VCS VERIFIED CARBON STANDARD

A Global Benchmark for Carbon

Approved VCS Methodology
VM0019

Version 1.0
Sectoral Scope 7

Fuel Switch from Gasoline to Ethanol in Flex-Fuel Vehicle Fleets

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Relationship to Approved or Pending Methodologies

There is no sectoral scope 7 methodology currently approved under the VCS. Also, none of the sectoral scope 7 methodologies under development in the VCS are focused on commercial fleet fossil fuel substitution, as further explained below:

Methodology for Determining GHG Emission Reductions Through Bicycle Sharing Projects – from sectoral scope 7, this methodology is applicable for project activities that reduce GHG emissions through the usage of public sharing-based bicycle projects which introduce an alternative mode of transportation to displace other, more carbon intensive modes.

Methodology for Efficiency Improvements HDV's and Mobile Machinery – from sectoral scope 7, this methodology aims to improve the efficiency of trucks and/or mobile machinery equipment. Measures to improve operating vehicle efficiency may include but are not limited to anti-idling devices, eco-drive, tire-rolling resistance improvement, air-conditioning system improvement, low viscosity oils, cab-heaters, aerodynamic drag reduction measures, transmission improvements, etc.

There is no approved or pending methodology in the UNFCCC, from sectoral scope 7, for which a revision could be requested to comprise the project activity of fossil fuel substitution in commercial fleets, as presented below:

AM0031 - Baseline methodology for bus rapid transit projects - focuses on the construction and operation of a new bus rapid transit system (BRT) for urban transport of passengers.

AM0090 - Modal shift in transportation of cargo from road transportation to water or rail transportation - focuses on the displacement of a more-carbon-intensive transportation mode.

ACM0016 - Baseline methodology for mass rapid transit projects - focuses on the establishment and operation of rail-based or bus-based mass rapid transit systems in urban or suburban regions for passenger transport by replacing a traditional urban bus-driven public transport system.

AMS-III.AA - Transportation energy efficiency activities using retrofit technologies - focuses on energy efficiency measures in transportation to reduce GHG emissions due to decreased fuel consumption.

AMS-III.AK - Biodiesel production and use for transport applications - focuses on the production of biodiesel that is used for transportation applications, where the biodiesel is produced from oilseed cultivated on dedicated plantations and from waste oil/fat.

AMS-III.AP - Transport energy efficiency activities using post-fit Idling Stop device - focuses on the demand side activities associated with the installation of post-fit type Idling Stop devices in passenger vehicles used for public transport, in order to reduce fossil fuel consumption and GHG emissions.

AMS-III.AQ - Introduction of Bio-CNG in transportation applications - focuses on the production of Biogenic Compressed Natural Gas (Bio-CNG) from renewable biomass including waste organic matters to be used in transportation applications. The crops from renewable biomass origin used for production of the Bio-CNG should be sourced from dedicated plantations.

AMS-III.AT - Transportation energy efficiency activities installing digital tachograph systems to commercial freight transport fleets - focuses on the installation of a digital tachograph system that reduces GHG emissions associated with fossil fuel combustion in freight transport by providing to the driver feedback against inefficient driving.

AMS-III.C - Emission reductions by electric and hybrid vehicles - comprises emission reductions from electric and hybrid vehicle use only.

AMS-III.S - Introduction of low-emission vehicles/technologies to commercial vehicle fleets - focuses on introducing low-greenhouse gas emitting vehicles for commercial passenger (including public transportation), material and freight transport, operating on a number of routes with comparable conditions. Retrofitting of existing vehicles is also included in the methodology.

AMS-III.T - Plant oil production and use for transport applications - covers project activities involving the cultivation of oilseeds, the production of plant oil and the use of plant oil for transportation applications.

AMS-III.U - Cable Cars for Mass Rapid Transit System (MRTS) - focuses on cable cars substituting traditional road based transport trips.

NM0360 - Use of lower energy-intensive intermodal transportation method to transport freight (use of pipeline rather than over-the-road truck) - assumes that switching from truck transportation to an alternative transport method of lower energy intensity will result in reduction of fossil fuel consumption.

NM0357 - Methodology for Rail Projects - applicable for rail projects investing in new infrastructure for passenger and cargo transport. Emission reductions are due to mode shift basically from road to rail.

SSC-NM074 - Emission Reductions through Improved Efficiency of Vehicle Fleets - for project activities that improve the efficiency of vehicle fleets through improvement of the operational efficiency, i.e. a reduction of fuel usage.

