**PROJECT DESIGN DOCUMENT FORM
FOR SMALL-SCALE CDM PROJECT ACTIVITIES (F-CDM-SSC-PDD)
Version 04.1**

PROJECT DESIGN DOCUMENT (PDD)

Title of the project activity	Yangyang renewable energy project (3MW wind power)
Version number of the PDD	5.2
Completion date of the PDD	05/11/2013
Project participant(s)	Korea Midland Power Corporation(KOMIPO)
Host Party(ies)	Republic of Korea
Sectoral scope(s) and selected methodology(ies)	- Sectoral Scope: 01(Energy Industries) - Methodology: AMS-I.D(Ver.17.0)
Estimated amount of annual average GHG emission reductions	5,539 tCO_2/y

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

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Description of the project activity

The Yangyang renewable energy project (wind power) is located in the north eastern region of Republic of Korea. The project consists of the implementation of 3MW wind power plant in the site of Yangyang pumping up power generation plant. The production of two wind turbine (each capacity 1.5MW) annual generation will be 8,463MWh/year and 5,539 ton/CO2e will be abated.

Purpose of the project activity

According to energy statistics4, the 97% of using energy is imported. It means that Korea has a weakness to supply energy stably. Moreover electric generations in Korea rely on fossil fuels more than 50%. It attributes to emit a plenty of Green House Gases (GHGs). That's why Korea ranked 9th in CO2 emissions in the world. Nevertheless, until recently there has been just a little effort to mitigate GHGs.

The company Korea Midland Power Co. Ltd (KOMIPO) is the owner and developer of the Yangyang renewable energy project(wind power). On 25th July, KOMIPO and other eight large energy suppliers signed up an agreement, called the Renewable Portfolio Agreement (RPA) with the Ministry of Commerce, Industry and Energy (MOCIE). The contractors agreed to invest a combined 1.1 trillion KRW in developing renewable energy resources and renewing waste energy over the three years till 2008 to build an environment-friendly energy supplying system. KOMIPO decided to invest 76.9 billion KRW to promote renewable energy till 2008. This project is planned as a part of the RPA by using a new and renewable local source of energy, the project will contribute to the reduction of GHG emissions, the decrease of the country's dependence on the importation of fossil fuels and will help create directly and indirectly new jobs. Furthermore the project is supporting the government policy of promoting new renewable energy technologies in the Republic of Korea. This project has two purposes.

One is to establish role model of domestic renewable energy project, and the other is to accumulate experiences for future abroad CDM projects.

Ultimately KOMIPO prepares to cope with climate change actively, and contributes to sustainable development as central electricity power generation cooperation.

The contribution of the project activity to sustainable development

The Yangyang renewable energy project (wind power) will contribute to sustainable development through the following ways:

- Reduction of Green House Gases emissions, specifically CO2
- Diversification of the national supply of energy
- Help the country to reduce the imported energy (oil, gas etc) bill
- Promote renewable energy policy of the country

A.2. Location of project activity

A.2.1. Host Party(ies)

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Republic of Korea

A.2.2. Region/State/Province etc.

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Gangwon Province

A.2.3. City/Town/Community etc.

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Gongsujeonri, Seomyeon, Yangyang-gun

A.2.4. Physical/ Geographical location

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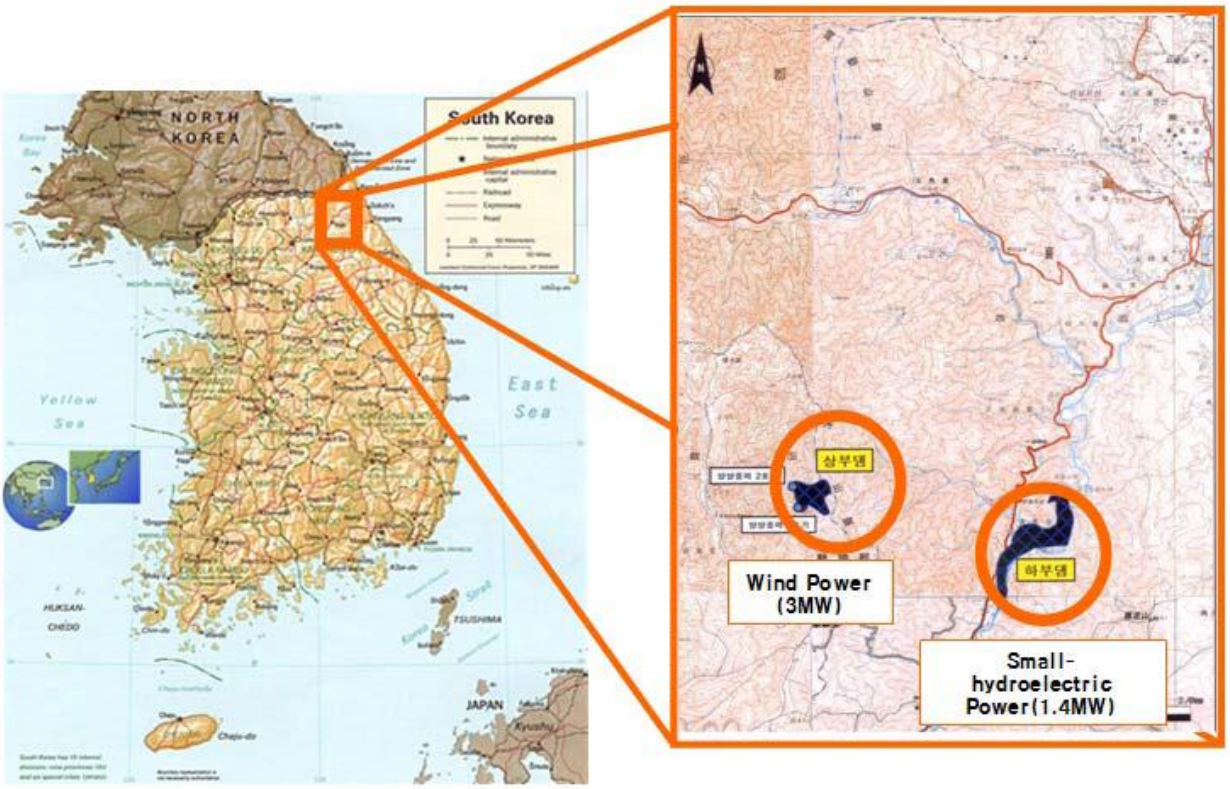
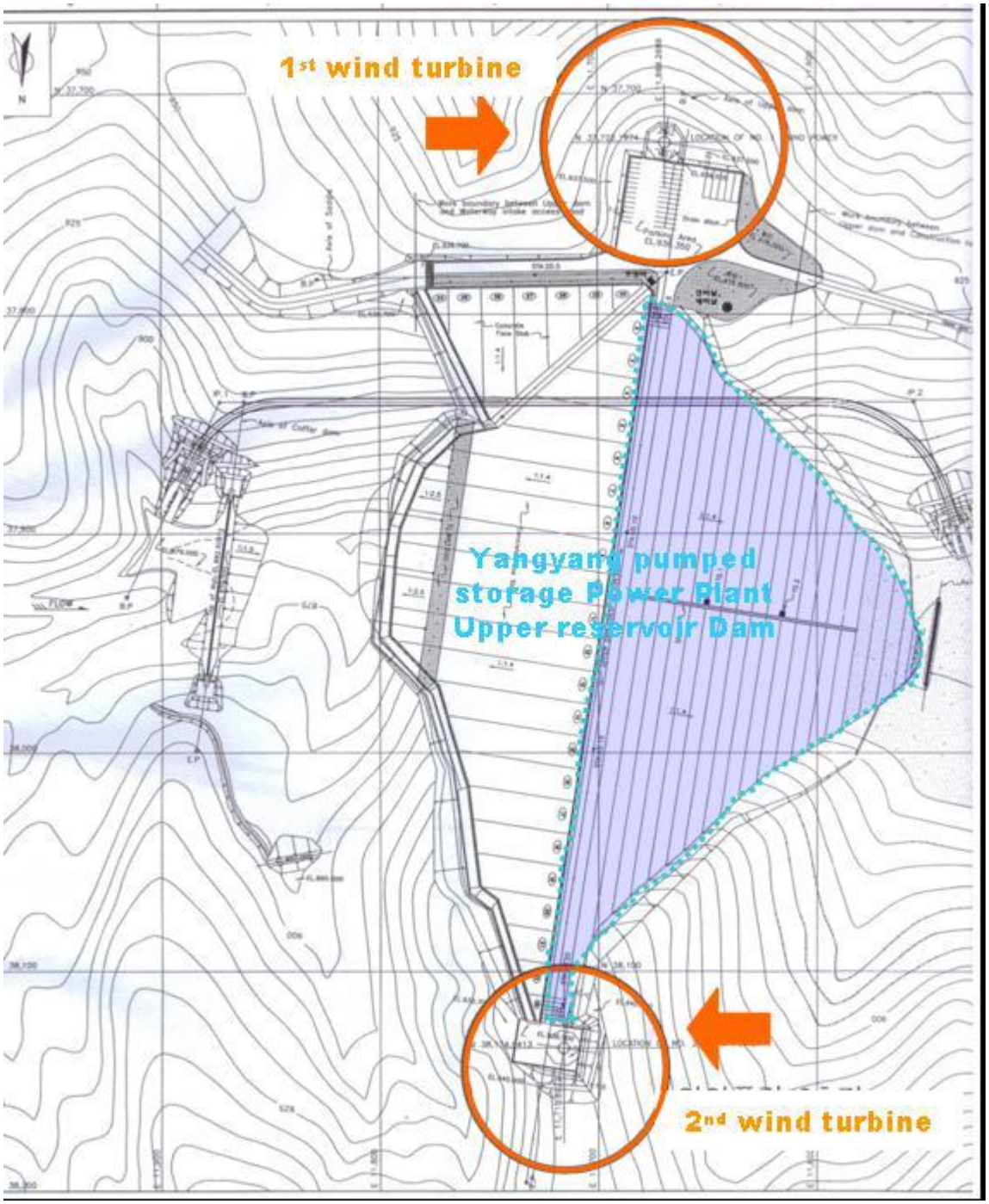
The Yangyang renewable energy (wind power) project will be located upper side of the Yangyang pumped storage dam which is located at the valley of Jumbong mountain range in Inje-gun, approximately 225km east of Seoul, the Capital of Korea (N 38.019297° and E 128.496564°)

The following figures depict the location of the project site.



[Figure 1] The location drawing for the Yangyang renewable energy project (wind power)

[Figure 2] The bird's eye view of wind power plant site



[Figure 3] The detail location of renewable power plant

A.3. Technologies and/or measures

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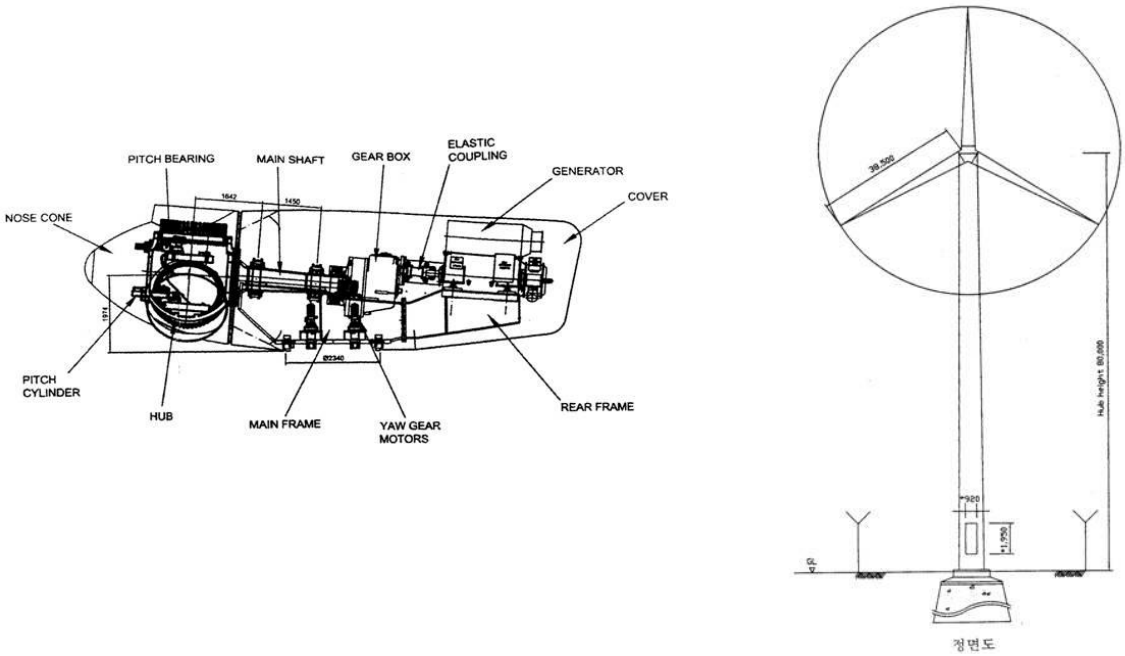
Description Wind power plant of technology



[Figure 4] The wind turbine structure

Type		Details
Turbine	Type	3 blades, up-Wind, horizontal-axis
	Manufacturer	Acciona Windpower
	Model	IT77 / 1500kW Class Ⅱ
	Rated output voltage	12,000V
Generator	capacity	3MW (1.5MW x 2 turbines)

The electrical integrated grid connection system shall be provided to the transformer and switchgear system. The transformer shall be functioned as a step-up transformer for a primary generator voltage to the secondary outgoing 24kV high voltage and the switchgear shall also function as an outgoing feeder circuit breaker of wind turbine generating power to the grid system via the transformer.
Substation shall be consisted of two incoming 24kV switchgear panel and the one outgoing 24kW switchgear panel with tariff metering system to deliver wind generating power to the KEPCO 22.9kV distribution.

A.4. Parties and project participants

Party involved (host) indicates a host Party	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Republic of Korea (host)	Korea Midland Power Corporation(KOMIPO)	NO

A.5. Public funding of project activity

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This project doesn't involve any public funding.

A.6. Debundling for project activity

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According to the Guidelines on assessment of debundling for SSC project activities, V03, EB 54, debundling is defined as the fragmentation of a large project activity into smaller parts. A proposed smallscale project activity shall be deemed to be a debundled component of a large project activity if there is a registered small-scale CDM project activity or an application to register another small-scale CDM 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.

Following the above Guidelines on assessment of debundling for SSC project activities, V03, EB 54, this project is not a fragmentation of a larger CDM project activity nor this project have applied before to be registered as part of another small scale project activity.

SECTION B. Application of selected approved baseline and monitoring methodology

B.1. Reference of methodology

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According to the categories' list of CDM projects' activities of the appendix B on the simplified modalities and procedures for small-scale CDM activities, the Yangyang renewable energy project(wind power) relates to the category I.D:

Methodology: AMS-I.D, Grid connected renewable electricity generation (Ver. 17.0)
Methodological Tool:

- **Tool to calculate the emission factor for an electricity system(Ver.04.0.0)**
- **Guidelines on Assessment of debundling for SSC project activities(Ver.03)**
- **Guidelines for Demonstrating Additionality of Microscale project activities (Ver.05.0)**

B.2. Project activity eligibility

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The methodology is applicable under the following conditions:

The applicability of the AMS-I.D

Criteria	Applicability	Conclusion
This category comprises renewable energy generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal and renewable biomass that supply electricity to a national or a regional grid; or Supplying electricity to an identified consumer facility via national/regional grid through a contractual arrangement such as wheeling.	The proposed project activity is the installation of wind power plants that supply electricity to a national grid.	
Illustration of respective situation under	The project activity will supply electricity to	O.K.

which each of the methodology (i.e. AMS-I.D, AMS-I.F and AMS-I.A) applies is included in Table 2. As per table 2, AMS-I.D is applicable for following project types: 1. Project supplies electricity to a national/regional grid Project supplies electricity to an identified consumer facility via national/regional grid (through a contractual arrangement such as wheeling)	national grid i.e KEPCO grid. Hence the project activity refers to the project type 1 of the table 2 given under the Methodology. Hence applicable to use AMS I.D. The project activity therefore meet this applicability requirement.	
This methodology is applicable to project activities that: (a) Install a new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity (Greenfield plant); (b) Involve a capacity addition; (c) Involve a retrofit of (an) existing plant(s); or (d) Involve a replacement of (an) existing plant(s).	The project activity is an installation of a new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity (Greenfield plant). The project activity satisfies the mentioned criteria/ requirement (a).	O.K.
Hydro power plants with reservoirs that satisfy at least one of the following conditions are eligible to apply this methodology:	This project is wind power project, not hydro power project, so PP doesn't need to consider it.	O.K.
If the new unit has both renewable and non-renewable components (e.g. a wind/diesel unit), the eligibility limit of 15 MW for a small-scale CDM project activity applies only to the renewable component. If the new unit co-fires fossil fuel,8 the capacity of the entire unit shall not exceed the limit of 15 MW.	The installed capacity of the proposed project is 3 MW, which is less than 15 MW.	O.K.
Combined heat and power (co-generation) systems are not eligible under this category.	Not Applicable. The proposed project activity is a wind power plant.	O.K.
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 15 MW and should be physically distinct from the existing units.	This project is to install a new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity, so PP doesn't need to be considered.	O.K.
In the case of retrofit or replacement, to qualify as a small-scale project, the total output of the retrofitted or replacement unit shall not exceed the limit of 15 MW.	This project is to install a new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity, so PP doesn't need to be considered.	O.K.

From the analysis above, AMS-I.D. (Version 17.0) is applicable for the proposed project.

B.3. Project boundary

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According to the methodology AMS-I.D, the spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system that the CDM project power plant is connected to.

The project activity is to install a new power plant at the site. It is estimated that the primary source of GHG emissions will be CO2 from combustion of fossil fuel in the conventional power generation systems in the baseline. Emissions of other GHG such as CH4 and N2O are excluded with conservative approach. The Methodology only takes into account leakage if the energy generating equipment is transferred from another activity or if the existing equipment is transferred to another activity. The proposed project activity doesn't involve any transfer of equipment and hence there is no leakage as a result of project activity.

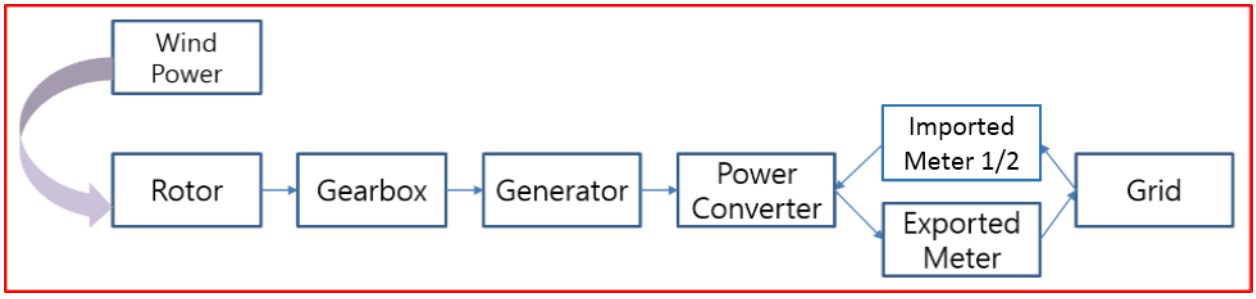
An overview of all emission sources included in or excluded is depicted in the following table:

- The description of the emission sources

ITEM	Source	Gas	Included?	Justification / Explanation
Baseline	Emission from combustion of fossil fuel for electricity generation	CO2	Yes	This consists of the major source of GHG emission from combustion of fossil fuel.
		CH4	No	Excluded as they are minor emission sources
		N2O	No	Excluded as they are minor emission sources
Project Activity	Electricity generation from renewable sources	CO2	No	Power generation utilizing wind energy result in zero emission
		CH4	No	Power generation utilizing wind energy result in zero emission
		N2O	No	Power generation utilizing wind energy result in zero emission

Spatial boundary

The spatial extent of the proposed project boundary includes the proposed wind power plants (including Rotor, Generator, transmission line) and all power plants connected physically to the KEPCO.



[Figure5] The structure of the wind turbine (generate electricity by wind power)

B.4. Establishment and description of baseline scenario

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This project activity is to install a new wind power plant. Therefore, according to the methodology AMS-I.D, the baseline scenario is that the electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources in to the grid. In other words, the project is not a modification (or retrofit) of an existing plant but the installation of a new grid-connected renewable power plant. The baseline scenario is provision of the equivalent amount of electricity delivered from the KEPCO grid (Korea Electric Power Corporation)
However, because this project is the renewal of a crediting period, project proponents shall address below issues according to the methodological tool ("Validity of the original/current baseline and to update the baseline at the renewal of a crediting period" Ver. 03.0.1). To assess the validity of the original/current baseline, project proponents have to address two issues as follow:

- Assess the continued validity of the baseline; and
- Update the baseline.

In the Methodological tool of "Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period (Ver.03.0.1)", the stepwise procedure to assess the continued validity of the baseline and to update the baseline at the renewal of a crediting period are as follows:

Step 1: Assess the validity of the current baseline for the next crediting period

The "Procedures for the renewal of the crediting period of a registered CDM project activity" approved by the CDM Executive Board require assessing the impact of new relevant national and/or sectoral policies and circumstances on the baseline.

The validity of the current baseline is assessed using the following Sub-steps:

Step 1.1: Assess compliance of the current baseline with relevant mandatory national and/or sectoral policies

In assessing the continued validity of the baseline, it has been assessed that there is no relevant mandatory national and/or sectoral policies that should be considered to define a new baseline scenario for this renewal of crediting period of the proposed project.

Korean government has promoted some programs to propagate renewable energy system. There are "Act on the Promotion of the Development, Use and Diffusion of New and Renewable Energy" to promote the use of renewable energy.
However, according to the guidance about E+/E-policies, the impacts of these policies can be excluded in establishing a baseline scenario if they have been implemented since the adoption of the Marrakesh Accords (11 November 2001). In accordance with the Accords, the policy which has been implemented to promote the use of renewable energy in Korea can be regarded as if the policies did not exist because it was implemented since April 2010. In conclusion, the current baseline complies with relevant mandatory national and/or sectoral policies.

Step 1.2: Assess the impact of circumstances

As per requirement of the sub-step, it has been assessed that there is no impact of circumstances existing at the time of requesting renewal of the crediting period on the current baseline emissions. As per the '2011 KEPCO in Brief (published on May 2012) by KEPCO, although diffusion of the new and renewable energy has been encouraged, the new and renewable resource accounts for only 3.59% of total

grid generation in KEPCO in 2011. Hence in the absence of the proposed project, electricity would still have been generated in the existing fossil fuel power plants or by the addition of new fossil fuel power plants connected to the KEPCO grid.

- **The proportion of the new and renewable energy**

Item	2007	2008	2009	2010	2011
New and renewable (GWh)	5,871	6,655	7,432	10,456	17,816
Total generation (GWh)	403,124	422,355	433,604	474,660	496,893
Proportion of new and renewable	**1.46**	**1.58**	**1.71**	**2.20**	**3.59**

Also project participant has updated the emission factor and estimation of the baseline emissions for the 2nd crediting period in line with the methodology AMS-I.D (Ver. 17.0.0) and the "Tool to calculate the emission factor for an electricity system (Ver.04.0.0)".

Step 1.3: Assess whether the continuation of use of current baseline equipment(s) or an investment is the most likely scenario for the crediting period for which renewal is requested

In absence of the proposed project, the amount of electricity would have been generated by the KEPCO grid. Thus, this sub-step is not applicable to the proposed project.

Step 1.4: Assessment of the validity of the data and parameters

Some parameters, which were determined at the start of the 1st crediting period and not monitored during the 1st crediting period, are not valid anymore. Therefore, the current baseline has been updated for the 2nd crediting period according to the "Tool to calculate the emission factor for an electricity system (Ver.04.0.0)".
This update includes CO_2 emission factor of fossil fuel and all values used in its calculation (including OM and BM). In case of CO_2 emission factor of fossil fuel, the value for the 1st crediting period was derived from IPCC default value as provided in the 1996 IPCC Guidelines but current value for renewal of crediting period is derived from IPCC default value as provided in 2006 IPCC Guidelines according to the methodology AMS-I.D (Ver. 17.0.0). Therefore, the current baseline needs to be updated and Step 2 is applied.

Step2: Update the current baseline and the data and parameters

Step 2.1: Update the current baseline
As per the Step 1 above, the current baseline scenario is still valid as per the methodology AMS-I.D (Ver.17.0.0). The identified baseline scenario of the proposed project is as follows:

- Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system (Ver.04.0.0)".

Also, the baseline emissions for the 2nd crediting period have been updated, without reassessing the baseline scenario, based on the methodology AMS-I.D (Ver.17.0.0). This update was applied in the contest of the sectoral policies and circumstances that are applicable at the time of request for renewal of the crediting period. Further information for the updated baseline emissions for the 2nd crediting period can be seen below.

Step 2.2: Update the data and parameters

As stated in Step 1.4 above, all parameters regarding the grid emission factor calculation needs to be updated for the 2nd crediting period. Further information can be seen below.

