Energy Conservation (Industry) Sector

Appendix-7 Energy Efficiency Improvement
Appendix-8 Electricity and Heat Supply
Appendix-9 Fuel Switching

Input Sheet: New facilities

Project Name: Sample1【Energy efficiency of the industrial facilities_New facilities】

1. The electricity and fuel consumption in the absence of the project

Input the estimated data of the necessary electricity and fuel consumption required to generate the production capacity (output etc.) of new facilities based on the actual data of the similar facilities into the following cells.

Item		Entry field	Unit
Electricity consumption in the absence of the project		464	MWh/y
Fuel consumption in the absence of the project	Crude Oil	50	kL/y
	Coal		t/y
	Gas		m^3/y
	Others		

2. The electricity and fuel consumption after the project start

Input the planned data for the calculation before the project start and input the monitoring data for the calculation after the project start into the following cells.

Item		Entry field	Unit
Electricity consumption after the project start		350	MWh/y
Fuel consumption after the project start	Crude Oil	35	kL/y
	Coal		t/y
	Gas		m^3/y
	Others		

3. CO2 emission factor of the electric power ($t-CO_2/MWh$)

Emission factor of the general power facilities shall be used as CO2 emission factor of electric power which connects to the grid. Data availability is validated in the following order in regards of the selection of general

i) Data obtained from the interview with power management entity
ii) National default

Item	Entry field	Unit
CO_2 emission factor of electric power which connects to the grid	0.895	$t-CO_2/MWh$

Source: Data obtained from xx company of xx country through interview

4. Net calorific value according to fuel type and CO_2 emission factor

Data availability is validated in the following order because it should preferably be calculated using data and information unique to the project.

i) The unique data of the project obtained from the interview with power management entity
ii) National default
iii) IPCC Guideline default data

Item	Net calorific value		CO_2 emission factor	
Crude Oil	36.3	GJ/kL	73.3	$t-CO_2/TJ$
Coal	26.7	GJ/t	98.3	$t-CO_2/TJ$
Gas	0.0384	GJ/m^3	56.1	$t-CO_2/TJ$
Others				$t-CO_2/TJ$

Source: Data obtained from xx through interview
2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 2 Energy,table2.2

5. The production capacity before the project start

Input the production capacity before and after the project start into the following. (If the facility is newly constructed, input the same data for before and after the project start.)

	Entry field	Unit
The production capacity before the project start	12,000	t
The production capacity after the project start	14,000	t

Source: Data obtained from xx through interview

Entry field
Entry field of the reference documents

Result Sheet: New facilities

Sample1【Energy efficiency of the industrial facilities_New facilities】

GHG emission reduction with the project (t-CO_2/y) $ER_y = BE_y - PE_y$ (t-CO_2/y)

1. Baseline emission $BE_y = (BEelec_{,y} + BE_{i,y}) \times (P_{out} / B_{out})$

BE_y	Baseline emission: GHG emission without replacement, upgrading and improvement of the facilities	640	t-CO_2/y
$BE_{el,y}$	GHG emission from electric power generation before the project start	415	t-CO_2/y
$Be_{i,y}$	GHG emission from fuel power generation before the project start	133	t-CO_2/y
P_{out}	The production capacity before the project start	12000	t
B_{out}	The production capacity after the project start	14000	t

2. Project emission $PE_y = PE_{el,y} + PE_{i,y}$

PE_y	Project emission: GHG emission after the project start	406	t-CO_2/y
$PE_{el,y}$	GHG emission from electric power consumption after the project start	313	t-CO_2/y
$PE_{i,y}$	GHG emission from fuel power consumption after the project start	93	t-CO_2/y

3. GHG emission reduction with the project $ER_y = BE_y - PE_y$ (t-CO_2/y)

ER_y	GHG emission reduction with the project	234	t-CO_2/y
BE_y	Baseline emission: GHG emission without replacement, upgrading and improvement of the facilities	640	t-CO_2/y
PE_y	Project emission: GHG emission after the project start	406	t-CO_2/y

Input Sheet: New facilities

Project Name **Sample1【Use of thermoelectric energy of the waste energy in industry】**

1. Quantity of electric power and heat from recovery and utilization of the waste energy

Input the estimated data of the necessary electricity and fuel consumption required to generate the power production capacity (output etc.) of new facilities based on the actual data of the similar facilities into the following cells.

Item	Entry field	Unit
Quantity of electric power generation from recovery and utilization of the waste energy	69,000	MWh/y
Quantity of heat from recovery and utilization of the waste energy	100	TJ/y

2. CO2 emission factor of the electric power （t-CO_2/MWh）

Emission factor of the general power facilities shall be used as CO2 emission factor of electric power which connects the grid. Data availability is validated in the following order in regards of the selection of general

i) Interview with power management entity
ii) National default

Emission obtained from the interview with power management entity shall be used for the private generating fa

Item	Entry field	Unit
CO_2 emission factor of the electric power which connects the grid	0.968	t-CO_2/MWh
CO_2 emission factor of the electric power from private generating facility		t-CO_2/MWh
CO_2 emission factor of the electric power used for calculation	0.968	t-CO_2/MWh

Source: Data obtained from xx through interview

3. CO_2 emission factor of heat generation（t-CO_2/TJ）

Item		Entry field	Unit
CO_2 emission factor per unit of energy of the boiler fuel consumption in the absence of project	Fuel type: Crude Oil	73.3	t-CO_2/TJ
Boiler efficiency		50	%
Rate of heat generation from boiler out of the heat generation recovered and utilized from the waste energy in the absence of project		1	―
CO_2 emission factor per heat generated		146.6	t-CO_2/TJ

Source: 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 2 Energy

4. Amount of electricity and fuel consumption after the project start

Input the estimated data of the necessary electricity and fuel consumption required to generate the power production capacity (output etc.) of new facilities based on the actual data of the similar facilities into the following cells.

Item		Entry field	Unit
Amount of electricity consumption after the project start		364	MWh/y
Amount of fuel consumption after the project start	Crude Oil	80	kL/y
	Coal		t/y
	Gas		m^3/y
	Others		

5. Net calorific value according to fuel type and CO2 emission factor

Data availability is validated in the following order because it should preferably be calculated using data and information unique to the project.

i) The unique data of the project obtained from the interview with power management entity
ii) National default
iii) IPCC Guideline default data

Item	Net calorific value		CO_2 emission factor	
Crude Oil	36.3	GJ/kL	73.3	t-CO_2/TJ
Coal	26.7	GJ/t	98.3	t-CO_2/TJ
Gas	0.0384	GJ/m^3	56.1	t-CO_2/TJ
Others				t-CO_2/TJ

Source: Data obtained from xx through interview
2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 2 Energy table1.2,table2

(yellow)	Entry field
(orange)	Entry field of the reference documents
(green)	Automatic calculation
(blue)	Default value（revise by manual entry according to the project situation）

Result Sheet: New facilities

Sample1【Use of thermoelectric energy of the waste energy in industry】

GHG emission reduction with the project （$t\text{-}CO_2/y$） $ER_y = BE_y - PE_y$ （$t\text{-}CO_2/y$）

1. Baseline emission $BE_y = BE_{el,y} + BE_{ther,y}$

BE_y	Baseline emission: GHG emission without recovery and utilization of the waste energy	81,473	$t\text{-}CO_2/y$
$BE_{el,y}$	GHG emission generated by electric supply with recovery and utilization of the waste energy after the project start	66,813	$t\text{-}CO_2/y$
$BE_{ther,y}$	GHG emission generated by heat supply with recovery and utilization of the waste energy after the project start	14,660	$t\text{-}CO_2/y$

2. Project emission $PE_y = PE_{el,y} + PE_{i,y}$

PE_y	Project emission: GHG emission after the project start	565	$t\text{-}CO_2/y$
$PE_{el,y}$	GHG emission with electric consumption after the project start	352	$t\text{-}CO_2/y$
$PE_{i,y}$	GHG emission with fuel consumption after the project start	213	$t\text{-}CO_2/y$

3. GHG emission reduction with the project $ER_y = BE_y - PE_y$ （$t\text{-}CO_2/y$）

ER_y	GHG emission reduction with the project	80,907	$t\text{-}CO_2/y$
BE_y	Baseline emission: GHG emission without recovery and utilization of the waste energy	81,473	$t\text{-}CO_2/y$
PE_y	Project emission: GHG emission after the project start	565	$t\text{-}CO_2/y$

9. Fuel Switching

Input Sheet: New facilities, Existing facilities

Project name **Sample1【Fuel switching in the industrial facilities_new facilities】**

1.The production capacity before the project

Input the planned data for the calculation of the production capacity before the project start and the monitoring date for the calculation of the production capacity after the project start. (If the facility is newly constructed, input the same data for before and after the project start.)

Item	Entry field	Unit
Production capacity and others before the project start	850	t
Production capacity and others after the project start	1,035	t

2. Fuel consumption before and after the project start

Input the planned data for the calculation of the fuel consumption before the project start and input the monitoring data for the calculation of the fuel consumption after the project start into the following cells.

Item		Entry field	Unit
Fuel consumption before project activity	Crude Oil	27,668	kL/y
	Coal		t/y
	Gas		m^3/y
	Others (Kerose	2,934	kL/y
Fuel consumption after project activity	Crude Oil		kL/y
	Coal		t/y
	Gas	2,954,979	m^3/y
	Others		

3. Net calorific value according to fuel type and CO2 emission factor

Data availability is validated in the following order because it should preferably be calculated using data and information unique to the project.

i) The unique data of the project obtained from the interview with power management entity
ii) National default
iii) IPCC Guideline default data

Item	Net calorific value		CO_2 emission factor	
Crude Oil	36.3	GJ/kL	73.3	t-CO_2/TJ
Coal	26.7	GJ/t	98.3	t-CO_2/TJ
Gas	0.0384	GJ/m^3	56.1	t-CO_2/TJ
Others (Kerosene)	35.3	GJ/kL	71.9	t-CO_2/TJ

Source: 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 2 Energy table1.2,table2.2
Data obtained from xx gas company through interview

Yellow	Entry field
Orange	Entry field of the reference documents
Green	Automatic input, automatic calculation

Result Sheet: New facilities, Existing facilities

Sample1【Fuel switching in the industrial facilities_new facilities】

GHG emission reduction with the project （$t\text{-}CO_2/y$）　$ER_y = BE_y - PE_y$ （$t\text{-}CO_2/y$）

1. Baseline emission $BE_y = PG_{PJ,y} \times ((BC_{i,y} \times NCV_i \times COEF_i) / PG_{BL,y})$

BE_y	Baseline emission: GHG emission without switching fuel	98,703	$t\text{-}CO_2/y$
$PG_{BL,y}$	The power production capacity before the project start	850	t
$PG_{PJ,y}$	The power production capacity after the project start	1,035	t
$BC_{i,y}$	Fuel consumption of fuel i before the project start	−	kL,m3,t etc./y
	Crude Oil	27,668	kL/y
	Coal	0	t/y
	Gas	0	m3/y
	Others (Kerosene)	2,934	kL/y
NCV_i	Net calorific value of fuel i	−	GJ/kL,m^3,t etc
	Crude Oil	36.3	GJ/kL
	Coal	26.7	GJ/t
	Gas	0.0384	GJ/m3
	Others (Kerosene)	35.3	GJ/kL
$COEF_i$	CO_2 emission factor per calorific value of fuel i	−	$t\text{-}CO_2/TJ$
	Crude Oil	73.3	$t\text{-}CO_2/TJ$
	Coal	98.3	$t\text{-}CO_2/TJ$
	Gas	56.1	$t\text{-}CO_2/TJ$
	Others (Kerosene)	71.9	$t\text{-}CO_2/TJ$

2.Project emission $PE_y = PC_{i,y} \times NCV_i \times COEF_i$

PE_y	Project emission: GHG emission after fuel switching	6,366	$t\text{-}CO_2/y$
$PC_{i,y}$	Fuel consumption of fuel i after the project start	–	kL,m3,tetc./y
	Crude Oil	0	kL/y
	Coal	0	t/y
	Gas	2,954,979	m3/y
	Others	0	0
NCV_i	Net calorific value of fuel i	–	GJ/kL,m^3,t etc
	Crude Oil	36.3	GJ/kL
	Coal	26.7	GJ/t
	Gas	0.0384	GJ/m3
	Others (Kerosene)	35.3	GJ/kL
$COEF_i$	CO_2 emission factor per calorific value of fuel i	–	$t\text{-}CO_2/TJ$
	Crude Oil	73.3	$t\text{-}CO_2/TJ$
	Coal	98.3	$t\text{-}CO_2/TJ$
	Gas	56.1	$t\text{-}CO_2/TJ$
	Others (Kerosene)	71.9	$t\text{-}CO_2/TJ$

3. GHG emission reduction with the project $ER_y = BE_y - PE_y$ $(t\text{-}CO_2/y)$

ER_y	GHG emission reduction with the project	92,338	$t\text{-}CO_2/y$
BE_y	Baseline emission: GHG emission without fuel switching	98,703	$t\text{-}CO_2/y$
PE_y	Project emission: GHG emission after fuel switching	6,366	$t\text{-}CO_2/y$

Energy Sector

Appendix-10 Energy Plant Construction with Fuel Switching

Appendix-11 Thermal Power with Electricity and Heat Supply

Appendix-12 Thermal Power with Fuel Switching

Appendix-13 Thermal Power with Higher Efficiency

Appendix-14 Power Transmission with Improved Efficiency

Appendix-15 Power Distribution with Improved Efficiency

Appendix-16 Rural Electrification

Input Sheet: New facilities, Existing facilities

Project Name **Sample1【Introduction of the district heating and cooling system_new facilities】**

1. The amount of heat supply before and after the project

Input the planned data for the calculation of the amount of heat supply before the project start and the measured date for the calculation of the amount of heat supply after the project start.（If the facility is newly

Item	Entry field	Unit
Amount of heat supply before the project starts	398	TJ
Amount of heat supply after the project starts	1,072	TJ

2. Fuel consumption before and after the project start

Input the planned data for the calculation of the fuel consumption before the project start and input the measured data for the calculation of the fuel consumption after the project start into the following cells.

Item		Entry field	Unit
Fuel consumption before project activity	Crude Oil	12	kL/y
	Coal		t/y
	Gas		m^3/y
	Others		
Fuel consumption after project activity	Crude Oil		kL/y
	Coal		t/y
	Gas	3,068	m^3/y
	Others		

3. Net calorific value according to fuel type and CO2 emission factor

Data availability is validated in the following order because it should preferably be calculated using data and information unique to the project.

i) The unique data of the project obtained from the interview with power management entity
ii) National default
iii) IPCC Guideline default data

Item	Net calorific value		CO_2 emission factor	
Crude Oil	36.3	GJ/kL	73.3	t-CO_2/TJ
Coal	26.7	GJ/t	98.3	t-CO_2/TJ
Gas	0.0384	GJ/m^3	56.1	t-CO_2/TJ
Others				t-CO_2/TJ

Source: 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 2 Energy table1.2,table2.2

Entry field
Entry field of the reference documents

Calculation result sheet: New facilities

Sample1【Introduction of the district heating and cooling system_new facilities】

GHG emission reduction with the project（$t\text{-}CO_2/y$） $ER_y = BE_y - PE_y$ （$t\text{-}CO_2/y$）

1. Baseline emission $BE_y = PG_{PJ,y} \times ((BC_{i,y} \times NCV_i \times COEF_i) / PG_{BL,y})$

BE_y	Baseline emission: GHG emission without the district heating and cooling system	86	$t\text{-}CO_2/y$
$PG_{BL,y}$	Amount of heat supply before the project starts	398	TJ
$PG_{PJ,y}$	Amount of heat supply after the project starts	1,072	TJ
$BC_{i,y}$	Fuel consumption of fuel i before project activity	－	kL,m3,t etc./y
	Crude Oil	12	kL/y
	Coal	0	t/y
	Gas	0	m3/y
	Others	0	0
NCV_i	Net calorific value of fuel i	－	GJ/kL,m^3,t etc
	Crude Oil	36.3	GJ/kL
	Coal	26.7	GJ/t
	Gas	0.0384	GJ/m3
	Others	0.0	0
$COEF_i$	CO_2 emission factor per calorific value of fuel i	－	$t\text{-}CO_2/TJ$
	Crude Oil	73.3	$t\text{-}CO_2/TJ$
	Coal	98.3	$t\text{-}CO_2/TJ$
	Gas	56.1	$t\text{-}CO_2/TJ$
	Others	0	$t\text{-}CO_2/TJ$

2. Project emission $PE_y = PC_{i,y} \times NCV_i \times COEF_i$

PE_y	Project emission: GHG emission after introduction of the district heating and cooling system	7	$t\text{-}CO_2/y$
$PC_{i,y}$	Fuel consumption of fuel i after the project start	－	kL,m3,t etc./y
	Petroleum	0	kL/y
	Coal	0	t/y
	Gas	3,068	m3/y
	Others	0	0
NCV_i	Net calorific value of fuel i	－	GJ/kL,m^3,t etc
	Petroleum	36.3	GJ/kL
	Coal	26.7	GJ/t
	Gas	0.0384	GJ/m3
	Others	0.0	0
$COEF_i$	CO_2 emission factor per calorific value of fuel i	－	$t\text{-}CO_2/TJ$
	Petroleum	73.3	$t\text{-}CO_2/TJ$
	Coal	98.3	$t\text{-}CO_2/TJ$
	Gas	56.1	$t\text{-}CO_2/TJ$
	Others	0	$t\text{-}CO_2/TJ$

3. GHG emission reduction with the project $ER_y = BE_y - PE_y$ $(t\text{-}CO_2/y)$

ER_y	GHG emission reduction with the project	79	$t\text{-}CO_2/y$
BE_y	Project emission: GHG emission without introduction of the district heating and cooling system	86	$t\text{-}CO_2/y$
PE_y	Project emission: GHG emission after introduction of the district heating and cooling system	7	$t\text{-}CO_2/y$

Input Sheet: New facilities

Project Name **Sample1【Use of thermoelectric energy of the waste energy in thermal power facilities】**

1. Quantity of electric power and heat from recovery and utilization of the waste energy

Input the planned data of the necessary electricity and fuel consumption required to generate the power production

Item	Entry field	Unit
Quantity of electric power generation from recovery and utilization of the waste energy	12,100	MWh/y
Quantity of heat from recovery and utilization of the waste energy	326	TJ/y

2. CO2 emission factor of the electric power (t-CO_2/MWh)

Emission factor of the target power facilities shall be used. Data availability is validated in the following order and input into the following cells.

ii) National default

ii) Emission factor of the target power facilities obtained from the interview with power management entity

Item	Entry field	Unit
CO2 emission factor of the target power facilities	0.969	t-CO_2/MWh

Source: Data obtained from xx through interview

3. CO_2 emission factor of heat generation (t-CO_2/TJ)

Item		Entry field	Unit
CO_2 emission factor per unit of energy of the boiler fuel consumption in the absence of project	Fuel type: Crude Oil	73.3	t-CO_2/TJ
Boiler efficiency		50	%
Rate of heat generation from boiler out of the heat generation recovered and utilized from the waste energy in		1	—
CO_2 emission factor per heat generated		146.6	t-CO_2/TJ

Source: 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 2 Energy

4. mount of electricity and fuel consumption after the project start

Input the estimated data of the necessary electricity and fuel consumption required to generate the power production capacity (output etc.) of new facilities based on the actual data of the similar facilities into the following cells.

