



**United Nations
Environment
Programme**

Distr.
GENERAL

UNEP/OzL.Pro/ExCom/86/12/Rev.1
14 May 2021

ORIGINAL: ENGLISH



EXECUTIVE COMMITTEE OF
THE MULTILATERAL FUND FOR THE
IMPLEMENTATION OF THE MONTREAL PROTOCOL
Eighty-sixth Meeting
Montreal, 2-6 November 2020
Postponed to 8-12 March 2021¹

**TERMS OF REFERENCE FOR THE DESK STUDY FOR THE EVALUATION OF
DEMONSTRATION PROJECTS FOR LOW-GLOBAL-WARMING-POTENTIAL
ALTERNATIVES TO HCFCs**

Background

1. At its 55th meeting, the Executive Committee invited bilateral and implementing agencies to prepare and submit project proposals to the Secretariat for different HCFC uses so that the Committee could choose those projects that best demonstrated alternative technologies and facilitated the collection of accurate data on incremental capital cost and incremental operating costs or savings, as well as other data relevant to the application of the technologies (decision 55/43).
2. At its 72nd meeting, the Executive Committee considered document UNEP/OzL.Pro/ExCom/72/40, “Overview of approved HCFC demonstration projects and options for additional projects to demonstrate climate-friendly and energy-efficient alternative technologies to HCFCs (decision 71/51(a)).” One of the conclusions of the report was that “projects approved to date had been successful in facilitating the introduction of new low-global-warming-potential (GWP) technologies as alternatives in HCFC phase-out plans”.
3. Subsequent to a discussion,² the Executive Committee, *inter alia*, invited bilateral and implementing agencies (IAs) to continue to prepare and submit project proposals to the Secretariat that best demonstrate alternative technologies to replace HCFCs in various sectors and facilitate the collection of

¹ Due to coronavirus disease (COVID-19)

² Paragraphs 165 to 169 of document UNEP/OzL.Pro/ExCom/72/40

accurate data on incremental capital and operating costs, as well as other data relevant to the application of the technologies (decision 72/40).

4. Further to the adoption of decision 55/43, 36 demonstration projects have been approved in the following sectors: polyurethane (PU) foam (baseline technology: HCFC-141b); extruded polystyrene (XPS) foam (baseline technology: HCFC-22/HCFC-142b); air-conditioning (AC) (baseline technology: HCFC-22); industrial and commercial refrigeration (ICR) (baseline technology: HCFC-22); solvent (baseline technology: HCFC-141b); and refrigeration servicing. The list of demonstration projects is contained in Annex I of the present document.

5. At its 84th meeting, the Executive Committee approved the draft monitoring and evaluation work programme for 2020 (decision 84/11), which requested the Senior Monitoring and Evaluation Officer (SMEO) to prepare the terms of reference for the desk study for the evaluation of demonstration projects for low-GWP alternatives to HCFCs, to be presented to the 85th meeting.

6. In accordance with the agreed procedures for conducting the 85th and 86th meetings due to the COVID-19 pandemic, all the documents related to evaluation at the 85th meeting have been deferred to the 86th meeting.

Terms of reference for the desk study for the evaluation of demonstration projects for low-GWP alternatives to HCFCs

7. In line with decision 84/11, the SMEO has submitted to the 86th meeting, the terms of reference for the desk study for the evaluation of demonstration projects for low-GWP alternatives to HCFCs. The terms of reference encompass projects in all five sectors.

Objectives of the desk study

8. The desk study will focus on issues related to the design and implementation of the projects, as well as their results, their influence/impact in a wider adoption of the demonstrated technologies in the relevant sectors, and their sustainability and replicability. It will inquire whether the project design and the technologies adopted in the projects, could be applied to other projects with similar applications, whether it requires a specific regulatory framework and what were the main challenges encountered in both implementation and replicability of such projects. The desk study will also highlight the main lessons learned that could be applied to future technology demonstration activities associated to HFC phase-down.

9. The following aspects will be addressed:

Project objectives and design

10. What was the need for this project? How was it identified? What were the local, regional and international conditions in the sector that implied that such project could be implemented successfully and serve as an effective demonstration of the technology for other enterprises? How consistent were the project's objectives with the Executive Committee's decision?

