CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-PDD)
Version 03 - in effect as of: 28 July 2006

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SECTION A. General description of project activity

A.1 Title of the project activity:

Taegisan Wind Power Project
Version 05
20 Feb 2009

A.2. Description of the project activity:

Purpose and technology of the project activity

Taegisan Wind Power Project activity involves construction and operation of 20 numbers of 2MW capacity wind mills at south western area of Gangwon-Do, Republic of Korea.
The type of technology being employed in this project is wind power generation technology thus the proposed project is a renewable energy project that utilizes wind power energy, a renewable energy releasing no greenhouse gases. The generated electricity from the project will displace the electricity from existing grid from fossil fuel based power plants. The expected emission reductions of the project activities will reach 59,669tCO_2e (tonnes of carbon dioxide equivalent) annually.

Wind power energy used as the electric generation source of the proposed project is one of the clean renewable energy resources without being depleted.
Also currently in Korea, they make efforts to reduce fossil fuel usage in various ways and have great concerns about the renewable energies including wind power.
Under this situation Taegisan wind power project is expected to contribute to decrease the usage of electricity by fossil fuel based power plants. In 2006, those fossil fuel based power plants take 59.47% of electricity generation in Korea according to KEPCO. (KEPCO: Korea Electric Power Company)[1].

Outline of the project

Total installed capacity of the proposed project, Taegisan wind power plant is 40MW (2MW x 20) and it is composed of 20 generators (wind power turbines) each with 2MW.
Taegisan, the project site is located between Hoengseong-gun and Pyeongchang-gun in Gangwon Province area. And the generators (20units) will be installed into two groups in Hoengseon-gun for 9 units and in Pyeongchang-gun for 11 units as below:

- Hoengseong-gun, Gangwon-do : 9 units (2MW × 9 units = 18 MW)
- Pyeongchang-gun**,** Gangwon-do : 11 units (2MW × 11 units = 22 MW)

Taegisan is the highest mountain in Hoengseong-gun and rises 1,261 meters above the sea level, thus the sites of the project have favourable conditions of location as a wind farm. Utilisation rate of the plant is 26.5% and expected annual electric generation is 92,856 MWh. The electricity generated from the wind

[1] Korea Electric Power Statistics (“KEPCO in brief”. 30 June 2007 http://www.kepco.co.kr)

turbine is transmitted to the grid, KEPCO Pyeongchang transformer substation, through 22.9kV of transmission lines.
And the whole transmission lines reach 26.8km.
Among the whole lines, the 8 km block which goes through rural communities will be constructed underground and make the maximum use of existing roads for environmentally friendly development.

Contribution to sustainable development

The proposed project will contribute to sustainable development of Republic of Korea by reducing GHGs emissions from fossil fuel based plants.
Also this project will answer to government policy not only for the local environmental priority but also for the diffusion of clean energy resource displacing existing energies.
At the same time, as main technology of the wind power project is imported from developed countries, the proposed project may serve to develop and distribute the renewable energy technologies to all over the country.

POSCO E&C (POSCO Engineering & Construction Co., Ltd) and Eurus Energy Japan(EEJ) jointly participated in the project. And Gangwon-do, the local government, supported the promotion of the proposed project in domestic administrative process.
The project attracted foreign investment and imported advanced technologies and got the cooperation of the stakeholders who were related Gangwon-do and the project developer, POSCO E&C.
So the proposed project fulfilled the necessary conditions for performing the wind farm project in Korea. And it plays a role to reinvigorate local economy of Gangwon province through introduction of foreign capital.

And through the proposed wind power generation project, technologies for selection of favorable location, wind survey and construction of large scale wind farms can be secured. And it is expected to build up technological foundation for environmentally friendly electric generation through technical cooperation for development of renewable energy source, expanding localized lines and developing domestic wind power generation industry.

More specifically the proposed project contributes to sustainable development in the following ways:

- The CDM project is jointly supported by Gangwon-do, POSCO E&C, Eurus Energy Japan and it will stimulate the local economy and promote welfare of the residents.
  Also the regional development effects such as development of local human resources, long-term employment and building local infra structure can be expected.

- Transfer of the advanced wind power technologies and building infrastructure through technical cooperation, construction & operation of the plant. Also expansion of the localized lines and development of domestic wind power generation industry can be expected.

- The proposed project will contribute to reduce emissions of the air pollutants. It replaces electricity generated by fossil fuel in the grid and thus prevents discharge of the pollutants such as greenhouse gas, particles, SOx and NOx etc.

A.3. 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)
Republic of Korea (Host)	• POSCO Engineering and Construction Co., Ltd.	No
Japan	• Eurus Energy Japan Corporation	No
(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required.		

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

Republic of Korea

A.4.1.2. Region/State/Province etc.:

Gangwon-do (province)

A.4.1.3. City/Town/Community etc:

Taegi-ri, Dunnae-myun, Hoengseong-gun,
Mui-ri, Bongpyeong-myun, Pyeongchang-gun

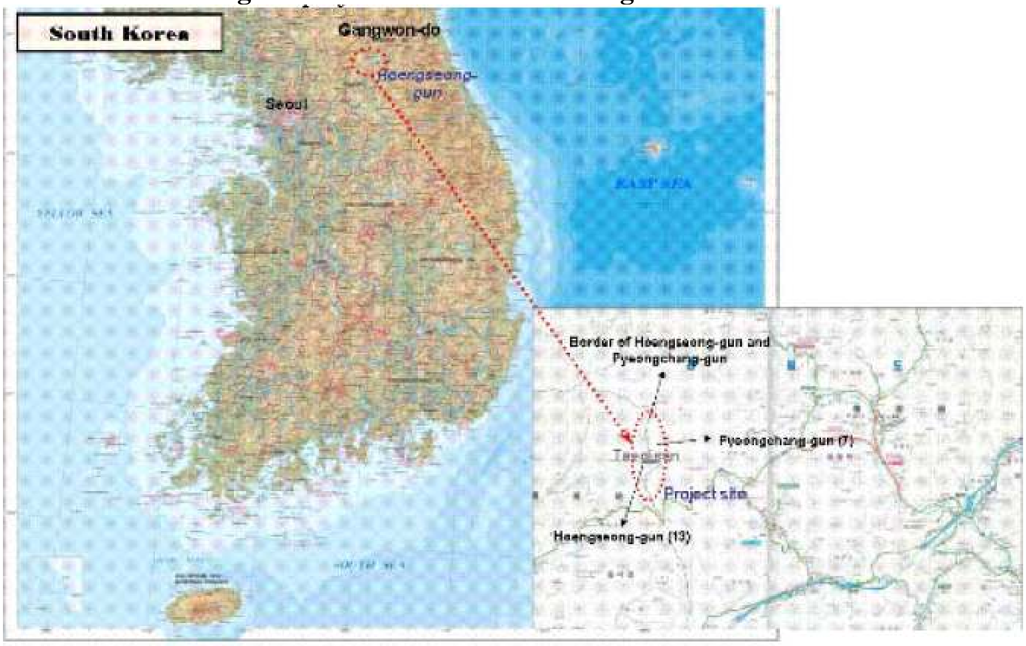
A.4.1.4. Detail of physical location, including information allowing the unique identification of this project activity (maximum one page):

The project site is located over the area of Taegi-ri, Dunnae-myun, Hoengseong-gun and Mui-ri, Bongpyeong-myun, Pyeongchang-gun in Gangwon Province. It is situated in the mountainous area of the Taebaek Mountains, neighbouring easterly to Pyeongchang-gun and westerly Hoengseong-gun.
The site location's approximate coordinates are east longitude of 128°20' and north latitude of 37°32' as its substation goes.
As the proposed project is a wind farm project, it is very important to choose a suitable place. The project needs appropriate wind speed and stable place where the wind directions don't fluctuate widely. Especially if the fluctuation of direction is sharp, the wind turbine could get damaged and life time of the mechanic could be shortened as well as brings serious danger. The project site, Taegi Mountain has stable natural conditions for wind farm project considering these conditions as the annual wind speeds of the site are in the range of 6.9m/sec at 80m above the ground. And wind direction of the site is mainly

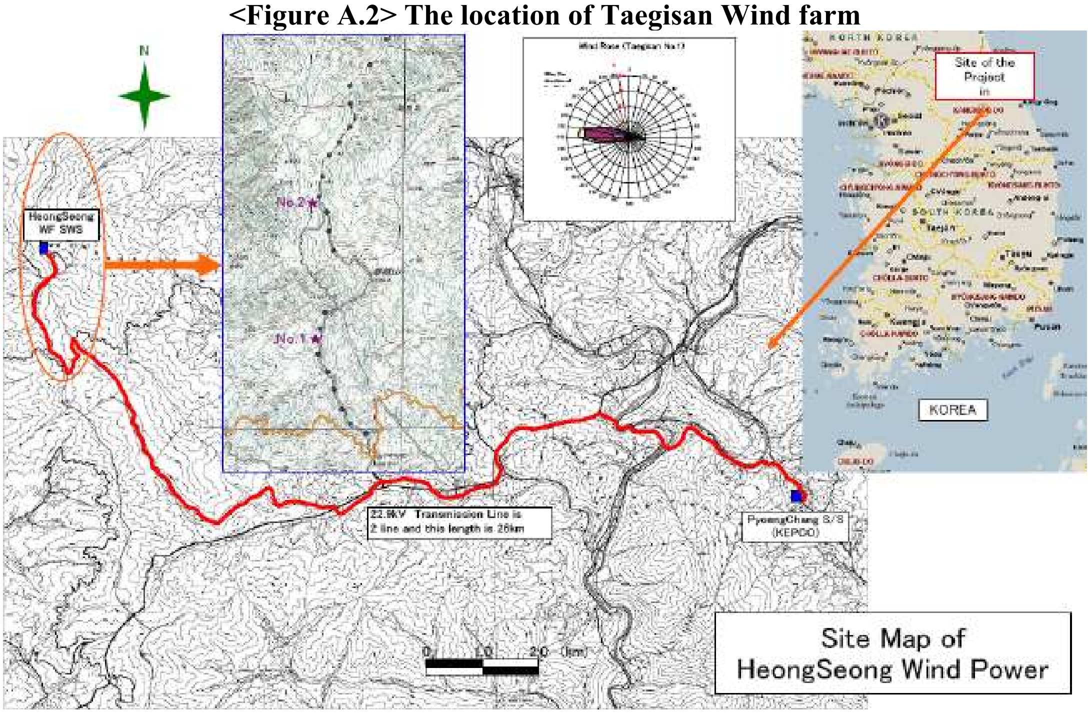
west south and west (WSW).

Following figures show the location of the project site and where the turbines are installed.

<Figure A.1> The location of Taegisan Wind farm



<Figure A.2> The location of Taegisan Wind farm



A.4.2. Category(ies) of project activity:

Sectoral scope 1 : Energy industries(renewable source)
- Renewable Electricity Generation for a Grid(Wind)

A.4.3. Technology to be employed by the project activity:

Wind power generation uses the current of wind to rotate the blades and gets electric power from it. So the proper amount of wind and choice of the generator which fits to the purpose is very important to build a wind power plant.
Wind, the energy source of wind power generation mostly depends on the terrain. So the project developers considered weather conditions and chose Mt. Taegie area as the plant site, which is the highest mountain of Hoengseong area in Gangwon Province. And total installed capacity of the project is 40MW (2MW x 20), which is composed of 20 generators (wind power turbines) with 2MW. The project will use the turbine technology with OptiSpeed ™[1] and OptiTip®[2] and these generator facilities will be imported from Denmark.
The turbine model is VESTAS V80-2.0MW, which has already been installed around the world for large scale wind power generation projects and it was chosen through bids.

The main facilities of the wind farm consist of rotor, nacelle, tower and generator.
And the VESTAS V80-2.0MW turbine being used the project has following features[2].
The VESTAS V80-2.0MW is a pitch regulated upwind turbine with active yaw and a rotor with three blades. The rotor is converting kinetic energy of wind to rotatory power and it effects on the efficiency of generator. Especially the design of each rotor blade is very important part of the facilities. This turbine has a rotor diameter of 80m and this feature enables the rotor to operate with variable speed(RPM). With pitch regulating system, the angles of the blades are constantly regulated so they are always pitched at the optimal angle for current wind conditions to optimize power production and noise levels. At higher wind speeds, the pitch regulating system keeps the power at nominal, regardless of the air temperature and density. At lower wind speeds it optimizes the power output by selecting the optimal RPM and pitch angle.
Also all functions of the wind turbine are monitored and controlled by microprocessor based control units.