Item		Entry field	Unit
Amount of electricity consumption after the project start		654	MWh/y
Amount of fuel consumption after the project start	Crude Oil	244	kL/y
	Coal		t/y
	Gas		m^3/y
	Others		

5. Net calorific value according to fuel type and CO2 emission factor

Data availability is validated in the following order because it should preferably be calculated using data and information unique to the project.

i) The unique data of the project obtained from the interview with power management entity

ii) National default

iii) IPCC Guideline default data

Item	Net calorific value		CO_2 emission factor	
Crude Oil	36.3	GJ/kL	73.3	t-CO_2/TJ
Coal	26.7	GJ/t	98.3	t-CO_2/TJ
Gas	0.0384	GJ/m^3	56.1	t-CO_2/TJ
Others				t-CO_2/TJ

Source: Data obtained from xx through interview

2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 2 Energy table1.2,table2.2

(yellow) Entry field
(orange) Entry field of the reference documents
(green) Automatic calculation

Result Sheet: New facilities

Sample1【Use of thermoelectric energy of the waste energy in thermal power facilities】

GHG emission reduction with the project（t-CO_2/y） $ER_y = BE_y - PE_y$ (t-CO_2/y)

1. Baseline emission $BE_y = BE_{el,y} + BE_{ther,y}$

BE_y	Baseline emission: GHG emission without recovery and utilization of the waste energy	59,517	t-CO_2/y
$BE_{el,y}$	GHG emission generated by electric supply with recovery and utilization of the waste energy after the project start	11,725	t-CO_2/y
$BE_{ther,y}$	GHG emission generated by heat supply with recovery and utilization of the waste energy after the project start	47,792	t-CO_2/y

2. Project emission $PE_y = PE_{el,y} + PE_{i,y}$

PE_y	Project emission: GHG emission after the project start	1,283	t-CO_2/y
$PE_{el,y}$	GHG emission with electric consumption after the project start	634	t-CO_2/y
$PE_{i,y}$	GHG emission with fuel consumption after the project start	649	t-CO_2/y

3. GHG emission reduction with the project $ER_y = BE_y - PE_y$ (t-CO_2/y)

ER_y	GHG emission reduction with the project	58,234	t-CO_2/y
BE_y	Baseline emission: GHG emission without recovery and utilization of the waste energy	59,517	t-CO_2/y
PE_y	Project emission: GHG emission after the project start	1,283	t-CO_2/y

Input Sheet: New plants, Existing facilities

Project Name **Sample1【Fuel switching in the fossil fuel fired power facilities_New facilities】**

1. Generating capacity before and after the project

Input the planned data for the electric generating capacity before the project start and input the planned data for the electric generating capacity after the project start into the following cells. (If the facility is newly constructed, input

Item	Entry field	Unit
Electric generating capacity before the project	4,695,800	MWh/y
Electric generating capacity after the project	4,928,000	MWh/y

2. Fuel consumption before and after the project start

Input the monitoring data for the fuel consumption before the project start and input the planned data for the fuel consumption after the project start into the following cells.

Item		Entry field	Unit
Fuel consumption before project activity	Crude Oil	1,330,569	kL/y
	Coal		t/y
	Gas		m^3/y
	Others		
Fuel consumption after project activity	Crude Oil		kL/y
	Coal		t/y
	Gas	1,415,982,226	m^3/y
	Others		

3. Net calorific value according to fuel type and CO2 emission factor

Data availability is validated in the following order because it should preferably be calculated using data and information unique to the project.

i) The unique data of the project obtained from the interview with power management entity
ii) National default
iii) IPCC Guideline default data

Item	Net calorific value		CO_2 emission factor	
Crude Oil	36.3	GJ/kL	73.3	t-CO_2/TJ
Coal	26.7	GJ/t	98.3	t-CO_2/TJ
Gas	0.0384	GJ/m^3	56.1	t-CO_2/TJ
Others				t-CO_2/TJ

Source: 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 2 Energy table1.2,table2.2

(yellow)	Entry field
(orange)	Entry field of the reference documents

Result Sheet: New facilities, Existing facilities

Sample1【Fuel switching in the fossil fuel fired power facilities_New facilities】

GHG emission reduction with the project（t-CO_2/y） $ER_y = BE_y - PE_y$ （t-CO_2/y）

1. Baseline emission $BE_y = PG_{PJ,y} \times ((BC_{i,y} \times NCV_i \times COEF_i) / PG_{BL,y})$

BE_y	Baseline emission: GHG emission without fuel switching	3,715,188	t-CO_2/y
$PG_{BL,y}$	The power production capacity before the project start	4,695,800	MWh/y
$PG_{PJ,y}$	The power production capacity after the project start	4,928,000	MWh/y
$BC_{i,y}$	Fuel consumption of fuel i before the project start	－	kL,m^3,t etc./y
	Cruide Oil	1,330,569	kL/y
	Coal	0	t/y
	Gas	0	m3/y
	Others	0	0
NCV_i	Net calorific value of fuel i	－	GJ/kL,m^3,t etc.
	Cruide Oil	36.3	GJ/kL
	Coal	26.7	GJ/t
	Gas	0.0384	GJ/m3
	Others	0.0	0
$COEF_i$	CO2 emission factor per calorific value of fuel i	－	t-CO_2/TJ
	Cruide Oil	73.3	t-CO_2/TJ
	Coal	98.3	t-CO_2/TJ
	Gas	56.1	t-CO_2/TJ
	Others	0	t-CO_2/TJ

2.Project emission $PE_y = PC_{i,y} \times NCV_i \times COEF_i$

PE_y	Project emission: GHG emission after fuel switching	3,050,366	$t\text{-}CO_2/y$
$PC_{i,y}$	Fuel consumption of fuel i after the project start	－	kL,m3,t etc./y
	Cruide Oil	0	kL/y
	Coal	0	t/y
	Gas	1,415,982,226	m3/y
	Others	0	0
NCV_i	Net calorific value of fuel i	－	GJ/kL,m^3,t etc.
	Cruide Oil	36.3	GJ/kL
	Coal	26.7	GJ/t
	Gas	0.0384	GJ/m3
	Others	0.0	0
$COEF_i$	CO2 emission factor per calorific value of fuel i	－	$t\text{-}CO_2/TJ$
	Cruide Oil	73.3	$t\text{-}CO_2/TJ$
	Coal	98.3	$t\text{-}CO_2/TJ$
	Gas	56.1	$t\text{-}CO_2/TJ$
	Others	0	$t\text{-}CO_2/TJ$

3. GHG emission reduction with the project $ER_y = BE_y - PE_y$ ($t\text{-}CO_2/y$)

ER_y	GHG emission reduction with the project	664,822	$t\text{-}CO_2/y$
BE_y	Baseline emission: GHG emission without fuel switching	3,715,188	$t\text{-}CO_2/y$
PE_y	Project emission: GHG emission after fuel switching	3,050,366	$t\text{-}CO_2/y$

Input Sheet: Existing facilities

Project Name Sample1【Efficiency improvement of the thermal power facilities_Existing facilities】

1. Quantity of power supply (of the target facilities after the project starts) (MWh/y)

Input the planned data for the calculation before the project start and the measured date for the calculation after the project start.

Item	Entry field	Unit
Quantity of power supply of the fossil fuel fired facilities after the project start	1,270,000	MWh/y

2. Efficiency of power generation

Input the monitoring data for the efficiency of aging facilities in general without the project,at the country or neighboring countries.
Input the planned data for the calculation of the efficiency of the target facilities before the project start and the monitoring date for the calculation of the efficiency of the target facilities after the project start.

Item		Entry field
Before project	Efficiency of aging facilities in general, at the country or	0.32
After project	Efficiency of power generation from the target facilities	0.45
Source:	Data obtained from xx through interview	

4. CO_2 emission factor according to fuel type ($t\text{-}CO_2/TJ$)

Data availability is validated in the following order because it should preferably be calculated using data and information unique to the project.

i) The unique data of the project obtained from the interview with power management entity
ii) National default
iii) IPCC Guideline default data

【The fuel used in the target facilities】

Input item	Entry field	Unit
Crude Oil	73.3	$t\text{-}CO_2/TJ$
Source:	2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 2 Energy	

(yellow)	Entry field
(orange)	Entry field of the reference documents

Result Sheet: Existing facilities

Sample1【Efficiency improvement of the thermal power facilities_Existing facilities】

GHG emission reduction with the project（$t\text{-}CO_2/y$）　$ER_y = BE_y - PE_y$ ($t\text{-}CO_2/y$)

1. Baseline emission　$BE_y = EG_{PJ,y} \times EF_{BL,y}$

BE_y	Baseline emission: GHG emission from low efficiency power generators	1,047,274	$t\text{-}CO_2/y$
$EG_{PJ,y}$	Annual energy production after the project starts (transmission edge)	1,270,000	MWh
$EF_{BL,y}$	CO2 emission factor of the electricity	0.825	$t\text{-}CO_2/MWh$

2. Project emission　$PE_y = EG_{PJ,y} \times EF_{PJ,y}$

PE_y	Project emission: GHG emission after the project	744,728	$t\text{-}CO_2/y$
$EG_{PJ,y}$	Annual energy production after the project starts (transmission edge)	1,270,000	MWh
$EF_{PJ,y}$	CO2 emission factor of the electricity	0.586	$t\text{-}CO_2/MWh$

3. GHG emission reduction with the project　$ER_y = BE_y - PE_y$ ($t\text{-}CO_2/y$)

ER_y	GHG emission reduction with the project	302,546	$t\text{-}CO_2/y$
BE_y	Baseline emission: GHG emission from low efficiency power generators	1,047,274	$t\text{-}CO_2/y$
PE_y	Project emission: GHG emission after the project	744,728	$t\text{-}CO_2/y$

Input Sheet: Existing facilities

Project Name	Sample1【Efficiency improvement of the thermal power facilities_Existing facilities】

1. Quantity of power supply （of the target facilities after the project starts）(MWh/y)

Input the planned data for the calculation before the project start and the measured date for the calculation after the project start.

Item	Entry field	Unit
Quantity of power supply of the fossil fuel fired facilities after the project start	1,270,000	MWh/y

2. Efficiency of power generation

Input the monitoring data for the efficiency of the target facilities in absence of the project.
Input the planned data for the calculation of the efficiency of the target facilities before the project start and the monitoring date for the calculation of the efficiency of the target facilities after the project start.

Item		Entry field
Before project	Monitoring data before start of the project from the target facilities	0.32
After project	Efficiency of power generation from the target facilities	0.45
Source:	Data obtained from xx through interview	

4. CO_2 emission factor according to fuel type (t-CO_2/TJ)

Data availability is validated in the following order because it should preferably be calculated using data and information unique to the project.

i) The unique data of the project obtained from the interview with power management entity
ii) National default
iii) IPCC Guideline default data

【The fuel used in the target facilities】

Input item	Entry field	Unit
Crude Oil	73.3	t-CO_2/TJ

Source: 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 2 Energy

(yellow)	Entry field
(orange)	Entry field of the reference documents

Result Sheet: Existing facilities

Sample1【Efficiency improvement of the thermal power facilities_Existing facilities】

GHG emission reduction with the project（t-CO_2/y） $ER_y = BE_y - PE_y$ (t-CO_2/y)

1. Baseline emission $BE_y = EG_{PJ,y} \times EF_{BL,y}$

BE_y	Baseline emission: GHG emission from low efficiency power generators	1,047,274	t-CO_2/y
$EG_{PJ,y}$	Annual energy production after the project starts (transmission edge)	1,270,000	MWh
$EF_{BL,y}$	CO2 emission factor of the electricity	0.825	t-CO_2/MWh

2. Project emission $PE_y = EG_{PJ,y} \times EF_{PJ,y}$

PE_y	Project emission: GHG emission after the project	744,728	t-CO_2/y
$EG_{PJ,y}$	Annual energy production after the project starts (transmission edge)	1,270,000	MWh
$EF_{PJ,y}$	CO2 emission factor of the electricity	0.586	t-CO_2/MWh

3. GHG emission reduction with the project $ER_y = BE_y - PE_y$ (t-CO_2/y)

ER_y	GHG emission reduction with the project	302,546	t-CO_2/y
BE_y	Baseline emission: GHG emission from low efficiency power generators	1,047,274	t-CO_2/y
PE_y	Project emission: GHG emission after the project	744,728	t-CO_2/y

Input Sheet: New facilities, Existing facilities

Project Name Sample1【Streamlining of the facilities in the transmission grid_new facilities】

1. Transmission power loss (MWh/y)

Acquire the data for power loss by the following measures and input data.

【New facilities】
Input the estimated data for the power loss before the project.
Input the estimated data before the project start when you calculates the power loss after project and input the

【Existing facilities】
Input the monitoring data for the power loss before the project.
Input the estimated data before the project start when you calculates the power loss after project and input the monitoring data for power loss after the project.

Item		Entry field	Unit
Power loss in the facilities in the transmission grid	Before the project	2,494	MWh/y
	After the project	890	MWh/y

2. Co2 emission factor of electric power (t-CO_2/MWh)

Emission factor of the electric power shall be used as CO2 emission factor from electricity in suppressor grid.
Data availability is validated in the following order in regards of the selection of suppressor grid and its emission

i) Data obtained from the interview with power management entity
ii) National default

Item	Entry field	Unit
CO2 emission factor of the electric powe	0.52	t-CO_2/MWh
Source: Data obtained from xx through interview		

Entry field
Entry field of the reference documents

Result Sheet: New facilities, Existing facilities

Sample1【Streamlining of the facilities in the transmission grid_new facilities】

GHG emission reduction with the project ($t\text{-}CO_2/y$) $ER_y = BE_y - PE_y$ ($t\text{-}CO_2/y$)

1. Baseline emission $BE_y = BL_y \times EF_{BL,y}$

BE_y	Baseline emission: GHG emissions without streamlining facilities in the transmission grid	1,297	$t\text{-}CO_2/y$
BL_y	Transmission power loss before the project starts	2,494	MWh/y
$EF_{BL,y}$	CO2 emission factor from electricity in suppressor grid	0.520	$t\text{-}CO_2/MWh$

2. Project emission $PE_y = PL_y \times EF_{BL,y}$

PE_y	Project emission: GHG emission after the project	463	$t\text{-}CO_2/y$
PL_y	Transmission power loss after the project starts	890	MWh/y
$EF_{BL,y}$	CO2 emission factor from electricity in suppressor grid	0.520	$t\text{-}CO_2/MWh$

3. GHG emission reduction with the project $ER_y = BE_y - PE_y$ ($t\text{-}CO_2/y$)

ER_y	GHG emission reduction with the project	834	$t\text{-}CO_2/y$
BE_y	Baseline emission: GHG emissions without streamlining facilities in the transmission grid	1,297	$t\text{-}CO_2/y$
PE_y	Project emission: GHG emission after the project	463	$t\text{-}CO_2/y$

Input Sheet: New facilities, Existing facilities

Project Name **Sample1【Streamlining of _existing distribution equipment】**

1. Distribution power loss （MWh/y）

Acquire the data for power loss by the following measures and input data.

【New facilities】

Input the estimated data for the power loss before the project.
Input the estimated data before the project start when you calculates the power loss after project and input the monitoring data for power loss after the project.

【Existing facilities】

Input the monitoring data for the power loss before the project.
Input the estimated data before the project start when you calculates the power loss after project and input the monitoring data for power loss after the project.

Item		Entry field	Unit
Power loss in the facilities in the distribution grid	Before the project	1,295	MWh/y
	After the project	465	MWh/y

2. CO_2 emission factor of electric power（t-CO_2/MWh）

Emission factor of the electric power shall be used as CO2 emission factor from electricity in suppressor grid. Data availability is validated in the following order in regards of the selection of suppressor grid and its emission factor.

i) Data obtained from the interview with power management entity
ii) National default

Item	Entry field	Unit
CO_2 emission factor of the electric powe	0.63	t-CO_2/MWh
Source: Data obtained from xx through interview		

Entry field
Entry field of the reference documents

Result Sheet: New facilities, Existing facilities

Sample1【Streamlining of _existing distribution equipment】

GHG emission reduction with the project $(t\text{-}CO_2/y)$ $ER_y = BE_y - PE_y$ $(t\text{-}CO_2/y)$

1. Baseline emission $BE_y = BL_y \times EF_{BL,y}$

BE_y	Baseline emission: GHG emissions without streamlining facilities in the distribution grid	816	$t\text{-}CO_2/y$
BL_y	Distribution power loss before the project starts	1,295	MWh/y
$EF_{BL,y}$	CO2 emission factor from electricity in suppressor grid	0.630	$t\text{-}CO_2/MWh$

2. Project emission $PE_y = PL_y \times EF_{BL,y}$

PE_y	Project emission: GHG emission after the project	293	$t\text{-}CO_2/y$
PL_y	Distribution power loss after the project starts	465	MWh/y
$EF_{BL,y}$	CO2 emission factor from electricity in suppressor grid	0.630	$t\text{-}CO_2/MWh$

3. GHG emission reduction with the project $ER_y = BE_y - PE_y$ $(t\text{-}CO_2/y)$

ER_y	GHG emission reduction with the project	523	$t\text{-}CO_2/y$
BE_y	Baseline emission: GHG emissions without streamlining facilities in the distribution grid	816	$t\text{-}CO_2/y$
PE_y	Project emission: GHG emission after the project	293	$t\text{-}CO_2/y$

Input Sheet: Mini-Grid/ Stand-Alone

Project Name **Sample1【Renewable power: Mini-Grid】**

1. Fuel consumption before project activity

For fuel consumption before project activity, enter the planned values before project activity, or the actual values after project activity in the corresponding cells.

Item		Entry	Unit
Fuel consumption before project activity	Diesel oil	6,734	kL/y
	Kerosene	246	kL/y
	Others		

2. CO2 emission factor and net calorific value per fuel type

Data/ information specific to the target country should be preferably used. Data availability should be validated in the following order to enter data in the cells below.

i) Project-specific data obtained through interview to the electric power management entity concerned
ii) Published values in the target country
iii) Default values adopted in IPCC guideline

Item	Net calorific value		CO_2 emission factor	
Diesel oil	36.1	GJ/kL	74.1	t-CO_2/TJ
Kerosene	35.3	GJ/kL	71.9	t-CO_2/TJ
Others				t-CO_2/TJ

Source: 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 2 Energy table1.2,tat

(yellow)	Entry
(orange)	Entry of data sources, etc.

