CLEAN DEVELOPMENT MECHANISM
SIMPLIFIED PROJECT DESIGN DOCUMENT
FOR SMALL-SCALE PROJECT ACTIVITIES (SSC-CDM-PDD)
Version 02

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SECTION A. General description of the small-scale project activity

A.1. Title of the small-scale project activity:

- **Hangyeong second phase SS-wind power** Project (hereinafter referred as the Project)
- Version 03, 2 March 2007

A.2. Description of the small-scale project activity:

- the purpose of the project activity

The Project is a wind power generating plant on the Jeju Island of Republic of Korea. The Project utilizes wind power which is generating zero greenhouse gas (GHG) emission into the atmosphere. The Project supports the government policy which promotes development of renewable energy technology in Republic of Korea. The Project also contributes to reduce the dependence on electricity generated by thermal power plants using fossil fuel which takes 57.7% of electricity generation in Korea (KEPCO, June 2005).

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

The Project supports the Korean government policy as follows:

- Contribute to increase the renewable energy supply ratio by generating electricity with wind power which Korean government encourages industries to develop.
- Promote, support, and cultivate the use of renewable energy as an alternative energy source.
- Minimize dependence on fossil fuel imports by utilizing wind power and save the cost by substituting the wind energy source for the conventional energy source such as fossil fuels.

The Project contributes the sustainable development in the following ways.

- Wind energy sources present environmental benefit. Compared to other energy sources, processing wind energy does not release pollutants into the air, nor does it emit residuals that can give harmful impacts on soil and water etc.
- Renewable energy sources provide future generations with environmentally friendly fuel alternatives that protect the environment.
- This Project will cut GHGs and other emissions such as sulphur dioxide, nitrogen oxide, and particulates.

The project will transfer the advance technology and knowledge regarding wind power plant as follows:

- While Engineers dispatched from Vestas will stay in the plant and monitor the operation and management of the plant, and transfer the knowledge and technology to the local people
- The local engineers will dispatch annually to Vestas in Denmark to obtain the technique of the operation & maintenance

A.3. Project participants:

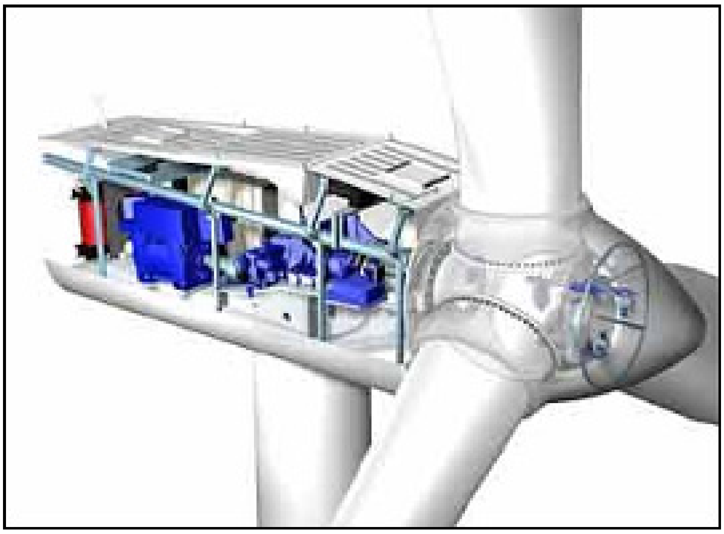
<TableA-1> shows Project Participants for **Hangyeong second phase SS-wind power project**

<TableA-1> Project Participants

Name of Party involved (*) ((host) indicates a host Party)	**Private and/or public entity(ies) project participants (*) (as applicable)**	**Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)**
KOREA (host)	• Public entity: Korea Southern Power Co.,Ltd • Public entity: Ecoeye Co., Ltd	No

A.4. Technical description of the small-scale project activity:

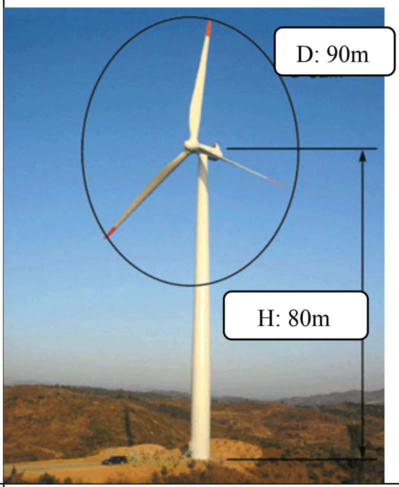
The **Hangyeong second phase SS-wind power project** of 5 wind turbines and its turbine model is V90-3.0MW from Vestas . Each wind turbine has 3 blades and is the pitch-regulated, upwind type.



<Figure A-1> Inside structure of turbine

The annual wind speeds for the site are in the range of 7.46 m/s at 60m above the ground. Capacity of each wind turbine is 3.0 MW, the total capacity of 5 wind turbines is 15 MW, the utilization rate is 31.48% and thus the expected generation is 39,689.1 MWh annually. The expected CO_2 reduction is 28,898.5ton CO_2/year. The Wind Turbine Specification is as followed <Table A-2>

<Table A-2> Hangyeong second phase Wind Turbine Specification

Model		 **V90/1758**
Rated Output		3000kW
Design Wind Speed (10 min. average)	Start up Wind Speed (m/s)	4
	Nominal Wind Speed (m/s)	16
	Stop Wind Speed (m/s)	25
Generator		Induction Generator
Rotor	Diameter (m)	90
	RPM	9.9-18.4
	Swept Area (m2)	6362
	Hub Height(m)	80
Gear Box		2 planetary stage + 1 helical stage
Brake System	Aerodynamic	Full blade pitch
	Mechanical	Hydraulic fail-safe
Standard Type	Nacelle	Class II
	Tower	Class II
Output Control Type		Pitch hydraulic (Stall control)

A.4.1. Location of the small-scale project activity

The project site is located at Hangyung County on Jeju Island

A.4.1.1. Host Party(ies)

Republic of Korea

A.4.1.2. Region/State/Province etc

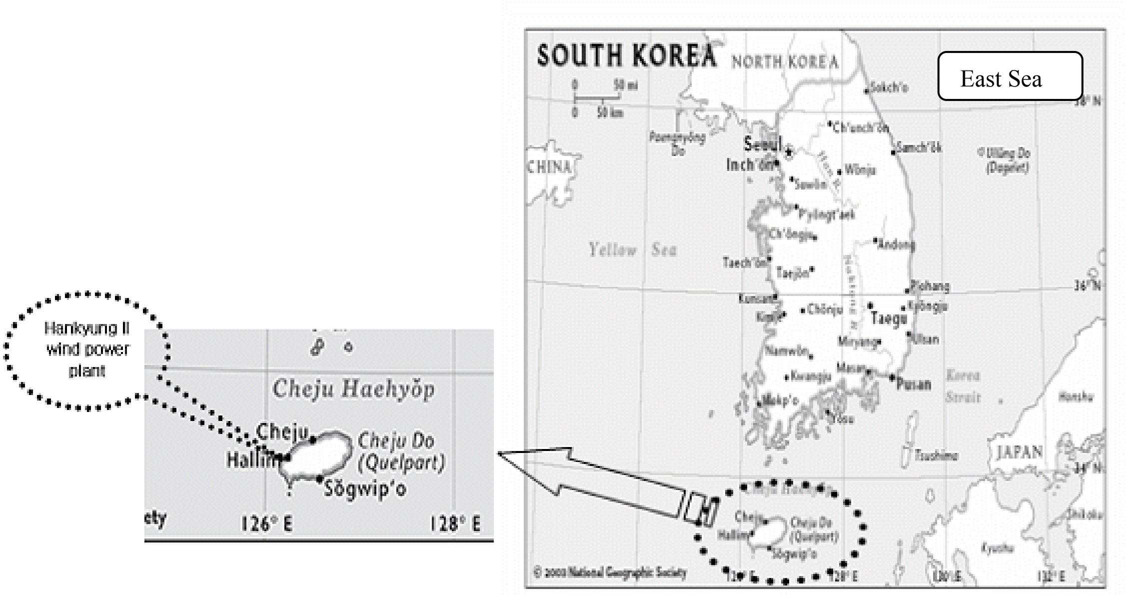
Hangyung County

A.4.1.3. City/Town/Community etc

Jeju City

A.4.1.4. Detail of physical location, including information allowing the unique identification of this small-scale project activity(ies)

The project site is located on the Jeju Island of the Republic of Korea which is the north of the major city Jeju in Jeju Island. The project site is 60km southwesterly of Jeju city



<Figure A-2> Location of the project

A.4.2. Type and category(ies) and technology of the small-scale project activity

The type and category of the project is as shown below, from the methodologies noted in UNFCCC document "Simplified Modalities and Procedures for Small-Scale CDM Project Activities "

Type I: Renewable energy projects
I.D.: Renewable electricity generation for a grid

The renewable energy projects include wind power generation and the maximum output capacity is required not to be over 15 MW to be eligible for type I project activities. The Project is to construct 15 MW wind power project activities. Therefore, the Project is eligible for type I.D. project activities.

In detail of wind power technology for **Hangyeong second phase SS-wind power**, Capacity of each wind turbine is 3.0 MW, the total capacity of 5 wind turbines is **15 MW**. In addition, pitch motor, gearbox, brake, turbine controller, anemometer, yaw drive and tower are the main components of **Hangyeong second phase SS-wind power** turbines. (referred to A..4)

A.4.3. Brief explanation of how the anthropogenic emissions of anthropogenic greenhouse gas (GHGs) by sources are to be reduced by the proposed small-scale project activity, including why the emission reductions would not occur in the absence of the proposed small-scale project activity, taking into account national and/or sectoral policies and circumstances

The main objective of the project is to develop and generate electricity by means of zero GHGs emitting renewable energy sources. Wind power project will reduce GHGs emissions by generating electricity with using wind power sources, and replace some portion of conventional energy sources.