11. What manufacturing line equipment redesign and installation, if any, were required for this project?

12. Were the set of activities selected during the project design conducive to complete the demonstration in a successful manner? What activities were unnecessary and which necessary activities were not included?

13. Was the time schedule allocated during project design sufficient to complete all the activities related to the demonstration? If not, how the implementation schedule could have been determined better?
14. Were there positive and/or negative results from the demonstration not envisaged during project design? Did the project have effects on broader policies and other enterprises to use new low-GWP alternatives?
15. How did the project design envisage outputs from the demonstration that could inform similar projects under the HCFC phase-out management plan (HPMP)? How was the project designed to ensure coordination with the HPMP phase-out activities?
16. How was the project designed to influence the HPMP's implementation? To what extent did the project influence the strategy determined and the technology selection in the HPMP?
17. How were the professional associations (e.g., foam, refrigeration and air-conditioning manufacturer associations) consulted in the project design phase and how were their inputs incorporated?
18. How did the project contribute to the country's overall compliance with the Montreal Protocol and the sustainable replacement of HCFCs-based technology by low-GWP alternatives technology?
19. What were the estimated impacts on direct greenhouse gas emission reductions and other environmental impacts identified during project design and how were these addressed during implementation?
20. What standards related to national and international energy efficiency were incorporated in the project design, if relevant?
21. How did the project design take into consideration gender mainstreaming elements? What indicators were identified to measure the integration of the gender policy?
22. In retrospect, what additional elements would need to be taken into consideration, when designing low-GWP technology demonstration projects in the future, to ensure their success and influence in the wider adoption of the selected technology?

Technology choice, adoption and implementation of conversion project

23. How were the criteria used to select the technology for the demonstration project selected (e.g., feasibility, availability, performance, operating cost, environment benefits and energy efficiency considerations, safety, market acceptability)? How was the cost-effectiveness assessed during technology selection?
24. What were the main technology related challenges faced in ensuring timely and effective completion of the demonstration projects, if any, (e.g., non-availability of equipment, components and materials poor-performance and need for optimization, manufacturing difficulties and need for training)? How were these challenges addressed?
25. Upon completion of the demonstration project, what were the main challenges faced to achieve a broader adoption of the selected low-GWP technology beyond the demonstration project? To what extent have those challenges been addressed through the HPMPs and the technology adopted in the country? Could any of these challenges been addressed through a different demonstration project design, or are these challenges beyond the scope of the demonstration project?

26. Once the technology was adopted by the beneficiary, how were the different aspects of the technology assessed (i.e., performance, safety, environmental impact, level of difficulty of application at manufacturing, usability at the end-user level)? Did the project include independent assessments and followed industry standard methodologies for these assessments?

27. If the conversion was implemented in a manufacturing facility, what new equipment were required to implement the conversion project? If existing equipment were retrofitted, how were the retrofits carried out (e.g., with in-house expertise, external technical experts)? Are there any measures taken to prevent retrofitting back to the previous (phased-out) technology?

28. If the conversion was not implemented in a manufacturing facility (e.g., design and technology development, service sector), what new equipment was provided for using the new technology? How were the new designs done for the new technology?

29. What are the main lessons and challenges faced by the choice of technology and its transition? What has been the overall value of the demonstration projects to the implementation of the HCFC phase-out and upcoming HFC phase-down?

30. If there were intellectual property (IP) rights aspects involved, what were they, if any, and how were these resolved? What actions were taken to ensure that the results of the project were widely available, considering IP concerns if applicable?

Policies and regulations

31. What were the changes needed, in the existing policies and regulation framework, to implement the project, if any? How long did it take to implement these changes? Have standards been introduced to facilitate the uptake of this technology, such as safety, energy efficiency or others?

32. What were the main policy and regulatory challenges faced in ensuring timely and effective completion of the demonstration project, if any? How were these challenges addressed?

33. What legal actions were planned/designed to ensure sustainability when replicating the demonstrated technology?

34. How did the changes in policies related to the project contribute to the broad uptake of the technology? What were the benefits of this project on policies to achieve a faster shift towards low-GWP technologies and to avoid additional emissions?