(1) Grid emission factor ($EF_{grid,CM,y}$ = $EF_{CO2,grid,y}$)

The grid emission factor is calculated according to "Tool to calculate the emission factor for an electricity system (Ver.04.0.0)". OM (Operating Margin) and BM (Build Margin) are calculated by using the data from existing power plants that provide electricity with the current grid-connected electricity generation, and with this result, the $EF_{grid,CM,y}$ (Combined Margin) can be calculated.
According to the tool, the steps for the calculation are as follows;

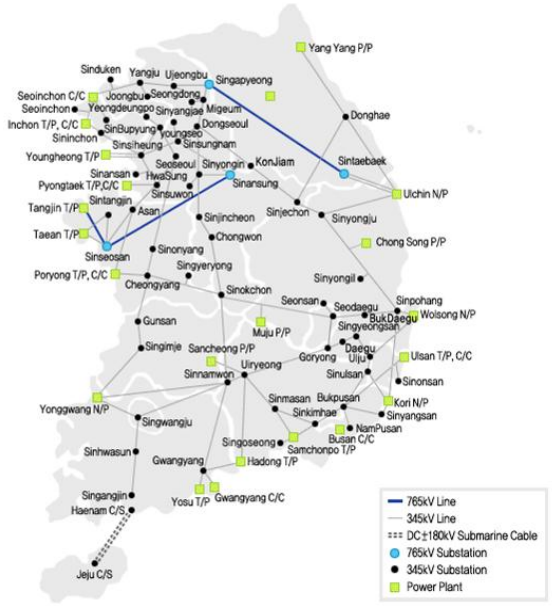
STEP 1. Identify the relevant electricity systems;
STEP 2. Choose whether to include off-grid power plants in the project electricity system (optional)
STEP 3. Select a method to determine the operating margin (OM)
STEP 4. Calculate the operating margin emission factor according to the selected method
STEP 5. Calculate the build margin (BM) emission factor
STEP 6. Calculate the combined margin (CM) emissions factor

- Major parameter of emission factor

Parameter	Value	Source
$FC_{i,m,y}$ is the amount of fuel *i* (in a mass or volume unit) consumed by a relevant power source m in year(s) y, which supplies electricity to the grid, not including low-operating cost and must-run power plants.	Refer to <Table Annex 4-1>	Statistics of Electric Power in KOREA 2009-2011 (Source: KEPCO 2010-2012)
Net Calorific Values by Power Plant		Caloric value sourced from Statistics of Electric Power in 2009-2011 (Source: KEPCO 2010-2012) (Net Caloric Value = Caloric value net × caloric value conversion factor)
$EG_{m,y}$ (MWh) is the electricity delivered to the grid by source m		Statistics of Electric Power in KOREA 2009-2011 (Source: KEPCO 2010-2012)
Net Caloric Values Conversion Factor	Solid/Liquid fossil fuel : 0.95 Gaseous fuel : 0.90	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Fuel CO2 Emission Factor($EF_{CO2,i,y}$)	Refer to <Table Annex 4-2>	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Operating Margin Emissions Factor ($EF_{grid,OM,y}$) (ton CO2/MWh)	0.6828	Calculated
Build Margin Emissions Factor ($EF_{grid,BM,y}$) (ton CO2/MWh)	0.5698	Calculated
Baseline Emissions Factor ($EF_{grid,CM,y}$) (ton CO2/MWh)	**For wind, solar : 0.6545**	Calculated Calculated

STEP 1. Identify the relevant electricity systems

The electricity from the project activities is connected to KEPCO grid, which is the only one in Korea and so relevant electric power system is KEPCO grid.



[Figure 6] The transmission map of Korea (Source: Korea power exchange)

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

According to "Tool to calculate the emission factor for an electricity system(Ver.04.0.0)", there are two options to calculate the operating margin and build margin emission factor:

Option I : Only grid power plants are include in the calculation.

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

This project chooses ***Option 1***. Only grid power plants are including in the calculation.

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

As described in "Tool to calculate the emission factor for an electricity system(Ver.04.0.0)", the OM emission factor is calculated as the generation-weighed emissions per electricity unit of all generating units serving the system, excluding low-operating cost and must-run power plants. Low-operating cost and must run power plants include hydro, nuclear, low cost biomass, geothermal and domestic coal.

Operating Margin emission factor ($EF_{grid,OM,simple,y}$) shall be calculated basis on one of the four following methods:

Option (a) Simple OM
Option (b) Simple adjusted OM
Option (c) Dispatch Data Analysis OM
Option (d) Average OM

If low-cost/must-run resources constitute less than 50% of total grid generation in average of the five most recent years, ***Option (a) simple OM*** can be chosen.

- Gross electricity generation in the Republic of Korea during past 5 years (GWh, million kWh)

Item \ Year		2007	2008	2009	2010	2011	Sum
Hydro		5,042	5,563	5,641	6,472	7,831	30,549
Thermal	Coal (Dom.)	4,470	5,010	5,559	4,613	3,269	22,921
	Coal (Bitum.)	150,204	168,498	187,657	189,156	196,855	892,370
	Oil	21,215	15,425	19,912	25,356	22,528	104,436
	Gas	78,427	75,809	65,273	96,483	101,702	417,694
Nuclear		142,937	150,958	147,771	148,596	154,723	744,985
alternative		829	1,092	1,791	3,984	9,985	17,681
Total		**403,124**	**422,355**	**433,604**	**474,660**	**496,893**	**2,230,636**

Source : Korea electric power Corporation, 2012

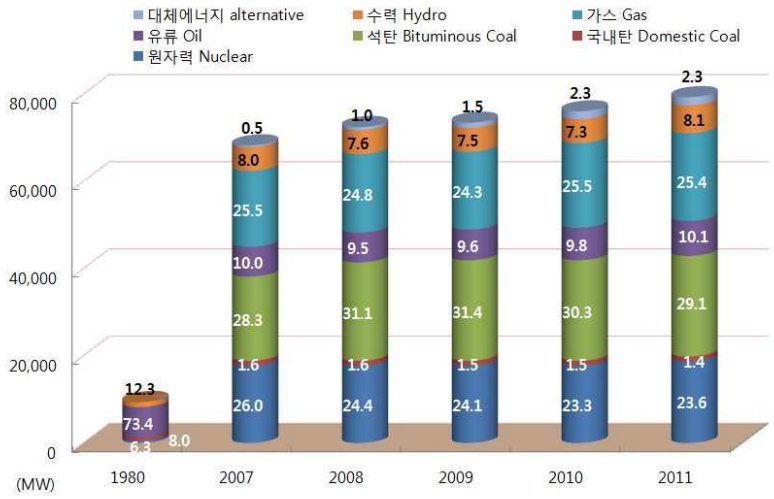
Referring to the gross electricity generation rate by energy sources of the host country (Republic of Korea), the rate of low cost/must run power generation does not exceed 50% of the total grid. Actually, the most recent 5-year (2007~2011) average data shows that the rate of low cost/must run is 36.59%. (Source: KEPCO) The low-cost/must-run plants –hydro, coal (dom), nuclear and alternative– are indicated in yellow.

Low-cost/ Must-run sources ratio

$$= \frac{[\text{Hydro (30,549)} + \text{Coal-Dom (22,921)} + \text{Nuclear (744,985)} + \text{Alternative (17,681)}]}{\text{Total generation (2,230,636)}} \times 100$$

= 36.59%

Therefore, for this project case, "***Option (a) Simple OM***" is available.



[Figure 7] Gross electricity generation in the Republic of Korea during past 5 years
(Korea Electric Power Corporation, 2012)

For the simple OM, the emissions factor can be calculated using either of the two following data vintages:

- ***Ex ante option***: If the ex ante option is chosen, the emission factor is determined once at the validation stage, thus no monitoring and recalculation of the emissions factor during the crediting period is required. For grid power plants, use 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. For off-grid power plants, use a single calendar year within the 5 most recent calendar years prior to the time of submission of the CDM-PDD for validation.
- ***Ex* post option**: If the ex post option is chosen, the emission factor is determined for the year in which the project activity displaces grid electricity, requiring the emissions factor to be updated annually during monitoring. If the data required calculating the emission factor for year y is usually only available later than six months after the end of year y, alternatively the emission factor of the previous year y-1 may be used. If the data is usually only available 18 months after the end of year y, the emission factor of the year proceeding the previous year y-2 may be used. The same data vintage (y, y-1 or y-2) should be used throughout all crediting periods.

For this project, ***Ex-ante option*** is chosen.

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

(a) *Simple OM option* is chosen for the project as described in STEP 3 above.
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.

The simple OM may be calculated using one of the following options;
Option A: Based on the net electricity generation and a CO2 emission factor of each power unit; or
Option B: Based on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system.
For this project, ***option A*** is chosen to calculate the simple OM.
Where Option A is used, the simple OM emission factor is calculated as follows:

$$EF_{grid,OMsimple,y} = \frac{\sum_{m} EG_{m,y} \cdot EF_{EL,m,y}}{\sum_{m} EG_{m,y}}$$

Where:

$EF_{grid,OMsimple,y}$	= Simple operating margin CO_2 emission factor in year y (tCO_2/MWh)
$EG_{m,y}$	= Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
$EF_{EL,m,y}$	= CO_2 emission factor of power unit m in year y (tCO_2/MWh)
m	= All power units serving the grid in year y except low-cost / must-run power units
y	= the relevant year as per the data vintage chosen in Step 3

Determination of $EF_{EL,m,y}$
For calculating $EF_{EL,m,y}$, Option A1 is chosen as follows;
Option A1. If for a power unit m data on fuel consumption and electricity generation is available, the emission factor ($EF_{EL,m,y}$) should be determined as follows:

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

Where:

$EF_{EL,m,y}$	= CO_2 emission factor of power unit m in year y (tCO_2/MWh)
$FC_{i,m,y}$	= Amount of fossil fuel type i consumed by power unit m in year y (Mass or volume unit)
$NCV_{i,y}$	= Net calorific value (energy content) of fossil fuel type i in year y (GJ/mass or volume unit)
$EF_{CO2,i,y}$	= CO_2 emission factor of fossil fuel type i in year y (tCO_2/GJ)
$EG_{m,y}$	= Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
m	= All power units serving the grid in year y except low-cost/must-run power units
i	= All fossil fuel types combusted in power unit m in year y
y	= The relevant year as per the data vintage chosen in Step 3

In the case of this project, the applied values of $EF_{CO2,i,y}$ are based on using conversion factor suggested in the 2006 IPCC Guidelines. And those of $NCV_{i,y}$ and $EF_{CO2,i,y}$ are country-specific. Actually, the calorific values are indicated as country-specific data of gloss calorific value (GCV), and this was recalculated for this PDD as net calorific value (NCV) using conversion factor suggested in the 2006 Revised IPCC Guidelines.
The detailed information used in the calculation is presented at tables in Annex 4.

Determination of $EG_{m,y}$
- For grid power plants, $EG_{m,y}$ should be determined as per the provisions in the monitoring tables.
- Off-grid power plants are not considered in determination of $EG_{m,y}$.

As a result, the OM emission factor ($EF_{grid,OM,simple,y}$) is 0.6828 (tCO_2/MWh).

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

According to "Tool to calculate the emission factor for an electricity system (version 04.0.0)", there are two options to choose in order to calculate the BM.

- ***Option 1***. For the first crediting period, 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. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period should be used. This option does not require monitoring the emission factor during the crediting period.
- ***Option 2***. For the first crediting period, the build Margin emission factor ($EF_{grid,BM,y}$)shall be updated annually, ex-post, including those unit 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. For the second crediting period, the build margin emissions factor shall be calculated ex ant, as described in Option 1 above. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used.

For this project case, ***Option 1*** is chosen to calculate the BM emission factor.

The sample group of power units m used to calculate the build margin should be determined as per the following procedure as described in the methodology, consistent with the data vintage selected in the steps above:

(a) Identify the set of five power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently ($SET_{5\text{-}units}$) and determine their annual electricity generation ($AEG_{SET\text{-}5\text{-}units}$, in MWh);

(b) Determine the annual electricity generation of the project electricity system, excluding power units registered as CDM project activities (AEG_{total}, in MWh). Identify the set of power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently and that comprise 20% of AEG_{total} (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) ($SET_{\geq 20\%}$) and determine their annual electricity generation ($AEG_{SET\text{-}\geq 20\%}$, in MWh);

(c) From $SET_{5\text{-}units}$ and $SET_{\geq 20\%}$ select the set of power units that comprises the larger annual electricity generation (SET_{sample}); Identify the date when the power units in SETsample started to supply electricity to the grid.

If none of the power units in SET_{sample} started to supply electricity to the grid more than 10 years ago, then use SET_{sample} to calculate the build margin. Ignore steps (d), (e) and (f).

Following the guidance above, the sample group of power unit *m* is established to calculate the build margin.

- Calculation of the Build Margin (BM) emission factor (Refer to <Table Annex 4-2>)

<table>
<tr><th></th><th>Result</th></tr>
<tr><td>Step (a)</td><td>- Five power units that started to supply electricity to the grid most recently ($SET_{5\text{-}units}$):
<table>
<tr><td>1. KC susan solar</td><td>2011.12</td></tr>
<tr><td>2. Hadong S/S solar</td><td>2011.09</td></tr>
<tr><td>3. Busan sinhang solar</td><td>2011.08</td></tr>
<tr><td>4. Ulsan solar</td><td>2011.08</td></tr>
<tr><td>5. Tangjeong solar</td><td>2011.08</td></tr>
</table>
- Total electricity generation in 2011: 5,515 MWh</td></tr>
</table>

Step (b)	- AEG_{total}: 477,204,188 MWh - The set of power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently and that comprise 20% of AEG_{total}: Refer to the Annex 4 - $AEG_{SET-\geq 20\%}$: 96,967,745 MWh (20.35% of AEG_{total})
Step (c)	- SET_{sample} : $SET_{\geq 20\%}$ because it is larger than $SET_{5\text{-units}}$. - Because none of the power units in SET_{sample} started to supply electricity to the grid more than 10 years ago, steps (d), (e) and (f) are ignored.
Step (d)~(f)	Skipped (Not applicable)

The build margin emissions 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 is 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;

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

According to the BM calculation formula and variables of above tables, $EF_{BM,y}$ is 0.5698 (tCO_2/MWh).

STEP 6. Calculate the combined margin emissions factor

The calculation of the combined margin (CM) emission factor ($EF_{grid,CM,y}$) is based on one of the following methods:

(a) Weighted average CM; or
(b) Simplified CM.

The ***weighted average CM*** method (option A) is used for this project .

(a) Weighted average CM

The combined margin emissions factor is calculated as follows:

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

Where,

$EF_{grid,CM,y}$ = Combined margin CO_2 emission factor in year y (tCO_2/MWh)
$EF_{grid,OM,y}$ = Operating margin CO_2 emission factor in year y (tCO_2/MWh)
$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year y (tCO_2/MWh)
W_{OM} = Weighting of operating margin emissions factor (%)
W_{BM} = Weighting of build margin emissions factor (%)

Wind and solar power generation project activities:

According to "Tool to calculate the emission factor for an electricity system (Ver.04.0.0)", Wind and solar power generation project activities are w_{OM} =0.75 and w_{BM} = 0.25 (owing to intermittent and non-dispatchable nature) for the first crediting period and for subsequent crediting periods.

And $EF_{grid,OM,y}$, $EF_{grid,BM,y}$ are calculated as described in Steps 1 and 2 above and are expressed in tCO_2/MWh. Therefore baseline emission factor ($\boldsymbol{EF_{grid,CM,y}}$) for this project is 0.6545(tCO_2/MWh) as

follows:

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

$= 0.75 \cdot 0.6828\ tCO_2/MWh + 0.25 \cdot 0.5698\ tCO_2/MWh$

$= 0.6545\ tCO_2/MWhs$

(2) Baseline emission

Baseline emission of this system can be calculated as below.

$BE_y = EG_{BL,y} * EF_{CO2,grid, y}$

Where:

BE_y = Baseline Emissions in year y (tCO_2)

$EG_{BL,y}$ = Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year *y* (MWh)

$EF_{CO2,grid,y}$ = CO_2 emission factor of the grid in year *y* (tCO_2/MWh)

$* BE_y = 8,463\ MWh/y \ x\ 0.6545\ tCO_2/MWh = 5,539\ tCO_2/y$ *(ex ante)*

B.5. Demonstration of additionality

>>

In case of the renewable energy project that up to 5 megawatts; it can demonstrate additionality by simplified modalities for demonstrating additionality tool. The capacity of the project is 3MW. Therefore, According to the definition in the methodology and project capacity, it can apply "Guidelines for demonstrating additionality of Microscale project activities, Ver.05 (EB 73, Annex 13)" to demonstrate additionality.

Demonstrating Additionality of Microscale project activity

Based on the "Guidelines for demonstrating additionality of microscale project activities, Ver.05", project activities up to five megawatts that employ renewable energy technology are additional if any one of the conditions below is satisfied;

(a) The geographic location of the project activity is in one of the least developed countries or the small island developing States (LDCs/SIDS) or in a special underdeveloped zone (SUZ) of the host country;

→ The project is located at the Gangwon province. It means that the site of the plants is not located in a LDC/SIDS or in a special underdeveloped zone (SUZ) of the host country. This condition is not applicable for the project activity.

(b) The project activity is an off grid activity supplying energy to households/communities (less than 12hrs grid availability per 24 hrs is also considered as 'off grid' for this assessment);

→ The project activity is connected to KEPCO grid and the generated electricity by the project activity delivered to KEPCO grid. So, this project is not an off-grid activity and this condition is not applicable for the project activity.

(c) The project activity is designed for distributed energy generation (not connected to a national or regional grid) with both conditions (i) and (ii) satisfied;

(i) Each of the independent subsystem/measure in the project activity is smaller than or equal to 1,500 kW electrical installed capacity;

(ii) End users of the subsystem or measure are households/communities/ small and medium enterprises (SMEs).

→ Because the energy generated by project activity is supplied to national grid, this condition is not applicable for the project activity

(d) The project activity employs specific renewable energy technologies/measures recommended by the host country designated national authority (DNA) and approved by the Board to be additional in the host country. The following conditions shall apply for DNA recommendations:

(i) "Specific renewable energy technologies/measures. refers to grid connected renewable energy technologies of installed capacity equal to or smaller than 5 MW;

(ii) The ratio of installed capacity of the specific grid connected renewable energy technology in the total installed grid connected power generation capacity in the host country shall be equal to or less than 3 per cent;

(iii) Most recent available data on the percentage of contribution of specific renewable energy technologies shall be provided to demonstrate compliance with the 3 per cent threshold. In no case shall data older than three years from the data of submission be used;

(iv) Technologies/measures recommended by DNAs and approved by the Board to be additional in the host country remain valid for three years from the data of approval.However, additionality of eligible project activities applying the guidelines remains valid for the entire crediting period;

(v) DNA submissions shall include the specific grid connected renewable electricity generation technologies that are being recommended and provide the required data as indicated above (e.g. wind power, biomass power, geothermal power, hydropower).

→ The proposed project activity is relevant to the condition of (d) for demonstrating the additionality. In accordance with the "procedure for submission and consideration of microscale renewable energy technologies for automatic additionality, version 01", the DNA of Republic of Korea proposed specific renewable technologies/measures for automatic additionality by submitting the F-CDM-RRT form and the supporting documents on 5 Jan 2012. The documents can be checked in the website http://cdm.unfccc.int/DNA/submissions/index.html

F-CDM-PRT - ver01

CDM: Proposed specific renewable technologies/measures submission form (version 01.0)	
Submitting DNA:	Republic of Korea
Indicate title/version of the EB guideline/procedure this submission relates to	Guidelines for demonstrating additionality of microscale project activities (version 03), Procedure for submission and consideration of microscale renewable energy technologies for automatic additionality (version 01.0)
Contact Information (name of person or office, e-mail addresses and phone contacts)	SungHee Shim, Prime Minister's Office, Republic of Korea Email address: hsims@pmo.go.kr or hsims@gmail.com Phone : +82-10-4709-7364

Information for completing the form

1. Briefly describe the summary of the proposed submission indicating the specific renewable energy technologies being recommended

The DNA of the Republic of Korea already submitted that the CDM project activities employing some grid connected renewable energy technologies with capacity up to 5MW be considered additional based on the guideline for demonstrating additionality of microscale project activities(version 02) on Sep 08, 2011.

However, according to the guideline for demonstrating additionality of microscale project activities(version 03) and the decision of the Board(refer to the paragraph 114 of the 65th CDM EB meeting report), the DNA of the Republic of Korea hereby submits the further required information concerning the total installed capacity of the following recommended renewable energy technologies.

☐ The recommended technologies

- Hydro
- Wind
- Solar Photovoltaics
- Solar thermal
- Geo-thermal
- Renewable Biomass
- Tidal, Wave and Ocean

F-CDM-PRT-REC ver01 PRT_001

CDM: Proposed specific renewable technologies/measures recommendation form (version 01)	
Submitting DNA	Republic of Korea
Title/version of the EB guideline/procedure this submission relates to	
Contact Information (name of person or office, e-mail addresses and phone contacts)	SungHee Shim, Prime Minister's Office, Republic of Korea Email address: hsims@pmo.go.kr or hsims@gmail.com Phone: +82-10-4709-7364

Summary of the proposal

According to the "Guidelines for demonstrating additionality of microscale project activities (version 03)" and following the "Procedure for submission and consideration of microscale renewable energy technologies for automatic additionality" (EB 65, annex 33) and taking into account the decision of the Board (EB 65, paragraph 114), the DNA of the Republic of Korea submitted further information concerning the total installed capacity of the following recommended renewable energy technologies[1]:

- Hydro;
- Wind;
- Solar Photovoltaics;
- Solar thermal;
- Geo-thermal;
- Renewable Biomass;
- Tidal, Wave and Ocean.

Recommendation to EB

[Figure 8] The submitted document to EB and recommendation of the EB

Therefore, this project activity is additional.

B.6. Emission reductions

B.6.1. Explanation of methodological choices

>>

The methodology AMS-I.D is applicable to the project, so emission reduction s are calculated according to the latest version of methodology AMS-I.D version 17, and the main steps are as follows:

1. Baseline emissions

$$BE_y = EG_{BL,y} * EF_{CO2,grid,y}$$

Where:

BE_y = Baseline Emissions in year y (tCO_2)

$EG_{BL,y}$ = Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year *y* (MWh)

$EF_{CO2,grid,y}$ = CO_2 emission factor of the grid in year *y* (tCO_2/MWh)

2. Project Emission

According to the AMS-I.D, Ver.17.0, the project emissions are considered as zero for most renewable energy project activities.

$$PE_y = 0$$

3. Leakage

As the energy generating equipment is not transferred from another activity, leakage is not to be considered.

$$LE_y = 0$$

4. Emission Reductions

$$ER_y = BE_y - PE_y - LE_y$$

Where:

ER_y = Emission reductions in year y (tCO_2/y)

BE_y = Baseline emissions in year y(tCO_2/y)

PE_y = Project emissions in year y (tCO_2/y)

LE_y = Leakage emissions in year y (tCO_2/y)

B.6.2. Data and parameters fixed ex ante

Data / Parameter	$EF_{grid,OM,y}$
Unit	tCO2/MWh
Description	Operating margin CO_2 emission factor in year y
Source of data	Calculated
Value(s) applied	0.6828
Choice of data or Measurement methods and procedures	This value was calculated according to "Tool to calculate the emission factor for an electricity system" (version 04.0.0). The applied value was derived from "2009, 2010, 2011 Statistics of Electric Power in Korea (2010, 2011, 2012)" (KEPCO) and "2011 Status of Generation facility (2012)" (Korea Power Exchange).
Purpose of data	Calculation of baseline emissions
Additional comment	This value is calculated at the time of PDD submission and will be applied during the crediting period without update.

Data / Parameter	$EF_{grid,BM,y}$
Unit	tCO2/MWh
Description	Build margin CO_2 emission factor in year y
Source of data	Calculated
Value(s) applied	0.5698
Choice of data or Measurement methods and procedures	This value was calculated according to "Tool to calculate the emission factor for an electricity system" (version 04.0.0). The applied value was derived from "2009, 2010, 2011 Statistics of Electric Power in Korea (2010, 2011, 2012)" (KEPCO) and "2011 Status of Generation facility (2012)" (Korea Power Exchange).
Purpose of data	Calculation of baseline emissions
Additional comment	This value is calculated at the time of PDD submission and will be applied during the crediting period without update.

Data / Parameter	$EF_{grid,CM,y}$ ($=EF_{CO2,grid,y}$)
Unit	tCO2/MWh
Description	Combined margin CO_2 emission factor in year y
Source of data	Calculated
Value(s) applied	0.6545
Choice of data or Measurement methods and procedures	This value was calculated according to "Tool to calculate the emission factor for an electricity system" (version 04.0.0). The applied value was derived from "2009, 2010, 2011 Statistics of Electric Power in Korea (2010, 2011, 2012)" (KEPCO) and "2011 Status of Generation facility (2012)" (Korea Power Exchange).
Purpose of data	Calculation of baseline emissions
Additional comment	This value is calculated at the time of PDD submission and will be applied during the crediting period without update.