The Project activity will substitute the fossil fuel fired plants by generating 39,689.1 MWh/yr, therefore, it will bring 28,898.5ton CO_2 annual reduction.

Due to the economical efficiency and lack of technology, it is preferred to build fossil fuel power plants using fossil fuel and nuclear plants over the past years instead of power plant using renewable energy sources in Korea. Fossil fuel power plants have caused GHGs and air pollutants emissions when they generate electricity using fossil fuel. As a result, 57.7% of total electricity is still generated using fossil fuel (Source : KEPCO, June 2005) and only 5% of electricity is generated using renewable energy sources, such as hydro power, wind power and photovoltaic etc. In Korea, there is a governmental subsidy related to renewable energy source power plant including wind power plant. However, the governmental subsidy is not the policy for renewable energy source power plant installation but the policy called Difference Compensation Act which subsidizes the difference between a market price and a standard price bid by government when the electricity generated using renewable energy is supplied.

This project will produce clean electricity and it is connected to grid system to distribute electricity without the GHGs emission. Not only producing clean electricity, but the project will encourage building more power plants which use renewable resources in Korea, replacing thermal power plants.

A.4.3.1 Estimated amount of emission reductions over the chosen crediting period

<Table A-3> Emission reductions

Please indicate the chosen crediting period and provide the total estimation of emission reductions as well as annual estimates for the chosen crediting period. Information on the emission reduction shall be in indicated using the following tabular format.	
Years	**Annual estimation of emission reductions in tones of CO_2 e**
Year 1 2008	28,898.5ton CO_2
Year 2 2009	28,898.5ton CO_2
Year 3 2010	28,898.5ton CO_2
Year 4 2011	28,898.5ton CO_2
Year 5 2012	28,898.5ton CO_2
Year 6 2013	28,898.5ton CO_2
Year 7 2014	28,898.5ton CO_2
Total estimated reductions(Tones of CO_2 e)	202,289.2ton CO_2
Total number of crediting years	7 years
Annual average over the crediting period of estimated reductions (tones of CO2e)	28,898.5ton CO_2

A.4.4. Public funding of the small-scale project activity

There is no public funding from ODA and diversion of any kind of international aids.

A.4.5. Confirmation that the small-scale project activity is not a debundled component of a larger project activity

According to Appendix C of the simplified modalities and procedures for small-scale CDM project activities, debundling is defined as the fragmentation of a large project activity into smaller parts. This project consists of only one power plant, and hence this project is not a fragmentation of a large project activity.

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

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

The Project is not included any of above indicator.

SECTION B. Application of a baseline methodology

B.1. Title and reference of the approved baseline methodology applied to the small-scale project activity

Methodology Title: Consolidated baseline methodology for grid connected renewable electricity generation from renewable sources

Reference: Latest amended version 10 (23rd Dec. 2006) of Appendix B of the simplified modalities and procedures for small-scale CDM project activities

Referred to small-scale project category of Appendix B of the simplified modalities and procedures for small-scale CDM project activities.

B.2. Project category applicable to the small-scale project activity

Facts for baseline to estimate emission reduction of the project is shown at 7th clause of Appendix B – Type I.D. of 'the simplified modalities and procedures for small-scale CDM project activities'. The baseline is the kWh produced by the renewable generating unit multiplied by an emission coefficient (measured in kg CO2 eq/kWh) and calculation should be transparent and conservative.

Baseline shown at 7th clause of Appendix B – Type I.D. of 'the simplified modalities and procedures for small-scale CDM project activities' is:

(a) A combined margin(CM), consisting of the combination of operating margin(OM) and build margin(BM) according to the procedures prescribed in the approved methodology ACM0002. Any of the four procedures to calculate the operating margin can be chosen, but the restrictions to use the Simple OM and the Average OM calculations must be considered;

(b) The weighted average emissions (in kg CO2 equ/kWh) of the current generation mix. The data of the year in which project generation occurs must be used.

Calculations must be based on data from an official source (where available) and made publicly available.

<Table B-1>

Parameter	Value	Source
GEN $_{j,y}$ ***(MWh)*** is the electricity delivered to the grid by source *j*.	Refer to Annex. 3 (Table.2)	Statistics of Electric Power in KOREA (2003, 2004, 2005) (KEPCO)
F $_{i,j,y}$ is the amount of fuel *i* (in a mass or volume unit) consumed by relevant power sources *j* in year(s) *y*, *j* refers to the power sources delivering electricity to the grid, not including low-operating cost and must-run power plants, and including imports to the grid	Refer to Annex. 3 (Table.1)	Statistics of Electric Power in KOREA (2003, 2004, 2005) (KEPCO)
Net Calorific Values by Power Plant	Refer to Annex. 3 (Table.5)	Statistics of Electric Power in KOREA (2003, 2004, 2005) (KEPCO)
Fuels Carbon Emission Factor (tC/TJ)	Refer to Annex. 3 (Table.4)	IPCC 1996 Revised Guidelines
Fraction of Carbon Oxidised (OXID)	Coal : 0.98 Oil and Oil product : 0.99 Gas : 0.995	IPCC 1996 Revised Guidelines
Operating Margin Emissions Factor (in ton CO_2***/MWh***) 2003~2005	(0.7345)	0.4*OM(Inland) +0.6*OM(Jeju island) Calculated
Build Margin Emissions Factor (in ton CO_2***/MWh)***	(0.7088)	Calculated
Baseline Emissions Factor (EFy in ton CO_2***/MWh)***	(0.7281)	Calculated

* Research on Korean specific OXID is under way. When the research is completed and therefore the OXID is publicly open, it will be used for calculating baseline factors. Before the Korean specific OXID is published, 0.98 OXID from UPCC is used.

B.3. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered small-scale CDM project activity

In order to prove additionality of the project, this project referred to attachment A to Appendix B of the simplified modalities and procedures for small-scale CDM project activities. According to attachment A to Appendix B of the simplified modalities and procedures for small-scale CDM project activities, project participants shall provide explanation to show that the project activity would not have occurred anyway due to at least one of investment barrier, technological barrier or other barriers. The biggest barrier of the project is investment barrier because renewable energy projects require high capital investments including wind power projects. In addition, expectation of capital return is very low. Due to these reasons, renewable energy is not very attractive option for power generation.

In Hangyeong second phase SS-wind power project, total construction costs are 34,378 million won and operation & maintenance costs are 1,019 million won per year. To analyze economic feasibility of this project, 75.85won based on http://epsis.kpx.or.kr/ is used as the cost of purchase. The applied **S**ystem **M**arginal **P**rice, 75.85won, in this project is the average value from September of 2005 to August of 2006.

The detail contents of the laws related to prices are as follows:

● Feed-in tariff : mandatory purchase by Korea Power Exchange at the SMP based on the Electric Utility Act (amended in February 1999)
● Public subsidy : compensation of the difference between the SMP and the standard price based on the Act on the Promotion of the Development and Use of New and Renewable Resources of Energy (amended in March 2002)

In this project, economic feasibility is analyzed without subsidy by the results of the 22nd EB meeting. According to the meeting report of the 22nd EB which was held on 23-25 November 2005, the subsidy adopted after 11 November 2001 do not need to be included in the economic analysis for the project.. The detail explanations are followed.

'Clarifications on the consideration of national and/or sectoral policies and circumstances in baseline scenarios (version 02)' which allows not to be taken into account in developing a baseline scenario, national or sectoral policies that give comparative advantages to less emissions-intensive technologies like renewable electricity generation only if the policies have been adopted after 11 November 2001.

Therefore, there are no problems at all about the economic analysis without subsidy in this project.

The result of NPV analysis is followed (Table B-2).

<Table B-2> NPV Analysis of the project

Plant Name	Total Expenses (unit: one million won)	Operation & Maintenance Cost including tax (unit: one million won /year)	Unit Cost of Purchase (unit: won/KWh)	Purchased Electricity (unit :MWh)	NPV (unit : one million won)
Hangyeong second phase wind power Plant	34,378	1,019	75.85	39,689	-14,154

* Crediting period is for 20 years except construction period.
* The dicount rate of **Hangyeong second phase SS-wind power** project is 7.00
* Discount rate and other variables are adopted from the execution design report of individual plant.
* Raw data (Excel sheet) for economic analysis is submitted to DOE (KEMCO).

As a result of economical analysis, NPV is lower than 0. It means, it doesn't have economic attraction. In addition, there are risks of difficulty in retrieving the investment. Investment retrieval depends on when power plants operate and how much power is generated. Power generation depends on operation time of power plants.

- Change of wind speed
- Stop of generating by the problem of the wind turbines
- Repair of wind turbines' equipments

The above mentioned risk factors act as obstacles against investment in **Hangyeong second phase SS-wind power** projects. This investment barrier can be resolved after registration as the CDM project of governmental support.

B.4. Description of how the definition of the project boundary related to the baseline methodology selected is applied to the small-scale project activity

For the baseline determination, project boundary is related to CO_2 emissions from electricity generation in a fossil fuel power plant that is displaced due to this project activity.
The spatial extent of the project boundary includes the project site and all the power plants connected physically to the electricity system of Korea Electric Power Corporation (KEPCO).

But the definition of electricity grid (spatial, inter-grid electricity supply) is not clear such as the case of Jeju Island (only for the electricity supply), ACM0002 clearly states how to estimate the baseline(B.5)

In the calculation of GHG emissions from the plant included in Project Boundary, the emissions generated during construction period of the power plant, the emissions related to electricity transmission and distribution losses, the emissions related to fossil-fuel transportation, mining, etc. have not been considered for the baseline.