Among all assessed methodologies from sectoral scope 7, four have been considered more similar to the present one (AMS-III.T, AMS-III.AK, AMS-III.AQ and AM0090) and deserved a better evaluation regarding its applicability. In the case of AM0090, the present methodology does not involve a modal shift. Flex-fuel vehicles both in the baseline and project scenarios compose the commercial fleets, and it also does not refer to cargo transportation, it refers only to the choice between two types of fuel. The approved methodologies AMS-III.T, AMS-III.AK and AMS-III.AQ are related to the biofuel production, while the present methodology is focused on the option to consume fuels available in the market (ethanol instead of gasoline); and the present methodology refers to ethanol, not biodiesel or Bio-CNG.

As demonstrated for each UNFCCC sectoral scope 7 methodology presented above, none are applicable to the proposed project activity of commercial fleet fossil fuel substitution or presents the possibility of requesting a revision.

Regarding the Climate Action Reserve, there is no protocol from the sectoral scope of transport.

Table of Contents

1 SOURCES

This methodology is not based on any approved baseline and/or monitoring methodologies.

It refers to the latest approved versions of the following tools:

- *Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion* (UNFCCC);
- *Combined tool to identify the baseline scenario and demonstrate additionality* (UNFCCC).

2 SUMMARY DESCRIPTION OF THE METHODOLOGY

This methodology is applicable to project activities that aim at complete substitution of gasoline or gasoline blends by ethanol in commercial fleets of flex-fuel vehicles. The monitoring plan must guarantee exclusive consumption of ethanol by vehicles from the project boundary. This should be done using a fuel monitoring system (direct or indirect measurement) with continuous registration of place (gas station), date, type and quantity of fuel used in the project activity.

In order to calculate the baseline emissions, historical fuel consumption pattern shall be analysed and a factor that shows the ratio of gasoline to ethanol in the total consumption of fuel by commercial fleet shall be calculated. In cases where the project area is not homogenous in terms of availability and prices of fuels, it should be stratified into project regions. The fuel consumption pattern should be calculated for each project region. Historical fuel consumption pattern is based on historical data of the project proponent. In cases when no credible historical data is available or in the case of a Greenfield project activity instance, the historical average pattern of the same regional group shall be used.

Additionality shall be demonstrated by applying the latest version of CDM *Combined tool to identify the baseline scenario and demonstrate additionality*.

The baseline emissions are calculated by applying the determined fuel consumption pattern (ratio of gasoline to ethanol in the total fuel consumption during the historical reference period), corrected by a fuel conversion factor, to the total quantity of ethanol consumed in the year *y* of the project activity. The fuel conversion factor determines a quantity of ethanol needed to substitute one liter of gasoline in the type of vehicles used in the project activity.

Project emissions are calculated by applying the emission factor to the quantity of gasoline consumed in the project activity and monitored in liters.

The emissions reductions are calculated as the difference between the baseline emissions and the project emissions. No leakage emissions are attributed to this project type.

Additionality	Project Method
Crediting Baseline	Project Method

3 DEFINITIONS

For the purpose of this methodology, the following definitions apply:

Commercial fleet - 10 or more vehicles owned by a single company and used for business purposes.

Direct measurement – Direct measurement of fuel consumption in the project activity corresponds to a measurement that registers the data that will be utilized in the emission reduction calculation with no treatment (i.e., no statistical estimation or conversion can be used to find the fuel consumption in liters).

Emergency gasoline - gasoline consumed in cases of ethanol temporary unavailability in specific gas stations.

Ethanol - fuel produced from renewable biological resources such as plant biomass.

Flex-fuel vehicle - a flexible-fuel vehicle (FFV) is an automobile that can alternate between at least two sources of fuel, such as gasoline or ethanol blends in any proportion.

Fuel consumption pattern - proportion of gasoline to ethanol used in the flex-fuel vehicles of the project proponent commercial fleets in the baseline scenario.

Greenfield – any new project activity instance, corresponding to an existent flex-fuel vehicles fleet, with insufficient history under the monitoring conditions specified by the project activity.

I**ndirect measurement** – Indirect measurement of fuel consumption in the project activity corresponds to a measurement of a data registry that needs to be converted to the unit that will be used for the emission reduction calculation, or the measurement of a sample group that will be used to estimate the consumption of the whole fleet.

Lifecycle emissions - The aggregate quantity of greenhouse gas emissions (including direct and significant indirect emissions such as land use changes), related to the full fuel lifecycle, including all stages of fuel and feedstock production and distribution, from feedstock generation or extraction through the distribution, delivery and use of the finished fuel by the final consumer.[1]

Opportunity cost - The cost of an alternative that must be forgotten when the fleet owner decides to adhere the project activity (e.g., the benefits from the flexible alternative (the choice for the cheapest fuel type) that the fleet owner is giving up when opting for the exclusive consumption of ethanol).