Result Sheet: Mini-grid/ Stand-alone

Sample1【Renewable power: Mini-Grid】

GHG emission reduction after project activity (t-CO_2/y) $ER_y = BE_y - PE_y$ (t-CO_2/y)

1. Baseline emission $BEy = EC_{diesel,y} \times NCV_{diesel,y} \times CEF_{diesel,y}$ +

BE_y	Baseline emission: GHG emission without installation of a photovoltaic power plant	18,638	t-CO_2/y
$EC_{diesel,y}$	Light gas oil consumption when electric consumption from TV and others is covered by diesel power generation.	6,734	kL/y
$EC_{kerosene,y}$	Kerosene consumption when electric consumption for lighting is covered by kerosene lamps.	246	kL/y
$NCV_{diesel,y}$	Net calorific value for Diesel oil	36	GJ/kL
$NCV_{kerosene,y}$	Net calorific value for kerosene	35	GJ/kL
$CEF_{diesel,y}$	CO2 emission factor per net calorific value for diesel oil	74	t-CO_2/TJ
$CEF_{kerosene,y}$	CO2 emission factor per net calorific factor for kerosene	72	t-CO_2/TJ

2. Project emission $PE_y = 0$

PE_y	Project emission: GHG emission associated with photovoltaic power generation	0	t-CO_2/y

3. GHG emission reduction after project activity $ER_y = BE_y - PE_y$ (t-CO_2/y)

ER_y	GHG emission reduction after project activity	18,638	t-CO_2/y
BE_y	Baseline emission: GHG emission without installation of a photovoltaic power plant	18,638	t-CO_2/y
PE_y	Project emission: GHG emission associated with photovoltaic power generation	0	t-CO_2/y

Renewable Energy

- Appendix-17 Hydro Power
- Appendix-18 Wind Power
- Appendix-19 Photovoltaic power / Solar heat
- Appendix-20 Geothermal Power
- Appendix-21 Biomass

Input Sheet: Grid

Project name **Sample 1【Construction of hydropower plant: Grid connected】**

1. Quantity of electricity (generated in the target power plant after project implementation)(MWh/y)

Enter the planned value before project activity and actual value after project activity.

Parameter	Entry	Unit
Quantity of electricity generated in the target power plant after project activity	121,956	MWh/y

2. Energy mix in the target country

Data/ information specific to the target country should be preferably used for calculation. Data availability should be validated in the following order to enter data in the cells.

i) Project-specific values obtained through interview to electric power management entity concerned.
ii) Published values in the target country
iii) IEA balance table

*Entry to either column is mandatory.

Fuel type	Quantity of generated electricity (GWh/y)	Fuel consumption (kL, m^3, t)		Fuel consumption (converted to crude oil)	
		Consumed volume	Unit	Consumed volume	Unit
Crude oil	31,222	9,568,000	kL/y		ktoe
Gas	62,475	17,321,000	m^3/y		ktoe
Coal	479,955	155,516,000	t/y		ktoe
Others					ktoe

Source: Interview to XX

3. CO2 emission factor per fuel type (t-CO_2/TJ)

Data/ information specific to the target country should be preferably used for calculation. Data availability should be validated in the following order to use.

i) Project-specific data obtained through interview to the electric power management entity concerned
ii) Published values in the target country
iii) Default values adopted in IPCC guideline

Fuel type	Net calorific value		CO_2 emission factor	
Crude oil	36.3	GJ/kL	73.3	t-CO_2/TJ
Gas	0.0384	GJ/m^3	56.1	t-CO_2/TJ
Coal	26.7	GJ/t	98.3	t-CO_2/TJ
Others				t-CO_2/TJ

Source: Interview to XX
2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 2 Energy table1.2,table2

4. Emission factor for GHG emissions from reservoir

For hydropower plants with reservoirs, GHG emission factor should be set also for reservoirs

Item	GHG emission factor	
GHG from reservoir	0.09	t-CO_2/MWh

Source: Values specified in 23rd CDM committee meeting

Entry
Entry of source, etc.

Project Name: Sample 1【Construction of hydropower plant: Grid connected】

1. Baseline emission (t-CO_2/y)

Project outcome	121,956	MWh/y
Conversion factor	3600	kJ/kWh
	41.868	TJ/ktoe
	10.000	Tcal/ktoe
	860	kcal/kWh

Legend

(blue)	Auto filled from Input Sheet
(light blue)	Default values (calculated automatically for manually entered data)
(yellow)	Manual entry
(red border)	Calculated value

	Quantity of generated electricity		Fuel consumption	Net calorific value	Quantity of energy	Fuel consumption (converted to crude oil)	Heat efficiency	Caloric CO_2 emission factor
	GWh/y	Ratio	kL,m^3,t	GJ/kL,m^3,t	TJ	ktoe/y	%	t-CO_2/TJ
Petroleum	31222	5.4%	9,568,000	36.3	347,296	8295	32.4%	73.3
Gas	62475	10.9%	17,321,000	0.0	665	16	33814.6%	56.1
Coal	479955	83.7%	155,516,000	26.7	4,152,277	99175	41.6%	98.3
Others	0	0.0%	0	0.0	0	0	0.0%	0.0
Total	573652							

	Fuel price	Suppression priority	Quantity of generated electricity	Quantity unable to suppress	Suppressible quantity
			MWh/y	MWh/y	MWh/y
Petroleum		1	31,222,000	28,683	31,193,317
Gas		2	62,475,000	28,683	62,446,317
Coal		3	479,955,000	28,683	479,926,317
Others		4	0	0	0

	Quantity unable to suppress	Suppressible quantity	Suppressed quantity	Heat efficiency	Caloric CO_2 emission factor	Fuel suppressed quantity	CO2 emission reduced quantity
	MWh/y	MWh/y	MWh/y	%	t-CO_2/TJ	ktoe/y	t-CO_2/y
Historical (Petro	0		0		73.3	0.0	0
Historical (Gas	0		0		56.1	0.0	0
Historical (Coal	0		0		98.3	0.0	0
Petroleum	28,683	31,193,317	121,956	32.4%	73.3	32.4	99,437
Gas	28,683	62,446,317	0	33814.6%	56.1	0.0	0
Coal	28,683	##########	0	41.6%	98.3	0.0	0
Others	0	0	0	0.0%	0.0	0.0	0
Total			121,956			32.4	99,437
						(reference value)	Average thermal	92,195
							Average grid	92,195

2. Project emission (t-CO_2/y)

【Emissions from reservoir】

Item	Emission facto	uantity of electric	antity of emission
	t-CO_2/MWh	MWh	t-CO_2
GHG	0.09	121,956	10,976

3. GHG emission reduction after project activity (t-CO_2/y)

	GHG emission
	t-CO_2/y
Baseline emission	99,437
Project emission	10,976
GHG emission reduction after project a	88,460

Result Sheet:Grid

Sample 1【Construction of hydropower plant: Grid connected】

GHG emission reduction after project activity (t-CO_2/y) $ER_y = BE_y - PE_y$ (t-CO_2/y)

1. Baseline emission $BE_y = \Sigma FC_i \times$ *conversion factor (41.868 : TJ/ktoe)* $\times$ $COEF_i$

BE_y	Baseline emission: GHG emission associated with fuel consumption which is assumed to be replaced by hydropower generation	99,437	t-CO_2/y
FC_i	Reduction of fuel type i consumption in scope of reduction	-	ktoe/y
	Crude oil	32	ktoe/y
	Gas	0	ktoe/y
	Coal	0	ktoe/y
	Others	0	ktoe/y
$COEF_i$	CO_2 emission factor per net calorific value of fuel type i	-	t-CO_2/TJ
	Crude oil	73.3	t-CO_2/TJ
	Gas	56.1	t-CO_2/TJ
	Coal	98.3	t-CO_2/TJ
	Others	0	t-CO_2/TJ

2. Project emission $PE_y = 0$

PE_y	Project emission: GHG emission after project activity	10,976	t-CO_2/y
PE_{res}	Emission from reservoirs	10,976	t-CO_2/y

3. GHG emission reduction after project activity $ER_y = BE_y - PE_y$ (t-CO_2/y)

ER_y	GHG emission reduction after project activity	88,460	t-CO_2/y
BE_y	Baseline emission: GHG emission reduction associated with fuel consumption which is assumed to be replaced by hydropower generation	99,437	t-CO_2/y
PE_y	Project emission: GHG emission after project activity	10,976	t-CO_2/y

Input Sheet: Mini-Grid/ Stand-Alone

Project Name	Virtual 1【Hydropower: Mini-Grid】

1. Fuel consumption before project activity

For fuel consumption before project activity, enter the planned values before project activity, or the actual values after project activity in the corresponding cells.

Item		Entry	Unit
Fuel consumption before project activity	Diesel oil	6,734	kL/y
	Kerosene	246	kL/y
	Others		

2. CO2 emission factor and net calorific value per fuel type

Data/ information specific to the target country should be preferably used. Data availability should be validated in the following order to enter data in the cells below.

i) Project-specific data obtained through interview to the electric power management entity concerned
ii) Published values in the target country
iii) Default values adopted in IPCC guideline

Item	Net calorific value		CO_2 emission factor	
Diesel oil	36.1	GJ/kL	74.1	t-CO_2/TJ
Kerosene	35.3	GJ/kL	71.9	t-CO_2/TJ
Others				t-CO_2/TJ

Source: 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 2 Energy table1

(yellow)	Entry
(orange)	Entry of data sources, etc.

Result Sheet: Mini-grid/ Stand-alone

Virtual 1【Hydropower: Mini-Grid】

GHG emission reduction after project activity ($t\text{-}CO_2/y$) $ER_y = BE_y - PE_y$ ($t\text{-}CO_2/y$)

1. Baseline emission $BEy = EC_{diesel,y} \times NCV_{diesel,y} \times CEF_{diesel,y} + EC_{kerosene,y} \times NCV_{kerosene,y} \times CEF_{kerosene,y}$

BE_y	Baseline emission: GHG emission without installation of a hydropower plant	18,638	$t\text{-}CO_2/y$
$EC_{diesel,y}$	Light gas oil consumption when electric consumption from TV and others is covered by diesel power generation.	6,734	kL/y
$EC_{kerosene,y}$	Kerosene consumption when electric consumption for lighting is covered by kerosene lamps.	246	kL/y
$NCV_{diesel,y}$	Net calorific value for Diesel oil	36	GJ/kL
$NCV_{kerosene,y}$	Net calorific value for kerosene	35	GJ/kL
$CEF_{diesel,y}$	CO2 emission factor per net calorific value for diesel oil	74	$t\text{-}CO_2/TJ$
$CEF_{kerosene,y}$	CO2 emission factor per net calorific factor for kerosene	72	$t\text{-}CO_2/TJ$

2. Project emission $PE_y = 0$

PE_y	Project emission: GHG emission associated with hydropower generation	0	$t\text{-}CO_2/y$

3. GHG emission reduction after project activity $ER_y = BE_y - PE_y$ ($t\text{-}CO_2/y$)

ER_y	GHG emission reduction after project activity	18,638	$t\text{-}CO_2/y$
BE_y	Baseline emission: GHG emission without installation of a hydropower plant	18,638	$t\text{-}CO_2/y$
PE_y	Project emission: GHG emission associated with hydropower generation	0	$t\text{-}CO_2/y$

18. Wind Power

Input Sheet: Grid

Project Name **Sample1【Construction of wind power plant】**

1. Quantity of electricity (quantity of electricity generated in the target power plant after project activity)(MWh/y)

Enter the planned value before project activity and the actual value after project activity in the cell below.

Parameter	Entry	Unit
Quantity of electricity generated in the target power plant after project activity	121,956	MWh/y

2. Energy mix of the target grid

Data/ information specific to the target country should be preferably used. Data availability should be validated in the following order to data in the cells below.

i) Project-specific values obtained through interview to the electric power management entity concerned

ii) Published values in the target country

iii) IEA Balance table

*Entry to either column is mandatory.

Fuel type	Quantity of generated electricity (GWh/y)	Fuel consumption (kL, m^3, t)		Fuel consumption (converted to crude oil)	
		Consumed volume	Unit	Consumed volume	Unit
Crude Oil	31,222	9,568,000	kL/y		ktoe
Gas	62,475	17,321,000	m^3/y		ktoe
Coal	479,955	155,516,000	t/y		ktoe
Others					ktoe

Source: Interview to XX

3. CO2 emission factor per fuel type (t-CO_2/TJ)

Data/ information specific to the target country should be preferably used for calculation. Data availability should be validated in the following order to use.

i) Project-specific data obtained through interview to the electric power management entity concerned

ii) Published values in the target country

iii) Default values adopted in IPCC guideline

Fuel type	Net calorific value		CO_2 emission factor	
Crude Oil	36.3	GJ/kL	73.3	t-CO_2/TJ
Gas	0.0384	GJ/m^3	56.1	t-CO_2/TJ
Coal	26.7	GJ/t	98.3	t-CO_2/TJ
Others				t-CO_2/TJ

Source: Interview to XX

2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 2 Energy table1.2,table2

Entry

Entry of source, etc.

Project Name: Sample1【Construction of wind power plant】

1. Baseline emission (t-CO_2/y)

Project outcome	121,956	MWh/y
Conversion factor	3600	kJ/kWh
	41.868	TJ/ktoe
	10.000	Tcal/ktoe
	860	kcal/kWh

Legend

- Auto filled from Input Sheet
- Default values (calculated automatically for manually entered dat
- Manual entry
- Calculated value

	Quantity of generated electricity		Fuel consumptio	Net calorific value	Quantity of energy	Fuel consumption (converted to crude oil)	Heat efficiency	Caloric CO_2 emission
	GWh/y	Ratio	kL,m^3,t	GJ/kL,m^3,t	TJ	ktoe/y	%	t-CO_2/TJ
Petroleum	31222	5.4%	9,568,000	36.3	347,296	8295	32.4%	73.3
Gas	62475	10.9%	17,321,000	0.0	665	16	33814.6%	56.1
Coal	479955	83.7%	155,516,000	26.7	4,152,277	99175	41.6%	98.3
Others	0	0.0%	0	0.0	0	0	0.0%	0.0
Total	573652							

	Fuel price	Suppression priority	Quantity of generated electricity	Quantity unable to suppress	Suppressible quantity
			MWh/y	MWh/y	MWh/y
Petroleum		1	31,222,000	28,683	31,193,317
Gas		2	62,475,000	28,683	62,446,317
Coal		3	479,955,000	28,683	479,926,317
Others		4	0	0	0

	Quantity unable to suppress	Suppressible quantity	Suppressed quantity	Heat efficiency	Caloric CO_2 emission factor	Fuel suppressed	CO2 emission reduced quantity
	MWh/y	MWh/y	MWh/y	%	t-CO_2/TJ	ktoe/y	t-CO_2/y
Historical (Petro	0		0		73.3	0.0	0
Historical (Gas)	0		0		56.1	0.0	0
Historical (Coal	0		0		98.3	0.0	0
Petroleum	28,683	31,193,317	121,956	32.4%	73.3	32.4	99,437
Gas	28,683	62,446,317	0	33814.6%	56.1	0.0	0
Coal	28,683	479,926,317	0	41.6%	98.3	0.0	0
Others	0	0	0	0.0%	0.0	0.0	0
Total			121,956			32.4	99,437

(reference value)	Average therma	92,195
	Average grid	92,195

2. Project emission (t-CO_2/y)

0.0384

27

3. GHG emission reduction after project activity (t-CO_2/y)

	GHG emission t-CO_2/y
Baseline emission	99,437
Project emission	27
GHG emission reduction after project a	99,410

Result Sheet: Grid

Sample1【Construction of wind power plant】

GHG emission reduction after project activity (t-CO_2/y) $ER_y = BE_y - PE_y$ (t-CO_2/y)

1. Baseline emission $BE_y = \Sigma FC_i \times$ *conversion factor (41.868 : TJ/ktoe)* $\times COEF_i$

BE_y	Baseline emission: GHG emission associated with fuel consumption which is assumed to be replaced by wind power plant.	99,437	t-CO_2/y
FC_i	Fuel consumption reduction for fuel type i for suppression	-	ktoe/y
	Crude Oil	32	ktoe/y
	Gas	0	ktoe/y
	Coal	0	ktoe/y
	Others	0	ktoe/y
$COEF_i$	CO2 emission factor per net calorific value for fuel type i	-	t-CO_2/TJ
	Crude Oil	73.3	t-CO_2/TJ
	Gas	56.1	t-CO_2/TJ
	Coal	98.3	t-CO_2/TJ
	Others	0	t-CO_2/TJ

2. Project emission $PE_y = 0$

PE_y	Project emission: GHG emission after project activity	27	t-CO_2/y

3. GHG emission reduction after project activity $ER_y = BE_y - PE_y$ **(t-CO_2/y)**

ER_y	GHG emission reduction after project activity	99,410	t-CO_2/y
BE_y	Baseline emission: GHG emission associated with fuel consumption which is assumed to be replaced by wind power generation.	99,437	t-CO_2/y
PE_y	Project emission: GHG emission after project activity	27	t-CO_2/y

Input Sheet: Mini-Grid/ Stand-Alone

Project Name	**Sample1【Wind power: Mini-Grid】**

1. Fuel consumption before project activity

For fuel consumption before project activity, enter the planned values before project activity, or the actual values after project activity in the corresponding cells.

Item		Entry	Unit
Fuel consumption before project activity	Diesel oil	6,734	kL/y
	Kerosene	246	kL/y
	Others		

2. CO2 emission factor and net calorific value per fuel type

Data/ information specific to the target country should be preferably used. Data availability should be validated in the following order to enter data in the cells below.

i) Project-specific data obtained through interview to the electric power management entity concerned
ii) Published values in the target country
iii) Default values adopted in IPCC guideline

Item	Net calorific value		CO_2 emission factor	
Diesel oil	36.1	GJ/kL	74.1	t-CO_2/TJ
Kerosene	35.3	GJ/kL	71.9	t-CO_2/TJ
Others				t-CO_2/TJ

Source: 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 2 Energy table1

(yellow)	Entry
(orange)	Entry of data sources, etc.

Result Sheet: Mini-grid/ Stand-alone

Sample1【Wind power: Mini-Grid】

GHG emission reduction after project activity ($t\text{-}CO_2/y$) $ER_y = BE_y - PE_y$ ($t\text{-}CO_2/y$)

1. Baseline emission $BEy = EC_{diesel,y} \times NCV_{diesel,y} \times CEF_{diesel,y} + EC_{kerosene,y} \times NCV_{kerosene,y} \times CEF_{kerosene,y}$

BE_y	Baseline emission: GHG emission without installation of a Wind power plant	18,638	$t\text{-}CO_2/y$
$EC_{diesel,y}$	Light gas oil consumption when electric consumption from TV and others is covered by diesel power generation.	6,734	kL/y
$EC_{kerosene,y}$	Kerosene consumption when electric consumption for lighting is covered by kerosene lamps.	246	kL/y
$NCV_{diesel,y}$	Net calorific value for Diesel oil	36	GJ/kL
$NCV_{kerosene,y}$	Net calorific value for kerosene	35	GJ/kL
$CEF_{diesel,y}$	CO2 emission factor per net calorific value for diesel oil	74	$t\text{-}CO_2/TJ$
$CEF_{kerosene,y}$	CO2 emission factor per net calorific factor for kerosene	72	$t\text{-}CO_2/TJ$

2. Project emission $PE_y = 0$

PE_y	Project emission: GHG emission associated with wind power generation	0	$t\text{-}CO_2/y$

3. GHG emission reduction after project activity $ER_y = BE_y - PE_y$ ($t\text{-}CO_2/y$)

ER_y	GHG emission reduction after project activity	18,638	$t\text{-}CO_2/y$
BE_y	Baseline emission: GHG emission without installation of a wind power plant	18,638	$t\text{-}CO_2/y$
PE_y	Project emission: GHG emission associated with wind power generation	0	$t\text{-}CO_2/y$

Input Sheet: Grid

Project Name **Sample1【Construction of photovoltaic power plant】**

1. Quantity of electricity (quantity of electricity generated in the target power plant after project activity)(MWh/y)

Enter the planned value before project activity and the actual value after project activity in the cell below.

