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TYPE III – OTHER PROJECT TYPES

Project participants shall take into account the general guidance to the methodologies, information on additionality, abbreviations and general guidance on leakage provided at <http://cdm.unfccc.int/methodologies/SSCmethodologies/approved.html>.

III.AB. Avoidance of HFC emissions in Standalone Commercial Refrigeration Cabinets

Technology/measure

1. This category comprises of activities resulting in the avoidance of hydro-fluro-carbon (HFC 134a) emissions during the life cycle of commercial standalone refrigeration equipment[1] (0.2kg < HFC usage < 6kg)[2] such as freezer ice cream cabinets used in storage and vending of ice cream. The fugitive emissions during manufacture, usage, servicing and disposal of refrigeration cabinets are included. Cabinets in the project case utilise refrigerants and foam blowing agents having no ozone depleting potential (ODP) and low global warming potential (GWP).

2. The technology/measure is the introduction of new refrigeration cabinets using low GWP refrigerants. The cabinets introduced by the project activity are equally efficient or more energy efficient[3] than the cabinets that would have been used in the absence of project activity[4]. Retrofit of HFC 134a cabinets to use alternative low GWP refrigerants is not eligible under this category. Measures are limited to those that result in emission reductions of less than or equal to 60 kt CO_2 equivalent annually.

3. The project proponent, involved in the project activity, has been producing or managing commercial refrigeration cabinets charged with HFC-134a or other refrigerant with a high GWP, for at least three years and has not been using refrigerants with a low GWP prior to the start of the project activity in significant quantities[5]. The management practice of the project proponent does not include any recover and reuse of HFC-134a or other refrigerant with high GWP during servicing/maintenance or at final decommissioning and disposal of cabinets at the end of their lifetime.

4. In case of cabinets manufactured in another country, and imported to the host country, the emissions due to the manufacturing cannot be claimed. The imported cabinets can only be considered as entering the project boundary by their commissioning in an in country user site.

[1] Condensing units and centralised systems are not eligible under this methodology.

[2] Table 7.9: Estimates for Charge, Lifetime and Emission Factors for Refrigeration and Air-conditioning Systems; 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

[3] Only avoided direct emissions of refrigerants is currently included in this methodology, project proponents are encouraged to submit a request for revision of the methodology in accordance with the procedures where the project activity includes an additional component involving emission reductions due to increased energy efficiency of the cabinets resulting in electricity savings.

[4] This should be demonstrated by showing that the thermodynamic properties of the low GWP refrigerant allow for a higher efficiency of refrigeration appliances compared to the refrigerant that was used prior to the start of the project activity. This should be documented through relevant, preferably peer-reviewed literatures.

[5] e.g., <5% of total annual refrigerant usage in the baseline

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III.x. Avoidance of HFC emissions in Standalone Commercial Refrigeration Cabinets (cont)

5. Only one low GWP refrigerant is used in manufacturing and servicing of refrigeration cabinets during any year of the crediting period of the project activity.

6. To avoid double counting of the emission reductions, the DOE performing validation of the project activity shall confirm in the validation report that no other project activity, involving the same cabinet models as proposed project activity, has been registered as a CDM project activity, submitted for registration or uploaded for public comments.

Boundary

7. The project boundary includes:

(a) Manufacturing Boundary (MB): the site where the refrigeration cabinet is manufactured and the refrigerant gas is charged, if this site is within the host country;

(b) Usage Boundary (UB): the sites where each refrigeration cabinet is in service during its lifetime;

(c) Servicing Boundary (SB): the site(s) where the refrigeration cabinets undergo servicing/maintenance, in the case of malfunction caused by refrigerant leakage or compressor failure;

(d) Disposal Boundary (DB): the site where the refrigeration cabinets are decommissioned, disassembled and disposed at the end of the life of the product.