Regional Grouping - is a multivariable method that aims at classifying a sample of subjects (or objects) on the basis of a set of measured variables.

Renewable materials - any natural resources of economic value that can be replaced or replenished fast enough so that the supply continues to be available in time. In the case of fuels, renewable materials are those whose source can be cultivated and/or replaced by human activity (e.g. wheat, corn, sugar beets, sugar cane and molasses).

[1] The definition of lifecycle emissions was adapted from the United States Energy Independence and Security Act of 2007 (EISA), retrieved from the United States Environmental Protection Agency (EPA), available at: http://www.epa.gov/oms/renewablefuels/420f10006.htm#footnotes

Start-up Gasoline - gasoline reserved for the ignition of ethanol engines at low temperatures in flex-fuel technologies, located in a separate reservoir of around 1 liter.

Vehicle owner - company responsible for the operational control of the vehicle.

4 APPLICABILITY CONDITIONS

This methodology applies to project activities that aim at complete substitution of fossil fuels or blends of gasoline by ethanol in commercial fleets of the project proponent. The methodology is applicable under the following conditions:

- Project boundary contains commercial fleets that consist exclusively of flex-fuel vehicles (i.e. only flex-fuel vehicles are used both in baseline scenario and in the project activity);
- Only existent fleets of flex-fuel vehicles are eligible (i.e. flex-fuel vehicle acquisition is not acceptable under this methodology);
- In the baseline scenario, the vehicles use gasoline or blend of any proportion of ethanol and gasoline (0-99%);
- Fuel consumed in the project activity is exclusively ethanol (E100); up to 5% of total fuel consumed per fleet and per year can be gasoline, for emergency cases and for the start-up mechanism as required by the flex-fuel motor technology. Where a fleet consumes more than 5% of gasoline in a given year, it shall be permanently excluded from the project activity, with no possibility to be reinserted and no right to receive credits for the reductions achieved in that year and all subsequent ones;
- The project activity fuel (ethanol) is available at the same gas stations as the baseline fuel (gasoline or blend of ethanol and gasoline) for at least 50% of the gas stations available in the project region;
- Gasoline, ethanol and their blends comply with relevant regulations (national or regional market);
- Ethanol used in the project is produced from renewable resources[2];
- Ethanol used in the project shall have lower lifecycle emissions than the gasoline used in the baseline. The onus is upon the project proponent to clearly demonstrate this, failing which the project shall not be eligible for crediting.[3]

[2] In order to demonstrate that the ethanol used in the project activity is produced from renewable materials, the project proponent shall evaluate the production of the ethanol available in the project region and the Validation/Verification Body must evaluate such assessment and issue its favorable opinion on the renewable characteristic of ethanol for the project region.

[3] Several lifecycle analyses have concluded that ethanol can have lower lifecycle emissions than gasoline. Such studies have been performed by the U.S. EPA, UNEP and FAO. In order to demonstrate compliance with this applicability condition, project proponents may also reference other studies, as relevant to their project, available from a recognized, credible source, and reviewed for publication by an appropriately qualified, independent organization or appropriate peer review group, or be published by a government agency.

- The monitoring system is designed to allow measurement of the fuel consumption for each vehicle in each fleet within the project boundaries continuously (on each fueling operation), over the whole project crediting period and during the period to which the historical consumption pattern refers;

- The system of measurement (direct and indirect) shall guarantee that 95% of the fuel consumed per fleet and per year under the project activity is ethanol. When direct measurement is used, the Validation/Verification Body has the authority to decide when the measurement method adopted by the project activity is robust enough to ensure that the data (type and quantity of fuel consumed) obtained, processed and registered is reliable. When indirect measurement is used, the project activity must guarantee that the width of a 95% confidence interval does not exceed 30% of the estimated value, in order to ensure that the uncertainty range is not significant. If the data does not satisfy this criteria, it cannot be used in the project activity;

- No legal requirement exists to use exclusively ethanol fuel in commercial fleets in the relevant market (national or regional);

- Where the project proponent is not the owner of the commercial fleet vehicles (e.g., the project proponent is a fleet manager with many clients, each client being the owner of its respective commercial fleet vehicles), there shall exist a contract between the project proponent and each fleet owner to establish clear ownership of the emission reductions;

- As in the CDM baseline and monitoring methodologies related to the biofuel production (i.e., AMS.III-T, AMS.III-AK, and AMS.III-AQ discussed above), "*the retailer, the final users, and the producer are bound by a contract that states that the final consumers and retailers shall not claim emission reductions resulting from its consumption"*, the contract between the project proponent and the fleet owner shall include a clause stating that, to avoid double counting in the supply chain, the commercial fleet owner must not participate in any other emission reduction project associated with a biofuel producer or retailer. Only the commercial fleet owner or manager can claim emissions reductions under this methodology.

