Project design document form

(Version 10.1)

Complete this form in accordance with the instructions attached at the end of this form.

BASIC INFORMATION	
Title of the project activity	Bundled Hadong-Busan photovoltaic Power Project of The Korea Southern Power Corporation (1MW Hadong Photovoltaic Power + 0.39MW Busan Photovoltaic Power, Bundling Project
Scale of the project activity	☐ Large-scale ☒ Small-scale
Version number of the PDD	08
Completion date of the PDD	05/01/2018
Project participants	Korea Southern Power CO.,LTD.(KOSPO)
Host Party	Republic of Korea
Applied methodologies and standardized baselines	AMS-I.D. Version 15
Sectoral scopes linked to the applied methodologies	1 - Energy industries (renewable - / non-renewable sources)
Estimated amount of annual average GHG emission reductions	1,027

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

>>

-The purpose of the project activity

Bundled Hadong-Busan PV (photovoltaic) Power Project activity is the construction and operation of The Korea Southern Power CO.,LTD.(hereinafter referred to as KOSPO). This bundled project is a photovoltaic plant inside of Hadong Thermal Power Plant site and Busan Combined Cycle Power Plant site in the Republic of Korea. The aim of this project activity is to generate and supply electricity using solar energy, which contributes to mitigation of climate change. The Hadong-Busan photovoltaic power plant will supply to the grid 1,600MWh of electricity per year and 15,998 MW in total during the crediting period.

- How to reduce greenhouse gas emissions by the proposed project activity

Since photovoltaic technology can generate electricity without emitting any greenhouse gas (hereinafter GHG), this project activity contributes to reduction of GHG by alternating at least one of the fossil fuel fired power plants which would have generated electricity with emitting GHG. The expected GHG emission reduction is 1,027 tCO2/yr and 10,266 tCO2 in total during the crediting period.

-The the project participants' view to the contribution of the project activity to sustainable development

The proposed project will contribute to sustainable development such as acquaintance of advanced technological experiences and maintenance know-how, creation of job opportunities of the country as follows.

• Social/Technological aspects
- The proposed project can diversify sources of electric generation and be a model case as a PV power plant that utilizes solar energy.
- The proposed project will contribute to revitalization of local energy industry under the corporation of a local government.

• Economical aspects
- The proposed project will supply the local area with the available electric power and contribute to national energy supply.
- The proposed project will create job opportunities directly and indirectly through construction and operation of the plant.

• Environmental and National aspects
- The proposed project will reduce GHG emission and other air pollutants occurring from fossil fuel extraction, processing, transportation, and burning.
- The proposed project will contribute to the policy of Korea government which promotes the development of new & renewable energy technology.

A.2. Location of project activity

>>

Host party(ies): Republic of Korea

Hadong Photovoltaic Power :

Region/state/province etc.: Gyeongsangnam-do

City/Town/Community etc.: Hadong-gun

Details of physical location: Hadong Photovoltaic Power is located at the Hadong Thermal Power Plant, Gadeok-ri, Geumseong-myeon

	Longitude	Latitude	Address
Hadong Photovoltaic Power	127°49' E	34°57' N	Gadeok-ri, Geumseong-myeon, Hadong-gun, Gyeongsangnam-do

Busan Photovoltaic Power

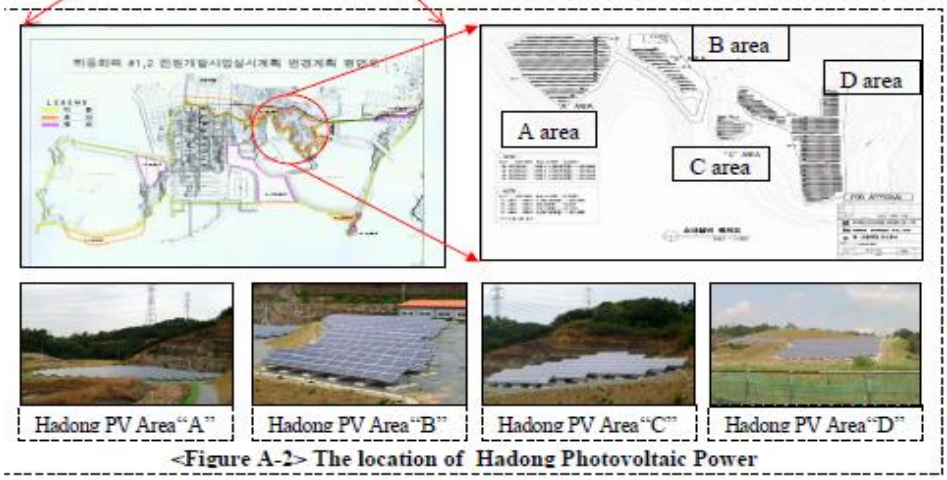
Region/state/province etc.: Busan Metropolitan City

City/Town/Community etc.: Saha-gu

Details of physical location: Busan Photovoltaic Power is located at the Busan Combined Cycle Power Plant, Gamcheon-1-dong

	Longitude	Latitude	Address
Busan Photovoltaic Power	128°59' E	35°05' N	Gamcheon-1-dong, Saha-gu, Busan Metropolitan City

<Figure A-1> The location of Busan Photovoltaic Power



<Figure A-2> The location of Hadong Photovoltaic Power

A.3. Technologies/measures

>>

The project type and category(ies) of the small-scale project activity

This project is a small-scale CDM project activity and according to the Appendix B of "*the simplified modalities and procedures for small-scale CDM project activities*" of UNFCCC, type and category of the project can be confirmed as follows ;

Project Type : I - Renewable energy project
Project category : I.D - Electricity generation for a system for a grid(Version 15)
Sectoral Scope: 1 - Energy industries (renewable - / non-renewable sources).

Technology/measure of the small-scale project activity

Bundled Hadong-Busan PV Power Project make use of renewable energy resources to generate electricity and the total installed capacity is 1.39MW(Hadong PV Power 1.0MW, Busan PV Power 0.39MW). Though the actual capacity of Hadong PV power plant is 0.9984 MW, it is written as 1.0 MW for brevity. This PV Power generates electricity by the photovoltaic technology that converts light directly into electricity. This facility is composed of photovoltaic modules, inverters, and transformer.

The principle of generating electricity is simple. Photovoltaic modules collect light and convert it into electricity, and then inverters convert the direct current (DC) to the alternating current (AC), and finally transformer changes a voltage suitable for transmitting it to grid.

Hadong-Busan PV Power is unmanned power plant. The remote operating and monitoring system of the PV Power Plant makes it possible to audit and measure the data by sending electric characteristics such as power generation, voltage, electric current and frequency electricity produced by photovoltaic technology to the main computer. If it happens to be a problem in communication facilities which transfers data to KPX, the person in charge is manually sending the data stored in meter recorder to KPX. It is also possible to audit and measure the data at a distant place by a LAN or a modem and so a part which breaks down will be captured and managed quickly at a distant place, in case that there is something wrong with the equipment.

The operating team was trained for operating, monitoring, and managing PV generation system by Manufacturing Company, (Hadong ; KC-cottrell, Busan ; Hex Power Energy). They furnished training materials to operation workers of central control room which makes them able to learn in order.

KOSPO forms the “Manual of procedures for photovoltaic operation and maintenance” which documents the detailed process and check points for power plant operation and manages Hadong PV power and Busan PV Power plant based on the manual for secure and systematic power plant operation. The technical information of each project activity is as follows:

<Table A-2> Technical Data of Hadong-Busan PV(photovoltaic) Power Project Item

Item	**Type**	**Specifications**		
		Hadong Photovoltaic Power	Busan Photovoltaic Power	
			Area A	Area B
Photovoltaic module	Type	Single-crystalline silicon	Single-crystalline silicon	Single-crystalline silicon
	Capacity	1.0MW	0.24MW	0.15MW
	Module maximum output power	160W	170W	200W
	Number of modules	6,240	1,428	736
Inverter	Type	GT250K	C3100S/C350S	C3100S/C350S
	Capacity	250kW×5 (1 for Stand-by)	100kW/50kW	100kW/50kW
	Output voltage	315V	380/220V	380/220V
	Control method	PWM Invert(IGBT)	PWM Invert(IGBT)	PWM Invert(IGBT)
	Node form	3-Phase 3-Wire	3-Phase 3-Wire	3-Phase 3-Wire
	Unit	4+1(1 for Stand-by)	2/1	1/1
Transformer	Capacity	1,250kVA	500kVA	
	Voltage	380V/22.9kV, 3phase, 60Hz	380V/22.9kV, 3phase, 60Hz	
	Cooling type	Forced wind cooling	Self-cooling	

Busan photovoltaic power plant is located on the parking lot of rooftop in Busan gas turbine power plant. A part of modules was demolished on 5 Feb 2015 because of Busan city's plan for underground tunnel construction. Demolished module will be relocated above the tunnel and it will be finished by 2018. Demolished module will be put the current location.
Some details of the requidation is as follows:

(From 5 Feb 2015 to the second half 2018)

	Registered PDD		Requidation		Remains	
	Area A	Area B	Area A	Area B	Area A	Area B
Number of modules	1,428	736	680	340	748	396
Capacity	0.24MW	0.15MW	0.113MW	0.071MW	0.127MW	0.079MW

(From the second half 2018)

	Re-installation		Final capacity	
	Area A	Area B	Area A	Area B
Number of modules	680	340	1,428	736
Capacity	0.113MW	0.071MW	0.24MW	0.15MW

During the second half 2018, photovoltaic modules will be re-installation as initial registered capacity (total capacity 0.39MW)

A.4. Parties and project participants

Parties involved	Project participants	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Republic of Korea (host)	Korea Southern Power CO.,LTD.(KOSPO)	No

A.5. Public funding of project activity

>>
Hadong-Busan PV Power Project has been fully funded by Korea Southern Power Co., Ltd. Therefore, this project is not funded by official development assistance or other sources as the financial obligations of Parties included in Annex I.

A.6. History of project activity

>>
This CDM project activity is neither registered as a CDM project activity nor included as a component project activity (CPA) in a registered CDM programme of activities (PoA) and This CDM project activity is not a project activity that has been deregistered.

A.7. Debundling

>>
According to Appendix C of the simplified modalities and procedures for small-scale CDM project activities, debundling is defined as the fragmentation of a large project activity into smaller parts. This project consists of two PV power plant(Hadong PV 1.0 MW + Busan PV 0.39MW) and hence this project is not a fragmentation of a large project activity.

In detail, 'Appendix C of the simplified Modalities and Procedures for Small-Scale CDM project' can be referred for guidance on how to determine whether the proposed project activity is not a debundled component of a larger project activity.

- With the same project participants;
- In the same project category and technology/measure; and
- Registered within the previous 2 years; and
- Whose project boundary is within 1 km of the project boundary of the proposed small-scale activity at the closest point.

The Project is not included any of above indicator.

SECTION B. Application of selected methodologies and standardized baselines

B.1. Reference to methodologies and standardized baselines

>>
Reference: Version 15 of AMS-I.D. Grid connected renewable electricity generation
Tool: Version 01.1 of Tool to calculate the emission factor for an electricity system.

B.2. Applicability of methodologies and standardized baselines

>>
The proposed project activity is a grid-connected solar power generation project (i.e. renewable power generation project activity) and installs a new power plant at the project site where no renewable power plant was operated prior to the implementation of the project activity. The project activity qualifies under the type I and category I.D. The relevant methodology for the mentioned type and category of small scale methodology is AMS-I.D., version 15. The applicability of the methodology is explained.

B.3. Project boundary, sources and greenhouse gases (GHGs)

>>

Source		GHG	Included?	Justification/Explanation
Baseline	Grid connected electricity generation	CO_2	Yes	Main emission source
		CH_4	No	Minor source
		N_2O	No	Minor source
Project activity	Small Photovoltaic Power	CO_2	No	Minor source
		CH_4	No	Minor source
		N_2O	No	Minor source

B.4. Establishment and description of baseline scenario

>>
This project activity supplies electricity to grid that is or would have been supplied by at least one fossil fuel-fired generating unit so the baseline is the kWh produced by the renewable generating unit multiplied by an emission factor (measured in tCO2/MWh).

$$BEy = EGy \times EFgrid,CM,y$$

Where,

BEy = Baseline Emissions (tCO2/yr)
EGy = Net Electricity Generation (MWh/yr)
EFgrid,*CM, y* = Emission Factor (tCO2/MWh)

Emission factor can be calculated in a transparent and conservative manner such as combined margin (CM) or the weighted average emissions of the current generation mix. This project activity would use combined

margin. The calculation procedure of combined margin follows the *Tools to calculate the emission factor for an electricity system* and is as follows:

Step 1. Identify the relevant electric power system

Because DNA of Republic of Korea has not published a delineation of the project electricity system and connected electricity systems, project electricity system is defined as the national grid by default. The electricity from the project activities is connected physically to KEPCO grid, which is the only one in Korea and so relevant electric power system is KEPCO grid. The power plants in islands except Jeju Island are not connected to the national grid, so they are not considered.

Step 2. Select an operating margin (OM) method

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

(a) Simple OM, or
(b) Simple adjusted OM, or
(c) Dispatch data analysis OM, or
(d) Average OM.
Any of the four methods can be used, however, the simple OM method can be used if low-cost/must-run resources constitute less than 50% of total grid generation in average of the five most recent years or based on long-term averages for hydroelectricity production. For the selection of simple OM method, the constitution of low-cost/must-run resources during 2004 ~ 2008 was checked and the result is shown in Table B-1.

