CLEAN DEVELOPMENT MECHANISM
SMALL-SCALE PROGRAM ACTIVITY DESIGN DOCUMENT FORM (CDM-SSC-CPA-DD)
Version 01

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NOTE:

(i) This form is for submission of CPAs that apply a small scale approved methodology using the provision of the proposed small scale CDM PoA.

(ii) The coordinating/managing entity shall prepare a CDM Small Scale Programme Activity Design Document (CDM-SSC-CPA-DD)[1,2] that is specified to the proposed PoA by using the provisions stated in the SSC PoA DD. At the time of requesting registration the SSC PoA DD must be accompanied by a CDM-SSC CPA-DD form that has been specified for the proposed SSC PoA, as well as by one completed CDM-SSC CPA-DD (using a real case). After the first CPA, every CPA that is added over time to the SSC PoA must submit a completed CDM-SSC CPA-DD.

[1] The latest version of the template form CDM-CPA-DD is available on the UNFCCC CDM web site in the reference/document section.

[2] At the time of requesting validation/registration, the coordinating managing entity is required to submit a completed CDM-POA-DD, the PoA specific CDM-CPA-DD, as well as one of such CDM-CPA-DD completed (using a real case).

SECTION A. General description of small scale CDM programme activity (CPA)

A.1. Title of the small-scale CPA:

Improving energy efficiency of public lighting systems in Ho Chi Minh City

A.2. Description of the small-scale CPA:

Ho Chi Minh City is the biggest commercial city in Vietnam and the main contributor to the country's economy. The GDP of Ho Chi Minh City accounted for 20.1% of country's GDP in 2006. The year-to-year growth rate of GDP in 2006 recorded 12.2%. According to a decision of Ho Chi Minh City People's Committee, Ho Chi Minh City will try to achieve an annual industrial growth rate of 13% from 2006 to 2010. Having this rapid economic growth, the electricity demand is growing faster than the forecasted supply. Vietnamese government is working on energy saving and improvement of energy efficiency in order to ensure a stable electricity supply. This proposed programme of activities will directly contribute to the government's efforts.

The public lighting systems of Ho Chi Minh City is divided into two parts: the major public lighting system (MPLS) and the civil public lighting system (CPLS). MPLSs are located on major streets and managed by a public lighting company, while CPLSs are not managed by government because of the small size and traffic level of alleys where CPLSs locate. Local residents install CPLSs according to their own needs. For this specific reason, the lamps used for CPLS have low efficiency and located inappropriately, i.e. distance between lamps, height, wiring connection are not appropriate to effectively provide sufficient brightness at alleys. Furthermore, lighting duration is controlled manually by local residents, and so lights are sometimes not turned off even in the day time. As a result, CPLSs are not energy efficient and consume 46% of the total energy consumption of public lighting system in Ho Chi Minh City. Although Vietnamese government introduced standard for public lighting to enhance efficient lighting system, CPLSs are not the target of this standard.

This project aims to improve the efficiency of CPLSs which will otherwise consume more and more electricity along with growth of economic activity. This project will improve the quality of public lighting to provide sufficient brightness at alleys as well as saving energy.

This project activity comprises of:

1. Designing of energy efficient lighting system
    - Design appropriate distribution of street lighting luminaries
    - Select appropriate equipment to maximize the lighting effect
2. Installing new lighting system
    - Remove low efficient and broken lamps
    - Install new high-efficient lamps, according to the distribution plan designed above
    - Replace old and dull reflectors with new reflectors
    - Install electronic ballast
    - Install automatic controllers

Contribution to Sustainable Development

The project activities will contribute to sustainable development of Vietnam in following areas:

Economic dimension –The electricity supply is not enough for the demand and development target of Vietnam. Especially in Southern region, the government is working on energy saving as well as expanding the capacity of electric supply in order to support the rapid economic development. The project activities will reduce energy consumption of CPLSs at alleys in Ho Chi Minh City.

Currently, Ho Chi Minh City allocates to districts the budget for the public lighting system. This project helps alleviate the expenditure of the districts and Ho Chi Minh City by reducing energy consumption. On the local level, the project activities enhance the economic activities at night by securing sufficient brightness and safety on the streets.

Environmental dimension – The project activities reduce electricity consumption by promoting energy efficient public lighting system, and thereby reduce the amount of greenhouse gases (GHGs) produced by fossil fuel combustion at a national electricity grid.