B.5. Details of the baseline and its development

When the baseline is estimated for 'Renewable electricity generation for a grid' , the definition of electricity grid (spatial, inter-grid electricity supply) is not clear such as the case of Jeju Island (only for the electricity sulpply), ACM0002 clearly states how to estimate the baseline as follows;

Project Boundary

For the purpose of determining the Build Margin (BM) emission factor, as described below, the spatial extent is limited to the project electricity system, except where recent or likely future additions to transmission capacity enable significant increases in imported electricity. In such cases, the transmission capacity may be considered a build margin source, with the emission factor determined as for the OM imports below.

For the purpose of determining the Operating Margin (OM) emission factor, as described below, use one of the following options to determine the CO2 emission factor(s) for net electricity imports (*COEFi,j,imports*) from a connected electricity system within the same host country(ies):

(a) 0 tCO2/MWh, or
(b) the emission factor(s) of the specific power plant(s) from which electricity is imported, if and only if the specific plants are clearly known, or
(c) the average emission rate of the exporting grid, if and only if net imports do not exceed 20% of total generation in the project electricity system, or
(d) the emission factor of the exporting grid, determined as described in steps 1,2 and 3 below, if netimports exceed 20% of the total generation in the project electricity system.

For imports from connected electricity system located in another country, the emission factor is 0 tonsCO2 per MWh.
Electricity exports should not be subtracted from electricity generation data used for calculating and monitoring the baseline emission rate.

In the case of Jeju Island, when the BM EF is estimated, the amount of electricity supply from inland is not rapidly increased last 3 years. In the close future, it is anticipated that the rapid increase of electricity supply will not happen either. Also, the increase of electricity generation by the plan of electricity generation project in Jeju Island effects on BM which is estimation value of emission amount trend in the future. Therefore, the estimation of BM EF is considered only the situation of Jeju Island.

As well, the amount of electricity supply from inland to Jeju Island is occupied 40 % of total electricity generation amount of Jeju Island. When the OM EF is estimated which presents the current emission trend, in the basis of ACM 0002, it should reflect the value of OM EF supplied to Jeju Island by using a weighted average of OM(Inland) (Selected option (d))

OM EF = OM(Inland)*0.4% + OM(Jeju Island)*0.6%

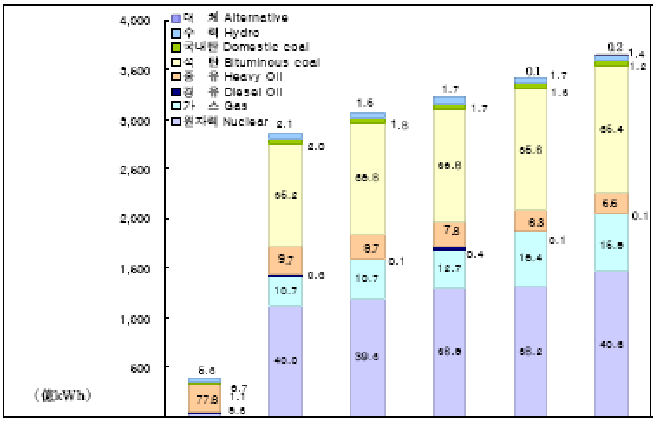
-0.4%:electricity import ratio of total generation in Jeju Island
-0.6%:electricity generation ratio of Jeju Island

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 EFy (Emission Factor) can be calculated. The steps for the Baseline calculation methodology are as follows;

Step 1. Calculation of the Operating Margin emission factor (OM)

Based on ACM0002 (Version06), if low-cost/must-run resources constitute less than 50% of total grid generation in average of the five most recent years, simple OM can be chosen. ACM0002 says that hydro, geothermal, wind, low-cost biomass, nuclear and solar generation are included in must-run sources. In addition, domestic coal is supported by governmental fund as a must-run generation.

<Figure B-1> is shown the yearly proportion of the generation of electricity based on the source of energy (Korea Electric Power Corporation, 2006). The rate of low cost/must run power generation does not exceed 50% of the total grid (the most recent 5-year (2001~2005) average data shows that the rate of low cost/must run is 43.01%) referred to the host country's gross electricity generation rate by energy sources (Source: KEPCO), and an hourly dispatched data is not available at this point of time. Therefore, Option (a) (Simple OM) has been chosen



(單位 Unit : 百萬kWh million kWh)

區分 Item \ 年度 Year		1980	2001	2002	2003	2004	2005
水力 Hydro		1,984	4,151	5,311	6,887	5,744	5,015
火力 Thermal	國內炭 Coal(Dom.)	2,481	5,235	5,144	5,398	4,603	4,484
	石炭 Coal(Bitum.)	–	105,098	112,877	114,878	122,556	129,174
	重油 Oil(Heavy)	28,876	27,770	23,940	23,656	21,595	20,074
	輕油 Oil(Diesel)	421	386	1,155	2,870	474	412
	가스 Gas	–	30,451	38,943	39,091	55,999	58,118
原子力 Nuclear		3,477	112,133	119,103	129,672	130,715	146,779
代替에너지 (alternative)		–	–	–	–	463	583
計 Total		37,239	285,224	306,474	322,452	342,148	364,639

< Figure B-1> Gross generation (Source: KEPCO in brief, 2006)

Figure B-1. Yearly proportion of the Generation of Electricity based on the Source of Energy (Source: Electricity statistics on Electricity quantity from Korea Electric Power Corporation, 2006) As described in ACM0002, the OM 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. The OM is calculated as follows, using a 3-year average:

$$EF_{OM,\, simple,\, y} = \frac{\sum_{i,j} F_{i,j,y} \cdot COEF_{i,j}}{\sum_{j} GEN_{j,y}}$$

$F_{i,j,y}$ is the amount of fuel *i* (in a mass or volume unit) consumed by relevant power sources *j* in year(s) *y*, *j* refers to the power sources delivering electricity to the grid, not including low-operating cost and must-run power plants, and including imports to the grid,
$COEF_{i,j,y}$ ($COEFi = NCVi \cdot EFco2i \cdot OXIDi$) is the CO_2 emission coefficient of fuel *i* (tCO_2 / mass or volume unit of the fuel), taking into account the carbon content of the fuels used by relevant power sources j and the percent oxidation of the fuel in year(s) y, and
$GEN_{j,y}$ is the electricity (MWh) delivered to the grid by source *j*.

The CO_2 emission coefficient $COEF_i$ is obtained as

$COEFi = NCVi \cdot EFco2i \cdot OXIDi$

NCV_i is the net calorific value (energy content) per mass or volume unit of a fuel *i*,
$OXID_i$ is the oxidation factor of the fuel (see page 1.29 in the 1996 Revised IPCC Guidelines for default values),
$EF_{CO2,i}$ is the CO_2 emission factor per unit of energy of the fuel *i*.
Where available, local values of NCV_i and $EF_{CO2,i}$ should be used. If no such values are available, country-specific values (see e.g. IPCC Good Practice Guidance) are preferable to IPCC world-wide default values.

Based on ACM0002, the emission factor is calculated using a 3-year average, based on the most recent statistics available at the time of PDD submission.

The detailed baseline information used in the calculation is presented in Annex 3.

Step 2. – Calculation of the Build Margin (BM)

According to ACM0002, there are two options to choose in order to calculate the BM.

Option 1. Calculate the Build Margin emission factor $EF_{BM,y}$ *ex ante* based on the most recent information available on plants already built for sample group *m* at the time of PDD submission. The sample group *m* consists of either

- the five power plants that have been built most recently, or
- the power plants capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently.

Option 2. For the first crediting period, the Build Margin emission factor $EF_{BM,y}$ must be updated annually *ex post* for the year in which actual project generation and associated emissions reductions occur. For subsequent crediting periods, $EF_{BM,y}$ should be calculated *ex-ante*, as described in option 1 above. The sample group *m* consists of either

- the five power plants that have been built most recently, or

- the power plants capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently.

Project participants should use from these two options that sample group that comprises the larger annual generation.

Based on figure 4, in the case of fossil fuel (oil, LNC, and coal), the capacity of them is expected not to be fluctuated during crediting periods (2006~2012). In addition, low cost and must-run generation will posses less than 50%, therefore, CM (the value of 'OM+BM') will be constant. From this consideration, Option 1 is selected for the **Hangyeong second phase SS-wind power** Project.

To select the sample group *m*, "the five power plants that have been built most recently" and "the power plants capacity additions in the electricity system that comprise 20% of the system generation (in MWh) which have been built most recently" were compared and the results are as follows.

<Table B-3>. Sample Plant group (m) for determining Build margin Emission factor

Sample group(m) / Classification	"the five power plants that have been built most recently"	"the power plants capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently."	Comments
Electricity quantity	1,077GWh	1,057GWh	Total generation is 3,008 GWh in Jeju Island (based on KEPCO's data of the year 2005)
Proportion (ratio to total generation in Korea)	35.8%	35.1%	
Selected Group	O		

The annual generation of **"the power plants capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently."**was 1,057 GWh (35.1% of total generation of the Jeju Island), and the annual generation of ""the five power plants that have been built most recently" was 1,077 GWh(35.8%). Therefore, the latter was chosen as a lager figure than the other one. The detailed data used in the calculation are presented in Annex 3.

The calculation of BM $_y$ is as follows;

$$EF_{BM,y} = \frac{\sum_{i,m} F_{i,m,y} \cdot COEF_{i,m}}{\sum_{m} GEN_{m,y}}$$

where $F_{i,m,y}$, $COEF_{i,m}$ and $GEN_{m,y}$ are analogous to the variables described for the simple OM method above for plants *m*.