<Table B-1. Ratio of must-run / low–cost of the five most recent years in Korea>

Year	Total Generation (GWh)	Must-un/Low cost (GWh)	MR/LC ratio (%)
2004	342,148	141,529	41.36
2005	364,638	156,856	43.02
2006	381,181	158,790	41.66
2007	403,125	153,278	38.02
2008	422,355	162,623	38.50
Total	1,913,447	773,076	40.40

Source: statistics of electric power in Korea (KEPCO, 2004 ~ 2008)

Since the requirement condition for the use of simple OM method is satisfied, the simple OM method is selected. The simple OM emission factor can be calculated using either ex ante option or ex post option. Any option can be used and project activity uses the ex-ante option.

- ✓ Ex ante option: A 3-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation, without requirement to monitor and recalculate the emissions factor during the crediting period.

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

The simple OM emission factor is calculated as the generation-weighted average CO2 emissions per unit net electricity generation (tCO2/MWh) of all generating power plants serving the system, not including low-cost / must-run power plants / units. It may be calculated:

- ✓ Based on data on fuel consumption and net electricity generation of each power plant / unit (Option A), or
- ✓ Based on data on net electricity generation, the average efficiency of each power unit and the fuel type(s) used in each power unit (Option B), or
- ✓ Based on data on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system (option C).

Option A was selected because option A must be used if fuel consumption data are available for each power plant / unit. The equation of Option A is as follows:

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

Where:
EFgrid, OMsimple,y = Simple operating margin CO2 emission factor in year *y* (tCO2/MWh)
FCi,,m,y = Amount of fossil fuel type *i* consumed by power plant / unit m in year *y* (mass or volume unit)
NCVi,y = Net calorific value (energy contents) of fossil fuel type *i* in year *y* (GJ / mass or volume unit)
*EFCO2,i,*y = CO2 emission factor of fossil fuel type *i* in year *y* (tCO2/GJ)
EGm,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 = Three most recent years (2006 ~ 2008)

Local values of NCVi ,y and EFCO2,i (Table 1, 2, 3 in Annex 3) and IPCC world-wide default values of OXIDi (Table B-2) are used.

<Table B-2. CO2 emission factor and oxidation rate>

Fual Type	CO2 Emission Factor (kgCO2/TJ)	Carbon oxidation factor
Anthracite	94,600	1
Bituminous	89,500	1
Heavy Oil	75,500	1
Diesel Oil	72,600	1
LNG	54,300	1

Data source: 2006 IPCC Guidelines, vol. 2, p. 1.23

* Default values at the lower limit of the uncertainty at a 95% confidence interval as provided in the 2006 IPCC Guidelines on National GHG Inventories

The calculation result of simple OM emission factor is shown in Table B-3.

<Table B-3. EF*grid,OM*, y for this project activity>

Year	Σ*EGm,y* [MWh]	[tCO2] Σ*FCi,m, y • NCV i, y • EFCO2,i,y* [tCO2]	*EFgrid,OM,,y* [tCO2/MWh]
2006	206,605,293	140,300,889	0.6791
2007	230,642,413	156,360,113	0.6779
2008	237,888,670	163,529,777	0.6874
Total	675,136,376	460,190,779	0.6816

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

The sample group of power plant/unit m used to calculate the build margin consists of either:
(a) The set of five power units that have been built most recently, or
(b) The set of power capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently.

Project participants should use the set of power units that comprise the larger annual generation. The annual generation in 2008 (the most recent year) of case (a) and case (b) was calculated and compared as shown in Table B-4 (full data are listed in Table 4 of Annex 3).

<Table B-4. Comparison of case (a) and case (b)>

	Case (a) : BM(5 Unit)	Case(b) : BM(20%)
Electricity generation (MWh)	4,813,540	82,412,683
% of total electricity	1.19	20.38

supplied to the grid		

Since case (b) is larger than case (a), case (b) is selected.

In terms of vintage of data, project participants can choose from either of the following two options:

Option 1. Calculate the build margin emission factor ex-ante based on the most recent information available on units already built for sample group m at the time of CDM-PDD submission to the DOE for validation.

Option 2. The build margin emission factor shall be updated annually, ex-post, including those units built up to the year of registration of the project activity or, if information up to the year of registration is not yet available, including those units built up to the latest year for which information is available.

This project activity used option 1.

Step 5. Calculate the build margin emission factor

The build margin emission factor is the generation-weighted average emission factor (tCO2/MWh) of all power units m during the most recent year y for which power generation data are available, calculated as follows:

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

Where:
EFgrid,*BM, y* = Build margin CO2 emission factor in year *y* (tCO2/MWh)
EGm,*y* = Net electricity generated and delivered to the grid by power plant / unit m in year *y* (MWh)
EFEL,*m,y* = CO2 emission factor of power unit m in year y (tCO2/MWh)
m = Power units included in the build margin
y = Most recent historical year(2008)

The CO2 emission factor of each power unit m (EFEL,m,y) is determined as per the guidance in Step 3(a) for the simple OM, using Option B1. The calculation result of build margin emission factor was 0.5221. For more details about input data, refer to Table 4 of Annex 3.

EFgrid,*BM, y* = 0.5221

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

EFgrid,*CM, y* = *EFgrid*,*OM, y* ×*wOM* + *EFgrid*,*BM, y* × *wBM*

Where:
EFgrid,*OM, y* = Operating margin CO2 emission factor in year y (tCO2/MWh)
EFgrid,*BM, y* = Build margin CO2 emission factor in year y (tCO2/MWh)
wOM = Weighting of operating margin emissions factor (%)
wBM = Weighting of build margin emissions factor (%)

Wind and solar power generation project activities use *wOM* = 0.75 and *wBM* = 0.25, so the calculation result of combined margin emission factor is 0.6417.

EFgrid,*CM, y* = 0.6816 × 0.75 + 0.5221 × 0.25 = 0.6417

B.5. Demonstration of additionality

>>
1. Barrier Analysis In order to prove additionality of the project, this project referred to *attachment A to Appendix B of the simplified modalities and procedures for small-scale CDM project activities*. According to

attachment A to Appendix B of the simplified modalities and procedures for small-scale CDM project activities, project participants shall provide explanation to show that the project activity would not have occurred anyway due to at least one of barriers: Investment barrier, Technological barrier, Barrier due to prevailing practice and Other barriers.

a) Investment Barrier Analysis

The biggest barrier of the project is investment barrier because renewable energy projects require high capital investments including Photovoltaic power projects. In addition, expectation of capital return is very low. Due to these reasons, renewable energy is not a very attractive option for power generation. The main reason is the renewable energy projects are unprofitable, because the average price of the system marginal price (SMP) is very low, which is 89.64 KRW/kWh(the highest price in 2006.9~2007.8).

In 2002, the Korean government first established the law (Alternative Energy Development Promotion Act) to stimulate the renewable energy in Korea. And the government compensates difference between the SMP by Korea Power Exchange and the standard price that is pre-determined by the government to attract to promote the diffusion of renewable energy. But this law to promote renewable energy policy does not to be taken into account in developing a baseline scenario according to decision of 22nd CDM EB meeting (Annex 3 –Clarifications on the consideration of national and/or sectoral policies and circumstances in baseline scenarios, version 02).

In case of this project, we calculate IRRs and Net Present Value (NPV) for this category considering the average price of the system marginal price and expected annual generation. IRRs of both sites for this project activity are <0% (#DIV/0!) which is much lower than the benchmark of 7%.

<Table B-5> Result of economical analysis

Plant Name	Total Expense (unit: one million won)	Operation & Maintenance Cost (unit: one million won/year)	Corporation Tax (unit: one milion won/year)	Unit Cost of Purchase (Unit:won/KWh)	Purchased Electricity (unit: KWh)	NPV (unit: one million won)
Hadong PV Power Project	7,377.995	51.646	2.180	89.64	1,246,300	- 6,796.233
Busan PV Power Project	3,909.864	26.414	0.735	89.64	433,610	- 3,802.502
* Business life time is for 20 years expect construction period * Hadong and Busan PV power project of Discount rate is 7.0% * Discount rate and other variable are adopted from the execution design report of individual plant * Raw data(Excel file) for economical analysis is submitted to DOE(KSA)						

As a result of economical analysis, NPV is lower than 0. It means, it doesn't have economic attraction. In addition, there are risks of difficulty in retrieving the investment. Investment retrieval depends on when power plants operate and how much power is generated. However, power generation could be changed by virtue of below mentioned risk factors.

- Electricity generation depending on insolation
- Unstableness of output of power depending on insolation change

The above mentioned risk factors act as obstacles against investment in photovoltaic power plant project.

b) Sensitivity Analysis

First, we calculated NPV with using expected benefits from electricity and CERs sales and costs from construction and operation for PV power facility as follows

<Table B-6> The project's NPVHadong PV

	Hadong PV			Busan PV		
	Without CERs	With CERs (€ 10)	With CERs (€ 20)	Without CERs	With CERs (€ 10)	With CERs (€ 20)

NPV (unit: one million won)	- 6,796.233	-6,727.499	-6,658.764	-3,802.502	-3,778.856	-3,755.210

In order to check how this project's NPV is affected by changing discount rate, PV generation utilization rate and the average price of the system marginal price(SMP), sensitivity analysis is required. This analysis was performed using discount rate, PV generation utilization rate and the average price of the SMP as a parameter.

<Table B-7> NPV's Sensitivity analysis by changing PV generation discount rate

Discount rate (in current 7%)	Hadong PV			Busan PV		
	Without CERs	With CERs (€ 10)	With CERs (€ 20)	Without CERs	With CERs (€ 10)	With CERs (€ 20)
Discount rate is 5%	-6,688.678	-6,612.062	-6,535.446	-3,782.514	-3,756.131	-3,729.748
Discount rate is 9%	-6,880.495	-6,818.517	-6,756.539	-3,818.158	-3,796.858	-3,775.558

(Unit : million won)

<Table B-8> NPV's Sensitivity analysis by changing PV generation utilization rate

Utilization rate	Hadong PV (In current 15%)			Busan PV (In current 13.36%)		
	Without CERs	With CERs (€ 10)	With CERs (€ 20)	Without CERs	With CERs (€ 10)	With CERs (€ 20)
Utilization rate is 10%	-7,162.675	-7,116.852	-7,071.029	-3,897.952	-3,880.253	-3,862.554
Utilization rate is 20%	-6,429.800	-6,338.154	-6,246.508	-3,613.885	-3,578.487	-3,543.089

(Unit : million won)

<Table B-9> NPV's Sensitivity analysis by changing the average price of SMP

SMP changing	Hadong PV			Busan PV		
	Without CERs	With CERs (€ 10)	With CERs (€ 20)	Without CERs	With CERs (€ 10)	With CERs (€ 20)
10% higher than expected	-6,683.977	-6,615.243	-6,546.508	-3,763.745	-3,740.099	-3,716.453
15% higher than expected	-6,627.844	-6,559.110	-6,490.375	-3,744.371	-3,720.725	-3,697.079
20% higher than expected	-6,571.712	-6,502.977	-6,434.243	-3,724.987	-3,701.341	-3,677.695

(Unit : million won)

As a result of sensibility analysis, NPV of this project is also very poor. Therefore, sensibility analysis didn't make difference of additionality of the project.

c) Barrier due to prevailing practice

The Korea Grid heavily depends upon thermal power generation such as petroleum, nuclear, bituminous coal, and LNG for its energy source. Even though the several laws and regulations of encouraging development, utilization, and expansion of new and renewable energy industry have been enacted in recent years, the portion of the renewable energy consists of only 3.02% of total power generation facilities in Korea as you see in below Table B-10.

<Table B-10> Total Power Generation Capacities in Korea

Energy Source	2007 Actual		2008 Actual	
	MW	%	MW	%
Hydro	5,492	8.05	5,505	7.59
Domestic coal	1,125	1.65	1,125	1.55
Petroleum	4,897	7.17	5,407	7.46
Nuclear	17,716	25.95	17,716	24.44

Bituminous coal	19,340	28.33	22,580	31.15
LNG	17,943	26.28	17,970	24.79
Others*	1,755	2.57	2,188	3.02
Total	68,268	100.0	72,491.	100.0

** Data source: 2009 Power Plant Status, Korea Power Exchange*

Compared with thermal power, the photovoltaic power is getting more favorable grid price. However, because of the high investment costs and the instability and uncertainty of insolation, the photovoltaic power plant is lack of commercial attraction. The project faces couple of barriers which prevent the implementation of the specific project activity. The CER revenue would help to overcome those barriers. If the project is not implemented, the equal electric power will be supplied by the Korea Grid. Then the Grid surely finds an easy solution such as thermal power for its energy source without any GHG emission reductions.

2. Prior Consideration of the CDM

The purpose of this project activity is to support the Government's policy to encourage new & renewable energy supply and to comply with Convention on Climate Change.

As a first step related to this project activity, In September 2005 KOSPO contracted a MOU with Eco Eye, which is specialized in development and promotion of CDM project activity

In November 2005 KOSPO established a basic plan for registration and management of CDM project activity to reduce the green house gas and above plan include that made all kind of new & renewable energy consider as a CDM project activity.

In August 2007 KOSPO started to establish the comprehensive plan to comply with Convention on Climate Change and searched for a way to expand new & renewable energy project activity. In September 2007 KOSPO decided to develop Hadong/Pusan photovoltaic power plant as CDM project activity. There were three considerations for the decision: first, this project activity is able to mitigate climate change. Second, KOSPO as a public company should support the Government's policy to boost renewable energy supply and consumption with this project activity. And third, this project activity has the potential to initiate public attention to CDM project and lower the investment barrier.

But the result of economic efficiency analysis suggested that to register CDM projects for each power plant respectively would cost a lot more than to register and verify and certificate CDM project as a bundling CDM project activity. Because of this, KOSPO decided to bundle the CDM project activity with another project plan.

