Monitoring Report

Voluntary Carbon Standard 2007

Siam Cement Biomass Project

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1. Project Background

This grouped project is a combination of five project locations, which are part of a single GHG reduction project. The project activity involves partial replacement of fossil fuels by alternative fuels or less carbon intensive fuels such as biomass residue in cement manufacture. The project belongs to Scope 4, as per the guidelines by UNFCCC for CDM projects.

Each project site is illustrated as follows:

The Siam Cement (Ta Luang) Co., Ltd (Ta Luang).
The Siam Cement (Ta Luang) Co., Ltd (Khan Wong).
The Siam Cement (Kaeng Khoi) Co., Ltd.
The Siam Cement (Thung Song) Co., Ltd.
The Siam Cement (Lampang) Co., Ltd.

They are the cement manufactures holding by SCG Cement Co., Ltd. The address for each site and installation capacity is shown in the table below:

Name of Participants	Name of the cement plant	Production capacity (tonnes/day)	Site location
The Siam Cement (Kaeng Khoi) CO., Ltd.	The Siam Cement (Kaeng Khoi)	19,000	Kaeng Khoi Saraburi
The Siam Cement (Ta Luang) Co., Ltd.	The Siam Cement (Ta Luang)	8,000	Ta Luang Saraburi
The Siam Cement (Ta Luang) Co., Ltd	The Siam Cement (Khao Wong)	10,000	Khaowong Saraburi
The Siam Cement (Lampang) Co., Ltd	The Siam Cement (Lampang)	5,500	Chaehome Lampang
The Siam Cement (Thung Song) Co., Ltd	The Siam Cement (Thung Song)	16,000	Thung Song Nakon Si Thammarat

All cement plants have invested into infrastructure including storage and handling system for alternative fuels and biomass residue.

By means of this Monitoring Report GHG reduction achieved by the project activities this proposed grouped project are being verified and certifies as per requirements of the Voluntary Carbon Standard (VCS) under monitoring methodology approved by UNFCCC; for this grouped project the ACM0003 version 07.2 is used.

Further background information on all project activities in the group can be found in the VCS Project Description (PD) and associated documents. The PD and associated documents are available upon request.

2. Monitoring Background

Sections 3 and 4 of the PD (Monitoring GHG Emission Reductions) provides all details in regard to calculation of emission reductions and the monitoring plan to be followed by the project activities. Both the emission reduction calculations and the monitoring plan are based on the approved methodology by UNFCCC, ACM0003 version 07.2.

The monitoring plan has been developed and implement before initial verification according to Section 3 in PD:

- Establish a data measurement and recording protocol for all relevant data needed, based on the monitoring plan outlined, and taking into account the QA/QC issues highlighted in Section 3.3 in PDD;
- Development of procedures for archiving data both electronic and paper;
- Coordination of basic training procedures for operational staffs so that they are able to fulfil the requirements the proposed monitoring plan, taking into account the QA/QC issues highlighted in Section 3.3 in PDD;
- Procedure for project performance review before submitted for verification;
- Procedure for corrective actions to improve future monitoring and reporting.

3. Monitoring Data used

In each project sites, the following parameters were monitored:

Data	Unit	Description	Source of data	Measurement methods
$FC_{PJ,k,y}$	Tonne	Quantity of alternative fuel or less carbon intensive fuel used in projects.	On-site measurement.	Using weight scale to measure continuously recorded and reported monthly and annually with adjusted according to stock change.
$FC_{PJ,i,y}$	Tonne	Quantity of fossil fuel used in the projects.	On-site measurement	Using weight scale to measure continuously recorded and reported monthly and annually with adjusted according to stock change.
$EF_{CO2,k,y}$	tCO_2/GJ	Weighted average CO_2 emission factor for alternative or less carbon intensive fuels.	IPCC default values.	-
$EF_{CO2,FF,I,y}$	tCO_2/GJ	Weight average CO_2 emission factor for fossil fuel.	IPCC default values.	-
$NCV_{k,y}$	GJ/tonne	Weighted average net calorific value of the alternative or less carbon intensive fuel.	On-site measurement.	The measurement will be undertaken in line with international fuel standards such as ASTM.
$NCV_{i,y}$	GJ/tonne	Weighted average net calorific value of the alternative or less carbon intensive fuel.	On-site measurement.	The measurement will be undertaken in line with international fuel standards such as ASTM.
AVD_y	Km	Average round trip distance between the	Conservativeness by using 400km	Any future revision of the methodology will be taken