Social dimension –The project activities will improve the quality of CPLSs at alleys in Ho Chi Minh City. The sufficient brightness on the allyes at night will reduce the number of traffic accidents, secure the safety of passers-by, and reduce the number of crimes at night. Improvement of electric wire connection avoids short circuits and accidents of electric shock which occurred often in rainy season, thereby provides safety of local residents.

A.3. Entity/individual responsible for the small-scale CPA:

The coordinating entity for the CPA is Energy Conservation Center of Ho Chi Minh City (ECC).

A.4. Technical description of the small-scale CPA:

A.4.1. Identification of the small-scale CPA:

A.4.1.1. Host Party:

Vietnam

A.4.1.2. Geographic reference or other means of identification allowing the unique identification of the small-scale CPA (maximum one page):

The proposed CPA will be implemented at alleys in Ho Chi Minh City. The names and length of alleys are shown in table 4.1.2.

Table 4.1.2. Name and length of alleys

ID	Name of Alley	Length (m)

A.4.2. Duration of the small-scale CPA:

A.4.2.1. Starting date of the small-scale CPA:

January 2008

A.4.2.2. Expected operational lifetime of the small-scale CPA:

21years

A.4.3. Choice of the crediting period and related information:

Renewable crediting period

A.4.3.1. Starting date of the crediting period:

Date of registration.

A.4.3.2. Length of the crediting period, first crediting period if the choice is renewable CP:

The length of the first crediting period is 7 years.

A.4.4. Estimated amount of emission reductions over the chosen crediting period:

The estimated amount of emission reduction was calculated from the equations described in the PoA-DD. The below table shows the total emission reduction for this CPA.

Years	Annual estimation of emission reductions in tones of CO2 (tCO2e)
Year 1	
Year 2	
Year 3	
Year 4	
Year 5	
Year 6	

Year 7	
Total estimated reductions (tonnes of CO2e)	
Total number of crediting years	7 years
Annual average over the crediting period of estimated reductions (tonnes of CO2e)	

A.4.5. Public funding of the CPA:

119,200USD will be offered on loan from Ho Chi Minh City for the first CPA. The funding for the subsequent CPAs has not decided yet.

A.4.6. Information to confirm that the proposed small-scale CPA is not a de-bundled component

This proposed SSC-CPA is not a de-bundled component of a CDM project because no other CDM project activity has been undertaken by the same activity implementer as the proposed small scale CPA. Also, no other CDM project has a coordinating or managing entity which also manages a large sale PoA of the same sectoral scope.

A.4.7. Confirmation that small-scale CPA is neither registered as an individual CDM project activity or is part of another Registered PoA:

This SSC-PA is neither registered as an individual CDM project activity nor part of another registered PoA.

SECTION B. Eligibility of small-scale CPA and Estimation of emissions reductions

B.1. Title and reference of the Registered PoA to which small-scale CPA is added:

Improving energy efficiency of public lighting systems in Ho Chi Minh City

B.2. Justification of the why the small-scale CPA is eligible to be included in the Registered PoA :

- The lighting systems included in this proposed SSC-CPA are CPLSs. There is no regulation which requires a standard of energy saving for CPLSs.
- The proposed SSC-CPA will apply the same technology and baseline and monitoring methodology, AMS-II.C. and AMS-I.D. described in the PoA-DD.
- The proposed CPA will apply the same baseline scenario described in the PoA-DD, so the energy baseline will differ only according to number of alleys and feature of individual alleys included in a CPA.

- The proposed CPA has access to financial resource leveraged by CERs of other CPAs under registered PoA.

B.3. Assessment and demonstration of additionality of the small-scale CPA, as per eligibility criteria listed in the Registered PoA:

There are currently no regulations to control CPLSs which are installed by local people at small alleys. Although Ho Chi Minh City recognizes the need of their energy saving to ensure the future electricity supply, it is difficult to implement project activities without implementing as a CPA and being included in a registered PoA due to the following barriers.

Investment barrier

There are investment barriers to improve CPLSs in Vietnam. Because electricity rate is inexpensive in Vietnam (approximately 0.061 USD per 1 kWh), there are not enough incentives for Ho Chi Minh City to plan and implement energy savings measures and reduce their CPLS-related expenditure. In addition to the initial investment, operating and maintenance costs for a CPA further make the project activities less attractive to Ho Chi Minh City without CDM.
For this project, ECC will loan from Ho Chi Minh City to finance the initial cost for implementing the first CPA. Electricity cost saving resulted from the CPA will be considered as part pf the repayment scheme of this debt. The revenues from the sale of CERs will be used to subsidize the cost for equipment maintenance. Therefore, without CDM, it will be difficult to implement the project activity for Ho Chi Minh City.