In February 2008, KOSPO decided to develop three project activities(Hadong PV, Busan PV and Sininchoen/Busan fuel cell power plant) as a bundle for CDM project activity.

The Hadong PV power plant, in March 2008, entered into the contract of the construction work for CDM project activity, and started the construction in April 2008, completed in July 2008. The Busan PV project activity entered into the contract to start the construction work in March 2008, and started to the construction in April, completed in August 2008. But fuel cell power plant activity, which were planned to start in 2008, was decided to be delayed after 2011 because there were internal constraining conditions in KOSPO.

At the 41th meeting CDM EB released the "*GUIDANCE ON THE DEMONSTRATION AND ASSESSMENT OF PRIOR CONSIDERATION OF THE CDM*".

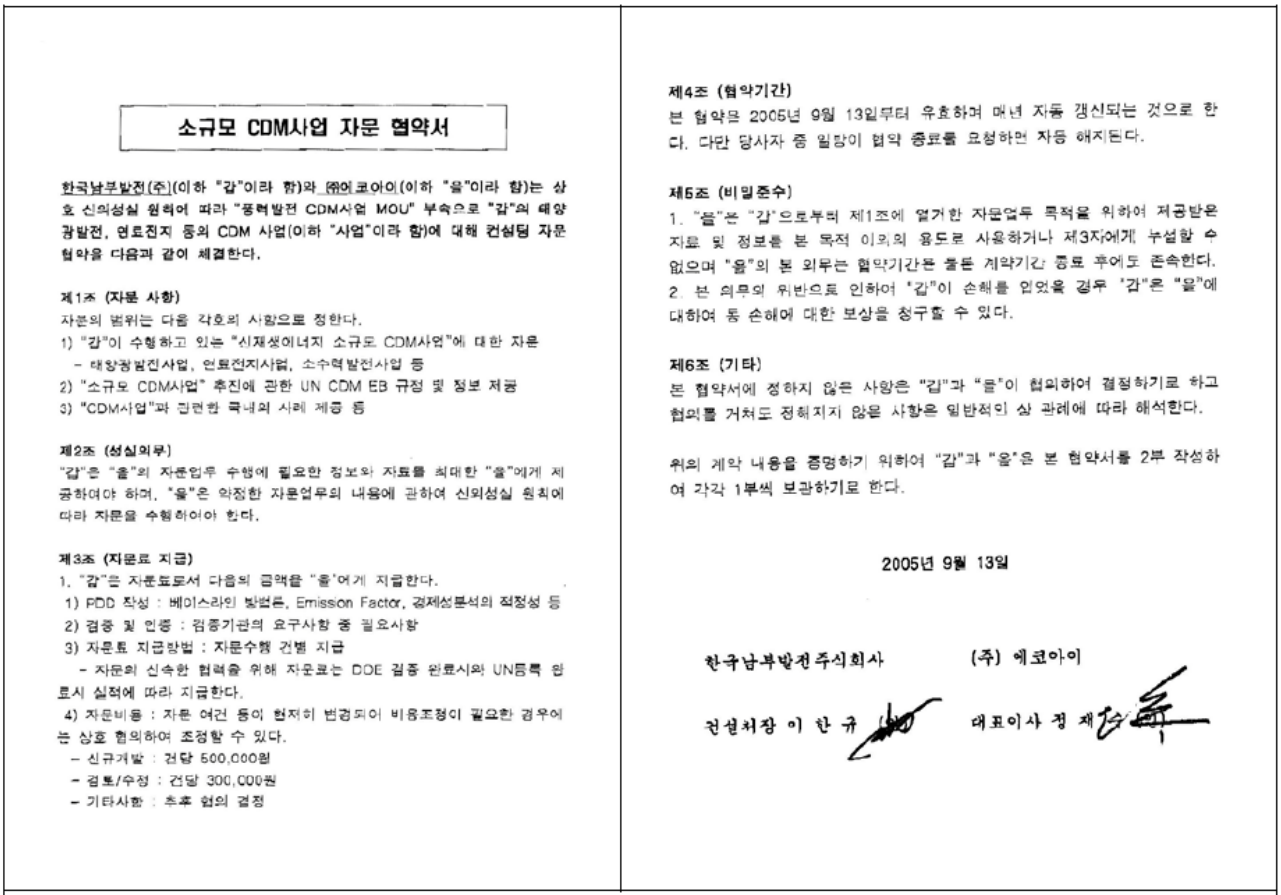
From the decision by CDM EB, the registration procedure of CDM project activity was changed before the 2 August 2008 and after that.

So it became to difficult to promote the prior two PV project activities and fuel cell project activity, delayed after the 2011, together as a bundling CDM project activity. Inevitably, in February 2009, KOSPO decided to promote only the two PV project activity that is Hadong/Busan PV which is commenced before 2 August 2008, as a bundling CDM. Due to this situation, the day of PDD validation for CDM project activity(2009.03) was started late than actual start day of Hadong and Busan photovoltaic project activity(2008.03).

<Table B-11> Bundled Hadong-Busan PV power project activity

Timeline	Event
2005. 9	Contracting memorandum of understanding CDM consulting to Eco eye Co., ltd
2005. 11	Basic plan establishment of CDM project registration and management
2007. 9	Investment analysis of Hadong/Busan Photovoltaic power CDM Project (Decision to construct the PV power plant and proceed with the CDM project) - Hadong PV(05/09) : Basic plan establishment of PV power plant - Busan PV(20/09) : Feasibility review and establishment planning PV power plant
2008. 2	Planning to promote CDM project activity Bundling with Hadong PV, Busan PV and others
2008. 3	Approval of the government(Ministry of environment, Ministry of knowledge economy) about the agreement of the Environment impact and changed plan, occurred by constructuring PV power plan. (Hadong PV project)
2008. 3	The start of PV Power project activity (Contracting for construction) - Hadong PV

	power plant(17/03), Busan PV power plant(26/03)
2008. 3	Registration the plan of constructing grid(Registration of Generator)) to KPX - Busan PV power plant(14/03)
2008. 4	Agreement of constructing PV power plan by Busan-city (Busan PV project)
2008. 4	Starting construction - Hadong PV power plant(01/04), Busan PV power plant(27/03)
2008. 7	The complete of construction - Hadong PV power plant(23/07), Busan PV power plant(29/07)
2009. 1	Receipting CDM validation proposal from KEMCO and KFQ
2009. 2	Planning to promote small scale PV Power bundling CDM project activity with Hadong PV and Busan PV plant
2009. 4	Contract with DOE (KSA) for CDM project validation
2009. 5	The start of CDM validation by DOE
	Request for approval of the CDM project to DNA(Republic of Korea)
	Acquisition of approval by DNA



소규모 CDM사업 자문 협약서

한국남부발전(주)(이하 "갑"이라 함)과 ㈜에코아이(이하 "을"이라 함)는 상호 신의성실 원칙에 따라 "풍력발전 CDM사업 MOU" 부속으로 "갑"의 태양광발전, 연료전지 등의 CDM 사업(이하 "사업"이라 함)에 대해 컨설팅 자문 협약을 다음과 같이 체결한다.

제1조 (자문 사항)
자문의 범위는 다음 각호의 사항으로 정한다.
1) "갑"이 수행하고 있는 "신재생에너지 소규모 CDM사업"에 대한 자문
 - 태양광발전사업, 연료전지사업, 소수력발전사업 등
2) "소규모 CDM사업" 추진에 관한 UN CDM EB 규정 및 정보 제공
3) "CDM사업"과 관련한 국내외 사례 제공 등

제2조 (성실의무)
"갑"은 "을"의 자문업무 수행에 필요한 정보와 자료를 최대한 "을"에게 제공하여야 하며, "을"은 약정한 자문업무의 내용에 관하여 신의성실 원칙에 따라 자문을 수행하여야 한다.

제3조 (자문료 지급)
1. "갑"은 자문료로서 다음의 금액을 "을"에게 지급한다.
 1) PDD 작성 : 베이스라인 방법론, Emission Factor, 경제성분석의 적정성 등
 2) 검증 및 인증 : 검증기관의 요구사항 중 필요사항
 3) 자문료 지급방법 : 자문수행 건별 지급
 - 자문의 신속한 협력을 위해 자문료는 DOE 검증 완료시와 UN등록 완료시 실적에 따라 지급한다.
 4) 자문비용 : 자문 여건 등이 현저히 변경되어 비용조정이 필요한 경우에는 상호 협의하여 조정할 수 있다.
 - 신규개발 : 건당 500,000원
 - 검토/수정 : 건당 300,000원
 - 기타사항 : 추후 협의 결정

제4조 (협약기간)
본 협약은 2005년 9월 13일부터 유효하며 매년 자동 갱신되는 것으로 한다. 다만 당사자 중 일방이 협약 종료를 요청하면 자동 해지된다.

제5조 (비밀준수)
1. "을"은 "갑"으로부터 제1조에 열거한 자문업무 목적을 위하여 제공받은 자료 및 정보를 본 목적 이외의 용도로 사용하거나 제3자에게 누설할 수 없으며 "을"의 본 의무는 협약기간뿐 아니라 계약기간 종료 후에도 존속한다.
2. 본 의무의 위반으로 인하여 "갑"이 손해를 입었을 경우 "갑"은 "을"에 대하여 동 손해에 대한 보상을 청구할 수 있다.

제6조 (기타)
본 협약서에 정하지 않은 사항은 "갑"과 "을"이 협의하여 결정하기로 하고 협의를 거쳐도 정해지지 않은 사항은 일반적인 상 관례에 따라 해석한다.

위의 계약 내용을 증명하기 위하여 "갑"과 "을"은 본 협약서를 2부 작성하여 각각 1부씩 보관하기로 한다.

2005년 9월 13일

한국남부발전주식회사 건설처장 이 한 규

(주) 에코아이 대표이사 정 재 [illegible]

MOU of CDM consulting with Eco eye Co., Ltd

B.6. Estimation of emission reductions

B.6.1. Explanation of methodological choices

>>
This project is generating electricity by Hadong PV and Busan PV power project and connecting to grid instead of using fossil fuel for abating greenhouse gas (GHG) emissions. The category applicable to the methodology AMS I.D comprises the below.

1. This category comprises renewable energy generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal and renewable biomass.
2. If the unit added has both renewable and non-renewable components (e.g. a wind/diesel unit), the eligibility limit of 15MW for a small-scale CDM project activity applies only to the renewable component. If the unit added co-fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15MW.

3. Combined heat and power (co-generation) systems are eligible.
4. In the case of project activities that involve the addition of renewable energy generation units at an existing renewable power generation facility, the added capacity of the units added by the project should be lower than 15MW and should be physically distinct from the existing units
5. Project activities that seek to retrofit or modify an existing facility for renewable energy generation are included in this category. To qualify as a small scale project, the total output of the modified or retrofitted unit shall not exceed the limit of 15MW.

This project is satisfied with the above condition like the below.

1. This Bundling project is small scale photovoltaic power project. All capacity, 1.39MW including (Hadong photovoltaic power project 1.0MW and Busan photovoltaic power project 0.39MW) are less than the applicable condition for small scale, which is 15MW.
2. The capacity of this bundling project is 1.39MW. This project does not comprise any other fossil fuel.
3. This project is not Combined heat and power (co-generation) systems, but electricity generation facility.
4. This project is not the addition of renewable energy generation units at an existing renewable power generation facility, but it is the construction of new renewable energy generation.
5. This Project is not retrofit or modifies an existing facility for renewable energy generation.

This project is applicable to the methodology AMS I.D like the above.

B.6.2. Data and parameters fixed ex ante

Data/Parameter	EF
Data unit	tCO2/MWh
Description	CO2 emissions factor of grid
Source of data	Calculated (combined margin)
Value(s) applied	Refer to Table 1 ~ Table 3 in Annex 3
Choice of data or measurement methods and procedures	This value was calculated according to *Tool to calculate the emission factor for an electricity system*. Applied value is calculated by referring Statistics of Electric Power in KOREA (2006, 2007, 2008) (KEPCO) and Status of Generation Facilities (2008) (Korea Power Exchange).
Purpose of data	Calculation of Baseline emission
Additional comment	- The same value will be applied during the crediting period without updating. - For more detail calculation method, refer to B.4.

Data/Parameter	EF_{OM}
Data unit	tCO2/MWh
Description	operating margin emission factor
Source of data	calculated
Value(s) applied	0.6816tCO2/MWh
Choice of data or measurement methods and procedures	This value was calculated according to *Tool to calculate the emission factor for an electricity system*. Applied value is calculated by referring Statistics of Electric Power in KOREA (2006, 2007, 2008) (KEPCO) and Status of Generation facilities (2008) (Korea Power Exchange).
Purpose of data	Calculation of Baseline emission
Additional comment	-This data will be calculated at the time of PDD submission and will not be changed during the crediting period. - This value is ex-ante value which is calculated at the time of PDD submission and will be applied during the crediting period without update.

Data/Parameter	EFBM,
Data unit	tCO2/MWh
Description	build margin emission factor
Source of data	calculated
Value(s) applied	0.5221tCO2/MWh
Choice of data or measurement methods and procedures	This value was calculated according to *Tool to calculate the emission factor for an electricity system*. Applied value is calculated by referring Statistics of Electric Power in KOREA (2006, 2007, 2008) (KEPCO) and Status of Generation facilities (2008) (Korea Power Exchange).
Purpose of data	Calculation of Baseline emission
Additional comment	-This data will be calculated at the time of PDD submission and will not be changed during the crediting period. - This value is ex-ante value which is calculated at the time of PDD submission, and will be applied during the crediting period without update.