5 PROJECT BOUNDARY

The project boundary encompasses flex-fuel vehicles from the project commercial fleets. The project area includes all the gas stations used by the project commercial fleets as a part of the project activity.

The only emission source included in both the baseline and project scenario is the gasoline consumption by the commercial fleets within the project boundary[4]:

[4] This approach is the same used in AM0090.

Source		Gas	Included?	Justification/Explanation
Baseline	Gasoline Consumption	CO_2	Yes	Main emission source.
		CH_4	No	Excluded for simplification. This is conservative.
		N_2O	No	Excluded for simplification. This is conservative.
Project	Gasoline Consumption	CO_2	Yes	Main emission source.
		CH_4	No	Excluded for simplification. This is conservative.
		N_2O	No	Excluded for simplification. This is conservative.

Stratification of the project area into the project regions

In order to guarantee the accuracy and precision of the baseline emissions calculation, a stratification of the project region shall be carried out. Stratification is conducted *ex ante* and remains fixed for the whole project crediting period. It shall be based on publicly available data.

Stratification of the project area is conducted through a multivariable method that aims at classifying a sample of subjects (or objects) on the basis of a set of measured variables. The subjects are classified into a number of different groups in a way that similar subjects are placed in the same group. The obligatory variables that shall be included in the regional grouping of the project are fuel availability, prices and regulatory framework. Additional optional variables can be proposed by the project proponent and shall be justified.

The use of hierarchical methods (agglomerative or divisive) is suggested as the most suitable option for regional grouping of the project, considering the obligatory variables. Such methods include different approaches to define the distance that is used to establish the regional groups, such as Ward method (which minimizes the variance inside each group), single linkage (where the distance between two groups is the minimum of the distances of all pairs of patterns drawn from the two groups), complete linkage (where the distance between two groups is the maximum of all pairwise distances between patterns in the two groups), etc. Still, the project proponent can suggest application of non-hierarchical methods[5] (also known as k-means grouping methods) along with justification of the choice.

The project proponent shall select a distance measure (e.g., Euclidean distance) and justify why it is the most appropriate to determine similarity between regions in the project activity.

For both definition of the regional grouping method and distance measure to be applied by a project activity, the Validation/Verification Body has the authority to decide whether they are the most suitable and proper for the regional grouping process.

Therefore, a regional group is a subdivision of the project activity region, defined by its features of fuel availability, price, regulatory framework and other additional optional variables. The baseline and additionality assessments shall be conducted for each of the regional groups separately.

[5] In these methods the desired number of regional groups is specified in advance and the 'best' solution is chosen.

6 PROCEDURE FOR DETERMINING THE BASELINE SCENARIO

The project proponent shall apply the latest version of the CDM *Combined tool to identify the baseline scenario and demonstrate additionality* to identify the baseline scenario for every regional group and for every commercial fleet in the project boundary, including Greenfield instances.

When applying Step 1 of the CDM *Combined tool to identify the baseline scenario and demonstrate additionality*, the project proponent shall consider as alternative scenarios, at least the following alternatives:

S1: The proposed project activity undertaken without being registered as a VCS project activity;

S3: The continuation of the current situation, not requiring any investment or expenses to maintain the current situation.

7 PROCEDURE FOR DEMONSTRATING ADDITIONALITY

Additionality shall be demonstrated for each regional group by applying the latest version of the CDM *Combined tool to identify the baseline scenario and demonstrate additionality*.

8 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

8.1 Baseline Emissions

The baseline emissions include exclusively the emissions from fossil fuel combustion by the commercial fleet that would have occurred in the baseline scenario.

The baseline emissions are calculated as follows:

$$BE_y = \sum_{i=x_1}^{x_n} BE_{FF,i,y} \quad \textbf{(1)}$$

Where:

BE_y	Baseline emissions in the year *y* (tCO_2);
$BE_{FF,i,y}$	Baseline emissions from gasoline combustion by commercial fleet *i* in year *y* (tCO_2e);
i	x_1, x_2,..., x_n commercial fleets in the project activity.

The baseline emissions from fossil fuel combustion by a commercial fleet are calculated as follows:

$$BE_{FF,i,y} = COEF_{gas,y} \bullet \sum_{R=r_1}^{r_m} FC_{gas,i,R,y} \quad \textbf{(2)}$$

Where:

$BE_{FF,i,y}$	Baseline emissions from gasoline combustion by commercial fleet *i* in year *y* (tCO_2e);

$FC_{gas,i,R,y}$	Gasoline consumption by the commercial fleet *i* in the baseline scenario, in regional group *R* in year *y* (L);
$COEF_{gas,y}$	CO_2 emission coefficient of gasoline in year *y* (tCO_2/L)
R	r_1, r_2, ... , r_m regional groups where a fleet *i* has fueled during the year *y*.

