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EXECUTIVE COMMITTEE OF
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Item 11(d) of the provisional agenda¹

**UPDATE ON THE LOCAL INSTALLATION AND ASSEMBLY SUBSECTOR
(Decision 93/94(d))**

Introduction

1. At the 91st meeting, in considering the Kigali HFC implementation plan (KIP) for the Niger, the Executive Committee recognized that additional data on the subsector of local installation and assembly of refrigeration and air-conditioning (RAC) systems needed to be collected. This was because there appeared to be a significant level of HFC consumption in that sector in the Niger, although in the project proposal it was not identified separately from the consumption for servicing. Accordingly, the Committee requested the Secretariat to prepare a document, for consideration at the 92nd meeting, describing the subsector and identifying to the extent possible the types of equipment manufactured, and refrigerants used that characterized that subsector as well as the challenges in transitioning to alternatives with low global-warming potential (GWP) (decision 91/39(b)).

2. At the 92nd meeting, in considering document UNEP/OzL.Pro/ExCom/92/49 prepared by the Secretariat, the Executive Committee acknowledged that the subsector could play a key role in supporting the transition to low-GWP technologies but indicated that additional data was required and further discussion was needed *inter alia* on the need to increase the technical capacity of local assemblers, the sustainability of conversions in this subsector, the need to address critical supply-chain issues, the possibility of funding the subsector separately from the servicing sector and the associated risk of double-counting; and the role of end users and standards in ensuring the adoption of low-GWP technologies. As a result of the discussion, the Executive Committee decided *inter alia* (decision 92/39):

- (a) To invite Article 5 countries, through the bilateral and implementing agencies, to provide to the Secretariat, on a voluntary basis, by 20 September 2023, information on the local installation and assembly subsector;

¹ UNEP/OzL.Pro/ExCom/95/1

- (b) To request the Secretariat, taking into account the information provided by the Article 5 countries, to prepare for consideration by the Executive Committee at its 93rd meeting a paper containing information on the types of activities that Article 5 countries could undertake, on the nature of the assistance required and on supply-chain issues that needed to be resolved to address consumption in the local installation and assembly subsector in their KIPs; and
- (c) To consider projects in the local installation and assembly subsector in the context of KIPs on a case-by-case basis.

3. At the 93rd meeting, the Executive Committee discussed the issue regarding the assembly sector in the light of the document UNEP/OzL.Pro/ExCom/93/99 prepared by the Secretariat in response to decision 92/39(b). One member emphasized the importance of reaching out to end users through demonstration projects; the need for supportive regulations and incentives to address the challenges faced by end users; and the desirability of targeting high-priority subsectors where gains could more easily be achieved, such as supermarket refrigeration. Projects in the local installation and assembly subsector in the context of KIPs would be considered on a case-by-case basis in line with decision 92/39(d), and should aim to take a strategic approach, taking account of the suggested activities in document UNEP/OzL.Pro/ExCom/93/99. Other members noted the importance of collecting more information before agreeing to provide additional funding and said that a useful approach would be to take account of lessons learned and expertise gained, including from non-Article 5 countries. Consequently, the Executive Committee decided *inter alia* (decision 93/94):

- (a) To invite Article 5 countries, through the bilateral and implementing agencies or their KIPs, to continue providing to the Secretariat, on a voluntary basis, information on the local installation and assembly subsector;
- (b) To request the Secretariat to provide, at the 95th meeting, an update to document UNEP/OzL.Pro/ExCom/93/99, taking into account additional information provided by Article 5 countries on the local installation and assembly subsector; and
- (c) To encourage bilateral and implementing agencies and Article 5 countries, when developing projects in the local installation and assembly subsector under stage I of their KIPs, to ensure that such projects take a strategic approach to facilitate the sustained phase-down of HFCs in the applications being targeted by the project, taking into account the suggestions and activities proposed in document UNEP/OzL.Pro/ExCom/93/99.

4. In response to decision 93/94, the Secretariat prepared the present document based on additional information provided by Article 5 countries through their KIPs on the local installation and assembly subsector.

Updated information on the local installation and assembly subsector

5. As of 25 November 2024, countries had not submitted information on the local installation and assembly subsector through the implementing agencies in line with decision 93/93(c). However, several KIPs have included information on the subsector.