		alternative fuel supply sites.	for round trip as suggested in methodology.	into account.
$EF_{km,CO2,y}$	tCO_2/km	Average CO_2 emission factor for the truck.	IPCC 1996 table 1-32	Any future revision of the US-EPA Guide will be taken into account.
$AF_{T,k,y}$	Tonne	Quantity of alternative fuels that has been transported to the project site.	On-site measurement	Using weight scale to measure continuously recorded and reported monthly and annually with adjusted according to stock change.
TL_y	Tonne	Average truck load of the trucks used.	Thai transportation regulation	Any future revision of the regulation will be taken into account.
$P_{clinker,y}$	Tonne	Production of clinker.	On-site measurement	Weighing feeders recorded continuously and reported monthly and annually.
$EF_{CO2,BL,y}$	tCO_2/GJ	Carbon dioxide emission factor for the fossil fuels displaced by use of alternative fuels or less carbon intensive fossil fuels in the project plant.	Weighted average annual CO_2 emission factor for the fossil fuel consumed and monitored ex-ante.	Aggregated at least annually depending on crediting period.
$EF_{CO2,LE}$	tCO_2/GJ	Carbon dioxide emission factor of the most carbon intensive fuels use in country.	IPCC default values are used.	Any future revision of the IPCC report will be taken into account.
$FC_{BL,i,y}$	Tonne	Quantity of fossil fuel displaced in the project activity.	On-site measurement	Using weight scale to measure continuously recorded and reported monthly and annually with adjusted according to stock change.
-	-	Availability of a surplus of biomass residue.	Fuel purchasing department	Survey.

Parameter	Quality Control and Quality Assurance procedures for monitoring
$FC_{PJ,k,y}$	Instrument should be calibrated according to manufacturer's guidelines. All data is available and record according to ISO9001 management system.
$FC_{PJ,i,y}$	Instrument should be calibrated according to manufacturer's guidelines. All data is available and record according to ISO9001 management system.
$EF_{CO2,k,y}$	Any future revision of the IPCC Guideline will be taken into account.
$EF_{CO2,FF,I,y}$	Any future revision of the IPCC Guideline will be taken into account.
$NCV_{k,y}$	Measurements will be undertaken in line with international fuel standards. Also all data is available and recorded according to ISO9001 management system.
$NCV_{i,y}$	Measurements will be undertaken in line with international fuel standards. Also all data is available and recorded according to ISO9001 management system.
AVD_y	Any future revision of the CDM methodology.
$EF_{km,CO2,y}$	Any future revision of the IPCC Guideline will be taken into account.
$AF_{T,k,y}$	Instrument should be calibrated and all data is available and record according to ISO9001 management system.

TL_y	Any future revision of the regulation will be taken into account.
$P_{clinker,y}$	Instrument should be calibrated and all data is available and record according to ISO9001 management system.

4. Monitoring Result

4.1 Monitoring period

This is the first monitoring report of this grouped project. It covers the period 01/09/2006 to 31/12/2006, although the project has been operated since 2003.

4.2 Presentation of monitoring results

All monitoring data is available in the Excel spreadsheet "***180_SCG _Biomass_VERcalculation_final.xls***". The spreadsheet includes:

- Summary of the monitoring data,
- VER calculations for the monitoring period.