B.6.3. Ex-ante calculation of emission reductions

>>

1. Baseline emissions

$BE_y = EG_{BL,y} * EF_{CO2,grid,y}$

Where:

BE_y = Baseline Emissions in year y (tCO_2)

$EG_{BL,y}$ = Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year *y* (MWh)

$EF_{CO2,grid,y}$ = CO_2 emission factor of the grid in year *y* (tCO_2/MWh)

**** BE_y = 8,463 MWh/y x 0.6545 tCO_2/MWh***

= 5,539 tCO_2 /y

2. Project Emission

According to the AMS-I.D, Ver.17.0, the project emissions are considered as zero for most renewable energy project activities.

$$PE_y = 0$$

3. Leakage

As the energy generating equipment is not transferred from another activity, leakage is not to be considered.

$$LE_y = 0$$

4. Emission Reductions

$$ER_y = BE_y - PE_y - LE_y$$

Where:

ER_y = Emission reductions in year y (tCO_2/y)

BE_y = Baseline emissions in year y(tCO_2/y)

PE_y = Project emissions in year y (tCO_2/y)

LE_y = Leakage emissions in year y (tCO_2/y)

**** ER_y = 5,539 tCO_2 / y - 0 tCO_2 / y - 0 tCO_2 / y***

= 5,539 tCO_2 / y

= 5,539 tCO_2 / y

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

Year	Baseline emissions (tCO_2 e)	Project emissions (tCO_2 e)	Leakage (tCO_2 e)	Emission reductions (tCO_2 e)
Year 1	5,539	0	0	5,539
Year 2	5,539	0	0	5,539
Year 3	5,539	0	0	5,539
Year 4	5,539	0	0	5,539
Year 5	5,539	0	0	5,539
Year 6	5,539	0	0	5,539
Year 7	5,539	0	0	5,539
Total	38,773	0	0	38,773
Total number of crediting years	7 years			
Annual average over the crediting period	5,539	0	0	5,539

B.7. Monitoring plan

B.7.1. Data and parameters to be monitored

Data / Parameter	$EG_{facility,\ y}$
Unit	MWh
Description	Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year *y*
Source of data	Measured by Watt-hour meters
Value(s) applied	8,463
Measurement methods and procedures	Measurement methods and procedures will be compliance with "Law regarding measurement" and "Act on operation of electricity market".
Monitoring frequency	Continuous monitoring, hourly measurement and at least monthly recording.
QA/QC procedures	- Accuracy of meter for the electricity supplied to grid : ± 0.5% - Accuracy of meter1 for the electricity imported from grid : ± 1.0% - Accuracy of meter2 for the electricity imported from grid : ± 1.0% - The calibration of the watt-hour meter for the electricity exported to grid will be periodically performed by authorized organization at least once in 3 years and 6 months ± 6 months in accordance with "Act on operation of electricity market." The meter for the electricity imported from grid will be calibrated at least once in 7 years according to the "Law regarding measurement" by authorized organization. - The data of electricity supplied to the grid will be cross-checked with relevant sales records provided by KPX. - The data of electricity imported from the grid will be cross-checked with receipts provided by KEPCO.
Purpose of data	Calculation of baseline` emission
Additional comment	$EG_{facility,\ y} = EG_{facility,\ supplied,\ y} - EG_{facility,\ imported,\ y}$

B.7.2. Sampling plan

>>

Not applicable

B.7.3. Other elements of monitoring plan

>>

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

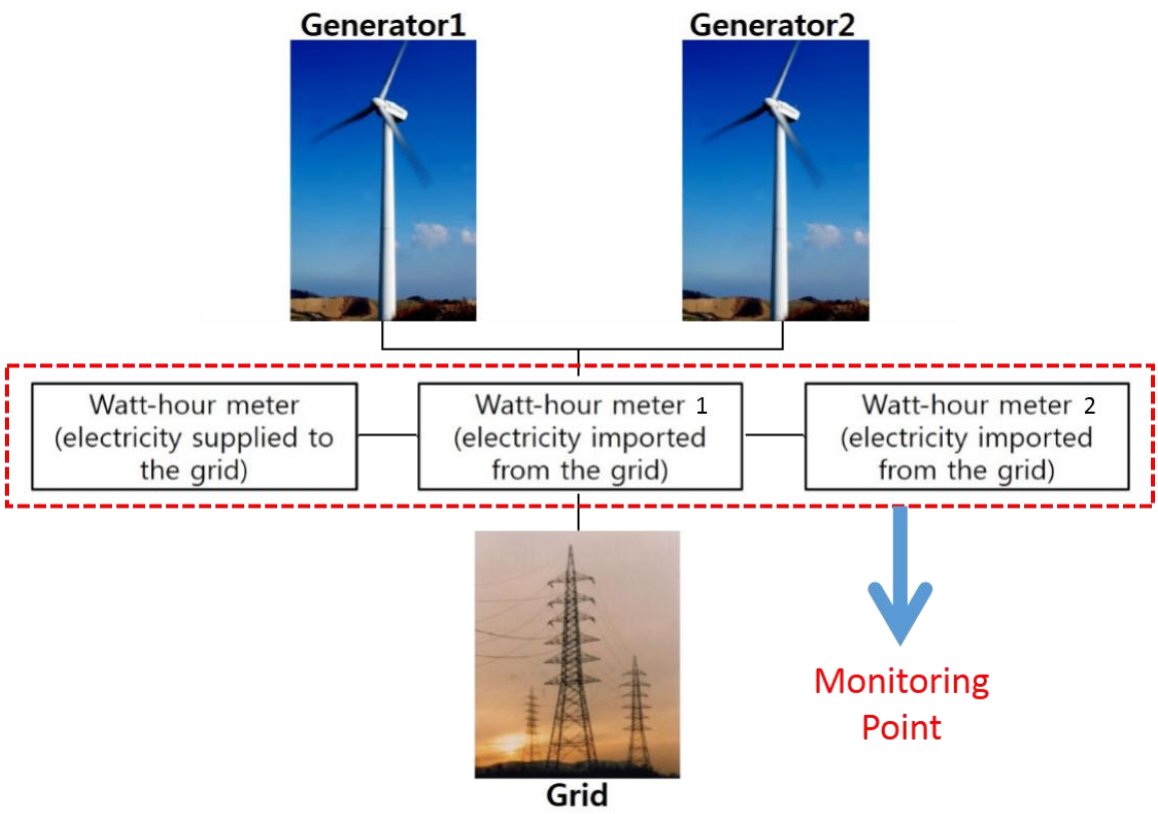
1. Monitoring equipment

1-1. Electricity measuring meters shall be set up transparently in accordance with "Law regarding measurement" and "Act on operation of electricity market" and shall be sealed after affirmation of Korea Power Exchange.

1-2. Meters shall be approved through the certified official process.

1-3. The calibration of the watt-hour meter for the electricity exported to grid will be periodically performed at least once in 3 years and 6 months ± 6 months and the meter for the electricity imported from grid will be calibrated at least once in 7 years according to the "Act on operation of electricity market" and will be certified by authorized organization.

1-4. The monitoring point of the proposed project is as follow:



[Figure 9] Monitoring point

2. Measure & Archive

2-1. Amount of electricity that has transmitted to the grid shall be measured automatically by established meters. The measured data are simultaneously transferred to the Korea Power Exchange.

2-2. The electricity exported to grid will be monitored continuously, measured hourly and recorded at least monthly and the electricity imported from grid will be same.

2-3. The collected exported data in article 2-2. will be compared with those of Korea power Exchange and imported electricity data will be cross-checked with receipts provided by KEPCO.

2-4. If two data compared in article 2-3. is different, the operation condition of electricity meters and other equipment shall be examined. In case meters are improperly operated, internal audits and correction procedure shall be implemented and be certified by the final decision-maker, Korea Power exchange and KEPCO.

2-5. All data will be kept and archived electronically for 2 years after the end of the crediting period or the last issuance of CERs for the proposed project, whichever occurs later.

3. Management of monitoring and electricity safety

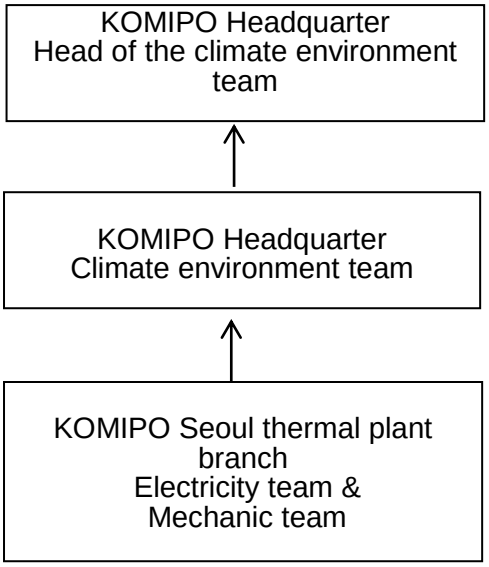
3-1. Person in charge of monitoring and electricity safety shall attend the following courses once every three years.

- Course on Electricity safety

The course on 'Act on operation of electricity market' shall be attended once in case of replacing the person in charge of monitoring and electricity safety.

3-2. In case of absence of the responsible person, the second responsible person shall be selected.

4. Operational and management structure



Final approval of CDM Monitoring activity

Overall monitoring procedure for the management of emissions reduction.
Collecting the monitoring result and managing monitoring report and approvals.

Monitoring installation management
Monitoring of the CDM project
Providing the monitoring result regularly to the Climate environment team of the Head Office

SECTION C. Duration and crediting period

C.1. Duration of project activity

C.1.1. Start date of project activity

>>

01/10/2005 – Construction date of the proposed project

C.1.2. Expected operational lifetime of project activity

>>

20 years

C.2. Crediting period of project activity

C.2.1. Type of crediting period

>>

Renewable type of crediting period

C.2.2. Start date of crediting period

>>

10/02/2014 – Start date of second crediting period

C.2.3. Length of crediting period

>>

7 years – Length of second crediting period

SECTION D. Environmental impacts

D.1. Analysis of environmental impacts

>>

The Republic of Korea does not require an EIA (Environmental Impact Assessment) for Yangyang renewable energy project(wind power) whose facility is 3MW. Because, according to the Act on Assessment of Impacts of Works on Environment, Traffic, Disasters, etc, plant facility whose power source is solar power, wind power or fuel cell which is more than 100MW shall be carried out Environmental Impact Assessment.

Though this project didn't have duty to be conducted in general procedure of EIA, project developer estimated environmental impact to assess exactly whether this project could support sustainable development or not. The environmental impact assessment study allows for an estimate of the effects on the human population, the flora and fauna, water, air, climate, landscape and the structure and functioning of the ecosystems in the are expected to be affected. The analysis covers both the wind park itself and the connection lines associated with the project.

At the preliminary report of the environmental impact assessment for the Yangyang renewable energy project(wind power), the conclusion of the report was that there is a little environmental impact by this project. EIA report for Yangyang wind power was published in May. 2005

SECTION E. Local stakeholder consultation

E.1. Solicitation of comments from local stakeholders

>>

The local stakeholders of the project activity are local people of Jindongri, Girinmyeon and village administration authorities in Gangwondo. Meetings were organised with local stakeholders in both the villages and comments were invited from the local community regarding the project activity. The meeting was arranged on 22 April 2005 at Jindongri, Girinmyeon which is located where wind power facility would be constructed. Thirty people who are the local community leaders and the village administration authorities attended in this public meeting.

E.2. Summary of comments received

>>

The local people were interested in this project because there would be some potential to improve local community, like advertisement or development for local community. Most of positive opinion was about how the project would contribute to Jindongri community for sustainable development. KOMIPO explained that there could be some environmental and social benefit through this project at the meeting.

E.3. Report on consideration of comments received

>>

No major concerns have been raised by the stakeholders that were present at the stakeholder consultation meeting. The answers provided by KOMIPO satisfied the participants. KOMIPO will ensure that the renewable power plants will be placed in such a way that noise impacts for the local population will be minimized.

SECTION F. Approval and authorization

>>

Approval date: 17/11/2006

Host country: Republic of Korea

- - - - -

Appendix 1: Contact information of project participants

Organization	KOMIPO (Korea Midland Power Company Limited)
Street/P.O. Box	38, Teheran-ro 114-gil
Building	Dong-il tower
City	Seoul
State/Region	Gangnam-gu
Postcode	135-280
Country	Republic of Korea
Telephone	
Fax	
E-mail	
Website	www.komipo.co.kr
Contact person	
Title	Senior Manager
Salutation	Mr.
Last name	Oh
Middle name	
First name	Dong-hun
Department	Power Generation Department
Mobile	
Direct fax	+82-70-7511-1055
Direct tel.	+ 82-70-7511-1342
Personal e-mail	odh468@komipo.co.kr

Appendix 2: Affirmation regarding public funding

There is no public funding in this project.

Appendix 3: Applicability of selected methodology

Please refer to the section B.2. Applicability of methodology.

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

The baseline information used to calculate emission reductions of the proposed project is as follows:

- Determination of Emission Factor

[Appendix 4-1] Calculation of Operating Margin emission factor

Year	Plant		Amount of fossil fuel(FCi,m,y)				Net Caloric value(NCVi,y)				Net electricity generated (EGm,y)	EF for each plant (tonCO2eq./MWh)
			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)		
2009	Honam	#1	923,895	471	167	0	5,012	9,323	8,510		1,843,823	0.9420
		#2	853,508	818	201	0	4,982	9,314	8,507		1,696,597	0.9409
	Samchonpo	#1	1,611,736	0	299	0	5,582		8,496		3,881,067	0.8689
		#2	1,596,153	0	447	0	5,543		8,446		3,869,863	0.8570
		#3	1,818,061	0	110	0	5,545		8,490		4,494,850	0.8404
		#4	1,552,530	0	486	0	5,557		8,384		3,873,780	0.8349
		#5	1,909,143	0	151	0	4,850		8,537		4,225,306	0.8213
		#6	1,765,537	0	576	0	4,854		8,557		3,902,690	0.8232
	Yonghung	#1	2,316,758	0	1,996	0	5,681		8,446		6,121,660	0.8065
		#2	2,437,083	0	1,632	0	5,654		8,218		6,309,794	0.8190
		#3	2,533,024	0	966	0	5,642		8,469		6,711,338	0.7983
		#4	2,740,096	0	117	0	5,647		6,764		7,183,514	0.8071
	Boryeong	#1	896,958	0	1,982	0	5,259		8,496		2,076,329	0.8538
		#2	1,361,908	0	5,689	0	5,292		8,385		3,148,655	0.8623
		#3	1,686,579	0	180	0	5,363		8,476		4,153,516	0.8162
		#4	1,554,579	0	672	0	5,337		8,551		3,823,603	0.8136
		#5	1,681,591	0	516	0	5,354		8,425		4,136,937	0.8159
		#6	1,538,187	0	935	0	5,378		8,363		3,802,516	0.8158
		#7	1,438,768	0	568	0	5,390		8,319		3,720,811	0.7814
		#8	1,701,650	0	341	0	5,384		8,661		4,417,673	0.7773

Taean	#1	1,561,372	0	348	0	5,646		8,400		4,087,057	0.8085
	#2	1,483,233	0	22	0	5,651		8,248		3,858,541	0.8139
	#3	1,550,278	0	209	0	5,650		8,327		4,041,441	0.8123
	#4	1,471,251	0	410	0	5,641		8,351		3,843,816	0.8094
	#5	1,409,802	0	978	0	5,672		8,369		3,689,068	0.8129
	#6	1,548,690	0	285	0	5,688		8,393		4,064,658	0.8122
	#7	1,576,347	0	394	0	5,674		8,437		4,232,409	0.7921
	#8	1,382,469	0	1,397	0	5,676		8,385		3,730,433	0.7891
Hadong	#1	1,647,434	0	341	0	5,469		8,416		4,064,233	0.8310
	#2	1,551,648	0	648	0	5,428		8,456		3,799,030	0.8312
	#3	1,554,931	0	473	0	5,462		8,442		3,862,769	0.8242
	#4	1,634,941	0	226	0	5,465		8,441		4,049,790	0.8268
	#5	1,543,027	0	547	0	5,467		8,434		3,848,711	0.8217
	#6	1,637,877	0	286	0	5,465		8,407		4,085,588	0.8211
	#7	1,500,309	0	72	0	5,614		8,497		4,068,510	0.7757
	#8	1,169,132	0	692	0	5,625		7,654		3,153,402	0.7820
Dangjin	#1	1,601,422	0	677	0	5,425		8,602		4,025,605	0.8092
	#2	1,572,097	0	291	0	5,423		8,547		3,964,389	0.8060
	#3	1,669,969	0	155	0	5,431		8,575		4,232,358	0.8031
	#4	1,658,923	0	110	0	5,432		8,585		4,195,301	0.8050
	#5	1,324,949	0	582	0	5,445		8,553		3,400,082	0.7956
	#6	1,330,803	0	517	0	5,468		8,530		3,471,850	0.7857
	#7	1,609,342	0	133	0	5,478		8,564		4,172,321	0.7918
	#8	1,334,679	0	625	0	5,513		8,550		3,531,321	0.7812
Ulsan	#1	0	30,963	35	0		9,415	8,767		116,425	0.7923
	#2	0	27,250	41	0		9,416	8,689		104,292	0.7787
	#3	0	7,139	35	0		9,399	8,631		26,061	0.8174
	#4	0	253,330	2,938	0		9,486	8,517		1,058,708	0.7247
	#5	0	313,474	2,805	0		9,488	8,619		1,318,789	0.7185
	#6	0	288,842	2,460	0		9,491	8,601		1,215,616	0.7181
Yeongnam	#1	0	108,767	764	0		9,681	8,657		437,034	0.7662
	#2	0	104,675	647	0		9,684	8,709		415,404	0.7755

Yeosu	#1	0	113,633	187	0		9,419	8,357		466,519	0.7263
	#2	0	193,394	203	0		9,427	7,792		805,262	0.7163
Pyeongtaek	#1	0	56,671	354	2,922		9,456	11,684	11,446	251,576	0.7085
	#2	0	280,992	696	4,203		9,388	11,900	11,480	1,211,425	0.6995
	#3	0	282,894	581	4,046		9,378	11,595	11,598	1,225,561	0.6947
	#4	0	192,380	545	3,838		9,399	10,619	11,617	834,285	0.6994
Namjeju	#1	0	0	0	0					0	
	#2	0	0	0	0					0	
	#3	0	140,564	143	0		9,387	8,510		550,851	0.7579
	#4	0	153,841	89	0		9,385	8,529		603,417	0.7567
Jeju	#1	0	0	0	0					0	
	#2	0	82,010	103	0		9,360	8,495		324,784	0.7479
	#3	0	91,221	72	0		9,348	8,537		356,297	0.7570
Seoul	#4	0	0	0	36,893				11,745	157,606	0.6250
	#5	0	0	0	91,258				11,740	412,265	0.5908
Incheon	#1	0	0	0	15,168				11,738	72,854	0.5556
	#2	0	0	0	15,317				11,739	76,672	0.5332
	#3	0	0	47	2,411			8,550	11,753	11,865	0.5533
	#4	0	0	0	0					0	
Pyongtaek	C/C	0	0	0	80,050				11,740	483,959	0.4415
Ilsan	C/C	0	0	0	595,190				11,737	3,270,241	0.4856
Bundang	C/C	0	0	13,142	541,739				11,540	3,108,338	0.4572
Ulsan	C/C	0	0	0	489,946				11,558	3,299,104	0.3902
Seoincheon	C/C	0	0	0	1,061,332				11,740	7,503,395	0.3775
Shinincheon	C/C	0	0	0	1,394,939				11,739	9,901,080	0.3760
Boryeong	C/C	0	0	86	543,342				11,726	3,655,848	0.3962
Incheon	C/C	0	0	0	806,154				11,784	6,075,599	0.3555
Busan	C/C	0	0	0	1,247,488				11,747	9,268,113	0.3595
Hallim	C/C	0	0	0	0					0	
Anyang	C/C	0	0	0	202,108				14,084	1,301,286	0.4973
Bucheon	C/C	0	0	0	230,085				14,232	1,556,502	0.4783
POSCO POWER	C/C	0	0	0	342,724				11,739	1,859,273	0.4919

	GS Bugog	C/C	0	0	0	603,232				12,532	4,344,271	0.3956
	Yulchon	C/C	0	0	0	282,344				11,744	1,995,914	0.3777
	Kwangyang	C/C	0	0	0	0					0	
	Hyundai-Daesan	C/C	0	0	0	0					0	
	Namjeju	D/P	0	29,527	275	0		9,407	8,498		136,189	0.6499
	Jeju	G/T	0	0	626	0			8,503		842	1.9215
	Jeju	D/P	0	72,724	0	0		6,082			345,163	0.4050
	Total		70,242,669	2,825,580	55,323	8,596,729					247,025,690	0.7117
2010	Honam	#1	661,468	1,855	301	0	5,014	9,321	8,458	0	1,321,140	0.9454
		#2	722,994	897	350		5,057	9,322	8,482	0	1,462,407	0.9392
	Samchonpo	#1	1,899,819		518		5,385	0	8,466	0	4,433,574	0.8649
		#2	1,891,944		421		5,388	0	8,457	0	4,418,264	0.8647
		#3	1,581,512		1,261		5,373	0	8,478	0	3,766,380	0.8462
		#4	1,909,672		369		5,358	0	8,473	0	4,544,757	0.8439
		#5	1,949,826		293		4,714	0	8,563	0	4,174,333	0.8252
		#6	1,758,651		573		4,718	0	8,557	0	3,767,928	0.8256
	Yonghung	#1	2,201,446		2,189		5,432	0	8,387	0	5,558,681	0.8071
		#2	2,264,564		1,531		5,433	0	8,381	0	5,627,774	0.8199
		#3	2,778,041		739		5,386	0	8,391	0	6,887,344	0.8144
		#4	2,821,533		663		5,379	0	8,381	0	6,943,045	0.8193
	Boryeong	#1	1,771,953		732		5,176	0	8,402	0	4,012,817	0.8569
		#2	1,635,347		1,068		5,175	0	8,353	0	3,706,927	0.8562
		#3	1,618,460		464		5,206	0	8,321	0	3,855,846	0.8191
		#4	1,775,851		289		5,206	0	8,349	0	4,232,288	0.8188
		#5	1,604,934		911		5,201	0	8,313	0	3,817,181	0.8200
		#6	1,778,254		359		5,202	0	8,317	0	4,226,837	0.8203
		#7	1,670,727		662		5,244	0	8,322	0	4,189,558	0.7840
		#8	1,493,422		439		5,255	0	8,316	0	3,787,312	0.7767

	Taean	#1	1,512,930		865		5,458	0	8,428	0	3,817,336	0.8111
		#2	1,626,596		518		5,427	0	8,429	0	4,058,392	0.8154
		#3	1,506,479		476		5,433	0	8,436	0	3,776,949	0.8123
		#4	1,656,710		296		5,456	0	8,422	0	4,165,579	0.8133
		#5	1,450,465		680		5,491	0	8,437	0	3,657,234	0.8166
		#6	1,319,263		1,094		5,486	0	8,428	0	3,339,271	0.8130
		#7	1,521,262		879		5,469	0	8,430	0	3,940,580	0.7918
		#8	1,674,579		240		5,456	0	8,431	0	4,335,230	0.7899
	Hadong	#1	1,651,998		386		5,263	0	7,561	0	3,948,643	0.8253
		#2	1,758,216		133		5,262	0	8,421	0	4,181,012	0.8292
		#3	1,760,793		94		5,264	0	8,671	0	4,229,016	0.8213
		#4	1,623,350		610		5,260	0	8,416	0	3,877,595	0.8255
		#5	1,762,407		369		5,259	0	8,643	0	4,210,179	0.8251
		#6	1,642,064		367		5,263	0	8,423	0	3,972,047	0.8155
		#7	1,314,119		674		5,528	0	8,474	0	3,497,189	0.7789
		#8	1,586,695		34		5,525	0	8,578	0	4,221,464	0.7782
	Dangjin	#1	1,802,866		89		5,140	0	8,294	0	4,240,235	0.8190
		#2	1,812,592		168		5,133	0	8,522	0	4,271,208	0.8163
		#3	1,660,911		430		5,140	0	8,532	0	3,924,887	0.8153
		#4	1,593,667		974		5,134	0	8,469	0	3,757,184	0.8167
		#5	1,676,374		332		5,198	0	8,533	0	4,133,329	0.7902
		#6	1,722,658		157		5,195	0	8,520	0	4,242,960	0.7904
		#7	1,572,939		347		5,207	0	8,534	0	3,870,155	0.7932
		#8	1,729,056		90		5,191	0	8,497	0	4,272,886	0.7872
	Ulsan	#1		59,593	278	0	0	9,420	8,369	0	220,710	0.8072
		#2		50,627	249	0	0	9,423	8,382	0	185,534	0.8162

