CDM proposed standardized baseline form (Version 01.0)

(To be used by a designated national authority (DNA) when submitting a proposed standardized baseline in accordance with the "Procedure for submission and consideration of standardized baselines".)

SECTION 1: GENERAL INFORMATION

DNA submitting this form:	Republic of Mauritius
Developer of the standardized baseline: *(Parties, project participants, international industry organizations or admitted observer organizations)*	DNA, Mauritius
Party or Parties to which the standardized baseline applies:	Mauritius
Sector to which the proposed standardized baseline applies: *(the sector according to the definition of sector in the "Guidelines for the establishment of sector specific standardized baselines")*	Energy Industries; Energy demand (all applications that displace grid electricity)

SECTION 2: LIST OF DOCUMENTS TO BE ATTACHED TO THIS FORM *(please check)*

☐ An assessment report presenting how the data was collected, processed and compiled to establish the proposed standardized baselines;

☐ Where the proposed standardized baseline applies to a group of Parties, letters of approval of all the DNAs of the Parties to which the standardized baseline applies;

√ Additional documentation supporting the submission (e.g. relevant data, documentation, statistics, studies, calculation tables, etc.), when applicable.

Name of authorized officer signing for the DNA:	**Mrs. Sin Lan Ng Yun Wing** (Director of Environment)
Date and signature for the DNA:	27 September 2013
Name and contact details of the focal point(s) for any follow up communication: *(all communication regarding procedural or technical issues will be sent to the focal point(s))*	J.Seewoobaduth (Divisional Environment Officer, Climate Change Division) jseewoobaduth@mail.gov.mu Mob: +230 59189251 D.S.Chamilall (Environment Officer) dchamilall@mail.gov.mu Mob: +230 57091590

DEPARTMENT OF ENVIRONMENT & S.D. DIRECTOR

SECTION BELOW TO BE COMPLETED BY THE UNFCCC SECRETARIAT

CDM-PSB ID number:	
Date when the form was received at UNFCCC secretariat:	
Have all Parties for which the standardized baseline is applicable fewer than 10 registered CDM project activities as of 31 December 2010? (Y/N):	
CDM-PSB ID number and version: *(to be completed by UNFCCC)*	

CLEAN DEVELOPMENT MECHANISM
PROPOSED STANDARDIZED BASELINE
(CDM-PSB)
(VERSION 01.0)

"Standardized baseline title"

Submission date

Version Number

Source

If the standardized baseline was developed using a methodological approach contained in an approved methodology or tool please provide the name, number (if applicable) and version of the approved methodology or tool used.

If it was developed using the "*Guidelines for the establishment of sector specific standardized baselines*" please state the version of the guidelines used.

If a table of calculation is available for the development of the standardized baseline, please state the version of the table used, and submit it with this form.

CDM Methodological Tool 07 – i.e. "Tool to calculate the emission factor for an electricity system (Version 04.0.0)"

Type of standardized baseline approach

The standardized baseline is developed for:

☐ Additionality demonstration;

☐ Baseline identification;

√ Baseline emission estimation.

Please note that one, two or all three items can be checked.

SECTION A: STANDARDIZED BASELINE DEVELOPED USING THE "GUIDELINES FOR THE ESTABLISHMENT OF SECTOR SPECIFIC STANDARDIZED BASELINES"

This section should only be completed when the standardized baseline is developed using the "Guidelines for the establishment of sector specific standardized baselines".

Applicability of the standardized baseline

Please provide the following information:

- The host country(ies) or region(s) within a host country to which the standardized baseline is applicable. In case of region(s) within a host country, please document transparently the geographical boundaries of the region (e.g. provinces, electric grids, etc).

- The sector(s) to which the standardized baselines is applied. Note that a sector refers to a segment of a national economy that delivers defined output(s) (e.g. clinker production, domestic / household energy supply). The sector is characterized by the output(s) O_i it generates.

- The output(s) to which the standardized baseline is applied, i.e. the goods or services with comparable quality, properties, and application areas (e.g.clinker, lighting, residential cooking).