A detailed technical specification of VESTAS V80 is shown as followed.

<Figure A. 3> VESTAS V80 technical specifications

[2] Further detail of the VESTAS V80-2.0MW turbine is provided by VESTAS's website(www.vestas.com)

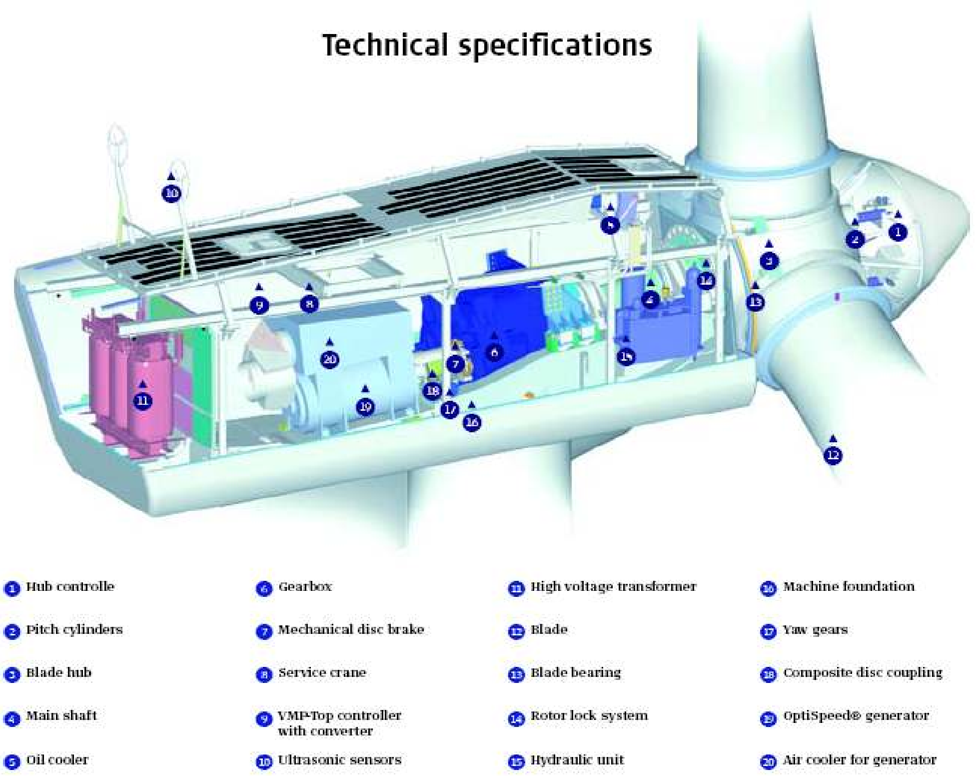


Table A.1 : Power Curves VESTAS V80-2.0 MW

Rotor	
Diameter	80 m
Swept area	5027 m^2
Rotational speed static, rotor	16.7 RPM
Rotational speed, operation interval rotor	9.0 - 19.0 RPM
Rotational direction	Clockwise (front view)
Orientation	Upwind
Tilt	6°
Blade coning	2°
Number of blades	3
Aerodynamic brakes	Full feathering
Tip angle	Pitch regulated
Turbulence	10 %

Specification Vestas V80-2MW wind turbine		
Operational data	Cut-in wind speed	4 m/s
	Normal wind speed	15 m/s
	Cut-out wind Speed	25 m/s
Generator	Nominal output	2000kW
	Operation data	50 Hz / 60 Hz 690V
Weight	Nacelle	67t
	Rotor	37t

The expected output of the proposed project is 92,856MWh/year and it will be transmitted to KEPCO Pyeongchang transformer substation, through 22.9kV of transmission lines.
Meanwhile, the manufacturer, VESTAS based in Denmark provides 2 weeks of training program for specialized management staffs besides basic manual for operation and maintenance as below.

<Table A.2 Training Programme >

Participants: 3 Qualified* O&M Technicians selected by Purchaser
Period: [To be agreed]
Duration: 2 weeks (10 working days)
Language: This course will be held in English.
Subject: V80-2.0MW Operation and Maintenance.
Place: Denmark

Date	Time	Programme	Place
Day 1	08.00 - 16.00	Introduction of teacher and participants, Introduction of Vestas Wind Systems A/S. safety, wind turbine/energy, operation strategy, different processors and what they control, different modules, signal path, temperature circuit, watch dog.	Classroom
Day 2	08.00 - 16.00	Signal description, electric description, drawings, functional diagram, error list, error log list emergency stop circuit, vog, error correcting in practice.	Classroom
Day 3	08.00 - 16.00	Mode of operation of the generator, menu 17, error log list, chap. 15. presentation of converter, measuring exercise on converter, correcting on converter.	Classroom
Day 4	08.00 - 16.00	Hydraulic system, proportional valve, LVDT signal, control signal, error correcting on the hydraulic system.	Classroom and/or Turbine
Day 5	08.00 - 15.00	Gear, mechanical manual, US sensor, yaw control.	Classroom.
Day 6	08.00 - 16.00	Scheduled maintenance theoretical and practical, Error correcting	Classroom. and/or Turbine
Day 7	08.00 - 16.00	Scheduled maintenance theoretical and practical, Error correcting	Classroom. and/or Turbine
Day 8	08.00 - 16.00	Scheduled maintenance theoretical and practical, Error correcting	Class room. and/or Turbine
Day 9	08.00 - 16.00	Scheduled maintenance theoretical and practical, Error correcting	Class room. and/or Turbine
Day 10	08.00 - 13.00	Follow up, Test, Test results, Evaluation.	Class room. and/or Turbine

The intensive training program for turbine model VESTAS V80-2.0MW will be performed in Denmark and through the detailed program, the staffs of the proposed project will be initiated in technical management know-how of the equipment.

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

It is expected that 59,669 t CO_2e/year will be reduced over 10 years of crediting period, from Feb 2009 to Jan 2019.

<Table A.3> Emission reductions

Year	Annual estimation of emission reductions in tonnes of CO_2e
Year 1	59,669
Year 2	59,669
Year 3	59,669
Year 4	59,669
Year 5	59,669
Year 6	59,669
Year 7	59,669
Year 8	59,669
Year 9	59,669
Year 10	59,669
Total estimated reductions (tonnes of t CO_2e)	59,669
Total number of crediting years	10
Annual average over the crediting period of estimated reductions (tonnes of t CO_2e)	596,690

A.4.5. Public funding of the project activity:

No public funding, including official development assistance, is provided for this project activity.

SECTION B. Application of a baseline and monitoring methodology

B.1. Title and reference of the approved baseline and monitoring methodology applied to the project activity:

The project is a grid-connected zero-emission renewable power generation activity and meets all following conditions stated in the Baseline Methodology (ACM0002 ver.7): "Consolidated baseline methodology for grid-connected electricity generation from renewable sources." For more information regarding the methodology please refer to http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

According to ACM0002(version 7) , baseline emission factor is calculated by "Tool to calculate the emission factor for an electricity system (ver 01). Baseline emission factor is calculated by combined margin (CM), which is weighted average of operating margin (OM) and build margin (BM).

The additionality of the project activity shall be demonstrated and assessed using latest version of the "Tool for the demonstration and assessment of additionality, version 4(EB36) agreed by the CDM Executive Board, which is available on the UNFCCC CDM website. http://cdm.unfccc.int/methodologies/PAmethodologies/AdditionalityTools/Additionality_tool.pdf

B.2 Justification of the choice of the methodology and why it is applicable to the project activity:

Applicability

The proposed project involves the electricity capacity additions from newly installed wind power plant. ACM0002 is applicable under the installation or modification/retrofit of hydro, wind, geothermal, solar, wave, tidal power plant/unit. And the geographic and system boundaries for the relevant electricity grid can be clearly identified and information on the characteristics of the grid is available. But ACM0002 is not applicable to switching from fossil fuels to renewable energy sources, biomass fired power plants and hydro power plants which are under specific conditions.

According to the consolidated baseline methodology ACM0002, the project meets all applicability conditions of the methodology. Therefore the project applies the consolidated baseline methodology ACM0002.

B.3. Description of the sources and gases included in the project boundary

According to the methodology ACM0002(ver.7), the only greenhouse gas accounted for in the calculation of the emission reductions is CO_2.

	Source	Gas	Included	Justification /Explanation
Baseline	Power plants connected to the Korea Power grid	CO_2	**Yes**	Included as per the ACM0002 methodology
		CH_4	**No**	Excluded for simplification as per the ACM 0002 methodology
		N_2O	**No**	Excluded for simplification as per the ACM 0002 methodology
Project Activity	Electricity generated from the wind power plant	CO_2	**No**	Excluded. The project is a zero-emission project activity
		CH_4	**No**	
		N_2O	**No**	

The electricity produced by this project will be delivered to the grid system and replace the electricity generated by fossil fuel in the grid. In Korea, KEPCO represent the grid system, therefore, the boundary of the project could be identified as KEPCO and the proposed project site.

B.4. Description of how the baseline scenario is identified and description of the identified baseline scenario:

In accordance with the description in the approved baseline methodology ACM0002(version 7), for the project activities that do not modify or retrofit an existing electricity generation facility, baseline scenario is the following :

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) calculated latter.

The baseline scenario of the Taegisan 40MW Wind Power Project is establishment of a new generation sources on the Korea Power Grid to meet electricity demand. The project activity involves a construction of a zero-emission power source. Thus, the emission reductions are equal to the baseline emissions.

The analysis and description in B.5 and B.6 will support the baseline scenario shown above.

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity (assessment and demonstration of additionality):

The additionality of the project activity shall be demonstrated and assessed using latest version of the “Tool for the demonstration and assessment of additionality, version 4(EB36) agreed by the CDM Executive Board, which is available on the UNFCCC CDM website. The tool includes the following steps :

http://cdm.unfccc.int/methodologies/PAmethodologies/AdditionalityTools/Additionality_tool.pdf

Step 1. Identification of alternatives to the project activity consistent with current laws and Regulations

The objective of this step is to identify realistic and credible alternatives to the project activity(s) that can be (part of) the baseline scenario through the following sub-steps :

Sub-step 1a. Define alternatives to the project activity:
In absence of the proposed project, reasonable and credible alternatives that are in accordance with current laws and regulations include:

1) The proposed project activity undertaken without being registered as a CDM project;
2) Construction of a power plant using other sources of renewable energy with equivalent amount of annual electricity generation; and
3) Provision of an equivalent amount of annual power output by the grid into which the project is connected. (Continuation of present situation)

Regard alternative 1), as shown in Step 2 investment analysis, if the proposed project would not undertaken as a CDM project and there aren't revenues from CERs, the potential economical efficiency of the project become worse and it won't attract investment from potential investors.
Therefore alternative 1) should be excluded among the realistic and credible alternative(s).

Additionally, the Korea government established "Act on the Promotion of the Development, Use and Diffusion of New and Renewable Energy"(revised in 27/09/2006. No 7998) to encourage use and develop the renewable energy sources in Korea in 2002.
This law is intended to improve the profitability and promote investment on renewable energy projects through preferential treatments for the electricity prices because in Korea, investing on those renewable energy projects is not much activated due to the high cost and low returns of those projects.
The law first established in 2002 to promote diffusion of renewable energy. And according to decision of 22nd CDM EB meeting, it need not be taken into account in developing a baseline scenario. Therefore the law is not considered in this baseline calculation.

Alternative 2) is also unrealistic so it should be excluded among feasible one(s).
Besides wind farm project such as solar, geothermal power and biomass generation could be considered as grid-connected zero-emission renewable power generation activities. However the project developers and investors, with private investor point of view, are not considering other way except wind power project in Hoengseong-gun and Pyeongchang-gun because of the given condition of the area and economical feasibility. So given geographical and other conditions, other renewable energy generation should be excluded from feasible alternative(s).
In conclusion, as discussed in B4, the only practical and feasible baseline scenario that could provide output or services like the proposed project is the alternative 3).

Outcome of step 1a:
Alternative (3) is selected the realistic and credible alternative to the project activity and (1),(2) are excluded.
Sub-step 1b. Consistency with mandatory laws and regulations:
The alternative scenario identified in the sub-step 1a is in compliance with all mandatory applicable legal

and regulatory requirements in the region or country.

In Korea there is no mandatory role or restriction at present for displacing the fossil fuel based power plants with renewable energies like wind power generation.

Outcome of step 1b:
In conclusion, alternative 3) is realistic and feasible one that is in compliance with legal and regulatory requirement.