6. So far, a total of 40 KIPs have been approved between 91st and 94th meeting; and KIPs for 26 countries (14 national and one regional for the 12 Pacific Island Countries) have been submitted to the 95th meeting for consideration by the Executive Committee. Based on the information contained in these KIPs on the local installation and assembly subsector, the Secretariat conducted an analysis and summarized the results as presented below.

7. While it was expected that more information on this subsector would become available as Article 5 countries collected HFC consumption data during the preparation of their KIPs,² the information collected so far is limited.

8. Most of the KIPs submitted did not separate the consumption of HFCs associated with the local installation and assembly of RAC systems (first charge) from the refrigeration servicing sector, acknowledging that it was difficult to collect the data. However, 18 countries (27 per cent of countries that submitted KIPs) provided preliminary estimates of HFC consumption in the subsector, systems installed and types of applications. Several countries also indicated that they would undertake additional work during stage I of their KIPs to gain a better understanding of the subsector.

9. One country (Costa Rica) identified consumption in the local installation and assembly subsector but did not discriminate it from the RAC servicing sector use in the CP data as there is not a specific column for that subsector in the CP report format. Upon the Secretariat's suggestion, the Government revised the CP data to include the use of HFCs in this subsector under the column "others" and to specify the subsector in the remarks.

10. The HFC consumption in the local installation and assembly subsector varies widely, from 4.1 mt to 143.94 mt. This consumption, as a percentage of total HFC consumption in the RAC servicing sector, also fluctuates greatly from 1 per cent to 21 per cent. The Secretariat noted that the consumption in this subsector may change significantly with a country's economic development, as large development projects in building construction or the cold chain sector can create high demand for HFCs to charge newly installed RAC equipment in a single year, which may not be representative of long-term trends, especially in low-volume-consuming (LVC) countries.

11. Based on the preliminary information provided in the 18 KIPs, the subsector consumes mainly HFC-134a, R-404A, R-507A used for charging medium- and low-temperature commercial and industrial refrigeration equipment, such as condensing units and centralized systems; and to a lesser extent, R-410A, R-407C and HFC-32 used for charging large stationary AC systems (split AC, VRF systems, ducted system and packaged rooftops) and chillers. Some of these systems also use HCFC-22. These systems are installed in supermarkets, retail stores, hotels, and cold rooms for storage and processing of food, beverage, medical and agriculture products. Pre-charged stand-alone equipment are excluded from the subsector.

12. While many of the 18 KIPs could estimate HFC consumption and main applications, it was difficult to provide exact number of RAC systems that were assembled and installed. Three countries (Albania, Montenegro and North Macedonia) provided detailed information on the number of RAC systems that were assembled and installed in the country, the substances used and the enterprises operating in the subsector. However, stage I of these KIPs did not include specific activities for the subsector. Instead, the KIPs included support for sectoral studies on the consumption and HFC uses for sectors other than RAC servicing, including the local installation and assembling subsector to better understand it and explore options to phase out HFCs.

13. Several countries found it difficult to have a clear distinction between the local installation and assembly subsector and the RAC servicing sector. Moreover, for different applications, there could be different ways in which equipment is assembled. For example, in Türkiye, the installation and assembly of equipment in the food retail and commercial refrigeration subsector is usually performed by general servicing enterprises, while large-capacity industrial refrigeration systems are installed by dedicated

² Decision 91/39(a) encouraged Article 5 countries and implementing agencies, in the context of HFC surveys conducted during the preparation of KIPs, to collect information on and provide estimates of any HFC consumption in the local installation and assembly subsector, when it was possible to do so and on a voluntary basis.

departments or servicing representatives of equipment manufacturers. Commercial AC systems and process chillers are assembled by the manufacturers' installation departments or servicing representatives.

14. Although most KIPs acknowledged the existence of local enterprises assembling, installing and charging equipment at end-users premises, only 10 KIPs provided an estimation of the number of enterprises in the subsector: Plurinational State of Bolivia (3), Burkina Faso (26), Colombia (7), Costa Rica (14), Ecuador (at least one), Kyrgyzstan (9), Mexico (18 were identified in stage I but indication was provided that there are more enterprises working in the subsector), Montenegro (5), North Macedonia (15), and Viet Nam (more than 500). Some of these countries indicated that the estimation on the number of enterprises was preliminary and they expected to identify additional enterprises during stage I. In addition, three KIPs (Plurinational State of Bolivia, the Gambia, Lao's People Democratic Republic (the)) indicated that enterprises installing large refrigerated systems are primarily contracted technicians from overseas through local representation in the country, and more specialized refrigeration equipment are installed directly by equipment manufacturers or importers.