- The measure to which the standardized baseline is applicable:

  ☐ Fuel and feedstock switch; or

  ☐ Switch of technology with or without change of energy source (including energy efficiency improvement); or

  ☐ Methane destruction; or

  ☐ Methane formation avoidance.

Additionality demonstration

Please explain how the "Guidelines for the establishment of sector specific standardized baselines" were applied to demonstrate additionality and develop a positive list of project activities that are deemed additional. Follow the steps and guidance of the "Guidelines for the establishment of sector specific standardized baselines". Document all underlying data, data sources, assumptions, calculation steps and outcomes in a clear and transparent manner.

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Baseline identification

Please explain how the "*Guidelines for the establishment of sector specific standardized baselines*" were applied to identify the baseline for the measures. Follow the steps and guidance of the "*Guidelines for the establishment of sector specific standardized baselines*". Document all underlying data, data sources, assumptions, calculation steps and outcomes in a clear and transparent manner.

Baseline emission factor estimation (if applicable)

Please explain how the "*Guidelines for the establishment of sector specific standardized baselines*" were applied to determine a baseline emission factor. Follow the steps and guidance of the "*Guidelines for the establishment of sector specific standardized baselines*". Document all underlying data, data sources, assumptions, calculation steps and outcomes in a clear and transparent manner.

Use of the standardized baseline with an approved methodology

Please explain how the standardized baseline will be used with the relevant approved methodology(ies) or an approved tool, i.e. which (parts of) the approved methodology(ies) or the approved tool are replaced by the standardized baseline. Note that a standardized baseline derived from the *"Guidelines for the establishment of sector specific standardized baselines"* will usually replace the sections on demonstration of additionality, identification of the baseline scenario and the determination of baseline emissions, while the methodology sections on applicability, project boundary, project emissions, leakage emissions and provision to monitor project and leakage emissions may not be affected by the use of the standardized baseline. If an approved methodology is not available, a new methodology should be submitted to be used with the standardized baseline, following the relevant procedures ("*Procedure for the submission and consideration of a proposed new baseline and monitoring methodology for large scale CDM project activities*" or "*Procedures for the submission and consideration of a proposed new small scale methodology*").

Validity of the standardized baseline

Please state the period of time for which the standardized baseline is valid. Please note that Appendix I of the "Guidelines for the establishment of sector specific standardized baselines" provide interim values for data vintage and the frequency of update.

SECTION B: STANDARDIZED BASELINE DEVELOPED USING A METHODOLOGICAL APPROACH CONTAINED IN AN APPROVED METHODOLOGY OR TOOL

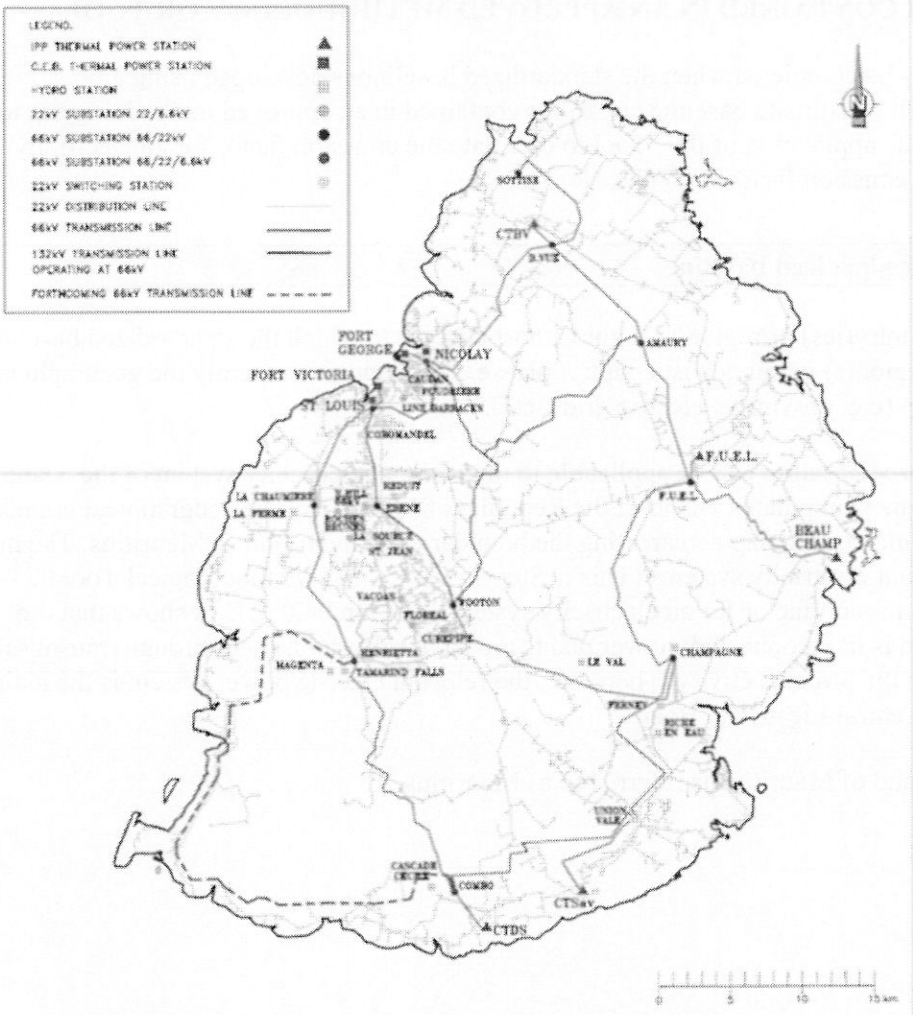
This section should only be completed when the standardized baseline is developed using a methodological approach to estimate baseline emissions contained in an approved methodology or tool. An example for this is the application of the "Tool to calculate the emission factor for an electricity system" to estimate the emission factor for a electric grid.