Step 2. Investment analysis

In this section, it is determined whether the proposed project activity is economically or financially less than at least one other alternative, identified in step 1, without the revenue from the sale of certified emission reductions (CERs). To conduct the investment analysis, the following sub-steps are used.

Sub-step 2a : Determine appropriate analysis method

As the proposed CDM project activity generates economic benefits from electric power sales, other than CDM related income, simple cost analysis (Option I) can't be applied to the project. So according to the additionality tool (Ver 04), the investment comparison (Option II) or the benchmark analysis (Option III) should be used.
The alternative baseline scenario of the proposed project is the Korea Power Grid rather than a new investment project.
And as project participants, POSCO E&C and Eurus Energy Japan don't consider other generation projects other than wind farm, thus the investment comparison (Option II) is not proper either. Therefore the benchmark analysis (Option III) was chosen for the proposed project.

Sub-step 2b — Option III: Apply benchmark analysis.

IRR(Internal rate of return) is employed as financial indicator for benchmark analysis of the project activity.
For the project activities, about 97% of total requirement capital (about eighty billion won) was raised loans from banks of Korea and Japan.

POSCO E&C & Eurus Energy Japan, the participants of the proposed project, each made loans under 3 Months CD rate +α. And as of the second half of the year 2006 (2006. 7.1~ 2006. 12.15), the weighted average interest rates of those loans from outside for the project is 5.23%. (*Source of the CD rate data : http://www.ksdabond.or.kr*)

And the financial feasibility of the project can be secured if only the expected benefits from the project are higher than interest rates from bank loans. Therefore, as a benchmark for IRRs, 5.23% is applied for the project. (*Source of the corporate bonds : http://www.ksdabond.or.kr*)

Sub-step 2c: Calculation and comparison of financial indicators

Key factors of the project's financial viability in calculating financial indicators are the estimated prices of electricity, investment costs including construction costs, operation costs and maintenance costs, loans from outside and interest rates etc.
To conduct an investment analysis of the project activities, the information provided by Taegisan Wind Power Co., Ltd and the project participants under their own internal regulations and SMP (System Marginal Price) of wind power generation were used to calculate returns on sales of the generated electricity from the project. And the recent official price data on the wind power generation provided by KPX was used. (http://epsis.kpx.or.kr/)

<Table B.1> Parameters for financial analysis

Items	Value
Annual generated electricity	92,856 MWh
Electricity sales price	75.69 Won/KWh
O&M Cost	2.26% of Investment cost
Depreciation	20 years
Total Investment - Equity - Loan	82,295 Million Won 2,295 Million Won 80,000 Million Won
Interest on Term Loans	5.23%
Term of redemption	Repayment in 10 years a with 5-year grace period

For the project activities, 75.69won/kwh, the average SMP based on official price data during the latest year (2005.12.1~2006.11.30) was used.
IRR and NPV analysis came out as followings and more information for IRR and NPV calculation would be presented separately.

<Table B.2> Results from IRR & NPV analysis

	Without CER	**With CERs**	
		€10	**€20**
IRR	**2.3%**	**3.9%**	**5.4%**
NPV (Million Won)	**-18,173**	**-8,518**	**1,136**
1. Purchased Electricity : 75.69 won (Average SMP of the given one year : 2005.12.1 ~ 2006.11.30) 2. Duration of operation : 20 years 3. Further details will be presented to DOE.			

As the table shows, project IRR(without CERs) of the proposed project is 2.3%, which is lower than the benchmark rate 5.23% (weighted average interest rate of the loans from banks in Korea and Japan). Therefore, the proposed CDM project activity is not financially attractive or feasible.

Sub-step 2d. Sensitivity analysis

Sensitivity analysis was performed on following indicators which have significant effects on the investment analysis of the proposed project.

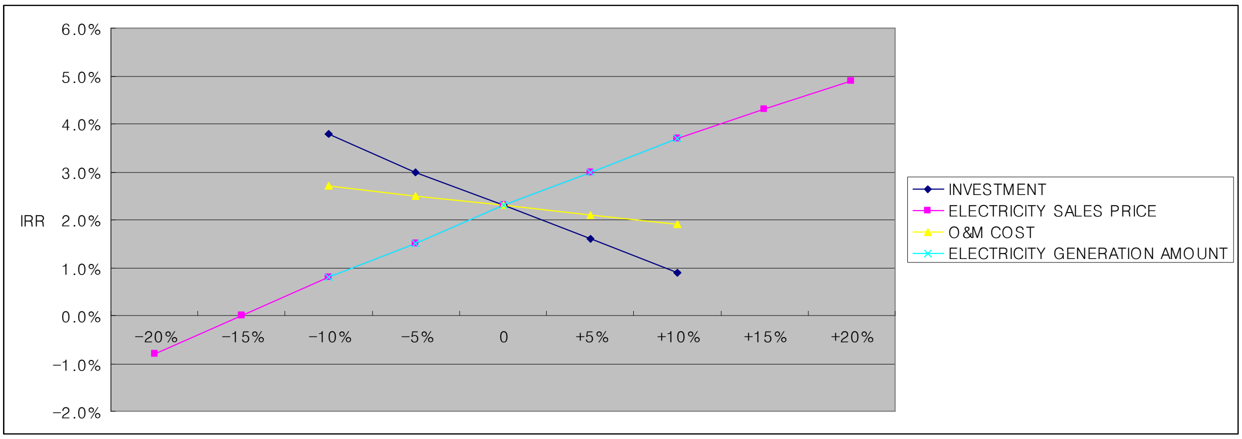
- Total Investments
- Electricity Sales Price
- Operation & Maintenance Cost
- Electric Generation Amount

As the economical structure & condition of Korea is relatively stable, above indicators don't fluctuate much widely, thus their fluctuations rise up normally within the range of ±10%.
In Korea, the average of the economic growth rates during the 5 years (2001~2005) is 4.5% and inflation rate during same period is 3.4%. (http://www.kosis.kr/)
And it is expected that future economic growth rates on 2007~2008 is about 4.3% and the inflation rate of during 2years is about 3.0%, thus analysis of the proposed project is conservative.
Also, for more conservative analysis, sensitivity analysis on those Electricity Sales Price was performed more widely as in the range of ± 20%, as it is influenced by electric supply & demand and other market conditions.
According to the sensitive analysis, the results come out as below.

<Table B.3> Results of Sensitivity analysis

Parametas / Range	-20%	-15%	-10%	-5%	0	+5%	+10%	+15%	+20%
Total Investment	-	-	3.8%	3.0%	2.3%	1.6%	0.9%	-	-
Electricity Sales Price	-0.8%	0%	0.8%	1.5%	2.3%	3.0%	3.7%	4.3%	4.9%
O&M Cost	-	-	2.7%	2.5%	2.3%	2.1%	1.9%	-	-
Electric Generation Amount	-	-	0.8%	1.5%	2.3%	3.0%	3.7%	-	-

<Figure B.1> Results of Sensitivity analysis



As shown in the table & figure above, the results from sensitivity analysis show that according to the fluctuations of total investment (-10% ~ +10%), Project IRR (without CERs) becomes 3.8%~0.9% and according to the fluctuations of Electricity Sales Price(-20% ~ +20%), it becomes -0.8%~4.9%. Also

according to O&M Cost (-10% ~ +10%), it becomes 2.7%~1.9%, finally to the fluctuations of electric generation amount(-10% ~ +10%), it becomes 0.8%~3.7%.

Therefore, as well the results of sensitivity analysis show that Project IRR(without CERs) of the proposed project is lower than 5.23%, the benchmark rate (weighted average interest rate of the loans from banks in Korea and Japan).

Outcome of step 2:
Those results from the analysis confirm that the project is not financially attractive or viable.

Step 3. Barrier analysis
For the proposed project, the barrier analysis is not carried out.

Step 4. Common Practice Analysis

Sub-step 4a. Analyze other activities similar to the proposed project activity.

In Korea, wind power plants were started to be constructed in high gear since the end of 2003 due to development of the wind power technologies and policy of Korean government.
However, according to KEMCO, the total capacity facility of the wind power generation was 177.7MW and the net generation during 2006 was 238,911MWh[3].
And in 2006, total electric generation of Korea was 365,368,967MWh[4] and wind power held only 0.07% of it, of which portion is very low.

Following table shows the annual wind farm installations status in Korea until 2006[5].

<Table B.4> Status of annual wind farm installations

Year	~ 2000	2001	2002	2003	2004	2005	2006	Total
Capacity (MW)	5.9	2.0	4.8	5.5	49.9	30.7	78.9	177.7

In Korea, small scale wind power facilities with capacity of 1KW~750KW had been established until 2003 and MW scale facilities were started to establish since 2004.
Following table shows the status of wind farm installations in MW level in Korea.

[3] 2007' Renewable Energy Statistics (2007.11.5, http://www.knrec.or.kr)

[4] 2007' Korea Electric Power Statistics (2007.5.30, http://www.kepco.co.kr)

[5] 2007' Renewable Energy Statistics (2007.11.5, http://www.knrec.or.kr)

<Table B.5> Status of wind farm installations in MW level

Title	Capacity	Completion	Remarks
Hangyeoung First phase wind power Project	6MW (1.5MW x 4)	2004. 2	A Pilot Project
Gangwon Wind Park Project	98MW (2.0MW x 49)	2005. 5	CDM registered (20 March 2006)
Yangyang Renewable Energy Project	3MW (1.5MW x 2)	2005.10	CDM registered (10 February 2007)
Youngduk Wind Park Project	39.6MW (1.65MW x 24)	2005. 3	CDM registered (02 June 2006)
Hangyeoung second phase SS-wind power Project	15MW (3.0MW x 5)	2007.11	CDM registered (17 October 2007)
K water Wind Power Project in Bang-a muri	3MW (1.5MW x 2)	2008.6	CDM registered (06 November 2007)
Taegisan Wind Power Project	40MW (2.0MW x 20)	2008.12	The proposed Project

Sub-step 4b. Discuss any similar options that are occurring

Table B.5 presents the status of wind power projects with capacity of MW level like the proposed project in Korea. As shown in the table, “Hangyeoung 1st phase project 6MW(1.5MW x 4), Feb. 2004” was a pilot project by KOSPO(Korea southern Power Co., Ltd), whish was the first wind farm project in Korea with MW level.
And except the pilot project, other two large-scale projects similar to the proposed project, of which capacity are beyond 15MW, Gangwon and Youngduk Wind Park Project were both registered as CDM projects in 2006.
Then three wind farm projects of which capacity is each under 15MW were registered as small scale CDM projects in 2007. (http://cdm.unfccc.int/Projects/projsearch.html)
Therefore in Korea, all wind power projects with MW level were registered as CDM project except the pilot project “Hangyeoung 1st phase project 6MW (1.5MW x 4)”.
And as the pilot project was installed on R&D purpose, it is different from the proposed project.
Additionally as stated in above Sub-step 4.a, the generated output from wind power held only 0.07% of whole generation of Korea in 2006 and the wind power generation is not common or spread widely.

Prior Consideration of CDM

Taegisan wind power project was seriously examined and considered for CDM by the project developers before they started. Project developers seriously examined and considered of the additional benefits from CERs and finally came to make their internal decision for CDM in the board of directors.
Though the project was not financially attractive to them, according to the estimation performed internally, they decided to promote the CDM project under the consideration of benefits from CERs as well environmental benefits.

< Timeline of the Taegisan wind power project >

Date (dd/mm/yyyy)	Description
03/02/2006	**JDA Agreement** : POSCO E&C and Eurus Energy Japan(PP) signed an agreement to develop Taegisan Wind Power Project as a CDM project under KP. On the Agreement, they agreed to jointly develop Taegisan wind power project and to decide on the distribution of CERs benefits including cost & risk caused from the project separately. They agreed to promote CDM based on the JDA.
26/12/2006	**BOD Meeting of POSCO E&C** : POSCO E&C held a board of directors and reviewed the project with a summary on Taegisan wind power project plan. And the summary reviewed at the internal meeting was submitted to DOE separately. At the meeting, POSCO E&C actually settled to invest and proceed Taegisan wind power project and their decision was based on the financial analysis including IRRs (with CERs/without CERs) stated in the summary on the project plan.
05/03/2007	**PEA** : Preliminary Environment Assessment for environmental impacts were performed by Taeil Environment Co., Ltd (Published 2007. 1, Approved 2007. 3) : Review for impacts on natural scenery (Published 2007.2) : Review for impacts on ecology of fauna and flora (Published 2007.6)
Starting date 12/03/2007	**Equipment purchase contract (Turbine Purchase)** : POSCO E&C VESTECH JAPAN
22/03/2007	**Approval of electricity business by MKE** : Obtained a license to do electric business from the authorities in charge, “Ministry of Knowledge Economy” of Korea
26/03/2007	**Bank Loan Agreement** : Between Taegisan Wind Power Co and a Korean Bank
16/04/2007	**Appointing CDM Consultant (Consulting contract)** : Between Taegisan Wind Power and RCC. Co., Ltd (CDM consulting company)
01/05/2007	**Starting construction work**
19/03/2008	**DOE contract** **:** Appointing KFQ (Korea Foundation for Quality) as a DOE

B.6. Emission reductions :

B.6.1. Explanation of methodological choices:

Emission reductions can be calculated by multiplying of the generated electricity and emission factor as below.