The detailed information used in the calculation is presented in Annex 3.
Step 3. – Calculation of the baseline emission factor (EF_y)

Based on the results derived from Step 1, and Step 2, EF_y has been calculated using the following formula:

$$EF_y = w_{OM} * EF_{OM,y} + w_{BM} * EF_{BM,y}$$

where the weights w_{OM} and w_{BM}, by default at the Wind Power, are w_{OM} =75%, w_{BM} =25%(i.e., w_{OM} =0.75 w_{BM} = 0.25), and $EF_{OM,y}$ and $EF_{BM,y}$ are calculated as described in Steps 1 and 2 above and are expressed in tCO_2/MWh.

Dr. Jeasu Jung(civilenvi@ecoeye.com) / Ecoeye Co., Ltd
Contacted : +82-31-716-2108, fittyo@ecoeye.com

SECTION C. Duration of the project activity / Crediting period

C.1. Duration of the small-scale project activity

C.1.1. Starting date of the small-scale project activity

1 November 2007

C.1.2. Expected operational lifetime of the small-scale project activity

The project will have the operational lifetime of approximately 20 years

C.2. Choice of crediting period and related information

20years

C.2.1. Renewable crediting period

7years

C.2.1.1. Starting date of the first crediting period:

1 November 2007

C.2.1.2. Length of the first crediting period:

7years

C.2.2. Fixed crediting period:

N/A

C.2.2.1. Starting date:

N/A

C.2.2.2. Length:

N/A

SECTION D. Application of a monitoring methodology and plan

D.1. Name and reference of approved monitoring methodology applied to the small-scale project activity

Name: monitoring methodology for Project activity I.D “Renewable electricity generation for a grid”

Reference: Article 9 Type I.D. Appendix B of the simplified modalities and procedures for small-scale CDM project activities.

D.2. Justification of the choice of the methodology and why it is applicable to the small-scale project activity

The project generates electricity by wind power. The generated electricity is connected to the grid. Therefore the project is included in the category of I.D. The electricity connected to the grid replaces electricity generated by the existing fossil fuel power plants. Accordingly, the reduction of fossil fuel leads to the reduction of CO_2 emission.

The monitoring plan for emission factor for baseline and electricity generated is as fallows:

- Emission factor for baseline: As emission factor is calculated, so all the parameters and data used for calculation shall be transparent and credible. All the data shall be collected and calculated in the same way as D.3.

- Electricity used for the project activity: Electricity is defined as the grid connected electricity and the value of it is measured. Measurement shall be done by both project participant and Korea power exchange. The measured data by both entities shall be equal. Monitoring equipment for measurement shall fulfill step 1 of QA/QC in D.4.

D.3 Data to be monitored

<Table D-1> Data to be monitored

ID number	Data type	Data variable	Data unit	Measured (m), calculated (c), estimated (e),	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	For how long Is archived Data kept?	Comment
1. EGy*	Electricity quantity	Electricity supplied to the grid by the project	MWh	Directly measured	hourly measurement and monthly recording	100%	Electronic	During the crediting period and two years after	Data will be aggregated weekly, monthly and yearly Double checked against receipt of sales. Electricity transmission except Electricity consumed in the plant *
2. EFy	Emission factor	CO_2 emission factor of the Korea grid	tCO_2/ MWh	c	Starting point of every crediting period	100%	Electronic	During the crediting period and two years after	Data will be used of 3 year vintage data. Calculated as a weighted sum of the OM and BM emission factors.
3. $EF_{OM, y}$	Emission factor	CO_2 OM emission factor of the Korea grid	tCO_2/ MWh	c	Starting point of every crediting period	100%	Electronic	During the crediting period and two years after	Data will be used of 3 year vintage data. Calculated as indicated in the relevant OM baseline method above.
4. $EF_{BM, y}$	Emission factor	CO_2 BM emission factor of the Korea grid	tCO_2/ MWh	c	Starting point of every crediting period	100%	Electronic	During the crediting period and two years after	Data will be used of a year vintage data. Calculated as [∑ i, m F i, m, y · COEF i, m]/ [∑ m GEN m, y] over recently built power plants defined in the baseline methodology.
5. $F_{i, y}$	Fuel quantity	Amount of each fossil fuel consumed by each power source / plant	Mass or volume	m	Starting point of every crediting period	100%	Electronic	During the crediting period and two years after	Data will be used of 3 year vintage data. Obtained from the KEPCO.

6. $COEF_i$	Emission factor coefficient	CO_2 emission coefficient of each fuel type i	t CO_2/ mass or t CO_2/ volume	c	Starting point of every crediting period	100%	Electronic	During the crediting period and two years after	Caculated as [NCVi · EF_{co2}i · OXIDi]. Data will be calculated by each energy source in accordance with IPCC 1996 default value..
7. NCVi (Local value)	Net Caloric Value	Net Caloric coefficient of each fuel type i to calculate $COEF_i$	Kcal/ Mass or Kcal/ volume	m	Starting point of every crediting period	100%	Electronic	During the crediting period and two years after	NCVi (Local value) is obtained from the KEPCO. Data will be calculated by each energy source in accordance with IPCC 1996 default value.
8. GENy	Electricity quantity	Electricity generation of each power source / plant	MWh/ each plant	m	Starting point of every crediting period	100%	Electronic	During the crediting period and two years after	Data will be used of 3 year vintage data. Obtained from the KEPCO.
9. OM plant	Plant name	Identification of power source / plant for the OM	text	e	Starting point of every crediting period	100% of set of plants	Electronic	During the crediting period and two years after	Identification of plants to calculate Operating Margin emission factors.
10. BM plant	Plant name	Identification of power source / plant for the BM	text	e	Starting point of every crediting period	100% of set of plants	Electronic	During the crediting period and two years after	Identification of plants to calculate Build Margin emission factors.

D.4. Qualitative explanation of how quality control (QC) and quality assurance (QA) procedures are undertaken

All variables, except one related to off-site transportation, used to calculate project and baseline emissions are directly measured or are publicly available official data. To ensure the quality of the data, in particular the measured data are double-checked against commercial data. Measuring the quality control and quality assurance which were planned for the project are outlined in the following table.

<Table D-2> Data quality control

Data	Uncertainty of data (high/middle/low)	Explanation of planned QA/QC procedures for data or the reason that the procedures are not needed
1.EGy	Low	QA/QC procedure for this are planned. The electricity output from each wind turbine to the grid will be monitored and recorded at the on-site control The allowable error of data must be within ± 0.5%.
5. $F_{i,y}$	Low	QA/QC procedure for this are planned. The data will be obtained by KEPCO.
6.$COEF_i$	Low	QA/QC procedure for this are planned. Data will be checked against other sources.
Others	Low	QA/QC procedure for this are planned. All the data and grid statistics data will be used, and provided by KEPCO

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 "KOSPO's Regulation"

1-2. The watt-hour meters for electric power exchange is utilized for monitoring as they shall be calibrated per two year.

2. The amount of electricity monitoring

2-1. The amount of electric power transmission is estimated for each wind turbine and then, the amount of electric power transmission for Hankyung second phase Wind Power will be estimated as well.

2-2. The measured amount of electricity shall be collected daily, weekly, and monthly and shall be archived in electronic way.

2-3. The amount of generated electric power will be checked based on KOSPO's rule. Then, compatibility will be verified through comparing to KPX's data

2-4. If compared datas (in article 2-3) are inproperly, the operation condition of electricity meters and other equipments shall be examined. In case meters are improperly operated equipments, internal investigation and correction procedure shall be followed and be certified by the final decision-maker of KOSPO.

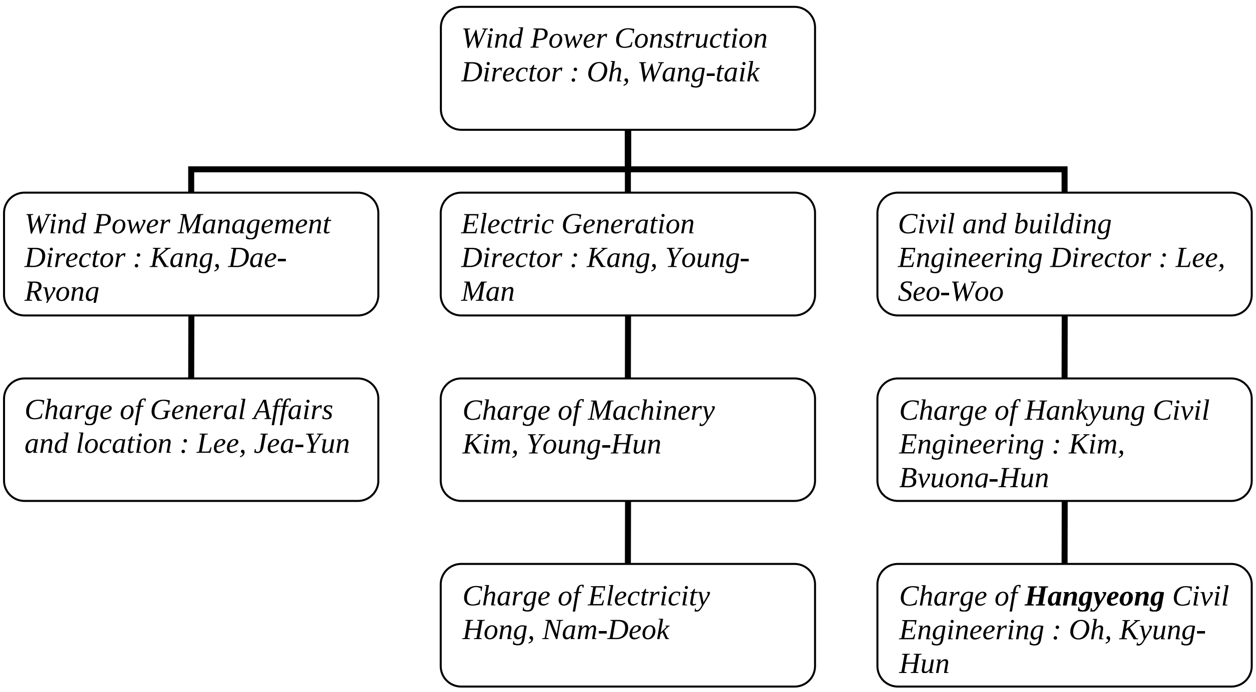
3. Management of monitoring and electricity safety

3-1. The person in charge of monitoring and electricity safety shall attend the following courses three times per year.
- Course on 'Law regarding measurement'
- Course on 'Act on operation of electricity market
- Course on Electricity safety

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

3-3. If the responsibility for monitoring and electricity safety is transferred to another person, it is needed to be approved by the final decision-maker.

