TYPE III - OTHER PROJECT ACTIVITIES

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.S. Introduction of low-emission vehicles to commercial vehicle fleets

Technology/measure

1. This methodology is for project activities introducing low-greenhouse gas emitting vehicles for commercial passenger and freight transport, operating on a number of identified fixed routes.

2. Types of low-emission vehicles to be introduced[1] include:

- Compressed natural gas (CNG) vehicles;
- Electric vehicles;
- Liquid petroleum gas (LPG) vehicles;
- Hybrid vehicles with electrical and internal combustion motive systems.

3. This category is only applicable to project activities involving the replacement of entire vehicles.

4. Types of vehicles covered by the methodology include:

- Busses (public transport);
- Trucks (freight transport).

5. Project participants must demonstrate that:

- The project activity is unlikely to change the level of service provided on each route before the project activity.[2]
- There is no significant change in tariff discernible from their natural trend, which could lead to change in patterns of vehicle use;
- The project activity does not include measures to bring about a modal switch (e.g. shift from bus transport to underground train system) in transport.

6. Project participants shall identify the following parameters:

- The fixed routes along which the vehicles operate;

[1] Project activities involving the use of biofuels and other renewable sources shall apply a corresponding type I category.

[2] E.g. by showing that the frequency of operations is not decreased by the project activity, the characteristics of the travel route - distance, start and end points and the route itself and /or that the capacity introduced by the project activity is sufficient to service the level of passenger/freight transport previously provided.

- The distances and characteristics of those routes;
- The level of service on each route, for example the average/total number of passengers or tonnage transported and the average distance the passengers or freight was transported on that route on an annual basis;
- The vehicles that are in use on that each fixed route before and after project implementation.

7. Measures are limited to those that result in emission reductions of less than or equal to 60 kt CO_2 equivalent annually.

Boundary

8. The project boundary includes the following:

- Fleet to which low emission vehicles are introduced;
- The geographical area covering the fixed physical route along which these vehicles operate (start to end point);
- Auxiliary facilities such as fuelling stations and workshops and service stations that are visited by the vehicles in the feet.

The conditions which govern the operation of the fleet (e.g. tariffs, regulations) should be homogeneous within the project boundary.

Baseline

9. The first step to determine the baseline emissions is to calculate a baseline emission factor per passenger or per tonne of goods per kilometre for the baseline vehicle (BEFi). The baseline emission factor is determined by dividing the emissions from the total annual distance travelled by each baseline vehicle before the project begins (Di) by the total annual passengers or volume of goods transported by each baseline vehicle (P i) times the annual average distance of transportation per person or tonne before the project begins.

$$BEF_i = \frac{\sum_j \sum_I D_i * \eta_{BLV\,i} * NCV_j * EF_{CO2,j}}{P_i * dp_i} \quad \textbf{(1)}$$

Where:

BEF_i	Baseline emission factor per passenger or ton of goods per kilometre for the baseline vehicle i (tCO_2/passenger km or tCO_2/ton km)
P_i	Total annual passengers or tons of goods transported by each baseline vehicle *i* (passengers or tons)
dp_i	The annual average distance of transportation per person or tonne of freight by each baseline vehicle *i* (km)
D_i	Total annual distance travelled by each baseline vehicle *i* (km)
η_{BLVi}	Fuel efficiency of baseline vehicle i (qty of fuel/km, See paragraph 13)

NCV_j	Net calorific value of fuel *j* (MJ/Unit qty of fuel)
$EF_{CO2,j}$	CO_2 emission factor of fuel used by baseline vehicle (tCO_2/MJ). Any biofuel component of the baseline fuel should be taken into account accordingly using zero as its emissions factor

10. In the baseline calculations the remaining lifetime of the vehicles replaced shall be taken into account in accordance to the guidance provided by the Board (EB 22 annex 2).

11. If electricity is used by the vehicles, the associated emissions shall be estimated in accordance with paragraphs of category AMS I.D.