4.3 Calculation Methodology

Emission reduction were calculated on the basis of following formula:

Emission Reduction = Baseline Emission – Project Emission

Baseline emission

The project reduces CO2 emissions by using alternative fuels and/or less carbon intensive fossil fuels in the pre-calciner and the kiln for the production of clinker in cement manufacture. CH_4 emissions from preventing disposal or uncontrolled burning of biomass residues are included in this emission.

$$BE_y = BE_{FF,y} + BE_{CH_4,biomass,y}$$

Where:

BE_y	=	Baseline emissions in year *y* (tCO_2)
$BE_{FF,y}$	=	Baseline emission from fossil fuels displaced by alternative fuels or less carbon intensive fossil fuels in year *y* (tCO_2)
$BE_{CH4,biomass,y}$	=	Baseline methane emissions avoided during the year *y* from preventing disposal or uncontrolled burning of biomass residues (tCO_2e)

Baseline emissions are determined in the following step:

Step 1: Estimate the project specific "fuel penalty"
Step 2: Calculate baseline emissions from the fossil fuels displaced by the alternative or less carbon intensive fossil fuel(s)
Step 3: Calculate baseline emission from decay, dumping or burning of biomass residues.

Step 1.Estimate the project specific "fuel penalty"

This project specific fuel penalty (FPy) should be determined as follows:

$$FP_y = P_{clinker,y} \times \left(SEC_{clinker,PJ,y} - SEC_{clinker,BL}\right)$$

Where:

FP_y	=	Fuel penalty in year *y* (GJ)
$P_{clinker,y}$	=	Production of clinker in year *y* (tons)
$SEC_{clinker,PJ,y}$	=	Specific energy consumption of the project plant in year *y* (GJ/t clinker)
$SEC_{clinker,BL}$	=	Specific energy consumption of the project plant in the absence of the project activity (GJ/t clinker)

The specific energy consumption in the project is calculated based on the quantity of all fuels used in the project plant and the quantity of clinker produced in year, as follows:

$$SEC_{clinker,PJ,y} = \frac{\sum_i (FC_{PJ,y} \times NCV_{i,y}) + \sum_k (FC_{PJ,k,y} \times NCV_{k,y})}{P_{clinker,y}}$$

Where:

$SEC_{clinker,PJ,y}$	=	Specific energy consumption of the project plant in year *y* (GJ/t clinker)
$FC_{PJ,i,y}$	=	Quantity of fossil fuel type *i* fired in the project plant in year *y* (tons)
$NCV_{i,y}$	=	Net calorific value of the fossil fuel type *i* in year y (GJ/ton)
$FC_{PJ,k,y}$	=	Quantity of alternative fuel or less carbon intensive fossil fuel type *k* used in the project plant in year *y* (tons)
$NCV_{k,y}$	=	Net calorific value of the alternative or less carbon intensive fuel type *k* in year y (GJ/tonne)
$P_{clinker,y}$	=	Production of clinker in year *y* (tons)
k	=	Alternative fuel types and less carbon intensive fossil fuel types used in the project plant in year *y*
I	=	Fossil fuel types used in the project plant in year *y* that are not less carbon intensive fossil fuel types

$$SEC_{clinker,BL} = MIN\left[\frac{HG_x}{P_{clinker,x}}; \frac{HG_{x-1}}{P_{clinker,x-1}}; \frac{HG_{x-2}}{P_{clinker,x-2}}\right]$$

With

Where:

$SEC_{clinker,BL}$	=	Specific energy consumption of the project plant in the absence of the project activity (GJ/t clinker)
HG_x	=	Heat generated from fuel combustion in the project plant in the historical year *x* (GJ)
$FC_{i,x}$	=	Quantity of fossil fuel type *i* used in the project plant in year *x* (tons)
NCV_i	=	Net calorific value of the fossil fuel type *i* (GJ/ton)
$P_{clinker,x}$	=	Production of clinker in year *x* (tons)
x	=	Year prior to the start of the project activity
I	=	Fossil fuel types used in the project plant in the last three years prior to the start of the project activity

$$HG_x = \sum_i FC_{i,x} \times NCV_i$$

Step 2. Calculate baseline emission from the fossil displaced by the alternative or less carbon intensive fuel(s)