		#3		70,519	286	0	0	9,352	8,361	0	261,312	0.8006
		#4		229,069	4,116	0	0	9,511	8,350	0	927,792	0.7535
		#5		204,124	4,395	0	0	9,526	8,350	0	823,717	0.7597
		#6		217,795	3,058	0	0	9,506	8,350	0	887,331	0.7463
	Yeongnam	#1		91,050	1,170		0	9,705	8,785	0	354,224	0.7974
		#2		80,387	786		0	9,702	8,696	0	304,146	0.8174
	Yeosu	#1		118,289	370		0	9,539	8,350	0	481,530	0.7426
		#2		236,662	278		0	9,543	8,345	0	956,556	0.7471
	Pyeongtaek	#1		188,829	121	3,409	0	9,435	8,542	11,693	794,103	0.7210
		#2		172,352	102	6,484	0	9,430	8,485	11,691	742,439	0.7156
		#3		194,662	115	4,814	0	9,443	8,517	11,702	830,437	0.7155
		#4		158,042	91	3,646	0	9,443	8,540	11,651	669,443	0.7195
	Namjeju	#1		0	0	0	0	0	0	0	0	0.0000
		#2		0	0	0	0	0	0	0	0	0.0000
		#3		151,950	105	0	0	9,410	8,505	0	594,537	0.7607
		#4		146,544	134	0	0	9,410	8,472	0	580,342	0.7517
	Jeju	#1		0	0	0	0	0	0	0	0	
		#2		76,706	78	0	0	9,379	8,440	0	298,469	0.7626
		#3		89,373	82	0	0	9,379	8,492	0	344,920	0.7688
	Seoul	#4		0	0	77,219	0	0	0	11,746	356,493	0.5784
		#5		0	1	169,145	0	0	6,650	11,746	815,062	0.5542
	Incheon	#1		0	0	95,108	0	0		11,747	477,252	0.5322
		#2		0	0	105,649	0	0		11,748	544,351	0.5184
		#3		0	0	0	0	0		0	0	0.0000
		#4		0	0	0	0	0		0	0	
	Pyongtaek	C/C				237,805	0	0		11,691	1,472,808	0.4291

	Ilsan	C/C			0	755,305	0	0		11,745	4,306,850	0.4683
	Bundang	C/C			0	725,097	0	0		11,747	4,311,466	0.4491
	Ulsan	C/C			0	846,672	0	0		11,576	5,709,782	0.3902
	Seoincheon	C/C			76	1,633,316	0	0	8,750	11,745	11,756,041	0.3710
	Shinincheon	C/C			0	1,349,902	0	0		11,747	9,595,856	0.3757
	Boryeong	C/C			0	1,016,783	0	0		11,747	7,053,566	0.3850
	Incheon	C/C			0	1,035,486	0	0		11,745	7,789,931	0.3549
	Busan	C/C			12	1,666,675	0	0	4,275	11,748	12,489,596	0.3564
	Hallim	C/C			12,737	0	0	0	8,536	0	45,450	0.7271
	Anyang	C/C			0	308,918	0	0		12,447	1,824,654	0.4791
	Bucheon	C/C			0	303,789	0	0		12,454	1,806,919	0.4760
	POSCO POWER	C/C			0	809,100	0	0		11,411	4,297,788	0.4884
	GS Bugog	C/C	0		0	807,082	0	0		11,756	6,053,971	0.3563
	Yulchon	C/C	0		0	372,560	0	0		11,748	2,680,710	0.3712
	Kwangyang	C/C	0		0	0	0	0		0	-	0.0000
	Hyundai-Daesan	C/C	0		0	0	0	0		0	-	0.0000
	Kunsan	C/C			0	398,151	0	0		11,746	2,937,873	0.3619
	Yungwol	C/C			263	182,365	0	0	8,499	11,750	1,281,206	0.3807
	Namjeju	D/P		20,334	369		0	9,385	8,493	0	91,340	0.6709
	Jeju	G/T		0	697		0	0	8,550	0	1,115	1.6246
	Jeju	D/P	0	85,093	0		0	9,371	0	0	405,634	0.6214
	Total		74,729,407	2,644,752	54,403	12,914,480					279,038,209	0.6820
2011	Honam	#1	953,215	177	112	0	5,248	9,334	8,440	0	1,905,966	0.9839
		#2	879,567	1,210	214	0	5,249	9,321	8,395	0	1,747,338	0.9924
	Samchonpo	#1	1,948,868	0	475	0	5,206	0	7,770	0	4,359,352	0.8724
		#2	1,970,242	0	262	0	5,192	0	8,470	0	4,419,002	0.8676

		#3	1,986,001	0	105	0	5,191	0	10,025	0	4,573,786	0.8447
		#4	1,690,312	0	1,035	0	5,179	0	8,717	0	3,865,121	0.8494
		#5	1,838,960	0	560	0	4,567	0	8,450	0	3,810,806	0.8262
		#6	1,846,398	0	251	0	4,575	0	8,444	0	3,835,815	0.8253
	Yonghung	#1	2,699,097	0	1,340	0	5,225	0	8,410	0	6,433,472	0.8219
		#2	2,683,956	0	1,759	0	5,227	0	8,832	0	6,426,393	0.8188
		#3	2,880,873	0	651	0	5,231	0	8,407	0	6,959,292	0.8116
		#4	2,543,874	0	2,002	0	5,194	0	8,651	0	5,993,268	0.8270
	Boryeong	#1	1,631,824	0	683	0	5,130	0	8,320	0	3,658,190	0.8579
		#2	1,862,926	0	514	0	5,129	0	8,430	0	4,152,770	0.8625
		#3	1,773,564	0	244	0	5,137	0	8,297	0	4,195,243	0.8140
		#4	1,622,205	0	537	0	5,139	0	8,295	0	3,855,254	0.8106
		#5	1,671,582	0	1,308	0	5,135	0	8,306	0	3,929,511	0.8193
		#6	1,514,320	0	3,349	0	5,156	0	8,312	0	3,592,960	0.8167
		#7	1,595,059	0	703	0	5,187	0	8,301	0	3,985,396	0.7784
		#8	1,684,495	0	608	0	5,193	0	8,347	0	4,230,455	0.7752
	Taean	#1	1,718,777	0	1,054	0	5,219	0	8,431	0	4,081,011	0.8243
		#2	1,686,651	0	968	0	5,216	0	8,427	0	3,981,618	0.8285
		#3	1,732,630	0	917	0	5,210	0	8,427	0	4,095,757	0.8265
		#4	1,579,296	0	1,132	0	5,218	0	8,427	0	3,730,898	0.8285
		#5	1,659,427	0	804	0	5,386	0	8,431	0	4,044,894	0.8285
		#6	1,660,393	0	766	0	5,385	0	8,428	0	4,036,939	0.8305
		#7	1,714,300	0	423	0	5,225	0	8,431	0	4,143,649	0.8102
		#8	1,676,411	0	620	0	5,218	0	8,434	0	4,052,165	0.8094
	Hadong	#1	1,800,151	0	193	0	5,168	0	8,442	0	4,201,848	0.8298

		#2	1,697,458	0	372	0	5,163	0	8,999	0	3,939,767	0.8338
		#3	1,690,815	0	267	0	5,168	0	8,322	0	3,948,628	0.8295
		#4	1,819,283	0	132	0	5,164	0	8,341	0	4,210,204	0.8363
		#5	1,679,060	0	522	0	5,172	0	8,381	0	3,955,693	0.8230
		#6	1,801,037	0	156	0	5,172	0	8,404	0	4,234,960	0.8243
		#7	1,547,047	0	583	0	5,449	0	8,346	0	3,989,890	0.7921
		#8	1,361,806	0	2,010	0	5,453	0	8,462	0	3,536,970	0.7881
	Dangjin	#1	1,656,563	0	953	0	5,046	0	8,338	0	3,722,484	0.8421
		#2	1,644,619	0	704	0	5,052	0	8,303	0	3,703,032	0.8412
		#3	1,874,479	0	0	0	5,050	0	0	0	4,260,116	0.8326
		#4	1,880,478	0	71	0	5,053	0	8,349	0	4,275,089	0.8328
		#5	1,601,149	0	337	0	5,119	0	8,310	0	3,822,712	0.8037
		#6	1,590,289	0	861	0	5,102	0	8,359	0	3,799,971	0.8007
		#7	1,683,155	0	545	0	5,110	0	8,548	0	3,990,467	0.8080
		#8	1,611,032	0	699	0	5,106	0	8,501	0	3,885,254	0.7938
	Ulsan	#1	0	65,421	320	0	0	9,399	8,357	0	241,206	0.8092
		#2	0	60,052	271	0	0	9,410	8,368	0	220,870	0.8119
		#3	0	71,455	231	0	0	9,409	8,365	0	263,718	0.8081
		#4	0	141,246	2,447	0	0	9,527	8,350	0	579,319	0.7450
		#5	0	195,802	3,498	0	0	9,526	8,360	0	811,709	0.7373
		#6	0	172,458	1,274	0	0	9,533	8,351	0	706,839	0.7398
	Yeongnam	#1	0	66,130	903	0	0	9,693	8,366	0	257,829	0.7948
		#2	0	57,618	481	0	0	9,705	8,374	0	218,307	0.8153
	Yeosu	#1	0	76,903	452	0	0	9,740	8,338	0	311,053	0.7649
		#2	0	0	6,167	0	0	0	8,314	0	873,675	0.0178
	Pyeongtaek	#1	0	139,046	85	26,800	0	9,533	8,516	12,448	700,456	0.7068

	#2	0	119,917	75	34,935	0	9,521	8,550	11,496	665,563	0.6797
	#3	0	125,416	39	17,618	0	9,571	8,501	11,770	606,066	0.7040
	#4	0	108,044	47	20,060	0	9,508	8,449	11,974	543,457	0.6982
Namjeju	#1	0	0	0	0	0	0	0	0	0	0.0000
	#2	0	0	0	0	0	0	0	0	0	0.0000
	#3	0	141,259	116	0	0	9,392	8,444	0	551,178	0.7614
	#4	0	161,171	52	0	0	9,390	8,568	0	630,859	0.7585
Jeju	#1	0	0	0	0	0	0	0	0	0	
	#2	0	78,003	128	0	0	9,390	3,229	0	307,320	0.7538
	#3	0	96,861	75	0	0	9,391	7,220	0	376,774	0.7636
Seoul	#4	0	0	0	67,400	0	0	0	11,747	313,916	0.5734
	#5	0	0	0	145,131	0	0	0	11,748	705,553	0.5494
Incheon	#1	0	0	0	105,615	0	0		11,746	542,437	0.5199
	#2	0	0	0	112,296	0	0		11,746	581,043	0.5161
	#3	0	0	0	0	0	0		0	0	0.0000
	#4	0	0	0	0	0	0		0	0	0.0000
Pyongtaek	C/C	0	0	0	235,935	0	0		11,858	1,458,270	0.4361
Ilsan	C/C	0	0	0	595,669	0	0		11,747	3,415,525	0.4657
Bundang	C/C	0	0	0	632,263	0	0		11,755	3,762,236	0.4491
Ulsan	C/C	0	0	0	1,021,561	0	0		11,647	7,011,947	0.3858
Seoincheon	C/C	0	0	26	1,645,667	0	0	8,879	11,746	11,828,077	0.3715
Shinincheon	C/C	0	0	0	1,225,449	0	0		11,747	8,470,640	0.3863
Boryeong	C/C	0	0	0	925,348	0	0		11,757	6,463,535	0.3827
Incheon	C/C	0	0	0	965,530	0	0		11,747	7,230,855	0.3566
Busan	C/C	0	0	32	1,554,837	0	0	8,550	11,753	11,583,721	0.3587
Hallim	C/C	0	0	12,493	0	0	0	8,510	0	43,828	0.7374

Anyang	C/C	0	0	0	322,478	0	0		11,754	1,888,326	0.4563
Bucheon	C/C	0	0	0	513,362	0	0		6,895	1,775,876	0.4531
POSCO POWER	C/C	0	0	0	1,088,204	0	0		13,172	10,681,153	0.3051
GS Bugog	C/C	0		0	770,789	0	0		15,685	5,794,391	0.4744
Yulchon	C/C	0	0	0	368,468	0	0		11,752	2,667,408	0.3691
Kwangyang	C/C	0	0	0	0	0	0		0	6,439,416	0.0000
Hyundai-Daesan	C/C	0		0	0	0	0		0	167,685	0.0000
Kunsan	C/C	0	0	0	648,722	0	0		11,754	4,926,279	0.3519
Yungwol	C/C	0	0	65	564,915	0	0	8,535	11,756	4,107,372	0.3676
Namjeju	D/P	0	22,894	381	0	0	9,357	8,550	0	103,234	0.6655
Jeju	G/T	0	0	552	0	0	0	8,495	0	1,021	1.3960
Jeju	D/P	0	97,504	0	0	0	9,395	0	0	469,240	0.6171
Total		77,643,644	1,998,587	62,011	13,609,052					292,872,588	0.6592

**** Operating Margin emission factor**

Year	Electricity generation by OM plants	CO_2 emissions by OM plants
2009	247,025,690	175,798,820
2010	279,038,209	190,305,054
2011	292,872,588	193,066,862
Total	**818,936,487**	**559,170,736**

EF_{OM} = 0.6828 tonCO_2/MWh

[Appendix 4- 2] **Sample group plants used in the Build Margin calculation and CO_2 Emission Factor of the Build Margin**

Year	No.	Plant name		Technology	Type of Fossil Fuel	year operation	Net electricity generated (EGm,y)	CO2 emission factor tCO2/MWh	EF for each plant (tonCO2eq./MWh)
2011	1	Kwangyanghang solar		Solar		2011.12	0		
	2	KC susan solar		Solar		2011.12	167		
	3	Seoul solar		Solar		2011.09	0		
	4	Hadong S/S solar		Solar		2011.09	23		
	5	Busan sinhang solar		Solar		2011.08	60		
	6	Ulsan solar		Solar		2011.08	511		
	7	Tangjeong solar		Solar		2011.08	713		
	8	Hoengseongdaem		small hydro power		2011	0		
	9	Kangjeong		small hydro power		2011	0		
	10	Kangcheonbo		small hydro power		2011	0		
	11	Kumibo		small hydro power		2011	0		
	12	Keumkangbo		small hydro power		2011	0		
	13	Keumnambo		small hydro power		2011	532		
	14	Baekjebo		small hydro power		2011	0		
	15	Seungchonbo		small hydro power		2011	0		
	16	Epobo		small hydro power		2011	0		
	17	Juksanbo		small hydro power		2011	0		
	18	Pankyo		small hydro power		2011	1,496		
	19	Yeoicheon pumping	#1	pumping		2011	151,322		
	20	Yeoicheon pumping	#2	pumping		2011	65,763		
20	1	Haengwon solar park		solar		2010.11	0		
	2	Gunwi		small hydro power		2010.11	1,347		

10	3	Dangjin solar park		solar		2010.10	1,329		
	4	Yeoicheon solar park		solar		2010.10	2,839		
	5	Yeongheung-wind power		wind		2010.10	0		
	6	Hangwon		small hydro power		2010.10	104		
	7	Seolibo		small hydro power		2010.08	0		
	8	Kyeongcheon	#2	small hydro power		2010.07	0		
	9	Gunsan		Combined		2010.06	4,926,279	0.3519	0.0179
	10	Tapjeong		small hydro power		2010.03	0		
	11	Sinkori	#1	nuclear		2010.02	7,867,030		
	12	Pangweo		small hydro power		2010	0		
	13	Yeongwol		Combined		2010	4,107,372	0.3676	0.0156
	14	Dangjin		small hydro power		2010			
	15	Rural community corp.		small hydro power		2010	0		
	16	New solar energy and others				2010	0		
2009	1	Gosan		small hydro power		2009.12	0		0.0000
	2	Ilsan fuel cell		fuel cell		2009.09	30,468		
	3	Gosado solar		solar		2009.07			
	4	Pyeongsado solar		solar		2009.07			
	5	Yukdo solar		solar		2009.07			
	6	Yuldo solar		solar		2009.07			
	7	Hadong	# 8	steam power	Bituminous coal	2009.06	3,536,970	0.7881	0.0287
	8	Daehanboryeong		small hydro power		2009.05	0		
	9	Hankukhaeyang		small hydro power		2009.05	0		
	10	Wooldolmok		small hydro power		2009.05	0		
	11	Dangsado solar		solar		2009.04			
	12	Hahwado solar		solar		2009.04			
	13	Hwangjedo solar		solar		2009.04			
	14	Seongsan-wind		wind		2009.04	0		
	15	Yeongwol solar		solar		2009.01	57		

	16	Boseong		small hydro power		2009	0		
	17	Seongju		small hydro power		2009	0		
	18	New solar energy and others				2009	0		
	1	Boryeong	#8	steam power	Bituminous coal	2008.12	4,230,455	0.7752	0.0338
	2	Hadong	#7	steam power	Bituminous coal	2008.12	3,989,890	0.7921	0.0326
	3	Yeongheung	#4	steam power	Bituminous coal	2008.12	5,993,268	0.8270	0.0511
	4	Kyeongcheon		small hydro power		2008.11	0		
	5	Seongnam 2		small hydro power		2008.1	0		
	6	Nulokdo solar		solar		2008.09	0		
	7	Jeju solar		solar		2008.09	57		
	8	Boryeong fuel cell		fuel cell		2008.09	2,087		
	9	Naebyeong solar		solar		2008.08	0		
2	10	Yulhyeon		small hydro power		2008.07	0		
	11	Busan C/C solar		solar		2008.07			
0	12	Hadong solar		solar		2008.07			
	13	Hongikdongjin		small hydro power		2008.06	0		
0	14	Daecheongdaem		small hydro power		2008.06	0		
	15	Boryeong	#7	steam power	Bituminous coal	2008.06	3,985,396	0.7784	0.0320
8	16	Yeongheung	#3	steam power	Bituminous coal	2008.06	6,959,292	0.8116	0.0582
	17	Kori-wind power		wind		2008.05	0		
	18	Samlangjin solar				2008.04	0		
	19	Boryeong solar		solar		2008.04	0		
	20	Boryeong		small hydro power		2008.03	0		
	21	Yeongheung		small hydro power		2008.03	0		
	22	Yeonggwang solar park				2008.03	0		
	23	Boryeong 2		small hydro power		2008.03	1,045		
	24	POSCO fuel cell		fuel cell		2008.03	0		
	25	Gunjang heat & power		combined		2008.01	0		

	26	Seocheon solar		solar		2008.01	0		
	27	New solar energy and others		solar		2008	0		
	1	Taean		small hydro power		2007	0		
	2	Hanbit Sungsan the second solar		solar		2007.12	0		
	3	Taein gangjin solar		solar		2007.12	0		
	4	Suni gangjin solar		solar		2007.12	0		
	5	Korea yeongcheon solar		solar		2007.12	0		
	6	Solar yungam solar		solar		2007.12	0		
	7	Changwhan yeongduk solar		solar		2007.12	0		
	8	Samsung jindo		solar		2007.12	0		
	9	Hwaseong heat & power		combined		2007.12	0		
	10	Dangjin	#8	steam power	Bituminous coal	2007.12	3,885,254	0.7938	0.0318
2	11	SP solar yonggwang		solar		2007.11	0		
	12	Dongyang energy sinan		solar		2007.11	0		
0	13	Ef yungam solar		solar		2007.11	0		
	14	Dongwon gangjin solar		solar		2007.11	0		
0	15	Solec yonggwang solar		solar		2007.11	0		
	16	Solar jungeub solar		solar		2007.11	0		
7	17	Sinbuk yungam solar		solar		2007.11	0		
	18	Hyein haenam solar		solar		2007.11	0		
	19	Samlangjin solar		solar		2007.11	0		
	20	Hyosung daegi-wind power		wind		2007.11	0		
	21	Nonhyun heat & power		combined		2007.10	0		
	22	Wuriyungam solar		solar		2007.08	0		
	23	Hwasung solar		solar		2007.08	0		
	24	Yeongju the first solar		solar		2007.08	0		
	25	Muan solar		solar		2007.08	0		
	26	Jangheung solar		solar		2007.08	0		
	27	Gomun		small hydro power		2007.08	0		

	28	Taean	#8	steam power	Bituminous coal	2007.08	4,052,165	0.8094	0.0338
	29	Dangjin	#7	steam power	Bituminous coal	2007.06	3,990,467	0.8080	0.0333
	30	Munkyung solar		solar		2007.06	0		
	31	Younggwang solar park		solar		2007.06	0		
	32	Yungam Solar		solar		2007.06	0		
	33	Wonjungsu		small hydro power		2007.05	0		
	34	Baekgok		small hydro power		2007.05	0		
	35	damyangho		small hydro power		2007.05	0		
	36	Juam		small hydro power		2007.05	0		
	37	Namjeju	#4	thermal	heavy oil	2007.03	630,859	0.7585	0.0049
	38	Eco energy		solar		2007.03	0		
	39	hapcheon		small hydro power		2007.02	7,915		
	40	Jeonju-resource recovery facility				2007.02	0		
	41	Seoul Marin(suncheon)		solar		2007.02	0		
	42	Mirae energy		solar		2007.02	0		
	43	samcheonpo		small hydro power		2007.02	0		
	44	dalbang		small hydro power		2007.02	0		
	45	Taean	#7	steam power	Bituminous coal	2007.02	4,143,649	0.8102	0.0346
	46	Yeongju the second solar		solar		2007.01	0		
	47	Hyundaedaesan		combined		2007.01			
2	1	Cheongsong pumping	#2	pumping		2006.12	236,677		
	2	S&P Solar		solar		2006.10	0		
0	3	Bundang fuel cell		fuel cell	LNG	2006.10	2,031		
	4	Namhae Solar		solar		2006.10	0		
0	5	HanlaJeunggong Solar		solar		2006.10	0		
	6	Yungam Solar		solar		2006.09	0		
6	7	Enepark		solar		2006.09	0		
	8	Yeongheung solar		solar		2006.09	1,058		

	9	Cheongsong pumping	#1	pumping		2006.09	340,430		
	10	Namjeju	#3	thermal	heavy oil	2006.09	551,178	0.7614	0.0043
	11	yangyang(pumping)	#4	pumping		2006.08	228,095		
	12	Donghae Solar		solar		2006.08	0		
	13	Kangwon-wind power		wind		2006.07	0		
	14	Woljeong-wind power		wind		2006.07	0		
	15	yangyang pump windpower		wind		2006.06	0		
	16	Hadongho		small hydro power		2006.06	0		
	17	yangyang (pumping)	#3	pumping		2006.06	209,815		
	18	Goheung Solar		solar		2006.06	0		
	19	Jangseong		small hydro power		2006.05	0		
	20	yangyang (pumping)	#2	pumping		2006.04	100,955		
	21	Dangjin	#6	thermal	Bituminous coal	2006.04	3,799,971	0.8007	0.0314
	22	Sinchang-wind power		wind		2006.03	0		
	23	yangyang (pumping)	#1	pumping		2006.02	191,936		
2 0 0 5	1	Janghengdam		small hydro power		2005.12	0		
	2	Suncheon Solar		solar		2005.12	0		
	3	Samcheonpo solar energy		solar		2005.12	0		
	4	Dangjin	#5	steam power	Bituminous coal	2005.10	3,822,712	0.8037	0.0317
	5	yangyang pump small hydro		small hydro power		2005.10	0		
	6	Taean solar energy		solar		2005.10	130		
	7	Jeju DP		internal combustion	heavy oil	2005.07	469,240	0.6171	0.0030
	8	WunjeongLFG		internal combustion	LFG	2005.07	0		
	9	Yulchon		combined	LNG	2005.07	2,667,408	0.3691	0.0102
	10	Incheon		combined	LNG	2005.07	7,230,855	0.3566	0.0266
	11	Daegok		small hydro power		2005.07	1,295		
	12	Donghwa		small hydro power		2005.07	0		
	13	Ulchin	#6	nuclear		2005.04	8,090,567		

	14	Hanrye		LFG	LFG	2005.04	0		
	15	Busan Bio-gas		internal combustion	LFG	2005.03	0		
	16	Sungnam		small hydro power		2004.12	0		
	17	Yungduk-wind power		wind		2004.12	0		
	18	Yongdam		small hydro power		2004.12	30,818		
	19	Maebongsan-wind power		wind		2004.12	0		
	20	Daegwanryeong-wind power		wind		2004.12	0		
	21	Yeongheung	#2	steam power	Bituminous coal	2004.11	6,426,393	0.8188	0.0543
	22	Yeongheung	#1	steam power	Bituminous coal	2004.07	0		
Total							**96,967,745**		***0.5698***

[Appendix 4- 3] Default Values of Carbon content

Fuel	Default carbon content (kg/GJ)	Fuel	Default carbon content (kg/GJ)
Crude oil	20	Oil shale and Tar sands	29.1
Orimulsion	21	Brown Coal Briquettes	26.6
Natural gas liquids	17.2	Patent Fuel	26.6
Motor Gasoline	18.9	Coke Oven Coke and Lignite Coke	29.2
Aviation Gasoline	19.1	Gas Coke	29.2
Jet Gasoline	19.1	Coal Tar	22.0
Jet kerosene	19.5	Gas Works Gas	12.1
Other Kerosene	19.6	Coke Oven Gas	12.1
Shale oil	20	Blast Furnace Gas	70.8
Gas/Diesel oil	20.2	Oxygen Steel Furnace Gas	49.6
Residual fuel oil	21.1	Natural Gas	15.3
LPG	17.2	Municipal Wastes (non-biomass fraction)	25.0
Ethane	16.8	Industrial Wastes	39.0
Naphtha	20.0	Waste Oils	20.0
Bitumen	22.0	Peat	28.9
Lubricants	20.0	Wood/Wood Waste	30.5
Petroleum coke	26.6	Sulphite lyes (black liquor)	26.0
Refinery Feedstocks	20.0	Other Primary Solid Biomass	27.3
Refinery gas	15.7	Charcoal	30.5
Paraffin Waxes	20.0	BioGasoline	19.3
White Spirit & SBP	20.0	Biodiesels	19.3
Other Petroleum Products	20.0	Other Liquid Biofuels	21.7
Anthracite	26.8	Land fill Gas	14.9
Coking coal	25.8	Sludge Gas	14.9
Other bituminous coal	25.8	Other Biogas	14.9
sub-bituminous coal	26.2	Municipal Wastes (biomass fraction)	27.3
Lignite	27.6		

Appendix 5: Further background information on monitoring plan

Please refer to section B.7. Monitoring plan.