Applicability of the standardized baseline

Please state the host country(ies) or region(s) within a host country to which the standardized baseline is applicable. In case of region(s) within a host country, please document transparently the geographical boundaries of the region (e.g. provinces, electric grids, etc).

The proposed standardized baseline will be applicable to the national electricity system of the island of Mauritius, which is the most populated island of the Republic of Mauritius. The geographical boundary is shown in Figure 1, which is the map demarcating the boundaries of the island of Mauritius. The map also identifies the relevant electricity systems (This is Step 1 of the CDM Methodological Tool 07 – i.e. "Tool to calculate the emission factor for an electricity system (Version 04.0.0))". It shows that the Mauritian electrical grid is interconnected: power plants are physically connected through transmission and distribution lines to the project activity. Therefore, the relevant electric power system is the national grid. It is managed by Central Electricity Board.

In what follows, the island of Mauritius is referred to as Mauritius.



Baseline emission estimation

Please explain how the methodological approach contained in the approved methodology or tool was applied to estimate the baseline emissions of a project activity in (a) country(ies) or region. Follow the steps and guidance of the approved methodologies or tools. Document all underlying data, data sources, assumptions, calculation steps and outcomes in a clear and transparent manner. Note that the underlying methodology or tool has to provide a methodological approach to derive the baseline emissions for a country or region in order to apply this step. This applies, for example, to the methodological tool "Tool to determine the emission factor of an electricity system".

Step 1 on identifying the electricity system has been discussed above. The following applies the remaining steps of the CDM Methodological Tool 07 – i.e. "Tool to calculate the emission factor for an electricity system (Version 04.0.0)". Please note that the calculations are provided in the accompanying report and also the EFgrid calculator (Excel file).

STEP 2 : Choose whether to include off-grid power plants in the project electricity system (optional).

The tool allows selecting one of the following two options to calculate the operating margin and build margin emission factor:

Option 1: Only grid power plants are included in the calculation.

Option 2: Both grid power plants and off-grid power plants are included in the calculation.

Since there are no off-grid power plants in Mauritius, **Option 1** is selected for the calculation of both the operating margin (OM) and build margin (BM) emission factors.

STEP 3 : Select a method to determine the operating margin (OM).

The calculation of the operating margin emission factor (*EFgrid,OM,y*) is based on one of the following methods:

(a) Simple OM, or

(b) Simple adjusted OM, or

(c) Dispatch Data Analysis OM, or

(d) Average OM.

The method (c) requires the detailed operation and hourly dispatch data of power plants in the grid. To date, there is no publicly available dispatch data with that level of details for the Mauritian grid. Method (c) is therefore not applicable.