Parameter	Entry	Unit
Quantity of electricity generated in the target power plant after project activity	121,956	MWh/y

2. Energy mix of the target grid

Data/ information specific to the target country should be preferably used. Data availability should be validated in the following order to data in the cells below.
i) Project-specific values obtained through interview to the electric power management entity concerned
ii) Published values in the target country
iii) IEA Balance table

*Entry to either column is mandatory.

Fuel type	Quantity of generated electricity (GWh/y)	Fuel consumption (kL, m^3, t)		Fuel consumption (converted to crude oil)	
		Consumed volum	Unit	onsumed volum	Unit
Crude Oil	31,222	9,568,000	kL/y		ktoe
Gas	62,475	17,321,000	m^3/y		ktoe
Coal	479,955	155,516,000	t/y		ktoe
Others					ktoe

Source: Interview to XX

3. CO2 emission factor per fuel type (t-CO_2/TJ)

Data/ information specific to the target country should be preferably used for calculation. Data availability should be validated in the following order to use.
i) Project-specific data obtained through interview to the electric power management entity concerned
ii) Published values in the target country
iii) Default values adopted in IPCC guideline

Fuel type	Net calorific value		CO_2 emission factor	
Crude Oil	36.3	GJ/kL	73.3	t-CO_2/TJ
Gas	0.0384	GJ/m^3	56.1	t-CO_2/TJ
Coal	26.7	GJ/t	98.3	t-CO_2/TJ
Others				t-CO_2/TJ

Source: Interview to XX
2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 2 Energy table1.2,table2

(yellow)	Entry
(orange)	Entry of source, etc.

Project Name: Sample1【Construction of photovoltaic power plant】

1. Baseline emission (t-CO_2/y)

Project outcome	121,956	MWh/y
Conversion factor	3600	kJ/kWh
	41.868	TJ/ktoe
	10.000	Tcal/ktoe
	860	kcal/kWh

Legend

(blue)	Auto filled from Input Sheet
(light cyan)	Default values (calculated automatically for manually entered dat
(yellow)	Manual entry
(red frame)	Calculated value

	Quantity of generated electricity		Fuel consumptio	Net calorific value	Quantity of energy	Fuel consumption (converted to crude oil)	Heat efficiency	Caloric CO_2 emission
	GWh/y	Ratio	kL,m^3,t	GJ/kL,m^3,t	TJ	ktoe/y	%	t-CO_2/TJ
Petroleum	31222	5.4%	9,568,000	36.3	347,296	8295	32.4%	73.3
Gas	62475	10.9%	17,321,000	0.0	665	16	33814.6%	56.1
Coal	479955	83.7%	155,516,000	26.7	4,152,277	99175	41.6%	98.3
Others	0	0.0%	0	0.0	0	0	0.0%	0.0
Total	573652							

	Fuel price	Suppression priority	Quantity of generated electricity	Quantity unable to suppress	Suppressible quantity
			MWh/y	MWh/y	MWh/y
Petroleum		1	31,222,000	28,683	31,193,317
Gas		2	62,475,000	28,683	62,446,317
Coal		3	479,955,000	28,683	479,926,317
Others		4	0	0	0

	Quantity unable to suppress	Suppressible quantity	Suppressed quantity	Heat efficiency	Caloric CO_2 emission factor	Fuel suppressed	CO2 emission reduced quantity	
	MWh/y	MWh/y	MWh/y	%	t-CO_2/TJ	ktoe/y	t-CO_2/y	
Historical (Petro	0		0		73.3	0.0	0	
Historical (Gas)	0		0		56.1	0.0	0	
Historical (Coal	0		0		98.3	0.0	0	
Petroleum	28,683	31,193,317	121,956	32.4%	73.3	32.4	99,437	
Gas	28,683	62,446,317	0	33814.6%	56.1	0.0	0	
Coal	28,683	479,926,317	0	41.6%	98.3	0.0	0	
Others	0	0	0	0.0%	0.0	0.0	0	
Total			121,956			32.4	99,437	
						(reference value)	Average therma	92,195
							Average grid	92,195

2. Project emission (t-CO_2/y)

0.0384

27

3. GHG emission reduction after project activity (t-CO_2/y)

	GHG emission t-CO_2/y
Baseline emission	99,437
Project emission	27
GHG emission reduction after project a	99,410

Result Sheet: Grid

Sample1【Construction of photovoltaic power plant】

GHG emission reduction after project activity (t-CO_2/y) $ER_y = BE_y - PE_y$ (t-CO_2/y)

1. Baseline emission $BE_y = \Sigma FC_i \times$ *conversion factor (41.868 : TJ/ktoe)* $\times COEF_i$

BE_y	Baseline emission: GHG emission associated with fuel consumption which is assumed to be replaced by photovoltaic power plant.	99,437	t-CO_2/y
FC_i	Fuel consumption reduction for fuel type i for suppression	-	ktoe/y
	Crude Oil	32	ktoe/y
	Gas	0	ktoe/y
	Coal	0	ktoe/y
	Others	0	ktoe/y
$COEF_i$	CO2 emission factor per net calorific value for fuel type i	-	t-CO_2/TJ
	Crude Oil	73.3	t-CO_2/TJ
	Gas	56.1	t-CO_2/TJ
	Coal	98.3	t-CO_2/TJ
	Others	0	t-CO_2/TJ

2. Project emission $PE_y = 0$

PE_y	Project emission: GHG emission after project activity	27	t-CO_2/y

3. GHG emission reduction after project activity $ER_y = BE_y - PE_y$ (t-CO_2/y)

ER_y	GHG emission reduction after project activity	99,410	t-CO_2/y
BE_y	Baseline emission: GHG emission associated with fuel consumption which is assumed to be replaced byphotovoltaic power generation	99,437	t-CO_2/y
PE_y	Project emission: GHG emission after project activity	27	t-CO_2/y

Input Sheet: Mini-Grid/ Stand-Alone

Project Name **Sample1【photovoltaic power: Mini-Grid】**

1. Fuel consumption before project activity

For fuel consumption before project activity, enter the planned values before project activity, or the actua values after project activity in the corresponding cells.

Item		Entry	Unit
Fuel consumption before project activity	Diesel oil	6,734	kL/y
	Kerosene	246	kL/y
	Others		

2. CO2 emission factor and net calorific value per fuel type

Data/ information specific to the target country should be preferably used. Data availability should be validated in the following order to enter data in the cells below.

i) Project-specific data obtained through interview to the electric power management entity concerned
ii) Published values in the target country
iii) Default values adopted in IPCC guideline

Item	Net calorific value		CO_2 emission factor	
Diesel oil	36.1	GJ/kL	74.1	t-CO_2/TJ
Kerosene	35.3	GJ/kL	71.9	t-CO_2/TJ
Others				t-CO_2/TJ

Source: 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 2 Energy table1.2,tal

Entry
Entry of data sources, etc.

Result Sheet: Mini-grid/ Stand-alone

Sample1【photovoltaic power: Mini-Grid】

GHG emission reduction after project activity (t-CO_2/y) $ER_y = BE_y - PE_y$ (t-CO_2/y)

1. Baseline emission $BEy = EC_{diesel,y} \times NCV_{diesel,y} \times CEF_{diesel,y} + EC_{kerosene,y} \times NCV_{kerosene,y} \times CEF_{kerosene,y}$

BE_y	Baseline emission: GHG emission without installation of a photovoltaic power plant	18,638	t-CO_2/y
$EC_{diesel,y}$	Light gas oil consumption when electric consumption from TV and others is covered by diesel power generation.	6,734	kL/y
$EC_{kerosene,y}$	Kerosene consumption when electric consumption for lighting is covered by kerosene lamps.	246	kL/y
$NCV_{diesel,y}$	Net calorific value for Diesel oil	36	GJ/kL
$NCV_{kerosene,y}$	Net calorific value for kerosene	35	GJ/kL
$CEF_{diesel,y}$	CO2 emission factor per net calorific value for diesel oil	74	t-CO_2/TJ
$CEF_{kerosene,y}$	CO2 emission factor per net calorific factor for kerosene	72	t-CO_2/TJ

2. Project emission $PE_y = 0$

PE_y	Project emission: GHG emission associated with photovoltaic power generation	0	t-CO_2/y

3. GHG emission reduction after project activity $ER_y = BE_y - PE_y$ (t-CO_2/y)

ER_y	GHG emission reduction after project activity	18,638	t-CO_2/y
BE_y	Baseline emission: GHG emission without installation of a photovoltaic power plant	18,638	t-CO_2/y
PE_y	Project emission: GHG emission associated with photovoltaic power generation	0	t-CO_2/y

Input Sheet: Grid

Project Name **Virtual 1【Construction of photovoltaic power plant】**

1. Quantity of electricity (quantity of electricity generated in the target power plant after project activity)(MWh/y)

Enter the planned value before project activity and the actual value after project activity in the cell below.

Parameter	Entry	Unit
Quantity of electricity generated in the target power plant after project activity	121,956	MWh/y

2. Energy mix of the target grid

Data/ information specific to the target country should be preferably used. Data availability should be validated in the following order to data in the cells below.

i) Project-specific values obtained through interview to the electric power management entity concerned

ii) Published values in the target country

iii) IEA Balance table

*Entry to either column is mandatory.

Fuel type	Quantity of generated electricity (GWh/y)	Fuel consumption (kL, m^3, t)		Fuel consumption (converted to crude oil)	
		Consumed volume	Unit	Consumed volume	Unit
Crude Oil	31,222	9,568,000	kL/y		ktoe
Gas	62,475	17,321,000	m^3/y		ktoe
Coal	479,955	155,516,000	t/y		ktoe
Others					ktoe

Source: Interview to XX

3. CO2 emission factor per fuel type (t-CO_2/TJ)

Data/ information specific to the target country should be preferably used for calculation. Data availability should be validated in the following order to use.

i) Project-specific data obtained through interview to the electric power management entity concerned

ii) Published values in the target country

iii) Default values adopted in IPCC guideline

Fuel type	Net calorific value		CO_2 emission factor	
Crude Oil	36.3	GJ/kL	73.3	t-CO_2/TJ
Gas	0.0384	GJ/m^3	56.1	t-CO_2/TJ
Coal	26.7	GJ/t	98.3	t-CO_2/TJ
Others				t-CO_2/TJ

Source: Interview to XX
2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 2 Energy table1.2,table2.2

(yellow)	Entry
(orange)	Entry of source, etc.

Project Name: Virtual 1【Construction of photovoltaic power plant】

1. Baseline emission (t-CO_2/y)

Project outcome	121,956	MWh/y
Conversion factor	3600	kJ/kWh
	41.868	TJ/ktoe
	10.000	Tcal/ktoe
	860	kcal/kWh

Legend

(blue)	Auto filled from Input Sheet
(light blue)	Default values (calculated automatically for manually entered dat
(yellow)	Manual entry
(red box)	Calculated value

	Quantity of generated electricity		Fuel consumptio	Net calorific value	Quantity of energy	Fuel consumption (converted to crude oil)	Heat efficiency	Caloric CO_2 emission
	GWh/y	Ratio	kL,m^3,t	GJ/kL,m^3,t	TJ	ktoe/y	%	t-CO_2/TJ
Petroleum	31222	5.4%	9,568,000	36.3	347,296	8295	32.4%	73.3
Gas	62475	10.9%	17,321,000	0.0	665	16	33814.6%	56.1
Coal	479955	83.7%	155,516,000	26.7	4,152,277	99175	41.6%	98.3
Others	0	0.0%	0	0.0	0	0	0.0%	0.0
Total	573652							

	Fuel price	Suppression priority	Quantity of generated electricity	Quantity unable to suppress	Suppressible quantity
			MWh/y	MWh/y	MWh/y
Petroleum		1	31,222,000	28,683	31,193,317
Gas		2	62,475,000	28,683	62,446,317
Coal		3	479,955,000	28,683	479,926,317
Others		4	0	0	0

	Quantity unable to suppress	Suppressible quantity	Suppressed quantity	Heat efficiency	Caloric CO_2 emission factor	Fuel suppressed	CO2 emission reduced quantity
	MWh/y	MWh/y	MWh/y	%	t-CO_2/TJ	ktoe/y	t-CO_2/y
Historical (Petro	0		0		73.3	0.0	0
Historical (Gas)	0		0		56.1	0.0	0
Historical (Coal	0		0		98.3	0.0	0
Petroleum	28,683	31,193,317	121,956	32.4%	73.3	32.4	99,437
Gas	28,683	62,446,317	0	33814.6%	56.1	0.0	0
Coal	28,683	479,926,317	0	41.6%	98.3	0.0	0
Others	0	0	0	0.0%	0.0	0.0	0
Total			121,956			32.4	99,437

(reference value)	Average therma	92,195
	Average grid	92,195

2. Project emission (t-CO_2/y)

0.0384

27

3. GHG emission reduction after project activity (t-CO_2/y)

	GHG emission t-CO_2/y
Baseline emission	99,437
Project emission	27
GHG emission reduction after project a	99,410

Result Sheet: Grid

Virtual 1【Construction of photovoltaic power plant】

GHG emission reduction after project activity (t-CO_2/y) $ER_y = BE_y - PE_y$ (t-CO_2/y)

1. Baseline emission $BE_y = \Sigma FC_i \times$ *conversion factor (41.868 : TJ/ktoe)* $\times COEF_i$

BE_y	Baseline emission: GHG emission associated with fuel consumption which is assumed to be replaced by photovoltaic power plant.	99,437	t-CO_2/y
FC_i	Fuel consumption reduction for fuel type i for suppression	-	ktoe/y
	Crude Oil	32	ktoe/y
	Gas	0	ktoe/y
	Coal	0	ktoe/y
	Others	0	ktoe/y
$COEF_i$	CO2 emission factor per net calorific value for fuel type i	-	t-CO_2/TJ
	Crude Oil	73.3	t-CO_2/TJ
	Gas	56.1	t-CO_2/TJ
	Coal	98.3	t-CO_2/TJ
	Others	0	t-CO_2/TJ

2. Project emission $PE_y = 0$

PE_y	Project emission: GHG emission after project activity	27	t-CO_2/y

3. GHG emission reduction after project activity $ER_y = BE_y - PE_y$ (t-CO_2/y)

ER_y	GHG emission reduction after project activity	99,410	t-CO_2/y
BE_y	Baseline emission: GHG emission associated with fuel consumption which is assumed to be replaced by photovoltaic power generation.	99,437	t-CO_2/y
PE_y	Project emission: GHG emission after project activity	27	t-CO_2/y

Input Sheet: Mini-grid/ Stand-alone

Project Name **Virtual 2【Solar Water Heater: Installation of Stand-alone Type】**

1. Requirements for electric water heaters

For requirements for electric water heaters to be installed during the project, enter the planned values before project activity and the actual values after project activity in the cells below.

Parameter	Value	Unit
Quantity of water supplied	768,000	kL/y
Heated water temperature	35	℃
Working ratio	80	%

Source: Interview to XX

Data type

2. Efficiency of electric water heater to be installed in the project

Enter the planned value obtained from case studies for efficiency of electric water heater to be installed in the project.

Parameter	Value	Unit
Efficiency of electric water h	100	%

Source: Interview to XX

3. CO2 emission factor for electricity (t-CO_2/MWh)

Employ the emission factor for a typical power plant in the target grid as the emission factor for grid-connected electricity. Data availability should be validated in the following order in selecting a typical power plant and

i) Interview to the electric power management entity concerned

ii) Published values in the target country

Parameter	Entry	Unit
CO_2 emission factor for electricity	0.967	t-CO_2/MWh

Source: 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 2 Energy

Entry

Entry for sources, etc.

Result Sheet: Mini-grid/ Stand-alone

Virtual 2【Solar Water Heater: Installation of Stand-alone Type】

GHG emission reduction after project activity (t-CO_2/y) $ER_y = BE_y - PE_y$ (t-CO_2/y)

1. Baseline emission $BE_y = EC_{BL,y} \times EF_{BL,y}$

BE_y	Baseline emission: GHG emission accompanied with electricity consumption which is assumed to be replaced by solar water heater.	25,005	t-CO_2/y
$EC_{BL,y}$	Electricity consumption to gain heated water quantity which solar water heater will supply.	25,005	MWh/y
	Heated water quantity to be supplied by solar water heater	768,000	kL/y
	Water temperature rise	35	℃
	Working ratio of solar water heater	80	%
	Efficiency of electric water heater	100	%
$EF_{BL,y}$	Co2 emission factor for grid-connected electricity	0.967	t-CO_2/MWh

2. Project emission $PE_y = 0$

PE_y	Project emission: GHG emission after project activity	27	t-CO_2/y

3. GHG emission reduction after project activity $ER_y = BE_y - PE_y$ (t-CO_2/y)

ER_y	GHG emission reduction after project activity	24,978	t-CO_2/y
BE_y	Baseline emission: GHG emission accompanied with electricity consumption which is assumed to be replaced by solar water heater.	25,005	t-CO_2/y
PE_y	Project emission: GHG emission after project activity	27	t-CO_2/y

Input Sheet

20. Geothermal Power

Project Name **Virtual 1 【Construction of geothermal power plant**

1. Quantity of electricity (generated in the target power plant after project implementation)(MWh/y)

Enter the planned value before project activity and actual value after project activity.

Parameter	Entry	Unit
Quantity of electricity generated in the target power plant after project activity	473,040	MWh/y

2. Energy mix in the target country

Data/ information specific to the target country should be preferably used for calculation. Data availability should be validated in the following order to enter data in the cells.

i) Project-specific values obtained through interview to electric power management entity concerned.

ii) Published values in the target country

iii) IEA balance table

*Entry to either column is mandatory.

Fuel type	Quantity of generated electricity (GWh/y)	Fuel consumption (kL, m^3, t)		Fuel consumption (converted to crude oil)	
		Consumed volume	Unit	Consumed volume	Unit
Petroleum	31,222	9,568,000	kL/y		ktoe
Gas	62,475	17,321,000	m^3/y		ktoe
Coal	479,955	155,516,000	t/y		ktoe
Others					ktoe

Source: Interview to XX

3. CO2 emission factor per fuel type (t-CO_2/TJ)

Data/ information specific to the target country should be preferably used for calculation. Data availability should be validated in the following order to use.

i) Project-specific data obtained through interview to the electric power management entity concerned

ii) Published values in the target country

iii) Default values adopted in IPCC guideline

Fuel type	Net calorific value		CO_2 emission factor	
Petroleum	36.3	GJ/kL	73.3	t-CO_2/TJ
Gas	0.0384	GJ/m^3	56.1	t-CO_2/TJ
Coal	26.7	GJ/t	98.3	t-CO_2/TJ
Others				t-CO_2/TJ

Source: Interview to XX
2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 2 Energy table1.2,table2.:

4. Fuel consumption in geothermal power plant

Acquire amounts of fuel consumption used in the geothermal power plant during the project and enter values in the cells below.