The gasoline consumption by fleets in the baseline scenario is calculated as follows:

$$FC_{gas,i,R,y} = FC_{ethanol,i,R,y} \bullet P_{i,R,BSL} \bullet T_{ff,y} \quad \textbf{(3)}$$

Where:

$FC_{gas,i,R,y}$	Gasoline consumption by the commercial fleet *i* in the baseline scenario, in regional group *R* in year *y* (L);
$FC_{ethanol,i,R,y}$	Ethanol consumption by the commercial fleet *i* in the project activity in regional group *R* in year *y* (L);
$P_{i,R,BSL}$	Baseline fuel consumption pattern of commercial fleet *i* in regional group *R* in the baseline scenario (adimensional);
$T_{ff,y}$	Conversion factor between gasoline and ethanol in year *y* (dimensionless);

8.1.1. Procedure to calculate the CO_2 emission coefficient ($COEF_{gas,y}$)

The CO_2 emission coefficient $COEF_{gas,y}$ is calculated through the CDM *Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion*. It can be calculated using one of the following two options depending on the availability of data on gasoline as follows:

Option A: The CO_2 emission coefficient $COEF_{gas,y}$ is calculated based on the chemical composition of gasoline, using the following approach:

$$COEF_{gas,y} = w_{C,gas,y} \bullet \rho_{gas,y} \bullet 44/12 \quad \textbf{(4)}$$

Where:

$COEF_{gas,y}$	CO_2 emission coefficient of gasoline in year *y* (tCO_2/L);
$w_{C,gas,y}$	weighted average mass fraction of carbon in gasoline in year *y* (tC/mass unit);
$\rho_{gas,y}$	weighted average density of gasoline in year *y* (mass unit/L).

Option B: The CO_2 emission coefficient $COEF_{gas,y}$ is calculated based on net calorific value and CO_2 emission factor of gasoline, as follows:

$$COEF_{gas,y} = NCV_{gas,y} \bullet EF_{CO2,gas,y} \quad \textbf{(5)}$$

Where:

$COEF_{gas,y}$	CO_2 emission coefficient of gasoline in year *y* (tCO_2/L);
$NCV_{gas,y}$	weighted average net calorific value of gasoline in year *y* (GJ/L);
$EF_{CO2,gas,y}$	weighted average CO_2 emission factor of gasoline (tCO_2/GJ).

Option A is the preferred approach, if the necessary data is available.

8.1.2. Procedure to determine the baseline fuel consumption pattern of a commercial fleet ($P_{i,R,BSL}$)

Proportion between the use of gasoline and the use of ethanol in the annual fuel consumption in the baseline scenario in a regional group characterizes the baseline fuel consumption

pattern of a fleet in this regional group. The historical values of the fuel consumption patterns of the project proponent's commercial fleets shall be adopted. For this purpose it is acceptable that a minimum reference period of three years and a maximum period that is consistent with the ethanol availability in the project region be used (i.e., it shall take into account national circumstances, including policies and market conditions). The Validation/Verification Body has the authority to decide whether the maximum historical period is suitable or not.

In the case of a Greenfield project activity instance, or if insufficient historical data is available, the historical average consumption pattern from the same regional group shall be adopted.

Baseline fuel consumption pattern in a regional group is determined as follows:

$$P_{i,R,BSL} = \frac{FC_{gas,i,R,BSL}}{FC_{gas,i,R,BSL} + FC_{ethanol,i,R,BSL}} \quad \textbf{(6)}$$

Where:

$P_{i,R,BSL}$	Baseline fuel consumption pattern of a commercial fleet *i* in regional group *R* in the baseline scenario (adimensional);
$FC_{gas,i,R,BSL}$	Total quantity of gasoline consumed by commercial fleet *i* in regional group *R* during the reference period (L);
$FC_{ethanol,i,R,BSL}$	Total quantity of ethanol consumed by commercial fleet *i* in regional group *R* during the reference period (L).

8.1.3. Procedure to determine the conversion factor between gasoline and ethanol ($T_{ff,y}$)

The conversion factor between gasoline and ethanol is calculated as a relationship between net calorific values (NCV) of these fuels. It shows the equivalent volume of ethanol necessary to substitute one liter of gasoline in the project activity.