D.5. Please describe briefly the operational and management structure that the project participant(s) will implement in order to monitor emission reductions and any leakage effects generated by the project activity



D.6. Name of person/entity determining the monitoring methodology

Dr. Jeasu Jung(civilenvi@ecoeye.com) / Ecoeye Co., Ltd..
Contacted : +82-31-716-2108, fittyo@ecoeye.com

SECTION E. Estimation of GHG emissions by sources

E.1. Formulae used

E.1.1 Selected formulae as provided in appendix B

Project emission reduction = BE (Baseline emissions) – PE (Project emissions)

E.1.2 Description of formulae when not provided in appendix B

GHGs emissions due to the project activity is not occurred.(For further information, refer to Section D.2)

E.1.2.1 Describe the formulae used to estimate anthropogenic emissions by sources of GHGs due to the project activity within the project boundary

The project activity utilizes renewable wind power, and therefore there is no anthropogenic emissions by sources of GHGs due to the project activity**.**

E.1.2.2 Describe the formulae used to estimate leakage due to the project activity, where required, for the applicable project category in appendix B of the simplified modalities and procedures for small-scale CDM project activities

There is no leakage.

E.1.2.3 The sum of E.1.2.1 and E.1.2.2 represents the small-scale project activity emissions:

The emissions and leakage are zero.

E.1.2.4 Describe the formulae used to estimate the anthropogenic emissions by sources of GHGs in the baseline using the baseline methodology for the applicable project category in appendix B of the simplified modalities and procedures for small-scale CDM project activities

Step 1. Calculation of the Operating Margin emission factor (OM)

Low-operating cost and must run power plants have to be deducted from the data to calculate OM factor. In here, Low-operating cost and must run power plants mean hydro, nuclear, low cost biomass, and geothermal plants.

The OM is calculated as follows, using 3-year average data.

$$EF_{OM,\,simple,\,y} = \frac{\sum_{i,j} F_{i,j,y} \cdot COEF_{i,j}}{\sum_{j} GEN_{j,y}}$$

$F_{i,j,y}$ is the amount of fuel i (in a mass or volume unit) consumed by relevant power sources j in year(s) y,
j refers to the power sources delivering electricity to the grid, not including low-operating cost and must-run power plants, and including imports to the grid,
$COEF_{i,j,y}$ ($COEF\ i = NCV\ i \cdot EFco_2 i \cdot OXID\ i$) is the CO_2 emission coefficient of fuel i (tCO_2 / mass or volume unit of the fuel), taking into account the carbon content of the fuels used by relevant power sources j and the percent oxidation of the fuel in year(s) y, and
$GEN_{j,y}$ is the electricity (MWh) delivered to the grid by source j.

The data used for the formula and the result Refer to Annex 3.

According to the OM calculation formula and variables of above tables, OM is 0.7345 CO_2 ton/MWh.

Step 2. – Calculation of the Build Margin (BM)

Participants have to use the most recent data from the sample group that has already been built. Among the sample groups, the participants have to choose one that has a larger annual generation than the other.
- The five power plants that have been built most recently
- The power plants capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently

<Table E-1> Sample Plant group (m) for determining Build margin Emission factor

Sample group(m) / Classification	"the five power plants that have been built most recently"	"the power plants capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently."	Comments
Electricity quantity	1,077GWh	1,057GWh	Total generation is 3,008 GWh in Jeju Island (based on KEPCO's data of the year 2005)
Proportion (ratio to total generation in Korea)	35.8%	35.1%	
Selected Group	O		

The result of the calculation of "the five power plants that have been built most recently" was 1,077GWh which is comprised of 35.8% of the total system generation (GWh based on KEPCO's 2005 data). The detailed data used in the calculation are presented in Annex 3.
The calculation of BM_y is as follows;

$$EF_{BM,y} = \frac{\sum_{i,m} F_{i,m,y} \cdot COEF_{i,m}}{\sum_{m} GEN_{m,y}}$$

According to the BM calculation formula and variables of above tables, BM is 0.7088 CO_2 ton/MWh

Step 3. – Calculation of the baseline emission factor (*EF y*)

The average of OM and BM factors calculated by step 1 and 2 is EF_y, baseline emission factor.

$EF_y = 0.75*EF_{OM\,y} + 0.25*EF_{BM,\,y}$

Step 4. – Calculation of the baseline emission

Baseline emission = Electricity supplied to a grid (MWh) x Baseline emission factor (CO_2 ton/MWh)

<Table E-2> Annual electricity produced and baseline emission

Category	Value
Electricity produced due to the project	39,689.1MWh/yr
Baseline emission factor	0.7281ton CO_2 eq./MWh
Baseline emission	28,898.5ton CO_2 eq./yr

According to the formula above, baseline emission is 28,898.5ton CO_2 eq./yr

E.1.2.5 Difference between E.1.2.4 and E.1.2.3 represents the emission reductions due to the project activity during a given period

Emission reductions estimated for the first crediting period is 202,289.3ton CO_2.

E.2 Table providing values obtained when applying formulae above

<Table E-3>Estimated emission reductions by the project activity

Years	**Estimated emission by the project activity (t CO_2 e)**	**Estimated baseline emission (t CO_2 e)**	**Estimated leakage (t CO_2 e)**	**Estimated emission reductions (t CO_2 e)**
Year 1	0	28,898.5	0	28,898.5
Year 2	0	28,898.5	0	28,898.5
Year 3	0	28,898.5	0	28,898.5
Year 4	0	28,898.5	0	28,898.5
Year 5	0	28,898.5	0	28,898.5
Year 6	0	28,898.5	0	28,898.5
Year 7	0	28,898.5	0	28,898.5
Total (tCO_2 e)	0	202,289.3	0	202,289.3

SECTION F.: Environmental impacts

F.1. If required by the host Party, documentation on the analysis of the environmental impacts of the project activity

According to the Korean Environmental Law, the project activity does not apply to environmental impact assessment.

SECTION G. Stakeholders' comments

G.1. Brief description of how comments by local stakeholders have been invited and compiled

Hangyeong second phase SS-wind power project implementation brought economical compensation from local residents to KOSPO. Therefore, discussion has been performed. Latest details are as followed;

1. Time/ Place : 22 August 2005, PM 12:00 ~ 2:30 / Restaurant around Shinchang Ri office

2. Attendants : KOSPO- Head director, Management director/ 8 development committee of Headman of Shinchang Ri office, representative of fishing village

3. Visit purpose : Discussion about supplement 2 turbines at the joint ownership of Shinchang authority

4.Main contents

* Headmand of Shinchang Ri office : examine to the 1st development committee about KOSPO's supporting plan of draw wind turbine
* KOSPO : explain supplement 2 turbines and agreement process
* Development committee : In the case of KOSPO's project, turbines will be beloning to KOSPO permanently. Therefore, 1.3 hundred million won is too low.
* Headmand of Shinchang Ri office : Compared to the case of Sam-moo Co., Ltd., which are wind turines of Doomo, Panmo area, KOSPO's compensation is too low.
* KOSPO : KOSPO is the public company, local compensation is necessary to be followed the law and regulation. Therefore, an arbitrary decision is not possible. Compensation of Sam-moo Co., Ltd. doen't look to make realization based on wind power earings.
* Headmand of Shinchang Ri office : KOSPO is a big company. Compensation plan may be arranged in the concrete unit per turbine. As well, the increase possibility is necessary to be defined to the 1st presented price.
* KOSPO : Unit capacity is not decided yet and site distribution is in a fluid situation.Therefore, it is impossible to tell about compensation. If unit capacity is decided as 2 MW, 40~50 % of price will increase.
* representative of fishing village : If compensation from KOSPO cannot meet with fishing village's request, supplement 2 turbines will be opposed.
* Headmand of Shinchang Ri office : As a public company, KOSPO gives faith. Therefore, development committe will agree but compensation should be discussed afterwards. This case will come to the Shinchag Ri meeting.

G.2. Summary of the comments received

Related to **Hangyeong second phase SS-wind power** project, local residents and assemblyman of Yongsu Ri and Shinchang Ri, which are the project area, request economical compensation to KOSPO. KOSPO has continuously discussed about supporting plan. At the moment, most of matters are meeting the solution and remains details.

G.3. Report on how due account was taken of any comments received

Korea southern power Co., Ltd regularly collects comments from regional community around the Wind Power and their opinion is reflected to corporation management policy. Also, community people can directly appeal to Susan Ri Office if they have any opinion about **Hangyeong second phase SS-wind power** Project. One more positive thing of comment- reflection is that community people often have opportunity to talk to a County Governor about their opinion.