Baseline

8. The baseline emissions are calculated as the summation of the following:

(a) Emissions during manufacturing, where applicable. These emissions are calculated as the quantity of HFC refrigerant emitted to the atmosphere during initial charging of the refrigeration cabinets in the manufacturing site;

(b) HFC emission during usage and servicing. These fugitive emissions would occur during the usage of the freezer ice cream cabinets including emissions during the servicing of the cabinets;

(c) HFC emission during disposal of refrigeration cabinets; these emissions would occur during the disposal of the refrigeration cabinet at the end of useful life of the cabinet.

$$BE_y = BE_{MB,y} + BE_{SB,y} + BE_{DB,y} \quad (1)$$

Where:

BE_y Baseline emissions in year y [tCO_2e]

$BE_{MB,y}$ Baseline emissions for the cabinets entering the manufacturing boundary within the year *y* [tCO_2e]

$BE_{SB,y}$ Baseline emissions for the cabinets entering the servicing boundary within the year *y* [tCO_2e]

$BE_{DB,y}$ Baseline emissions for the cabinets entering the disposal boundary within the year *y* [tCO_2e]

9. Baseline emissions in the manufacturing boundary are estimated as below:

$$BE_{MB,y} = \sum_i R_i * EF_{MB} * N_{MB,i,y} * GWP_{HFC} * 1/1000 \quad (2)$$

Where:

i Index for refrigerant cabinet types

R_i Nameplate initial charge of refrigerant of the refrigeration cabinet type *i* as per manufacturer's specifications [kg]

EF_{MB} Fugitive emission of refrigerant which occur during the manufacturing of refrigeration cabinets expressed as a fraction of initial charge. In the absence of country (region) or project specific data, default values in Chapter 7: Emissions of fluorinated substitutes for Ozone depleting substances, Volume 3, Industrial Processes and Product Use, 2006 IPCC Guidelines for National Greenhouse Gas Inventories may be used

$N_{MB,i,y}$ Number of refrigeration cabinets of the type *i* entering the manufacturing boundary in the year *y*

GWP_{HFC} Global Warming Potential of HFC 134a

1/1000 Factor to convert kg to t

10. Baseline emissions in the servicing boundary is estimated as below:

$$BE_{SB,y} = \sum_i R_i * EF_{SB} * N_{SB,i,y} * GWP_{HFC} * 1/1000 \quad (3)$$

Where:

EF_{SB} Fugitive emission factor of HFC during servicing of refrigeration cabinets expressed as a fraction of initial charge. In the absence of country (region) or project specific data default values in Chapter 7: Emissions of fluorinated substitutes for Ozone depleting substances, Volume 3, Industrial Processes and Product Use, 2006 IPCC Guidelines for National Greenhouse Gas Inventories may be used

$N_{SB,i,y}$ Number of refrigeration cabinets type *i* serviced/repaired during year *y*

11. Baseline emissions during disposal boundary is estimated as below:

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$$BE_{DB,y} = \sum_i R_i * EF_{DB} * N_{DB,i,y} * GWP_{HFC} * 1/1000 \quad (4)$$

Where:

EF_{DB} Fugitive emission factor of HFC during disposal of refrigeration cabinets [fraction]. In the absence of country (region) or project specific data default values in Chapter 7: Emissions of fluorinated substitutes for Ozone depleting substances, Volume 3, Industrial Processes and Product Use, 2006 IPCC Guidelines for National Greenhouse Gas Inventories may be used.

$N_{DB,i,y}$ Number of refrigeration cabinets type *i* entering the disposal boundary during year *y*

12. IPCC default values for emission coefficients may be used in the absence of country specific or project specific data. Any project specific data shall be conservative values estimated in accordance with the tier 2(a) emission factor or 2(b) mass-balance approach specified under Chapter 7 of 2006 IPCC Guidelines for National Greenhouse Gas Inventories. When using project specific data, any significant difference (more than + 10%) between project data and default values in 2006 IPCC guidelines shall be substantiated including supporting data and evidences.