The conversion factor between gasoline and ethanol is calculated as follows:

$$T_{ff,y} = \frac{NCV_{ethanol,y}}{NCV_{gas,y}} \quad \textbf{(7)}$$

Where:

$T_{ff,y}$	conversion factor between gasoline and ethanol in year *y*;
$NCV_{ethanol,y}$	weighted average net calorific value of ethanol in year *y* (GJ/L);
$NCV_{gas,y}$	weighted average net calorific value of gasoline in year *y* (GJ/L).

8.2 Project Emissions

Project emissions include start-up and emergency consumption of gasoline in the project activity, for which the sum shall not exceed 5% of the total fuel consumption under the project activity per each fleet per year. The project emissions from ethanol consumption that is renewable fuel are considered zero.

Project emissions are calculated as follows:

$$PE_y = \sum_{i=x_1}^{x_n} PE_{FC,i,y} \quad \textbf{(8)}$$

Where:

PE_y	Project emissions in year *y* (t CO_2/yr)
$PE_{FC,i,y}$	Project emissions from gasoline combustion by commercial fleet *i* in year *y* (t CO_2/yr)
i	x_1, x_2,..., x_n commercial fleets in the project activity.

Project emissions from gasoline combustion are calculated as follows:

$$PE_{FC,i,y} = FC_{gas,i,y} \bullet COEF_{gas,y} \quad \textbf{(9)}$$

Where:

$PE_{FC,i,y}$	Project emissions from gasoline combustion in year y (tCO_2);
$FC_{gas,\ i,\ y}$	Gasoline consumption by commercial fleet *i* in the project scenario in year *y* (L);
$COEF_{gas,y}$	CO_2 emission coefficient of gasoline in year *y* (tCO_2/L), according to Procedure 8.1.1.

8.3 Leakage

No leakage emissions are considered in this methodology.

8.4 Summary of GHG Emission Reduction and/or Removals

Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y - LE_y \quad \textbf{(10)}$$

Where:

ER_y	Emission reductions in year *y* (tCO_2e/yr)
BE_y	Baseline emissions in year *y* (tCO_2e/yr)
PE_y	Project emissions in year *y* (tCO_2/yr)
LE_y	Leakage emissions in year *y* (tCO_2/yr)

9 MONITORING

9.1 Data and Parameters Available at Validation

In addition to the parameters listed in the tables below, the provisions on data and parameters not monitored in the tools referred to in this methodology apply.

Data Unit / Parameter:	$P_{i,R,BSL}$
Data unit:	adimensional
Description:	Fuel consumption pattern of fleet *i* in project region *R*, in the baseline scenario
Source of data:	Calculated *ex ante*
Justification of choice of data or description of measurement methods and procedures applied:	Calculated according to Procedure 8.1.2.
Any comment:	

Data Unit / Parameter:	$FC_{gas,i,R,BSL}$
Data unit:	liters
Description:	Total quantity of gasoline consumed by commercial fleet *i* in project region *R* during the reference period before the start of the project activity
Source of data:	Historical values
Justification of choice of data or description of measurement methods and procedures applied:	The historical fuel consumption of the project proponent's commercial fleets, obtained through direct or indirect measurement of fuel quantity and type, shall be adopted. If direct measurement was used, the respective equipment shall have been regularly calibrated following the manufacture specification. If indirect measurement was used, the Validation/Verification Body has the authority to decide when the measure method adopted by the project activity is robust enough to ensure that the data (type and quantity of fuel consumed) obtained, processed and registered is reliable. In the case of a Greenfield project activity instance or if no sufficient historical data is available, the historical average consumption pattern from the same regional group shall be adopted.
Any comment:	

Data Unit / Parameter:	$FC_{ethanol,i,R,BSL}$
Data unit:	liters
Description:	Total quantity of ethanol consumed by commercial fleet *i* in

	project region *R* during the reference period before the start of the project activity
Source of data:	Historical values
Justification of choice of data or description of measurement methods and procedures applied:	The historical fuel consumption of the project proponent's commercial fleets, obtained through direct or indirect measurement of fuel quantity and type, shall be adopted. If direct measurement was used, the respective equipment shall have been regularly calibrated following the manufacture specification. If indirect measurement was used, the Validation/Verification Body has the authority to decide when the measure method adopted by the project activity is robust enough to ensure that the data (type and quantity of fuel consumed) obtained, processed and registered is reliable. In the case of a Greenfield project activity instance or if no sufficient historical data is available, the historical average consumption pattern from the same regional group shall be adopted.
Any comment:	

9.2 Data and Parameters Monitored

Data Unit / Parameter:	$NCV_{gas,y}$
Data unit:	GJ/L
Description:	Weighted average net calorific value of gasoline in year *y*
Source of data:	The following data sources may be used if the relevant conditions apply:

Data source	Conditions for using the data source
a) Values provided by the fuel supplier in invoices	This is the preferred source
b) Measurements by the project proponent	If a) is not available
c) Regional or national default values	If a) and b) are not available. These sources should be based on well documented, reliable sources (such as national energy balances)
d) IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol.2 (Energy) of the 2006 IPCC Guidelines on National	If a), b) and c) are not available

	GHG Inventories
Description of measurement methods and procedures to be applied:	For a) and b): Measurements should be undertaken in line with national or international fuel standards.
Frequency of monitoring/recording:	For a) and b): The NCV should be obtained for each fuel delivery, from which weighted average annual values should be calculated. For c): Review appropriateness of the values annually For d): Any future revision of the IPCC Guidelines should be taken into account
QA/QC procedures to be applied:	Verify if the values under a), b) and c) are within the uncertainty range of the IPCC default values as provided in Table 1.2, Vol. 2 of the 2006 IPCC Guidelines. If the values fall below this range collect additional information from the testing laboratory to justify the outcome or conduct additional measurements. The project proponent must justify the value according to such conditions and the Validation/Verification Body has the authority to decide when the justification is appropriate. The laboratories in a), b) or c) should have ISO 17025 accreditation or justify that they can comply with similar quality standards.
Any comment:	

Data Unit / Parameter:	$NCV_{ethanol,y}$
Data unit:	GJ/L
Description:	Weighted average net calorific value of ethanol in year *y*.
Source of data:	The following data sources may be used if the relevant conditions apply:

Data source	Conditions for using the data source
a) Values provided by the fuel supplier in invoices	This is the preferred source
b) Measurements by the project proponent	If a) is not available
c) Regional or national default values	If a) and b) are not available. These sources should be based on well documented, reliable sources (such as national energy balances)
d) IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol.2 (Energy) of the 2006 IPCC Guidelines on National	If a), b) and c) are not available

	GHG Inventories	
Description of measurement methods and procedures to be applied:	For a) and b): Measurements should be undertaken in line with national or international fuel standards	
Frequency of monitoring/recording:	For a) and b): The NCV should be obtained for each fuel delivery from which weighted average annual values should be calculated. For c): Review appropriateness of the values annually. For d): Any future revision of the IPCC Guidelines should be taken into account	
QA/QC procedures to be applied:	Verify if the values under a), b) and c) are within the uncertainty range of the IPCC default values as provided in Table 1.2, Vol. 2 of the 2006 IPCC Guidelines. If the values fall below this range collect additional information from the testing laboratory to justify the outcome or conduct additional measurements. The project proponent must justify the value according to such conditions and the Validation/Verification Body has the authority to decide when the justification is appropriate. The laboratories in a), b) or c) should have ISO 17025 accreditation or justify that they can comply with similar quality standards.	
Any comment:		

Data Unit / Parameter:	$FC_{ethanol,i,R,y}$
Data unit:	liters
Description:	Ethanol consumption by the commercial fleet *i* in the project scenario in project region *R* in year *y*
Source of data:	Refueling transactions database
Description of measurement methods and procedures to be applied:	Direct or indirect measurement of place (gas station), date, type and quantity of fuel used in the project activity.
Frequency of monitoring/recording:	Every transaction
QA/QC procedures to be applied:	If direct measurement is used, the respective equipment shall be regularly calibrated following the manufacture specification. If indirect measurement is used, the Validation/Verification Body has the authority to decide when the measure method adopted by the project activity is robust enough to ensure that the data (type and quantity of fuel consumed) obtained, processed and registered is reliable.
Any comment:	

Data Unit / Parameter:	$w_{C,gas,y}$
Data unit:	tC/mass unit of gasoline
Description:	Weighted average mass fraction of carbon in gasoline in year *y*.
Source of data:	The following data sources may be used if the relevant conditions apply: **Data source** / **Conditions for using the data source** a) Values provided by the fuel supplier in invoices — This is the preferred source b) Measurements by the project proponent — If a) is not available
Description of measurement methods and procedures to be applied:	Measurements should be undertaken in line with national or international fuel standards
Frequency of monitoring/recording:	The mass fraction of carbon should be obtained for each fuel delivery, from which weighted average annual values should be calculated.
QA/QC procedures to be applied:	Verify if the values under a) and b) are within the uncertainty range of the IPCC default values as provided in Table 1.3, Vol. 2 of the 2006 IPCC Guidelines. If the values fall below this range collect additional information from the testing laboratory to justify the outcome or conduct additional measurements. The project proponent must justify the value according to such conditions and the Validation/Verification Body has the authority to decide when the justification is appropriate. The laboratories in b) should have ISO 17025 accreditation or justify that they can comply with similar quality standards.
Any comment:	Applicable where Option A is used. Preferably the same data source should be used for $w_{C,gas,y}$ and $\rho_{gas,y}$.