Baseline emissions (BEy) of the proposed project are as follows.

$BE_y = EG_y * EF_y$ = 92,856 MWh x 0.6426 tCO_2e/MWh = 59,669 tCO_2e/ year

Emission reductions of the proposed project are same with the emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity.

Emission reductions are calculated as follows:
ER y = BE y − PE y − LE y

Where:
ERy = Emission reductions in year y (t CO2e/yr).
BEy = Baseline emissions in year y (t CO2e/yr).
PEy = Project emissions in year y (t CO2/yr).
LEy = Leakage emissions in year y (t CO2/yr).

According to ACM0002(version 7) , baseline emission factor is calculated by "Tool to calculate the emission factor for an electricity system (ver 01). Baseline emission factor is calculated by combined margin (CM), which is weighted average of operating margin (OM) and build margin (BM).

Baseline emissions will be calculated as following 6 steps.

STEP 1. Identify the relevant electric power system.
STEP 2. Select an operating margin (OM) method.
STEP 3. Calculate the operating margin emission factor according to the selected method.
STEP 4. Identify the cohort of power units to be included in the build margin (BM).
STEP 5. Calculate the build margin emission factor.
STEP 6. Calculate the combined margin (CM) emissions factor.

STEP 1. Identify the relevant electric power system

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 B.2> The transmission map of Korea

Step 2. Select an Operating Margin (OM) Method

The calculation of the Operating Margin emission factor (EF grid OM,y) is based on one of the four following methods:

(a) Simple OM, or
(b) Simple adjusted OM, or
(c) Dispatch Data Analysis OM, or
(d) Average OM.

Among above 4 options, the Simple OM method can be used where low cost/must run resources constitute less than 50% of total grid generation in average of the five most recent years. During 5 years(2002~2006), average low-cost/must run generation holds 42.63% of total KPX grid generation.(See Annex 3) . Thus the Simple OM method is employed in order to calculate OM emission factor.
Simple OM emission factor ($EF_{OM,simple,y}$) is calculated using a 3-year generation-weighted average(ex-ante) of all generating power plants serving the system, based on the most recent data available at the time of submission of the PDD.

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

According to the "Tool to calculate the emission factor for an electricity system (Version 01)", the Simple OM emission factor is calculated as the generation-weighted average emissions per unit net electricity (tCO_2/MWh) of all generating power plants serving the system, not including low-operating cost and must-run power plants based on the three following options:

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

Based on data on fuel consumption and net electricity generation of each power plant/unit is available in Korea. So the proposed project can employ Option A.

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

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

$EF_{grid,OMsimple,y}$ = Simple operating margin CO_2 emission factor in year y (tCO_2/MWh)
$FC_{i,m,y}$ = Amount of fossil fuel type i consumed by power plant / unit m in year y
$NCV_{i,y}$ = Net calorific value (energy content) of fossil fuel type i in year y(GJ / mass or volume unit). If gross calorific values are provided by the data sources used, the gross calorific value (GCV) of the fuel can be used.
$EF_{CO2,i,y}$ = CO_2 emission factor of fossil fuel type i in year y (tCO_2/GJ). IPCC default values at the lower limit of the uncertainty at a 95% confidence interval as provided in Table 1.4 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories
$EG_{m,y}$ = Net electricity generated and delivered to the grid by power plant / unit m in year y (MWh)
m = All power plants / units serving the grid in year y except low-cost / must-run power plants / units
i = All fossil fuel types combusted in power plant / unit m in year y
y = Either the three most recent years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex ante option) or the applicable year during monitoring (ex post option), following the guidance on data vintage in step 2

For the proposed project, GCV_i provided by official data source of Korea is used. IPCC default value is used as CO_2 emission factor of fuel. Simple OM factor during 3 years (2004~2006) is 0.7281 tCO_2/MWh and this value is fixed along the credit period.
The detailed baseline information used in the calculation is presented in Annex 3.

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

According to “Tool to calculate the emission factor for an electricity system (Version 01)”, the sample group of power units *m* used to calculate the build margin consists of either:
(a) The set of five power units that have been built most recently, or
(b) The set of power capacity additions in the electricity system that comprise 20% of the system

generation (in MWh) and that have been built most recently.

In the project, as 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 74,355,414MWh and the annual generation of "the five power plants that have been built most recently" was 22,522MWh. Therefore, the former is lager figure than the latter, Option b is selected between the two options proposed by the methodology.
The detailed data used in the calculation are presented in Annex 3.

Also according to "Tool to calculate the emission factor for an electricity system (Version 01)", the BM emission factor is fixed during the credit period of the project activity.
As a general guidance, a power unit is considered to have been built at the date when it started to supply electricity to the grid. Power plant registered as CDM project activities should be excluded from the sample group m. However, if group of power units, not registered as CDM project activity, identified for estimating the build margin emission factor includes power unit(s) that is(are) built more than 10 years ago then, power unit(s) that is (are) built more than 10 years ago from the group should be excluded and grid connected power projects registered as CDM project activities, which are dispatched by dispatching authority to the electricity system should be included. Besides capacity additions from retrofits of power plants were not included in the calculation of the build margin emission factor.
In calculation of BM emission factor of the proposed project, these details were considered.

According to "Tool to calculate the emission factor for an electricity system (Version 01)", in terms of vintage of data, project participants can choose between one of the two options (Option 1 and Option 2).

In accordance with Option 1, for the first crediting period, build margin emission factor is calculated 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 to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period could be used. This option does not require monitoring the emission factor during the crediting period.

In accordance with Option 2, for the first crediting period, BM emission factor shall be updated annually, ex-post. And for the second crediting period, it shall be calculated ex-ante as the Option 1 above.
As the participants of the project won't update BM emission factor annually and instead, they will use the BM emission factor calculated ex-ante based on the most recent information for the first crediting period and fix it to use during the crediting period, Option 1 was chosen for the project.

STEP 5. Calculate the build margin emission factor

According to the "Tool to calculate the emission factors for electricity system (Version 01)", the build margin emissions factor is the generation-weighted average emission factor (t CO_2/MWh) of all power units *m* during the most recent year y for which power generation data is available, calculate 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 (t CO_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 (t CO_2/MWh)
m = Power units included in the build margin
y = Most recent historical year for which power generation data is available

The CO_2 emission factor of each power unit m ($EF_{EL,m,y}$) should be determined as per the guidance in step 3 (a) for the simple OM, using options B1, B2 or B3, using for y the most recent historical year for which power generation data is available, and using for m the power units included in the build margin.
In this project, as the generation amount and fuel consumption data on the power unit *m* is available thus the Option 1 presented in Step 3 (a) Simple OM was used.

For BM emission factor, $EF_{EL,m,y}$ was calculated by multiplying $FC_{i,m,y}$ (electricity consumption) by $GCV_{i,y}$ * EF $CO_{2,i,y}$ and divide it by power generation of each plant.
And then $EF_{EL,m,y}$ was multiplied by power generation of each plant and finally it was divided by total power generation.(2006 IPCC Guidelines on National GHG Inventories Table 1.2, Table 1.4)

BM emission factor is 0.3859 tCO_2/MWh. And further information on calculation for BM emission factor is shown in Annex 3.

STEP 6. Calculate the combined emission factor

According to the tool to calculate the emission factor for electricity system (Ver01), the combined emissions factor is calculated as follows:

$$EF_{grid,} CM_{,y} = EF_{grid,} OM_{,y} * wOM + EF_{grid,} BM_{,y} * wBM$$

Where:
$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year y (t CO_2/MWh)
$EF_{grid,OM,y}$ = Operating margin CO_2 emission factor in year y (t CO_2/MWh)
wOM = Weighting of operating margin emissions factor (75% for wind project)
wBM = Weighting of build margin emissions factor (25% for wind project)

$EF_{grid,CM,y}$= 0.7281*0.75+0.3859*0.25 = 0.6426 (tCO2e/MWh)

B.6.2. Data and parameters that are available at validation:

Data / Parameter:	$F_{i,m,y}$
Data unit:	Mass: Bituminous, LNG Volume: Heavy oil, Diesel
Description:	Fuel consumption

	i : bituminous, heavy oil, diesel, LNG *m*: sample group consisting of power plant capacity additions that comprises 20% of system generation and that have been built most recently. *y*: 2006
Source of data used:	2006 STATISTICS OF ELECTRIC POWER IN KOREA
Value applied:	
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	Applicable in calculation of the simple OM

Data / Parameter:	GCV_i
Data unit:	kcal/ mass or volume unit
Description:	Gross calorific value of fuel *i* : bituminous, heavy oil, diesel oil, LNG
Source of data used:	2006 STATISTICS OF ELECTRIC POWER IN KOREA 2005 STATISTICS OF ELECTRIC POWER IN KOREA 2004 STATISTICS OF ELECTRIC POWER IN KOREA
Value applied:	
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	According to "Tool to calculate the emission factor for an electricity system", the gross calorific value (GCV) of the fuel can be used, if gross calorific values are provided by the data sources used. Thus, as the GCV of fuel can be provided, GCV of fuel was used in this project.

Data / Parameter:	$EF_{CO2,i}$
Data unit:	tCO_2 /GJ
Description:	CO_2 emission factor of fuel *i* *i* : bituminous, heavy oil, diesel oil, LNG
Source of data used:	Revised 2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied:	
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	Emission factor will be fixed during the credit period of the project.

Data / Parameter:	$EG_{m,y}$
Data unit:	MWh
Description:	Net electricity generated and delivered to the grid by power plant/unit *m,j,k* or *n* in year *y* or hour *h*
Source of data used:	
Value applied:	92,856MWh
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	

B.6.3 Ex-ante calculation of emission reductions:

Emission reductions are calculated as follows:
$ER_y = BE_y - PE_y - LE_y$

Where:
ER_y = Emission reductions in year y (t CO_2e/yr).
BE_y = Baseline emissions in year y (t CO_2e/yr).
PE_y = Project emissions in year y (t CO_2/yr).
LE_y = Leakage emissions in year y (t CO_2/yr).

Project Emissions
Since the proposed project is wind power generation project, the emissions are not considered.
Therefore
PEy = 0.

Baseline Emissions
According to section B.6.1, baseline emissions are calculated.
And according to section B.6.1, the baseline emissions (BEy) of the proposed project are as follows.

$BE_y = EG_y * EF_y$ = 92,856 MWh x 0.6426 tCO_2e/MWh = 59,669 tCO_2e/ year

Leakage
According to ACM0002, $L_y = 0$

Emission Reductions
According to Section B.6.1, the annual emission reduction results to be :

$ER_y = BE_y - PE_y - L_y$ = 59,669- 0 - 0 = 59,669 tCO_2e/year

B.6.4 Summary of the ex-ante estimation of emission reductions:

The total emission reductions of the project are 596,690 tCO_2e during the crediting period.

<Table B.6> Emission reductions of the project

Year	Estimation of project activity emissions (t CO_2e)	Estimation of baseline emissions (t CO_2e)	Estimation of leakage (t CO_2e)	Estimation of overall emission reductions (t CO_2e)
Year 1	0	59,669	0	59,669
Year 2	0	59,669	0	59,669
Year 3	0	59,669	0	59,669
Year 4	0	59,669	0	59,669
Year 5	0	59,669	0	59,669
Year 6	0	59,669	0	59,669
Year 7	0	59,669	0	59,669
Year 8	0	59,669	0	59,669
Year 9	0	59,669	0	59,669
Year 10	0	59,669	0	59,669
Total (t CO_2e)	0	596,690	0	596,690

B.7 Application of the monitoring methodology and description of the monitoring plan:

B.7.1 Data and parameters monitored:

(Copy this table for each data and parameter)

Data / Parameter:	**EGy**
Data unit:	MWh
Description:	Net electricity supplied to the grid by the project
Source of data to be used:	Measured by meters.
Value of data applied for the purpose of calculating expected emission reductions in section B.6	92,856
Description of measurement methods and procedures to be applied:	Hourly measurement and monthly recording. 100% of data will be monitored and archived.
QA/QC procedures to be applied:	The Measurement will be in compliance with the National Guidelines and requirement of the KPX(Korea Power Exchange) for accuracy and reliability.