Data/Parameter	**Total net electricity generation** (EG*m,y*)
Data unit	MWh
Description	Electricity Generation data for all plants per year
Source of data	KEPCO, Statistics of Electric Power in 2006, 2007, 2008
Value(s) applied	Refer to Table 1 ~ Table 3 in Annex 3
Choice of data or measurement methods and procedures	The amounts of total net electricity generation using in calculating emission factor is from numerical values of Statistics of Electric Power published by KEPCO in 2006, 2007, 2008
Purpose of data	Calculation of Baseline emission
Additional comment	

Data/Parameter	FCi,m,y
Data unit	Mass or volume unit
Description	Amount of fossil fuel type *i* consumed by power plant / unit *m* in year *y*
Source of data	Statistics of Electric Power in KOREA (2006, 2007, 2008) (KEPCO)
Value(s) applied	Refer to Table 1 ~ Table 3 in Annex 3
Choice of data or measurement methods and procedures	The most recent three historical years for which data are available at the time of submission of the CDM-PDD to the DOE for validation (ex-ante option)
Purpose of data	Calculation of Baseline emission
Additional comment	

Data/Parameter	NCVi,y
Data unit	GJ / mass or volume unit
Description	Net calorific value (energy content) of fossil fuel type *i* in year *y*
Source of data	KEPCO, Statistics of Electric Power in 2006, 2007, 2008
Value(s) applied	Refer to Table 1 ~ Table 3 in Annex 3
Choice of data or measurement methods and procedures	The Caloric value of fuel using in calculating emission factor is from numerical values of Statistics of Electric Power in 2006, 2007, 2008 published by KEPCO.
Purpose of data	Calculation of Baseline emission
Additional comment	

Data/Parameter	$EF_{CO2,i,y}$
Data unit	tCO2/GJ
Description	Carbon Emission Factors for all fuels
Source of data	Calculated
Value(s) applied	Refer to Table 1 ~ Table 3 in Annex 3
Choice of data or measurement methods and procedures	The Carbon Emission Factors using in calculating emission factor is from numerical values of Statistics of Electric Power in 2006, 2007, 2008 published by KEPCO.
Purpose of data	Calculation of Baseline emission
Additional comment	

Data/Parameter	Carbon Oxidation Factors
Data unit	%
Description	Carbon Emission Factors for all fuels
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value(s) applied	Refer to Table B-2
Choice of data or measurement methods and procedures	The Carbon Oxidation Factors using in calculating emission factor is the values of '2006 IPCC Guidelines for National Greenhouse Gas Inventories' Volume2 Table 1.4
Purpose of data	Calculation of Baseline emission
Additional comment	To calculate OM and BM

Data/Parameter	$EF_{CO2,\ combined\ cycle\ power\ plant}$
Data unit	tCO2/MWh
Description	CO2 emission factor from Busan combined cycle power plant in year y.
Source of data	The value in the PDD is from Methodological tool: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation (Version 03.0)
Value(s) applied	1.3 tCO2/MWh
Choice of data or measurement methods and procedures	The project activity is to be supplied the electricity consumption sources from Busan combined cycle power plant. These combined cycle power plant are also connected to the National electricity grid. As per scenario C of the "Methodological tool: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation (Version 03.0)", the project activity applies to an emission factor of 1.3tCO2/MWh which used to project electricity consumption sources for Busan site only as a conservative simplification.
Purpose of data	Calculation of baseline emissions
Additional comment	

B.6.3. Ex ante calculation of emission reductions

>>

This project is generating electricity by small scale photovoltaic power plant and connecting to grid instead of using fossil fuel for abating greenhouse gas (GHG) emissions. The amount of GHG emissions are calculated according to the methodology AMS I.D

Baseline emissions

Baseline emissions of this project are calculated by multiplying the amount of this project electricity generation by the electricity Carbon Emission Factor which is calculated through the methodology

BEelectricity, y = *EGy* × EFgrid,CM, y
BEelectricity, y : the amount of Baseline emissions in year *y* (tCO2)
EGy : the amount of Total net electricity generation in year *y* (MWh)
EFgrid,CM, y: the Baseline Electricity CO2 Emissions Factor in year *y* (tCO2/MWh)

The capacity of Hadong PV project activity is 1.0MW, coefficient of utilization is 15% and internal consumption and loss of transfer is 5.0% and Busan PV project activity is 0.329MW, coefficient of utilization is 13.36% and internal consumption and loss of transfer is 5.0%.

Hadong PV EGy = 0.9984MWh × 24hrs/day × 365 days/yr × 0.15 × (1 – 0.05) = 1,246 MWh/yr,
Busan PV EGy=
(from 2010 to 2014) : 0.39MWh × 24hrs/day × 365 days/yr × 0.1336 × (1 – 0.05) = 434 MWh/yr,
(At 2015) : (0.39MWh × 24hrs/day × 31 days/yr × 0.1336 × (1 – 0.05))+(0.206MWh × 24hrs/day × (365- 31) days/yr × 0.1336 × (1 – 0.05))=246.41MWh/yr
(from 2016 to 2018): 0.206MWh × 24hrs/day × 365days/yr × 0.1336 × (1 – 0.05)= 229.03 MWh/yr
(from 2019 to 2020): 0.39MWh × 24hrs/day × 365 days/yr × 0.1336 × (1 – 0.05) = 434 MWh/yr

The amount of total net electricity generation by bundling photovoltaic power project is 1,600 MWh

BEelectricity, y = EGy × EFgrid,CM, y
= 1,600MWh/yr × 0.6417 tCO2/MWh
= 1,027 tCO2/yr.

Project emission
Because of there is no emission through small photovoltaic power project activity, amount of the emission is 0

Project leakage
This is not applicable as the renewable energy technology used is not equipment transferred from another activity. There for, as per the Simplified Procedures for SSC Project Activities no leakage calculation is required. The amount of Leakage is 0.

Ex-ante emission reduction
ER = Baseline emissions – Project emissions – Leakage
= 1,027 tCO2/yr – 0 tCO2/yr– 0 tCO2/yr
= 1,027 tCO2/yr.

B.6.4. Summary of ex ante estimates of emission reductions

Year	Baseline emissions (t CO_2e)	Project emissions (t CO_2e)	Leakage (t CO_2e)	Emission reductions (t CO_2e)
Year 1	1,078	0	0	1,078
Year 2	1,078	0	0	1,078
Year 3	1,078	0	0	1,078
Yea 4	1,078	0	0	1,078
Yea 5	958	0	0	958
Yea 6	947	0	0	947
Yea 7	947	0	0	947
Yea 8	947	0	0	947
Yea 9	1,078	0	0	1,078
Yea 10	1,078	0	0	1,078
Total	10,266	0	0	10,266
Total number of crediting years	10			
Annual average over the crediting period	1,027	0	0	1,027

B.7. Monitoring plan

B.7.1. Data and parameters to be monitored

(Copy this table for each piece of data or parameter.)

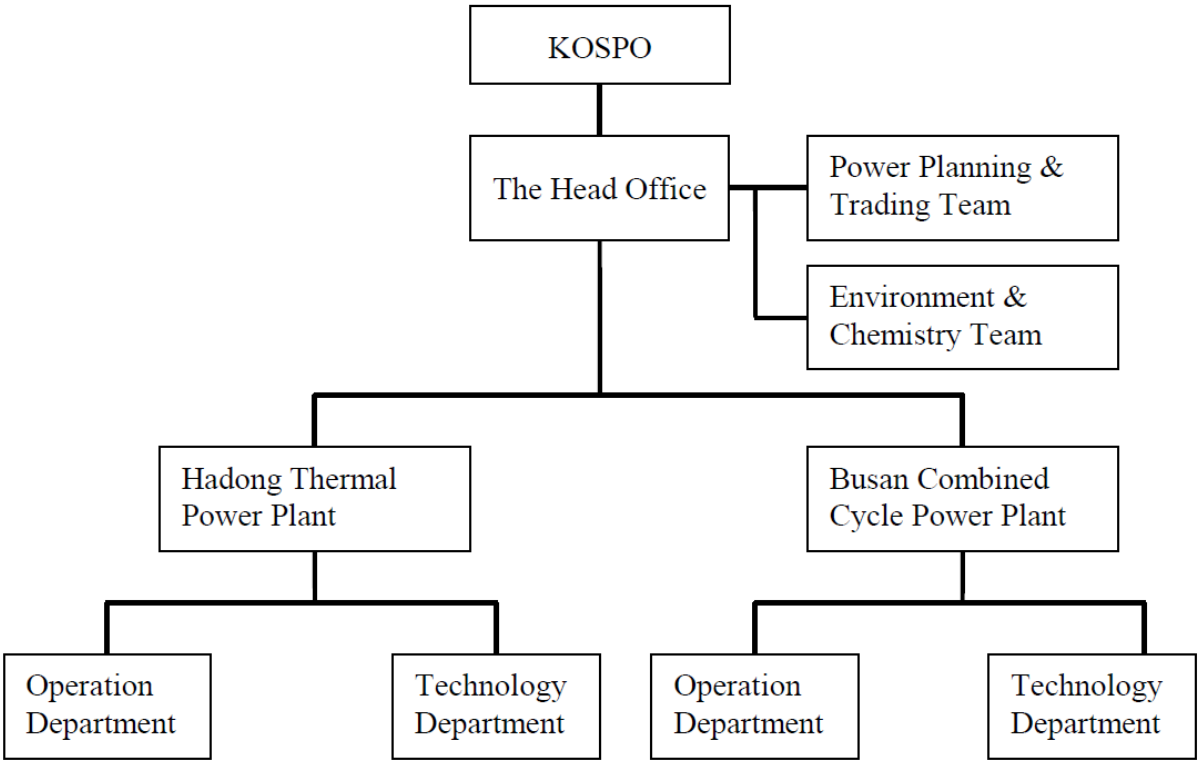
Data/Parameter	Electricity Quantity, EGy
Data unit	MWh
Description	Net Electricity supplied to the grid by renewable technology in the year y
Source of data	KOSPO
Value(s) applied	Measured value
Measurement methods and procedures	Electricity exported to grid by Hadong PV& Busan PV Power Plant is measured electronically by established meter hourly and sent to KPX.
Monitoring frequency	- Data will be measured hourly and recorded monthly.
QA/QC procedures	The meter was set up transparently in accordance with 'Law regarding measurement' and 'Act on operation of electricity market' and sealed after affirmation of KPX and KEPCO. Calibration frequency will be applied to 7years according to national standards in "Law regarding measurement" and "Act on operation of electricity market" because each capacity of Hadong•Busan project is less than 1MW. - In accordance with 'Act on operation of electricity market, exported meter of allowed error must be within ±0.5%, imported meter of allowed error must be within ±1.0%
Purpose of data	Calculation of baseline emissions
Additional comment	- Data will be measured hourly and recorded monthly. - Data will be kept for more than two years after the last issuance of CERs for this project activity in paper form and electric form. - Data will be aggregated monthly and yearly. - This data is only the amount of electricity generation except the electricity consumed in the plant and electricity imported for the project activity. - Electricity imported for the project in Busan photovoltaic power plant is imported from the Busan combined cycle power plant - Electricity imported for the project in Hadong photovoltaic power plant is imported from the KEPCO

B.7.2. Sampling plan

>>
N/A

B.7.3. Other elements of monitoring plan

>>
KOSPO have acquired ISO 9001. Currently KOSPO have established a systematic quality management system.
The remote operating and monitoring system of the PV Power Plant makes possible to audit and measure the data by sending electric characteristics such as power generation, voltage, electric current and frequency of photovoltaic generation of electric power to the main computer. It is also possible to audit and measure the data at a distant place by a LAN or a modem. Hadong& Busan PV Plant will be operated and monitored by KOSPO Hadong & Busan branch's operation teams through the remote operating and monitoring system. Since the project is a grid connected renewable energy project, emission reduction quantity depends on the units of energy generated from wind power based on power plant and exported to the grid. Based on the monitoring methodology of AMS I.D., the methodology covers monitoring of units exported and the other parameters affecting the quantity of power export and CO2 emissions thereof. The net emission reductions will result from the units of power supplied to the grid. The monitoring will be based on the framework shown below.



- Power Planning & Trading Team : Working group responsible for monitoring and recording,
- Environment & Chemistry : Working group responsible for Practical operation, monitoring, management and data collection of CDM.
- Operation Department : Working group responsible for monitoring and wattmeter operation,
- Technology Department : Working group responsible for wattmeter maintenance and calibration.

Quality control (QC) and quality assurance (QA) procedure

The monitoring plan has been developed based on approved methodology AMS I.D. and more details are as follows:

Monitoring equipment : wattmeter

Relevant laws and standards of Korea :
- Law regarding measurement,
- Act on the operation of electricity market.

Measuring method and frequency :
- The transmitted electricity rate will be electronically measured and transferred to Korea Power Exchange (KPX) and KOSPO so it is double check by both entities.
- The transmitted electricity rate is collected hourly and archived electronically.
- The data archived electronically will be kept at least for two years after the end of the last crediting period.

Contingency Plan :
- In case of measurement equipment trouble or data transferring error, the person in charge is responsible for prompt grasping the problem and restoring it in due course. Also the person in charge should report progress to the final decision maker and KPX.
-While restoring, KOSPO converts generated electricity rate which does not include internal consumption and transmission loss into transmitted electricity rate, and KPX verifies it.

Calibration of equipment

Exported meter
- Measurement equipment shall be electronic multipurpose exported meter of accuracy range ±0.5%.
- The exported meter of calibration frequency is specified in “Act on operation of electricity market”. If installed capacity is less than 1MW, Calibration is exempt from the rule

- But watt-hour meter of calibration frequency is applied to 7years according to “Law regarding measurement”
- This project of calibration frequency is decided to once in 7years according to “Law regarding measurement” because capacity of Hadong•Busan project is less than 1MW.