Baseline emissions from displacement of fossils fuels are calculated as follows:

$$BF_{FF,y} = \left[\sum_k (FC_{PJ,k,y} \times NCV_{k,y}) - FP_y \right] \times EF_{CO2,BL,y}$$

Where:

$BE_{FF,y}$	=	Baseline emission from fossil fuels displaced by alternative fuels or less carbon intensive fossil fuels in year *y* (tCO_2)
$FC_{PJ,k,y}$	=	Quantity of alternative fuel or less carbon intensive fossil fuel type *k* used in the project plant in year *y* (tons)
$NCV_{k,y}$	=	Net calorific value of the alternative or less carbon intensive fuel type *k* in year y (GJ/tonne)
FP_y	=	Fuel penalty in year *y* (GJ)
$EF_{CO2,BL,y}$	=	Carbon dioxide emissions factor for the fossil fuels displaced by the use of alternative fuels or less carbon intensive fossil fuels in the project plant in year *y* (tCO_2/GJ)
k	=	Alternative fuel types and less carbon intensive fossil fuel types used in the project plant in year *y*

Since F3 has been determined as the most likely baseline scenario, the weighted average annual CO2 emission factor for the fossil fuel(s) that would have been consumed according to fuel mix determined in "Procedure for the selection of the most plausible baseline scenario" as follows:

$$EF_{BL,CO2,y} = \frac{\sum_i FC_{BL,F3,i,y} \times NCV_{i,y} \times EF_{CO2,i,y}}{\sum_i FC_{BL,F3,i,y} \times NCV_i}$$

Where:

$EF_{CO2,BL,y}$	=	Carbon dioxide emissions factor for the fossil fuels displaced by the use of alternative fuels or less carbon intensive fossil fuels in the project plant in year *y* (tCO_2/GJ)
$FC_{BL,F3,i,y}$	=	Quantity of fossil fuel type *i* that would in the absence of the project activity be used in the project plant according to the selected baseline scenario F3 in year *y* (tons)
$NCV_{i,y}$	=	Net calorific value of the fossil fuel type *i* in year y (GJ/ton)
$EF_{CO2,i,y}$	=	Carbon dioxide emission factor for fossil fuel type *i* in year *y* (tCO_2/GJ)
i	=	Fossil fuel types that are not less carbon intensive fossil fuel types and that would in the absence of the project activity be used in the project plant according to the selected baseline scenario F3 in year *y*

Step 3. Calculate baseline emissions from decay, dumping or burning of biomass residues.

In this case only scenario B3 is the applicable baseline. Then the calculation for methane baseline emissions will be as follows:

$$BE_{CH4,B1/B3,y} = GWP_{CH4} \times \sum_k FC_{PJ,k,y} \times NCV_{k,y} \times EF_{burning,CH4,k,y}$$

Where:

$BE_{CH4,B1/B3,y}$	=	Baseline methane emissions avoided during the year *y* from aerobic decay and/or uncontrolled burning of biomass residues (tCO_2e)
GWP_{CH4}	=	Global Warming Potential of methane valid for the commitment period (tCO_2e/tCH_4)
$FC_{PJ,k,y}$	=	Quantity of alternative fuel or less carbon intensive fossil fuel type *k* used in the project plant in year *y* (tons)
$NCV_{k,y}$	=	Net calorific value of the alternative or less carbon intensive fuel type *k* in year *y* (GJ/tonne)
$EF_{burning,CH4,k,y}$	=	CH_4 emission factor for uncontrolled burning of the biomass residue type *k* during the year *y* (tCH_4/GJ)
k	=	Types of biomass residues used as alternative fuel in the project plant in year *y* for which the identified baseline scenario is B1 or B3 and for which leakage effects could be ruled out with one of the approaches L_1, L_2 or L_3 described in the leakage section

As per recommendation in methodology, page 17, 0.0027 tCH4 per ton of biomass should be used as default value for the project. To provide conservative estimates of emission reductions, a conservativeness factor must be applied to the CH4 emission factor. The level of the conservativeness factor depends on the uncertainty rage of the estimate for the CH4 emission factor. The Table 2 in methodology, page 18, is shown the conservativeness factor and for this case, the uncertainty can be deemed to be greater than 100%, resulting in a conservativeness factor of 0.73. Thus an emission factor of 0.001971 tCH4/t biomass should be used.