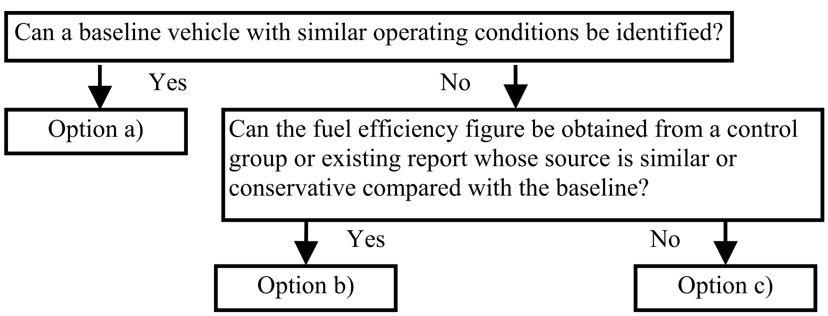
12. The total baseline emissions are calculated on an annual basis using the monitored data as below.

$$BEy = \Sigma P_{i,y,k} * BEF_i * dp_{i,y} \quad \textbf{(2)}$$

Where:

$P_{i,y,k}$	Total annual passengers or tons of goods transported by each project vehicle i in year y on route k taking into account provisions of paragraph 22
BE_y	Total baseline emissions in year *y* (tCO2/yr)
$dp_{i,y}$	Annual average distance of transportation per passenger or tonne of goods by project vehicle "i" in year "y" (km) taking into account the provisions of paragraph 22

13. The baseline vehicle fuel efficiency (η_{BLV}) is determined as follows (in order of preference):



(a) When a specific baseline vehicle can be identified, i.e. a vehicle used along the same route and therefore with similar operating conditions and this vehicle will not be replaced over the life of the project, the following applies: η_{BLV} is determined from average operational data of the vehicle under baseline operating conditions, using at least one year of operational data, if that data is available. Otherwise data on fuel efficiency can be obtained from manufacturer's specification, if it can be demonstrated that the value is conservative given the operating conditions of the baseline vehicles.

Such cases may include the situations where the project activity is the introduction of new vehicles, and the baseline vehicle is also new and of the same capacity.

(b) If no specific baseline vehicle can be identified or appropriate operational data is not available, then fuel efficiency should be obtained through a statistically significant control group or existing statistics. Such group or the source of data must have similar or conservative characteristics with respect to vehicle age (equal or newer), traffic conditions (equal or better), and air conditioning. The choice of such control group will be, in descending order:

- Fleet of the same company operating simultaneously with the project activity;
- Fleet of company with similar operations operating simultaneously with the project activity;
- Host country statistics;
- IPCC or other international data.

Under this option fuel efficiency is monitored throughout the project crediting period thus gradual efficiency improvements of the fleet or gradual deterioration of driving conditions would automatically be incorporated into the project efficiency levels.

(c) Other cases. Where neither option a) or b) is not feasible then baseline fuel efficiency is determined by using the fuel efficiency of top 20% of the fleet before project activity, as determined according to travel distance of each vehicle for the previous three years. If no data exists for the time period, a shorter period can be chosen, with a minimum period of one year.

Note that under all options a) till c), if the identified baseline vehicle does not have air conditioning then the data used should also be from vehicles without air conditioning.

Project Activity Emissions

14. Project emissions are determined by monitoring the consumption of fuel or energy consumed by the vehicles introduced, according to the following formula:

$$PE_y = \sum_j \sum_i FC_{i,j,y} * NCV_j * EF_{CO2,j} \qquad \textbf{(3)}$$

Where:

PE_y: Total project emissions in year y (tCO_2/yr)

$FC_{i,j,y}$: Consumption of fuel j by vehicle i in year y (quantity of fuel)

NCV_j: Net calorific value of fuel j (as obtained by country specific data or IPCC default value).

$EF_{CO2,j}$: CO_2 emission factor of fuel used by baseline vehicle (tCO_2/energy content of fuel, country specific data or IPCC default value). Any biofuel component of the baseline fuel should be taken into account accordingly using zero as its emissions factor.

15. For electric vehicles, the emissions from the production of electricity used will constitute the project emissions. This will be determined in accordance with the relevant sections of category AMS I.D.

16. For hybrid vehicles that can run on fossil fuels and electricity, the emissions resulting from the fossil fuel use should also be included in the direct emissions, in addition to emissions from electricity used.

17. Project activities that switch to LPG or CNG should calculate project emissions in accordance with ACM0009 to take into account increased methane emissions from these fuels (both direct combustion emissions and upstream emissions associated with the production of the fuel).