■ Act on operation of electricity market (sep 2015)

The measuring equipment inspection period is as below table.

Capacity	More than 1MW	Less than 1MW
Test Period	3 years 6 months ±6months	Exemption

Imported meter
- Imported meter of accuracy range must be within ±1.0%
(In accordance with ‘Act on operation of electricity market’, allowable error for electricity meter can be within ± 2.0%, if equipment capacity is less than 500kW and can be within ± 1.0%, if equipment capacity is more than 500kW or less than 10,000kW. Busan·Hadong Project of capacity is less than 1,000kW, so imported meter of 1% allowable error is valid)- The watt-hour meter for electricity imported from the KEPCO and internal imported electricity will be calibrated 7years in accordance with “Law regarding measurement” in national standard

Internal monitor and training
- The measurement data are regularly monitored and checked by operation department. Also corrective actions are recorded and kept on file. The persons related to the monitoring are trained to be aware of the procedures of CDM project and the importance of monitoring.

SECTION C. Start date, crediting period type and duration

C.1. Start date of project activity

>>
The starting date of the project activity is as below:

Hadong Photovoltaic Power : 17 March 2008
Busan Photovoltaic Power : 26 March 2008

Each starting date chosen is the date when the contract for construction of the plant was signed, and is therefore the date when the implementation of the project activity begins.

C.2. Expected operational lifetime of project activity

>>
The Hadong and Busan PV power project will have the operational lifetime of approximately 20 years.

C.3. Crediting period of project activity

C.3.1. Type of crediting period

>>
Fixed

C.3.2. Start date of crediting period

>>
18/12/2010

C.3.3. Duration of crediting period

>>
18/12/2010 ~ 17/12/2020

SECTION D. Environmental impacts

D.1. Analysis of environmental impacts

>>
According to the Korean Environmental Law (the Act on Assessment of Impacts of Works on Environmental, Traffic, and Disasters), the project participant has to perform EIA(Environmental Impact Assessment) if the capacity of photovoltaic power plant is more than 100,000kW. Since the capacity of Hadong PV power is 1,000 kW and the capacity of Busan PV power is 390 kW, their activities do not necessarily require EIA.

Busan PV power plant had not undertaken EIA because the capacity of its facility, built at the parking lot of Pusan thermal power plant, was under the level requiring EIA by MKE(Ministry of Knowledge, and Economy). However, Hadong PV power plant had entered into EIA for the amendment of existing power plant usage conditions and acquired permission by MKE. MKE admitted the usage change of real estate by the results of EIA.

In addition, because this project does not emit any air pollutants and GHGs unlike other fossil fuel power generations, this project is sure to be the project which helps to improve its environment.

D.2. Environmental impact assessment

>>
No significant negative environmental impact is expected from this project activities

SECTION E. Local stakeholder consultation

E.1. Modalities for local stakeholder consultation

>>
The stakeholders of this project are the government, local resident, workers and so on. The KOSPO informs about the CDM and collects opinions of the stakeholder through the KOSPO website on March 2008.

< Figure E.1> PV NEWs on KOSPO Website (2008. 2, http://www.kospo.co.kr/)

< Figure E.2> PV NEWs on Young-Shin Website (2007. 10, http://solrapower.com/)

E.2. Summary of comments received

>>

Hadong PV power plant was built in the idle area of Hadong power plant while Busan PV power plant was built in the parking area of Busan power plant. The local governments of Kyungsangnam Do and Busan Metropolitan City have aggressively supported their respective PV power generation project as a typical example of new & renewable energy policy.

Meanwhile, regarding the announcement of the project, there were no questions or opinions received on the proposed project.

< Figure E.3> Meeting of environmental committee for PV power (2008.12, http://www.kumnam.or.kr/)

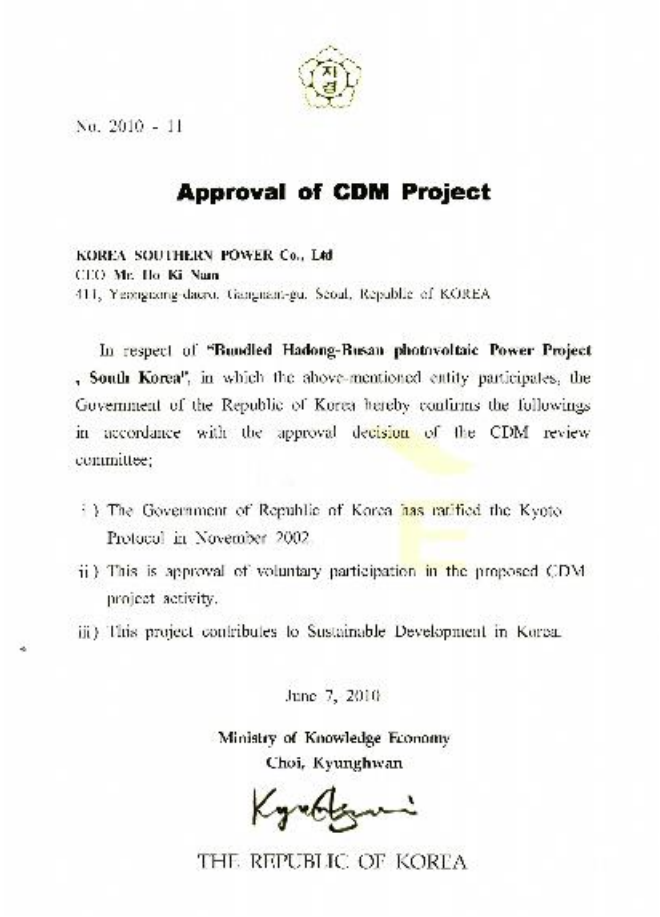
E.3. Consideration of comments received

>>

Not available

SECTION F. Approval and authorization

>>



No. 2010 - 11

Approval of CDM Project

KOREA SOUTHERN POWER Co., Ltd
CEO Mr. Ho Ki Nam
411, Yeongdong-daero, Gangnam-gu, Seoul, Republic of KOREA

In respect of **"Bundled Hadong-Busan photovoltaic Power Project , South Korea"**, in which the above-mentioned entity participates, the Government of the Republic of Korea hereby confirms the followings in accordance with the approval decision of the CDM review committee;

i) The Government of Republic of Korea has ratified the Kyoto Protocol in November 2002

ii) This is approval of voluntary participation in the proposed CDM project activity.

iii) This project contributes to Sustainable Development in Korea.

June 7, 2010

Ministry of Knowledge Economy
Choi, Kyunghwan

THE REPUBLIC OF KOREA

Appendix 1. Contact information of project participants

Organization name	Korea Southern Power Co., Ltd.
Country	Republic of Korea
Address	
Telephone	82-70-7713-8440
Fax	82-70-7713-8274
E-mail	ych1648@kospo.co.kr
Website	
Contact person	

Appendix 2. Affirmation regarding public funding

This project will not receive any public funding

Appendix 3. Applicability of methodologies and standardized baselines

Mentioned in the concerned section of the PD

Appendix 4. Further background information on ex ante calculation of emission reductions

BASELINE INFORMATION

According to “tool to calculate the emission factor for an electricity system”, operational margin and build margin can be calculated as below:

The baseline is the kWh produced by the renewable generating unit multiplied by an emission coefficient (measured in kg CO2equ/kWh) calculated in a transparent and conservative manner as a combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in “tool to calculate the emission factor for an electricity system”. Any of the four procedures to calculate the operating margin can be chosen, but the restrictions to use the Simple OM and the Average OM calculations must be considered.

1. Operational Margin emission factor
According to “tool to calculate the emission factor for an electricity system”, dispatch data analysis should be the first methodological choice for OM emission factor. But, in Korea, dispatch data of the grid is not available. Thus this dispatch data analysis is not selected as a emission factor. Here, Simple OM method is selected for calculating emission factor. As indicated in “tool to calculate the emission factor for an electricity system”, the Simple OM method can only be used where low-cost/must run resources constitute less than 50% of total grid generation in: 1) average of the five most recent years, or 2) based on long-term normal for hydroelectricity production.

The ratio must run/low cost resources constitute of total grid

	2004	2005	2006	2007	2008
Hydro generation(MWh)	5,861	5,189	5,218	5,042	5,563
Anthracite Coal(Dom.)(MWh)	4,603	4,484	4,312	4,470	5,510
Nuclear generation(MWh)	130,715	146,779	148,749	142,937	150,958
Alternative generation(MWh)	350	404	511	829	1,092
Net generation of must run/low cost resources	141,529	156,856	158,790	153,278	162,623
Total Net generation(MWh)	342,148	364,638	381,181	403,125	422,355
The ratio must run/low cost resources constitute of total grid(%)	41.36	43.02	41.66	38.02	38.50

As above, in average of the five most recent years, low-cost/must run resources constitute less than 50% of total grid generation in Korea. Thus Simple OM is appropriate method for OM emission factor.

2. Build Margin emission factor

According to "*tool to calculate the emission factor for an electricity system*", Build Margin emission factor $EF_{BM,y}$ can be calculated 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 m consists of either the five power plants that have been built most recently, or the power plant capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently. Project participants should use from these two options that sample group that comprises the larger annual generation.

	The power plant capacity additions in the electricity system that comprise 20% of the system generation	Capacity of five power plants that have been built most recently	Total electricity supplied to the grid in 2008
Net generation(MWh)	82,412,683	4,813,650	404,424,813
% of total electricity supplied to the grid	20.38	1.19	-
Selected	◎		-

In calculating the BM, emission factor of the power plant capacity additions in the electricity system that comprise 20% of the system generation is selected because the power plant capacity additions in the electricity system that comprise 20% of the system generation is larger than plant capacity five power plants that have been built most recently.

Key Parameter and data sources

	Key parameter	Data Source
1	Generation data for all plants for the year 2006-2008	KEPCO 2007, Statistics of Electric Power in 2006 KEPCO 2008, Statistics of Electric Power in 2007 KEPCO 2009, Statistics of Electric Power in 2008
2	fuel consumption data	KEPCO 2007, Statistics of Electric Power in 2006 KEPCO 2008, Statistics of Electric Power in 2007 KEPCO 2009, Statistics of Electric Power in 2008
3	Calorific value of fuel	KEPCO 2007, Statistics of Electric Power in 2006 KEPCO 2008, Statistics of Electric Power in 2007 KEPCO 2009, Statistics of Electric Power in 2008
4	Oxidation Factors	IPCC, Revised 2006 IPCC Guidelines for National Greenhouse Gas Inventories
5	Generation facility of Korea	KPX 2009, Statistics of Electricity Generation facility.