The method (b), simple adjusted OM, needs the annual load duration curve of the grid. Based on the same reason stated above, the data required is difficult to obtain. Method (b) is therefore not applicable.

The method (d), average OM, is used when low-cost/must run resources constitute more than 50% of the total amount of power generation on the grid. According to CEB, the total electric power generation of the Mauritian Grid in 2012 was 2,495.5 GWh, in which fossil fuel based thermal power generation was 1,921.7 GWh, accounting for 77.0% of total grid electricity generation, and renewable energy sources (hydro, bagasse-based power generation, photovoltaics, and landfill gas to electricity) represented 573.8 GWh accounting for 23.0% of total grid electricity generation. Therefore, the Mauritius grid generation system is dominated by fossil fuel power generation, and the trends are such that the proportion of fossil fuel based power generation will remain high in upcoming years. Method (d) is therefore not applicable.

The Simple OM method (a) can be used when low-cost/must run resources constitute less than 50% of the total amount of the power generation on the grid, in average of the five most recent years. In 2012, the Mauritian grid generation system was dominated by coal, heavy fuel oil, diesel and kerosene based power. As **Table 1.2** shows, hydropower, bagasse and more recently landfill gas to electricity represent all of the low-cost/must run resources with a total share not exceeding 27.4% between 2008 and 2012. Therefore, method (a) is the most appropriate method to calculate the OM emission factor.

Table 1.2: Share of low cost/must run renewable electricity in the national electricity grid of Mauritius.

Share of renewable (%)	2008	2009	2010	2011	2012
Hydropower (%)	4.2	5.4	4.2	2.3	3.0
Bagasse (%)	19.0	15.8	23.2	20.1	19.3
Photovoltaic (%)	-	-	-	-	0.0(1)
Landfill gas (%)	-	-	-	0.1	0.7
Total (%)	*23.2*	*21.2*	*27.4*	*22.5*	*23.0*

Sources of data:
(please see: http://statsmauritius.gov.mu/English/StatsbySubj/Pages/Energy-and-Water.aspx - accessed 2 December 2013):
For the years 2011 and 2012: **Statistics Mauritius. (2013). Energy and Water Statistics – 2012. Port Louis, Mauritius.**
For the years 2009 and 2010: **Statistics Mauritius. (2011). Energy and Water Statistics – 2010. Port Louis, Mauritius.**
For the year 2008: **Statistics Mauritius. (2010). Energy and Water Statistics – 2009. Port Louis, Mauritius.**

The same statistics can be found in the: **Statistics Mauritius. (2013). Digest of Water and Energy Statistics, Port Louis, Mauritius: Statistics Mauritius**.

STEP 4 : Calculate the operating margin emission factor according to the selected method.

According to the tool, the simple OM emission factor (*EFOM,simple,y*) is calculated as the generation-weighted average CO_2 emissions per unit net electricity generation (tCO_2/MWh) of all generating power plants serving the system, not including low-cost/must-run power plants/units.

The simple OM may be calculated in two ways:

(a) **Option A:** Based on the net electricity generation and a CO_2 emission factor of each power unit; or

(b) **Option B:** Based on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system.

According to the tool, Option B can only be used if:

(a) The necessary data for Option A is not available; and

(b) Only nuclear and renewable power generation are considered as low-cost/must-run power sources and the quantity of electricity supplied to the grid by these sources is known; and

(c) Off-grid power plants are not included in the calculation (i.e., if Option I - only grid power plants are included in the calculation- has been chosen in **STEP 2**).