Data Unit / Parameter:	$\rho_{gas,y}$
Data unit:	mass unit of gasoline/L
Description:	Weighted average density of gasoline in year *y* (mass unit/L)
Source of data:	The following data sources may be used if the relevant conditions apply: **Data source** / **Conditions for using the data source** a) Values provided by the fuel — This is the preferred source

	supplier in invoices	
	b) Measurements by the project proponent	If a) is not available
	c) Regional or national default values	If a) and b) are not available. These sources should be based on well documented, reliable sources (such as national energy balances)
Description of measurement methods and procedures to be applied:	Measurements should be undertaken in line with national or international fuel standards	
Frequency of monitoring/recording:	The density of the fuel should be obtained for each fuel delivery, from which weighted average annual values should be calculated.	
QA/QC procedures to be applied:		
Any comment:	Applicable where Option A is used. Preferably the same data source should be used for $w_{C,gas,y}$ and $\rho_{gas,y}$.	

Data Unit / Parameter:	$EF_{CO2,gas,y}$
Data unit:	tCO_2/GJ
Description:	Weighted average CO_2 emission factor of gasoline
Source of data:	The following data sources may be used if the relevant conditions apply:

Data source	**Conditions for using the data source**
a) Values provided by the fuel supplier in invoices	This is the preferred source
b) Measurements by the project proponent	If a) is not available
c) Regional or national default values	If a) and b) are not available. These sources should be based on well documented, reliable sources (such as national energy balances)
d) IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in Table 1.4 of Chapter 1 of Vol.2 (Energy) of	If a), b) and c) are not available

	the 2006 IPCC Guidelines on National GHG Inventories
Description of measurement methods and procedures to be applied:	For a) and b): Measurements should be undertaken in line with national or international fuel standards
Frequency of monitoring/recording:	For a) and b): The CO_2 emission factor should be obtained for each fuel delivery, from which weighted average annual values should be calculated. For c): Review appropriateness of the values annually. For d): Any future revision of the IPCC Guidelines should be taken into account.
QA/QC procedures to be applied:	
Any comment:	Applicable where option B is used. For a): If the fuel supplier does provide the NCV value and the CO_2 emission factor on the invoice and these two values are based on measurements for this specific fuel, this CO_2 factor should be used. If another source for the CO_2 emission factor is used or no CO_2 emission factor is provided, Options b), c) or d) should be used.

Data Unit / Parameter:	$COEF_{gas,y}$
Data unit:	tCO_2/L
Description:	CO_2 emission coefficient of gasoline in year *y*.
Source of data:	Calculated
Description of measurement methods and procedures to be applied:	Calculated according to Procedure 8.1.
Frequency of monitoring/recording:	
QA/QC procedures to be applied:	
Any comment:	

Data Unit / Parameter:	$T_{ff,y}$
Data unit:	dimensionless
Description:	Conversion factor between gasoline and ethanol in year *y*

Source of data:	Calculated
Description of measurement methods and procedures to be applied:	Calculated according to Procedure 8.3.
Frequency of monitoring/recording:	
QA/QC procedures to be applied:	
Any comment:	

Data Unit / Parameter:	$FC_{gas, i, y}$
Data unit:	L
Description:	Gasoline consumption by commercial fleet *i* in the project scenario in year *y*
Source of data:	Refueling transactions database
Description of measurement methods and procedures to be applied:	Direct or indirect measurement of place (gas station), date, type and quantity of fuel used in the project activity.
Frequency of monitoring/recording:	Every transaction
QA/QC procedures to be applied:	If direct measurement is used, the respective equipment shall be regularly calibrated following the manufacture specification. If indirect measurement is used, the Validation/Verification Body has the authority to decide when the measure method adopted by the project activity is robust enough to ensure that the data (type and quantity of fuel consumed) obtained, processed and registered is reliable.
Any comment:	When the $FC_{gas, i, y}$ represents more than 5% of the sum of $FC_{ethanol,i,R,y}$ and $FC_{gas, i, y}$ for an individual fleet and year, the project activity instance corresponding to this fleet shall be definitely excluded from the project activity, with no possibility to be reinserted and no right to reduction credits derived from such transgression year.

9.3 Description of the Monitoring Plan

All data collected as a part of monitoring process should be archived electronically and be kept at least for 2 years after the end of the last project crediting period. 100% of the data should be monitored if not indicated otherwise in the tables above. All direct measurements should be conducted with calibrated measurement equipment according to relevant industry standards.

10 REFERENCES AND OTHER INFORMATION

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