【Fuel used in the target power plant】

Fuel type	Fuel consumption (kL, m^3, t)	
	Consumption	Unit
Petroleum	5	kL/y
Gas		m^3/y
Coal		t/y
Others		

Source: Interview to XX

5. GHG emission factor from vapor emission

For CO2/CH4 emission from vapor emitted during the project, enter the planned values before project activity and the actual values after project activity for the average mass of vapor in the cells below.

Parameter	Value	Unit
Average CO2 mass in vapor generated	0.005	t-CO_2/t
Average CH4 mass of vapor generated	0.000	t-CO_2/t
Global warming factor of methane	21	—
Vapor generated in the year y	1,000	t/y

Source: Interview to XX

Entry
Entry of source, etc.

Project Name: Virtual 1【Construction of geothermal power plant

1. Baseline emission (t-CO_2/y)

Project outcome	473,040	MWh/y
Conversion factor	3600	kJ/kWh
	41.868	TJ/ktoe
	10.000	Tcal/ktoe
	860	kcal/kWh

Legend

(blue)	Auto filled from Input Sheet
(light blue)	Default values (calculated automatically for manually entered data)
(yellow)	Manual entry
(red frame)	Calculated value

	Quantity of generated electricity		Fuel consumptio	Net calorific value	Quantity of energy	Fuel consumption (converted to crude oil)	Heat efficiency	Caloric CO_2 emission	CO_2 emission factor for electricity	
	GWh/y	Ratio	kL,m^3,t	GJ/kL,m^3,t	TJ	ktoe/y	%	t-CO_2/TJ	kg-CO_2/kWh	
Petroleum	31222	5.4%	9,568,000	36.3	347,296	8295	32.4%	73.3	0.815	Average thermal
Gas	62475	10.9%	17,321,000	0.0	665	16	33814.6%	56.1	0.001	0.756
Coal	479955	83.7%	155,516,000	26.7	4,152,277	99175	41.6%	98.3	0.850	
Others	0	0.0%	0	0.0	0	0	0.0%	0.0		
Total	573652								Grid	0.756

	Fuel price	Suppression priority	Quantity of generated electricity	Quantity unable to suppress	Suppressible quantity
			MWh/y	MWh/y	MWh/y
Petroleum		1	31,222,000	28,683	31,193,317
Gas		2	62,475,000	28,683	62,446,317
Coal		3	479,955,000	28,683	479,926,317
Others		4	0	0	0

		Quantity unable to suppress	Suppressible quantity	Suppressed quantity	Heat efficiency	Caloric CO_2 emission factor	Fuel suppressed	CO2 emission reduced quantity
		MWh/y	MWh/y	MWh/y	%	t-CO_2/TJ	ktoe/y	t-CO_2/y
0	Historical (Petro	0		0		73.3	0.0	0
0	Historical (Gas	0		0		56.1	0.0	0
0	Historical (Coal	0		0		98.3	0.0	0
1	Petroleum	28,683	31,193,317	473,040	32.4%	73.3	125.7	385,692
2	Gas	28,683	62,446,317	0	33814.6%	56.1	0.0	0
3	Coal	28,683	479,926,317	0	41.6%	98.3	0.0	0
4	Others	0	0	0	0.0%	0.0	0.0	0
	Total			473,040			125.7	385,692

(reference value)	Average therma	357,603
	Average grid	357,603

2. Project emission (t-CO_2/y)

【Vapor emission】

Parameter	Emission facto	Vapor emissio	Emission
	t-CO2/t	t	t-CO_2/y
CO2	0.005	1,000	5
CH4	0	1,000	0
GHG	−	−	5

【Emission associated with fuel consumption】

	Fuel consumptio	Net calorific value	Caloric CO_2 emission	CO2 emission
	kL,m^3,t	GJ/kL,m^3,t	t-CO_2/TJ	t-CO_2/y
Petroleum	5	36.3	73.3	13
Gas	0	0.0	56.1	0
Coal	0	26.7	98.3	0
Others	0	0.0	0.0	0
Total				13

Project emission (t-CO2/y) 18

3. GHG emission reduction after project activity (t-CO_2/y)

	GHG emission t-CO_2/y
Baseline emission	385,692
Project emission	18
GHG emission after project activity	385,674

Result Sheet

Virtual 1 【Construction of geothermal power plant

GHG emission reduction after project activity ($t\text{-}CO_2/y$) $ER_y = BE_y - PE_y$ ($t\text{-}CO_2/y$)

1. Baseline emission $BE_y = \Sigma FC_i \times$ *conversion factor (41.868 : TJ/ktoe)* $\times COEF_i$

BE_y	Baseline emission: GHG emission from fuel consumption which is assumed to be replaced by geothermal power generation	385,692	$t\text{-}CO_2/y$
FC_i	Fuel reduction of fuel type i for suppression	-	ktoe/y
	Petroleum	126	ktoe/y
	Gas	0	ktoe/y
	Coal	0	ktoe/y
	Others	0	ktoe/y
$COEF_i$	CO2 emission factor per net calorific value for fuel type i	-	$t\text{-}CO_2/TJ$
	Petroleum	73.3	$t\text{-}CO_2/TJ$
	Gas	56.1	$t\text{-}CO_2/TJ$
	Coal	98.3	$t\text{-}CO_2/TJ$
	Others	0	$t\text{-}CO_2/TJ$

2. Project emission $PE_y = PES_y + PEFF_y$

PE_y	Project emission: GHG emission after project activity	18	$t\text{-}CO_2/y$
PES_y	Emission from reservoir	5	$t\text{-}CO_2/y$
$PEFF_y$	Emission associated with fuel consumption	13	$t\text{-}CO_2/y$

3. GHG emission reduction after project activity $ER_y = BE_y - PE_y$ **($t\text{-}CO_2/y$)**

ER_y	GHG emission reduction after project activity	385,674	$t\text{-}CO_2/y$
BE_y	Baseline emission: GHG emission associated with fuel consumption which is assumed to be replaced by geothermal power generation	385,692	$t\text{-}CO_2/y$
PE_y	Project emission: GHG emission after project activity	18	$t\text{-}CO_2/y$

Input Sheet

21. Biomass

Project Name **Sample:Electric power generation through use of biomass residues**

1. Quantity of Electlicity and heat generation of using of biomass residues

Input the planned data for the calculation of the fuel consumption before the project start and input the monitoring data for the calculation of the fuel consumption after the project start into the following cells.

Parameter	Entry	Unit
Quantity of electric power generation through use of biomass residues after the project starts	150,150	MWh/y
Quantity of heat generation through use of biomass residues after the project starts	80	TJ/y

2. CO_2 Emission factor or electricity (t-CO_2/MWh)

In the environment where the facilities are installed with private generating facilities, or where the facilities are newly constructed and private generating facilities are planned to be installed, select whichever higher by comparing with the CO_2 emissions factor for the grid supplying electricity.The emissions factor of grid should be determined base on one or two typical plants among existing power plants in the target grid.
Data availability is validated in the following order in selecting the target power plant and obtaining the emissions factor specific to the target:

i) Interview to the electric power management entity concerned
ii) Published values in the target country
If private generating facilities are available, interview to the electric power management entity concerned

Parameter	Entry	Unit
CO_2 emission factor of the electric power which connects the grid	0.927	t-CO_2/MWh
CO_2 emission factor of the electric power from private generating facility		t-CO_2/MWh
CO_2 emission factor of the electric power used for calculation	0.927	t-CO_2/MWh

Source: 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 2 Energy

3. CO_2 emission factor of heat generation (t-CO_2/TJ)

Parameter		Entry	Unit
CO_2 emission factor per unit of energy of the boiler fuel consumption in the absence of project	Fuel type: crude oil	73.3	t-CO_2/TJ
Boiler efficiency		100	%
Rate of heat generation from boiler out of the heat generation recovered and utilized from the waste energy in the absence		1	—
CO_2 emission factor per heat generated		73.3	t-CO_2/TJ

Source:

4. Amount of electricity and fuel consumption after the project start

Input the planned data for the calculation of the fuel consumption before the project start and input the monitoring data for the calculation of the fuel consumption after the project start into the following cells.

Parameter		Entry	Unit
Amount of electricity consumption after the project start		750	MWh/y
Amount of fuel consumption after the project start	Crude Oil	178	kL/y
	Coal		t/y
	Gas		m^3/y
	Others		

5. Net calorific value according to fuel type and CO_2 emission factor

Data availability is validated in the following order because it should preferably be calculated using data and information unique to the project.

i) The unique data of the project obtained from the interview with power management entity
ii) National default
iii) IPCC Guideline default data

Parameter	Net calorific value		CO_2 emission factor	
Crude Oil	36.3	GJ/kL	73.3	t-CO_2/TJ
Coal	26.7	GJ/t	98.3	t-CO_2/TJ
Gas	0.0384	GJ/m^3	56.1	t-CO_2/TJ
Others				t-CO_2/TJ

Source:

Entry
Entry of source, etc.

Result Sheet

Sample : Electric power generation through use of biomass residues

GHG emission reduction with the project ($t\text{-}CO_2/y$)　$ER_y = BE_y - PE_y$ ($t\text{-}CO_2/y$)

1. Baseline emission　$BE_y = BE_{el,y} + BE_{ther,y}$

BE_y	Baseline emission: GHG emission without using of biomass residues	145,053	$t\text{-}CO_2/y$
$BE_{el,y}$	GHG emission generated by electric supply with utilization of the biomass residues after the project start	139,189	$t\text{-}CO_2/y$
$BE_{ther,y}$	GHG emission generated by heat supply with utilization of the biomass residues after the project start	5,864	$t\text{-}CO_2/y$

2. Project emission　$PE_y = PE_{el,y} + PE_{i,y}$

PE_y	Project emission: GHG emission after the project start	1,169	$t\text{-}CO_2/y$
$PE_{el,y}$	GHG emission with electric consumption after the project start	695	$t\text{-}CO_2/y$
$PE_{i,y}$	GHG emission with fuel consumption after the project start	474	$t\text{-}CO_2/y$

3. GHG emission reduction with the project　$ER_y = BE_y - PE_y$ ($t\text{-}CO_2/y$)

ER_y	GHG emission reduction with the project	143,884	$t\text{-}CO_2/y$
BE_y	Baseline emission: GHG emission without utilization of biomass resideues	145,053	$t\text{-}CO_2/y$
PE_y	Project emission: GHG emission after the project start	1,169	$t\text{-}CO_2/y$

Sewerage, Urban Sanitation

Appendix-22 Landfill Disposal of Waste

Appendix-23 Intermediate Treatment of Waste

Appendix-24 Wastewater Treatment

Appendix-25 Sewerage

Input sheet

Project name	SAMPLE:Landfill Disposal of Waste

Default value in red

1 . Information for LFG recovery after the project starts

(1) Quantity of LFG recovered and destroyed after the project starts (m^3/h) ＊

Enter the monitoring data after project activity.

Parameter	Entry	Unit
Quantity of LFG recovered		m^3/h

(2) Average methane fraction of the LFG after the project starts (%)

Enter the monitoring data after project activity.

Enter the ACM0001 default value (0.5) when actual measurement is not available.

Parameter	Entry	Unit
Average methane fraction of the LFG	0.5	%

(3) Methane density at temperature or pressure at recovery after the project starts ($t\text{-}CH_4/m^3$)

Enter the monitoring data after project activity.

Enter the ACM0001 default value (0.0007168) when actual measurement is not available.

Parameter	Entry	Unit
Methane density at recovery	0.00072	$t\text{-}CH_4/m^3$

＊ Enter the data in the following (4) - (12) when the planned data of LFG recovered after the project starts(1) is not determined.

(4) Model correction factor to account for model uncertainties

Enter 0.9 as default value.

Parameter	Entry	Unit
Model correction factor to account for model uncertainties	0.9	-

(5) Oxidization rate

Enter the default value 0.1 (covered with soil) or 0 (not covered with soil).

Parameter	Entry	Unit
oxidization rate	0.0	-

(6) Fraction of methane in LFG from landfill

Enter 0.5 as default value.

Parameter	Entry	Unit
Fraction of methane in LFG	0.5	-

(7) Fraction of degradable organic carbon (DOC) that can decompose

Enter 0.5 as default value.

Parameter	Entry	Unit
Fraction of degradable organic carbon (DOC) that can decompose	0.5	-

(8) Methane correction factor in LFG

Methane correction factor according to LFG type (Refer to Appendix).

Parameter	Entry	Unit
Methane correction factor	1.0	-

（9）**Total weight of waste in landfill (t)**

Enter the planned data before project activity.

Parameter	Entry	Unit
Annual average weight of waste (= total weight of waste landfilled/duration of disposal in the landfill)	50,000	t/y
Year starting disposal in the landfill（A） (year of Christian Era)	1983	y
Completion year of disposal in the landfill (year of Christian Era)	2007	y
Year starting the project (year of Christian Era)	2009	y
Final year of estimation of GHG emission reductions (year of Christian Era)（B）	2019	y

＊(A)−(B)＜50

（10）**Composition of solid waste（%）**

Enter the planned data before project activity.

Parameter	Entry	Unit
Wood	4.2	%
Paper	22.1	%
Organic, garbage, beverage (exclude sludge)	51.1	%
Fabric	5.1	%
Yard waste, park waste	0.0	%
Glass, plastic, metal, other inert waste	17.5	%

（11）**Fraction of degradable organic carbon according to waste type (weight based)**

Data/ information specific to the target country should be preferably used for calculation. Data availability should be validated in the following order to enter data in the cells.

ii) National default

iii) IPCC Guideline default data

Parameter	Entry	Unit
Wood	43	%
Paper	40	%
Organic, garbage, beverage (exclude sludge)	15	%
Fabric	24	%
Yard waste, park waste	20	%
Glass, plastic, metal, other inert waste	0	%

（12）**Decay rate of degradable organic carbon in waste type j**

Data/ information specific to the target country should be preferably used for calculation. Data availability should be validated in the following order to enter data in the cells.

ii) National default

iii) IPCC Guideline default data

Parameter	Entry	Unit
Wood	0.020	-
Paper	0.040	-
Organic, garbage, beverage (exclude sludge)	0.060	-
Fabric	0.040	-
Yard waste, park waste	0.050	-

2. LFG production and thermal production

(1) The amount of electricity and thermal energy using LFG after the project starts (MWh/y)

Enter the planned data before the project starts or input the monitoring data after the project starts.

Parameter	Entry	Unit
The amount of electricity generated using LFG	1,000	MWh/y
Quantity of thermal energy generated	100	TJ/y

(2) Emission factor of the typical power plant ($t\text{-}CO_2/MWh$)

Data availability should be validated in the following order in selecting the typical power plant and obtaining CO_2 emissions factor specific to the target.

i) Interview to the electric power management entity concerned

ii) Published values in the target country

Parameter	Entry	Unit
Emission factor of the typical power plant	0.896	$t\text{-}CO_2/MWh$
Source:	Interview to XX company of XX country	

(3) CO_2 emission factor of heat generated ($t\text{-}CO_2/TJ$)

Parameter		Entry	Unit
CO_2 emission factor per unit of energy of the boiler fuel consumption in the absence of project	Fuel type: Petroleum	73.3	$t\text{-}CO_2/TJ$
Boiler efficiency		100	%
Rate of heat generation from boiler out of the heat generation using LFG in absence of project		1	—
CO_2 emission factor per heat generated		73.3	$t\text{-}CO_2/TJ$
Source:	2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 2 Energy table2.2		

3. Project Information

(1) The electricity and fuel consumption after the project starts in the LFG recovery facilities (MWh/y)

Enter the planned data before the project starts or input the monitoring data after the project starts.

Parameter		Entry	Unit
Electricity consumption after the project starts		500	MWh/y
Fuel consumption after the project starts	Petroleum	500	kL/y
	Coal	50	t/y
	Gas	100	m^3/y
	Others		

(2) Emission factor of the typical power plant ($t\text{-}CO_2/MWh$)

Data availability should be validated in the following order in selecting the typical power plant and obtaining CO_2 emissions factor specific to the target.

i) Interview to the electric power management entity concerned

ii) Published values in the target country

Parameter	Entry	Unit
Emission factor of the typical power plant	0.896	$t\text{-}CO_2/MWh$
Source:	Interview to XX company of XX country	

(3) Net calorific value according to fuel type

Data/ information specific to the target country should be preferably used for calculation. Data availability should be validated in the following order to enter data in the cells.

i) Project-specific values obtained through interview to electric power management entity concerned.

ii) National default

iii) IPCC Guideline default data

Parameter	Net calorific value		CO_2 emission factor	
Petroleum	36.3	GJ/kL	73.3	$t\text{-}CO_2/TJ$
Coal	26.7	GJ/t	98.3	$t\text{-}CO_2/TJ$
Gas	0.0384	GJ/m^3	56.1	$t\text{-}CO_2/TJ$
Others				$t\text{-}CO_2/TJ$
Source:	Interview toXX 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 2 Energy table1.2,table2.2			

(yellow)	Entry
(orange)	Entry of source, etc.

Result Sheet

SAMPLE:Landfill Disposal of Waste

GHG emission reduction after the project starts($t\text{-}CO_2/y$) ***ERy* ＝*BEy* － *PEy*** **($t\text{-}CO_2/y$)**

1. Baseline emission ***BEy*** $=(MD_{PJ,y} - MD_{reg,y}) \times GWP_{CH4} + BE_{EN,y}$

BE_y	Baseline emission: GHG emission from methane vented to atmosphere without LFG recovery	28,954	$t\text{-}CO_2/y$
$MD_{PJ,y}$	CH_4 quantity recovered from landfill after the project starts	987	$t\text{-}CH_4/y$
$MD_{reg,y}$	CH_4 quantity decomposed and combusted by national regulation before the project starts It shall be "0" where developing countries have a very few regulation.	0	$t\text{-}CH_4/y$
GWP_{CH4}	Methane global warming potential(=21)	21	$t\text{-}CO_2/t\text{-}CH_4$
$BE_{EN,y}$	CO_2 emissions from generation of energy displaced by the project activity	8,226	$t\text{-}CO_2/y$

2. Project emission $PE_y = PE_{EC,y} + PE_{FC,y}$

PE_y	Project emission: GHG emission after the project starts	1,910	$t\text{-}CO_2/y$
$PE_{EC,y}$	GHG emission from electricity consumption after the project starts	448	$t\text{-}CO_2/y$
$PE_{FC,y}$	GHG emission from fossil fuel consumption after the project starts	1,462	$t\text{-}CO_2/y$

3. GHG emission reduction after the project starts ***ERy*** ***＝BEy － PEy*** $(t\text{-}CO_2/y)$

ER_y	GHG emission reduction after the project starts	27,045	$t\text{-}CO_2/y$
BE_y	Baseline emission: GHG emission from methane vented to atmosphere without LFG recovery	28,954	$t\text{-}CO_2/y$
PE_y	Project emission: GHG emission after the project starts	1,910	$t\text{-}CO_2/y$

Input Sheet : Before the Project starts

Project name	SAMPLE : Intermediate treatment of the waste

Default value in red

1． Information of the current Biogas

(1) Model correction factor to account for model uncertainties

Enter 0.9 as default value.

Parameter	Entry	Unit
Model correction factor to account for model uncertainties	0.9	MWh/y

(2) Oxidation factor

Enter the default value 0.1 (covered with soil) or 0 (not covered).