	The calibration will be carried out according to relevant national standards and regulations by authorized organization. Double checked by receipt of sales.
Any comment:	Monitored data will be kept for two years after the crediting period. * According to the regulation on the electricity measurement equipment, the equipment must use the main metering equipment that has allowable error of ± 0.2%. This equipment shall be sealed by the authorized person from the connected substation right after the installation of the equipment. * The amount of electricity consumed in the plant and electricity transmission to a grid will be measured. Also the received electricity as a driving force for starting the operation and in emergencies will be measured by electric power meter. EGy means a net amount of electricity transmitted to the grid excluding electricity consumed in the plant and received from grid. And the amount of electricity consumed in the plant and received from the gird will be deducted from the emission reduction of the proposed project according to the monitoring.

B.7.2 Description of the monitoring plan:

Monitoring plan is setting up the series of monitoring works on GHG emission reduction of the proposed project.
Monitoring plan includes followings.

- Establishing and keeping the appropriate and transparent monitoring system for the generated electricity from the project
- Measuring instrument management, maintenance and quality control.
- Role and demands of the person in charge of monitoring
- Dada management and storage system
- Preparations and coping with the third parties audit

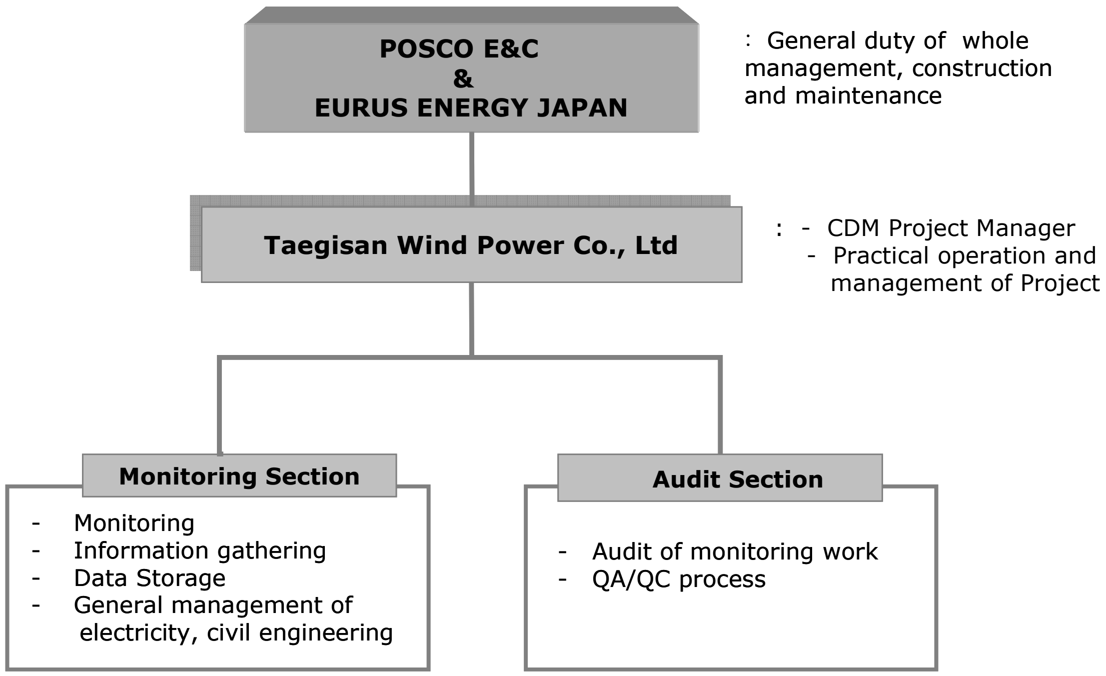
1. Monitoring Organization

The generated electricity supplied to the KEPCO grid is the main data to be monitored. And CDM project manager will be in charge of all related matters including monitoring of reduction, collecting and keeping of the data, QA/QC and audit.

Project owner(s) of the Taegisan wind power plant are POSCO E&C and Eurus Energy Japan. The former, POSCO E&C will take charge of engineering, purchasing the equipment including generators and other construction work etc.
And the latter, Eurus Energy Japan will undertake management of the SPC (Taegisan wind power company) and project financing. And the SPC(Taegisan wind power company) is the manager of project. So Taegisan wind power company will take charge of overall operation, monitoring and audit of the plant. There are two sections under the Taegisan wind power company : monitoring section and auditor section.

Monitoring section manager will undertake monitoring, gathering and storage required according to the monitoring plan. And the gathered information is recorded and sent to the CDM project manager and auditor section monthly.
Also auditor section manager will audit the monitoring section's work and proceed QA/QC process according to the monitoring plan.
CDM project manager will take the responsibility for entire compliance of the monitoring plan including confirmation of monitoring plan, emission reduction and report.
Following figure describes the operational structure to perform the monitoring plan.

<Figure B-3> Operational and management structure



CDM project manager should report any important changes of the outline and fulfillment of entire monitoring plan to the project owner.

2. Monitoring Equipment

Electricity meters for measuring the amount of electricity shall be set up transparently in accordance with the Korean law "Law regarding measurement" and "Act on operation of electricity market", and they shall be sealed after confirmation on the correct set up of the meters by Korea Power Exchange.
The meters shall be investigated according to "Act on operation of electricity market" by certificated examination standard.
And calibration regarding sealing of the meters shall be performed regularly every two years after the installation.
The proposed project will be maintained in accordance with the process defined on the "Law regarding measurement" and "Act on operation of electricity market".

3. Data Collection and Management

The amount of electricity transmitted to the grid shall be measured automatically by the established meters as described above. The measured variables are simultaneously transferred to central control system of the Taegisan wind power plant.
The measured amount of electricity shall be collected hourly, daily and monthly and shall be archived in electronic way.

Additionally, according to "Act on operation of electricity market", KPX shall keep and maintenance the transmitted data from the electricity meters of the proposed project in its data base.
And the measured amount of electricity shall be compared with those of KPX to ensure quality of the data. If the two variables compared are different, the electricity meters and other equipment shall be checked if they are working properly by internal investigation and procedures regulated in the related laws. Then the results will be reported to the CDM project manager for appropriate follow-up measures.

Even after the internal investigation and procedures in related laws, if the reason why those two variables are different is not found, then data stored in the electricity meters of Taegisan will be used in the first place according to "Act on operation of electricity market"
Collected data record for monitoring will be archived electronically at least for 2 years after the crediting period (10years) to which the records pertain.

4. Training
The project developers and manager will continue the training and maintenance over the equipment of wind power plant. And regard monitoring and training of the proposed project such as plant O& M, generation and operation manual, maintenance and training plans are under way with promotion of a contract, accordingly specific plans are in progress currently.

B.8 Date of completion of the application of the baseline study and monitoring methodology and the name of the responsible person(s)/entity(ies)

Date of completion of the methodology application: The application of the baseline study and monitoring methodology of the Project was completed on 14/02/2008.

Entity responsible for the application of the baseline and monitoring methodology
RCC Co., Ltd.
Pohang Techno Park 601, Venture 1st building
Gigok-dong 601, Nam-gu, Pohang-si
Gyeongbuk 790-834, Korea.
e-mail: joko08@rcc-posco.co.kr

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

The starting date of the project activity is 12/03 /2007. The starting date chosen is the date when contract for turbine purchase was closed and also it is the earliest date at which the project participant (POSCO E&C) has committed to big expenditures for the project.

C.1.2. Expected operational lifetime of the project activity:

20 years

C.2 Choice of the crediting period and related information:

C.2.1. Renewable crediting period

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

C.2.1.2. Length of the first crediting period:

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

01 /02/ 2009(or registration date whatever is later)

C.2.2.2. Length:

10 years

SECTION D. Environmental impacts

D.1. Documentation on the analysis of the environmental impacts, including transboundary impacts:

According to Article 4, paragraph 3 of "Act on Assessment of impacts of Works on Environment, Traffic, Disasters, etc." and its enforcement decree(Article 2, paragraph 3), any plant facility whose power source is solar power, wind power or fuel cell is more than 100,000kW shall be carried out EIA (Revised 2005.9.16). As facility capacity of the proposed project is 40,000MW, it is not required to be performed EIA.
However, Preliminary Environmental Assessment (PEA) was performed as specified in "National Land Planning and Utilization Act" (Article 6, subparagraph 2) and the enforcement decree (Article 7, paragraph 1)of "Framework Act on Environmental Policy".

PEA was performed by an environmental impact assessment agency, Taeil Environment Co., Ltd (President Changho Cho, tienv@chollian.net, Tel. 82-2-489-5747).
Additionally review for impacts on natural scenery and review for ecology of fauna and flora were performed respectively in 2006 and 2007 by Taeil Environment Co., Ltd and UPEHCO Korea Co., Ltd according to the requirement of authorities in charge and each report was published in 2007.

The PEA covers the sectors of natural environment, residential environment, and social/economical environment as follows,

- Natural environment: Weather, Topography, Geology, Fauna, and Flora
- Residential environment: Land utilization, Air quality, Water quality, Soil, Waste, Noise, Vibration, Recreation, Scenery, and Radio interference

The PEA report (2007) mainly contains followings.

1. Influence on the scenery
According to simulation results, it is expected that environmental influence on the scenery caused by the project will be insignificant.
And the project developers will try to minimize the damage of geographical features and skyline by building the road along the ridge of Taegi Mt.
They will harmonize the colours of the facilities with natural scenery by matching their colours with sky blue for a distant view including tower painting.
Also through underground construction of some transaction lines, influence on the scenery will be little.

2. Natural geographical features
According to PEA report, it is expected that some scarified surface and sub soils will be caused by the construction work of the plant, roads and supporting structures for transmission lines.
For this matter, the developers try to utilize even areas as possible for construction and restore them with native plants.
And they utilize those remaining soils (38,393m^3) caused by the construction as restoration lest they should be taken out of the sites. Also they minimize geographical damage caused from new road construction by utilizing existing roads.

3. Radio interference & radiation of electromagnetism
Magnetic field of the transmission lines is between 1.0~1.8mG and this is under the Swedish magnetic field standard (2mG), which is the strictest one in the world. Therefore it is expected that the influence of interference & radiation of electromagnetism due to the proposed project won't be happened.
And in order to protect Radio interference, transmission lines which go through rural communities will be constructed underground, thus there is no influence of magnetic field between project sites and Pyunchang transformer substation.
Also they are keeping separation more than 30m from dispatched houses to minimize the magnetic field. Transmission lines of the project are 22.9Kv and the minimum safe distance of 154Kv is 30m; thus in the proposed project, the neighbour hood houses and villages are affected little or no from the transmission lines.

4. Influence on ecosystem
- Flora : Destruction of the cultivated land and a forest
- Fauna : Movement of the habitat to around area due to the noises and tremors from construction work.

For these influences on ecosystem, the project developers will reimplant some damaged trees that are available to be restored.
And they will avoid destruction outside the planned site by thorough supervision and minimize the night works.

5. Land Use
As wind turbines, transmission lines and substation will be installed relatively even areas, it is expected that soils won't run out excessively. But heavy rain can make the soils flow out and turbidity of water can be raised. So they will do the preliminary inspection before rainy season and cover the areas with plastic and install waterways at those highly probable soil washed-away areas.

6. Noise & vibration
According to PEA report, it is expected that noise of turbine operating will be under the environmental standard (day : 585dB, night : 45dB), thus noise from turbines is insignificant. Also influence of corona

will be also negligible.
And the project developers will do the construction work according to the related regulations for protection of construction noise.
Thus, in order to reduce construction noise, equipment operation work will be done during day (08:00~18:00) and speed limit for the construction vehicles is 20km/hr on site.
Also if minimum distance is 30m, vibration from the construction equipment is expected to be slight. And the developers will select low-vibration construction method and equip devices against vibration to diminish vibration influences on near the sites.

7. Waste water and sewage
According to PEA report, sewage discharged from the construction workers and staffs is expected $0.8m^3$ /day, which is not much. Thus they will install a separate septic tank and dispose the sewage after appropriate treatment to reach the level required by related environmental regulations so as not to pollute environment of the around areas. Also the developers will supervise and instruct the workers not to dump daily life waste and utilize the reusable waste and consign other unusable ones for legal disposal without causing secondary pollution.