Annex 1
CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Korea Southern Power Co., Ltd.
Street/P.O.Box:	167
Building:	Samsung B/D
City:	Seoul Metro City
State/Region:	Gangnamgu, Samsungdong
Postfix/ZIP:	135-791
Country:	The Republic of Korea
Telephone:	+82-2-3430-5113
FAX:	+82-2-3430-5119
E-Mail:	kimgyoo@kospo.co.kr
URL:	http://www.kospo.co.kr/
Represented by:	
Title:	Project Manager
Salutation:	
Last Name:	Kim
Middle Name:	
First Name:	Kwanggyu
Department:	Construction Division
Mobile:	+82-17-844-5852
Direct FAX:	+82-2-3430-5119
Direct tel:	+82-2-3430-5113
Personal E-Mail:	kimgyoo@kospo.co.kr

Organization:	ecoeye. Co., Ltd.
Street/P.O.Box:	153
Building:	Lordland EZ Building #607
City:	Seongnam
State/Region:	Gu-mi dong
Postfix/ZIP:	463-810
Country:	The Republic of Korea
Telephone:	+82-31-716-2108
FAX:	+82-31-716-1848
URL:	Http://www.ecoeye.com
Represented by:	
Title:	CEO
Salutation:	Dr.
Last Name:	Jung
Middle Name:	
First Name:	Jeasu
Mobile:	+82-19-331-1675
Direct FAX:	+82-31-716-1848
Direct tel:	+82-31-716-1648
Personal E-Mail:	civilenvi@ecoeye.com

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

THERE IS NO PUBLIC FUNDING.

Annex 3

Data for the formula of Operating Margin

<Table Annex-1> Data on fuel consumption for plants in the Operating Margin

Energy sources	Plant Name		Fuel consumption 2003 (ton)	Fuel consumption 2004 (ton)	Fuel consumption 2005 (ton)
Bituminous	Honam	#1	633,609	885,758	870,214
		#2	832,014	783,300	912,497
	Samchonpo	#1	1,535,849	1,624,500	1,534,223
		#2	1,680,305	1,564,986	1,731,265
		#3	1,634,224	1,467,177	1,723,152
		#4	1,710,195	1,538,768	1,632,334
		#5	1,430,182	1,707,777	1,516,654
		#6	1,436,503	1,734,977	1,546,663
	Boryeong	#1	1,263,072	1,599,557	1,440,343
		#2	1,311,401	1,555,055	1,388,532
		#3	1,478,200	1,427,263	1,589,150
		#4	1,355,767	1,560,014	1,421,343
		#5	1,468,153	1,397,343	1,587,999
		#6	1,343,310	1,559,785	1,260,305
	Taean	#1	1,466,761	1,438,094	1,508,570
		#2	1,333,563	1,509,379	1,323,078
		#3	1,459,118	1,415,585	1,494,175
		#4	1,358,587	1,539,502	1,383,297
		#5	1,243,228	1,547,217	1,411,398
		#6	1,335,853	1,531,751	1,504,962
	Hadong	#1	1,476,164	1,389,739	1,513,930
		#2	1,377,617	1,515,681	1,410,099
		#3	1,362,366	1,501,027	1,422,196
		#4	1,483,166	1,397,482	1,511,054
		#5	1,375,276	1,501,672	1,345,648
		#6	1,473,500	1,379,396	1,520,774
	Dangjin	#1	1,369,223	1,502,885	1,438,702
		#2	1,360,761	1,523,605	1,437,473
		#3	1,488,422	1,404,465	1,549,041
		#4	1,501,207	1,434,844	1,544,010

		#5	–	-	499,714
		#6	–	-	38,671
	Yonghung	#1	–	1,114,254	2,081,972
		#2	–	459,217	1,761,395
Energy sources	**Plant Name**		**Fuel consumption 2003 (kl)**	**Fuel consumption 2004 (kl)**	**Fuel consumption 2005 (kl)**
Heavy Oil	Honam	#1	3,528	606	961
		#2	641	1,714	338
	Ulsan	#1	113,103	73,408	70,183
		#2	104,734	65,316	67,296
		#3	109,039	71,305	53,085
		#4	361,447	420,739	375,417
		#5	484,842	513,497	363,992
		#6	327,005	527,083	352,776
	Youngnam	#1	250,280	347,107	359,910
		#2	223,269	248,049	190,085
	Yosu	#1	173,830	181,712	106,919
		#2	85,905	316,523	218,356
	Pyongtaek	#1	343,765	204,664	293,214
		#2	325,723	209,664	321,188
		#3	329,779	179,921	308,042
		#4	361,331	192,294	311,245
	Namjeju	#1	12,520	16,510	14,628
		#2	12,216	16,040	15,031
	Jeju	#1	10,363	15,306	12,564
		#2	107,856	118,473	129,516
		#3	124,954	124,160	122,866
	Incheon	#1	22,390	-	-
		#2	22,656	-	-
		#3	24,998	-	-
		#4	23,774	-	-
	Namjeju	D/P	56,401	57,808	56,727
Energy sources	**Plant Name**		**Fuel consumption 2003 (kl)**	**Fuel consumption 2004 (kl)**	**Fuel consumption 2005 (kl)**
Diesel Oil	Honam	#1	409	300	278
		#2	366	335	185
	Samchonpo	#1	1,144	1,674	1,220
		#2	657	744	626
		#3	838	814	377
		#4	299	785	1,029
		#5	2,118	230	1,415

	#6	1,570	652	1,001
Boryeong	#1	968	311	761
	#2	934	616	551
	#3	59	574	90
	#4	307	179	603
	#5	152	422	156
	#6	356	350	627
Taean	#1	319	999	621
	#2	730	310	395
	#3	193	390	650
	#4	628	254	365
	#5	994	329	742
	#6	1,011	230	417
Hadong	#1	390	533	284
	#2	445	145	792
	#3	613	670	472
	#4	302	737	567
	#5	435	318	614
	#6	223	689	331
Dangjin	#1	926	294	637
	#2	787	211	632
	#3	510	605	141
	#4	746	528	134
	#5	-	-	5,701
	#6	-	-	1,779
Ulsan	#1	484	114	750
	#2	1,061	82	585
	#3	500	554	662
	#4	1,450	1,238	1,971
	#5	1,740	931	1,676
	#6	1,525	1,603	1,708
Youngnam	#1	1,024	837	844
	#2	270	274	584
Yosu	#1	370	571	434
	#2	86	436	346
Pyongtaek	#1	167	247	118
	#2	195	232	140
	#3	111	240	132
	#4	123	225	138
Namjeju	#1	20	6	15
	#2	24	13	12
Jeju	#1	23	7	12
	#2	65	73	-
	#3	-	41	48
Seoul	#4	-	1	-

		#5	4	3	1
	Incheon	#1	6	-	-
		#2	6	-	-
		#3	247	149	372
		#4	170	-	400
	Pyongtaek C/C		96,032	21	1
	Ilsan	C/C	40,006	-	-
	Bundang	C/C	-	-	-
	Ulsan	C/C	63,295	-	-
	Seoincheon	C/C	44,792	88	335
	Shinincheon	C/C	47,393	-	-
	Boryeong	C/C	97,106	-	-
	Hallim	C/C	16,286	28,796	29,686
	Anyang	C/C	-	-	30,022
	Bucheon	C/C	-	-	-
	K I E Co.	C/C	103,057	-	-
	L G Bugog	C/C	67,273	-	-
	Namjeju	D/P	84	80	37
	Busan		1,213	2,687	-
	Yonghung	#1	-	27,916	4,541
		#2	-	18,314	2,903
	Yulchon	C/C	-	596	159
	Jeju	G/T	-	2,232	2,869
Energy sources	**Plant Name**		**Fuel consumption 2003 (ton)**	**Fuel consumption 2004 (ton)**	**Fuel consumption 2005 (ton)**
LNG	Pyongtaek	#1	2,727	2,095	3,553
		#2	2,402	2,515	2,641
		#3	2,238	3,791	1,784
		#4	2,370	3,217	2,047
	Seoul	#4	32,670	22,409	49,143
		#5	126,211	117,908	108,761
	Incheon	#1	25,930	10,523	4,365
		#2	28,612	11,094	8,505
		#3	34,035	4,235	746
		#4	24,093	-	6,620
	Pyongtaek C/C		76,012	98,846	110,953
	Ilsan	C/C	530,874	593,548	533,188
	Bundang	C/C	598,396	653,880	671,944
	Ulsan	C/C	189,997	347,076	470,131
	Seoincheon	C/C	1,012,670	1,209,806	989,645
	Shinincheon	C/C	1,405,724	1,587,638	1,458,763
	Boryeong	C/C	571,742	988,548	1,161,510

	Anyang	C/C	325,207	270,559	261,202
	Bucheon	C/C	266,577	258,596	261,705
	K I E Co.	C/C	381,684	467,583	445,253
	GS Bugog	C/C	121,037	260,653	297,976
	Busan	C/C	234,533	1,298,418	1,211,144

Source : Statistics of Electric Power in KOREA (2003, 2004, 2005) (KEPCO)

<Table Annex-2> Caloric value(2003)