Leakage

13. If equipment is transferred from another activity leakage is to be considered under this methodology.

Project activity emissions

14. Project fugitive emission of Low GWP refrigerant for the standalone refrigeration cabinets are calculated as the summation of the following:

$$PE_y = PE_{MB,y} + PE_{SB,y} + PE_{DB,y} \quad (5)$$

Where:

PE_y Project emissions in year *y* [tCO_2e]

$PE_{MB,y}$ Project emissions for the cabinets entering the manufacturing boundary within the year *y* [tCO_2e]

$PE_{SB.y}$ Project emissions for the cabinets entering the servicing boundary within the year *y* [tCO_2e]

$PE_{DB.y}$ Project emissions for the cabinets entering the disposal boundary within the year *y* [tCO_2e]

15. Project emissions in the manufacturing boundary are estimated as below:

$$PE_{MB,y} = \sum_i R_i * EF_{MB} * N_{MB,i,y} * GWP_{HC} * 1/1000 \quad (6)$$

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Where:

GWP_{HC} Global Warming Potential of low GWP refrigerant in the project refrigeration cabinets

16. Project emissions in the servicing boundary are estimated as below:

$$PE_{SB,y} = \sum_i R_i * EF_{SB} * N_{SB,i,y} * GWP_{HC} * 1/1000 \quad (7)$$

17. Project emissions during lifetime and disposal of refrigerant cabinets are estimated as below:

$$PE_{DB,y} = \sum_i R_i * EF_{DB} * N_{DB,i,y} * GWP_{HC} * 1/1000 \quad (8)$$

Monitoring

18. Emission reductions in each year of the crediting period (ER_y) are calculated as the difference between baseline emissions and project activity emissions and leakage.

$$ER_y = BE_y - PE_y - LE_y \quad (9)$$

19. *Ex ante* estimation of the emission reduction will be presented in the PDD based on the estimated number of newly introduced refrigeration cabinets, the expected number of servicing works and of the number of cabinets undergoing decommissioning and disposal in each year *y*. IPCC default values for charge, lifetime and emission factors may be used in the absence of country specific or project specific data. If project parameters are less conservative than the IPCC default values, proper justification shall be given in the PDD.

20. Monitoring shall include:

(a) Number of refrigeration cabinets of the type *i* entering the manufacturing boundary in the year *y* ($N_{MB,i,y}$);

(b) Number of refrigeration cabinets of the type *i* entering the usage boundary in the year *y* ($N_{UB,i,y}$). This boundary encompasses the cabinets manufactured within the host country and included in the manufacturing boundary ($N_{MB,i,y}$), plus the cabinets manufactured abroad that entered the usage boundary in the year *y*;

(c) Number of refrigeration cabinets of the type *i* serviced in the year *y* ($N_{SB,i,y}$), in case of malfunction caused by refrigerant leakage or compressor failure;

(d) Number of refrigeration cabinets of the type *i* decommissioned and disposed at the end of their lifetime in year *y* ($N_{DB,i,y}$).

21. Other key variables monitored are:

(a) The refrigerant charge for each model;

(b) The amount of refrigerant procured in cylinders for refilling of the cabinets. The amount of refrigerant used for the servicing of the cabinets should be tallied with the amount of refrigerant procured for refilling. This is done on the basis of mass balance approach of IPCC 2006 chapter 7 such that:

Amount of refrigerant procured in a specific year $y = \sum_i R_i * EF_{SB} * N_{SB,i,y}$.

22. A project database shall record the following:

(a) Number of units of each model of cabinets procured and put into service, including the date of commissioning, place of operation, individual and uniquely generated log. Any change in location and servicing performed will be recorded in the database;

(b) Refrigerant charge for each model: fixed quantity based on the name plate capacity (range is from 0.2 kg < R_i < 6 kg for each standalone commercial unit);

(c) Supporting documents for the procurement of the total amount of refrigerant annually at the servicing and refilling units. This database is also manually maintained;

(d) Number of refrigeration cabinets for servicing: The total number of cabinets for a particular year which undergo compressor repair, refilling and/or overhauling/ servicing;

(e) Number of Rejected/disposed units for each model.

23. During the validation or verification DOE shall check on site a random sample of the cabinets in each boundary: manufacturing, in use, servicing, and disposal. During this verification, a hydrocarbon detector will be used to verify the gas used as a low GWP refrigerant.

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History of the document

Version	Date	Nature of revision
01	EB 47, Annex 18 28 May 2009	Initial adoption.