Table 1. Operation Margin 2006

No.	Fuel Type	Plant		Amount of fossil fuel($FC_{i,m,y}$)				Net Caloric value($NCV_{i,y}$)				Electricity generation ($EG_{m,y}$)	CO_2 Emission by fuel					Results
				Coal (t)	Heavy oil (kl)	Diesel oil (kl)	L. N. G (t)	Coal (kcal/kg)	Heavy oil (kcal/l)	Diesel oil (kcal/l)	L. N. G (kcal/kg)	(MWh)	Coal (tonCO2/yr)	Heavy oil (tonCO2/yr)	Diesel oil (tonCO2/yr)	L. N. G (tonCO2/yr)	Total (tonCO2/yr)	EF for each plant (tonCO2eq./MWh)
1	bituminous coal	Honam	#1	781,139	1,113	279		5,164	9,318	8,472		1,622,639	1,511,497	3,279	718	-	1,515,494	0.9340
2			#2	859,736	1,251	359		5,137	9,332	8,426		1,782,016	1,654,942	3,689	920	-	1,659,551	0.9313
3		Samchonpo	#1	1,696,271		860		5,640		8,373		4,161,219	3,584,812	-	2,188	-	3,587,000	0.8620
4			#2	1,508,082		1,362		5,645		8,373		3,703,880	3,190,202	-	3,467	-	3,193,669	0.8622
5			#3	1,519,385		457		5,565		8,373		3,779,585	3,168,627	-	1,164	-	3,169,792	0.8387
6			#4	1,521,263		1,818		5,568		8,363		3,816,997	3,174,190	-	4,622	-	3,178,811	0.8328
7			#5	1,665,339		977		4,974		8,550		3,761,205	3,104,021	-	2,539	-	3,106,560	0.8259
8			#6	1,770,348		428		4,993		8,550		4,065,091	3,312,004	-	1,113	-	3,313,117	0.8150
9		Yonghung	#1	2,004,193		2,548		5,768		8,447		5,337,432	4,332,042	-	6,543	-	4,338,586	0.8129
10			#2	2,129,118		2,545		5,782		8,454		5,727,937	4,612,955	-	6,539	-	4,619,495	0.8065
11		Boryeong	#1	1,638,140		306		5,479		8,412		3,988,848	3,363,434	-	782	-	3,364,216	0.8434
12			#2	1,389,425		1,137		5,478		8,496		3,423,101	2,852,112	-	2,936	-	2,855,048	0.8341
13			#3	1,323,779		514		5,552		8,496		3,409,486	2,754,196	-	1,327	-	2,755,523	0.8082
14			#4	1,610,928		82		5,533		8,496		4,133,946	3,339,871	-	212	-	3,340,083	0.8080
15			#5	1,296,455		541		5,552		8,312		3,364,148	2,697,377	-	1,367	-	2,698,744	0.8022
16			#6	1,553,273		518		5,542		8,312		3,987,488	3,225,608	-	1,309	-	3,226,916	0.8093
17		Taean	#1	1,354,832		514		5,683		8,312		3,556,797	2,885,329	-	1,299	-	2,886,628	0.8116
18			#2	1,532,209		162		5,679		7,952		4,035,753	3,260,769	-	392	-	3,261,161	0.8081
19			#3	1,338,967		575		5,684		8,216		3,528,613	2,851,709	-	1,437	-	2,853,146	0.8086
20			#4	1,548,909		133		5,680		8,232		4,069,820	3,296,777	-	332	-	3,297,109	0.8101
21			#5	1,542,775		544		5,638		8,232		4,013,235	3,259,204	-	1,362	-	3,260,566	0.8125
22			#6	1,294,577		1,113		5,662		8,232		3,381,867	2,746,851	-	2,784	-	2,749,635	0.8131
23			#7	61,910		4,799		5,667		8,130		159,677	131,462	-	11,860	-	143,322	0.8976
24		Hadong	#1	1,373,049		515		5,670		8,396		3,607,063	2,917,409	-	1,313	-	2,918,722	0.8092
25			#2	1,543,074		293		5,662		8,482		4,068,036	3,273,588	-	755	-	3,274,344	0.8049
26			#3	1,549,094		153		5,660		8,481		4,079,158	3,285,640	-	395	-	3,286,035	0.8056
27			#4	1,376,612		796		5,671		8,384		3,631,374	2,925,179	-	2,029	-	2,927,208	0.8061
28			#5	1,554,524		242		5,665		8,466		4,092,625	3,300,081	-	622	-	3,300,703	0.8065
29			#6	1,371,801		690		5,669		8,456		3,610,222	2,914,047	-	1,773	-	2,915,820	0.8077
30		Dangjin	#1	1,380,527		966		5,588		8,526		3,598,820	2,890,860	-	2,504	-	2,893,364	0.8040
31			#2	1,570,077		161		5,611		8,529		4,115,891	3,301,079	-	417	-	3,301,496	0.8021
32			#3	1,402,916		433		5,592		8,556		3,666,490	2,939,482	-	1,127	-	2,940,609	0.8020
33			#4	1,386,317		1,549		5,581		8,564		3,610,984	2,899,382	-	4,032	-	2,903,414	0.8041
34			#5	1,456,458		745		5,743		8,507		3,946,931	3,134,571	-	1,927	-	3,136,498	0.7947
35			#6	1,216,582		3,051		5,814		8,450		3,392,395	2,650,276	-	7,836	-	2,658,112	0.7836
36			#7	1,008		505		5,527		8,535		1,474	2,088	-	1,310	-	3,398	2.3058
37	heavy oil	Ulsan	#1		72,243	605			9,419	8,664		275,016	-	215,094	1,594	-	216,688	0.7879
38			#2		80,187	469			9,427	8,664		306,668	-	238,938	1,236	-	240,174	0.7832
39			#3		96,459	518			9,423	8,664		376,132	-	287,319	1,365	-	288,684	0.7675
40			#4		360,919	3,729			9,529	8,664		1,511,557	-	1,087,113	9,822	-	1,096,934	0.7257
41			#5		375,985	3,678			9,531	8,664		1,583,846	-	1,132,808	9,687	-	1,142,494	0.7213
42			#6		378,331	3,694			9,533	8,664		1,589,838	-	1,140,064	9,728	-	1,149,792	0.7232

43		Yeongnam	#1		107,090	1,016			9,631	8,403		359,205	-	326,028	2,595	-	328,623	0.9149
44			#2		95,127	1,494			9,605	8,419		323,595	-	288,806	3,823	-	292,629	0.9043
45		Yeosu	#1		99,129	281			9,465	8,358		403,547	-	296,580	715	-	297,295	0.7367
46			#2		215,957	291			9,456	8,356		906,849	-	645,508	740	-	646,248	0.7126
47		Pyeongtaek	#1		261,458	141	3,997		9,222	8,496	11,647	1,123,948	-	762,173	364	10,583	773,121	0.6879
48			#2		277,025	166	5,687		9,233	8,496	11,647	1,198,620	-	808,551	428	15,058	824,037	0.6875
49			#3		303,858	134	3,891		9,260	8,501	11,573	1,304,568	-	889,398	347	10,237	899,982	0.6899
50			#4		245,602	103	3,473		9,208	8,501	11,667	1,052,228	-	714,900	267	9,211	724,377	0.6884
51		Namjeju	#1		11,406	17			9,413	8,525		34,448	-	33,935	44	-	33,980	0.9864
52			#2		9,772	14			9,412	8,504		28,686	-	29,074	36	-	29,110	1.0148
53			#3		46,504	2,509			9,403	8,491		179,033	-	138,225	6,475	-	144,701	0.8082
54		Jeju	#1		8,603	23			9,377	8,429		24,748	-	25,501	59	-	25,560	1.0328
55			#2		113,679	64			9,454	8,524		462,023	-	339,737	165	-	339,902	0.7357
56			#3		117,464	67			9,455	8,524		479,676	-	351,072	173	-	351,244	0.7323
57	LNG	Seoul	#4			1	69,383			8,617	11,716	306,558	-	-	2	184,805	184,807	0.6028
58			#5			1	152,891			8,617	11,594	685,011	-	-	2	402,999	403,001	0.5883
59		Incheon	#1				6,945				11,733	32,932	-	-	-	18,524	18,524	0.5625
60			#2				5,223				11,725	24,366	-	-	-	13,923	13,923	0.5714
61			#3			311	15,426			8,533	11,716	78,669	-	-	805	41,088	41,893	0.5325
62			#4			311	12,454			8,532	11,722	62,414	-	-	806	33,187	33,993	0.5446
63	Combined Cycle	Pyongtaek C/C	C/C			45	84,054			8,503	11,727	497,441	-	-	116	224,084	224,200	0.4507
64		Ilsan	C/C			1,384	556,504			8,540	11,715	3,038,165	-	-	3,592	1,482,157	1,485,750	0.4890
65		Bundang	C/C				720,381				11,723	4,059,300	-	-	-	1,919,865	1,919,865	0.4730
66		Ulsan	C/C				536,196				11,381	3,608,435	-	-	-	1,387,386	1,387,386	0.3845
67		Seoincheon	C/C			1,066	1,199,196			8,740	11,723	8,726,521	-	-	2,831	3,195,987	3,198,818	0.3666
68		Shinincheon	C/C				1,641,038				11,723	11,797,500	-	-	-	4,373,491	4,373,491	0.3707
69		Boryeong	C/C				998,683				11,730	7,089,662	-	-	-	2,663,316	2,663,316	0.3757
70		Incheon	C/C				484,606				11,698	3,648,288	-	-	-	1,288,826	1,288,826	0.3533
71		Busan	C/C				1,396,417				11,716	10,455,401	-	-	-	3,719,328	3,719,328	0.3557
72		Hallim	C/C			48,475				8,506		175,356	-	-	125,330	-	125,330	0.7147
73		Anyang	C/C				230,969				11,726	1,286,480	-	-	-	615,699	615,699	0.4786
74		Bucheon	C/C			215	225,713			10,381	11,711	1,241,795	-	-	679	600,967	601,646	0.4845
75		POSCO POWER	C/C				408,018				11,728	2,338,128	-	-	-	1,087,850	1,087,850	0.4653
76		G S Bugog	C/C				389,811				11,727	2,911,683	-	-	-	1,039,246	1,039,246	0.3569
77		Yulchon	C/C				315,132				12,039	2,276,276	-	-	-	862,481	862,481	-
78	Internal combustion	Namjeju	D/P		51,347	111			9,734	8,462		239,690	-	157,984	286	-	158,270	0.6603
79		Jeju	G/T			8,264				8,352		15,986	-	-	20,979	-	20,979	1.3123
80		Jeju	D/P		52,907				9,136			252,764	-	152,798	-	-	152,798	0.6045
total				**50,123,092**	**3,383,417**	**111,869**	**9,466,086**					**206,605,293**	**104,743,673**	**10,068,574**	**288,345**	**25,200,298**	**140,300,889**	**0.6791**

Table 2. Operation Margin 2007

No.	Fuel Type	Plant	Amount of fossil fuel($FC_{i,m,y}$)				Net Caloric value($NCV_{i,y}$)				Electricity generation ($EG_{m,y}$)	CO_2 Emission by fuel					Results
			Coal (t)	Heavy oil (kl)	Diesel oil (kl)	L. N. G (t)	Coal (kcal/kg)	Heavy oil (kcal/l)	Diesel oil (kcal/l)	L. N. G (kcal/kg)	(MWh)	Coal (tonCO2/yr)	Heavy oil (tonCO2/yr)	Diesel oil (tonCO2/yr)	L. N. G (tonCO2/yr)	Total (tonCO2/yr)	EF for each plant (tonCO2eq./MWh)

1		Honam	#1	866,853	889	281		5,186	9,311	8,497		1,806,765	1,684,708	2,616	727	-	1,688,051	0.9343
2			#2	846,931	811	262		5,190	9,311	8,493		1,773,852	1,647,152	2,386	677	-	1,650,214	0.9303
3		Samchonpo	#1	1,631,706		296		5,545		8,373		3,903,591	3,390,302	-	752	-	3,391,054	0.8687
4			#2	1,804,695		384		5,537		8,373		4,398,382	3,744,262	-	976	-	3,745,239	0.8515
5			#3	1,755,374		434		5,525		8,349		4,311,704	3,634,298	-	1,101	-	3,635,399	0.8431
6			#4	1,543,140		677		5,540		8,349		3,840,729	3,203,269	-	1,718	-	3,204,988	0.8345
7			#5	1,850,764		315		4,865		8,550		4,074,103	3,374,253	-	818	-	3,375,071	0.8284
8			#6	1,714,320		619		4,864		8,550		3,823,174	3,124,719	-	1,608	-	3,126,326	0.8177
9		Yonghung	#1	1,902,557		3,320		5,745		8,391		5,020,901	4,095,760	-	8,469	-	4,104,229	0.8174
10			#2	2,296,289		1,779		5,739		8,457		6,081,490	4,938,455	-	4,573	-	4,943,029	0.8128
11			#3	119,883		3,964		5,822		7,878		320,502	261,554	-	9,491	-	271,045	0.8457
12			#4										-	-	-	-	-	
13		Boryeong	#1	1,466,761		811		5,519		8,496		3,604,642	3,033,357	-	2,094	-	3,035,451	0.8421
14			#2	1,655,488		169		5,515		8,496		4,120,511	3,420,910	-	435	-	3,421,345	0.8303
15			#3	1,648,008		187		5,518		8,655		4,214,892	3,407,839	-	492	-	3,408,331	0.8086
16			#4	1,347,303		646		5,513		8,944		3,438,773	2,783,471	-	1,755	-	2,785,227	0.8099
17			#5	1,629,904		195		5,520		8,655		4,162,530	3,371,526	-	514	-	3,372,040	0.8101
18			#6	1,490,809		387		5,518		8,655		3,817,024	3,082,303	-	1,019	-	3,083,322	0.8078
19		Taean	#1	1,524,391		410		5,733		8,174		4,055,394	3,275,068	-	1,018	-	3,276,086	0.8078
20	bituminous coal		#2	1,434,221		374		5,733		8,387		3,796,670	3,081,205	-	954	-	3,082,158	0.8118
21			#3	1,521,349		350		5,734		8,388		4,039,811	3,268,930	-	892	-	3,269,821	0.8094
22			#4	1,320,380		422		5,727		7,963		3,504,214	2,833,460	-	1,021	-	2,834,481	0.8089
23			#5	1,342,358		676		5,686		8,361		3,523,988	2,860,103	-	1,719	-	2,861,822	0.8121
24			#6	1,535,931		491		5,695		8,347		4,036,733	3,277,922	-	1,246	-	3,279,169	0.8123
25			#7	1,430,171		2,321		5,717		8,044		3,868,817	3,063,817	-	5,676	-	3,069,493	0.7934
26			#8	919,055		3,636		5,722		7,256		2,528,587	1,970,443	-	8,020	-	1,978,464	0.7824
27		Hadong	#1	1,582,726		178		5,647		8,492		4,140,667	3,349,049	-	458	-	3,349,508	0.8089
28			#2	1,396,830		637		5,645		8,456		3,681,670	2,954,591	-	1,638	-	2,956,229	0.8030
29			#3	1,424,033		375		5,627		8,469		3,727,907	3,002,420	-	965	-	3,003,385	0.8056
30			#4	1,572,409		292		5,639		8,519		4,115,014	3,322,273	-	757	-	3,323,030	0.8075
31			#5	1,486,776		452		5,652		8,492		3,905,190	3,148,961	-	1,168	-	3,150,129	0.8067
32			#6	1,585,307		109		5,640		8,495		4,158,792	3,350,524	-	282	-	3,350,806	0.8057
33		Dangjin	#1	1,512,904		269		5,660		8,610		3,968,103	3,208,626	-	704	-	3,209,330	0.8088
34			#2	1,358,316		543		5,663		8,606		3,595,927	2,882,218	-	1,421	-	2,883,639	0.8019
35			#3	1,516,065		119		5,657		8,617		4,010,715	3,213,731	-	311	-	3,214,042	0.8014
36			#4	1,519,231		342		5,659		8,635		4,009,178	3,221,374	-	897	-	3,222,271	0.8037
37			#5	1,279,796		1,038		5,713		8,620		3,443,482	2,739,896	-	2,721	-	2,742,616	0.7965
38			#6	1,281,318		878		5,737		8,613		3,497,359	2,754,469	-	2,300	-	2,756,768	0.7882
39			#7	1,059,612		6,681		5,725		8,621		2,904,680	2,273,202	-	17,509	-	2,290,711	0.7886
40			#8	467,807		4,873		5,742		8,596		1,297,925	1,006,467	-	12,731	-	1,019,197	0.7853
41		Ulsan	#1		107,844	406			9,413	8,664		406,685	-	320,878	1,070	-	321,948	0.7916
42			#2		108,381	483			9,420	8,664		407,321	-	322,732	1,271	-	324,004	0.7955
43			#3		120,571	576			9,360	8,664		458,584	-	356,733	1,518	-	358,251	0.7812
44			#4		341,170	3,525			9,508	8,664		1,418,034	-	1,025,384	9,284	-	1,034,668	0.7296
45			#5		370,712	4,711			9,511	8,664		1,540,400	-	1,114,502	12,407	-	1,126,909	0.7316
46	heavy oil		#6		216,409	3,021			9,502	8,664		899,604	-	650,001	7,957	-	657,958	0.7314
47		Yeongnam	#1		174,082	1,232			9,643	8,402		688,935	-	530,622	3,145	-	533,767	0.7748
48			#2		122,249	796			9,643	8,403		474,475	-	372,630	2,033	-	374,663	0.7896
49		Yeosu	#1		121,572	332			9,464	8,368		497,053	-	363,690	845	-	364,535	0.7334
50			#2		257,420	367			9,462	8,370		1,071,405	-	769,909	934	-	770,843	0.7195
51		Pyeongtaek	#1		269,284	114	3,316		9,445	8,534	11,650	1,147,515	-	803,977	295	8,783	813,055	0.7085
52			#2		359,870	140	6,339		9,448	8,530	11,653	1,553,162	-	1,074,808	364	16,792	1,091,965	0.7031