18. In the case where electric vehicles consuming grid electricity are introduced project activity emissions are calculated as follows:

$$PE_y = \sum_j \sum_i EC_{i,y} * NCV_j * EF_{elec} \qquad \textbf{(4)}$$

Where:

PE_y	Total project emissions in year y (tCO2/yr)
$EC_{i,y}$	Consumption of electricity by vehicle i in year y
EF_{elec}	CO_2 emission factor of electricity, as determined as per the methods of AMS I-D.

19. In project activities where the project vehicles have air conditioning whereas the baseline vehicles do not, then leakage of HFC shall be taken into account. If data is available this should be calculated for the specific AC units and operating conditions of the vehicles in questions. Otherwise a default value of 400 kg of CO_2e/year should be used for each vehicle.

Leakage

20. No leakage calculation is required.

Monitoring

21. The following shall be monitored:

Abbr.	Item, unit	Monitoring method / item
$DT_{PJ,i,y,k}$	Total distance travelled by vehicle i in year y on route k (km/yr)	Driver logs and route maps, confirmed by odometer reading.
η_{BLVi}	Efficiency of baseline vehicle (km/quantify of fuel)	As detailed in paragraph 13
$FC_{i,j,y}$ $EC_{i,y}$	Consumption of fuel j (or electricity) by vehicle i in year y (quantity of fuel or electricity consumed)	Purchase or consumption records, whose higher value is taken to ensure conservativeness.
NCV_j	Net calorific value of fuel j (energy content of fuel / quantity of fuel).	Country specific data or IPCC default value.
$EF_{CO2,j}$ EF_{elec}	CO_2 emission factor of fuel or electricity used by baseline vehicle	Country specific data or IPCC default value.

Abbr.	Item, unit	Monitoring method / item
	(tCO_2/ energy content of fuel). If biofuel is used as a baseline fuel, it should be taken into account accordingly using zero as its emissions factor.	
P_i	Total annual passengers or goods transported by each baseline vehicle	Monitored data before project begins.
$P_{i,y,k}$	Total annual passengers or goods transported by each project vehicle in year y on route k	Monitored data during the project e.g. driver logs and route maps, plus sales receipts
D_i	Total annual distance travelled by each baseline vehicle	Monitored data before project begins.
dp_i	Annual average distance of transportation per person or tonne of freight by each baseline vehicle *i*	Monitored through company records
$dp_{i,y}$	Annual average distance of transportation per person or tonne of freight by each project vehicle *i*	Monitored through company records
$D_{k,y}$	Distance of route *k* in year *y*.	Monitored through company records
$SL_{k,y}$	Service level in terms of total passengers or volume of goods on route *k* in year *y*.	Monitored for each route, from company records, e.g. driver logs and route maps, plus sales receipts.
$SL_{BL,k}$	Service level in terms of total passengers or volume of goods carried on route k before the beginning of project.	Determined from company records, e.g. driver logs and route maps, plus sales receipts.

22. Service level determined by number of passengers or volume of goods times the average distance of transportation per person or tonne of freight ($SL_{k,y}$) shall be capped at baseline level ($SL_{BL,k}$). Emission reductions beyond this level will not be counted.

Project activity under a programme of activities

The following conditions apply for use of this methodology in a project activity under a programme of activities:

23. In case the project activity involves fossil fuel switching measures leakage resulting from fuel extraction, processing, liquefaction, transportation, re-gasification and distribution of fossil fuels outside of the project boundary shall be considered. The guidance provided in the leakage section of ACM0009 shall be followed in this regard.

24. In case the project activity involves the replacement of equipment, and the leakage effect of the use of the replaced equipment in another activity is neglected, because the replaced equipment is scrapped, an independent monitoring of scrapping of replaced equipment needs to be implemented. The monitoring should include a check if the number of project activity equipment distributed by the project and the number of scrapped equipment correspond with each other. For this purpose scrapped

equipment should be stored until such correspondence has been checked. The scrapping of replaced equipment should be documented and independently verified.