Given that all these conditions are met in the present case, Option B has been used to calculate the OM emission factor. Under this option, the simple OM emission factor is calculated based on the net electricity supplied to the grid by all power plants serving the system, not including low-cost/must-run power plants/units, and based on the fuel type(s) and total fuel consumption of the project electricity system, as follows:

$$EF_{grid,OMsimple,y} = \frac{\sum_i FC_{i,y} \times NCV_{i,y} \times EF_{CO2,i,y}}{EG_y}$$

Where:

$EF_{grid,OMsimple,y}$ = Simple operating margin CO2 emission factor in year y (t CO2/MWh);

$FC_{i,y}$ = Amount of fuel type i consumed in the project electricity system in year y (mass or volume unit);

$NCV_{i,y}$ = Net calorific value (energy content) of fuel type i in year y (GJ/mass or volume unit);

$EFCO_{2,i,y}$ = CO_2 emission factor of fuel type i in year y (t CO_2/GJ);

EG_y = Net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost/must-run power plants/units, in year y (MWh);

i = All fuel types combusted in power sources in the project electricity system in year y ; and

y = The relevant year as per the data vintage chosen in Step 3.

For the calculation of the OM emission factor, the consumption data for each fossil fuel used to power the different power plants were obtained from the CEB. The calculation of the OM is based on data for the years 2010, 2011 and 2012. Local values of $\boldsymbol{NCV_i}$ and IPCC default values of $\boldsymbol{EFCO_{2,i}}$ are used. **Table 1.3 and Table 1.4** summarize the data used to calculate the OM emission factor.

Table 1.3: Data for fuel consumption and electricity delivered to grid from different fuel sources, 2010 – 2012.

Fuel Source	Fuel Consumption (FC, t)			Electricity delivered to grid (EG, MWh)		
	2010	2011	2012	2010	2011	2012
Coal	612942	617334	643135	966583	980983	1021373
HFO	189406	181458	211753	910088	868976	1026941
Kerosene	5995	3651	3430	18382	11580	10984

Sources of data: Statistics Mauritius. (2013). Digest of Water and Energy Statistics, Port Louis, Mauritius: Statistics Mauritius; and Mr Shamshir Mukoon, Corporate Planning and Research Manager, Central Electricity Board, Curepipe, Mauritius (Phone: +230 5250 2226 and Email: shams.mukoon@ceb.intnet.mu).

Table 1.4: Net calorific value and emission factor of fuel sources.

Fuel Source	NCV (GJ/t)	EF (tCO_2/TJ)
Coal	25.5	87.3
HFO	40.19	75.5
Kerosene	43.4	69.7

Source of data:

The values of NCV were obtained from the Central Electricity Board (Mr Shamshir Mukoon, Corporate Planning and Research Manager, Central Electricity Board, Curepipe, Mauritius (Phone: +230 5250 2226)).

The emission factors for the fossil combustibles were taken from Table 2.2 – Chapter 2 – Stationary Combustion, 2006 IPCC Guidelines for National Greenhouse Gas Inventories. The values correspond to the lower bound default emission factors for CO_2.

Using the data in **Table 1.3** and **Table 1.4**, the calculated OM is: **1.0279 tCO_2/MWh**.

STEP 5 : Calculate the build margin (BM) emission factor.

According to the "*Tool to calculate emissions factor for an electricity system*", project participants should use the set of power units that comprises the larger annual generation. The build margin consists of either:

(a) The set of five power units ($SET_{5\text{-units}}$) that have been built most recently,

The set of five power units that have been built most recently represents a gross electricity production (in year 2012) of **685,423 MWh.**

Or (b) The set of power capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently ($SET_{\geq 20 \text{ per cent}}$).

20% of gross electricity production in 2012 represented **499,045 MWh.**

According to the methodological tool, the set of power units (SET_{sample}) that comprises the larger annual generation must be used. In the present case, $SET_{sample} = SET_{5\text{-units}}$.

Identify the date when the power units in SET_{sample} started to supply electricity to the grid. If none of the power units in SET_{sample} started to supply electricity to the grid more than 10 years ago, then use SET_{sample} to calculate the build margin.

The set of 5 most recent power units is described in **Table 1.5**. A power plant/unit is a facility that generates electric power. Several power units at one site comprise one power plant, whereas a power unit is characterized by the fact that it can operate independently from other power units at the same site. Where several identical power units (i.e. with the same capacity, age and efficiency) are installed at one site, they may be considered as one single power unit.

Table 1.5: Set of 5 power units under consideration.