53			#3		349,481	157	4,874		9,447	8,518	11,650	1,502,099	-	1,043,650	407	12,909	1,056,966	0.7037
54			#4		255,443	117	4,047		9,460	8,517	11,651	1,095,986	-	763,845	304	10,721	774,869	0.7070
55		Namjeju	#1									-	-	-	-	-	-	
56			#2									-	-	-	-	-	-	
57			#3		124,559	225			9,411	8,201		484,459	-	370,564	562	-	371,125	0.7661
58			#4		127,900	341			9,410	8,515		500,222	-	380,429	882	-	381,312	0.7623
59		Jeju	#1		1,049	4			9,412	8,458		3,019	-	3,122	11	-	3,133	1.0379
60			#2		70,122	112			9,420	7,906		280,454	-	208,806	269	-	209,075	0.7455
61			#3		98,846	34			9,419	8,490		396,186	-	294,291	89	-	294,380	0.7430
62	L.NG	Seoul	#4			1	75,080			7,411	11,727	357,572	-	-	3	200,172	200,175	0.5598
63			#5			1	206,908			8,617	11,727	962,861	-	-	4	551,613	551,617	0.5729
64		Incheon	#1				30,402				11,727	148,821	-	-	-	81,054	81,054	0.5446
65			#2				31,528				11,730	157,042	-	-	-	84,077	84,077	0.5354
66			#3			354	41,270			8,514	11,730	205,530	-	-	916	110,059	110,975	0.5399
67			#4			201	18,892			8,483	11,730	95,143	-	-	519	50,381	50,901	0.5350
68		Bundang	fuel cell				313				11,673	1,959	-	-	-	831	831	0.4243
69	Combined Cycle	Pyongtaek C/C	C/C			67	151,414			8,503	11,739	909,449	-	-	173	404,098	404,271	0.4445
70		Ilsan	C/C				635,260				11,725	3,506,350	-	-	-	1,693,418	1,693,418	0.4830
71		Bundang	C/C			3	660,899			8,716	11,728	3,741,296	-	-	8	1,762,091	1,762,099	0.4710
72		Ulsan	C/C				649,494				11,610	4,383,453	-	-	-	1,714,248	1,714,248	0.3911
73		Seoincheon	C/C				1,495,687				11,739	10,895,505	-	-	-	3,991,580	3,991,580	0.3664
74		Shinincheon	C/C				1,761,001				11,735	12,533,994	-	-	-	4,698,040	4,698,040	0.3748
75		Boryeong	C/C				1,121,251				11,735	7,839,371	-	-	-	2,991,344	2,991,344	0.3816
76		Incheon	C/C				494,690				11,726	3,696,784	-	-	-	1,318,811	1,318,811	0.3567
77		Busan	C/C				1,552,997				11,727	11,616,221	-	-	-	4,140,385	4,140,385	0.3564
78		Hallim	C/C			17,753				8,533		61,752	-	-	46,045	-	46,045	0.7457
79		Anyang	C/C				289,384				11,741	1,615,090	-	-	-	772,460	772,460	0.4783
80		Bucheon	C/C				269,651				11,898	1,523,068	-	-	-	729,393	729,393	0.4789
81		POSCO POWER	C/C				660,445				11,756	3,788,598	-	-	-	1,765,182	1,765,182	0.4659
82		G S Bugog	C/C				371,586				11,734	2,767,811	-	-	-	991,283	991,283	0.3581
83		Yulchon	C/C				292,336				11,732	2,083,451	-	-	-	779,747	779,747	0.3743
84		Kwangyang	C/C															
85	Internal combustion	Namjeju	D/P		35,297	238			9,419	8,323		164,390	-	105,097	602	-	105,699	0.6430
86		Jeju	G/T			850				8,447		1,294	-	-	2,181	-	2,181	1.6864
87		Jeju	D/P		49,613				9,396			235,626	-	147,354	-	-	147,354	0.6254
total				**55,641,771**	**3,683,575**	**76,359**	**10,829,064**					**230,642,413**	**116,256,886**	**11,028,025**	**195,727**	**28,879,474**	**156,360,113**	**0.6779**

Table 3. Operation Margin 2008

No.	Fuel Type	Plant		Amount of fossil fuel($FC_{i,m,y}$)				Net Caloric value($NCV_{i,y}$)				Electricity generation ($EG_{m,y}$)	CO_2 Emission by fuel					Results
				Coal (t)	Heavy oil (kl)	Diesel oil (kl)	L. N. G (t)	Coal (kcal/kg)	Heavy oil (kcal/l)	Diesel oil (kcal/l)	L. N. G (kcal/kg)	(MWh)	Coal (tonCO2/yr)	Heavy oil (tonCO2/yr)	Diesel oil (tonCO2/yr)	L. N. G (tonCO2/yr)	Total (tonCO2/yr)	EF for each plant (tonCO2eq./MWh)
1	bituminous coal	Honam	#1	866,853	889	281		5,186	9,311	8,497		1,806,765	1,684,708	2,616	727	-	1,688,051	0.9343
2			#2	846,931	811	262		5,190	9,311	8,493		1,773,852	1,647,152	2,386	677	-	1,650,214	0.9303
3		Samchonpo	#1	1,631,706		296		5,545		8,373		3,903,591	3,390,302	-	752	-	3,391,054	0.8687

4			#2	1,804,695		384		5,537		8,373		4,398,382	3,744,262	-	976	-	3,745,239	0.8515
5			#3	1,755,374		434		5,525		8,349		4,311,704	3,634,298	-	1,101	-	3,635,399	0.8431
6			#4	1,543,140		677		5,540		8,349		3,840,729	3,203,269	-	1,718	-	3,204,988	0.8345
7			#5	1,850,764		315		4,865		8,550		4,074,103	3,374,253	-	818	-	3,375,071	0.8284
8			#6	1,714,320		619		4,864		8,550		3,823,174	3,124,719	-	1,608	-	3,126,326	0.8177
9		Yonghung	#1	1,902,557		3,320		5,745		8,391		5,020,901	4,095,760	-	8,469	-	4,104,229	0.8174
10			#2	2,296,289		1,779		5,739		8,457		6,081,490	4,938,455	-	4,573	-	4,943,029	0.8128
11			#3	119,883		3,964		5,822		7,878		320,502	261,554	-	9,491	-	271,045	0.8457
12			#4										-	-	-	-	-	
13		Boryeong	#1	1,466,761		811		5,519		8,496		3,604,642	3,033,357	-	2,094	-	3,035,451	0.8421
14			#2	1,655,488		169		5,515		8,496		4,120,511	3,420,910	-	435	-	3,421,345	0.8303
15			#3	1,648,008		187		5,518		8,655		4,214,892	3,407,839	-	492	-	3,408,331	0.8086
16			#4	1,347,303		646		5,513		8,944		3,438,773	2,783,471	-	1,755	-	2,785,227	0.8099
17			#5	1,629,904		195		5,520		8,655		4,162,530	3,371,526	-	514	-	3,372,040	0.8101
18			#6	1,490,809		387		5,518		8,655		3,817,024	3,082,303	-	1,019	-	3,083,322	0.8078
19			#7	1,524,391		410		5,733		8,174		4,055,394	3,275,068	-	1,018	-	3,276,086	0.8078
20			#8	1,434,221		374		5,733		8,387		3,796,670	3,081,205	-	954	-	3,082,158	0.8118
21		Taean	#1	1,521,349		350		5,734		8,388		4,039,811	3,268,930	-	892	-	3,269,821	0.8094
22			#2	1,320,380		422		5,727		7,963		3,504,214	2,833,460	-	1,021	-	2,834,481	0.8089
23			#3	1,342,358		676		5,686		8,361		3,523,988	2,860,103	-	1,719	-	2,861,822	0.8121
24			#4	1,535,931		491		5,695		8,347		4,036,733	3,277,922	-	1,246	-	3,279,169	0.8123
25			#5	1,430,171		2,321		5,717		8,044		3,868,817	3,063,817	-	5,676	-	3,069,493	0.7934
26			#6	919,055		3,636		5,722		7,256		2,528,587	1,970,443	-	8,020	-	1,978,464	0.7824
27			#7	1,582,726		178		5,647		8,492		4,140,667	3,349,049	-	458	-	3,349,508	0.8089
28			#8	1,396,830		637		5,645		8,456		3,681,670	2,954,591	-	1,638	-	2,956,229	0.8030
29		Hadong	#1	1,424,033		375		5,627		8,469		3,727,907	3,002,420	-	965	-	3,003,385	0.8056
30			#2	1,572,409		292		5,639		8,519		4,115,014	3,322,273	-	757	-	3,323,030	0.8075
31			#3	1,486,776		452		5,652		8,492		3,905,190	3,148,961	-	1,168	-	3,150,129	0.8067
32			#4	1,585,307		109		5,640		8,495		4,158,792	3,350,524	-	282	-	3,350,806	0.8057
33			#5	1,512,904		269		5,660		8,610		3,968,103	3,208,626	-	704	-	3,209,330	0.8088
34			#6	1,358,316		543		5,663		8,606		3,595,927	2,882,218	-	1,421	-	2,883,639	0.8019
35			#7	1,516,065		119		5,657		8,617		4,010,715	3,213,731	-	311	-	3,214,042	0.8014
36		Dangjin	#1	1,519,231		342		5,659		8,635		4,009,178	3,221,374	-	897	-	3,222,271	0.8037
37			#2	1,279,796		1,038		5,713		8,620		3,443,482	2,739,896	-	2,721	-	2,742,616	0.7965
38			#3	1,281,318		878		5,737		8,613		3,497,359	2,754,469	-	2,300	-	2,756,768	0.7882
39			#4															
40			#5	1,059,612		6,681		5,725		8,621		2,904,680	2,273,202	-	17,509	-	2,290,711	0.7886
41			#6															
42			#7															
43			#8	1,494,311		314		5,566		8,543		3,992,732	3,116,405	0	816	0	3,117,221	0.7807
44	heavy oil	Ulsan	#1		30,689	565			9,439	8,635		114,753	-	91,572	1,484	-	93,056	0.8109
45			#2		29,228	562			9,444	8,664		108,931	-	87,251	1,481	-	88,731	0.8146
46			#3		32,541	480			9,440	8,664		123,706	-	97,107	1,265	-	98,373	0.7952
47			#4		228,138	4,016			9,516	8,662		945,479	-	686,216	10,573	-	696,789	0.7370
48			#5		163,748	2,965			9,530	8,662		678,426	-	493,278	7,806	-	501,085	0.7386
49			#6		225,645	3,757			9,513	8,662		937,531	-	678,536	9,891	-	688,427	0.7343
50		Yeongnam	#1		59,763	1,476			9,674	8,446		229,316	-	182,762	3,789	-	186,551	0.8135
51			#2		40,030	802			9,676	8,450		149,357	-	122,439	2,061	-	124,500	0.8336
52		Yeosu	#1		32,576	202			9,449	8,352		130,854	-	97,302	514	-	97,816	0.7475
53			#2		111,854	341			9,447	8,352		454,052	-	334,034	866	-	334,899	0.7376
54		Pyeongtaek	#1		91,937	77	2,562		9,423	8,525	11,592	386,361	-	273,857	200	6,751	280,808	0.7268
55			#2		125,789	90	4,744		9,430	8,532	11,663	534,121	-	374,941	233	12,580	387,754	0.7260