15. The KIP of Honduras includes an assessment of the installed inventory of condensing units and centralized systems and the market penetration of low-GWP technologies in these subsectors to establish an energy consumption baseline and to disseminate information on low-GWP technologies and energy-efficiency improvement opportunities among large end users. The Secretariat noted that registering large end-users and their equipment will enhance data collection, providing deeper insights into HFC consumed and equipment used in the subsector. This process will also assist in identifying end-users and installers, so that further intervention can be designed to phase down HFCs by the subsector.

Updated information on projects in the local installation and assembly subsector so far approved or submitted for consideration at the present meeting

16. The following KIPs submitted to the 93rd meeting identified specific enterprises operating in the subsector and proposed concrete activities to assist the subsector:

- (a) The KIP of Mexico identified enterprises operating in the subsector including their main operations and provided clear discrimination between identified RAC systems in the country pre-charged by original equipment manufacturers (i.e., domestic fridges, commercial stand-alone units, split AC units, rooftop packaged AC) and those charged onsite (i.e., condensing units and evaporators for refrigeration, centralized systems, and variable refrigeration flow (VRF) AC systems). The KIP for Mexico³ included a component for eight enterprises in the local installation and assembly subsector, consisting of technical assistance in design and optimisation of RAC systems using low-GWP alternatives, and provision of a refrigerant handling package for eight local installation and assembly enterprises combined with demonstrations of the installation at end users' sites of eight centralized systems, chillers, VRF systems, and cold rooms using several technologies (e.g., carbon dioxide (CO₂), ammonia (NH₃), R-290, NH₃/CO₂ cascade system, R-290/CO₂ cascade system, HFO, and HFC-32). All these activities were integrated as part of the activities for the refrigeration servicing sector, within the same cost-effectiveness threshold applied for the sector (US \$5.10/kg); and
- (b) The KIP for Viet Nam⁴ identified more than 500 contractors employing five to ten technicians across the country installing, maintaining and repairing industrial and large commercial refrigeration systems include cold storage and food processing equipment. The approved KIP included assistance for addressing the consumption in the subsector, including the conversion of one component manufacturing enterprise to NH₃, and support

³ UNEP/OzL.Pro/ExCom/93/70

⁴ UNEP/OzL.Pro/ExCom/93/93

for 11 contractors to enable proper design and installation of ammonia industrial refrigeration systems through an end-user incentive component for contractors to promote installation of ammonia-based refrigeration systems at the project owners' facilities (US \$25,000 per enterprise). The project component plans to phase out 35.06 mt HFCs (28.67 mt of R-404A and 6.39 mt of R-507A) plus an additional 53.92 mt of HFCs at a cost effectiveness of US \$6.91/kg.

17. The KIPs of Colombia and Costa Rica submitted to the 95th meeting identified specific enterprises operating in the subsector and proposed concrete activities to assist the subsector, as explained below.

Colombia

18. The KIP for Colombia⁵ included a project for seven assembly enterprises, who lead the supply of condensing units and centralised and distributed refrigeration systems for supermarkets. The main refrigerant used are R-404A and R-507A by these enterprises.

19. This subproject aims to strengthen those enterprises by providing them with tools and technical assistance. The proposed project would phase out an estimated 78 mt of HFC and replace that consumption with R-290 for refrigeration systems under 50 kW and CO₂ for systems above 50 kW.

20. As per detailed discussion between the Secretariat and UNDP, it was agreed that it would be meaningful to provide assistance to these enterprises to enable them to develop and install prototype refrigeration systems at a limited number of supermarkets, monitor the performance and energy efficiency and the disseminate the results to highlight the benefits of R-290 and CO₂ based systems. Thus, the agreed subproject included equipment/tools provision to seven enterprises for handling flammable refrigerant, technical assistance (TA), including TA for development and installation of ten prototype refrigeration systems (seven R-290 cold rooms and three CO₂ based cooling districts), training and awareness.

Costa Rica

21. The KIP for Costa Rica⁶ included a project to phase-out the consumption of 16 mt of R-404A and R-507A by 14 local assembly and installation enterprises. These enterprises are associated with a commercial refrigeration manufacturing enterprise (Omega, also being assisted to phase out the manufacturing of smaller equipment). The enterprises carry out assembly, installation and first charge (onsite) of commercial refrigeration systems operating at medium and low temperature.