Power unit	Power plant	Date Commissioned	Fuel type	Installed capacity (MW)	Net electricity to grid (MWh)
G6	Fort Victoria	May 2012	HFO	15	132,989
G5		Apr 2012		15	
G4		Apr 2012		15	
G3		Apr 2012		15	
G2	Fort	Sept 2010	HFO	15	75,825

G1	Victoria	Sept 2010		15	
G2	La Baraque	Oct 2007	coal/bagasse	45	155,872
G1	La Baraque	Apr 2007	coal/bagasse	45	200,983
G7	St Louis	13 Apr 2006	HFO	13.8	119,754
G8		16 Feb 2006		13.8	
G9		16 Feb 2006		13.8	
TOTAL GENERATION					**685,423**

Sources of data:
Statistics for the generation of individual power plants or power units are not detailed in publicly available national statistics – i.e. from Statistics Mauritius. Generation data to calculate the build margin emission factor was therefore sought from the Central Electricity Board. In particular, Mr Shamshir Mukoon, Corporate Planning and Research Manager, Central Electricity Board, Curepipe, Mauritius (Phone: +230 5250 2226).

The build margin emissions factor is the generation-weighted average emission factor (tCO_2/MWh) of all power units m during the most recent year *y* for which electricity generation data is available (2012 in present case), calculated as follows:

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}}$$

Where:

$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year *y* (tCO_2/MWh);

$EG_{m,y}$ = Net quantity of electricity generated and delivered to the grid by power unit *m* in year *y* (MWh);

$EF_{EL,m,y}$ = CO_2 emission factor of power unit *m* in year *y* (tCO_2/MWh);

m = Power units included in the build margin; and

y = Most recent historical year for which electricity generation data is available.

Using data given in **Table 1.5** and **Table 1.4**, the BM has been calculated as: **0.9627 tCO_2/MWh**.

STEP 6 : Calculate the combined margin (CM) emissions factor.

The combined margin emissions factor is calculated as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM}$$

Where:

$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year y (tCO_2/MWh);

$EF_{grid,OM,y}$ = Operating margin CO_2 emission factor in year y (tCO_2/MWh);

w_{OM} = Weighting of operating margin emissions factor (%); and

w_{BM} = Weighting of build margin emissions factor (%).

The following default values should be used for w_{OM} and w_{BM}:

(a) **Wind** and **solar power generation** project activities: w_{OM} = 0.75 and w_{BM} = 0.25 (owing to their intermittent and non-dispatchable nature) for the first crediting period and for subsequent crediting periods;

(b) **All other projects**: w_{OM} = 0.5 and w_{BM} = 0.5 for the first crediting period, and w_{OM} = 0.25 and w_{BM} = 0.75 for the second and third crediting period, unless otherwise specified in the approved methodology which refers to this tool.

The combined margin grid emission factors for Mauritius are summarized in **Table 1.6**.

Table 1.6: Combined Margin grid emission factor for the national electricity system of Mauritius.

Type of Project	OM (tCO_2/MWh)	BM (tCO_2/MWh)	CM (tCO_2/MWh)
PV and wind	1.0279	0.9627	1.0116
All other projects	1.0279	0.9627	0.9953

Use of the standardized baseline with an approved methodology

Please explain how the standardized baseline will be used with the relevant approved methodology(ies) or approved tool, i.e. which (parts of) the approved methodology(ies) or the approved tool are replaced by the standardized baseline.

The standardized baseline may be used by any approved CDM methodologies that make reference and apply CDM Methodological Tool 07 – i.e. "Tool to calculate the emission factor for an electricity system (Version 04.0.0)". That is, the standardized baseline will replace parts of approved CDM methodologies that use baseline emission related to the grid emission factor.

Validity of the standardized baseline

Please state the vintage of the parameters used to derive the standardized baseline, in accordance with the requirements contained in the approved methodology or tool.

The standardized baseline will be valid for a period of 3 years as from the time of approval.

REFERENCES AND ANY OTHER INFORMATION

The following documents have been submitted with this submission:

- Report entitled "Calculating the grid emission factor of Mauritius"; and
- Excel sheet that has been developed to calculate the grid mission factor of Mauritius.

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History of the document

Version	Date	Nature of revision(s)
01.0	23 March 2012	Initial publication.
Decision Class: Regulatory **Document Type**: Form **Business Function**: Methodology		