Barriers due to common practice

There are no national or local regulations for CPLS. Although Vietnamese government set the standard to improve public lighting efficiency, CPLSs are not included in the target and will not be considered in a near future, either. CPLSs are the lighting systems which local residents purchase lamps and install them as they like without any authorization. Because local residents connect lamps to transmission lines outside of their properties, the local government pays for the electricity consumed by CPLSs.

Due to the absence of civil planning or consideration of energy efficiency, local residents purchase low price, thus low efficient lamps, such as incandescent lamps, and install too many lamps in one place for some area. These activities cause very high energy consumption. The local electric company sometimes cuts off cables of lamps installed by local residents to reduce energy consumption. Because of this current practice that local residents install low efficiency lamps but do not pay electricity expense, they do not care about the energy efficiency of CPLSs.

Faced with this investment barrier and common practice, the project will not be carried out in the course of regular business, and is therefore considered additional.

B.4. Description of the sources and gases included in the project boundary and proof that the small-scale CPA is located within the geographical boundary of the registered PoA.

The gas reduced through this SSC-CPA is CO_2. The project activities reduce electricity consumption by promoting energy efficient public lighting system, and thereby reduce the amount of CO_2 produced by fossil fuel combustion at the electricity grid.

B.5. Emission reductions:

B.5.1. Data and parameters that are available at validation:

Data / Parameter:	**EF_{grid}**
Data unit:	tCO_2/kWh
Description:	Emission factor of the connected grid
Source of data used:	Calculated based on the most recent data.
Value applied:	
Justification of the choice of data or description of measurement methods and procedures actually applied :	The grid emission factor is calculated using the "Tool to calculate the emission factor for an electricity system," according to AMS.I.D. (version 13). A combined margin is selected, and the simple OM method is applied. For OM, ex-ante option of Step 2 and Option (A) of Step 3 of the Tool are selected for the calculation. For BM, Option 1 of Step 4 is selected. See Annex 3 for details.
Any comment:	

Data / Parameter:	**n_i**
Data unit:	Units
Description:	The number of lamps replaced.
Source of data used:	ECC
Value applied:	
Justification of the choice of data or description of measurement methods and procedures actually applied :	ECC will count the number of old lamps replaced.
Any comment:	

Data / Parameter:	**p_i**
Data unit:	kW
Description:	Power capacity of old lamps replaced.
Source of data used:	ECC
Value applied:	
Justification of the choice of data or description of measurement methods	ECC checks the power capacity of old lamps replaced.

and procedures actually applied :	
Any comment:	

Data / Parameter:	**o_i**
Data unit:	hours
Description:	The average annual operating hours of lamps.
Source of data used:	ECC
Value applied:	4380
Justification of the choice of data or description of measurement methods and procedures actually applied :	Operation hours per day are estimated as 12 hours.
Any comment:	

B.5.2. Ex-ante calculation of emission reductions:

Given a rapid economic growth in Ho Chi Minh City with its 12% GDP increase in 2006 from the previous year, it is assumed that the demand of lighting at alleys will increase to enhance their economic activities at night. Hence, it is also assumed that local residents install more and more lamps at alleys around their houses. Because local residents do not pay electricity bills and neglect energy efficiency, they are currently buying cheap lamps, such as 40W tube fluorescent lamps, and expected to do so in the future. In fact, 40W tube fluorescent lamps are the most commonly used street lamps in the city. Therefore, the baseline scenario is the installation of 40W fluorescent lamps in absence of the SSC-CPA. The distribution of luminaries with 40W tube fluorescent lamps for the baseline scenario was estimated using Ullysse software, which calculates luminance distribution with the information of alley feature and type and distribution of luminaries. The distribution is based on the minimum requirements by the public lighting standard of TCSDVN 259:2001 “Human lighting for roadway and square design standard”. In the case the current electricity consumption is higher than the scenario with 40W fluorescent lamps, the current electricity consumption is applied as baseline scenario for these alleys instead of 40W fluorescent lamp scenario because it is difficult to assume that local residents remove lamps which have already installed or change them to high efficiency ones.

The energy baseline and baseline emissions are calculated as follows in accordance with AMS-II.C. (version 09).