Project emission

Project emissions include project emission from the use of alternative fuels and/or less carbon intensive fossil fuel (PEk,y), project emissions from additional electricity and/or fossil fuel consumption as a result of the project activity (PEEC,y and PEFC,y), project emission from combustion of fossil fuels for transportation of alternative fuels to the project plant (PET,y). In this grouped project activities the project emission from the cultivation of renewable biomass at the dedicated plantation is not included.

$$PE_y = PE_{k,y} + PE_{FC,y} + PE_{EC,y} + PE_{T,y}$$

Where:

PE_y	=	Project emissions during the year *y* (tCO_2e)
$PE_{k,y}$	=	Project emissions from combustion of alternative fuels and/or less carbon intensive fossil fuels in the project plant in year *y* (tCO_2)
$PE_{FC,y}$	=	Project emissions from additional fossil fuel combustion as a result of the project activity in year *y* (tCO_2)
$PE_{EC,y}$	=	Project emissions from additional electricity consumption as a result of the project activity in year *y* (tCO_2)
$PE_{T,y}$	=	CO_2 emissions during the year *y* due to transport of alternative fuels to the project plant (tCO_2)
$PE_{BC,y}$	=	Project emissions from the cultivation of renewable biomass at the dedicated plantation in year *y* (tCO_2e)

Project emissions are calculated in the following steps:

Step 1. Calculate project emission from the use of alternative fuels and/or less carbon intensive fossil fuels

Project emission from the use of alternative fuels and/or less carbon intensive fossil fuels in the project plant are calculated as follows:

$$PE_{k,y} = \sum_{k} FC_{PJ,k,y} \times NCV_{k,y} \times EF_{CO2,k,y}$$

Where:

$PE_{k,y}$	=	Project emissions from combustion of alternative fuels and/or less carbon intensive fossil fuels in the project plant in year *y* (tCO_2)
$FC_{PJ,k,y}$	=	Quantity of alternative fuel or less carbon intensive fossil fuel type *k* used in the project plant in year *y* (tons)
$EF_{CO2,k,y}$	=	Carbon dioxide emissions factor for alternative or less carbon intensive fossil fuels type *k* in year *y* (tCO_2/GJ)
$NCV_{k,y}$	=	Net calorific value of the alternative or less carbon intensive fossil fuel type *k* in year *y* (GJ/tonne)
k	=	Alternative fuel types and less carbon intensive fossil fuel types used in the project plant in year *y*

Step 2. Calculate project emissions from additional electricity and/or fossil fuel consumption as a result of the project activity

The use of alternative fuels or less carbon intensive fossil fuels may result in additional fossil fuel and/or electricity consumption at the project site which included

Mechanical treatment of the fuels; and
On-site transportation of the fuels.

CO_2 emission from on-site electricity consumption (PEEC,y) will be calculated using the latest approved version of the "Tool to calculate baseline, project and/or leakage emissions form electricity consumption". Then the project emission from electricity consumption is calculated as follows:

$$PE_{EC,y} = \sum EC_{PJ,j,y} \times EF_{EL,j,y} \times (1 + TDL_{j,y})$$

Where:

PEEC,y = Project emissions from electricity consumption in year (tCO2/yr)

ECPJ,j,y = Quantity of electricity consumed by project electricity consumption source j in year (MWh/year)

EFEL,j,y = Emission factor for electricity generation for source j in year (tCO2/MWh)

TDLj,y =Average technical transmission and distribution losses for providing electricity to source j in year

Step 3. Project emissions from combustion of fossil fuels for transportation of alternative fuels to the project plant