Institutional arrangements and management

35. Which were the institutions in charge with the management and coordination of the project? Were there changes in the management (i.e., structure and composition) during the project's life and how did this affect its implementation? What was the role of the national ozone units?

36. What were the mechanisms implemented to coordinate with key stakeholders relating to the project (e.g., industry associations, civil society, technical and standards authorities), and how was this achieved? If there were specialised new institutions that needed to be involved in the project, how was the outreach and coordination mechanisms established with these institutions (e.g., safety standards authorities, energy efficiency standards and testing authorities)?

37. What were the main institutional challenges faced in ensuring timely and effective completion of the demonstration project, if any? How were these challenges addressed?

Monitoring and evaluation/verification

38. What monitoring system was used to assess the project's achievements? How was the implementation of the project's milestones checked and who was involved in this process (e.g., external experts and Government employees)?

39. How was the project evaluated or verified, upon completion, against the intended targets?

40. How were the impacts of the project monitored (e.g., shift to a new technology at the national level, adoption of the technology in sector)?

Technical assistance and training

41. What were the technical assistance needs during implementation and how were they met (e.g., training of technical personnel, training of national experts, environmental and safety audits of the facilities)?

42. How were the training workshops planned and conducted? Where did the training take place? What indicators were used to measure success of the training conducted?

43. Did operators and technicians in the manufacturing plants converted or in charge of servicing equipment using the new technology, require a specific license or certification? How was it provided?

Financial aspects

44. Were the incremental capital and operating costs well estimated in the project design? Were there funding problems encountered during project implementation? Was funding for the demonstration project adequate? If not, what were the reasons for inadequate funding and the variances?

45. If there were differences between the planned and needed funding, what were the reasons for these differences? If none, describe how funding was determined to be sufficient. Were there components that were not adequately funded, and if so explain why? In cases where policies and regulations were needed in the country to introduce the demonstrated technology, did the project budget allocate funds for this activity?

46. What were the co-financing modalities considered, including details of specific components that were co-financed? What were the sources of co-financing along with the proportion of co-funded components (e.g., funding from non-Multilateral Fund sources, internal resources at enterprise)? If there was co-financing, what specific forms did it take (e.g., loans, concessional finance)?

47. What challenges were encountered in obtaining co-funding? How were these challenges addressed?

48. What were the financial incentives obtained from the Government for implementing the project, if any?

Communication and dissemination

49. What communication tools and platforms were used for disseminating the results of the project (e.g., information on availability and specific use characteristics of the new alternative; engineering design

of product and manufacturing process; product development and testing; consumer adoption of product and performance feedback; product release conferences including involvement of industry associations at national and regional level; environment impact of product adoption), to stakeholders at national and regional levels?

50. In cases where more than one enterprise was involved in the project (e.g., servicing sector), how was the project design and project implementation plan communicated to different stakeholders to secure their collaboration and ensure a smooth implementation?

51. What were the challenges encountered in communicating lessons learned from this experience?

52. Were the results of the communication efforts useful to influence policy making and to encourage adoption of demonstrated technologies and methodologies nationally, regionally and globally?

53. Was the designed communication strategy sufficient? Was it able to evolve in response to new information and ideas to reach new potential stakeholders and influence other enterprises? How were the results of the communication and dissemination activities measured?

Sustainability and replicability

54. Where the results obtained by the project aligned with the objectives?

55. How was the sustainability of the demonstration projects (i.e., adoption of the technology) and its achievements in the country/region taken into account in the project design?

56. What are the factors related to design and implementation of the project technology/processes that would result in replicability? Which aspects of the project that were expected to be replicated could not be replicated and why?

57. Were there solutions explored to use the enterprise's internal funding to ensure sustainability? Are there examples of replicability based on project results?

58. What impact did the project have on gender mainstreaming parameters and sustainability of gender mainstreaming in the sector/industry?

59. What were the benefits achieved through this project, in addition to the demonstration of the low-GWP technology (e.g., benefits to health sector, improvement in standards relating to specific technology)?