The energy baseline

$$E_B = \sum_i (n_i \cdot p_i \cdot o_i)$$

Where:

E_B Annual energy baseline in kWh per year (kWh)
$\sum_i$ The sum over the group of "i" devices replaced
n_i The number of devices of the group of "i" devices replaced for which the replacement is operating during the year.
p_i The power of devices of the group of "i" devices replaced.
o_i The average annual operating hours of devices of "i" devices replaced (hours) = 4380 hours

Baseline emissions

$$BE_y = E_B * EF_{grid} * 1/1000$$

Where:

BE_y Annual baseline emissions in year y (tCO_2)
E_B Annual electricity consumption in baseline scenario (kWh)
EF_{grid} Emission factor of the connected grid (kg CO_2/kWh)

Emission factor of the connected grid is calculated using AMS I.D. (version 13).The baseline emission factor is calculated as the combined margin, consisting of combination of operating margin and build margin factors calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" as follows.

Step 1. Identify the relevant electric power system

The electricity displaced by the project activity will be delivered from the Vietnamese national grid, the only grid exist in the country.

Step 2. Select an operating margin (OM) method

As no dispatch data is available and must-run/low cost resources constitute less than 50% of total grid generation over the past 5 years, the simple OM method is used (See table 1 in Annex 3). For the simple OM, ex-ante option is selected.

Step 3. Calculate the operating margin emission factor according to the selected method

The simple OM emission factor is calculated based on fuel consumption and net electricity generation of each power plant/unit (Option A). Following formula is used to calculate Simple OM.

$$EF_{grid,OMsimple,y} = \frac{\sum_{i,m} FC_{i,m,y} \cdot NCV_{i,y} \cdot EF_{CO2,i,y}}{\sum_m EG_{m,y}}$$

Where:

$EF_{grid,OMsimple,y}$	=	Simple operating margin CO_2 emission factor in year y (tCO_2/MWh)
$FC_{i,m,y}$	=	Amount of fuel type *i* consumed by power plant/unit *m* in year *y* (mass or volume unit)
$NCV_{i,y}$	=	Net calorific value (energy content) of fossil fuel type *i* in year *y* (GJ/mass or volume unit)
$EF_{CO2,i,y}$	=	CO_2 emission factor of fossil fuel type *i* in year *y* (tCO_2/GJ)
$EG_{m,y}$	=	Net electricity generated and delivered to the grid by power plant/unit *m* in year *y* (MWh)
m	=	All power plants/units serving the grid in year *y* except low-cost/must-run power plants/units
i	=	All fossil fuel types combusted in power plant/unit *m* in year *y*
y	=	The three most recent years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex-ante option)

The operating margin emission factor calculations are performed ex-ante using available official data on fuel consumption and electricity generation for each plats connected to the Vietnamese national grid in 2004-2006. All the data is summarized in table 2 in Annex3.

The "Operating Margin" emission factor will be:

$$EF_{OM} = \frac{\sum_{i,m} FC_{i,m,y} \cdot NCV_{i,y} \cdot EF_{CO2,i,y}}{\sum_{m} EG_{m,y}}$$

$$= \frac{1}{3}\left(\frac{20{,}218}{28{,}749} + \frac{25{,}763}{36{,}714} + \frac{28{,}070}{40{,}685}\right)$$

$$= 0.6983 ktCO_2 / GWh$$

$$= 0.6983 tCO_2 / MWh$$

Step 4. Identify the cohort of power units to be included in the build margin

For the project activity, the sample group of power units *m* used to calculate the build margin consists of the set of power capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently. In terms of vintage of data, Option 1 (ex-ante) was selected for the project activity.

Step 5. Calculate the Build margin emission factor

The build margin is calculated as the generation-weighted average emission factor (tCO_2/MWh) of sample of power plants as follows:

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

Where:

$EF_{grid,BM,y}$	=	Build margin CO_2 emission factor in year y (tCO_2/MWh)
$EG_{m,y}$	=	Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
$EF_{EL,m,y}$	=	CO_2 emission factor of power unit m in year y (tCO_2/MWh)
m	=	Power units included in the build margin
y	=	Most recent historical year for which power generation data is available

For the proposed project, Option 1 shall be chosen: Calculate the Build Margin emission factor $EF_{grid,BM,y}$ *ex-ante* based on the most recent information available on plants already built for sample group m at the time of PDD submission. The sample group of power unit m used to calculate the build margin consists of the set of power capacity additions in the electricity system that comprise 20% of the system generation (in GWh) and that have been built most recently. Data for the build margin calculation is shown in the table 3 in Annex 3.