Plant Name		Caloric value (by source in 2003)			
		Coal (kcal/kg)	Heavy oil (kcal/l)	Diesel oil (kcal/l)	L. N. G (kcal/kg)
Honam	#1	5,693	9,859	8,844	-
	#2	5,655	9,901	8,847	-
Samchonpo	#1	5,846	-	9,009	-
	#2	5,844	-	9,011	-
	#3	5,862	-	8,948	-
	#4	5,855	-	8,992	-
	#5	5,766	-	9,000	-
	#6	5,765	-	9,000	-
Boryeong	#1	6,066	-	8,942	-
	#2	6,075	-	8,944	-
	#3	6,254	-	8,749	-
	#4	6,254	-	8,777	-
	#5	6,254	-	8,749	-
	#6	6,239	-	8,749	-
Taean	#1	6,181	-	9,013	-
	#2	6,192	-	9,013	-
	#3	6,188	-	9,013	-
	#4	6,198	-	9,013	-
	#5	6,155	-	9,013	-
	#6	6,167	-	9,013	-
Hadong	#1	6,149	-	8,941	-
	#2	6,144	-	8,984	-
	#3	6,146	-	8,912	-
	#4	6,145	-	8,957	-
	#5	6,148	-	8,871	-
	#6	6,142	-	8,839	-
Dangjin	#1	6,102		8,892	-
	#2	6,121		8,904	-
	#3	6,129		8,889	-
	#4	6,118		8,893	-
Ulsan	#1	-	9,861	9,018	-
	#2	-	9,856	9,047	-
	#3	-	9,862	9,035	-
	#4	-	9,921	9,120	-
	#5	-	9,912	9,120	-
	#6	-	9,921	9,120	-
Youngnam	#1	-	9,196	8,997	-
	#2	-	9,043	8,993	-

Yosu	#1	-	9,979	8,975	-
	#2	-	9,983	8,970	-
Pyongtaek	#1	-	9,838	8,974	-
	#2	-	9,844	8,972	12,955
	#3	-	9,845	8,977	12,929
	#4	-	9,842	8,976	12,950
Namjeju	#1	-	9,852	8,900	-
	#2	-	9,853	8,958	-
Jeju	#1	-	10,009	9,238	-
	#2	-	9,945	8,928	-
	#3	-	9,943	8,928	-
Seoul	#4	-	-	9,070	13,013
	#5	-	-	7,515	13,003
Incheon	#1	-	9,828	7,526	13,018
	#2	-	9,833	8,986	13,018
	#3	-	9,822	8,993	13,017
	#4	-	9,830	8,988	13,015
Pyongtaek	C/C	-	-	8,926	13,026
Ilsan	C/C	-	-	8,966	13,021
Bundang	C/C	-	-	-	13,030
Ulsan	C/C	-	-	9,053	13,007
Seoincheon	C/C	-	-	9,151	12,999
Shinincheon	C/C	-	-	9,150	13,005
Boryeong	C/C	-	-	9,131	13,016
Busan	C/C	-	-	9,242	12,997
Hallim	C/C	-	-	8,964	-
Anyang C/C	(Other co.)	-	-	-	13,033
Bucheon C/C	(")	-	-	-	13,022
K I E Co.	(")	-	-	9,092	13,014
L G Bugog	(")	-	-	9,033	13,018
Namjeju	D/P	-	9,852	8,881	-

Source : Statistics of Electric Power in KOREA (2003) (KEPCO)

<Table Annex-3> Caloric value (2004)

Plant Name		Caloric value (by source in 2004)			
		Coal (kcal/kg)	Heavy oil (kcal/l)	Diesel oil (kcal/l)	L. N. G (kcal/kg)
Honam	#1	5,493	9,814	8,848	-
	#2	5,430	9,817	8,850	-
Samchonpo	#1	5,527	-	9,012	-
	#2	6,275	-	9,010	-
	#3	6,530	-	9,006	-
	#4	6,507	-	9,004	-
	#5	4,829	-	9,000	-
	#6	4,773	-	9,000	-
Yonghung	#1	5,892	-	8,927	-
	#2	5,852	-	8,720	-
Boryeong	#1	5,924	-	8,770	-
	#2	5,922	-	8,910	-
	#3	5,943	-	8,749	-
	#4	5,945	-	8,749	-
	#5	5,931	-	8,749	-
	#6	5,937	-	8,749	-
Taean	#1	5,980	-	8,765	-
	#2	5,977	-	8,699	-
	#3	5,975	-	9,004	-
	#4	5,967	-	8,721	-
	#5	5,996	-	8,912	-
	#6	5,996	-	8,804	-
Hadong	#1	6,032	-	9,002	-
	#2	6,025	-	8,975	-
	#3	6,046	-	8,983	-
	#4	6,097	-	8,993	-
	#5	5,982	-	8,983	-
	#6	5,935	-	8,983	-
Dangjin	#1	6,011	-	8,880	-
	#2	6,000	-	8,889	-
	#3	5,976	-	8,897	-
	#4	5,966	-	8,898	-
Ulsan	#1	-	9,893	9,010	-
	#2	-	9,901	9,010	-
	#3	-	9,896	9,010	-
	#4	-	9,972	9,120	-
	#5	-	9,963	9,120	-
	#6	-	9,959	9,120	-
Youngnam	#1	-	7,432	8,865	-
	#2	-	7,679	8,876	-
Yosu	#1	-	10,011	8,924	-

	#2	-	10,009	8,956	-
Pyongtaek	#1	-	9,877	8,917	12,920
	#2	-	9,879	8,941	12,907
	#3	-	9,902	8,907	12,910
	#4	-	9,903	8,915	12,956
Namjeju	#1	-	9,900	9,333	-
	#2	-	9,901	8,846	-
Jeju	#1	-	9,897	8,961	-
	#2	-	9,912	8,936	-
	#3	-	9,919	8,928	-
Namjeju	D/P	-	9,901		-
Seoul	#4	-	-	9,070	13,011
	#5	-	-	9,070	13,014
Incheon	#1	-	-		13,038
	#2	-	-		13,039
	#3	-	-	8,951	13,038
Pyongtaek C/C		-	-	8,758	13,033
Ilsan	C/C	-	-	-	13,017
Bundang	C/C	-	-	-	13,026
Ulsan	C/C	-	-	-	12,920
Seoincheon	C/C	-	-	9,211	13,010
Shinincheon	C/C	-	-	-	13,017
Boryeong	C/C	-	-	-	13,025
Busan	C/C	-	-	-	13,004
Hallim	C/C	-	-	8,972	-
Anyang	C/C	-	-	-	13,025
Bucheon	C/C	-	-	-	13,013
K I E Co.	C/C	-	-	-	13,023
L G Bugog	C/C	-	-	-	13,028
Yulchon	C/C	-	-	11,731	13,014
Namjeju	D/P	-	-	8,867	-
Jeju	G/T	-	-	8,948	-

Source: Statistics of Electric Power in KOREA (2004) (KEPCO)

<Table Annex-4> Caloric value (2005)

Plant Name		Caloric value (by source in 2005)			
		Coal (kcal/kg)	Heavy oil (kcal/l)	Diesel oil (kcal/l)	L. N. G (kcal/kg)
Honam	#1	5,693	9,859	8,844	-
	#2	5,655	9,901	8,847	-
Samchonpo	#1	5,846	-	9,009	-
	#2	5,844	-	9,011	-
	#3	5,862	-	8,948	-
	#4	5,855	-	8,992	-
	#5	5,766	-	9,000	-
	#6	5,765	-	9,000	-
Yonghung	#1	6,459	-	8,891	-
Boryeong	#1	6,066	-	8,942	-
	#2	6,075	-	8,944	-
	#3	6,254	-	8,749	-
	#4	6,254	-	8,777	-
	#5	6,254	-	8,749	-
	#6	6,239	-	8,749	-
Taean	#1	6,181	-	9,013	-
	#2	6,192	-	9,013	-
	#3	6,188	-	9,013	-
	#4	6,198	-	9,013	-
	#5	6,155	-	9,013	-
	#6	6,167	-	9,013	-
Hadong	#1	6,149	-	8,941	-
	#2	6,144	-	8,984	-
	#3	6,146	-	8,912	-
	#4	6,145	-	8,957	-
	#5	6,148	-	8,871	-
	#6	6,142	-	8,839	-
Dangjin	#1	6,102	-	8,892	-
	#2	6,121	-	8,904	-
	#3	6,129	-	8,889	-
	#4	6,118	-	8,893	-
	#5	6,115	-	8,904	-
	#6	6,221	-	11,095	-
Ulsan	#1	-	9,861	9,018	-
	#2	-	9,856	9,047	-
	#3	-	9,862	9,035	-
	#4	-	9,921	9,120	-
	#5	-	9,912	9,120	-
	#6	-	9,921	9,120	-
Youngnam	#1	-	9,196	8,997	-
	#2	-	9,043	8,993	-

Yosu	#1	-	9,979	8,975	-
	#2	-	9,983	8,970	-
Pyongtaek	#1	-	9,838	8,974	-
	#2	-	9,844	8,972	12,955
	#3	-	9,845	8,977	12,929
	#4	-	9,842	8,976	12,950
Namjeju	#1	-	9,852	8,900	-
	#2	-	9,853	8,958	-
Jeju	#1	-	10,009	9,238	-
	#2	-	9,945	8,928	-
	#3	-	9,943	8,928	-
Namjeju	D/P	-	9,852	8,881	-
Seoul	#4	-	-	9,070	13,013
	#5	-	-	7,515	13,003
Incheon	#1	-	9,828	7,526	13,018
	#2	-	9,833	8,986	13,018
	#3	-	9,822	8,993	13,017
	#4	-	9,830	8,988	13,015
Pyongtaek C/C		-	-	8,926	13,026
Ilsan	C/C		-	8,966	13,021
Bundang	C/C	-	-	-	13,030
Ulsan	C/C		-	9,053	13,007
Seoincheon	C/C	-	-	9,151	12,999
Shinincheon	C/C	-	-	9,150	13,005
Boryeong	C/C	-	-	9,131	13,016
Busan	C/C		-	9,242	12,997
Hallim	C/C	-	-	8,964	-
Anyang	C/C	-	-	-	13,033
Bucheon	C/C	-	-	-	13,022
K I E Co.	C/C	-	-	9,092	13,014
GS Bugog	C/C	-	-	9,033	13,018
Yulchon	C/C	-	- 9,877	10,930 8,975	13,023