As per methodology, the option 1 approach is chosen to calculate the emissions from combustion of fossil fuels for transportation of alternative fuels to the project plant which base on the basis of distance and the number of trips (or the average truck load) as follows:

$$PE_{T,y} = \frac{\sum_k AF_{T,k,y}}{TL_y} \times AVD_y \times EF_{km,CO2,y}$$

Where:

$PE_{T,y}$	=	CO_2 emissions during the year *y* due to transport of alternative fuels to the project plant (tCO_2/yr)
N_y	=	Number of truck trips during the year *y*
AVD_y	=	Average round trip distance (from and to) between the alternative fuel supply sites and the site of the project plant during the year *y* (km)
$EF_{km,CO2,y}$	=	Average CO_2 emission factor for the trucks measured during the year *y* (tCO_2/km)
$AF_{T,k,y}$	=	Quantity of alternative fuel type *k* that has been transported to the project site during the year *y* (mass or volume units)
TL_y	=	Average truck load of the trucks used (tons or liter) during the year *y*.
k	=	Types of alternative fuels used in the project plant and that have been transported to the project plant in year *y*

4.4 Emission Reductions

The emission reductions achieved by the project activities within the monitoring period amount to:

The Siam Cement (Ta Luang) Co., Ltd (Ta Lung): 6,900 tCO_2e
The Siam Cement (Ta Luang) Co., Ltd (KaoWong): 62,026 tCO_2e
The Siam Cement (Kaeng Khoi) Co., Ltd: 120,254 tCO_2e
The Siam Cement (ThungSong) Co., Ltd: 37,084 tCO_2e
The Siam Cement (Lampang) Co., Ltd: 14,566 tCO_2e

Then this grouped project achieved to reduce the emissions totally 240,830 tCO_2e within the first crediting period.

Year	TaLung			Kaowong			Keangkoi			Tong Song			Lumpang			Total
	ER	BE	PE	ER	BE	PE	ER	BE	PE	ER	BE	PE	ER	BE	PE	
01/09/06 - 31/12/06	6,900	7,159	259	62,026	64,179	2,153	120,254	128,610	8,356	37,084	39,494	2,410	14,566	15,640	1,075	240,830

5. Summary of Monitoring Data

A summary of monitoring data and emission reduction base on aggregated data on an annual basis are provided below:

A: The table below presents the "Quantity of alternative fuel and less carbon intensive fuel of type k ($FC_{PJ,k,y}$) and fossil fuel of type i($FC_{PJ,i,y}$) used in the project plants between 1st September 2006 and 31st December 2006"

		TaLung	Kao Wong	Kaeng Koi	Thung Song	Lumpang
Biomass		01/09/06-31/12/06	01/09/06-31/12/06	01/09/06-31/12/06	01/09/06-31/12/06	01/09/06-31/12/06
Rice Husk	Ton	7,034.29	54,806.98		-	8,407
Wood chip	Ton				-	
Palm shell	Ton				-	
Palm fiber	Ton				-	
Palm Trunk	Ton				-	
Bark	Ton		79.28		-	
Saw dust	Ton				-	17,999
Biomass	Ton			84,170.00	53,261.55	

Fuel Type		TaLung	Kao Wong	Kaeng Koi	Thung Song	Lumpang
Fossil		01/09/06-31/12/06	01/09/06-31/12/06	01/09/06-31/12/06	01/09/06-31/12/06	01/09/06-31/12/06
Fuel Oil	Ton	836.99	847.29	1,594.75	541.68	40.26
Coal	Ton	44,446.09	45,754.00	131,931.00	142,905.04	
Lignite	Ton	9,018.14	37,825.00	82,604.00		51,700.31
Pet-Coke	Ton	34.95		-		
Antharcite	Ton					
Bituminus dust	Ton					

B: The table below presents the "CO_2 emission factor for alternative and less carbon intensive fuels of type k ($EF_{CO2,k,y}$) and for fossil fuel of type i ($EF_{CO2,i,y}$) between 1st September 2006 and 31st December 2006".