Parameter	Entry	Unit
Oxidation factor	0.0	MWh/y

(3) Fraction of methane in Biogas from landfill

Enter 0.5 as default value.

Parameter	Entry	Unit
Fraction of methane in Biogas	0.5	-

(4) Fraction of degradable organic carbon (DOC) that can decompose

Enter 0.5 as default value.

Parameter	Entry	Unit
Fraction of degradable organic carbon (DOC) that can decompose	0.5	-

(5) Methane correction factor in Biogas

Methane correction factor according to landfill type (Refer to Appendix).

Parameter	Entry	Unit
Methane correction factor in Biogas	0.8	-

(6) Annual weight of waste prevented from disposal at the SWDS after the project starts

Enter the planned data before the project starts or input the monitoring data after the project starts.

Parameter		Entry	Unit
Total weight of waste	1st year	182,500	t/y
	2nd year	182,500	
	3rd year	182,500	
	4th year	182,500	
	5th year	182,500	
	6th year	182,500	
	7th year	182,500	
	8th year	182,500	
	9th year	182,500	
	10th year	182,500	

(7) Composition of solid waste

Enter the planned data before the project starts or input the monitoring data after the project startss .

Parameter	Entry	Unit
Wood	3.8	%
Paper	5.9	%
Organic, garbage, beverage (exclude sludge)	43.7	%
Fabric	3.1	%
Yard waste, park waste	19.1	%
Glass, plastic, metal, other inert waste	24.3	%

(8) Fraction of degradable organic carbon according to waste type (weight based)

Data/ information specific to the target country should be preferably used for calculation. Data availability should be validated in the following order to enter data in the cells.

ii) National default

iii) IPCC Guideline default data

Parameter	Entry	Unit
Wood	43	%
Paper	40	%
Organic, garbage, beverage (exclude sludge)	15	%
Fabric	24	%
Yard waste, park waste	20	%
Glass, plastic, metal, other inert waste	0	%

(9) Decay rate of degradable organic carbon according to waste type

Data/ information specific to the target country should be preferably used for calculation. Data availability should be validated in the following order to enter data in the cells.

ii) National default

iii) IPCC Guideline default data

Parameter	Entry	Unit
Wood	0.035	-
Paper	0.070	-
Organic, garbage, beverage (exclude sludge)	0.400	-
Fabric	0.070	-
Yard waste, park waste	0.170	-

2. Information of electricity and thermal energy generation by using biogas

$BE_{EN,y}$: CO_2 emissions from generation of energy displaced by the project activity

(1) Amount of electricity and quantity of thermal energy using Biogas after the project starts (MWh/y)

Enter the planned data before the project starts or input the monitoring data after the project starts .

Parameter	Entry	Unit
Amount of electricity produced using Biogas	1,000	MWh/y
Amount of thermal energy produced	100	TJ/y

(2) Emission factor of the typical power plant ($t\text{-}CO_2/MWh$)

Data availability should be validated in the following order in selecting the typical power plant and obtaining CO_2 emissions factor specific to the target.

i) Interview to the electric power management entity concerned

ii) Published values in the target country

Parameter	Entry	Unit
Emission factor of the typical power plant	0.896	$t\text{-}CO_2/MWh$
Source: Interview to XX company of XX country		

(3) CO_2 emission factor of heat generated ($t\text{-}CO_2/TJ$)

Parameter		Entry	Unit
CO_2 emission factor per unit of energy of the boiler fuel consumption in the absence of project	Fuel type: Petroleum	73.3	$t\text{-}CO_2/TJ$
Boiler efficiency		100	%
Rate of heat generation from boiler out of the heat generation using		1	–
CO_2 emission factor per heat generated		73.3	$t\text{-}CO_2/TJ$
Source: 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 2 Energy table2.2			

3. Project information

$PE_{elec,y}$: GHG emission from electricity consumption after the project starts

$PE_{fuel,y}$: GHG emission from fossil fuel consumption after the project starts

(1) The electricity and fuel consumption after the project starts in the Biogas recovery facilities (MWh/y)

Enter the planned data before the project starts or input the monitoring data after the project starts .

Parameter		Entry	Unit
Amount of electricity consumption after the		500	MWh/y
Amount of fuel consumption after the project starts	Petroleum	500	kL/y
	Coal	50	t/y
	Gas	100	m^3/y
	Others		

(2) **Emission factor of the typical power plant (t-CO_2/MWh)**

Data availability should be validated in the following order in selecting the typical power plant and obtaining CO_2 emissions factor specific to the target.

i) Interview to the electric power management entity concerned

ii) Published values in the target country

Parameter	Entry	Unit
Emission factor of the typical power plant	0.896	t-CO_2/MWh

Source: Interview to XX company of XX country

(3) **Net calorific value according to fuel type**

Data/ information specific to the target country should be preferably used for calculation. Data availability should be validated in the following order to enter data in the cells.

i) Project-specific values obtained through interview to electricity management entity concerned

ii) National default

iii) IPCC Guideline default data

Parameter		Net calorific value		CO_2 emission factor	
Petroleum		36.3	GJ/kL	73.3	t-CO_2/TJ
Coal		26.7	GJ/t	98.3	t-CO_2/TJ
Gas		0.0384	GJ/m3	56.1	t-CO_2/TJ
Others					t-CO_2/TJ

Source: Interview to XX

2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 2 Energy table1.2,table2.2

PEc,y : GHG emission during the composting process after the project starts

(1) **Quantity of organic waste composed (t/y)**

Enter the planned data before the project starts or input the monitoring data after the project starts .

Parameter	Entry	Unit
Quantity of organic waste composed	0	t/y

(2) **Emission factor for N_2O and CH_4 from the composting process (t-N_2O/t-compost)**

Enter the IPCC default value.

Parameter	Entry	Unit
Emission factor for N_2O from the composting process	0.0003	t-N_2O/t-waste
Emission factor for CH_4 from the composting process	0.004	t-CH_4/t-waste

Source: 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 5 Waste table4.1

PEa,y : GHG emission from the anaerobic digestion process after the project starts

(1) **Amount of organic waste fed into anaerobic digestion after the project starts (t/y)**

Enter the planned data.

Parameter	Entry	Unit
Amount of organic waste fed into anaerobic	5,000	t/y

(2) **Emission factor for CH_4 emissions from the anaerobic digestion (t-CH_4/t-waste)**

Enter the IPCC default value.

Parameter	Entry	Unit
Emission factor for CH_4 emissions from the	0.001	t-CH_4/m^3-waste

Source: 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 5 Waste table4.1

PEg,y : GHG emission from the gasification process after the project starts

(1) **Amount of waste type i fed into the gasifier (t/y)**

Enter the planned data before the project starts or input the monitoring data after the project starts .

Unit: t/y

Type of waste i	Weight
Wood	
Paper	
Organic, garbage, beverage (exclude sludge)	
Fabric	
Yard waste, park waste	
Glass, plastic, metal, other inert waste	

(2) **Fraction of carbon content in waste type i (-)**

Enter the planned data before the project starts or input the monitoring data after the project starts .

Unit: —

Type of waste i	Fraction of carbon content
Wood	
Paper	
Organic, garbage, beverage (exclude sludge)	
Fabric	
Yard waste, park waste	
Glass, plastic, metal, other inert waste	

(3) Fraction of fossil carbon in total carbon of waste type i (-))

Enter the planned data before the project starts or input the monitoring data after the project starts .

Type of waste i	Fraction of fossil carbon
Wood	
Paper	
Organic, garbage, beverage (exclude sludge)	
Fabric	
Yard waste, park waste	
Glass, plastic, metal, other inert waste	

Unit: —

(4) Combustion efficiency for waste (-)

Enter the planned data before the project starts or input the monitoring data after the project starts .

Type of waste i	Combustion efficiency
Wood	
Paper	
Organic, garbage, beverage (exclude sludge)	
Fabric	
Yard waste, park waste	
Glass, plastic, metal, other inert waste	

Unit: —

(5) Amount of waste gasified (t/y)

Enter the planned data.

Parameter	Entry	Unit
Amount of waste		t/y

(6) Emission factor for N_2O emissions from combustion (kg-N_2O/t)

Enter the planned data.

Parameter	Entry	Unit
N_2O emission factor	47	t-N_2O/t

(7) Emission factor for CH_4 emissions from combustion (kg-CH_4/t)

Enter the planned data.

Parameter	Entry	Unit
CH_4 emission factor	0.2	t-CH_4/t

PEr,y : GHG emission from the combustion pf RDF after the project starts

(1) Amount of waste type i fed into the RDF (t/y)

Enter the planned data before the project starts or input the monitoring data after the project starts .

Type of waste i	Weight
Wood	
Paper	
Organic, garbage, beverage (exclude sludge)	
Fabric	
Yard waste, park waste	
Glass, plastic, metal, other inert waste	

Unit: t/y

(2) Fraction of carbon content in waste type i (-)

Enter the planned data before the project starts or input the monitoring data after the project starts .

Type of waste i	Fraction of carbon content
Wood	
Paper	
Organic, garbage, beverage (exclude sludge)	
Fabric	
Yard waste, park waste	
Glass, plastic, metal, other inert waste	

Unit: —

(3) Fraction of fossil carbon in total carbon of waste type i (-))

Enter the planned data before the project starts or input the monitoring data after the project starts .

Type of waste i	Fraction of fossil carbon
Wood	
Paper	
Organic, garbage, beverage (exclude sludge)	
Fabric	
Yard waste, park waste	
Glass, plastic, metal, other inert waste	

Unit: —

(4) **Combustion efficiency for waste (-)**

Enter the planned data before the project starts or input the monitoring data after the project starts .

Type of waste i	Combustion efficiency
Wood	
Paper	
Organic, garbage, beverage (exclude sludge)	
Fabric	
Yard waste, park waste	
Glass, plastic, metal, other inert waste	

Unit: ―

(5) **Amount of waste type i fed into the RDF (t/y)**

Enter the planned data.

Parameter	Entry	Unit
Amount of waste		t/y

(6) **Emission factor for N_2O emissions from combustion (kg-N_2O/t)**

Enter the planned data.

Parameter	Entry	Unit
N_2O emission factor		t-N_2O/t

(7) **Emission factor for CH_4 emissions from combustion (kg-CH_4/t)**

Enter the planned data.

Parameter	Entry	Unit
CH_4 emission factor		t-CH_4/t

PEi,y : GHG emissions from waste incineration after the project starts

(1) **Amount of waste type i fed into the incineration (t/y)**

Enter the planned data before the project starts or input the monitoring data after the project starts .

Type of waste i	Weight
Wood	
Paper	
Organic, garbage, beverage (exclude sludge)	
Fabric	
Yard waste, park waste	
Glass, plastic, metal, other inert waste	

Unit: t/y

(2) **Fraction of carbon content in waste type i (-)**

Enter the planned data before the project starts or input the monitoring data after the project starts .

Type of waste i	Fraction of carbon content
Wood	
Paper	
Organic, garbage, beverage (exclude sludge)	
Fabric	
Yard waste, park waste	
Glass, plastic, metal, other inert waste	

Unit: ―

(3) **Fraction of fossil carbon in total carbon of waste type i (-))**

Enter the planned data before the project starts or input the monitoring data after the project starts .

Type of waste i	Fraction of fossil carbon
Wood	
Paper	
Organic, garbage, beverage (exclude sludge)	
Fabric	
Yard waste, park waste	
Glass, plastic, metal, other inert waste	

Unit: ―

(4) **Combustion efficiency for waste (-)**

Enter the planned data before the project starts or input the monitoring data after the project starts .

Type of waste i	Combustion efficiency
Wood	
Paper	
Organic, garbage, beverage (exclude sludge)	
Fabric	
Yard waste, park waste	
Glass, plastic, metal, other inert waste	

Unit: ―

(5) **Amount of waste incinerated (t/y)**

Enter the planned data.

Parameter	Entry	Unit
Amount of waste		t/y

(6) **Emission factor for N_2O emissions from combustion (kg-N_2O/t)**

Enter the planned data.

Parameter	Entry	Unit
N_2O emission factor		t-N_2O/t

(7) Emission factor for CH_4 emissions from combustion (kg-CH_4/t)

Enter the planned data.

Parameter	Entry	Unit
CH_4 emission factor		t-CH_4/t

PEw,y : GHG emissions from wastewater treatment after the project starts

(1) Amount of wastewater treated anaerobically or released untreated from the project starts (m^3/y)

Enter the planned data before the project starts or input the monitoring data after the project starts .

Parameter	Entry	Unit
Amount of wastewater after project	70,000	m^3/y

(2) Chemical oxygen demand (COD) of wastewater after the project starts (t-COD/m^3)

Enter the planned data before the project starts or input the monitoring data after the project starts .

Parameter	Entry	Unit
COD of wastewater	0.00003	t-COD/m^3

(3) Maximum methane producing capacity (t-CH_4/t-COD)

Use 0.265 as IPCC default value.

Parameter	Entry	Unit
Maximum CH_4 producing capacity	0.265	t-CH_4/t-COD

(4) Methane correction factor (-)

Data/ information specific to the target country should be preferably used for calculation. Data availability should

i) National default

ii)IPCC Guideline default data

Parameter	Entry	Unit
CH_4 correction factor	0.8	-

Source: 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 5 Waste table6.3

4. Other conditions

(1) Computation period of the emission reduction effect

XX year after the project 10 year

y≦10

(yellow)	Entry
(green)	Select from the list/input

Calculation Sheet : Before the Project starts

SAMPLE : Intermediate treatment of the waste

GHG emission reduction after project activity（t-CO_2/y） ***ERy*** **＝*BEy* － *PEy*** **(t-CO_2/y)**

1. Baseline emission $BE_y = MB_y - MD_{reg,y} + BE_{EN,y}$

BE_y	Baseline emission: GHG emission from CH_4 released into the atmosphere before the project starts which the waste treatment is installed	85,448	t-CO_2/y
MB_y	GHG emission from methane produced in landfill before the project starts	77,222	t-CO_2/y
$MD_{reg,y}$	GHG emission reduction of methane destroyed by national regulation before the project star This shall be "0" where developing countries have a very few regulation	0	t-CO_2/y
$BE_{EN,y}$	CO_2 emissions from generation of energy displaced by the project activity	8,226	t-CO_2/y

2. Project emission $PE_y = PE_{EC,y} + PE_{FC,y} + PE_{e,y} + PE_{a,y} + PE_{g,y} + PE_{r,y} + PE_{i,y} + PE_{w,y}$

PE_y	Project emission: GHG emission after the project star	2,024	t-CO_2/y
$PE_{EC,y}$	GHG emission from electricity consumption after the project starts	448	t-CO_2/y
$PE_{FC,y}$	GHG emission from fossil fuel consumption after the project starts	1,462	t-CO_2/y
PEc,y	GHG emission during the composting process after the project star If CH_4 produced in the composting process is recovered and destroyed by energy generation or flare after the project starts, this term shall be neglected.	0	t-CO_2/y
PEa,y	GHG emission from the anaerobic digestion process after the project starts If CH_4 produced in the anaerobic digestion process is recovered and destroyed by energy generation or flare after the project starts, this term shall be neglected.	105	t-CO_2/y
PEg,y	GHG emission from the gasification process after the project starts	0	t-CO_2/y
PEr,y	GHG emission from the combustion of RDF after the project starts	0	t-CO_2/y
PEi,y	GHG emissions from waste incineration after the project starts	0	t-CO_2/y
PEw,y	GHG emissions from wastewater treatment after the project starts	9	t-CO_2/y

3. GHG emission reduction after project activity ***ERy*** = ***BEy*** - ***PEy*** **(t-CO_2/y)**

ER_y	GHG emission reduction after project activity	83,424	t-CO_2/y
BE_y	Baseline emission: GHG emission from CH_4 released into the atmosphere before the project starts which the waste treatment is installed	85,448	t-CO_2/y
PE_y	Project emission: GHG emission after the project starts	2,024	t-CO_2/y

Input Sheet : After the Project starts

Project name	**SAMPLE : Intermediate treatment of waste**

Default value in red

1． Information of the current Biogas

(1) Model correction factor to account for model uncertainties

Enter 0.9 as default value.

Parameter	Entry	Unit
Model correction factor to account for model uncertainties	0.9	MWh/y

(2) Oxidation factor

Enter the default value 0.1 (covered) or 0 (not covered).

Parameter	Entry	Unit
Oxidation factor	0.0	MWh/y

(3) Fraction of methane in Biogas from landfill

Enter 0.5 as default value.

Parameter	Entry	Unit
Fraction of methane in Biogas	0.5	-

(4) Fraction of degradable organic carbon (DOC) that can decompose

Enter 0.5 as default value.

Parameter	Entry	Unit
Fraction of degradable organic carbon (DOC) that can decompose	0.5	-

(5) Methane correction factor in Biogas

Methane correction factor according to Biogas type (Refer to Appendix).

Parameter	Entry	Unit
Methane correction factor in Biogas	0.8	-

(6) Annual weight of waste prevented from disposal at the SWDS after the project starts

Enter the planned data before the project starts or input the monitoring data after the project starts.

Parameter		Entry	Unit
Total weight of waste	1st year	182,500	t/y
	2nd year	182,500	
	3rd year	182,500	
	4th year	182,500	
	5th year	182,500	
	6th year	182,500	
	7th year	182,500	
	8th year	182,500	
	9th year	182,500	
	10th year	182,500	

(7) Composition of solid waste

Enter the planned data before the project starts or input the monitoring data after the project startss .

Parameter	Entry	Unit
Wood	4	%
Paper	6	%
Organic, garbage, beverage (exclude sludge)	44	%
Fabric	3	%
Yard waste, park waste	19	%
Glass, plastic, metal, other inert waste	24	%

(8) Fraction of degradable organic carbon according to waste type (weight based)

Data/ information specific to the target country should be preferably used for calculation. Data availability should be validated in the following order to enter data in the cells.

ii) National default

iii) IPCC Guideline default data

Parameter	Entry	Unit
Wood	43	%
Paper	40	%
Organic, garbage, beverage (exclude sludge)	15	%
Fabric	24	%
Yard waste, park waste	20	%
Glass, plastic, metal, other inert waste	0	%

(9) Decay rate of degradable organic carbon according to waste type

Data/ information specific to the target country should be preferably used for calculation. Data availability should be validated in the following order to enter data in the cells.

ii) National default

iii) IPCC Guideline default data

Parameter	Entry	Unit
Wood	0.035	-
Paper	0.070	-
Organic, garbage, beverage (exclude sludge)	0.400	-
Fabric	0.070	-
Yard waste, park waste	0.170	-

2. Information of electricity and thermal energy generation by using biogas

$BE_{EN,y}$: CO2 emissions from generation of energy displaced by the project activity

(1) Amount of electricity and quantity of thermal energy using Biogas after the project starts (MWh/y)

Enter the planned data before the project starts or input the monitoring data after the project starts .