Source: Statistics of Electric Power in KOREA (2005) (KEPCO)

<Table Annex-5> Electricity power and CEF

Plant Name		MWh Produced in 2003	MWh Produced in 2004	MWh Produced in 2005	CEF (t CO_2 / MWh) 2003	CEF (t CO_2 / MWh) 2004	CEF (t CO_2 / MWh) 2005
Honam	#1	1,372,873	1,855,554	1,787,715	0.9771	0.9682	0.9698
	#2	1,784,483	1,625,399	1,875,790	0.9736	0.9683	0.9652
Samchonpo	#1	3,745,916	3,974,202	3,810,079	0.8845	0.8340	0.8788
	#2	4,110,134	3,839,080	4,323,618	0.8813	0.9436	0.8751
	#3	4,051,427	3,652,769	4,343,666	0.8723	0.9675	0.8628
	#4	4,250,404	3,811,371	4,112,297	0.8687	0.9691	0.8639
	#5	3,606,167	4,147,957	3,542,728	0.8446	0.7331	0.8450
	#6	3,609,696	4,185,213	3,643,969	0.8469	0.7299	0.8421
Boryeong	#1	3,237,526	4,014,109	3,547,140	0.8732	0.8705	0.8735
	#2	3,380,013	3,915,285	3,433,608	0.8697	0.8676	0.8677
	#3	4,090,927	3,746,265	4,124,745	0.8332	0.8352	0.8357
	#4	3,754,883	4,097,489	3,698,705	0.8327	0.8346	0.8350
	#5	4,063,865	3,660,240	4,121,314	0.8331	0.8351	0.8358
	#6	3,709,092	4,093,207	3,283,477	0.8333	0.8344	0.8357
Taean	#1	3,995,111	3,780,097	3,992,112	0.8368	0.8394	0.8364
	#2	3,651,716	3,975,123	3,484,251	0.8342	0.8368	0.8417
	#3	3,994,351	3,732,363	3,957,054	0.8334	0.8357	0.8368
	#4	3,708,360	4,048,258	3,653,534	0.8376	0.8368	0.8378
	#5	3,370,362	4,091,406	3,744,413	0.8379	0.8362	0.8389
	#6	3,637,652	4,056,835	3,999,847	0.8357	0.8348	0.8351
Hadong	#1	3,995,331	3,688,313	3,997,914	0.8378	0.8383	0.8384
	#2	3,739,800	4,028,529	3,732,583	0.8347	0.8357	0.8359
	#3	3,694,945	3,997,064	3,769,077	0.8358	0.8375	0.8349
	#4	4,029,035	3,724,757	3,989,315	0.8341	0.8438	0.8382
	#5	3,733,243	4,013,845	3,553,901	0.8353	0.8252	0.8375
	#6	4,013,010	3,685,698	4,037,763	0.8316	0.8194	0.8328
Dangjin	#1	3,677,169	3,986,406	3,797,307	0.8384	0.8357	0.8333
	#2	3,685,913	4,038,457	3,798,078	0.8337	0.8347	0.8325
	#3	4,034,969	3,711,787	4,081,017	0.8339	0.8340	0.8308
	#4	4,096,642	3,801,495	4,079,557	0.8270	0.8305	0.8292
	#5	-	-	1,318,670	-	0.0000	0.8657
	#6	-	-	96,365	-	0.0000	0.9803
Ulsan	#1	430,067	271,544	262,393	0.7929	0.8157	0.8143
	#2	404,834	244,246	255,812	0.7836	0.8073	0.7997
	#3	414,630	268,231	200,518	0.7931	0.8067	0.8079
	#4	1,507,363	1,759,376	1,549,091	0.7272	0.7283	0.7417
	#5	2,025,171	2,141,162	1,500,935	0.7251	0.7289	0.7413
	#6	1,363,879	2,196,344	1,454,644	0.7275	0.7299	0.7404
Youngnam	#1	890,011	973,872	1,022,470	0.7907	0.8090	0.8045
	#2	753,536	665,973	531,006	0.8171	0.8723	0.8457
Yosu Ⅱ	#1	703,557	723,968	430,310	0.7524	0.7674	0.7566
(Yosu)	#2	328,981	1,304,109	904,597	0.7947	0.7408	0.7323

Pyongtaek	#1	1,465,460	850,533	1,258,662	0.7032	0.7314	0.7107
	#2	1,393,188	880,646	1,376,342	0.7060	0.7248	0.7096
	#3	1,400,056	751,633	1,321,167	0.7109	0.7365	0.7077
	#4	1,539,552	800,854	1,338,204	0.7080	0.7359	0.7065
Namjeju	#1	38,080	50,294	44,602	0.9880	0.9902	0.9879
	#2	36,860	48,714	44,654	0.9963	0.9937	1.0138
Jeju	#1	30,288	44,659	36,266	1.0451	1.0336	1.0491
	#2	439,474	486,401	532,700	0.7438	0.7358	0.7354
	#3	513,880	509,330	502,189	0.7364	0.7367	0.7400
Seoul	#4	132,599	90,322	207,498	0.6743	0.6789	0.6477
	#5	503,383	480,919	444,324	0.6856	0.6710	0.6697
Incheon	#1	225,023	47,491	16,450	0.6134	0.6075	0.7273
	#2	242,806	49,144	37,727	0.6021	0.6190	0.6176
	#3	267,999	19,018	- 130	0.6291	0.6310	0.0000
	#4	214,153	594	29,202	0.6424	0.0000	0.6569
Pyongtaek		863,292	596,001	659,932	0.5307	0.4546	0.4608
Ilsan		3,097,425	3,281,407	2,873,958	0.5031	0.4951	0.5077
Bundang		3,344,852	3,650,122	3,742,073	0.4902	0.4907	0.4919
Ulsan		1,557,954	2,329,524	3,131,075	0.4408	0.4048	0.4027
Seoincheon		7,012,289	8,353,619	7,001,031	0.4118	0.3963	0.3869
Shinincheon		10,459,986	11,596,955	10,543,280	0.3796	0.3748	0.3787
Boryeong		4,436,234	6,979,928	8,221,926	0.4111	0.3879	0.3872
Busan		1,574,883	9,884,075	9,076,327	0.4091	0.3592	0.3649
Hallim		55,044	96,435	100,346	0.7734	0.7812	0.7742
Anyang (Other co.)		1,793,725	1,506,070	1,433,978	0.4969	0.4921	0.4990
Bucheon (Other co.)		1,454,854	1,425,073	1,404,160	0.5018	0.4966	0.5097
K I E Co. (Other co.)		2,683,591	2,809,983	2,571,095	0.4910	0.4557	0.0000
LG Bugog (Other co.)		1,221,992	1,894,996	2,189,808	0.4162	0.3768	0.3937
Namjeju(D/P)		265,063	274,089	268,073	0.6393	0.6368	0.6371
Yulchon	C/C	-	36,366	1,300,627	-	0.6120	0.4101
Jeju	G/T	-	3,016	5,069	-	1.9312	1.4723
Yonghung	#1	-	2,986,382	5,623,299	-	0.8348	0.8391
	#2	-	1,172,450	4,658,862	-	0.8847	0.8455
Incheon	CC	-	-	2,055,016	-	0.0000	0.3753
POSCO POWER	CC	-	-	2,571,095	-	0.0000	0.4744
Total(Inland)		**165,587,380**	**187,513,847**	**193,186,611**			
Total(Jeju Island)		**1,323,645**	**1,416,502**	**1,433,533**			

Source: Statistics of Electric Power in KOREA (2003, 2004, 2005) (KEPCO)

Annex 4: Data for the formula of Build Margin Emission Factor

Plant name		year operation	Fuel	MWh in 2005	% of total output
Hankyung-wind power		2004.02	wind power	18,265	1.70%
Hoicheon ENC		2003.05	LFG	3,650	0.34%
Jeju	#3	2000.12	Heavy Fuel oil	502,189	46.63%
Jeju	#2	2000.03	Heavy Fuel oil	532,700	49.46%
Hangwon-wind power	15EA	1998.02	wind power	20,126	1.87%
Total				1,076,930	100%
Total generation in Jeju Island					3,008,502
The power plants capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently				1,056,804	35.13%
The five power plants that have been built most recently				1,076,930	35.80%(selected)

Source: Statistics of Electric Power in KOREA (2005) (KEPCO)

<Table Annex-6>Fuel Carbon Emission Factor

Fuel	Carbon Emission Factor (tC/TJ)	Fuel	Carbon Emission Factor (tC/TJ)
Liquid Fossil		**Solid Fossil**	
Primary fuels		*Primary Fuels*	
Crude oil	20	Anthracite	26.8
Orimulsion	22	Coking coal	25.8
Natural gas liquids	17.2	Other bituminous coal	25.8
Secondary fuels/products		sub-bituminous coal	26.2
Gasoline	18.9	Lignite	27.6
Jet kerosene	19.5	Oil shale	29.1
Other Kerosene	19.6	Peat	28.9
Shale oil	20	*Secondary fuels/products*	
Gas/Diesel oil	20.2	BKB & Patent Fuel	25.8
Residual fuel oil	21.1	Coke Oven/Gas Coke	29.5
LPG	17.2	Coke gas oven	13
Ethane	16.8	Blast Furnace gas	66
Naphtha	20	**Gaseous Fossil**	
Bitumen	22	Natural gas (dry)	15.3
Lubricants	20	**Biomass**	
Petroleum coke	27.5	Solid Biomass	29.9
Refinery Feedstocks	20	Liquid Biomass	20
Refinery gas	18.2	Gas Biomass	30.6
Other oil	20		

Source: IPCC Guidelines, 1996a