60. Were there follow-up mechanisms or incentives to track the sustainability of these projects? If so, how was it achieved?

Scope, methodology and schedule of submission

61. A consultant will be recruited to prepare the desk study. She or he will review the relevant documents (i.e., project proposals, progress and final reports, project completion reports, Executive Committee documents and verification reports) and, if needed, discuss with members of the Secretariat and the bilateral and IAs. Particular attention will be given to document UNEP/OzL.Pro/ExCom/72/40, with the aim of updating and/or revising the information contained therein including the observations and conclusions. The consultant will also consider the case studies from the demonstration projects and integrate

the lessons regarding the development, dissemination and evaluation of effectiveness of these case studies and their replicability in future demonstration project activities.

62. The desk study for the evaluation of the demonstration projects for low-GWP alternatives to HCFCs will be presented at the 88th meeting.³

RECOMMENDATION

63. The Executive Committee may wish to approve the terms of reference for the desk study for the evaluation of the demonstration projects on low-global-warming-potential alternatives to HCFCs, contained in document UNEP/OzL.Pro/ExCom/86/12/Rev.1.

³ Subject to the filling of the SMEO post.

Annex I

LIST OF DEMONSTRATION PROJECTS FOR LOW-GLOBAL-WARMING-POTENTIAL ALTERNATIVES TO HCFCs APPROVED SINCE THE 56TH MEETING

Project Number	Agency	Project Title
ASP/REF/69/DEM/56	UNEP	Promoting low-global-warming-potential refrigerants for air-conditioning sectors in high-ambient temperature countries in West Asia
ASP/REF/69/DEM/57	UNIDO	Promoting low-global-warming-potential refrigerants for air-conditioning sectors in high-ambient temperature countries in West Asia
ASP/REF/76/DEM/59	UNEP	Promoting alternative refrigerants in air-conditioning for high-ambient countries in West Asia (PRAHA-II)
ASP/REF/76/DEM/60	UNIDO	Promoting alternative refrigerants in air-conditioning for high-ambient countries in West Asia (PRAHA-II)
BRA/FOA/56/DEM/285	UNDP	Pilot project for validation of methyl formate as a blowing agent in the manufacture of polyurethane foam (phase I)
BRA/FOA/58/DEM/292	UNDP	Pilot project to validate methylal as blowing agent in the manufacture of polyurethane foams (phase I)
COL/FOA/60/DEM/75	Japan	Demonstration project to validate the use of super-critical CO ₂ in the manufacture of sprayed polyurethane rigid foam
COL/FOA/76/DEM/100	UNDP	Demonstration project to validate the use of hydrofluoro-olefins for discontinuous panels in Article 5 Parties through the development of cost-effective formulations
COL/REF/75/DEM/97	UNDP	Demonstration of HC-290 (propane) as an alternative refrigerant in commercial air-conditioning manufacturing at Industrias Thermotar Ltda.
COS/REF/76/DEM/55	UNDP	Demonstration of the application of an ammonia/carbon dioxide refrigeration system in replacement of HCFC-22 for the medium-sized producer and retail store of Premezclas Industriales S.A.
CPR/FOA/59/DEM/491	IBRD	Conversion demonstration from HCFC-141b-based to cyclopentane-based pre-blended polyol in the manufacture of rigid polyurethane foam at Guangdong Wanhua Rongwei Polyurethane Co. Ltd.
CPR/FOA/59/DEM/492	IBRD	Conversion of the foam part of Jiangsu Huaiyin Huihuang Solar Co. Ltd. from HCFC-141b to cyclopentane
CPR/FOA/64/DEM/507	UNDP	Demonstration project for conversion from HCFC-22/HCFC-142b technology to CO ₂ with methyl formate co-blowing technology in the manufacture of extruded polystyrene foam at Feininger (Nanjing) Energy Saving Technology Co. Ltd.
CPR/REF/60/DEM/498	UNDP	Demonstration project for conversion from HCFC-22 technology to HFC-32 technology in the manufacture of commercial air-source chillers/heat pumps at Tsinghua Tong Fang Artificial Environment Co. Ltd.
CPR/REF/60/DEM/499	UNDP	Demonstration project for conversion from HCFC-22 technology to ammonia/CO ₂ technology in the manufacture of two-stage refrigeration systems for cold storage and freezing applications at Yantai Moon Group Co. Ltd.
CPR/REF/61/DEM/502	UNIDO	Demonstration sub-project for conversion of room air-conditioning compressor manufacturing from HCFC-22 to propane at Guangdong Meizhi Co.
CPR/REF/61/DEM/503	UNIDO	Demonstration sub-project for conversion from HCFC-22 to propane at Midea Room Air-conditioning Manufacturing Company