22. The project included at the enterprise level provision of tools suitable for use with flammable refrigerant⁷ and technical assistance for the design, engineering, assembly and installation of three types of equipment⁸ following relevant international and regional standards. The project also included the demonstration at an end user site of the assembly, installation and operation of the three prototype R-290-based refrigeration equipment designed, and measurement of performance and energy consumption. At the sectoral level, the project included support for the revision of relevant standards for the installation and operation of the equipment designed, and training to the subsector on handling the technology.

23. The Secretariat noted that project design considered suggestions and activities proposed in document UNEP/OzL.Pro/ExCom/93/99 and included assistance at different levels in the sector to facilitate HFC phase-down in the targeted applications. Regarding sustainability, as there were more enterprises in

⁵ UNEP/OzL.Pro/ExCom/95/48

⁶ UNEP/OzL.Pro/ExCom/95/50

⁷ As agreed: A3 recovery unit, cylinders, manifolds, leak detectors, lockring, and equipment to measure performance

⁸ R-290-based stand-alone units of dimensions 2.50 or 3.75 meters long and refrigeration capacity between 2 and 5 HP; one remote unit (R-290-based chiller); and R-290-based refrigeration system for cold rooms with capacity below 5 HP.

the subsector in the country, the implementing agency indicated that additional efforts were still required on building the local capacity of installers and technicians to handle flammable technologies before banning or controlling the manufacture of cold rooms with HFCs. Stage I of the KIP is expected to help identify key aspects of this transition and then establish policies to restrict and prohibit the use of HFCs in this activity.

Secretariat's observations

24. Based on the analysis of information available in 18 KIPs and the activities submitted so far, the following observations are made:

- (a) Many countries still face challenges in clearly defining this subsector and collecting relevant data on HFC consumption, covered applications, and the types of enterprises involved. The Secretariat highlights the importance of bilateral and implementing agencies continuing to provide technical assistance to help countries better understand this subsector and establish systems for effective data collection;
- (b) Once the consumption in the local installation and assembly subsector is identified, it is essential to report it consistently, especially for those countries that are considering a specific activity for this subsector. Currently, under the CP data report, countries categorize this use under servicing, manufacturing, or other. Given that the CP data report lacks a dedicated column for this subsector, and it would be premature to consider modifying the report format, the Secretariat encourages countries to report such consumption under "other" and specify the subsector in the remarks column, to ensure clarity and avoid potential double counting;
- (c) Many countries lack information on the types of equipment assembled domestically and charged onsite, the types of enterprises providing that service, and the HFOs consumed in this subsector. As a suggestion to help start addressing this gap, countries could consider adapting existing technicians' registry systems to also include enterprises in this subsector and regularly gather relevant data;
- (d) As observed in the previous analysis⁹ and the projects submitted so far, given the large variety of RAC applications in the local installation and assembly subsector, it would be not possible for Article 5 countries to address the entire subsector at the same time. Countries may consider targeting the assistance to specific RAC applications and technologies at different stages of the HFC phase-down, prioritizing those where the transition to a low-GWP technology is easier. Additional efforts are required to establishing ways to address the need for ensuring sustainability of HFC phase-down in this subsector; and
- (e) Ideally, a comprehensive policy addressing HFC phase-down in this subsector, along with measures to ensure sustainability, would be developed. However, the lack of concrete data, reliable methods to measure impact, and mechanisms for monitoring sustainability still pose significant challenges. Hence, continuing consideration of projects on a case-by-case basis is recommended to compile additional data and understanding of the subsector and its potential contribution to the HFC phase-down.

⁹ UNEP/OzL.Pro/ExCom/93/99

Recommendation

25. The Executive Committee may wish:

- (a) To note document UNEP/OzL.Pro/ExCom/95/89 containing an update on the local installation and assembly subsector;
 - (b) To continue considering projects in the local installation and assembly subsector in the context of Kigali HFC implementation plans (KIPs) on a case-by-case basis, in line with decisions 92/39(d) and 93/94(e); and
 - (c) To request the Secretariat to continue collecting information on the local installation and assembly subsector provided by Article 5 countries in their KIPs submitted for consideration by the Executive Committee, and to provide at the 98th meeting, an update to the document referred to in subparagraph (a) above.
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