8. Dust and air quality
Minute dusts and nitrogen dioxide are expected to be emitted from the construction. The developers will reduce these dusts through speed control of the vehicles, regular watering, and restraint of superfluous moving or operation of equipment and will set whole responsible workers as cleaners.

D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

N.A

SECTION E. Stakeholders' comments

E.1. Brief description how comments by local stakeholders have been invited and compiled:

For the promotion of the proposed project Gangwon Province, Eurus Energy Japan and POSCO E&C entered into an "Agreement on Joint Development" on Feb 2006 and established Taegisan Wind Power Corporation Ltd., (SPC).
Taegisan Wind Power Co Ltd. held executive meetings and presentations several times with local public officials, residents and local stakeholders to collect their opinions.
A meeting was held with the head of Hoengseong-gun and related public officials, representatives of residents and staffs in charge of Hoengseong-gun in Feb 2006.
During 21 Dec ~ 22 Dec 2006, presentation meetings were held respectively in Hoengseong-gun and Pyeongchang-gun with local residents and stakeholders to present the proposed project and collect their opinions. 10 persons of the local government interested including head of the Organization for investment inducement on Gangwon Province (President Mr Chun-soo, Park), Sae-jong Yoon, the local assembly man of Hoengseong and head of Dunnae-myun and 26 residents attended the presentation meeting held in Dunnae-myun office in Hoengseong-gun on 21 December.

< Picture E.1: Hoengseong-gun, Taegisan Wind Power Plant project Presentation (21/12/2006) >

And at the presentation meeting held in Pyeongchang-myun office in Pyeongchang-gun on 22 December, 10 persons of the local government interested including head of the Organization for attracting investment in Gangwon Province (President Mr Chun-soo, Park) and 36 residents attended.

< Picture E.2, Taegisan Wind Power Plant project Presentation (22/12/2006) >

In those meetings, presentations on the project activities were made to the attendances and there was question-and-answer session over the project.
After that, besides above two meetings, 15 times of official meetings were held by Tageisan Wind Power Co.Ltd (POSCO E & C and Eurus Energy Japan) for stakeholders and local residents of the project. Through these meetings, the project developers gave explanations sufficiently about the environmental meaning and safety of the wind power project as a renewable energy source and then could get understanding and supporting from the local residents enough to proceed the project successfully.

There were appropriate responses instantly concerning these comments received at the meetings. Also those comments from each meeting were summarised as four points collectively in Section. E. 2 and responses and reactions of the developers were put together in E.3.

Additionally in Section E. 2, there is summary of the official meetings (15times).

Besides the project developers informed the object of the project as well as its future plan through various media: Gangwon Daily News, Yonhap News, EBN Industrial News, KBS Wonju station etc.

< Gangwon Daily News. 04/02/2006>

< POSCO E&C website. 06/02/2006>

< 22/08/2007 Yonhap News >

E.2. Summary of the comments received:

Besides presentation meetings above two pictures (E-1,E-2), 15 times of official meetings were hold and summary of the comments from the meetings is as below.
And for these comments, appropriate response and reactions were undertaken instantly and gradually.

- Preservation of natural scenery and contribution on welfare of the local residents.
- Preventive measures on the natural outline destruction of the mountain and installation of a new observation platform on the site for sightseeing.
- Air pollution from the site due to dusts such as arsenic acid and noise from the generators.
- Damage limitation against radio interference of the areas where transmission lines go through and preventive measures for flood for the electric poles in the area.

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

Explanations and follow up measures taken/being taken to above comments from stakeholders are below.

- The project developers take appropriate measures for protection of environmental scenery from its early stage of construction. And Taegisan Wind Power Co. Ltd., promised to give financial support to local agricultural products processing plant and now they are under discussion for concrete steps. On the matter of giving back to the community, the project developers explained that they expected the project would much contribute to boost tourism, create new jobs and stimulate local economy.

- As roads already have been built to the summit of Taegi Mt mostly, additional destroy of the forest due to the project nearly would not happen and the transmission lines would be constructed along with the existing roads. And the project developers will try to minimize the damage of geographical features and skyline by building the road along the ridge of Taegi Mt.
  And on the matter of installation of a new observation platform for sightseeing, there are some dissents between those residents of related villages. Therefore according to the coordination of the different opinions, the developers promised to take actions for this matter.

- On the matter of dust, the developers promised to reduce these dusts through speed control of the vehicles, regular watering, and restraint of superfluous moving or operation of equipment. And they will set whole responsible workers as cleaners.
  Also for the matter of noises, the project developers informed that the noise level of the proposed plant become under 45dBA, which meets the requirement of noise control regulation. And they explained that the generators of the project are located far from the residential areas therefore, there is no influence against the residential areas. Besides, they actually made the local residents visit Youngduck Wind Park, which has been operating to remove their concerns over the noises.

- Regarding those areas where transmission lines would go through, project developers promised underground construction to prevent radio interference & radiation of electromagnetism. And they explained that the transmission lines will be constructed along with the existing roads to minimize additional destruction. On the matters regarding management of the electric poles against the natural

disasters like floods, they will do the preliminary inspection before rainy season and cover the areas with plastic and install waterways at those highly probable soil washed away areas.

Taegisan Wind Power Co. Ltd., collect comments from local communities around the project sites regularly and on occasion and they reflected those issues to company policy and design of the plant if necessary.
Also, community people can directly appeal to the country offices in Hoengseong-gun or Pyeongchang-gun and or to the Taegisan Wind Power Co. Ltd if they have any opinion about the wind farm project. Besides these direct ways, Taegisan Wind Power Co. Ltd collected comments on the progress or overall of the project after the announcement of the proposed project through mass media.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Eurus Energy Japan Corporation
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Represented by:	
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Salutation:	Mr.
Last Name:	Masaru
Middle Name:	
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State/Region:	Seoul
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E-Mail:	taeseon@poscoenc.com
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Represented by:	Han, Soo-Yang
Title:	CEO
Salutation:	Mr
Last Name:	Han
Middle Name:	
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Department:	
Mobile:	82-17-812-0206
Direct FAX:	--
Direct Tel:	--
Personal E-Mail:	--

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

This project will not receive public funding.

Annex 3

BASELINE INFORMATION

Simple OM calculation

The simple OM method can be used where low cost/must run resources constitute less than 50% of total grid generation in average of the five most recent years.

<Generation of power plants groups (MWh, Net)>

Year	Low cost/must run					Total grid generation	Low cost/must run ratio
	Hydro	Coal (Anthracite)	Nuclear	Alternative*	Subtotal		
2002	5,266,907	5,991,495	113,070,088	209,300	124,537,790	292,746,001	42.54%
2003	6,830,016	6,236,623	123,280,502	275,716	136,622,857	308,225,887	44.33%
2004	5,802,167	5,130,890	123,970,409	350,180	135,253,646	326,879,672	41.38%
2005	5,135,032	5,117,963	139,286,513	403,583	149,943,091	348,187,780	43.06%
2006	5,144,992	5,183,980	142,114,439	510,689	152,954,100	365,368,969	41.86%
Average of five recent years	**5,635,823**	**5,532,190**	**128,344,390**	**349,894**	**139,862,297**	**328,281,662**	**42.63%**

*Alternative: Geothermal, Wind, Low-cost biomass, Solar, LFG
Source: 2002~2006 Statistics of Electric Power in Korea, KEPCO, 2003~2007.

Carbon Emission Factor

CO_2 Emission Factor of fossil fuel type i (unit: tCO_2/GJ) ($EF_{CO2,i,y}$)

Bituminous coal	**0.089500**
Heavy Oil	**0.075500**
Diesel Oil	**0.072600**
LNG	**0.054300**

*Source:: IPCC 2006

IPCC default values at the lower limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter 1 of Vol. 2 of 2006 IPCC Guidances

Simple OM for the proposed project activity

	Net Generation (EGm,y) (MWh)	**CO_2 emission (tCO_2/yr)**	**Operating Margin**
2004	**187,513,847**	**136,991,906**	**0.7306**
2005	**195,045,066**	**142,804,311**	**0.7322**
2006	**206,605,295**	**149,156,959**	**0.7219**
Average (2004-2006)	**0.7281 *tCO_2/MWh***		

$$EF_{grid,OMsimple,y} = \frac{\sum_{i,m} FC_{i,m,y} * CV_{i,y} * EF_{CO2,i,y} = 136{,}991{,}906 + 142{,}804{,}311 + 149{,}156{,}959}{\sum_{,m} EG_{m,y} = 187{,}513{,}847 + 195{,}045{,}066 + 206{,}605{,}295} = 0.7281\ tCO2/MWh$$

Operating Margin for 2006

Power plant (m)	Fuel (i) Type	*Net Generation ($EG_{m,y}$) (MWh)	**Fuel consumption ($FC_{i,m,y}$)				***Calorific value (energy content)				Calorific value (energy content) ($CV_{i,y}$)				$FC_{i,m,y} * CV_{i,y} * EF_{CO2,i,y}$				$\sum_i FC_{i,m,y} * CV_{i,y} * EF_{CO2,i,y}$ (tCO_2)
			Bituminous coal (ton)	Heavy oil (kl)	Diesel Oil (kl)	LNG (ton)	Bituminous coal (kcal/kg)	Heavy oil (kcal/l)	Diesel Oil (kcal/l)	LNG (kcal/kg)	Bituminous coal (kJ/kg)	Heavy oil (kJ/l)	Diesel Oil (kJ/l)	LNG (kJ/kg)	Bituminous coal (tCO_2)	Heavy oil (tCO_2)	Diesel Oil (tCO_2)	LNG (tCO_2)	
Honam #1	Coal-thermal	1,622,639	781,139	1,113	279	0	5,436	9,809	8,917	0	22,759	41,068	37,334	0	1,591,157	3,451	756	0	1,595,364
#2	Coal-thermal	1,782,016	859,736	1,251	359	0	5,407	9,823	8,870	0	22,638	41,127	37,137	0	1,741,914	3,884	968	0	1,746,766
Samchonpo #1	Coal-thermal	4,161,219	1,696,271	0	860	0	5,937	0	8,814	0	24,857	0	36,902	0	3,773,701	0	2,304	0	3,776,005
#2	Coal-thermal	3,703,880	1,508,082	0	1,362	0	5,942	0	8,814	0	24,878	0	36,902	0	3,357,862	0	3,649	0	3,361,511
#3	Coal-thermal	3,779,585	1,519,385	0	457	0	5,858	0	8,814	0	24,526	0	36,902	0	3,335,204	0	1,224	0	3,336,429
#4	Coal-thermal	3,816,997	1,521,263	0	1,818	0	5,861	0	8,803	0	24,539	0	36,856	0	3,341,037	0	4,865	0	3,345,901
#5	Coal-thermal	3,761,205	1,665,339	0	977	0	5,236	0	9,000	0	21,922	0	37,681	0	3,267,439	0	2,673	0	3,270,112
#6	Coal-thermal	4,065,091	1,770,348	0	428	0	5,255	0	9,000	0	22,002	0	37,681	0	3,486,074	0	1,171	0	3,487,245
Yongheng #1	Coal-thermal	5,337,432	2,004,193	0	2,548	0	6,072	0	8,891	0	25,422	0	37,225	0	4,560,123	0	6,886	0	4,567,009
#2	Coal-thermal	5,727,937	2,129,118	0	2,545	0	6,086	0	8,899	0	25,481	0	37,258	0	4,855,533	0	6,884	0	4,862,417
Boryeong #1	Coal-thermal	3,988,848	1,638,140	0	306	0	5,768	0	8,855	0	24,149	0	37,074	0	3,540,638	0	824	0	3,541,462
#2	Coal-thermal	3,423,101	1,389,425	0	1,137	0	5,766	0	8,943	0	24,141	0	37,443	0	3,002,030	0	3,091	0	3,005,121
#3	Coal-thermal	3,409,486	1,323,779	0	514	0	5,845	0	8,943	0	24,472	0	37,443	0	2,899,381	0	1,397	0	2,900,778
#4	Coal-thermal	4,133,946	1,610,928	0	82	0	5,824	0	8,943	0	24,384	0	37,443	0	3,515,627	0	223	0	3,515,850
#5	Coal-thermal	3,364,148	1,296,455	0	541	0	5,845	0	8,749	0	24,472	0	36,630	0	2,839,535	0	1,439	0	2,840,974
#6	Coal-thermal	3,987,488	1,553,273	0	518	0	5,834	0	8,749	0	24,426	0	36,630	0	3,395,623	0	1,378	0	3,397,001
Taean #1	Coal-thermal	3,556,797	1,354,832	0	514	0	5,982	0	8,749	0	25,045	0	36,630	0	3,036,946	0	1,367	0	3,038,313
#2	Coal-thermal	4,035,753	1,532,209	0	162	0	5,978	0	8,371	0	25,029	0	35,048	0	3,432,252	0	412	0	3,432,664
#3	Coal-thermal	3,528,613	1,338,967	0	575	0	5,983	0	8,649	0	25,050	0	36,212	0	3,001,886	0	1,512	0	3,003,397
#4	Coal-thermal	4,069,820	1,548,909	0	133	0	5,979	0	8,665	0	25,033	0	36,279	0	3,470,242	0	350	0	3,470,592
#5	Coal-thermal	4,013,235	1,542,775	0	544	0	5,934	0	8,665	0	24,844	0	36,279	0	3,430,484	0	1,433	0	3,431,917
#6	Coal-thermal	3,381,867	1,294,577	0	1,113	0	5,960	0	8,665	0	24,953	0	36,279	0	2,891,208	0	2,931	0	2,894,140
#7	Coal-thermal	159,677	61,910	0	4,799	0	5,965	0	8,558	0	24,974	0	35,831	0	138,381	0	12,484	0	150,865
Hadong #1	Coal-thermal	3,607,063	1,373,049	0	515	0	5,969	0	8,838	0	24,991	0	37,003	0	3,071,092	0	1,384	0	3,072,476
#2	Coal-thermal	4,068,036	1,543,074	0	293	0	5,959	0	8,928	0	24,949	0	37,380	0	3,445,604	0	795	0	3,446,399
#3	Coal-thermal	4,079,158	1,549,094	0	153	0	5,958	0	8,928	0	24,945	0	37,380	0	3,458,466	0	415	0	3,458,881
#4	Coal-thermal	3,631,374	1,376,612	0	796	0	5,969	0	8,825	0	24,991	0	36,949	0	3,079,062	0	2,135	0	3,081,197
#5	Coal-thermal	4,092,625	1,554,524	0	242	0	5,963	0	8,911	0	24,966	0	37,309	0	3,473,502	0	655	0	3,474,157
#6	Coal-thermal	3,610,222	1,371,801	0	690	0	5,967	0	8,901	0	24,983	0	37,267	0	3,067,273	0	1,867	0	3,069,140