Project Number	Agency	Project Title
CPR/REF/76/DEM/573	UNDP	Demonstration project for ammonia semi-hermetic frequency convertible screw refrigeration compression unit in the industrial and commercial refrigeration industry at Fujian Snowman Co. Ltd.
CPR/SOL/64/DEM/506	Japan	Demonstration project for conversion from HCFC-141b-based technology to iso-paraffin and siloxane (KC-6) technology for cleaning in the manufacture of medical devices at Zhejiang Kindly Medical Devices Co. Ltd.
CPR/SOL/64/DEM/511	UNDP	Demonstration project for conversion from HCFC-141b-based technology to iso-paraffin and siloxane (KC-6) technology for cleaning in the manufacture of medical devices at Zhejiang Kindly Medical Devices Co. Ltd.
EGY/FOA/58/DEM/100	UNDP	Validation/demonstration of low-cost options for the use of hydrocarbons as foaming agent in the manufacture of polyurethane foams
EGY/FOA/76/DEM/129	UNDP	Demonstration of low-cost options for the conversion to non-ODS technologies in polyurethane foams at very small users
EUR/REF/76/DEM/16	Russian Federation	Development of a regional centre of excellence for training and certification and demonstration of low-global-warming-potential alternative refrigerants
GLO/REF/76/DEM/333	UNIDO	Demonstration project on refrigerant quality, containment and introduction of low-global-warming-potential alternatives (Eastern Africa and Caribbean regions)
GLO/REF/76/DEM/334	UNEP	Demonstration project on refrigerant quality, containment and introduction of low-global-warming-potential alternatives (Eastern Africa and Caribbean regions)
GLO/REF/76/DEM/335	UNIDO	Demonstration project for the introduction of trans-critical CO ₂ refrigeration technology for supermarkets (Argentina and Tunisia)
KUW/REF/76/DEM/32	UNDP	Demonstration project for HCFC-free low-global-warming-potential technology performance in air-conditioning applications (capacity above 8TR)
MDV/REF/76/DEM/30	UNDP	Demonstration project for HCFC-free low-global-warming-potential alternatives in refrigeration in the fisheries sector
MEX/FOA/56/DEM/141	UNDP	Pilot project for validation of methyl formate in microcellular polyurethane applications (phase I)
MOR/FOA/75/DEM/74	UNIDO	Demonstration of the use of low cost pentane foaming technology for the conversion to non-ODS technologies in polyurethane foams at small- and medium-sized enterprises
SAU/FOA/76/DEM/27	UNIDO	Demonstration project for the phase-out of HCFCs by using HFO as foam blowing agent in the spray foam applications in high-ambient temperatures
SAU/REF/76/DEM/28	UNIDO	Demonstration project on promoting HFO-based low-global-warming-potential refrigerants for air-conditioning sector in high-ambient temperatures
SAU/REF/76/DEM/29	IBRD	Demonstration project at air-conditioning manufacturers to develop window and packaged air-conditioners using low-global-warming-potential refrigerants
SOA/FOA/76/DEM/09	UNIDO	Demonstration project on the technical and economic advantages of the vacuum assisted injection in discontinuous panels plant retrofitted from HCFC-141b to pentane
THA/FOA/76/DEM/168	IBRD	Demonstration project at foam system houses to formulate pre-blended polyol for spray polyurethane foam applications using low-global-warming-potential blowing agent

Project Number	Agency	Project Title
TUR/FOA/60/DEM/96	UNDP	Validation of the use of HFO-1234ze as blowing agent in the manufacture of extruded polystyrene foam boardstock (phase I)