Parameter	Entry	Unit
Amount of electricity produced using Biogas	1,000	MWh/y
Amount of thermal energy produced	100	TJ/y

(2) Emission factor of the typical power plant (t-CO_2/MWh)

Data availability should be validated in the following order in selecting the typical power plant and obtaining CO_2 emissions factor specific to the target.

i) Interview to the electric power management entity concerned

ii) Published values in the target country

Parameter	Entry	Unit
Emission factor of the typical power plant	0.896	t-CO_2/MWh
Source:	Interview to XX company of XX country	

(3) CO2 emission factor of heat generated (t-CO2/TJ)

Parameter		Entry	Unit
CO2 emission factor per unit of energy of the boiler fuel consumption in the absence of project	Fuel type: Petroleum	73.3	t-CO_2/TJ
Boiler efficiency		100	%
Rate of heat generation from boiler out of the heat generation using		1	−
CO2 emission factor per heat generated		73.3	t-CO_2/TJ
Source:	2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 2 Energy table2.2		

3. Project information

$PE_{elec,y}$: GHG emission from electricity consumption after the project starts

$PE_{fuel,y}$: GHG emission from fossil fuel consumption after the project starts

(1) The electricity and fuel consumption after the project starts in the Biogas recovery facilities (MWh/y)

Enter the planned data before the project starts or input the monitoring data after the project starts .

Parameter		Entry	Unit
Amount of electricity consumption after the		500	MWh/y
Amount of fuel consumption after the project starts	Petroleum	500	kL/y
	Coal	50	t/y
	Gas	100	m^3/y
	Others		

（2）**Emission factor of the typical power plant （t-CO_2/MWh）**

Data availability should be validated in the following order in selecting the typical power plant and obtaining CO2 emissions factor specific to the target.

i) Interview to the electric power management entity concerned

ii) Published values in the target country

Parameter	Entry	Unit
Emission factor of the typical power plant	0.896	t-CO_2/MWh
Source:	Interview to XX company of XX country	

（3）**Net caloric value according to fuel type**

Data/ information specific to the target country should be preferably used for calculation. Data availability should be validated in the following order to enter data in the cells.

i) Project-specific values obtained through interview to electricity management entity concerned

ii) National default

iii) IPCC Guideline default data

Parameter		Net calorific value		CO2 emission factor	
Petroleum		36.3	GJ/kL	73.3	t-CO_2/TJ
Coal		26.7	GJ/t	98.3	t-CO_2/TJ
Gas		0.0384	GJ/m3	56.1	t-CO_2/TJ
Others					t-CO_2/TJ
Source:	Interview to XX 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 2 Energy table1.2,table2.2				

PEc,y ： GHG emission during the composting process after the project starts

（1）**Quantity of organic waste composed（t/y）**

Enter the planned data before the project starts or input the monitoring data after the project starts .

Parameter	Entry	Unit
Quantity of organic waste composed	0	t/y

（2）**Emission factor for N_2O and CH_4 from the composting process（t-N_2O/t-compost）**

Enter the IPCC default value.

Parameter	Entry	Unit
Emission factor for N_2O from the composting process	0.0003	t-N_2O/t-waste
Emission factor for CH_4 from the composting process	0.004	t-CH_4/t-waste
Source:	2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 5 Waste table4.1	

PEa,y ： GHG emission from the anaerobic digestion process after the project starts

（1）**Total volume of stack gas from anaerobic digestion (m^3/y)**

Enter the monitoring data

Parameter	Entry	Unit
Total volume of stack gas	30,000	m^3/y

（2）**Monitored content of CH_4 in the stack gas from anaerobic digestion（t-CH_4/m^3）**

Enter the monitoring data

Parameter	Entry	Unit
Monitored content of CH_4	0.001	t-CH_4/m^3

PEg,y ： GHG emission from the gasification process after the project starts

（1）**Amount of waste type i fed into the gasifier (t/y)**

Enter the planned data before the project starts or input the monitoring data after the project starts .

Unit：t/y

Type of waste i	Weight
Wood	
Paper	
Organic, garbage, beverage (exclude sludge)	
Fabric	
Yard waste, park waste	
Glass, plastic, metal, other inert waste	

（2）**Fraction of carbon content in waste type i（-）**

Enter the planned data before the project starts or input the monitoring data after the project starts .

Unit：－

Type of waste i	Fraction of carbon waste
Wood	
Paper	
Organic, garbage, beverage (exclude sludge)	
Fabric	
Yard waste, park waste	
Glass, plastic, metal, other inert waste	

(3) Fraction of fossil carbon in total carbon of waste type i (-))

Enter the planned data before the project starts or input the monitoring data after the project starts .

Type of waste i	Fraction of fossil carbon	Unit: －
Wood		
Paper		
Organic, garbage, beverage (exclude sludge)		
Fabric		
Yard waste, park waste		
Glass, plastic, metal, other inert waste		

(4) Combustion efficiency for waste (-)

Enter the planned data before the project starts or input the monitoring data after the project starts .

Type of waste i	Combustion efficiency	Unit: －
Wood		
Paper		
Organic, garbage, beverage (exclude sludge)		
Fabric		
Yard waste, park waste		
Glass, plastic, metal, other inert waste		

(5) Total volume of stack gas from gasification after the project starts (m^3/y)

Enter the planned data before the project starts or input the monitoring data after the project starts .

Parameter	Entry	Unit
Volume of stack gas		m^3/y

(6) Monitored content of nitrous oxide in the stack gas from gasification (t-N_2O/m^3)

Enter the monitoring data

Parameter	Entry	Unit
Monitored content of N_2O	0.00001	t-N_2O/m^3

(7) Monitored content of methane in the stack gas from gasification (t-CH_4/m^3)

Enter the monitoring data

Parameter	Entry	Unit
Monitored content of CH_4	0.000001	t-CH_4/m^3

PEr,y : GHG emission from the combustion of RDF after the project starts

(1) Amount of waste type i fed into the RDF (t/y)

Enter the planned data before the project starts or input the monitoring data after the project starts .

Type of waste i	Weight	Unit: t/y
Wood		
Paper		
Organic, garbage, beverage (exclude sludge)		
Fabric		
Yard waste, park waste		
Glass, plastic, metal, other inert waste		

(2) Fraction of carbon content in waste type i (-)

Enter the planned data before the project starts or input the monitoring data after the project starts .

Type of waste i	Fraction of carbon content	Unit: －
Wood		
Paper		
Organic, garbage, beverage (exclude sludge)		
Fabric		
Yard waste, park waste		
Glass, plastic, metal, other inert waste		

(3) Fraction of fossil carbon in total carbon of waste type i (-))

Enter the planned data before the project starts or input the monitoring data after the project starts .

Type of waste i	Fraction of fossil carbon	Unit: －
Wood		
Paper		
Organic, garbage, beverage (exclude sludge)		
Fabric		
Yard waste, park waste		
Glass, plastic, metal, other inert waste		

(4) **Combustion efficiency for waste (-)**

Enter the planned data before the project starts or input the monitoring data after the project starts .

Type of waste i	Combustion efficiency
Wood	
Paper	
Organic, garbage, beverage (exclude sludge)	
Fabric	
Yard waste, park waste	
Glass, plastic, metal, other inert waste	

Unit: —

(5) **Total volume of stack gas from RDF after the project starts (m^3/y)**

Enter the planned data before the project starts or input the monitoring data after the project starts .

Parameter	Entry	Unit
Volume of stack gas		m^3/y

(6) **Monitored content of N_2O in the stack gas from RDF (t-N_2O/m^3)**

Enter the monitoring data

Parameter	Entry	Unit
Monitored content of N_2O		t-N_2O/m^3

(7) **Monitored content of methane in the stack gas from RDF (t-CH_4/m^3)**

Enter the monitoring data

Parameter	Entry	Unit
Monitored content of CH_4		t-CH_4/m^3

PEi,y : GHG emissions from waste incineration after the project starts

(1) **Amount of waste type I fed into the incineration (t/y)**

Enter the planned data before the project starts or input the monitoring data after the project starts .

Type of waste i	Weight
Wood	
Paper	
Organic, garbage, beverage (exclude sludge)	
Fabric	
Yard waste, park waste	
Glass, plastic, metal, other inert waste	

Unit: t/y

(2) **Fraction of carbon content in waste type i (-)**

Enter the planned data before the project starts or input the monitoring data after the project starts .

Type of waste i	Fraction of carbon content
Wood	
Paper	
Organic, garbage, beverage (exclude sludge)	
Fabric	
Yard waste, park waste	
Glass, plastic, metal, other inert waste	

Unit: —

(3) **Fraction of fossil carbon in total carbon of waste type i (-))**

Enter the planned data before the project starts or input the monitoring data after the project starts .

Type of waste i	Fraction of fossil carbon
Wood	
Paper	
Organic, garbage, beverage (exclude sludge)	
Fabric	
Yard waste, park waste	
Glass, plastic, metal, other inert waste	

Unit: —

(4) **Combustion efficiency for waste (-)**

Enter the planned data before the project starts or input the monitoring data after the project starts .

Type of waste i	Combustion efficiency
Wood	
Paper	
Organic, garbage, beverage (exclude sludge)	
Fabric	
Yard waste, park waste	
Glass, plastic, metal, other inert waste	

Unit: —

(5) **Total volume of stack gas from incineration after the project starts (m^3/y)**

Enter the planned data before the project starts or input the monitoring data after the project starts .

Parameter	Entry	Unit
Volume of stack gas		m^3/y

(6) **Monitored content of N_2O in the stack gas from incineration (t-N_2O/m^3)**

Enter the monitoring data

Parameter	Entry	Unit
Monitored content of N_2O		t-N_2O/m^3

(7) Monitored content of methane in the stack gas from incineration (t-CH4/m3)

Enter the monitoring data

Parameter	Entry	Unit
Monitored content of CH_4		$t\text{-}CH_4/m^3$

PEw,y : GHG emissions from wastewater treatment after the project starts

(1) Amount of wastewater treated anaerobically or released untreated after the project starts (m3/y)

Enter the planned data before the project starts or input the monitoring data after the project starts .

Parameter	Entry	Unit
Amount of wastewater after project	70,000	m^3/y

(2) Chemical oxygen demand (COD) of wastewater after the project starts (t-COD/m3)

Enter the planned data before the project starts or input the monitoring data after the project starts .

Parameter	Entry	Unit
COD of wastewater	0.00003	$t\text{-}COD/m^3$

(3) Maximum methane producing capacity ($t\text{-}CH_4/t\text{-}COD$)

Use 0.265 as IPCC default value.

Parameter	Entry	Unit
Maximum CH_4 producing capacity	0.265	$t\text{-}CH_4/t\text{-}COD$

(4) Methane correction factor (-)

Data/ information specific to the target country should be preferably used for calculation. Data availability should be validated in the following order to enter data in the cells.

I) National default

ii)IPCC Guideline default data

Parameter	Entry	Unit
CH_4 correction factor	0.8	-

Source: 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 5 Waste tab

4. Other conditions

(1) Computation period of the emission reduction effect

XX year after the project 10 year

y≦10

(yellow)	Entry
(green)	Select from the list/input

Calculation Sheet : After the Project starts

SAMPLE : Intermediate treatment of waste

GHG emission reduction after project activity（t-CO_2/y） ***ERy*** **＝*BEy* － *PEy*** **(t-CO_2/y)**

1. Baseline emission BEy ＝MB $_y$ - MDreg $_{,y}$ + BE $_{EN,y}$

BE_y	Baseline emission: GHG emission from CH_4 released into the atmosphere before the project starts which the waste treatment is installed	85,448	t-CO_2/y
$MD_{PJ,y}$	GHG emission from methane produced in landfill before the project starts	77,222	t-CO_2/y
$MD_{reg,y}$	GHG emission reduction of methane destroyed by national regulation before the project star This shall be "0" where developing countries have a very few regulation	0	t-CO_2/y
$BE_{EN,y}$	CO_2 emissions from generation of energy displaced by the project activity	8,226	t-CO_2/y

2. Project emission PE $_y$ $= PE_{EC,y} + PE_{FC,y} + PE_{c,y} + PE_{a,y} + PE_{g,y} + PE_{r,y} + PE_{i,y} + PE_{w,y}$

PE_y	Project emission: GHG emission after the project star	2,549	t-CO_2/y
$PE_{EC,y}$	GHG emission from electricity consumption after the project starts	448	t-CO_2/y
$PE_{FC,y}$	GHG emission from fossil fuel consumption after the project starts	1,462	t-CO_2/y
PEc,y	GHG emission during the composting process after the project star If CH_4 produced in the composting process is recovered and destroyed by energy generation or flare after the project starts, this term shall be neglected.	0	t-CO_2/y
PEa,y	GHG emission from the anaerobic digestion process after the project starts If CH_4 produced in the anaerobic digestion process is recovered and destroyed by energy generation or flare after the project starts, this term shall be neglected.	630	t-CO_2/y
PEg,y	GHG emission from the gasification process after the project starts	0	t-CO_2/y
PEr,y	GHG emission from the combustion of RDF after the project starts	0	t-CO_2/y
PEi,y	GHG emissions from waste incineration after the project starts	0	t-CO_2/y
PEw,y	GHG emissions from wastewater treatment after the project starts	9	t-CO_2/y

3. GHG emission reduction after project activity ERy = BEy - PEy **(t-CO_2/y)**

ER_y	GHG emission reduction after project activity	82,899	t-CO_2/y
BE_y	Baseline emission: GHG emission from CH_4 released into the atmosphere before the project starts which the waste treatment is installed	85,448	t-CO_2/y
PE_y	Project emission: GHG emission after the project starts	2,549	t-CO_2/y

Input Sheet

Project name SAMPLE : Wastewater Treatment

Default value in red

1. Information before the project starts

$BE_{EC,y}$: GHG emissions from electricity consumption on site before the project starts

$BE_{FC,y}$: GHG emissions from fuel consumption on site before the project starts

(1) Amount of electricity consumption before the project starts (MWh/y)

Enter the monitoring data.

Parameter		Entry	Unit
Amount of electricity consumption before the project starts		500	MWh/y
Amount of fuel consumption before the project starts	Petroleum	500	kL/y
	Coal	50	t/y
	Gas	100	m^3/y
	Others		

(2) Emission factor of the typical power plant (t-CO_2/MWh)

Data availability should be validated in the following order in selecting the typical power plant and obtaining CO_2 emissions factor specific to the target.

i) Interview to the electric power management entity concerned

ii) Published values in the target country

Parameter	Entry	Unit
Emission factor of the typical power plant	0.896	t-CO_2/MWh
Source: Interview to XX company of XX country		

(3) Net calorific value according to fuel type (TJ/Gg)

Data/ information specific to the target country should be preferably used for calculation. Data availability

i) Project-specific values obtained through interview to electric power management entity concerned

ii) National default

iii) IPCC Guideline default data

Parameter	Net calorific value		CO_2 emission factor	
Petroleum	36.3	GJ/kL	73.3	t-CO_2/TJ
Coal	26.7	GJ/t	98.3	t-CO_2/TJ
Gas	0.0384	GJ/m3	56.1	t-CO_2/TJ
Others				t-CO_2/TJ

Source: Interview to XX

2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 2 Energy table1.2,table2.2

$BE_{ww,t,y}$: GHG emissions of the wastewater treatment system before the project starts

(1) Volume of wastewater treated in wastewater treatment system before the project starts (m^3)

Enter the monitoring data.

Parameter	Entry	Unit
Volume of wastewater treated	200,000	m^3/y

(2) Chemical oxygen demand removed by the wastewater treatment before the project starts (t-COD/m^3)

Enter the monitoring data.

It shall be determined as the difference of the COD of wastewater before and after the processing.

Parameter	Entry	Unit
Chemical oxygen demand removed	0.050000	t-COD/m^3

1 t/m^3=1,000,000 mg/L

(3) CH_4 correction factor for the wastewater treatment system before the project starts (-)

Enter the IPCC guideline default value (Refer to Appendix).

Parameter	Entry	Unit
CH4 correction factor	0.8	-

(4) CH_4 producing capacity of the wastewater (kg-CH_4/kg-COD)

Use 0.25 as IPCC default value.

Parameter	Entry	Unit
CH4 producing capacity of the wastewater	0.25	kg-CH_4/kg-COD

$BE_{s,t,y}$ ： GHG emissions from the baseline sludge treatment systems before the project starts

（1）Amount of dry matter in the treated sludge before the project starts（t）

Enter the monitoring data.

Parameter	Entry	Unit
Amount of dry matter in the treated sludge	954	m^3/y

Enter values when sludge treatment is not done before the project starts (when no sludge generated).

Parameter	Entry	Unit
Sludge generation ratio of the wastewater treatment	0	t-sludge/t-COD
Sludge generation ratio of the wastewater treatment	0	t-sludge/t-COD

（2）CH4 correction factor of the sludge treatment system before the project starts（-）

Enter the IPCC guideline default value (Refer to Appendix).

Parameter	Entry	Unit
CH_4 correction factor of the sluge treatment system	0.8	-

（3）Degradable organic content of the untreated sludge (dry basis) （-）

Data/ information specific to the target country should be preferably used for calculation. Data availability should be validated in the following order to enter data in the cells.

i) National default

ii) IPCC Guideline default data

Parameter	Entry	Unit
DOC in sludge	0.5	-

（4）Fraction of degradable organic carbon (DOC) dissimilated to biogas （-）

Use 0.5 as IPCC default value.

Parameter	Entry	Unit
Fraction of DOC dissimilated	0.5	-

（5）Fraction of CH_4 in biogas (-)

Use 0.5 as IPCC default value.

Parameter	Entry	Unit
Fraction of CH_4 in biogas	0.5	-

$BE_{ww,d,y}$ ： GHG emissions from degradable organic carbon in treated wastewater discharged into sea/river/lake before the project starts

（1）Volume of treated or untreated wastewater discharged（m^3）

Enter the monitoring data.

Parameter	Entry	Unit
Volume of wastewater discharged	70,000	m^3/y

（2）Monitored COD in treated wastewater discharged into sea/river/lake before the project starts starts（t/m^3）

Enter the monitoring data.

Parameter	Entry	Unit
Monitored content of COD	0.000500	t/m^3

1 t/m^3=1,000,000 mg/L

（3）CH_4 producing capacity of the wastewater（kg-CH_4/kg-COD）

Use 0.25 as IPCC default value.

Parameter	Entry	Unit
CH4 producing capacity of the wastewater	0.25	kg-CH_4/kg-COD

（4）CH_4 correction factor based on discharge pathway before the project starts（-）

Enter the IPCC guideline default value (Refer to Appendix).

Parameter	Entry	Unit
CH4 correction factor based on discharge pathway	0.1	-

$BE_{s,f,y}$: GHG emission from the final sludge decay before the project starts

(1) Amount of dry matter in the final sludge reclaimed before the project starts (t/y)

Enter the monitoring data.

Parameter	Entry	Unit
Amount of sludge	10,000	t/y

(2) Degradable organic content of the untreated sludge (dry basis) (-)

Data/ information specific to the target country should be preferably used for calculation. Data availability should be validated in the following order to enter data in the cells.

i) National default

ii) IPCC Guideline default data

Parameter	Entry	Unit
DOC in sludge	0.5	-

(3) CH_4 correction factor of the disposal site that receives the sludge before the project starts (-)

Enter the IPCC guideline default value (Refer to Appendix).

Parameter	Entry	Unit
CH4 correction factor of the disposal site	0.8	-

(4) Fraction of degradable organic carbon (DOC) dissimilated to biogas (-)

Use 0.5 as IPCC default value.

Parameter	Entry	Unit
Fraction of DOC dissimilated	0.5	-

(5) Fraction of CH_4 in biogas

Use 0.5 as IPCC default value.