56			#3		135,720	145	4,232		9,426	8,456	11,615	576,432	-	404,399	371	11,174	415,944	0.7216
57			#4		86,454	100	3,020		9,418	8,522	11,661	365,269	-	257,370	258	8,006	265,634	0.7272
58		Namjeju	#1									-	-	-	-	-	-	
59			#2									-	-	-	-	-	-	
60			#3		132,984	146			9,415	8,555		559,817	-	395,789	379	-	396,168	0.7077
61			#4		119,301	127			9,356	8,557		517,866	-	352,819	331	-	353,151	0.6819
62		Jeju	#1									-	-	-	-	-	-	
63			#2		84,258	81			9,423	8,490		336,676	-	250,983	209	-	251,192	0.7461
64			#3		89,652	101			9,421	8,490		357,666	-	266,988	260	-	267,248	0.7472
65	L.NG	Seoul	#4			1	55,095			8,617	11,739	258,052	-	-	2	147,032	147,034	0.5698
66			#5			-	138,068			8,609	11,734	596,641	-	-	1	368,318	368,319	0.6173
67		Incheon	#1				28,582				11,736	141,085	-	-	-	76,259	76,259	0.5405
68			#2				30,186				11,737	152,576	-	-	-	80,544	80,544	0.5279
69			#3			292	32,472			8,470	11,739	162,092	-	-	753	86,657	87,409	0.5393
70			#4			238	27,637			8,470	11,734	139,637	-	-	612	73,724	74,336	0.5324
71	Combined Cycle	Pyongtaek	C/C				150,276				11,744	903,201	-	-	-	401,231	401,231	0.4442
72		Ilsan	C/C				636,633				11,732	3,491,175	-	-	-	1,697,959	1,697,959	0.4864
73		Bundang	C/C				651,005				11,737	3,748,232	-	-	-	1,737,118	1,737,118	0.4634
74		Ulsan	C/C				655,938				11,648	4,454,326	-	-	-	1,736,996	1,736,996	0.3900
75		Seoincheon	C/C			721	1,436,788			-	11,739	10,308,626	-	-	-	3,834,590	3,834,590	0.3720
76		Shinincheon	C/C				1,607,180				11,739	11,531,252	-	-	-	4,289,057	4,289,057	0.3720
77		Boryeong	C/C				894,790				11,733	6,126,641	-	-	-	2,386,709	2,386,709	0.3896
78		Incheon	C/C				459,923				11,697	3,420,631	-	-	-	1,223,030	1,223,030	0.3575
79		Busan	C/C				1,456,370				11,730	10,848,484	-	-	-	3,883,709	3,883,709	0.3580
80		Hallim	C/C			6,883				8,536		23,547	-	-	17,857	-	17,857	0.7584
81		Anyang	C/C				292,931				11,816	1,638,638	-	-	-	786,893	786,893	0.4802
82		Bucheon	C/C				302,746				11,191	1,657,898	-	-	-	770,257	770,257	0.4646
83		POSCO POWER	C/C				587,956				11,740	3,328,129	-	-	-	1,569,266	1,569,266	0.4715
84		GS Bugog	C/C				709,116				12,084	5,509,092	-	-	-	1,948,143	1,948,143	0.3536
85		Yulchon	C/C				347,123				11,737	2,488,267	-	-	-	926,243	926,243	0.3722
		Kwangyang	C/C															
86		Hyundai-Daesan																
87	Internal combustion	Namjeju	D/P		19,875	482			9,392	8,546		93,201	-	59,007	1,252	-	60,259	0.6465
88		Jeju	G/T			503				8,457		643	-	-	1,293	-	1,293	2.0096
89		Jeju	D/P		46,728				9,407			223,630	-	138,954	-	-	138,954	0.6214
total				**62,694,298**	**1,888,943**	**59,590**	**10,515,372**					**237,888,670**	**129,665,654**	**5,651,587**	**150,289**	**28,062,248**	**163,529,777**	**0.6874**

Table 4. Build Margin 2008

Year	No.	Plant name		Technology	Type of Fossile Fue	year operation	Net electricity generated (EGm,y)	CO_2 emission factor ($EF_{EL,m,y}$)	Results
							MWh in 2008	tCO2/MWh	EF for each plant (tonCO2eq./MWh)
2	1	Boryeong	#8	steam power	Bituminous coal	2008.12	748,005	0.6171	0.0056
0	2	Hadong	#7	steam power	Bituminous coal	2008.12	870,781	0.7814	0.0083
	3	Yeongheung	#4	steam power	Bituminous coal	2008.12	3,193,481	0.8252	0.0320
0	4	Kyeongcheon		small hydro power		2008.11	1,273		
	5	Seongnam 2		small hydro power		2008.10			

8	6	Nulokdo solar		solar		2008.09			
	7	Jeju solar		solar		2008.09	11		
	8	Boryeong fuel cell		fuel cell		2008.09			
	9	Naebyeong solar		solar		2008.08			
	10	Yulhyeon		small hydro power		2008.07	144		
	11	Busan C/C solar		solar		2008.07	167		
	12	Hadong solar		solar		2008.07	554		
	13	Hongikdongjin		small hydro power		2008.06			
	14	Daecheongdaem		small hydro power		2008.06			
	15	Boryeong	#7	steam power	Bituminous coal	2008.06	2,878,738	0.7846	0.0274
	16	Kori-wind power		wind		2008.05			
	17	Samlangjin solar				2008.04			
	18	Boryeong solar		solar		2008.04	449		
	19	Boryeong		small hydro power		2008.03			
	20	Yeongheung		small hydro power		2008.03			
	21	Yeonggwang solar park				2008.03			
	22	POSCO fuel cell		fuel cell		2008.03			
	23	Gunjang heat & power		combined		2008.01			
	24	Seocheon solar		solar		2008.01	1,550		
	25	New solar energy and others		solar		2008	222,779		
	1	Yeongheung	#3	steam power	Bituminous coal	2007	4,535,951	0.8087	0.0445
	2	Taean		small hydro power		2007	3,924		
	3	Hanbit Sungsan the second solar		solar		2007.12			
	4	Taein gangjin solar		solar		2007.12			
	5	Suni gangjin solar		solar		2007.12			
	6	Korea yeongcheon solar		solar		2007.12			
	7	Solar yungam solar		solar		2007.12			
	8	Changwhan yeongduk solar		solar		2007.12			
	9	Samsung jindo		solar		2007.12			
	10	Hwaseong heat & power		combined		2007.12			
	11	Dangjin	#8	steam power	Bituminous coal	2007.12	3,992,732	0.7807	0.0378
	12	SP solar yonggwang		solar		2007.11			
	13	Dongyang energy sinan		solar		2007.11	4,698		
2	14	Ef yungam solar		solar		2007.11			
	15	Dongwon gangjin solar		solar		2007.11			
0	16	Solec yonggwang solar		solar		2007.11			
	17	Solar jungeub solar		solar		2007.11			
0	18	Sinbuk yungam solar		solar		2007.11			
	19	Hyein haenam solar		solar		2007.11			
7	20	Samlangjin solar		solar		2007.11			
	21	Hyosung daegi-wind power		wind		2007.11	409		
	22	Nonhyun heat & power		combined		2007.10			
	23	Wuriyungam solar		solar		2007.08			
	24	Hwasung solar		solar		2007.08			
	25	Yeongju the first solar		solar		2007.08			
	26	Muan solar		solar		2007.08			
	27	Jangheung solar		solar		2007.08			
	28	Gomun		small hydro power		2007.08			
	29	Taean	#8	steam power	Bituminous coal	2007.08	4,186,293	0.7885	0.0401
	30	Dangjin	#7	steam power	Bituminous coal	2007.06	3,336,619	0.7933	0.0321
	31	Munkyung solar		solar		2007.06			
	32	Younggwang solar park		solar		2007.06			

	33	Yungam Solar		solar		2007.06			
	34	Wonjungsu		small hydro power		2007.05			
	35	Baekgok		small hydro power		2007.05	518		
	36	damyangho		small hydro power		2007.05	1,048		
	37	Juam		small hydro power		2007.05			
	38	Namjeju	#4	thermal	heavy oil	2007.03	517,866	0.6819	0.0043
	39	Eco energy		solar		2007.03	357,529		
	40	hapcheon		small hydro power		2007.02	6,442		
	41	Jeonju-resource recovery facility				2007.02	12,682		
	42	Seoul Marin(suncheon)		solar		2007.02	1,271		
	43	Mirae energy		solar		2007.02			
	44	Seomjingang		small hydro power		2007.02	122,714		
	45	samcheonpo		small hydro power		2007.02			
	46	dalbang		small hydro power		2007.02			
	47	Taean	#7	steam power	Bituminous coal	2007.02	3,482,731	0.7894	0.0334
	48	Yeongju the second solar		solar		2007.01	2,272		
	49	Hyundaedaesan		combined		2007.01			
	1	Cheongsong pumping	#2	pumping		2006.12	276,444		
	2	S&P Solar		solar		2006.10			
	3	Bundang fuel cell		fuel cell	LNG	2006.10			
	4	Namhae Solar		solar		2006.10			
	5	HanlaJeunggong Solar		solar		2006.10			
	6	Yungam Solar		solar		2006.09			
	7	Enepark		solar		2006.09	460		
	8	Yeongheung solar		solar		2006.09	1,290		
	9	Cheongsong pumping	#1	pumping		2006.09	206,291		
2	10	Namjeju	#3	thermal	heavy oil	2006.09	559,817	0.7077	0.0048
0	11	yangyang(pumping)	#4	pumping		2006.08	163,281		
	12	Donghae Solar		solar		2006.08			
0	13	Kangwon-wind power		wind		2006.07			
6	14	Woljeong-wind power		wind		2006.07	3,445		
	15	yangyang pump windpower		wind		2006.06			
	16	Hadongho		small hydro power		2006.06	996		
	17	yangyang (pumping)	#3	pumping		2006.06	169,538		
	18	Goheung Solar		solar		2006.06			
	19	Jangseong		small hydro power		2006.05	1,937		
	20	yangyang (pumping)	#2	pumping		2006.04	210,031		
	21	Dangjin	#6	thermal	Bituminous coal	2006.04	4,006,307	0.7852	0.0382
	22	Sinchang-wind power		wind		2006.03	3,561		
	23	yangyang (pumping)	#1	pumping		2006.02	141,700		
	1	Janghengdam		small hydro power		2005.12			
	2	Suncheon Solar		solar		2005.12			
	3	Samcheonpo solar energy		solar		2005.12	135		
2	4	Dangjin	#5	steam power	Bituminous coal	2005.10	3,908,658	0.7961	0.0378
0	5	yangyang pump small hydro		small hydro power		2005.10			
	6	Taean solar energy		solar		2005.10	130		
0	7	Jeju DP		internal combustion	heavy oil	2005.07	223,630	0.6214	0.0017
	8	WunjeongLFG		internal combustion	LFG	2005.07	7,701		
5	9	Yulchon		combined	LNG	2005.07	2,488,267	0.3722	0.0112
	10	Incheon		combined	LNG	2005.07	3,420,631	0.3575	0.0148
	11	Daegok		small hydro power		2005.07	1,635		
	12	Donghwa		small hydro power		2005.07	1,853		

	13	Ulchin	#6	nuclear		2005.04	8,107,887		
	14	Hanrye		LFG	LFG	2005.04	21,265		
	15	Busan Bio-gas		internal combustion	LFG	2005.03	2,884		
	16	Sungnam		small hydro power		2004.12			
	17	Yungduk-wind power		wind		2004.12			
	18	Yongdam		small hydro power		2004.12	110,934		
	19	Maebongsan-wind power		wind		2004.12	20,896		
	20	Daegwanryeong-wind power		wind		2004.12	4,949		
	21	Yeongheung	#2	steam power	Bituminous coal	2004.11	5,112,704	0.8107	0.0503
	22	Yeongheung	#1	steam power	Bituminous coal	2004.07	5,137,490	0.8141	0.0507
	23	Ulchin	#5	nuclear		2004.07	8,763,822		
	24	Busan		combined combustion	LNG	2003.05/2004.03	10,848,484	0.3580	0.0471
Total							**82,412,683**		0.5221

3. Combined margin emission factor

The OM is calculated by using the sum of the annual net generation and the annual CO2 emission from 2006 to 2008. The annual CO2 emission is divided by the annual net generation equals the OM.

Year	Annual net generation (MWh/yr)	Annual CO2 emission (tCO2/yr)	Emission factor (tCO2/MWh)
2006	206,605,293	140,300,889	0.6791
2007	230,642,413	156,360,113	0.6779
2008	237,888,670	163,529,777	0.6874
Total	675,136,376	460,190,779	0.6816

		tCO2/MWh
		CM = 0.75 OM + 0.25 BM
OM	2006~2008	0.6816
BM	2008	0.5221
CM	2008	0.6417

Appendix 5. Further background information on monitoring plan

Monitoring plan was presented in section B.7. Please refer that section

Appendix 6. Summary report of comments received from local stakeholders

This section was presented in section E. Please refer that section

Appendix 7. Summary of post-registration changes

Correction

- ✓ Specification of transformer was incorrectly stated in Busan site. Therefore actual installed specification is reflected in the PDD

Monitoring plan

- ✓ Watt-hour exported meter of calibration period was revised to 7years according to national standards (3years -> 7years)
- ✓ Watt-hour imported meter of calibration period was revised to 7years according to national standards (3years -> 7years, imported meter from the KEPCO and internal imported meter from Busan combined cycle power plant)
- ✓ Imported watt-hour meter of allowable error was revised to 1.0% according to national standards (0.5%->1.0%)
- ✓ The table is added to EFco2(combined cycle power plant) factor in PDD B.6.2 (Electricity imported for the project in Busan photovoltaic power plant is imported from the Busan combined cycle power plant. Therefore as per scenario C of the “Methodological tool: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation (Version 03.0)”, the project activity applies to an emission factor of 1.3tCO2/MWh which used to project electricity consumption sources as a conservative simplification.

Changes to project design

- ✓ Temporary requidation of photovoltaic modules at Busan site

(Busan photovoltaic power plant is located on the parking lot of rooftop in Busan gas turbine power plant. A part of modules was demolished on 5 Feb 2015 because of Busan city’s plan for underground tunnel construction. Demolished module will be relocated above the tunnel and it will be finished by 2018. Demolished module will be put the current location.)