taken, there would be a reduction of 20 per cent of the annual tranches in 2020-2023, and a decrease in the net present value between 8 and 14 per cent, depending on the number of years included.

66. The Government of Argentina noted the proposal to include costs related to Government’s monitoring of HFC-23 destruction and proposed that an unspecified level funding for a project management unit (PMU), which had inadvertently not been included in the original submission, be included. The Government of Argentina further noted that during the CFC production closure project in Argentina, 6.2 per cent was applied for the PMU; that the appropriate percentage to be applied for a PMU could depend on the selected project option (i.e., refurbishment of the incinerator, off-site destruction, or closure), its duration and the level of funding approved; and that this topic should be included during the discussions at the Executive Committee meeting.

67. In its assessment of refurbishment of the incinerator and off-site destruction, the Secretariat included costs related to Government monitoring; in line with past practice, the Secretariat’s assessment did not include a PMU for the closure option. For the case of the HPMP that the Executive Committee approved, the agreed level of compensation did not include funding for a PMU; however, the country was given the flexibility to use a specified level of funding for its PMU.

PART II. POLICY ISSUES RELATED TO CONTROL OF HFC-23 BY-PRODUCT EMISSIONS

68. The Executive Committee decided *inter alia* to consider each of the project proposal options, including the data provided in the proposals submitted by UNIDO in line with decision 82/85(c), and to discuss the criteria for funding the activities related to the compliance obligations of Article 5 parties; and to consider applying the procedures set out in decision 82/85, and the criteria for funding the activities

related to the compliance obligations of Article 5 parties, when agreed, with respect to HFC-23 controls in the other Article 5 parties (decision 82/85(d) and (g)).

69. Accordingly, the Secretariat is raising the following policy issues for which it seeks the Executive Committee's guidance:

Extent to which market demand and profitability of HCFC-22 production should determine expected future production of HCFC-22

70. Consistent with the assessment of the independent consultant, the Secretariat considers that FIASA will shut down production by 1 January 2024 given the trend in the HCFC consumption and production in the country, market demand for HCFC-22 in Argentina, FIASA's price of HCFC-22 versus the price for which HCFC-22 can be imported, FIASA's cost of production relative to its international competitors, and that FIASA's cost of production will increase as production continues to decrease to the point where it will no longer be profitable. The Government of Argentina has a different assessment: it instead considers that, relative to 2018, production of HCFC-22 at FIASA will increase by at least 69 per cent in 2020, that such production can be maintained until 2024, and then continue at 10 per cent above the 2018 production levels between 2025 and 2029.

71. FIASA is profitable because it can charge a price that is at least double the international market price. A similar situation may apply to HCFC-22 production lines in other Article 5 countries.

72. The Executive Committee may wish to provide guidance to the Secretariat on:

- (a) The extent to which market demand and profitability of HCFC-22 production determine expected future production of HCFC-22; and
- (b) The extent to which the profitability of an HCFC-22 production line should depend on the local versus international market price.

Basis for HCFC-22 production to be used in determining IOCs

73. Given the financial crisis in Argentina in 2018, the Secretariat proposed using the average of the three years immediately preceding project preparation, in line with the decision in paragraph 32(b) of document UNEP/OzL.Pro/ExCom/16/20. UNIDO pointed out that this decision is applicable to ODS consumption and, therefore, should not be applied in the case of FIASA.

74. The Executive Committee may wish to provide guidance on whether the decision in paragraph 32(b) of document UNEP/OzL.Pro/ExCom/16/20 should be used as a basis for the HCFC-22 production to be used in determining IOCs, or whether to use another method.

Duration for which funding support for HFC-23 by-product emission controls is provided

75. Executive Committee members have expressed different views on the duration for which IOCs should be provided. Some Executive Committee members have suggested that IOCs should be provided as long as the destruction of HFC-23 is taking place; others have suggested a more limited duration.

76. Some Executive Committee members have suggested that IOCs are intended to incentivize early action, and the need for such an incentive may change as the cost of adopting control measures becomes the regular cost of business. Other Executive Committee members have suggested that the costs of destruction should not be considered as IOCs but recurring costs. In contrast to IOCs, which are expected to decrease as the cost of the alternative to be phased in goes down and the cost of the controlled substance that is phased out goes up, many of those recurring costs are not expected to change with time and, therefore,

funding should continue to be provided for them. As recurring costs are a new concept, the Executive Committee may wish to consider whether it wishes to develop guidelines for their application to HFC-23 by-product control projects.

77. The Executive Committee may wish to provide guidance to the Secretariat on the duration IOCs and/or recurring costs are provided for HFC-23 by-product control projects.

Level of agency support costs

78. In line with decision 67/15, projects with a project costs above US \$250,000 would receive an agency fee of 7 per cent, and for projects in the production sector, the agency fee would be no greater than 6.5 per cent, to be determined on a case-by-case basis. It is not clear whether HFC-23 by-product control projects would be considered projects in the production sector (i.e., up to 6.5 per cent support costs, to be determined on a case-by-case basis) or investment projects (i.e., 7 per cent support costs).

79. The Secretariat considers that in those HFC-23 by-product control projects where there would be continued production of HCFC-22, and hence continued generation of HFC-23 by-product that must be controlled, continued agency support of the project would be expected. Moreover, costs of independent verification would be included in the agency support costs. Accordingly, in such cases, it would be appropriate to consider an HFC-23 by-product control project as an investment project eligible for 7 per cent support costs.

80. In contrast, in projects where closure of the HCFC-22 production facility is the modality used to comply with HFC-23 by-product control obligations, the agency support costs for the production sector would be applicable. UNIDO emphasized that it was not selective in accepting projects and seeks to treat countries equally, irrespective of the level of consumption/production in the country and the project value; that UNIDO undertakes a number of projects in low-volume-consuming countries, where support costs do not fully cover UNIDO's costs; and that UNIDO considers that its portfolio is more relevant in determining the support costs, rather than on a project-by-project basis. Moreover, UNIDO emphasized that projects in the production sector always took into consideration lost profits and, in such cases, it was understandable that a lower support cost was applied. For production swing plants where it is not yet clear whether lost profits will be eligible, UNIDO considers that 7 per cent may be appropriate.

81. The Executive Committee may wish to consider providing guidance on the appropriate level of agency support costs for HFC-23 by-product control projects in Article 5 countries, including whether the costs of independent verification should be included in such costs or in the project costs, and whether the agency support costs should differ between (on- or off-site) destruction of HFC-23 by-product and closure of HCFC-22 production facilities.

RECOMMENDATION

82. The Executive Committee may wish to:

- (a) Note the key aspects related to HFC-23 by-product control technologies (decision 82/85) contained in document UNEP/OzL.Pro/ExCom/83/44;
- (b) Consider any technical and financial assistance it wishes to provide to the Government of Argentina to allow for compliance with the HFC-23 by-product control obligations of the Kigali Amendment of the Montreal Protocol, and in light of the information contained in document UNEP/OzL.Pro/ExCom/83/44; and
- (c) Consider whether it wishes to provide policy guidance on the following issues related to HFC-23 by-product control projects:

- (i) Extent to which market demand and profitability of HCFC-22 production should determine expected future production of HCFC-22;
 - (ii) Basis for HCFC-22 production to be used in determining incremental operating costs;
 - (iii) Duration for which funding support to control HFC-23 by-product emissions is provided; and
 - (iv) The appropriate level of agency support costs.
-