*, **, ***: 2006 Statistics of Electric Power in Korea, KEPCO, 2007.5.

Operating Margin for 2006 (continued)

Power plant (m)	Fuel (i) Type	*Net Generation ($EG_{m,y}$) (MWh)	**Fuel consumption ($FC_{i,m,y}$)				***Calorific value (energy content)				Calorific value (energy content) ($CV_{i,y}$)				$FC_{i,m,y}$ * $CV_{i,y}$ * $EF_{CO2,i,y}$				$\sum_i FC_{i,m,y}$ * $CV_{i,y}$ * $EF_{CO2,i,y}$ (tCO_2)
			Bituminous coal (ton)	Heavy oil (kl)	Diesel Oil (kl)	LNG (ton)	Bituminous coal (kcal/kg)	Heavy oil (kcal/l)	Diesel Oil (kcal/l)	LNG (kcal/kg)	Bituminous coal (kJ/kg)	Heavy oil (kJ/l)	Diesel Oil (kJ/l)	LNG (kJ/kg)	Bituminous coal (tCO_2)	Heavy oil (tCO_2)	Diesel Oil (tCO_2)	LNG (tCO_2)	
Dangjin #1	Coal-thermal	3,598,820	1,380,527	0	966	0	5,882	0	8,975	0	24,627	0	37,577	0	3,042,812	0	2,635	0	3,045,448
#2	Coal-thermal	4,115,891	1,570,077	0	161	0	5,906	0	8,978	0	24,727	0	37,589	0	3,474,719	0	439	0	3,475,158
#3	Coal-thermal	3,666,490	1,402,916	0	433	0	5,886	0	9,007	0	24,644	0	37,711	0	3,094,263	0	1,185	0	3,095,448
#4	Coal-thermal	3,610,984	1,386,317	0	1,549	0	5,875	0	9,015	0	24,597	0	37,744	0	3,051,938	0	4,245	0	3,056,182
#5	Coal-thermal	3,946,931	1,456,458	0	745	0	6,046	0	8,955	0	25,313	0	37,493	0	3,299,676	0	2,028	0	3,301,704
#6	Coal-thermal	3,392,395	1,216,582	0	3,051	0	6,120	0	8,895	0	25,623	0	37,242	0	2,789,961	0	8,249	0	2,798,210
#7	Coal-thermal	1,474	1,008	0	505	0	5,818	0	8,984	0	24,359	0	37,614	0	2,198	0	1,379	0	3,577
Ulsan #1	Heavy oil-thermal	275,016	0	72,243	605	0	0	9,915	9,120	0	0	41,512	38,184	0	0	226,421	1,677	0	228,099
#2	Heavy oil-thermal	306,668	0	80,187	469	0	0	9,923	9,120	0	0	41,546	38,184	0	0	251,522	1,300	0	252,822
#3	Heavy oil-thermal	376,132	0	96,459	518	0	0	9,919	9,120	0	0	41,529	38,184	0	0	302,440	1,436	0	303,876
#4	Heavy oil-thermal	1,511,557	0	360,919	3,729	0	0	10,030	9,120	0	0	41,994	38,184	0	0	1,144,300	10,337	0	1,154,637
#5	Heavy oil-thermal	1,583,846	0	375,985	3,678	0	0	10,033	9,120	0	0	42,006	38,184	0	0	1,192,423	10,196	0	1,202,619
#6	Heavy oil-thermal	1,589,838	0	378,331	3,694	0	0	10,035	9,120	0	0	42,015	38,184	0	0	1,200,103	10,240	0	1,210,343
Youngnam #1	Heavy oil-thermal	359,205	0	107,090	1,016	0	0	10,138	8,845	0	0	42,446	37,032	0	0	343,187	2,732	0	345,918
#2	Heavy oil-thermal	323,595	0	95,127	1,494	0	0	10,110	8,862	0	0	42,329	37,103	0	0	304,007	4,024	0	308,032
Yosu #1	Heavy oil-thermal	403,547	0	99,129	281	0	0	9,963	8,798	0	0	41,713	36,835	0	0	312,191	751	0	312,942
#2	Heavy oil-thermal	906,849	0	215,957	291	0	0	9,954	8,796	0	0	41,675	36,827	0	0	679,507	778	0	680,285
Pyongtaek #1	Heavy oil-thermal	1,123,948	0	261,458	141	3,997	0	9,707	8,943	12,941	0	40,641	37,443	54,181	0	802,262	383	11,759	814,404
#2	Heavy oil-thermal	1,198,620	0	277,025	166	5,687	0	9,719	8,943	12,941	0	40,692	37,443	54,181	0	851,079	451	16,731	868,261
#3	Heavy oil-thermal	1,304,568	0	303,858	134	3,891	0	9,747	8,949	12,859	0	40,809	37,468	53,838	0	936,205	365	11,375	947,944
#4	Heavy oil-thermal	1,052,228	0	245,602	103	3,473	0	9,693	8,949	12,963	0	40,583	37,468	54,273	0	752,522	280	10,235	763,037
Namjeju #1	Heavy oil-thermal	34,448	0	11,406	17	0	0	9,908	8,974	0	0	41,483	37,572	0	0	35,723	46	0	35,769
#2	Heavy oil-thermal	28,686	0	9,772	14	0	0	9,908	8,952	0	0	41,483	37,480	0	0	30,605	38	0	30,644
#3	Heavy oil-thermal	179,033	0	46,504	2,509	0	0	9,898	8,938	0	0	41,441	37,422	0	0	145,501	6,816	0	152,318
Jeju #1	Heavy oil-thermal	24,748	0	8,603	23	0	0	9,870	8,873	0	0	41,324	37,149	0	0	26,841	62	0	26,903
#2	Heavy oil-thermal	462,023	0	113,679	64	0	0	9,952	8,973	0	0	41,667	37,568	0	0	357,618	175	0	357,793
#3	Heavy oil-thermal	479,676	0	117,464	67	0	0	9,953	8,973	0	0	41,671	37,568	0	0	369,563	183	0	369,745
Seoul #4	Gas-thermal	306,558	0	0	1	69,383	0		9,070	13,018	0	0	37,974	54,504	0	0	3	205,343	205,346
#5	Gas-thermal	685,011	0	0	1	152,891	0		9,070	12,882	0	0	37,974	53,934	0	0	3	447,762	447,765

*, **, ***: 2006 Statistics of Electric Power in Korea, KEPCO, 2007.5.

Operating Margin for 2006

Power plant (m)	Fuel (i) Type	*Net Generation ($EG_{m,y}$) (MWh)	**Fuel consumption ($FC_{i,m,y}$)				***Calorific value (energy content)				Calorific value (energy content) ($CV_{i,y}$)				$FC_{i,m,y} * CV_{i,y} * EF_{CO2,i,y}$				$\sum_i FC_{i,m,y} * CV_{i,y} * EF_{CO2,i,y}$ (tCO_2)
			Bituminous coal (ton)	Heavy oil (kl)	Diesel Oil (kl)	LNG (ton)	Bituminous coal (kcal/kg)	Heavy oil (kcal/l)	Diesel Oil (kcal/l)	LNG (kcal/kg)	Bituminous coal (kJ/kg)	Heavy oil (kJ/l)	Diesel Oil (kJ/l)	LNG (kJ/kg)	Bituminous coal (tCO_2)	Heavy oil (tCO_2)	Diesel Oil (tCO_2)	LNG (tCO_2)	
Incheon #1	Gas-thermal	32,932	0	0	0	6,945	0		0	13,036	0	0	0	54,579	0	0	0	20,583	20,583
#2	Gas-thermal	24,366	0	0	0	5,223	0		0	13,028	0	0	0	54,546	0	0	0	15,470	15,470
#3	Gas-thermal	78,669	0	0	311	15,426	0		8,982	13,018	0	0	37,606	54,504	0	0	849	45,654	46,503
#4	Gas-thermal	62,414	0	0	311	12,454	0		8,981	13,024	0	0	37,602	54,529	0	0	849	36,875	37,724
Namjeju D/P	Internal combustion	239,690	0	51,347	111	0	0	10,246	8,907	0	0	42,898	37,292	0	0	166,302	301	0	166,603
Jeju G/T	Internal combustion	15,986	0	0	8,264	0	0	0	8,792	0	0	0	36,810	0	0	0	22,085	0	22,085
Jeju D/P	Internal combustion	252,764	0	52,907	0	0	0	9,617	0	0	0	40,264	0	0	0	160,836	0	0	160,836
Pyongtaek C/C	Combined cycle	497,441	0	0	45	84,054	0	0	8,950	13,030	0	0	37,472	54,554	0	0	122	248,992	249,114
Ilsan C/C	Combined cycle	3,038,165	0	0	1,384	556,504	0	0	8,989	13,017	0	0	37,635	54,500	0	0	3,782	1,646,877	1,650,659
Bundang C/C	Combined cycle	4,059,300	0	0	0	720,381	0	0	0	13,025	0	0	0	54,533	0	0	0	2,133,153	2,133,153
Ulsan C/C	Combined cycle	3,608,435	0	0	0	536,196	0	0	0	12,646	0	0	0	52,946	0	0	0	1,541,554	1,541,554
Seoincheon C/C	Combined cycle	8,726,521	0	0	1,066	1,199,196	0	0	9,200	13,025	0	0	38,519	54,533	0	0	2,981	3,550,994	3,553,975
Shinincheon C/C	Combined cycle	11,797,500	0	0	0	1,641,038	0	0	0	13,025	0	0	0	54,533	0	0	0	4,859,353	4,859,353
Boryeong C/C	Combined cycle	7,089,662	0	0	0	998,683	0	0	0	13,034	0	0	0	54,571	0	0	0	2,959,289	2,959,289
Incheon C/C	Combined cycle	3,648,288	0	0	0	484,606	0	0	0	12,998	0	0	0	54,420	0	0	0	1,432,014	1,432,014
Busan C/C	Combined cycle	10,455,401	0	0	0	1,396,417	0	0	0	13,017	0	0	0	54,500	0	0	0	4,132,454	4,132,454
Hallim C/C	Combined cycle	175,356	0	0	48,475	0	0	0	8,954	0	0	0	37,489	0	0	0	131,933	0	131,933
GS Anyang C/C	Combined cycle	1,286,480	0	0	0	230,969	0	0	0	13,028	0	0	0	54,546	0	0	0	684,090	684,090
GS Bucheon C/C	Combined cycle	1,241,795	0	0	215	225,713	0	0	10,927	13,013	0	0	45,749	54,483	0	0	714	667,753	668,467
POSCO Power	Combined cycle	2,338,128	0	0	0	408,018	0	0	0	13,031	0	0	0	54,558	0	0	0	1,208,757	1,208,757
GS EPS Bugog	Combined cycle	2,911,683	0	0	0	389,811	0	0	0	13,030	0	0	0	54,554	0	0	0	1,154,730	1,154,730
Yulchon C/C	Combined cycle	2,276,276	0	0	0	315,132	0	0	0	13,376	0	0	0	56,003	0	0	0	958,299	958,299
	$\Sigma_m EG_{m,y}$=	**206,605,295**																$\sum_{i,m} FC_{i,m,y} \cdot CV_{i,y} \cdot EF_{CO2,i,y}$=	**149,156,959**