Annex 1

(GUIDANCE ON LEAKAGE BELOW CONCERNS PROJECT ACTIVITY UNDER A PROGRAMME OF ACTIVITIES)

Leakage

1. Leakage may result from fuel extraction, processing, liquefaction, transportation, re-gasification and distribution of fossil fuels outside of the project boundary. This includes mainly fugitive CH_4 emissions and CO_2 emissions from associated fuel combustion and flaring. In this methodology, the following leakage emission sources shall be considered:[3]

- Fugitive CH_4 emissions associated with fuel extraction, processing, liquefaction, transportation, re-gasification and distribution of natural gas used in the project plant and fossil fuels used in the grid in the absence of the project activity.
- In the case LNG is used in the project plant: CO_2 emissions from fuel combustion / electricity consumption associated with the liquefaction, transportation, re-gasification and compression into a natural gas transmission or distribution system.

Thus, leakage emissions are calculated as follows:

$$LE_y = LE_{CH4,y} + LE_{LNG,CO2,y} \quad \textbf{(1)}$$

Where:

LE_y	Leakage emissions during the year y in t CO_2e
$LE_{CH4,y}$	Leakage emissions due to fugitive upstream CH_4 emissions in the year y in t CO_2e
$LE_{LNG,CO2,y}$	Leakage emissions due to fossil fuel combustion / electricity consumption associated with the liquefaction, transportation, re-gasification and compression of LNG into a natural gas transmission or distribution system during the year y in t CO_2e

Note that to the extent that upstream emissions occur in Annex I countries that have ratified the Kyoto Protocol, from 1 January 2008 onwards, these emissions should be excluded, if technically possible, in the leakage calculations.

Fugitive methane emissions

For the purpose of determining fugitive methane emissions associated with the production – and in case of natural gas, the transportation and distribution of the fuels – project participants should multiply the quantity of natural gas consumed in all element processes *i* with a methane emission factor for these upstream emissions ($EF_{NG,upstream,CH4}$), and subtract for all fuel types *k* which would be used in the absence of the project activity the fuel quantities multiplied with respective methane emission factors ($EF_{k,upstream,CH4}$), as follows:

[3] The Meth Panel is undertaking further work on the estimation of leakage emission sources in case of fuel switch project activities. This approach may be revised based on outcome of this work.

$$LE_{CH4,y} = \left[FF_{project,y} \cdot NCV_{NG,y} \cdot EF_{NG,upstream,CH4} - \sum_k FF_{baseline,k,y} \cdot NCV_k \cdot EF_{k,upstream,CH4} \right] \cdot GWP_{CH4} \quad \textbf{(2)}$$

with

$$FF_{project,y} = \sum_i FF_{project,i,y} \quad \text{and} \quad \textbf{(3)}$$

$$FF_{baseline,k,y} = \sum_i FF_{baseline,i,k,y} \quad \textbf{(4)}$$

Where:

$L_{CH4,y}$	Leakage emissions due to upstream fugitive CH_4 emissions in the year y in t CO_2e
$FF_{project,y}$	Quantity of natural gas combusted in all element processes during the year *y* in m³
$FF_{project,i,y}$	Quantity of natural gas combusted in the element process *i* during the year *y* in m³
$NCV_{NG,y}$	Average net calorific value of the natural gas combusted during the year *y* in MWh/m³
$EF_{NG,upstream,CH4}$	Emission factor for upstream fugitive methane emissions from production, transportation and distribution of natural gas in t CH_4 per MWh fuel supplied to final consumers
$FF_{baseline,k,y}$	Quantity of fuel type *k* (a coal or petroleum fuel type) that would be combusted in the absence of the project activity in all element processes during the year *y* in a volume or mass unit
$FF_{baseline,i,k,y}$	Quantity of fuel type *k* (a coal or petroleum fuel type) that would be combusted in the absence of the project activity in the element process *i* during the year *y* in a volume or mass unit
NCV_k	Average net calorific value of the fuel type *k* (a coal or petroleum fuel type) that would be combusted in the absence of the project activity during the year *y* in MWh per volume or mass unit
$EF_{k,upstream,CH4}$	Emission factor for upstream fugitive methane emissions from production of the fuel type k (a coal or petroleum fuel type) in t CH_4 per MWh fuel produced
GWP_{CH4}	Global warming potential of methane valid for the relevant commitment period

Where reliable and accurate national data on fugitive CH_4 emissions associated with the production, and in case of natural gas, the transportation and distribution of the fuels is available, project participants should use this data to determine average emission factors by dividing the total quantity of CH_4 emissions by the quantity of fuel produced or supplied respectively.[4] Where such data is not available, project participants may use the default values provided in Table 2 below. In this case, the natural gas emission factor for the location of the project should be used, except in cases where it can be shown that the relevant system element (gas production and/or

[4] GHG inventory data reported to the UNFCCC as part of national communications can be used where country-specific approaches (and not IPCC Tier 1 default values) have been used to estimate emissions.

processing/transmission/distribution) is predominantly of recent vintage and built and operated to international standards, in which case the US/Canada values may be used.