Appendix 6: Summary of post registration changes

Not applicable

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History of the document

Version	Date	Nature of revision
04.1	11 April 2012	Editorial revision to change history box by adding EB meeting and annex numbers in the Date column.
04.0	EB 66 13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the project design document form for small-scale CDM project activities" (EB 66, Annex 9).
03	EB 28, Annex 34 15 December 2006	• The Board agreed to revise the CDM project design document for small-scale activities (CDM-SSC-PDD), taking into account CDM-PDD and CDM-NM.
02	EB 20, Annex 14 08 July 2005	• The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document. • As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <http://cdm.unfccc.int/Reference/Documents>.
01	EB 07, Annex 05 21 January 2003	Initial adoption.
Decision Class: Regulatory **Document Type:** Form **Business Function:** Registration		

**PROJECT DESIGN DOCUMENT FORM
FOR SMALL-SCALE CDM PROJECT ACTIVITIES (F-CDM-SSC-PDD)
Version 04.1**

PROJECT DESIGN DOCUMENT (PDD)

Title of the project activity	Yangyang renewable energy project(1.4MW small hydroelectric power)
Version number of the PDD	5.2
Completion date of the PDD	05/11/2013
Project participant(s)	Korea Midland Power Corporation(KOMIPO)
Host Party(ies)	Republic of Korea
Sectoral scope(s) and selected methodology(ies)	- Sectoral Scope: 01(Energy Industries) - Methodology: AMS-I.D(Ver.17.0)
Estimated amount of annual average GHG emission reductions	3,470tCO_2/y

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

>>

Description of the project activity

The Yangyang renewable energy project(small hydroelectric power) is located in the north eastern region of Republic of Korea. The project consists of the implementation 1.4MW small hydroelectric power plant using stilling water from Yangyang pumping dam which is upper side of small hydroelectric system. The production of two small hydroelectric turbines (each capacity 0.7MW) annual generation will be 5,804MWh/year and 3,470 tons/year of CO2e will be abated.

Purpose of the project activity

According to energy statistics1, the 97% of using energy is imported. It means that Korea has a weakness to supply energy stably. Moreover electric generations in Korea rely on fossil fuels more than 50%. It attributes to emit a plenty of Green House Gases (GHGs). That's why Korea ranked 9th in CO2 emissions in the world. Nevertheless, until recently there has been just a little effort to mitigate GHGs.
The company Korea Midland Power Co. Ltd (KOMIPO) is the owner and developer of the Yangyang renewable energy project(small hydroelectric power). On 25th July, KOMIPO and other eight large energy suppliers signed up an agreement, called the Renewable Portfolio Agreement (RPA) with the Ministry of Commerce, Industry and Energy (MOCIE). The contractors agreed to invest a combined 1.1 trillion KRW in developing renewable energy resources and renewing waste energy over the three years till 2008 to build an environment-friendly energy supplying system. KOMIPO decided to invest 76.9 billion KRW to promote renewable energy till 2008. This project is planned as a part of the RPA
By using a new and renewable local source of energy, the project will contribute to the reduction of GHG emissions, the decrease of the country's dependence on the importation of fossil fuels and will help create directly and indirectly new jobs. Furthermore the project is supporting the government policy of promoting new renewable energy technologies in the Republic of Korea. This project has two purposes. One is to establish role model of domestic renewable energy project, and the other is to accumulate experiences for future abroad CDM projects.
Ultimately KOMIPO prepares to cope with climate change actively, and contributes to sustainable development as central electricity power generation cooperation.

The contribution of the project activity to sustainable development

The Yangyang renewable energy project(small hydroelectric power) will contribute to sustainable development through the following ways:
- Reduction of Green House Gases emissions, specifically CO2
- Diversification of the national supply of energy
- Help the country to reduce the imported energy (oil, gas etc) bill
- Promote renewable energy policy of the country

A.2. Location of project activity

A.2.1. Host Party(ies)

>>

Republic of Korea

A.2.2. Region/State/Province etc.

>>

Gangwon Province

A.2.3. City/Town/Community etc.

>>

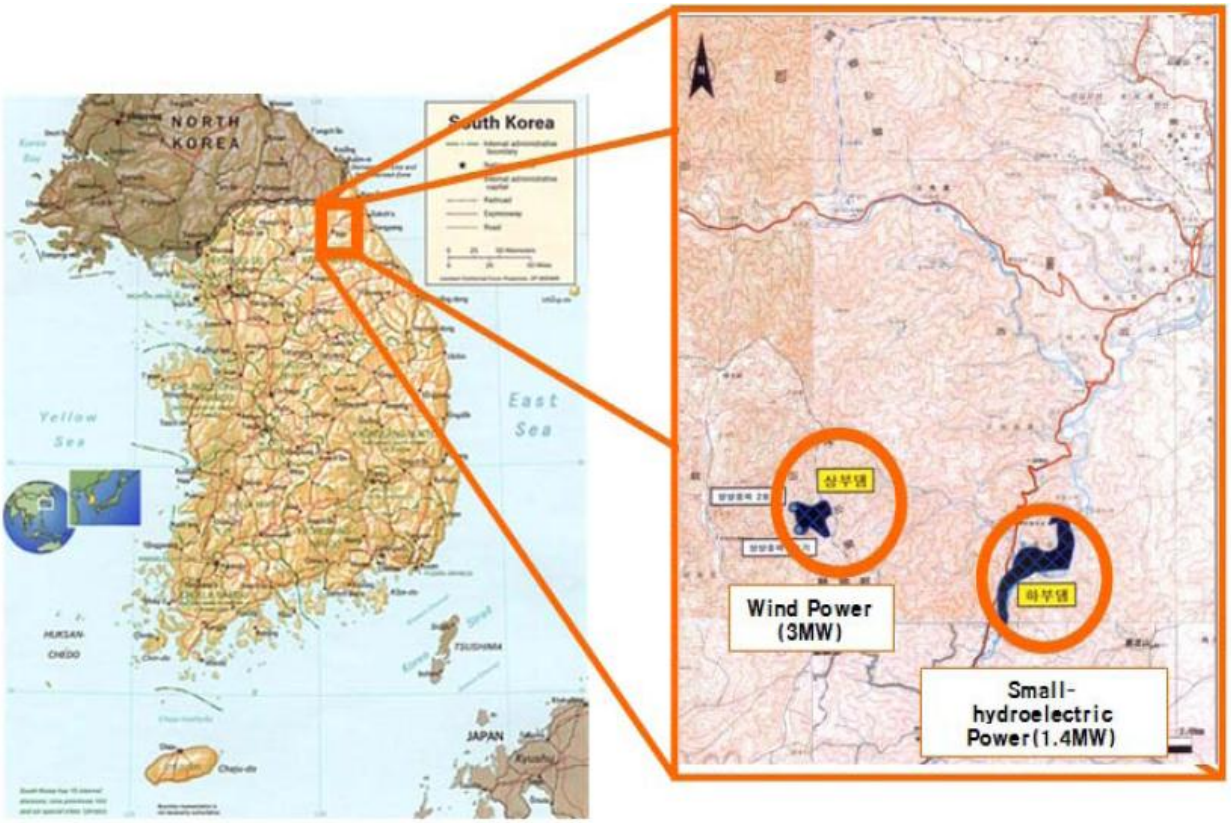
Gongsujeonri, Seomyeon, Yangyang-gun

A.2.4. Physical/ Geographical location

>>

The Yangyang renewable energy project(small hydroelectric power) is located at the Yangyang pumped storage dam which is located at the valley of Jumbong mountain range in Yangyang-gun, approximately 225km east of Seoul, the Capital of Korea.

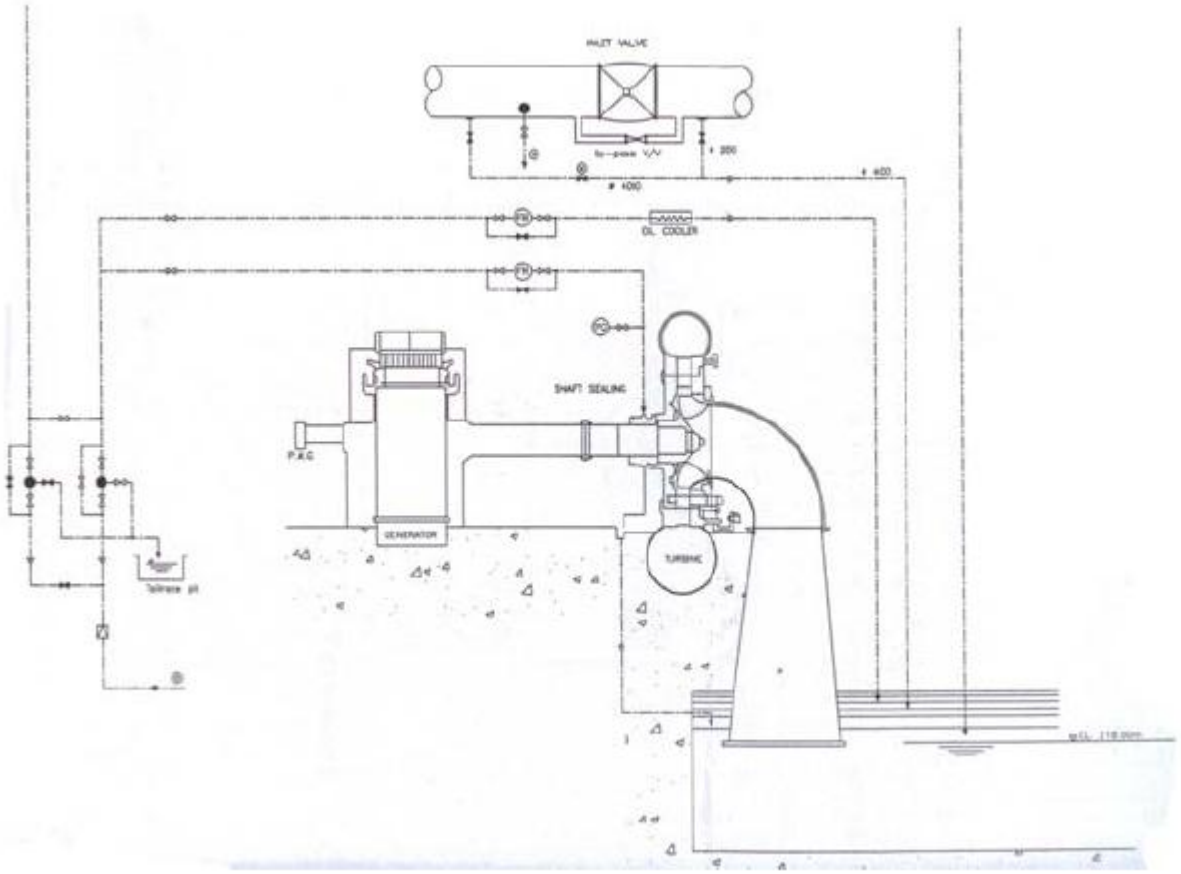
In a detail, the site is located at the right-side of the stilling basin of the spill way of the Lower dam of the Yangyang pumped storage power plant, which is located in Gongsujeonri, Seomyeon (N 38.013256° and E 128.556090°).



[Figure1] the location drawing for the Yangyang renewable energy project(small hydroelectric power)

A.3. Technologies and/or measures

>>



[Figure2] Small hydroelectric turbine structure

Type		Details
Turbine	Output power	1,400kW(700kW x 2unit)
	Rotation	620rpm
	Rated head	43.60m
Generator	Type	Three phase induction (horizontal axis)
	Rated output voltage	3,300V
	Frequency	60Hz

The turbine-generator unit at Yangyang small hydroelectric power plant will be operated for almost 24hours to supply water, outflows from the existing Dam. The main circuit will be connected to the Yangyang pumped storage power plant through 6.9kV power cable transmission line for the its station power.

The generating equipment of small hydroelectric power plant will be remote-controlled, supervised and telemetered by the DCS system supplied by other contractor from the control room of the Yangyang pumped storage power plant approximately 2,000m away through the local controller and interfacing system supplied by the contractor

A.4. Parties and project participants

Party involved (host) indicates a host Party	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Republic of Korea (host)	Korea Midland Power Corporation(KOMIPO)	NO

A.5. Public funding of project activity

>>

This project doesn't involve any public funding.

A.6. Debundling for project activity

>>

According to the Guidelines on assessment of debundling for SSC project activities, V03, EB 54, debundling is defined as the fragmentation of a large project activity into smaller parts. A proposed smallscale project activity shall be deemed to be a debundled component of a large project activity if there is a registered small-scale CDM project activity or an application to register another small-scale CDM 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.

Following the above Guidelines on assessment of debundling for SSC project activities, V03, EB 54, this project is not a fragmentation of a larger CDM project activity nor this project have applied before to be registered as part of another small scale project activity.

SECTION B. Application of selected approved baseline and monitoring methodology

B.1. Reference of methodology

>>

According to the categories' list of CDM projects' activities of the appendix B on the simplified modalities and procedures for small-scale CDM activities, the Yangyang renewable energy project(small hydroelectric power) relates to the category I.D:

Methodology: AMS-I.D, Grid connected renewable electricity generation(Ver. 17.0)
Methodological Tool:

- **Tool to calculate the emission factor for an electricity system(Ver.04.0.0)**
- **Guidelines on Assessment of debundling for SSC project activities(Ver.03)**
- **Guidelines for Demonstrating Additionality of Microscale project activities (Ver.05.0)**

B.2. Project activity eligibility

>>

The methodology is applicable under the following conditions:

The applicability of the AMS-I.D

Criteria	Applicability	Conclusion
This category comprises renewable energy generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal and renewable biomass that supply electricity to a national or a regional grid; or Supplying electricity to an identified consumer facility via national/regional grid through a contractual arrangement such as wheeling.	The proposed project activity is the installation of hydropower plants that supply electricity to a national grid.	OK
Illustration of respective situations under which each of the methodology(i.e. AMS-I.D, AMS-I.F and AMS-I,A) applies is included in table 2. As per table 2, AMS-I.D is applicable for following project types: 2. Project supplies electricity to a national/regional grid Project supplies electricity to an identified consumer facility via national/regional grid (through a contractual arrangement such as wheeling)	The project activity will supply electricity to national grid i.e KEPCO grid. Hence the project activity refers to the project type 1 of the table 2 given under the Methodology. Hence applicable to use AMS I.D. The project activity therefore meet this applicability requirement	OK
This methodology is applicable to project activities that (a) install a new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity (Greenfield plant); (b) involve a capacity addition; (c) involve a retrofit of (an) existing plant(s); or (d) involve a replacement of (an) existing plant(s).	The project activity is an installation of a new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity (Greenfield plant). The project activity satisfies the mentioned criteria/ requirement (a).	OK
Hydro power plants with reservoirs that satisfy at least one of the following conditions are eligible to apply this methodology: • The project activity is implemented in an existing reservoir, with no change in the volume of reservoir; or • The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the Project Emissions section, is greater than 4 W/m2; or • The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the Project Emissions section, is greater than 4 W/m2.	This project consists under pumped storage power plant and reservoir is constructed for pumped storage power plant. Therefore if small hydro power plant was not constructed, this reservoir would be existed. As this project activity is implemented in an existing reservoirs with no change in the volume of reservoir, the project activity meet this applicability requirement.	OK

If the new unit has both renewable and non-renewable components (e.g., a wind/diesel unit), the eligibility limit of 15 MW for a small-scale CDM project activity applies only to the renewable component. If the new unit co-fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15 MW.	The installed capacity of the proposed project is 1.4 MW, which is less than 15 MW.	OK
Combined heat and power (co-generation) systems are not eligible under this category	Not Applicable. The proposed project activity is a hydropower plant.	OK
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 15 MW and should be physically distinct from the existing units.	This project is to install a new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity, so PP doesn't need to be considered.	OK
In the case of retrofit or replacement, to qualify as a small-scale project, the total output of the retrofitted or replacement unit shall not exceed the limit of 15 MW.	This project is to install a new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity, so PP doesn't need to be considered.	OK

From the analysis above, AMS-I.D. (Version 17.0) is applicable for the proposed project.

B.3. Project boundary

>>

According to the methodology AMS-I.D, the spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system that the CDM project power plant is connected to.

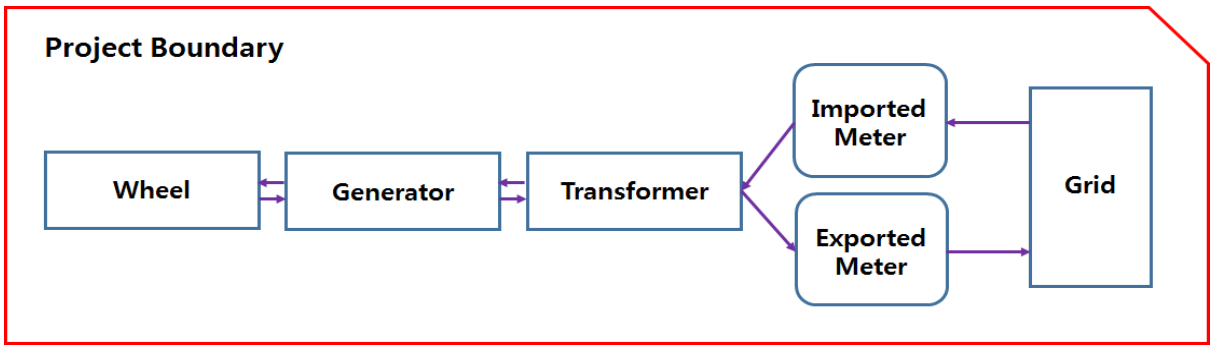
The project activity is to install a new power plant at the site. It is estimated that the primary source of GHG emissions will be CO2 from combustion of fossil fuel in the conventional power generation systems in the baseline. Emissions of other GHG such as CH4 and N2O are excluded with conservative approach. The Methodology only takes into account leakage if the energy generating equipment is transferred from another activity or if the existing equipment is transferred to another activity. The proposed project activity doesn't involve any transfer of equipment and hence there is no leakage as a result of project activity.

An overview of all emission sources included in or excluded is depicted in the following table:

- The description of the emission sources

ITEM	Source	Gas	Included?	Justification / Explanation
Baseline	Emission from combustion of fossil fuel for electricity generation	CO2	Yes	This consists of the major source of GHG emission from combustion of fossil fuel.
		CH4	No	Excluded as they are minor emission sources
		N2O	No	Excluded as they are minor emission sources
Project Activity	Electricity generation from renewable sources	CO2	No	Excluded as they are minor emission sources
		CH4	No	Excluded as they are minor emission sources
		N2O	No	Excluded as they are minor emission sources

Spatial boundary
The spatial extent of the proposed project boundary includes the proposed hydropower plants (including Generator, transformer, transmission line) and all power plants connected physically to the KEPCO.



[Figure3] Small hydroelectric turbine structure

B.4. Establishment and description of baseline scenario
>>
This project activity is to install a new hydro power plant. Therefore, according to the methodology AMS-I.D, the baseline scenario is that the electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources in to the grid. In other words, the project is not a modification (or retrofit) of an existing plant but the installation of a new grid-connected renewable power plant. The baseline scenario is provision of the equivalent amount of electricity delivered from the KEPCO grid (Korea Electric Power Corporation)
However, because this project is the renewal of a crediting period, project proponents shall address below issues according to the methodological tool ("Validity of the original/current baseline and to update the baseline at the renewal of a crediting period" Ver.03.0.1). To assess the validity of the original/current baseline, project proponents have to address two issues as follow:

- Assess the continued validity of the baseline; and
- Update the baseline.

In the Methodological tool of "Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period (Ver.03.0.1)", the stepwise procedure to assess the continued validity of the baseline and to update the baseline at the renewal of a crediting period are as follows:

Step 1: Assess the validity of the current baseline for the next crediting period

The "Procedures for the renewal of the crediting period of a registered CDM project activity" approved by the CDM Executive Board require assessing the impact of new relevant national and/or sectoral policies and circumstances on the baseline.

The validity of the current baseline is assessed using the following Sub-steps:

Step 1.1: Assess compliance of the current baseline with relevant mandatory national and/or sectoral policies

In assessing the continued validity of the baseline, it has been assessed that there is no relevant mandatory national and/or sectoral policies that should be considered to define a new baseline scenario for this renewal of crediting period of the proposed project.

Korean government has promoted some programs to propagate renewable energy system. There are "Act on the Promotion of the Development, Use and Diffusion of New and Renewable Energy" to promote the use of renewable energy.
However, according to the guidance about E+/E-policies, the impacts of these policies can be excluded in establishing a baseline scenario if they have been implemented since the adoption of the Marrakesh Accords (11 November 2001). In accordance with the Accords, the policy which has been implemented to promote the use of renewable energy in Korea can be regarded as if the policies did not exist because it was implemented since April 2010. In conclusion, the current baseline complies with relevant mandatory national and/or sectoral policies.

Step 1.2: Assess the impact of circumstances

As per requirement of the sub-step, it has been assessed that there is no impact of circumstances existing at the time of requesting renewal of the crediting period on the current baseline emissions. As per the '2011 KEPCO in Brief (published on May 2012) by KEPCO, although diffusion of the new and renewable energy has been encouraged, the new and renewable resource accounts for only 3.59% of total grid generation in KEPCO in 2011. Hence in the absence of the proposed project, electricity would still have been generated in the existing fossil fuel power plants or by the addition of new fossil fuel power plants connected to the KEPCO grid.

- **The proportion of the new and renewable energy**

Item	2007	2008	2009	2010	2011
New and renewable (GWh)	5,871	6,655	7,432	10,456	17,816
Total generation (GWh)	403,124	422,355	433,604	474,660	496,893
Proportion of new and renewable	**1.46**	**1.58**	**1.71**	**2.20**	**3.59**

Also project participant has updated the emission factor and estimation of the baseline emissions for the 2nd crediting period in line with the methodology AMS-I.D (Ver. 17.0.0) and the "Tool to calculate the emission factor for an electricity system (Ver.04.0.0)".

Step 1.3: Assess whether the continuation of use of current baseline equipment(s) or an investment is the most likely scenario for the crediting period for which renewal is requested

In absence of the proposed project, the amount of electricity would have been generated by the KEPCO grid. Thus, this sub-step is not applicable to the proposed project.

Step 1.4: Assessment of the validity of the data and parameters

Some parameters, which were determined at the start of the 1st crediting period and not monitored during the 1st crediting period, are not valid anymore. Therefore, the current baseline has been updated for the 2nd crediting period according to the "Tool to calculate the emission factor for an electricity system (Ver.04.0.0)".
This update includes CO_2 emission factor of fossil fuel and all values used in its calculation (including OM and BM). In case of CO_2 emission factor of fossil fuel, the value for the 1st crediting period was derived from IPCC default value as provided in the 1996 IPCC Guidelines but current value for renewal of crediting period is derived from IPCC default value as provided in 2006 IPCC Guidelines according to the methodology AMS-I.D (Ver. 17.0.0). Therefore, the current baseline needs to be updated and Step 2

is applied.

Step2: Update the current baseline and the data and parameters

Step 2.1: Update the current baseline
As per the Step 1 above, the current baseline scenario is still valid as per the methodology AMS-I.D (Ver.17.0.0). The identified baseline scenario of the proposed project is as follows:

- Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system (Ver.04.0.0)".

Also, the baseline emissions for the 2nd crediting period have been updated, without reassessing the baseline scenario, based on the methodology AMS-I.D (Ver.17.0.0). This update was applied in the contest of the sectoral policies and circumstances that are applicable at the time of request for renewal of the crediting period. Further information for the updated baseline emissions for the 2nd crediting period can be seen below.

Step 2.2: Update the data and parameters
As stated in Step 1.4 above, all parameters regarding the grid emission factor calculation needs to be updated for the 2nd crediting period. Further information can be seen below.