The build margin emission factor will be:

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

$$= \frac{8{,}476}{12{,}431}$$

$$= 0.68187 ktCO_2 / GWh$$

$$= 0.68187 tCO_2 / MWh$$

Step 6. Calculate the combined margin baseline emission factor
The combined margin emission factor is calculated as follows:

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

Where:

$EF_{grid,BM,y}$	=	Emission factor of the build margin
$EF_{grid,OM,y}$	=	Emission factor of the operating margin
w_{OM}	=	Weighting of the operating margin emission factor (%)
w_{BM}	=	Weighting of the build margin emission factor (%)

Where the weights w_{OM} and w_{BM}, by default, are 50%

So the baseline emission factor will be:

$$EF_y = w_{OM} \cdot EF_{OM,y} + w_{BM} \cdot EF_{BM,y}$$
$$= (0.5) \cdot (0.6983 tCO_2 / MWh) + (0.5) \cdot (0.68187 tCO_2 / MWh)$$
$$= 0.69009 tCO_2 / MWh$$

Project emissions

$$PE_y = E_P * EF_{grid} * 1/1000$$

Where:

PE_y	=	Annual project emissions in year y (tCO_2)
E_P	=	Annual electricity consumption in project scenario (kWh)
EF_{grid}	=	Emission factor of the connected grid (kg CO_2/kWh)＝0.69009kg CO_2/kWh

Leakage

Replaced lamps will be scrapped. Therefore, there is no leakage from this project activity.

Emission reduction

Emission reduction of a SSC-CPA is calculated by the following equation:

$$ER_y = BE_y - PE_y$$

Where:

ER_y	Annual emission reductions in year y (tCO_2)
BE_y	Annual baseline emissions in year y (tCO_2)
PE_y	Annual project emissions in year y (tCO_2)

B.5.3. Summary of the ex-ante estimation of emission reductions:

Year	Estimation of project activity emissions (tonnes of CO_2 e)	Estimation of baseline emissions (tonnes of CO_2 e)	Estimation of leakage (tonnes of CO_2 e)	Estimation of overall emission reductions (tonnes of CO_2 e)
Year 1			0	
Year 2			0	
Year 3			0	
Year 4			0	
Year 5			0	
Year 6			0	
Year 7			0	
Total (tonnes of CO_2 e)			0	

B.6. Application of the monitoring methodology and description of the monitoring plan:

B.6.1. Description of the monitoring plan:

The monitoring methodology for the category AMS-II.C. "Demand-side energy efficiency activities for specific technologies" (version 09) is applied for this SSC-CPA. The methodology consists of followings:

1. Meter electric use of alleys where projects are implemented
2. Monitor the number and power of replaced lamps
3. Annual check to ensure that systems are still operating

ECC will keep record of all data required for monitoring. Figure 7 shows the monitoring structure for a SSC-CPA and each procedure is explained as below.

1. Meter electric use of streets where projects are implemented

EVN Ho Chi Minh will check the meter of electricity consumption for each alley every month and send bills to ECC. ECC will record the monthly electricity consumption for each alley in its database and also keep all bills from EVN Ho Chi Minh as evidences.

2. Monitor the number and power of replaced lamps

ECC will collect old equipments and check the number, type and power capacity of old lamps which are collected from each alley and send them to a local scrapping company. The local scrapping company will scrap all lamps and send bills to ECC. ECC will record the number of scrapped lamps to make sure that all old lamps collected from alleys are scrapped. ECC will record both the number of scrapped lamps and old lamps collected from each alley.

3. Annual check to ensure that systems are still operating

ECC will visit all alleys and check to ensure that systems are operating every year.

In addition to above, the baseline grid emission factor will be calculated *ex-ante* using historical data. After CDM registration, it will be necessary to monitor electricity replaced from the EVN grid.

C.1. Please indicate the level at which environmental analysis as per requirements of the CDM modalities and procedures is undertaken. Justify the choice of level at which the environmental analysis is undertaken:

✔ Please tick if this information is provided at the PoA level. In this case sections C.2. and C.3. need not be completed in this form.

C.2. Documentation on the analysis of the environmental impacts, including transboundary impacts:

C.3. Please state whether an environmental impact assessment is required for a typical CPA included in the programme of activities (PoA), in accordance with the host Party laws/regulations:

SECTION D. Stakeholders' comments

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D.1. Please indicate the level at which local stakeholder comments are invited. Justify the choice:

☐ Please tick if this information is provided at the PoA level. In this case sections D.2. to D.4. need not be completed in this form.