Note that the emission factor for fugitive upstream emissions for natural gas ($EF_{NG,upstream,CH4}$) should include fugitive emissions from production, processing, transport and distribution of natural gas, as indicated in the Table 2 below. Note further that in case of coal the emission factor is provided based on a mass unit and needs to be converted in an energy unit, taking into account the net calorific value of the coal.

Table 2: Default emission factors for fugitive CH_4 upstream emissions

Activity	Unit	Default emission factor	Reference for the underlying emission factor range in Volume 3 of the *1996 Revised IPCC Guidelines*
Coal			
Underground mining	t CH4 / kt coal	13.4	Equations 1 and 4, p. 1.105 and 1.110
Surface mining	t CH4 / kt coal	0.8	Equations 2 and 4, p.1.108 and 1.110
Oil			
Production	t CH4 / PJ	2.5	Tables 1-60 to 1-64, p. 1.129 - 1.131
Transport, refining and storage	t CH4 / PJ	1.6	Tables 1-60 to 1-64, p. 1.129 - 1.131
Total	t CH4 / PJ	4.1	
Natural gas			
USA and Canada			
Production	t CH4 / PJ	72	Table 1-60, p. 1.129
Processing, transport and distribution	t CH4 / PJ	88	Table 1-60, p. 1.129
Total	t CH4 / PJ	160	
Eastern Europe and former USSR			
Production	t CH4 / PJ	393	Table 1-61, p. 1.129
Processing, transport and distribution	t CH4 / PJ	528	Table 1-61, p. 1.129
Total	t CH4 / PJ	921	
Western Europe			
Production	t CH4 / PJ	21	Table 1-62, p. 1.130
Processing, transport and distribution	t CH4 / PJ	85	Table 1-62, p. 1.130
Total	t CH4 / PJ	105	
Other oil exporting countries / Rest of world			
Production	t CH4 / PJ	68	Table 1-63 and 1-64, p. 1.130 and 1.131
Processing, transport and distribution	t CH4 / PJ	228	Table 1-63 and 1-64, p. 1.130 and 1.131
Total	t CH4 / PJ	296	

Note: The emission factors in this table have been derived from IPCC default Tier 1 emission factors provided in Volume 3 of the 1996 Revised IPCC Guidelines, by calculating the average of the provided default emission factor range.

CO_2 emissions from LNG

Where applicable, CO_2 emissions from fuel combustion / electricity consumption associated with the liquefaction, transportation, re-gasification and compression of LNG into a natural gas transmission or distribution system ($LE_{LNG,CO2,y}$) should be estimated by multiplying the quantity of natural gas combusted in the project with an appropriate emission factor, as follows:

$$LE_{LNG,CO2,y} = FF_{project,y} \cdot EF_{CO2,upstream,LNG} \quad \textbf{(5)}$$

Where:

$LE_{LNG,CO2,y}$	Leakage emissions due to fossil fuel combustion / electricity consumption associated with the liquefaction, transportation, re-gasification and compression of LNG into a natural gas transmission or distribution system during the year y in t CO_2e
$FF_{project,y}$	Quantity of natural gas combusted in all element processes during the year *y* in m³
$EF_{CO2,upstream,LNG}$	Emission factor for upstream CO_2 emissions due to fossil fuel combustion / electricity consumption associated with the liquefaction, transportation, re-gasification and compression of LNG into a natural gas transmission or distribution system

Where reliable and accurate data on upstream CO_2 emissions due to fossil fuel combustion / electricity consumption associated with the liquefaction, transportation, re-gasification and compression of LNG into a natural gas transmission or distribution system is available, project participants should use this data to determine an average emission factor. Where such data is not available, project participants may assume a default value of 6 t CO_2/TJ as a rough approximation.[5]

[5] This value has been derived on data published for North American LNG systems. "Barclay, M. and N. Denton, 2005. Selecting offshore LNG process. http://www.fwc.com/publications/tech_papers/files/LNJ091105p34-36.pdf (10th April 2006)".