(1) Grid emission factor ($EF_{grid,CM,y} = EF_{CO2,grid,y}$)

The grid emission factor is calculated according to "Tool to calculate the emission factor for an electricity system (Ver.04.0.0)". OM (Operating Margin) and BM (Build Margin) are calculated by using the data from existing power plants that provide electricity with the current grid-connected electricity generation, and with this result, the $EF_{grid,CM,y}$ (Combined Margin) can be calculated.
According to the tool, the steps for the calculation are as follows;

STEP 1. Identify the relevant electricity systems;
STEP 2. Choose whether to include off-grid power plants in the project electricity system (optional)
STEP 3. Select a method to determine the operating margin (OM)
STEP 4. Calculate the operating margin emission factor according to the selected method
STEP 5. Calculate the build margin (BM) emission factor
STEP 6. Calculate the combined margin (CM) emissions factor

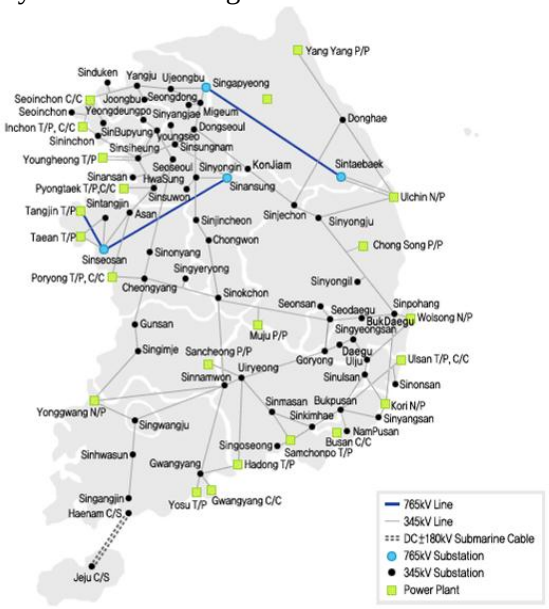
- Major parameter of emission factor

Parameter	Value	Source
$FC_{i,m,y}$ is the amount of fuel *i* (in a mass or volume unit) consumed by a relevant power source m in year(s) y, which supplies electricity to the grid, not including low-operating cost and must-run power plants.	Refer to <Table Annex 4-1>	Statistics of Electric Power in KOREA 2009-2011 (Source: KEPCO 2010-2012)
Net Calorific Values by Power Plant		Caloric value sourced from Statistics of Electric Power in 2009-2011 (Source: KEPCO 2010-2012) (Net Caloric Value = Caloric value net × caloric value conversion factor)
$EG_{m,y}$ (MWh) is the electricity delivered to the grid by source m		Statistics of Electric Power in KOREA 2009-2011 (Source: KEPCO 2010-2012)

Net Caloric Values Conversion Factor	Solid/Liquid fossil fuel : 0.95 Gaseous fuel : 0.90	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Fuel CO2 Emission Factor($EF_{CO2,i,y}$)	Refer to <Table Annex 4-2>	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Operating Margin Emissions Factor ($EF_{grid,OM,y}$) (ton CO2/MWh)	0.6828	Calculated
Build Margin Emissions Factor ($EF_{grid,BM,y}$) (ton CO2/MWh)	0.5698	Calculated
Baseline Emissions Factor ($EF_{grid,CM,y}$) (ton CO2/MWh)	**0.5980**	Calculated Calculated

STEP 1. Identify the relevant electricity systems

The electricity from the project activities is connected to KEPCO grid, which is the only one in Korea and so relevant electric power system is KEPCO grid.



[Figure 4] The transmission map of Korea (Source: Korea power exchange)

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

According to "Tool to calculate the emission factor for an electricity system(Ver.04.0.0)", there are two options to calculate the operating margin and build margin emission factor:

Option I : Only grid power plants are include in the calculation.

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

This project chooses ***Option 1***. Only grid power plants are including in the calculation.

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

As described in "Tool to calculate the emission factor for an electricity system(Ver.04.0.0)", the OM emission factor is calculated as the generation-weighed emissions per electricity unit of all generating units serving the system, excluding low-operating cost and must-run power plants. Low-operating cost and must run power plants include hydro, nuclear, low cost biomass, geothermal and domestic coal.

Operating Margin emission factor ($EF_{grid,OM,simple,y}$) shall be calculated basis on one of the four following methods:

Option (a) Simple OM

Option (b) Simple adjusted OM

Option (c) Dispatch Data Analysis OM
Option (d) Average OM

If low-cost/must-run resources constitute less than 50% of total grid generation in average of the five most recent years, ***Option (a) simple OM*** can be chosen.

- Gross electricity generation in the Republic of Korea during past 5 years (GWh, million kWh)

Item \ Year		2007	2008	2009	2010	2011	Sum
Hydro		5,042	5,563	5,641	6,472	7,831	30,549
Thermal	Coal (Dom.)	4,470	5,010	5,559	4,613	3,269	22,921
	Coal (Bitum.)	150,204	168,498	187,657	189,156	196,855	892,370
	Oil	21,215	15,425	19,912	25,356	22,528	104,436
	Gas	78,427	75,809	65,273	96,483	101,702	417,694
Nuclear		142,937	150,958	147,771	148,596	154,723	744,985
alternative		829	1,092	1,791	3,984	9,985	17,681
Total		**403,124**	**422,355**	**433,604**	**474,660**	**496,893**	**2,230,636**

Source : Korea electric power Corporation, 2012

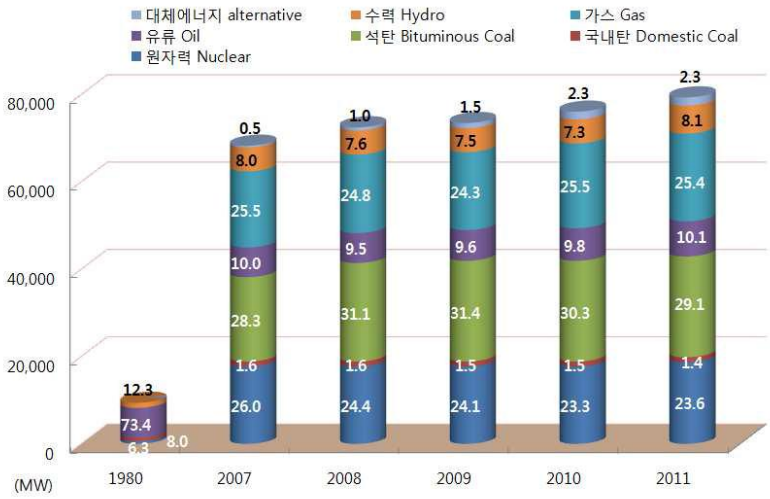
Referring to the gross electricity generation rate by energy sources of the host country (Republic of Korea), the rate of low cost/must run power generation does not exceed 50% of the total grid. Actually, the most recent 5-year (2007~2011) average data shows that the rate of low cost/must run is 36.59%. (Source: KEPCO) The low-cost/must-run plants –hydro, coal (dom), nuclear and alternative– are indicated in yellow.

Low-cost/ Must-run sources ratio

$$= \frac{[\text{Hydro (30,549)} + \text{Coal-Dom (22,921)} + \text{Nuclear (744,985)} + \text{Alternative (17,681)}]}{\text{Total generation (2,230,636)}} \times 100$$

= 36.59%

Therefore, for this project case, "***Option (a) Simple OM***" is available.



[Figure 5] Gross electricity generation in the Republic of Korea during past 5 years
(Korea Electric Power Corporation, 2012)

For the simple OM, the emissions factor can be calculated using either of the two following data vintages:

- ***Ex ante option***: If the ex ante option is chosen, the emission factor is determined once at the validation stage, thus no monitoring and recalculation of the emissions factor during the crediting

period is required. For grid power plants, use 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. For off-grid power plants, use a single calendar year within the 5 most recent calendar years prior to the time of submission of the CDM-PDD for validation.

- ***Ex* post option**: If the ex post option is chosen, the emission factor is determined for the year in which the project activity displaces grid electricity, requiring the emissions factor to be updated annually during monitoring. If the data required calculating the emission factor for year y is usually only available later than six months after the end of year y, alternatively the emission factor of the previous year y-1 may be used. If the data is usually only available 18 months after the end of year y, the emission factor of the year proceeding the previous year y-2 may be used. The same data vintage (y, y-1 or y-2) should be used throughout all crediting periods.

For this project, ***Ex-ante option*** is chosen.

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

(a) *Simple OM option* is chosen for the project as described in STEP 3 above.

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.

The simple OM may be calculated using one of the following options;

Option A: Based on the net electricity generation and a CO2 emission factor of each power unit; or

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

For this project, ***option A*** is chosen to calculate the simple OM.

Where Option A is used, the simple OM emission factor is calculated as follows:

$$EF_{grid,OMsimple,y} = \frac{\sum_{m} EG_{m,y} \cdot EF_{EL,m,y}}{\sum_{m} EG_{m,y}}$$

Where:

$EF_{grid,OMsimple,y}$	= Simple operating margin CO_2 emission factor in year y (tCO_2/MWh)
$EG_{m,y}$	= Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
$EF_{EL,m,y}$	= CO_2 emission factor of power unit m in year y (tCO_2/MWh)
m	= All power units serving the grid in year y except low-cost / must-run power units
y	= the relevant year as per the data vintage chosen in Step 3

Determination of $EF_{EL,m,y}$

For calculating $EF_{EL,m,y}$, Option A1 is chosen as follows;

Option A1. If for a power unit m data on fuel consumption and electricity generation is available, the emission factor ($EF_{EL,m,y}$) should be determined as follows:

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

Where:

$EF_{EL,m,y}$	= CO_2 emission factor of power unit m in year y (tCO_2/MWh)
$FC_{i,m,y}$	= Amount of fossil fuel type i consumed by power unit m in year y (Mass or volume unit)
$NCV_{i,y}$	= Net calorific value (energy content) of fossil fuel type i in year y (GJ/mass or volume unit)
$EF_{CO2,i,y}$	= CO_2 emission factor of fossil fuel type i in year y (tCO_2/GJ)
$EG_{m,y}$	= Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
m	= All power units serving the grid in year y except low-cost/must-run power units
i	= All fossil fuel types combusted in power unit m in year y
y	= The relevant year as per the data vintage chosen in Step 3

In the case of this project, the applied values of $EF_{CO2,i,y}$ are based on using conversion factor suggested in the 2006 IPCC Guidelines. And those of $NCV_{i,y}$ and $EF_{CO2,i,y}$ are country-specific. Actually, the calorific values are indicated as country-specific data of gloss calorific value (GCV), and this was recalculated for this PDD as net calorific value (NCV) using conversion factor suggested in the 2006 Revised IPCC Guidelines.
The detailed information used in the calculation is presented at tables in Annex 4.

Determination of $EG_{m,y}$
- For grid power plants, $EG_{m,y}$ should be determined as per the provisions in the monitoring tables.
- Off-grid power plants are not considered in determination of $EG_{m,y}$.

As a result, the OM emission factor ($EF_{grid,OM,simple,y}$) is 0.6828 (tCO_2/MWh).

STEP 5. Calculate the build margin (BM) emission factor
According to "Tool to calculate the emission factor for an electricity system (version 04.0.0)", there are two options to choose in order to calculate the BM.

- ***Option 1***. For the first crediting period, 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. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period should be used. This option does not require monitoring the emission factor during the crediting period.
- ***Option 2***. For the first crediting period, the build Margin emission factor ($EF_{grid,BM,y}$)shall be updated annually, ex-post, including those unit 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. For the second crediting period, the build margin emissions factor shall be calculated ex ant, as described in Option 1 above. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used.

For this project case, ***Option 1*** is chosen to calculate the BM emission factor.

The sample group of power units m used to calculate the build margin should be determined as per the following procedure as described in the methodology, consistent with the data vintage selected in the steps above:

(d) Identify the set of five power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently ($SET_{5\text{-units}}$) and determine their annual electricity generation ($AEG_{SET\text{-}5\text{-}units}$, in MWh);

(e) Determine the annual electricity generation of the project electricity system, excluding power units registered as CDM project activities (AEG_{total}, in MWh). Identify the set of power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently and that comprise 20% of AEG_{total} (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) ($SET_{\geq 20\%}$) and determine their annual electricity generation ($AEG_{SET\text{-}\geq 20\%}$, in MWh);

(f) From $SET_{5\text{-units}}$ and $SET_{\geq 20\%}$ select the set of power units that comprises the larger annual electricity generation (SET_{sample}); Identify the date when the power units in SETsample started to supply electricity to the grid.

If none of the power units in SET_{sample} started to supply electricity to the grid more than 10 years ago, then use SET_{sample} to calculate the build margin. Ignore steps (d), (e) and (f).

Following the guidance above, the sample group of power unit *m* is established to calculate the build

margin.

- **Calculation of the Build Margin (BM) emission factor (Refer to <Table Annex 4-2>)**

	Result
Step (a)	- Five power units that started to supply electricity to the grid most recently ($SET_{5\text{-units}}$): 1. KC susan solar — 2011.12 2. Hadong S/S solar — 2011.09 3. Busan sinhang solar — 2011.08 4. Ulsan solar — 2011.08 5. Tangjeong solar — 2011.08 - Total electricity generation in 2011: 5,515 MWh
Step (b)	- AEG_{total}: 477,204,188 MWh - The set of power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently and that comprise 20% of AEG_{total}: Refer to the Annex 4 - $AEG_{SET-\geq 20\%}$: 96,967,745 MWh (20.35% of AEG_{total})
Step (c)	- SET_{sample} : $SET_{\geq 20\%}$ because it is larger than $SET_{5\text{-units}}$. - Because none of the power units in SET_{sample} started to supply electricity to the grid more than 10 years ago, steps (d), (e) and (f) are ignored.
Step (d)~(f)	Skipped (Not applicable)

The build margin emissions 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 is 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;

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

According to the BM calculation formula and variables of above tables, $EF_{BM,y}$ is 0.5698 (tCO_2/MWh).

STEP 6. Calculate the combined margin emissions factor

The calculation of the combined margin (CM) emission factor ($EF_{grid,CM,y}$) is based on one of the following methods:

(a) Weighted average CM; or
(b) Simplified CM.

The ***weighted average CM*** method (option A) is used for this project .

(a) Weighted average CM

The combined margin emissions factor is calculated as follows:

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

Where,

$EF_{grid,CM,y}$ = Combined margin CO_2 emission factor in year y (tCO_2/MWh)
$EF_{grid,OM,y}$ = Operating margin CO_2 emission factor in year y (tCO_2/MWh)
$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year y (tCO_2/MWh)
W_{OM} = Weighting of operating margin emissions factor (%)
W_{BM} = Weighting of build margin emissions factor (%)

Hydro power generation project activities:

According to "Tool to calculate the emission factor for an electricity system (Ver.04.0.0)", hydro power generation project activities are w_{OM} =0.5 and w_{BM} = 0.5 (owing to intermittent and non-dispatchable nature) for the first crediting period. However, for the second and third crediting periods, the values of w_{OM} and w_{BM} should be 0.25 and 0.75 respectively, unless otherwise specified in the approved methodology which refers to this tool.

And $EF_{grid,OM,y}$, $EF_{grid,BM,y}$ are calculated as described in Steps 1 and 2 above and are expressed in tCO_2/MWh. Therefore baseline emission factor ($\boldsymbol{EF_{grid,CM,y}}$) for this project is 0.5980(tCO_2/MWh) as follows:

$$\boldsymbol{EF_{grid,CM,y} = w_{OM} \cdot EF_{grid,OM\,y} + w_{BM} \cdot EF_{grid,BM,y}}$$
$$\boldsymbol{= 0.25 \cdot 0.6828\ tCO_2/MWh + 0.75 \cdot 0.5698\ tCO_2/MWh}$$
$$\boldsymbol{= 0.5980\ tCO_2/MWh}$$

(2) Baseline emission

Baseline emission of this system can be calculated as below.

$$\boldsymbol{BE_y = EG_{BL,y} * EF_{CO2,grid,y}}$$

Where:

BE_y = Baseline Emissions in year y (tCO_2)

$EG_{BL,y}$ = Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year *y* (MWh)

$EF_{CO2,grid,y}$ = CO_2 emission factor of the grid in year *y* (tCO_2/MWh)

$\boldsymbol{* BE_y}$ ***= 5,804 MWh/y x 0.5980 tCO_2/MWh = 3,470 tCO_2/y*** *(ex ante)*

B.5. Demonstration of additionality

>>

In case of the renewable energy project that up to 5 megawatts; it can demonstrate additionality by simplified modalities for demonstrating additionality tool. The capacity of the project is 1.4MW. Therefore, According to the definition in the methodology and project capacity, it can apply "Guidelines for demonstrating additionality of Microscale project activities, Ver.05 (EB 73, Annex 13)" to demonstrate additionality.

Demonstrating Additionality of Microscale project activity

Based on the "Guidelines for demonstrating additionality of microscale project activities, Ver.05", project activities up to five megawatts that employ renewable energy technology are additional if any one of the conditions below is satisfied;

(e) The geographic location of the project activity is in one of the least developed countries or the small island developing States (LDCs/SIDS) or in a special underdeveloped zone (SUZ) of the host country;

→ The project is located at the Gangwon province. It means that the site of the plants is not located in a LDC/SIDS or in a special underdeveloped zone (SUZ) of the host country. This

condition is not applicable for the project activity.

(f) The project activity is an off grid activity supplying energy to households/communities (less than 12hrs grid availability per 24 hrs is also considered as 'off grid' for this assessment);
→ The project activity is connected to KEPCO grid and the generated electricity by the project activity delivered to KEPCO grid. So, this project is not an off-grid activity and this condition is not applicable for the project activity.

(g) The project activity is designed for distributed energy generation (not connected to a national or regional grid) with both conditions (i) and (ii) satisfied;
(i) Each of the independent subsystem/measure in the project activity is smaller than or equal to 1,500 kW electrical installed capacity;
(ii) End users of the subsystem or measure are households/communities/ small and medium enterprises (SMEs).
→ Because the energy generated by project activity is supplied to national grid, this condition is not applicable for the project activity

(h) The project activity employs specific renewable energy technologies/measures recommended by the host country designated national authority (DNA) and approved by the Board to be additional in the host country. The following conditions shall apply for DNA recommendations:
(i) "Specific renewable energy technologies/measures. refers to grid connected renewable energy technologies of installed capacity equal to or smaller than 5 MW;
(ii) The ratio of installed capacity of the specific grid connected renewable energy technology in the total installed grid connected power generation capacity in the host country shall be equal to or less than 3 per cent;
(iii) Most recent available data on the percentage of contribution of specific renewable energy technologies shall be provided to demonstrate compliance with the 3 per cent threshold. In no case shall data older than three years from the data of submission be used;
(iv) Technologies/measures recommended by DNAs and approved by the Board to be additional in the host country remain valid for three years from the data of approval.However, additionality of eligible project activities applying the guidelines remains valid for the entire crediting period;
(v) DNA submissions shall include the specific grid connected renewable electricity generation technologies that are being recommended and provide the required data as indicated above (e.g. wind power, biomass power, geothermal power, hydropower).
→ The proposed project activity is relevant to the condition of (d) for demonstrating the additionality. In accordance with the "procedure for submission and consideration of microscale renewable energy technologies for automatic additionality, version 01", the DNA of Republic of Korea proposed specific renewable technologies/measures for automatic additionality by submitting the F-CDM-RRT form and the supporting documents on 5 Jan 2012. The documents can be checked in the website http://cdm.unfccc.int/DNA/submissions/index.html

F-CDM-PRT - ver01

F-CDM-PRT-REC ver01 PRT_001

CDM: Proposed specific renewable technologies/measures submission form (version 01.0)	
Submitting DNA:	Republic of Korea
Indicate title/version of the EB guideline/procedure this submission relates to	Guidelines for demonstrating additionality of microscale project activities (version 03), Procedure for submission and consideration of microscale renewable energy technologies for automatic additionality (version 01.0)
Contact Information (name of person or office, e-mail addresses and phone contacts)	SungHee Shim, Prime Minister's Office, Republic of Korea Email address: hsims@pmo.go.kr or hsims@gmail.com Phone : +82-10-4709-7364
Information for completing the form 1. Briefly describe the summary of the proposed submission indicating the specific renewable energy technologies being recommended	
The DNA of the Republic of Korea already submitted that the CDM project activities employing some grid connected renewable energy technologies with capacity up to 5MW be considered additional based on the guideline for demonstrating additionality of microscale project activities(version 02) on Sep 08, 2011. However, according to the guideline for demonstrating additionality of microscale project activities(version 03) and the decision of the Board(refer to the paragragh 114 of the 65th CDM EB meeting report), the DNA of the Republic of Korea hereby submits the further required information concerning the total installed capacity of the following recommended renewable energy technologies. ☐ The recommended technologies • Hydro • Wind • Solar Photovoltaics • Solar thermal • Geo-thermal • Renewable Biomass • Tidal, Wave and Ocean	

CDM: Proposed specific renewable technologies/measures recommendation form (version 01)	
Submitting DNA	Republic of Korea
Title/version of the EB guideline/procedure this submission relates to	
Contact Information (name of person or office, e-mail addresses and phone contacts)	SungHee Shim, Prime Minister's Office, Republic of Korea Email address: hsims@pmo.go.kr or hsims@gmail.com Phone: +82-10-4709-7364
Summary of the proposal	
According to the "Guidelines for demonstrating additionality of microscale project activities (version 03)" and following the "Procedure for submission and consideration of microscale renewable energy technologies for automatic additionality" (EB 65, annex 33) and taking into account the decision of the Board (EB 65, paragraph 114), the DNA of the Republic of Korea submitted further information concerning the total installed capacity of the following recommended renewable energy technologies[1]: • Hydro; • Wind; • Solar Photovoltaics; • Solar thermal; • Geo-thermal; • Renewable Biomass; • Tidal, Wave and Ocean.	
Recommendation to EB	

[Figure 6] The submitted document to EB and recommendation of the EB

Therefore, this project activity is additional.

B.6. Emission reductions

B.6.1. Explanation of methodological choices

>>

The methodology AMS-I.D is applicable to the project, so emission reduction s are calculated according to the latest version of methodology AMS-I.D version 17, and the main steps are as follows:

1. Baseline emissions

$$BE_y = EG_{BL,y} * EF_{CO2,grid,y}$$

Where:

BE_y = Baseline Emissions in year y (tCO_2)

$EG_{BL,y}$ = Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year *y* (MWh)

$EF_{CO2,grid,y}$ = CO_2 emission factor of the grid in year *y* (tCO_2/MWh)

2. Project Emission

According to the AMS-I.D, Ver.17.0, the project emissions are considered as zero for most renewable energy project activities.

$$PE_y = 0$$

3. Leakage

As the energy generating equipment is not transferred from another activity, leakage is not to be considered.

$$LE_y = 0$$

4. Emission Reductions

$$ER_y = BE_y - PE_y - LE_y$$

Where:

ER_y = Emission reductions in year y (tCO_2/y)
BE_y = Baseline emissions in year y(tCO_2/y)
PE_y = Project emissions in year y (tCO_2/y)
LE_y = Leakage emissions in year y (tCO_2/y)

B.6.2. Data and parameters fixed ex ante

Data / Parameter	$EF_{grid,OM,y}$
Unit	tCO2/MWh
Description	Operating margin CO_2 emission factor in year y
Source of data	Calculated
Value(s) applied	0.6828
Choice of data or Measurement methods and procedures	This value was calculated according to "Tool to calculate the emission factor for an electricity system" (Ver.04.0.0). The applied value was derived from "2009, 2010, 2011 Statistics of Electric Power in Korea (2010, 2011, 2012)" (KEPCO) and "2011 Status of Generation facility (2012)" (Korea Power Exchange).
Purpose of data	Calculation of baseline emissions
Additional comment	This value is calculated at the time of PDD submission and will be applied during the crediting period without update.

Data / Parameter	$EF_{grid,BM,y}$
Unit	tCO2/MWh
Description	Build margin CO_2 emission factor in year y
Source of data	Calculated
Value(s) applied	0.5698
Choice of data or Measurement methods and procedures	This value was calculated according to "Tool to calculate the emission factor for an electricity system" (version 04.0.0). The applied value was derived from "2009, 2010, 2011 Statistics of Electric Power in Korea (2010, 2011, 2012)" (KEPCO) and "2011 Status of Generation facility (2012)" (Korea Power Exchange).
Purpose of data	Calculation of baseline emissions
Additional comment	This value is calculated at the time of PDD submission and will be applied during the crediting period without update.

Data / Parameter	$EF_{grid,CM,y}(=EF_{CO2,grid,y})$
Unit	tCO2/MWh
Description	Combined margin CO_2 emission factor in year y
Source of data	Calculated
Value(s) applied	0.5980
Choice of data or Measurement methods and procedures	This value was calculated according to "Tool to calculate the emission factor for an electricity system" (version 04.0.0). The applied value was derived from "2009, 2010, 2011 Statistics of Electric Power in Korea (2010, 2011, 2012)" (KEPCO) and "2011 Status of Generation facility (2012)" (Korea Power Exchange).
Purpose of data	Calculation of baseline emissions
Additional comment	This value is calculated at the time of PDD submission and will be applied during the crediting period without update.