Stakeholders' comments are provided at CPA level.

D.2. Brief description how comments by local stakeholders have been invited and compiled:

D.3. Summary of the comments received:

>>

D.4. Report on how due account was taken of any comments received:

The regular meeting will be held at each district to follow local residents' comments and concerns. For the concerns regarding operation and maintenance, ECC will have training to local residents.

Annex 1

CONTACT INFORMATION ON ENTITY/INDIVIDUAL RESPONSIBLE FOR THE SMALL-SCALE CPA

Organization:	The Energy Conservation Center, Ho Chi Minh City (ECC)
Street/P.O.Box:	244 Dien Bien Phu St., District 3
Building:	
City:	Ho Chi Minh city
State/Region:	
Postfix/ZIP:	
Country:	Vietnam
Telephone:	84 8 9332 2372
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Represented by:	
Title:	Vice Director
Salutation:	Ms.
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

Annex 3

BASELINE INFORMATION

Following tables provide information required to calculate emission factor.

Table 1: Rate of low cost/must-run sources based on generation[3]

Year	2002	2003	2004	2005	2006	Average
Hydro power generation (GWh)	18,205	19,034	17,759	16,221	19,209	18,086
Total (GWh)	36,415	41,304	46,508	52,935	59,894	47,411
Rate of low cost/must-run sources generation (%)	49.99	46.08	38.18	30.64	32.07	38.15

Table 2: Electricity outputs and fuel consumptions of thermal power sources in 2004– 2006[4]

Fuel Type		2004	2005	2006
Coal	GWh	7,075	8,518	9,601
NCV=7000 kcal/kg	kt	2,921	3,480	3,921
CO2EF=94.6kgCO2/GJ-IPCC-2006	kt CO_2	8,087	9,632	10,852
Gas Turbine (Gas)	GWh	14,155	18,380	20,424
CO2EF=56.1kgCO2/GJ-IPCC-2006	GJ	173,468,228	224,679,439	251,139,260
	kt CO_2	9,732	12,605	14,089
Gas Turbine (Diesel Oil)	GWh	250	446	221
NCV=10,200 kcal/kg-Vietnam	kt	72	125	66
CO2EF=74.1kgCO2/GJ-IPCC-2006	kt CO_2e	226	395	208
Diesel Oil	GWh	43	16	25
NCV=10,200 kcal/kg-Vietnam	kt	11	4	7
CO2EF=74.1kgCO2/GJ-IPCC-2006	kt CO_2e	36	13	21
Fuel Oil	GWh	2,348	3431	3181
NCV=9,900 kcal/kg-Vietnam	kt	667	974	905
CO2EF=77.4kgCO2/GJ-IPCC-2006	kt CO_2e	2,138	3119	2900
Add on Power	GWh	4,839	5540	6267

[3] Sources: Recapitulative Report on the operation of Vietnam Netional Electricity System in Year 2006, EVN/National Electricity system Dispatching Center - Department for Electricity System Operation, Hanoi, January 2007

[4] Sources: Recapitulative Report on the operation of Vietnam Netional Electricity System in Year 2006, EVN/National Electricity system Dispatching Center - Department for Electricity System Operation, Hanoi, January 2007

Imported electricity	GWh	39	383	966
Total CO2 emission from Vietnam grid	kt CO_2e	20,218	25,763	28,070
Total thermal electricity output generated	GWh	28,749	36,714	40,685

Table 3: The power plant capacity additions in the electricity system that comprise 20% of the system generation (in GWh) and that have been built most recently[5]

No	Plant name	Commissioning year	Capacity (MW)	Outputs (GWh)	Energy type	Emission (kt CO2)
1	Se San 3	2006	260	614	Hydro	0
2	Cao Ngan	2006	115	62	Coal	70
3	Na Duong	2005	110	709	Coal	801
4	Srokphumieng	2006	51	10	Hydro	0
5	Dam Phu My	2005	18	45	Gas	31
6	Phu My 2-2	2004	733	4,855	Gas	3,349
7	Phu My 3	2004	733	4,110	Gas	2,835
8	Phu My 4	2004	468	2,026	Gas	1,390
	Total		2,488	12,431		**8,476**

[5] Sources: Recapitulative Report on the operation of Vietnam Netional Electricity System in Year 2006,

EVN/National Electricity system Dispatching Center - Department for Electricity System Operation, Hanoi, January 2007

Annex 4

MONITORING INFORMATION

The monitoring structure on this SSC-CPA is shown below.