Fuel Type		Lower	Upper	Comments
Fossil				
Coal		92.80	100.00	2006 IPCC defaults: Volume 2, Chapter 2 (Table 2.3 page 2.18) -- Sub-Bituminous Coal
Coke		82.90	115.00	2006 IPCC defaults: Volume 2, Chapter 2 (Table 2.3 page 2.18) -- Petroleum Coke
Heavy fuel		75.50	78.80	2006 IPCC defaults: Volume 2, Chapter 2 (Table 2.3 page 2.18) -- Residual Fuel Oil
Diesel oil		72.60	74.80	2006 IPCC defaults: Volume 2, Chapter 2 (Table 2.3 page 2.18) -- Diesel Oil
Natural gas				2006 IPCC defaults: Volume 2, Chapter 2 (Table 2.3 page 2.18) -- Natural Gas Liquids
Lignite		90.90	115.00	2006 IPCC defaults: Volume 2, Chapter 2 (Table 2.3 page 2.18) -- Shale Oil
Anthracite		94.60	101.00	2006 IPCC defaults: Valume 2, Chapter 2 (Ta ble 2.3 page 2.18)-- Anthracite
Bituminous		92.80	100.00	2006 IPCC defaults: Volume 2, Chapter 2 (Table 2.3 page 2.18) -- sub-bituminous coal
Biomass				
Wood	tCH4/tonne dry	0.01	0.10	TABLE 2.3 - DEFAULT EMISSION FACTORS FOR STATIONARY COMBUSTION IN MANUFACTURING INDUSTRIES AND CONSTRUCTION
Agricultural waste	tCH4/tonne dry	0.01	0.10	

C: The table below presents the "Net Calorific Value of the alternative and less carbon intensive fuel type k ($NCV_{k,y}$) and fossil fuel types I ($NCV_{i,y}$)between1st September 2006 and 31st December 2006".

Fuel Type		TaLung	Kao Wong	Kaeng Koi	Thung Song	Lumpang
Fossil		01/09/06-31/12/06	01/09/06-31/12/06	01/09/06-31/12/06	01/09/06-31/12/06	01/09/06-31/12/06
Fuel Oil	GJ/ton	40.39	40.39	40.39	40.39	40.39
Coal	GJ/ton	23.51	23.56	26.37	23.20	
Lignite	GJ/ton	18.15	18.70	10.47		18.02
Pet-Coke	GJ/ton	32.36	30.29	32.50		0.00
Antharcite	GJ/ton	0.00	1.00	26.70		0.00
Bituminus dust	GJ/ton	0				
Rice Husk	GJ/ton	14.09	11.69		-	11.00
Wood chip	GJ/ton	-	-		-	-
Palm shell	GJ/ton	-	-		-	-
Palm fiber	GJ/ton	-	-		-	-
Palm Trunk	GJ/ton	-	-		-	-
Bark	GJ/ton	-	4.99		-	-
Saw dust	GJ/ton	-	-		-	8.42
Biomass	GJ/ton	-	-	15.42	10.42	

D: The average round trip distance (from and to) between the alternative fuel supply sites and the project site (AVD_y) in this monitoring period use the maximum distance according to the suggestion in the methodology as conservative calculation which is 400 km.

E: Average CO_2 emission factor for the trucks estimated during the year is as per IPCC 1996, Table 1-32. The 0.001097 tCO_2/km is used for calculation.

F: Average truck load of the trucks used during this monitoring period is 15 tonne per truck refer to transportation regulation in Thailand.

G: The production of clinker between 1st September 2006 and 31st December 2006 as shown in the table below.

Fuel Type		TaLung	Kao Wong	Kaeng Koi	Thung Song	Lumpang
Fossil		01/09/06-31/12/06	01/09/06-31/12/06	01/09/06-31/12/06	01/09/06-31/12/06	01/09/06-31/12/06
Pclinker,y	tonne	380,329.55	1,034,346.00	1,798,351.00	1,219,842.51	348,175

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