B.6.3. Ex-ante calculation of emission reductions

>>

1. Baseline emissions

$$BE_y = EG_{BL,y} * EF_{CO2,grid,y}$$

Where:

BE_y = Baseline Emissions in year y (tCO_2)

$EG_{BL,y}$ = Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year *y* (MWh)

$EF_{CO2,grid,y}$ = CO_2 emission factor of the grid in year *y* (tCO_2/MWh)

*** BE_y = 5,804 MWh/y x 0.5980tCO_2/MWh**
= 3,470 tCO_2/y

2. Project Emission

According to the AMS-I.D, Ver.17.0, the project emissions are considered as zero for most renewable energy project activities.

$$PE_y = 0$$

3. Leakage

As the energy generating equipment is not transferred from another activity, leakage is not to be considered.

$$LE_y = 0$$

4. Emission Reductions

$$ER_y = BE_y - PE_y - LE_y$$

Where:

ER_y = Emission reductions in year y (tCO_2/y)

BE_y = Baseline Emissions in year y(tCO_2/y)

PE_y = Project emissions in year y (tCO_2/y)

LE_y = Leakage emissions in year y (tCO_2/y)

*** ER_y = 3,470 tCO_2 / y - 0 tCO_2 / y - 0 tCO_2 / y**
= 3,470 tCO_2 / y
= 3,470 tCO_2 / y

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

Year	Baseline emissions (tCO_2 e)	Project emissions (tCO_2 e)	Leakage (tCO_2 e)	Emission reductions (tCO_2 e)
Year 1	3,470	0	0	3,470
Year 2	3,470	0	0	3,470
Year 3	3,470	0	0	3,470
Year 4	3,470	0	0	3,470
Year 5	3,470	0	0	3,470
Year 6	3,470	0	0	3,470
Year 7	3,470	0	0	3,470
Total	24,290	0	0	24,290
Total number of crediting years	7 years			
Annual average over the crediting period	3,470	0	0	3,470

B.7. Monitoring plan

B.7.1. Data and parameters to be monitored

Data / Parameter	$EG_{facility,y}$
Unit	MWh
Description	Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year *y*
Source of data	Measured by Watt-hour meters
Value(s) applied	5,804
Measurement methods and procedures	Measurement methods and procedures will be compliance with "Law regarding measurement" and "Act on operation of electricity market".
Monitoring frequency	Continuous monitoring, hourly measurement and at least monthly recording.
QA/QC procedures	- Accuracy of meter for the electricity exported to grid : ± 0.5% - Accuracy of meter for the electricity imported from grid : ± 1.0% - The calibration of the watt-hour meter for the electricity exported to grid will be periodically performed by authorized organization at least once in 3 years and 6 months ± 6 months in accordance with "Act on operation of electricity market." The meter for the electricity imported from grid will be calibrated at least once in 7 years according to the "Law regarding measurement" by authorized organization. - The data of electricity imported from the grid will be cross-checked with receipts provided by KEPCO.
Purpose of data	Calculation of baseline emission
Additional comment	$EG_{facility,\ y} = EG_{facility,\ supplied,\ y} - EG_{facility,\ imported,\ y}$

B.7.2. Sampling plan

>>

Not applicable

B.7.3. Other elements of monitoring plan

>>

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

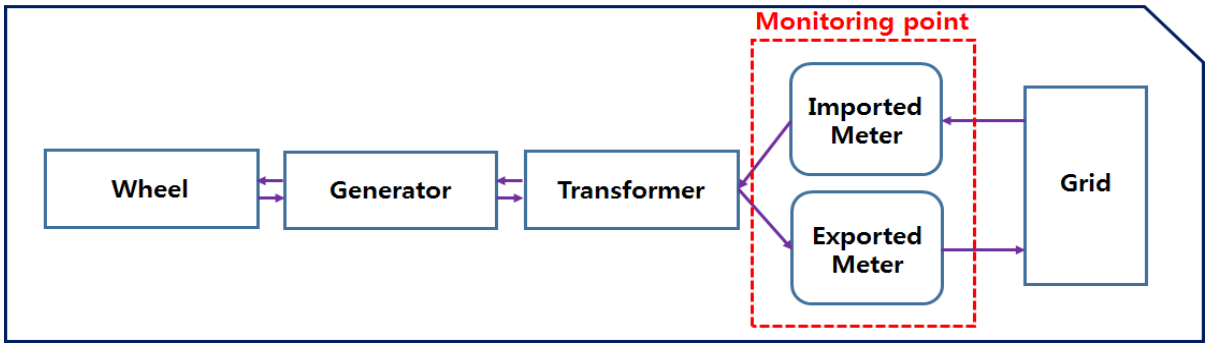
1. Monitoring equipment

1-1. Electricity measuring meters shall be set up transparently in accordance with "Law regarding measurement" and "Act on operation of electricity market" and shall be sealed after affirmation of Korea Power Exchange.

1-2. Meters shall be approved through the certified official process.

1-3. The calibration of the watt-hour meter for the electricity exported to grid will be periodically performed by authorized organization at least once in 3 years and 6 months ± 6 months in accordance with "Act on operation of electricity market." The meter for the electricity imported from grid will be calibrated at least once in 7 years according to the "Law regarding measurement" by authorized organization.

1-4. The monitoring point of the proposed project is as follow:



[Figure 7] Monitoring point

2. Measure & Archive

2-1. Amount of electricity that has transmitted to the grid shall be measured automatically by established meters. The measured data are simultaneously transferred to the Korea Power Exchange.

2-2. The electricity exported to grid will be monitored continuously, measured hourly and recorded at least monthly and the electricity imported from grid will be same.

2-3. The collected exported data in article 2-2. will be compared with those of Korea power Exchange and imported electricity data will be cross-checked with receipts provided by KEPCO.

2-4. If two data compared in article 2-3. is different, the operation condition of electricity meters and other equipment shall be examined. In case meters are improperly operated, internal audits and correction procedure shall be implemented and be certified by the final decision-maker and Korea Power exchange and KEPCO.

2-5. All data will be kept and archived electronically for 2 years after the end of the crediting period or the last issuance of CERs for the proposed project, whichever occurs later.

3. Management of monitoring and electricity safety

3-1. Person in charge of monitoring and electricity safety shall attend the following courses once every three years.

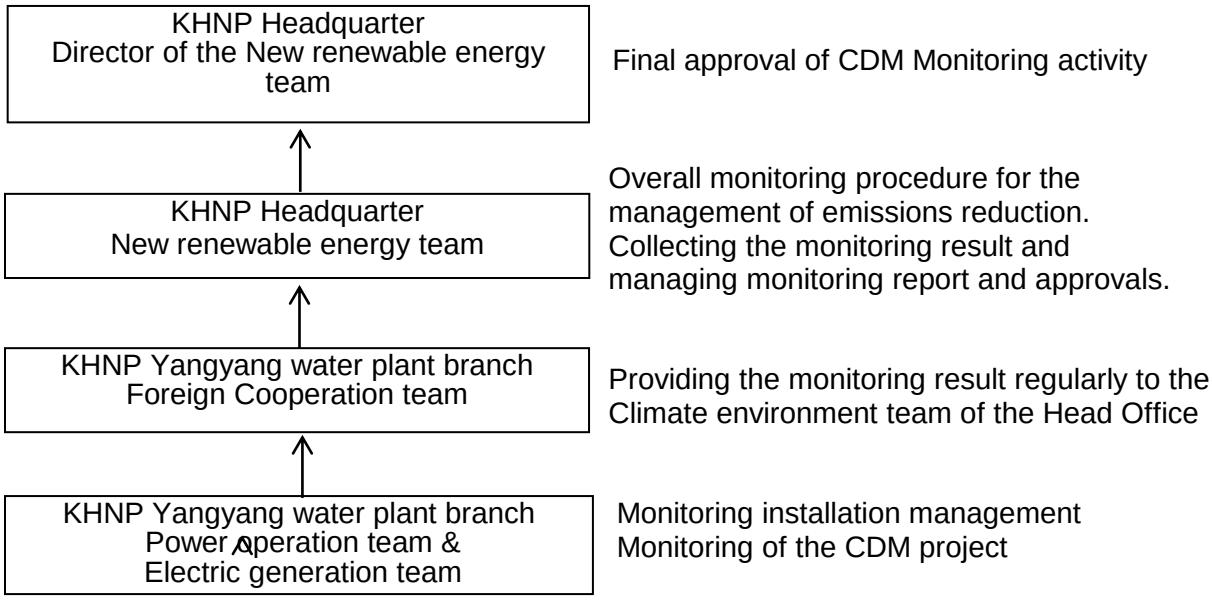
- Course on Electricity safety

The course on 'Act on operation of electricity market' shall be attended once in case of replacing the person in charge of monitoring and electricity safety.

CDM and Monitoring plan in the PDD training will be trained as per the internal procedure.

3-2. In case of absence of the responsible person, the second responsible person shall be selected.

4. Operational and management structure



SECTION C. Duration and crediting period

C.1. Duration of project activity

C.1.1. Start date of project activity

>>

01/10/2005 – Construction date of the proposed project

C.1.2. Expected operational lifetime of project activity

>>

20 years

C.2. Crediting period of project activity

C.2.1. Type of crediting period

>>

Renewable type of crediting period

C.2.2. Start date of crediting period

>>

10/02/2014 – Start date of second crediting period

C.2.3. Length of crediting period

>>

7 years – Length of second crediting period

SECTION D. Environmental impacts

D.1. Analysis of environmental impacts

>>

The Republic of Korea does not require an EIA (Environmental Impact Assessment) for Yangyang renewable energy project(hydro power) whose facility is 1.4MW. Because, according to the Act on Assessment of Impacts of Works on Environment, Traffic, Disasters, etc, plant facility whose power source is solar power, wind power or fuel cell which is more than 100MW shall be carried out Environmental Impact Assessment.

Though this project didn't have duty to be conducted in general procedure of EIA, project developer

estimated environmental impact to assess exactly whether this project could support sustainable development or not. The environmental impact assessment study allows for an estimate of the effects on the human population, the flora and fauna, water, air, climate, landscape and the structure and functioning of the ecosystems in the are expected to be affected. The analysis covers both the wind park itself and the connection lines associated with the project.
At the preliminary report of the environmental impact assessment for the Yangyang renewable energy project(wind power), the conclusion of the report was that there is a little environmental impact by this project. EIA report for Yangyang wind power was published in May. 2005

SECTION E. Local stakeholder consultation

E.1. Solicitation of comments from local stakeholders

>>

The local stakeholders of the project activity are local people of Jindongri, Girinmyeon and village administration authorities in Gangwondo. Meetings were organised with local stakeholders in both the villages and comments were invited from the local community regarding the project activity. The meeting was arranged on 22 April 2005 at Jindongri, Girinmyeon which is located where wind power facility would be constructed. Thirty people who are the local community leaders and the village administration authorities attended in this public meeting.

E.2. Summary of comments received

>>

The local people were interested in this project because there would be some potential to improve local community, like advertisement or development for local community. Most of positive opinion was about how the project would contribute to Jindongri community for sustainable development. KOMIPO explained that there could be some environmental and social benefit through this project at the meeting.

E.3. Report on consideration of comments received

>>

No major concerns have been raised by the stakeholders that were present at the stakeholder consultation meeting. The answers provided by KOMIPO satisfied the participants. KOMIPO will ensure that the renewable power plants will be placed in such a way that noise impacts for the local population will be minimized.

SECTION F. Approval and authorization

>>

Approval date: 17/11/2006
Host country: Republic of Korea

- - - - -

Appendix 1：Contact information of project participants

Organization	KOMIPO (Korea Midland Power Company Limited)
Street/P.O. Box	38, Teheran-ro 114-gil
Building	Dong-il tower
City	Seoul
State/Region	Gangnam-gu
Postcode	135-280
Country	Republic of Korea
Telephone	
Fax	
E-mail	
Website	www.komipo.co.kr
Contact person	
Title	Senior Manager
Salutation	Mr.
Last name	Oh
Middle name	
First name	Dong-hun
Department	Power Generation Department
Mobile	
Direct fax	+82-70-7511-1055
Direct tel.	+ 82-70-7511-1342
Personal e-mail	odh468@komipo.co.kr

Appendix 2: Affirmation regarding public funding

There is no public funding in this project.

Appendix 3: Applicability of selected methodology

Please refer to the section B.2. Applicability of methodology.

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

The baseline information used to calculate emission reductions of the proposed project is as follows:

- Determination of Emission Factor

[Appendix 4-1] Calculation of Operating Margin emission factor

Year	Plant		Amount of fossil fuel(FCi,m,y)				Net Caloric value(NCVi,y)				Net electricity generated (EGm,y)	EF for each plant (tonCO2eq./MWh)
			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)		
2009	Honam	#1	923,895	471	167	0	5,012	9,323	8,510		1,843,823	0.9420
		#2	853,508	818	201	0	4,982	9,314	8,507		1,696,597	0.9409
	Samchonpo	#1	1,611,736	0	299	0	5,582		8,496		3,881,067	0.8689
		#2	1,596,153	0	447	0	5,543		8,446		3,869,863	0.8570
		#3	1,818,061	0	110	0	5,545		8,490		4,494,850	0.8404
		#4	1,552,530	0	486	0	5,557		8,384		3,873,780	0.8349
		#5	1,909,143	0	151	0	4,850		8,537		4,225,306	0.8213
		#6	1,765,537	0	576	0	4,854		8,557		3,902,690	0.8232
	Yonghung	#1	2,316,758	0	1,996	0	5,681		8,446		6,121,660	0.8065
		#2	2,437,083	0	1,632	0	5,654		8,218		6,309,794	0.8190
		#3	2,533,024	0	966	0	5,642		8,469		6,711,338	0.7983
		#4	2,740,096	0	117	0	5,647		6,764		7,183,514	0.8071
	Boryeong	#1	896,958	0	1,982	0	5,259		8,496		2,076,329	0.8538
		#2	1,361,908	0	5,689	0	5,292		8,385		3,148,655	0.8623
		#3	1,686,579	0	180	0	5,363		8,476		4,153,516	0.8162
		#4	1,554,579	0	672	0	5,337		8,551		3,823,603	0.8136
		#5	1,681,591	0	516	0	5,354		8,425		4,136,937	0.8159
		#6	1,538,187	0	935	0	5,378		8,363		3,802,516	0.8158
		#7	1,438,768	0	568	0	5,390		8,319		3,720,811	0.7814
		#8	1,701,650	0	341	0	5,384		8,661		4,417,673	0.7773

Taean	#1	1,561,372	0	348	0	5,646		8,400		4,087,057	0.8085
	#2	1,483,233	0	22	0	5,651		8,248		3,858,541	0.8139
	#3	1,550,278	0	209	0	5,650		8,327		4,041,441	0.8123
	#4	1,471,251	0	410	0	5,641		8,351		3,843,816	0.8094
	#5	1,409,802	0	978	0	5,672		8,369		3,689,068	0.8129
	#6	1,548,690	0	285	0	5,688		8,393		4,064,658	0.8122
	#7	1,576,347	0	394	0	5,674		8,437		4,232,409	0.7921
	#8	1,382,469	0	1,397	0	5,676		8,385		3,730,433	0.7891
Hadong	#1	1,647,434	0	341	0	5,469		8,416		4,064,233	0.8310
	#2	1,551,648	0	648	0	5,428		8,456		3,799,030	0.8312
	#3	1,554,931	0	473	0	5,462		8,442		3,862,769	0.8242
	#4	1,634,941	0	226	0	5,465		8,441		4,049,790	0.8268
	#5	1,543,027	0	547	0	5,467		8,434		3,848,711	0.8217
	#6	1,637,877	0	286	0	5,465		8,407		4,085,588	0.8211
	#7	1,500,309	0	72	0	5,614		8,497		4,068,510	0.7757
	#8	1,169,132	0	692	0	5,625		7,654		3,153,402	0.7820
Dangjin	#1	1,601,422	0	677	0	5,425		8,602		4,025,605	0.8092
	#2	1,572,097	0	291	0	5,423		8,547		3,964,389	0.8060
	#3	1,669,969	0	155	0	5,431		8,575		4,232,358	0.8031
	#4	1,658,923	0	110	0	5,432		8,585		4,195,301	0.8050
	#5	1,324,949	0	582	0	5,445		8,553		3,400,082	0.7956
	#6	1,330,803	0	517	0	5,468		8,530		3,471,850	0.7857
	#7	1,609,342	0	133	0	5,478		8,564		4,172,321	0.7918
	#8	1,334,679	0	625	0	5,513		8,550		3,531,321	0.7812
Ulsan	#1	0	30,963	35	0		9,415	8,767		116,425	0.7923
	#2	0	27,250	41	0		9,416	8,689		104,292	0.7787
	#3	0	7,139	35	0		9,399	8,631		26,061	0.8174
	#4	0	253,330	2,938	0		9,486	8,517		1,058,708	0.7247
	#5	0	313,474	2,805	0		9,488	8,619		1,318,789	0.7185
	#6	0	288,842	2,460	0		9,491	8,601		1,215,616	0.7181
Yeongnam	#1	0	108,767	764	0		9,681	8,657		437,034	0.7662
	#2	0	104,675	647	0		9,684	8,709		415,404	0.7755

Yeosu	#1	0	113,633	187	0		9,419	8,357		466,519	0.7263
	#2	0	193,394	203	0		9,427	7,792		805,262	0.7163
Pyeongtaek	#1	0	56,671	354	2,922		9,456	11,684	11,446	251,576	0.7085
	#2	0	280,992	696	4,203		9,388	11,900	11,480	1,211,425	0.6995
	#3	0	282,894	581	4,046		9,378	11,595	11,598	1,225,561	0.6947
	#4	0	192,380	545	3,838		9,399	10,619	11,617	834,285	0.6994
Namjeju	#1	0	0	0	0					0	
	#2	0	0	0	0					0	
	#3	0	140,564	143	0		9,387	8,510		550,851	0.7579
	#4	0	153,841	89	0		9,385	8,529		603,417	0.7567
Jeju	#1	0	0	0	0					0	
	#2	0	82,010	103	0		9,360	8,495		324,784	0.7479
	#3	0	91,221	72	0		9,348	8,537		356,297	0.7570
Seoul	#4	0	0	0	36,893				11,745	157,606	0.6250
	#5	0	0	0	91,258				11,740	412,265	0.5908
Incheon	#1	0	0	0	15,168				11,738	72,854	0.5556
	#2	0	0	0	15,317				11,739	76,672	0.5332
	#3	0	0	47	2,411			8,550	11,753	11,865	0.5533
	#4	0	0	0	0					0	
Pyongtaek	C/C	0	0	0	80,050				11,740	483,959	0.4415
Ilsan	C/C	0	0	0	595,190				11,737	3,270,241	0.4856
Bundang	C/C	0	0	13,142	541,739				11,540	3,108,338	0.4572
Ulsan	C/C	0	0	0	489,946				11,558	3,299,104	0.3902
Seoincheon	C/C	0	0	0	1,061,332				11,740	7,503,395	0.3775
Shinincheon	C/C	0	0	0	1,394,939				11,739	9,901,080	0.3760
Boryeong	C/C	0	0	86	543,342				11,726	3,655,848	0.3962
Incheon	C/C	0	0	0	806,154				11,784	6,075,599	0.3555
Busan	C/C	0	0	0	1,247,488				11,747	9,268,113	0.3595
Hallim	C/C	0	0	0	0					0	
Anyang	C/C	0	0	0	202,108				14,084	1,301,286	0.4973

	Bucheon	C/C	0	0	0	230,085				14,232	1,556,502	0.4783
	POSCO POWER	C/C	0	0	0	342,724				11,739	1,859,273	0.4919
	GS Bugog	C/C	0	0	0	603,232				12,532	4,344,271	0.3956
	Yulchon	C/C	0	0	0	282,344				11,744	1,995,914	0.3777
	Kwangyang	C/C	0	0	0	0					0	
	Hyundai-Daesan	C/C	0	0	0	0					0	
	Namjeju	D/P	0	29,527	275	0		9,407	8,498		136,189	0.6499
	Jeju	G/T	0	0	626	0			8,503		842	1.9215
	Jeju	D/P	0	72,724	0	0		6,082			345,163	0.4050
	Total		70,242,669	2,825,580	55,323	8,596,729					247,025,690	0.7117
2010	Honam	#1	661,468	1,855	301	0	5,014	9,321	8,458	0	1,321,140	0.9454
		#2	722,994	897	350		5,057	9,322	8,482	0	1,462,407	0.9392
	Samchonpo	#1	1,899,819		518		5,385	0	8,466	0	4,433,574	0.8649
		#2	1,891,944		421		5,388	0	8,457	0	4,418,264	0.8647
		#3	1,581,512		1,261		5,373	0	8,478	0	3,766,380	0.8462
		#4	1,909,672		369		5,358	0	8,473	0	4,544,757	0.8439
		#5	1,949,826		293		4,714	0	8,563	0	4,174,333	0.8252
		#6	1,758,651		573		4,718	0	8,557	0	3,767,928	0.8256
	Yonghung	#1	2,201,446		2,189		5,432	0	8,387	0	5,558,681	0.8071
		#2	2,264,564		1,531		5,433	0	8,381	0	5,627,774	0.8199
		#3	2,778,041		739		5,386	0	8,391	0	6,887,344	0.8144
		#4	2,821,533		663		5,379	0	8,381	0	6,943,045	0.8193
	Boryeong	#1	1,771,953		732		5,176	0	8,402	0	4,012,817	0.8569
		#2	1,635,347		1,068		5,175	0	8,353	0	3,706,927	0.8562
		#3	1,618,460		464		5,206	0	8,321	0	3,855,846	0.8191
		#4	1,775,851		289		5,206	0	8,349	0	4,232,288	0.8188
		#5	1,604,934		911		5,201	0	8,313	0	3,817,181	0.8200
		#6	1,778,254		359		5,202	0	8,317	0	4,226,837	0.8203

		#7	1,670,727		662		5,244	0	8,322	0	4,189,558	0.7840
		#8	1,493,422		439		5,255	0	8,316	0	3,787,312	0.7767
	Taean	#1	1,512,930		865		5,458	0	8,428	0	3,817,336	0.8111
		#2	1,626,596		518		5,427	0	8,429	0	4,058,392	0.8154
		#3	1,506,479		476		5,433	0	8,436	0	3,776,949	0.8123
		#4	1,656,710		296		5,456	0	8,422	0	4,165,579	0.8133
		#5	1,450,465		680		5,491	0	8,437	0	3,657,234	0.8166
		#6	1,319,263		1,094		5,486	0	8,428	0	3,339,271	0.8130
		#7	1,521,262		879		5,469	0	8,430	0	3,940,580	0.7918
		#8	1,674,579		240		5,456	0	8,431	0	4,335,230	0.7899
	Hadong	#1	1,651,998		386		5,263	0	7,561	0	3,948,643	0.8253
		#2	1,758,216		133		5,262	0	8,421	0	4,181,012	0.8292
		#3	1,760,793		94		5,264	0	8,671	0	4,229,016	0.8213
		#4	1,623,350		610		5,260	0	8,416	0	3,877,595	0.8255
		#5	1,762,407		369		5,259	0	8,643	0	4,210,179	0.8251
		#6	1,642,064		367		5,263	0	8,423	0	3,972,047	0.8155
		#7	1,314,119		674		5,528	0	8,474	0	3,497,189	0.7789
		#8	1,586,695		34		5,525	0	8,578	0	4,221,464	0.7782
	Dangjin	#1	1,802,866		89		5,140	0	8,294	0	4,240,235	0.8190
		#2	1,812,592		168		5,133	0	8,522	0	4,271,208	0.8163
		#3	1,660,911		430		5,140	0	8,532	0	3,924,887	0.8153
		#4	1,593,667		974		5,134	0	8,469	0	3,757,184	0.8167
		#5	1,676,374		332		5,198	0	8,533	0	4,133,329	0.7902
		#6	1,722,658		157		5,195	0	8,520	0	4,242,960	0.7904
		#7	1,572,939		347		5,207	0	8,534	0	3,870,155	0.7932
		#8	1,729,056		90		5,191	0	8,497	0	4,272,886	0.7872

	Ulsan	#1		59,593	278	0	0	9,420	8,369	0	220,710	0.8072
		#2		50,627	249	0	0	9,423	8,382	0	185,534	0.8162
		#3		70,519	286	0	0	9,352	8,361	0	261,312	0.8006
		#4		229,069	4,116	0	0	9,511	8,350	0	927,792	0.7535
		#5		204,124	4,395	0	0	9,526	8,350	0	823,717	0.7597
		#6		217,795	3,058	0	0	9,506	8,350	0	887,331	0.7463
	Yeongnam	#1		91,050	1,170		0	9,705	8,785	0	354,224	0.7974
		#2		80,387	786		0	9,702	8,696	0	304,146	0.8174
	Yeosu	#1		118,289	370		0	9,539	8,350	0	481,530	0.7426
		#2		236,662	278		0	9,543	8,345	0	956,556	0.7471
	Pyeongtaek	#1		188,829	121	3,409	0	9,435	8,542	11,693	794,103	0.7210
		#2		172,352	102	6,484	0	9,430	8,485	11,691	742,439	0.7156
		#3		194,662	115	4,814	0	9,443	8,517	11,702	830,437	0.7155
		#4		158,042	91	3,646	0	9,443	8,540	11,651	669,443	0.7195
	Namjeju	#1		0	0	0	0	0	0	0	0	0.0000
		#2		0	0	0	0	0	0	0	0	0.0000
		#3		151,950	105	0	0	9,410	8,505	0	594,537	0.7607
		#4		146,544	134	0	0	9,410	8,472	0	580,342	0.7517
	Jeju	#1		0	0	0	0	0	0	0	0	
		#2		76,706	78	0	0	9,379	8,440	0	298,469	0.7626
		#3		89,373	82	0	0	9,379	8,492	0	344,920	0.7688
	Seoul	#4		0	0	77,219	0	0	0	11,746	356,493	0.5784
		#5		0	1	169,145	0	0	6,650	11,746	815,062	0.5542
	Incheon	#1		0	0	95,108	0	0		11,747	477,252	0.5322
		#2		0	0	105,649	0	0		11,748	544,351	0.5184
		#3		0	0	0	0	0		0	0	0.0000