Parameter	Entry	Unit
Fraction of CH_4 in biogas	0.5	-

BE_{EN}: CO_2 emissions from electric power or thermal energy displaced by the Biogas recovery

(1) Amount of electric power and thermal energy in biogas after the project starts (MWh/y)

Enter the planned data before the project starts or input the monitoring data after the project starts.

Parameter	Entry	Unit
Amount of electric power in biogas	1,000	MWh/y
Quantity of thermal energy in biogas	100	TJ/y

(2) Emission factor of the typical power plant (t-CO_2/MWh)

Data availability should be validated in the following order in selecting the typical power plant and obtaining CO_2 emissions factor specific to the target.

i) Interview to the electric power management entity concerned

ii) Published values in the target country

Parameter	Entry	Unit
Emission factor of the typical power plant	0.896	t-CO_2/MWh
Source: Interview to XX company of XX country		

(3) Net calorific value according to fuel type (t-CO_2/TJ)

Enter the planned data before the project starts or input the monitoring data after the project starts.

Parameter		Entry	Unit
CO_2 emission factor per unit of energy of the boiler fuel consumption in the absence of project	Fuel type: Petroleum	73.3	t-CO_2/TJ
Boiler efficiency		100	%
Rate of heat generation from boiler out of the heat generation using biomass		1	—
CO_2 emission factor per heat generated		73.3	t-CO_2/TJ

Source: 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 2 Energy table2.2

2． Information after the project starts

$PE_{EC,y}$ ：GHG emission from electric consumption after the project starts

$PE_{FC,y}$ ：GHG emission from fossil fuel consumption after the project starts

(1) The electricity and fuel consumption after the project starts in the biogas recovery facilities (MWh/y)

Enter the planned data before the project starts or input the monitoring data after the project starts.

Parameter		Entry	Unit
Amount of electricity consumption after the project		500	MWh/y
Amount of fuel consumption after the project starts	Petroleum	500	kL/y
	Coal	50	t/y
	Gas	100	m^3/y
	Others		

(2) Emission factor of the typical power plant （$t\text{-}CO_2$/MWh）

Data availability should be validated in the following order in selecting the typical power plant and obtaining CO_2 emissions factor specific to the target.

Parameter	Entry	Unit
Emission factor of the typical power plant	0.896	$t\text{-}CO_2$/MWh
Source: Interview to XX company of XX country		

(3) Net calorific value according to fuel type (TJ/Gg)

Data/ information specific to the target country should be preferably used for calculation. Data availability should be validated in the following order to enter data in the cells.

i) Project-specific values obtained through interview to electric power management entity concerned
ii) National default
iii) IPCC Guideline default data

Parameter	Net calorific value		CO_2 emission factor	
Petroleum	36.3	GJ/kL	73.3	$t\text{-}CO_2$/TJ
Coal	26.7	GJ/t	98.3	$t\text{-}CO_2$/TJ
Gas	0.0384	GJ/m3	56.1	$t\text{-}CO_2$/TJ
Others				$t\text{-}CO_2$/TJ

Source: Interview to XX
2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 2 Energy table1.2,table2.2

$PE_{ww,t,y}$ ： GHG emissions of the wastewater treatment system after the project starts

(1) Volume of wastewater treated in wastewater treatment system after the project starts （m^3）

Enter the planned data before the project starts or input the monitoring data after the project starts.

Parameter	Entry	Unit
Volume of wastewater treated	70,000	m^3/y

(2) Chemical oxygen demand removed by the wastewater treatment system after the project starts (t-COD/m^3)

Enter the planned data before the project starts or input the monitoring data after the project starts.
It shall be determined as the difference of the COD of wastewater before and after the processing.

Parameter	Entry	Unit
Chemical oxygen demand removed	0.000450	t-COD/m^3

1 t/m^3=1,000,000 mg/L

(3) CH_4 correction factor for the wastewater treatment system after the project starts (-)

Enter the IPCC guideline default value (Refer to Appendix).

Parameter	Entry	Unit
CH_4 correction factor for the wastewater treatment	0.8	-

(4) CH_4 producing capacity of the wastewater （kg-CH_4/kg-COD）

Use 0.25 as IPCC default value.

Parameter	Entry	Unit
CH_4 producing capacity of the wastewater	0.25	kg-CH_4/kg-COD

$PE_{s,t,y}$: GHG emissions from the sludge treatment systems（excluding composting）

（1）Amount of dry matter in the sludge treated by the sludge treatment system after the project starts（t）

Enter the planned data before the project starts or input the monitoring data after the project starts.

Parameter	Entry	Unit
Amount of dry matter in the treated sludge	70,000	m^3/y

（2）CH4 correction factor of the sludge treatment system after the project starts（-）

Enter the IPCC guideline default value (Refer to Appendix).

Parameter	Entry	Unit
CH_4 correction factor of the sludge treatment system	0.0	-

（3）Degradable organic content of the untreated sludge (dry basis)）(-)

Data/ information specific to the target country should be preferably used for calculation. Data availability should be validated in the following order to enter data in the cells.

i) National default

ii) IPCC Guideline default data

Parameter	Entry	Unit
DOC in sludge	0.5	-

（4）Fraction of degradable organic carbon (DOC) dissimilated to biogas (-)

Use 0.5 as IPCC default value.

Parameter	Entry	Unit
Fraction of DOC dissimilated to biogas	0.5	-

（5）Fraction of CH_4 in biogas (-)

Use 0.5 as IPCC default value.

Parameter	Entry	Unit
Fraction of CH_4 in biogas	0.5	-

$PE_{s,t,y}$: GHG emissions of the sludge treatment system after the project starts（composting）

（1）Amount of dry matter in the treated sludge by composting after the project starts（t/y）

Enter the planned data before the project starts or input the monitoring data after the project starts.

Parameter	Entry	Unit
Amount of dry matter in the treated sludge		t/y

（2）CH_4 emission factor by composting of sludge（t-CH_4/t-sludge）

Emission factor of the general power facilities shall be used as CO_2 emission factor of electric power which connects to the grid. Data availability is validated in the following order in regards of the selection of general facilities and its emission factor.

i)National default

ii)IPCC Guideline default data（0.01）

Use the planned data after the project starts.

Parameter	Entry	Unit
Emission factor by composting	0.01	t-CH_4/t-sludge

$PE_{ww,d,y}$: GHG emissions from degradable organic carbon in treated wastewater discharged into sea/river/lake after the project starts

（1）Volume of treated or untreated wastewater discharged（m^3）

Enter the planned data before the project starts or input the monitoring data after the project starts.

Parameter	Entry	Unit
Volume of wastewater discharged	70,000	m^3/y

（2）COD of the treated wastewater discharged into sea, river or lake after the project starts（t/m^3）

Enter the planned data before the project starts or input the monitoring data after the project starts.

Parameter	Entry	Unit	
Monitored content of COD	0.000050	t/m^3	1 t/m^3=1,000,000 mg/L

（3）CH_4 producing capacity of the wastewater（kg-CH_4/kg-COD）

Use 0.25 as IPCC default value.

Parameter	Entry	Unit
CH_4 producing capacity of the wastewater	0.25	kg-CH_4/kg-COD

（4）CH_4 correction factor based on discharge pathway after the project starts（-）

Enter the IPCC guideline default value (Refer to Appendix).

Parameter	Entry	Unit
CH_4 correction factor based on discharge pathway	0.1	-

$PE_{s,f,y}$: GHG emissions from anaerobic decay of the final sludge after the project starts

(1) Amount of dry matter in the final sludge reclaimed after the project starts (t/y)

Enter the planned data before the project starts or input the monitoring data after the project starts.

Parameter	Entry	Unit
Amount of dry matter in the final sludge	0	t/y

(2) Degradable organic content of the untreated sludge (dry basis)) (-)

Data/ information specific to the target country should be preferably used for calculation. Data availability should be validated in the following order to enter data in the cells.

i) National default
ii) IPCC Guideline default data

Parameter	Entry	Unit
DOC is sludge	0.5	-

(3) CH_4 correction factor of the disposal site that receives the final sludge after the project starts (-)

Enter the IPCC guideline default value (Refer to Appendix).

Parameter	Entry	Unit
CH_4 correction factor of the disposal site	0.8	-

(4) Fraction of degradable organic carbon (DOC) dissimilated to biogas (-)

Use 0.5 as IPCC default value.

Parameter	Entry	Unit
Fraction of DOC dissimilated	0.5	-

(5) Fraction of CH_4 in biogas

Use 0.5 as IPCC default value.

Parameter	Entry	Unit
Fraction of CH_4 in biogas	0.5	-

3. Other conditions

(1) Model correction factor to account for model uncertainties (before the project starts) (-)

Use 0.94 as default value.

Parameter	Entry	Unit
Model correction factor (default value)	0.94	-

(2) Model correction factor to account for model uncertainties (after the project starts) (-)

Use 1.06 as default value.

Parameter	Entry	Unit
Model correction factor (default value)	1.06	-

(yellow)	Entry
(orange)	Entry of source, etc.

Calculation Sheet

SAMPLE : Wastewater Treatment

GHG emission reduction after project activity ($t\text{-}CO_2/y$) ***ERy*** **=*BEy* − *PEy* ($t\text{-}CO_2/y$)**

1. Baseline emission BEy $= BE_{EC,y} + BE_{FC,y} + BE_{ww,t,y} + BE_{s,t,y} + BE_{ww,d,y} + BE_{s,f,y} + BE_{EN,y}$

BE_y	Baseline emission : GHG emission from methane released into the atmosphere before the project starts	70,237	$t\text{-}CO_2/y$
$BE_{EC,y}$	GHG emissions from electricity consumption on site before the project	448	$t\text{-}CO_2/y$
$BE_{FC,y}$	GHG emissions from fuel consumption on site before the project	1,462	$t\text{-}CO_2/y$
$BE_{ww,t,y}$	GHG emissions of the wastewater treatment system before the project	39,480	$t\text{-}CO_2/y$
$BE_{s,t,y}$	GHG emissions from the baseline sludge treatment	2,510	$t\text{-}CO_2/y$
$BE_{ww,d,y}$	GHG emissions on pathway of wastewater discharged into sea/river/lake before the project	17	$t\text{-}CO_2/y$
$BE_{s,f,y}$	GHG emissions from anaerobic decay of the final sludge before the project If the sludge is controlled combusted, disposed in a landfill with biogas recovery, or used for soil application before the project, this term shall be neglected.	26,320	$t\text{-}CO_2/y$
$BE_{EN,y}$	Baseline emissions from generation of energy displaced by the project activity	8,226	$t\text{-}CO_2/y$

2. Project emission $PE_y = PE_{EC,y} + PE_{FC,y} + PE_{ww,t,y} + PE_{s,t,y} + PE_{ww,d,y} + PE_{s,f,y}$

PE_y	Project emission: GHG emission with wastewater or sludge treatment systems is installed or revised after the project starts	2,052	$t\text{-}CO_2/y$
$PE_{EC,y}$	GHG emission from electric consumption after the project starts	448	$t\text{-}CO_2/y$
$PE_{FC,y}$	GHG emission from fossil fuel consumption after the project starts	1,462	$t\text{-}CO_2/y$
$PE_{ww,t,y}$	GHG emissions of the wastewater treatment system after the project If the CH_4 generated during the process is recovered and destroyed, this term shall be neglected.	140	$t\text{-}CO_2/y$
$PE_{s,t,y}$	GHG emissions from the sludge treatment systems If the CH_4 generated during the process is recovered and destroyed, this term shall be neglected.	0	$t\text{-}CO_2/y$
$PE_{ww,d,y}$	GHG emissions on pathway of wastewater discharged into sea/river/lake after the project	2	$t\text{-}CO_2/y$
$PE_{s,f,y}$	GHG emissions from anaerobic decay of the final sludge in wastewater treatment after the project . If the sludge is controlled combusted, disposed in a landfill with biogas recovery, or used for soil application after the project, this term shall be neglected.	0	$t\text{-}CO_2/y$

3. GHG emission reduction after project activity ERy **=*BEy* − *PEy* ($t\text{-}CO_2/y$)**

ER_y	GHG emissions reduction in year y achieved by the projec	68,185	$t\text{-}CO_2/y$
BE_y	Baseline emission : GHG emission from methane released into the atmosphere before the project starts	70,237	$t\text{-}CO_2/y$
PE_y	Project emission: GHG emission with composting the sewage sludge decay in year y	2,052	$t\text{-}CO_2/y$

Input Sheet

Project name	SAMPLE : Sewerage

Default value in red

1. Information before the project

$BE_{CH4,S,y}$: GHG emissions from anaerobic decay of the final sludge in wastewater treatment before the project

(1) Amount of dry matter in the final sludge generated by the baseline wastewater treatment system (-)

Use 0.5 as IPCC guidline default value (domestic wastewater sludge).

Parameter	Entry	Unit
Amount of DOC in sludge	0.5	-

(2) CH_4 correction factor of the disposal site that receives the sludge before the poject (-)

Enter the IPCC guidline default value (Refer to Appendix).

Parameter	Entry	Unit
CH_4 correction factor of the disposal site	1.0	-

(3) Fraction of degradable organic carbon (DOC) dissimilated to biogas (-)

Use 0.5 as IPCC guideline default data.

Parameter	Entry	Unit
Fraction of DOC dissimilated	0.5	-

(4) Fraction of CH_4 in biogas

Use 0.5 as IPCC guideline default data.

Parameter	Entry	Unit
Fraction of CH_4 in biogas	0.5	-

2. Information of electricity and thermal energy generation by using biogas

BE_{EN}: CO_2 emissions from electric power or thermal energy displaced by the Biogas recovery

(1) Amount of electricity and thermal energy produced using biogas (MWh/y)

Enter the planned data before the project starts or input the monitoring data after the project starts.

Parameter	Entry	Unit
Amount of electricity produced using	1,000	MWh/y
Amount of thermal energy produced using biogas	100	TJ/y

(2) Emission factor of the typical power plant (t-CO_2/MWh)

Data availability should be validated in the following order in selecting the typical power plant and obtaining CO_2 emissions factor specific to the target.

i) Interview to the electric power management entity concerned

ii) Published values in the target country

Parameter	Entry	Unit
Emission factor of the typical power plant	0.896	t-CO_2/MWh
Source:	Interview to XX company of XX country	

(3) CO2 emission factor of heat generated (t-CO2/TJ)

Parameter		Entry	Unit
CO_2 emission factor per unit of energy of the boiler fuel consumption in the absence of project	Fuel type: Petroleum	73.3	t-CO_2/TJ
Boiler efficiency		100	%
Rate of heat generation from boiler out of the heat generation using biogas in absence of project		1	–
CO_2 emission factor per heat generated		73.3	t-CO_2/TJ
Source:	2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 2 Energy table2.2		

2． Information after the project starts

$PE_{EC,y}$ ： GHG emission from electric consumption after the project starts

$PE_{FC,y}$ ： GHG emission from fossil fuel consumption after the project starts

（１） The electricity and fuel consumption after the project starts in the biogas recovery facilities（MWh/y）

Enter the planned data before the project starts or input the monitoring data after the project starts.

Parameter		Entry	Unit
Amount of electricity consumption after		500	MWh/y
Amount of fuel consumption after the project starts	Petroleum	500	kL/y
	Coal	50	t/y
	Gas	100	m^3/y
	Others		

(2)Emission factor of the typical power plant （t-CO_2/MWh）

Data availability should be validated in the following order in selecting the typical power plant and obtaining CO_2 emissions factor specific to the target.

i) Interview to the electric power management entity concerned

ii) Published values in the target country

Parameter	Entry	Unit
CO2 emission factor of electricity which connects to grid	0.896	t-CO_2/MWh
Source:	Interview to XX company of XX country	

(3)Net calorific value according to fuel type(TJ/Gg)

Data/ information specific to the target country should be preferably used for calculation. Data availability should be validated in the following order to enter data in the cells.

i) Project-specific values obtained through interview to electricity management entity concerned

ii) National default

iii) IPCC Guideline default data

Parameter		Net calorific value		CO_2 emission factor	
Petroleum		36.3	GJ/kL	73.3	t-CO_2/TJ
Coal		26.7	GJ/t	98.3	t-CO_2/TJ
Gas		0.0384	GJ/m3	56.1	t-CO_2/TJ
Others					t-CO_2/TJ

Source: Interview to XX
2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 2 Energy table1.2,table2.2

$PE_{C,y}$ ： GHG emission during the composting process after the project starts

(1)Amount of dry matter in the sludge composed (t/y)

Enter the planned data before the project starts or input the monitoring data after the project starts.

Parameter	Entry	Unit
Amount of dry matter composed	30,000	t/y

(2)Emission factor for CH_4 from the composting process(t-CH_4/t-sludge)

Data/ information specific to the target country should be preferably used for calculation. Data availability should be validated in the following order to enter data in the cells.

i)National default

ii)IPCC Guideline default data(0.01)

Enter the monitoring data after the project starts.

Parameter	Entry	Unit
Emission factor during composting process	0.01	t-CH_4/t-sludge

4. Other conditions

(1)Fraction of methane destroyed by national regulation before the project starts (t-CH_4/y)

It shall be "0" where developing countries have a very few regulation.

Parameter	Entry	Unit
Fraction of CH_4 destroyed	0.00	-

(2)Model correction factor to account for model uncertainties(before the project starts)(-)

Enter 0.94 as default value.

Parameter	Entry	Unit
Model correction factor (default value)	0.94	-

(yellow)	Entry
(orange)	Entry of source, etc.

Calculation Sheet

SAMPLE : Sewerage

GHG emission reduction after project activity（t-CO_2/y） ERy ＝BEy － PEy (t-CO_2/y)

1. Baseline emission BEy ＝ $BE_{CH4,S,y}$ × (1-AF) ＋ BE_{EN}

BE_y	Baseline emission: GHG emission from CH_4 released into the atmosphere before the project starts which the sludge is composted	106,926	t-CO_2/y
$BE_{CH4,S,y}$	GHG emissions from anaerobic decay of the final sludge in sludge treatment before the project	98,700	t-CO_2/y
AF	GHG emission reduction of methane destroyed by national regulation before the project starts This shall be “0” where developing countries have a very few regulation.	0	-
$BE_{EN,y}$	GHG emission from electricity and thermal energy genaration displaced by the project activity	8,226	t-CO_2/y

2. Project emission PE_y $= PE_{EC,y} + PE_{FC,y} + PE_{C,y}$

PE_y	Project emission: GHG emission from CH_4 released into the atmosphere after the project starts which the sludge is composted	8,210	t-CO_2/y
$PE_{EC,y}$	GHG emission from electric consumption after the project star	448	t-CO_2/y
$PE_{FC,y}$	GHG emission from fossil fuel consumption after the project starts	1,462	t-CO_2/y
$PE_{C,y}$	GHG emission during the composting process after the project starts	6,300	t-CO_2/y

3. GHG emission reduction after project activity ERy ＝BEy － PEy **(t-CO_2/y)**

ER_y	GHG emissions reduction in year y achieved by the proje	98,716	t-CO_2/y
BE_y	Baseline emission: GHG emission from CH_4 released into the atmosphere before the project starts which the sludge is composted	106,926	t-CO_2/y
PE_y	Project emission: GHG emission from CH4 released into the atmosphere after the project starts	8,210	t-CO_2/y