		#4		0	0	0	0	0		0	0	
	Pyongtaek	C/C				237,805	0	0		11,691	1,472,808	0.4291
	Ilsan	C/C			0	755,305	0	0		11,745	4,306,850	0.4683
	Bundang	C/C			0	725,097	0	0		11,747	4,311,466	0.4491
	Ulsan	C/C			0	846,672	0	0		11,576	5,709,782	0.3902
	Seoincheon	C/C			76	1,633,316	0	0	8,750	11,745	11,756,041	0.3710
	Shinincheon	C/C			0	1,349,902	0	0		11,747	9,595,856	0.3757
	Boryeong	C/C			0	1,016,783	0	0		11,747	7,053,566	0.3850
	Incheon	C/C			0	1,035,486	0	0		11,745	7,789,931	0.3549
	Busan	C/C			12	1,666,675	0	0	4,275	11,748	12,489,596	0.3564
	Hallim	C/C			12,737	0	0	0	8,536	0	45,450	0.7271
	Anyang	C/C			0	308,918	0	0		12,447	1,824,654	0.4791
	Bucheon	C/C			0	303,789	0	0		12,454	1,806,919	0.4760
	POSCO POWER	C/C			0	809,100	0	0		11,411	4,297,788	0.4884
	GS Bugog	C/C	0		0	807,082	0	0		11,756	6,053,971	0.3563
	Yulchon	C/C	0		0	372,560	0	0		11,748	2,680,710	0.3712
	Kwangyang	C/C	0		0	0	0	0		0	-	0.0000
	Hyundai-Daesan	C/C	0		0	0	0	0		0	-	0.0000
	Kunsan	C/C			0	398,151	0	0		11,746	2,937,873	0.3619
	Yungwol	C/C			263	182,365	0	0	8,499	11,750	1,281,206	0.3807
	Namjeju	D/P		20,334	369		0	9,385	8,493	0	91,340	0.6709
	Jeju	G/T		0	697		0	0	8,550	0	1,115	1.6246
	Jeju	D/P	0	85,093	0		0	9,371	0	0	405,634	0.6214
	Total		74,729,407	2,644,752	54,403	12,914,480					279,038,209	0.6820
2011	Honam	#1	953,215	177	112	0	5,248	9,334	8,440	0	1,905,966	0.9839
		#2	879,567	1,210	214	0	5,249	9,321	8,395	0	1,747,338	0.9924
	Samchonpo	#1	1,948,868	0	475	0	5,206	0	7,770	0	4,359,352	0.8724

		#2	1,970,242	0	262	0	5,192	0	8,470	0	4,419,002	0.8676
		#3	1,986,001	0	105	0	5,191	0	10,025	0	4,573,786	0.8447
		#4	1,690,312	0	1,035	0	5,179	0	8,717	0	3,865,121	0.8494
		#5	1,838,960	0	560	0	4,567	0	8,450	0	3,810,806	0.8262
		#6	1,846,398	0	251	0	4,575	0	8,444	0	3,835,815	0.8253
	Yonghung	#1	2,699,097	0	1,340	0	5,225	0	8,410	0	6,433,472	0.8219
		#2	2,683,956	0	1,759	0	5,227	0	8,832	0	6,426,393	0.8188
		#3	2,880,873	0	651	0	5,231	0	8,407	0	6,959,292	0.8116
		#4	2,543,874	0	2,002	0	5,194	0	8,651	0	5,993,268	0.8270
	Boryeong	#1	1,631,824	0	683	0	5,130	0	8,320	0	3,658,190	0.8579
		#2	1,862,926	0	514	0	5,129	0	8,430	0	4,152,770	0.8625
		#3	1,773,564	0	244	0	5,137	0	8,297	0	4,195,243	0.8140
		#4	1,622,205	0	537	0	5,139	0	8,295	0	3,855,254	0.8106
		#5	1,671,582	0	1,308	0	5,135	0	8,306	0	3,929,511	0.8193
		#6	1,514,320	0	3,349	0	5,156	0	8,312	0	3,592,960	0.8167
		#7	1,595,059	0	703	0	5,187	0	8,301	0	3,985,396	0.7784
		#8	1,684,495	0	608	0	5,193	0	8,347	0	4,230,455	0.7752
	Taean	#1	1,718,777	0	1,054	0	5,219	0	8,431	0	4,081,011	0.8243
		#2	1,686,651	0	968	0	5,216	0	8,427	0	3,981,618	0.8285
		#3	1,732,630	0	917	0	5,210	0	8,427	0	4,095,757	0.8265
		#4	1,579,296	0	1,132	0	5,218	0	8,427	0	3,730,898	0.8285
		#5	1,659,427	0	804	0	5,386	0	8,431	0	4,044,894	0.8285
		#6	1,660,393	0	766	0	5,385	0	8,428	0	4,036,939	0.8305
		#7	1,714,300	0	423	0	5,225	0	8,431	0	4,143,649	0.8102
		#8	1,676,411	0	620	0	5,218	0	8,434	0	4,052,165	0.8094

Hadong	#1	1,800,151	0	193	0	5,168	0	8,442	0	4,201,848	0.8298
	#2	1,697,458	0	372	0	5,163	0	8,999	0	3,939,767	0.8338
	#3	1,690,815	0	267	0	5,168	0	8,322	0	3,948,628	0.8295
	#4	1,819,283	0	132	0	5,164	0	8,341	0	4,210,204	0.8363
	#5	1,679,060	0	522	0	5,172	0	8,381	0	3,955,693	0.8230
	#6	1,801,037	0	156	0	5,172	0	8,404	0	4,234,960	0.8243
	#7	1,547,047	0	583	0	5,449	0	8,346	0	3,989,890	0.7921
	#8	1,361,806	0	2,010	0	5,453	0	8,462	0	3,536,970	0.7881
Dangjin	#1	1,656,563	0	953	0	5,046	0	8,338	0	3,722,484	0.8421
	#2	1,644,619	0	704	0	5,052	0	8,303	0	3,703,032	0.8412
	#3	1,874,479	0	0	0	5,050	0	0	0	4,260,116	0.8326
	#4	1,880,478	0	71	0	5,053	0	8,349	0	4,275,089	0.8328
	#5	1,601,149	0	337	0	5,119	0	8,310	0	3,822,712	0.8037
	#6	1,590,289	0	861	0	5,102	0	8,359	0	3,799,971	0.8007
	#7	1,683,155	0	545	0	5,110	0	8,548	0	3,990,467	0.8080
	#8	1,611,032	0	699	0	5,106	0	8,501	0	3,885,254	0.7938
Ulsan	#1	0	65,421	320	0	0	9,399	8,357	0	241,206	0.8092
	#2	0	60,052	271	0	0	9,410	8,368	0	220,870	0.8119
	#3	0	71,455	231	0	0	9,409	8,365	0	263,718	0.8081
	#4	0	141,246	2,447	0	0	9,527	8,350	0	579,319	0.7450
	#5	0	195,802	3,498	0	0	9,526	8,360	0	811,709	0.7373
	#6	0	172,458	1,274	0	0	9,533	8,351	0	706,839	0.7398
Yeongnam	#1	0	66,130	903	0	0	9,693	8,366	0	257,829	0.7948
	#2	0	57,618	481	0	0	9,705	8,374	0	218,307	0.8153
Yeosu	#1	0	76,903	452	0	0	9,740	8,338	0	311,053	0.7649
	#2	0	0	6,167	0	0	0	8,314	0	873,675	0.0178

Pyeongtaek	#1	0	139,046	85	26,800	0	9,533	8,516	12,448	700,456	0.7068
	#2	0	119,917	75	34,935	0	9,521	8,550	11,496	665,563	0.6797
	#3	0	125,416	39	17,618	0	9,571	8,501	11,770	606,066	0.7040
	#4	0	108,044	47	20,060	0	9,508	8,449	11,974	543,457	0.6982
Namjeju	#1	0	0	0	0	0	0	0	0	0	0.0000
	#2	0	0	0	0	0	0	0	0	0	0.0000
	#3	0	141,259	116	0	0	9,392	8,444	0	551,178	0.7614
	#4	0	161,171	52	0	0	9,390	8,568	0	630,859	0.7585
Jeju	#1	0	0	0	0	0	0	0	0	0	
	#2	0	78,003	128	0	0	9,390	3,229	0	307,320	0.7538
	#3	0	96,861	75	0	0	9,391	7,220	0	376,774	0.7636
Seoul	#4	0	0	0	67,400	0	0	0	11,747	313,916	0.5734
	#5	0	0	0	145,131	0	0	0	11,748	705,553	0.5494
Incheon	#1	0	0	0	105,615	0	0		11,746	542,437	0.5199
	#2	0	0	0	112,296	0	0		11,746	581,043	0.5161
	#3	0	0	0	0	0	0		0	0	0.0000
	#4	0	0	0	0	0	0		0	0	0.0000
Pyongtaek	C/C	0	0	0	235,935	0	0		11,858	1,458,270	0.4361
Ilsan	C/C	0	0	0	595,669	0	0		11,747	3,415,525	0.4657
Bundang	C/C	0	0	0	632,263	0	0		11,755	3,762,236	0.4491
Ulsan	C/C	0	0	0	1,021,561	0	0		11,647	7,011,947	0.3858
Seoincheon	C/C	0	0	26	1,645,667	0	0	8,879	11,746	11,828,077	0.3715
Shinincheon	C/C	0	0	0	1,225,449	0	0		11,747	8,470,640	0.3863
Boryeong	C/C	0	0	0	925,348	0	0		11,757	6,463,535	0.3827
Incheon	C/C	0	0	0	965,530	0	0		11,747	7,230,855	0.3566
Busan	C/C	0	0	32	1,554,837	0	0	8,550	11,753	11,583,721	0.3587

Hallim	C/C	0	0	12,493	0	0	0	8,510	0	43,828	0.7374
Anyang	C/C	0	0	0	322,478	0	0		11,754	1,888,326	0.4563
Bucheon	C/C	0	0	0	513,362	0	0		6,895	1,775,876	0.4531
POSCO POWER	C/C	0	0	0	1,088,204	0	0		13,172	10,681,153	0.3051
GS Bugog	C/C	0		0	770,789	0	0		15,685	5,794,391	0.4744
Yulchon	C/C	0	0	0	368,468	0	0		11,752	2,667,408	0.3691
Kwangyang	C/C	0	0	0	0	0	0		0	6,439,416	0.0000
Hyundai-Daesan	C/C	0		0	0	0	0		0	167,685	0.0000
Kunsan	C/C	0	0	0	648,722	0	0		11,754	4,926,279	0.3519
Yungwol	C/C	0	0	65	564,915	0	0	8,535	11,756	4,107,372	0.3676
Namjeju	D/P	0	22,894	381	0	0	9,357	8,550	0	103,234	0.6655
Jeju	G/T	0	0	552	0	0	0	8,495	0	1,021	1.3960
Jeju	D/P	0	97,504	0	0	0	9,395	0	0	469,240	0.6171
Total		77,643,644	1,998,587	62,011	13,609,052					292,872,588	0.6592

**** Operating Margin emission factor**

Year	Electricity generation by OM plants	CO_2 emissions by OM plants
2009	247,025,690	175,798,820
2010	279,038,209	190,305,054
2011	292,872,588	193,066,862
Total	**818,936,487**	**559,170,736**

EF_{OM} = 0.6828 tonCO₂/MWh

[Appendix 4- 2] **Sample group plants used in the Build Margin calculation and CO_2 Emission Factor of the Build Margin**

Year	No.	Plant name		Technology	Type of Fossil Fuel	year operation	Net electricity generated (EGm,y)	CO2 emission factor tCO2/MWh	EF for each plant (tonCO2eq./MWh)
2011	1	Kwangyanghang solar		Solar		2011.12	0		
	2	KC susan solar		Solar		2011.12	167		
	3	Seoul solar		Solar		2011.09	0		
	4	Hadong S/S solar		Solar		2011.09	23		
	5	Busan sinhang solar		Solar		2011.08	60		
	6	Ulsan solar		Solar		2011.08	511		
	7	Tangjeong solar		Solar		2011.08	713		
	8	Hoengseongdaem		small hydro power		2011	0		
	9	Kangjeong		small hydro power		2011	0		
	10	Kangcheonbo		small hydro power		2011	0		
	11	Kumibo		small hydro power		2011	0		
	12	Keumkangbo		small hydro power		2011	0		
	13	Keumnambo		small hydro power		2011	532		
	14	Baekjebo		small hydro power		2011	0		
	15	Seungchonbo		small hydro power		2011	0		
	16	Epobo		small hydro power		2011	0		
	17	Juksanbo		small hydro power		2011	0		
	18	Pankyo		small hydro power		2011	1,496		
	19	Yeoicheon pumping	#1	pumping		2011	151,322		
	20	Yeoicheon pumping	#2	pumping		2011	65,763		
20	1	Haengwon solar park		solar		2010.11	0		
	2	Gunwi		small hydro power		2010.11	1,347		

10	3	Dangjin solar park		solar		2010.10	1,329		
	4	Yeoicheon solar park		solar		2010.10	2,839		
	5	Yeongheung-wind power		wind		2010.10	0		
	6	Hangwon		small hydro power		2010.10	104		
	7	Seolibo		small hydro power		2010.08	0		
	8	Kyeongcheon	#2	small hydro power		2010.07	0		
	9	Gunsan		Combined		2010.06	4,926,279	0.3519	0.0179
	10	Tapjeong		small hydro power		2010.03	0		
	11	Sinkori	#1	nuclear		2010.02	7,867,030		
	12	Pangweo		small hydro power		2010	0		
	13	Yeongwol		Combined		2010	4,107,372	0.3676	0.0156
	14	Dangjin		small hydro power		2010			
	15	Rural community corp.		small hydro power		2010	0		
	16	New solar energy and others				2010	0		
2009	1	Gosan		small hydro power		2009.12	0		0.0000
	2	Ilsan fuel cell		fuel cell		2009.09	30,468		
	3	Gosado solar		solar		2009.07			
	4	Pyeongsado solar		solar		2009.07			
	5	Yukdo solar		solar		2009.07			
	6	Yuldo solar		solar		2009.07			
	7	Hadong	# 8	steam power	Bituminous coal	2009.06	3,536,970	0.7881	0.0287
	8	Daehanboryeong		small hydro power		2009.05	0		
	9	Hankukhaeyang		small hydro power		2009.05	0		
	10	Wooldolmok		small hydro power		2009.05	0		
	11	Dangsado solar		solar		2009.04			
	12	Hahwado solar		solar		2009.04			
	13	Hwangjedo solar		solar		2009.04			
	14	Seongsan-wind		wind		2009.04	0		
	15	Yeongwol solar		solar		2009.01	57		

	16	Boseong		small hydro power		2009	0		
	17	Seongju		small hydro power		2009	0		
	18	New solar energy and others				2009	0		
	1	Boryeong	#8	steam power	Bituminous coal	2008.12	4,230,455	0.7752	0.0338
	2	Hadong	#7	steam power	Bituminous coal	2008.12	3,989,890	0.7921	0.0326
	3	Yeongheung	#4	steam power	Bituminous coal	2008.12	5,993,268	0.8270	0.0511
	4	Kyeongcheon		small hydro power		2008.11	0		
	5	Seongnam 2		small hydro power		2008.1	0		
	6	Nulokdo solar		solar		2008.09	0		
	7	Jeju solar		solar		2008.09	57		
	8	Boryeong fuel cell		fuel cell		2008.09	2,087		
	9	Naebyeong solar		solar		2008.08	0		
2	10	Yulhyeon		small hydro power		2008.07	0		
	11	Busan C/C solar		solar		2008.07			
0	12	Hadong solar		solar		2008.07			
	13	Hongikdongjin		small hydro power		2008.06	0		
0	14	Daecheongdaem		small hydro power		2008.06	0		
	15	Boryeong	#7	steam power	Bituminous coal	2008.06	3,985,396	0.7784	0.0320
8	16	Yeongheung	#3	steam power	Bituminous coal	2008.06	6,959,292	0.8116	0.0582
	17	Kori-wind power		wind		2008.05	0		
	18	Samlangjin solar				2008.04	0		
	19	Boryeong solar		solar		2008.04	0		
	20	Boryeong		small hydro power		2008.03	0		
	21	Yeongheung		small hydro power		2008.03	0		
	22	Yeonggwang solar park				2008.03	0		
	23	Boryeong 2		small hydro power		2008.03	1,045		
	24	POSCO fuel cell		fuel cell		2008.03	0		
	25	Gunjang heat & power		combined		2008.01	0		

	26	Seocheon solar		solar		2008.01	0		
	27	New solar energy and others		solar		2008	0		
	1	Taean		small hydro power		2007	0		
	2	Hanbit Sungsan the second solar		solar		2007.12	0		
	3	Taein gangjin solar		solar		2007.12	0		
	4	Suni gangjin solar		solar		2007.12	0		
	5	Korea yeongcheon solar		solar		2007.12	0		
	6	Solar yungam solar		solar		2007.12	0		
	7	Changwhan yeongduk solar		solar		2007.12	0		
	8	Samsung jindo		solar		2007.12	0		
	9	Hwaseong heat & power		combined		2007.12	0		
	10	Dangjin	#8	steam power	Bituminous coal	2007.12	3,885,254	0.7938	0.0318
2	11	SP solar yonggwang		solar		2007.11	0		
	12	Dongyang energy sinan		solar		2007.11	0		
0	13	Ef yungam solar		solar		2007.11	0		
	14	Dongwon gangjin solar		solar		2007.11	0		
0	15	Solec yonggwang solar		solar		2007.11	0		
	16	Solar jungeub solar		solar		2007.11	0		
7	17	Sinbuk yungam solar		solar		2007.11	0		
	18	Hyein haenam solar		solar		2007.11	0		
	19	Samlangjin solar		solar		2007.11	0		
	20	Hyosung daegi-wind power		wind		2007.11	0		
	21	Nonhyun heat & power		combined		2007.10	0		
	22	Wuriyungam solar		solar		2007.08	0		
	23	Hwasung solar		solar		2007.08	0		
	24	Yeongju the first solar		solar		2007.08	0		
	25	Muan solar		solar		2007.08	0		
	26	Jangheung solar		solar		2007.08	0		
	27	Gomun		small hydro power		2007.08	0		

	28	Taean	#8	steam power	Bituminous coal	2007.08	4,052,165	0.8094	0.0338
	29	Dangjin	#7	steam power	Bituminous coal	2007.06	3,990,467	0.8080	0.0333
	30	Munkyung solar		solar		2007.06	0		
	31	Younggwang solar park		solar		2007.06	0		
	32	Yungam Solar		solar		2007.06	0		
	33	Wonjungsu		small hydro power		2007.05	0		
	34	Baekgok		small hydro power		2007.05	0		
	35	damyangho		small hydro power		2007.05	0		
	36	Juam		small hydro power		2007.05	0		
	37	Namjeju	#4	thermal	heavy oil	2007.03	630,859	0.7585	0.0049
	38	Eco energy		solar		2007.03	0		
	39	hapcheon		small hydro power		2007.02	7,915		
	40	Jeonju-resource recovery facility				2007.02	0		
	41	Seoul Marin(suncheon)		solar		2007.02	0		
	42	Mirae energy		solar		2007.02	0		
	43	samcheonpo		small hydro power		2007.02	0		
	44	dalbang		small hydro power		2007.02	0		
	45	Taean	#7	steam power	Bituminous coal	2007.02	4,143,649	0.8102	0.0346
	46	Yeongju the second solar		solar		2007.01	0		
	47	Hyundaedaesan		combined		2007.01			
2	1	Cheongsong pumping	#2	pumping		2006.12	236,677		
	2	S&P Solar		solar		2006.10	0		
0	3	Bundang fuel cell		fuel cell	LNG	2006.10	2,031		
	4	Namhae Solar		solar		2006.10	0		
0	5	HanlaJeunggong Solar		solar		2006.10	0		
	6	Yungam Solar		solar		2006.09	0		
6	7	Enepark		solar		2006.09	0		
	8	Yeongheung solar		solar		2006.09	1,058		

	9	Cheongsong pumping	#1	pumping		2006.09	340,430		
	10	Namjeju	#3	thermal	heavy oil	2006.09	551,178	0.7614	0.0043
	11	yangyang(pumping)	#4	pumping		2006.08	228,095		
	12	Donghae Solar		solar		2006.08	0		
	13	Kangwon-wind power		wind		2006.07	0		
	14	Woljeong-wind power		wind		2006.07	0		
	15	yangyang pump windpower		wind		2006.06	0		
	16	Hadongho		small hydro power		2006.06	0		
	17	yangyang (pumping)	#3	pumping		2006.06	209,815		
	18	Goheung Solar		solar		2006.06	0		
	19	Jangseong		small hydro power		2006.05	0		
	20	yangyang (pumping)	#2	pumping		2006.04	100,955		
	21	Dangjin	#6	thermal	Bituminous coal	2006.04	3,799,971	0.8007	0.0314
	22	Sinchang-wind power		wind		2006.03	0		
	23	yangyang (pumping)	#1	pumping		2006.02	191,936		
2005	1	Janghengdam		small hydro power		2005.12	0		
	2	Suncheon Solar		solar		2005.12	0		
	3	Samcheonpo solar energy		solar		2005.12	0		
	4	Dangjin	#5	steam power	Bituminous coal	2005.10	3,822,712	0.8037	0.0317
	5	yangyang pump small hydro		small hydro power		2005.10	0		
	6	Taean solar energy		solar		2005.10	130		
	7	Jeju DP		internal combustion	heavy oil	2005.07	469,240	0.6171	0.0030
	8	WunjeongLFG		internal combustion	LFG	2005.07	0		
	9	Yulchon		combined	LNG	2005.07	2,667,408	0.3691	0.0102
	10	Incheon		combined	LNG	2005.07	7,230,855	0.3566	0.0266
	11	Daegok		small hydro power		2005.07	1,295		
	12	Donghwa		small hydro power		2005.07	0		
	13	Ulchin	#6	nuclear		2005.04	8,090,567		

	14	Hanrye		LFG	LFG	2005.04	0		
	15	Busan Bio-gas		internal combustion	LFG	2005.03	0		
	16	Sungnam		small hydro power		2004.12	0		
	17	Yungduk-wind power		wind		2004.12	0		
	18	Yongdam		small hydro power		2004.12	30,818		
	19	Maebongsan-wind power		wind		2004.12	0		
	20	Daegwanryeong-wind power		wind		2004.12	0		
	21	Yeongheung	#2	steam power	Bituminous coal	2004.11	6,426,393	0.8188	0.0543
	22	Yeongheung	#1	steam power	Bituminous coal	2004.07	0		
Total							**96,967,745**		***0.5698***

[Appendix 4- 3] Default Values of Carbon content

Fuel	Default carbon content (kg/GJ)	Fuel	Default carbon content (kg/GJ)
Crude oil	20	Oil shale and Tar sands	29.1
Orimulsion	21	Brown Coal Briquettes	26.6
Natural gas liquids	17.2	Patent Fuel	26.6
Motor Gasoline	18.9	Coke Oven Coke and Lignite Coke	29.2
Aviation Gasoline	19.1	Gas Coke	29.2
Jet Gasoline	19.1	Coal Tar	22.0
Jet kerosene	19.5	Gas Works Gas	12.1
Other Kerosene	19.6	Coke Oven Gas	12.1
Shale oil	20	Blast Furnace Gas	70.8
Gas/Diesel oil	20.2	Oxygen Steel Furnace Gas	49.6
Residual fuel oil	21.1	Natural Gas	15.3
LPG	17.2	Municipal Wastes (non-biomass fraction)	25.0
Ethane	16.8	Industrial Wastes	39.0
Naphtha	20.0	Waste Oils	20.0
Bitumen	22.0	Peat	28.9
Lubricants	20.0	Wood/Wood Waste	30.5
Petroleum coke	26.6	Sulphite lyes (black liquor)	26.0
Refinery Feedstocks	20.0	Other Primary Solid Biomass	27.3
Refinery gas	15.7	Charcoal	30.5
Paraffin Waxes	20.0	BioGasoline	19.3
White Spirit & SBP	20.0	Biodiesels	19.3
Other Petroleum Products	20.0	Other Liquid Biofuels	21.7
Anthracite	26.8	Land fill Gas	14.9
Coking coal	25.8	Sludge Gas	14.9
Other bituminous coal	25.8	Other Biogas	14.9
sub-bituminous coal	26.2	Municipal Wastes (biomass fraction)	27.3
Lignite	27.6		

Appendix 5: Further background information on monitoring plan

Please refer to section B.7. Monitoring plan.

Appendix 6: Summary of post registration changes

Not applicable

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History of the document

Version	Date	Nature of revision
04.1	11 April 2012	Editorial revision to change history box by adding EB meeting and annex numbers in the Date column.
04.0	EB 66 13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the project design document form for small-scale CDM project activities" (EB 66, Annex 9).
03	EB 28, Annex 34 15 December 2006	• The Board agreed to revise the CDM project design document for small-scale activities (CDM-SSC-PDD), taking into account CDM-PDD and CDM-NM.
02	EB 20, Annex 14 08 July 2005	• The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document. • As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <http://cdm.unfccc.int/Reference/Documents>.
01	EB 07, Annex 05 21 January 2003	Initial adoption.
Decision Class: Regulatory **Document Type:** Form **Business Function:** Registration		