*, **, ***: 2006 Statistics of Electric Power in Korea, KEPCO, 2007.5.

$$EF_{grid,OMsimple,y} = \Sigma_{i,m} FC_{i,m,y} * CV_{i,y} * EF_{CO2,i,y} / \Sigma_m EG_{m,y} = \mathbf{0.7219}$$

Operating Margin for 2005(continued)

Plant (m)	Fuel (i) Type	*Net Generation ($EG_{m,y}$) (MWh)	**Fuel consumption ($FC_{i,m,y}$)				***Calorific value (energy content)				Calorific value (energy content) ($CV_{i,y}$)				$FC_{i,m,y} * CV_{i,y} * EF_{CO2,i,y}$				$\sum_i FC_{i,m,y} * CV_{i,y} * EF_{CO2,i,y}$ (tCO_2)
			Bituminous coal (ton)	Heavy oil (kl)	Diesel Oil (kl)	LNG (ton)	Bituminous coal (kcal/kg)	Heavy oil (kcal/l)	Diesel Oil (kcal/l)	LNG (kcal/kg)	Bituminous coal (kJ/kg)	Heavy oil (kJ/l)	Diesel Oil (kJ/l)	LNG (kJ/kg)	Bituminous coal (tCO_2)	Heavy oil (tCO_2)	Diesel Oil (tCO_2)	LNG (tCO_2)	
Honam #1	Coal-thermal	1,787,715	870,214	961	278	0	5,392	9,835	8,809	0	22,575	41,177	36,882	0	1,758,252	2,988	744	0	1,761,984
#2	Coal-thermal	1,875,790	912,497	338	185	0	5,376	9,854	8,804	0	22,508	41,257	36,861	0	1,838,214	1,053	495	0	1,839,761
Samchonpo #1	Coal-thermal	3,810,079	1,534,223	0	1,220	0	5,913	0	8,841	0	24,757	0	37,015	0	3,399,395	0	3,279	0	3,402,673
#2	Coal-thermal	4,323,618	1,731,265	0	626	0	5,924	0	8,883	0	24,803	0	37,191	0	3,843,119	0	1,690	0	3,844,809
#3	Coal-thermal	4,343,666	1,723,152	0	377	0	5,897	0	9,000	0	24,690	0	37,681	0	3,807,676	0	1,031	0	3,808,707
#4	Coal-thermal	4,112,297	1,632,334	0	1,029	0	5,898	0	8,943	0	24,694	0	37,443	0	3,607,606	0	2,797	0	3,610,403
#5	Coal-thermal	3,542,728	1,516,654	0	1,415	0	5,347	0	8,614	0	22,387	0	36,065	0	3,038,799	0	3,705	0	3,042,504
#6	Coal-thermal	3,643,969	1,546,663	0	1,001	0	5,376	0	9,000	0	22,508	0	37,681	0	3,115,733	0	2,738	0	3,118,471
Yongheng #1	Coal-thermal	5,623,299	2,081,972	0	4,541	0	6,131	0	8,935	0	25,669	0	37,409	0	4,783,122	0	12,333	0	4,795,455
#2	Coal-thermal	4,658,862	1,761,395	0	2,903	0	6,053	0	8,947	0	25,343	0	37,459	0	3,995,146	0	7,895	0	4,003,041
Boryeong #1	Coal-thermal	3,547,140	1,440,343	0	761	0	5,830	0	8,943	0	24,409	0	37,443	0	3,146,587	0	2,069	0	3,148,656
#2	Coal-thermal	3,433,608	1,388,532	0	551	0	5,816	0	8,943	0	24,350	0	37,443	0	3,026,116	0	1,498	0	3,027,614
#3	Coal-thermal	4,124,745	1,589,150	0	90	0	5,882	0	8,740	0	24,627	0	36,593	0	3,502,637	0	239	0	3,502,876
#4	Coal-thermal	3,698,705	1,421,343	0	603	0	5,890	0	8,748	0	24,660	0	36,626	0	3,137,036	0	1,603	0	3,138,639
#5	Coal-thermal	4,121,314	1,587,999	0	156	0	5,882	0	8,749	0	24,627	0	36,630	0	3,500,100	0	415	0	3,500,515
#6	Coal-thermal	3,283,477	1,260,305	0	627	0	5,901	0	8,749	0	24,706	0	36,630	0	2,786,805	0	1,667	0	2,788,472
Taean #1	Coal-thermal	3,992,112	1,508,570	0	621	0	6,000	0	8,692	0	25,121	0	36,392	0	3,391,735	0	1,641	0	3,393,376
#2	Coal-thermal	3,484,251	1,323,078	0	395	0	6,009	0	8,684	0	25,158	0	36,358	0	2,979,154	0	1,043	0	2,980,196
#3	Coal-thermal	3,957,054	1,494,175	0	650	0	6,007	0	8,676	0	25,150	0	36,325	0	3,363,290	0	1,714	0	3,365,004
#4	Coal-thermal	3,653,534	1,383,297	0	365	0	5,999	0	8,705	0	25,117	0	36,446	0	3,109,564	0	966	0	3,110,530
#5	Coal-thermal	3,744,413	1,411,398	0	742	0	6,032	0	8,676	0	25,255	0	36,325	0	3,190,187	0	1,957	0	3,192,143
#6	Coal-thermal	3,999,847	1,504,962	0	417	0	6,017	0	8,691	0	25,192	0	36,387	0	3,393,210	0	1,102	0	3,394,312
Hadong #1	Coal-thermal	3,997,914	1,513,930	0	284	0	6,003	0	8,940	0	25,133	0	37,430	0	3,405,488	0	772	0	3,406,260
#2	Coal-thermal	3,732,583	1,410,099	0	792	0	5,997	0	8,928	0	25,108	0	37,380	0	3,168,757	0	2,149	0	3,170,906
#3	Coal-thermal	3,769,077	1,422,196	0	472	0	5,998	0	8,982	0	25,112	0	37,606	0	3,196,474	0	1,289	0	3,197,763
#4	Coal-thermal	3,989,315	1,511,054	0	567	0	5,999	0	8,938	0	25,117	0	37,422	0	3,396,754	0	1,540	0	3,398,294
#5	Coal-thermal	3,553,901	1,345,648	0	614	0	5,995	0	8,975	0	25,100	0	37,577	0	3,022,915	0	1,675	0	3,024,590
#6	Coal-thermal	4,037,763	1,520,774	0	331	0	5,995	0	8,928	0	25,100	0	37,380	0	3,416,325	0	898	0	3,417,223

*, **, ***: 2005 Statistics of Electric Power in Korea, KEPCO, 2006.5.

Operating Margin for 2005(continued)

Plant (m)	Fuel (i) Type	*Net Generation ($EG_{m,y}$) (MWh)	**Fuel consumption ($FC_{i,m,y}$)				***Calorific value (energy content)				Calorific value (energy content) ($CV_{i,y}$)				$FC_{i,m,y} * CV_{i,y} * EF_{CO2,i,y}$				$\sum_i FC_{i,m,y} * CV_{i,y} * EF_{CO2,i,y}$ (tCO_2)
			Bituminous coal (ton)	Heavy oil (kl)	Diesel Oil (kl)	LNG (ton)	Bituminous coal (kcal/kg)	Heavy oil (kcal/l)	Diesel Oil (kcal/l)	LNG (kcal/kg)	Bituminous coal (kJ/kg)	Heavy oil (kJ/l)	Diesel Oil (kJ/l)	LNG (kJ/kg)	Bituminous coal (tCO_2)	Heavy oil (tCO_2)	Diesel Oil (tCO_2)	LNG (tCO_2)	
Dangjin #1	Coal-thermal	3,797,307	1,438,702	0	637	0	5,962	0	8,834	0	24,962	0	36,986	0	3,214,164	0	1,710	0	3,215,875
#2	Coal-thermal	3,798,078	1,437,473	0	632	0	5,962	0	8,915	0	24,962	0	37,325	0	3,211,419	0	1,713	0	3,213,131
#3	Coal-thermal	4,081,017	1,549,041	0	141	0	5,935	0	8,844	0	24,849	0	37,028	0	3,444,997	0	379	0	3,445,376
#4	Coal-thermal	4,079,557	1,544,010	0	134	0	5,941	0	8,828	0	24,874	0	36,961	0	3,437,280	0	360	0	3,437,640
#5	Coal-thermal	1,318,670	499,714	0	5,701	0	6,115	0	8,904	0	25,602	0	37,279	0	1,145,047	0	15,430	0	1,160,476
#6	Coal-thermal	96,365	38,671	0	1,779	0	6,221	0	11,095	0	26,046	0	46,453	0	90,147	0	6,000	0	96,147
Ulsan #1	Heavy oil-thermal	262,393	0	70,183	750	0	0	9,900	9,116	0	0	41,449	38,167	0	0	219,632	2,078	0	221,711
#2	Heavy oil-thermal	255,812	0	67,296	585	0	0	9,903	9,113	0	0	41,462	38,154	0	0	210,662	1,620	0	212,282
#3	Heavy oil-thermal	200,518	0	53,085	662	0	0	9,908	9,119	0	0	41,483	38,179	0	0	166,260	1,835	0	168,095
#4	Heavy oil-thermal	1,549,091	0	375,417	1,971	0	0	10,001	9,122	0	0	41,872	38,192	0	0	1,186,825	5,465	0	1,192,290
#5	Heavy oil-thermal	1,500,935	0	363,992	1,676	0	0	9,993	9,122	0	0	41,839	38,192	0	0	1,149,786	4,647	0	1,154,433
#6	Heavy oil-thermal	1,454,644	0	352,776	1,708	0	0	9,979	9,118	0	0	41,780	38,175	0	0	1,112,795	4,734	0	1,117,529
Youngnam #1	Heavy oil-thermal	1,022,470	0	359,910	844	0	0	7,482	8,942	0	0	31,326	37,438	0	0	851,218	2,294	0	853,512
#2	Heavy oil-thermal	531,006	0	190,085	584	0	0	7,729	8,943	0	0	32,360	37,443	0	0	464,409	1,588	0	465,996
Yosu #1	Heavy oil-thermal	430,310	0	106,919	434	0	0	9,960	8,887	0	0	41,701	37,208	0	0	336,623	1,172	0	337,795
#2	Heavy oil-thermal	904,597	0	218,356	346	0	0	9,944	8,886	0	0	41,634	37,204	0	0	686,365	935	0	687,300
Pyongtaek #1	Heavy oil-thermal	1,258,662	0	293,214	118	3,553	0	9,903	8,943	12,898	0	41,462	37,443	54,001	0	917,869	321	10,418	928,608
#2	Heavy oil-thermal	1,376,342	0	321,188	140	2,641	0	9,905	8,961	12,872	0	41,470	37,518	53,892	0	1,005,641	381	7,729	1,013,751
#3	Heavy oil-thermal	1,321,167	0	308,042	132	1,784	0	9,907	8,949	12,942	0	41,479	37,468	54,186	0	964,676	359	5,249	970,284
#4	Heavy oil-thermal	1,338,204	0	311,245	138	2,047	0	9,909	8,949	12,893	0	41,487	37,468	53,980	0	974,903	375	6,000	981,278
Namjeju #1	Heavy oil-thermal	44,602	0	14,628	15	0	0	9,878	9,318	0	0	41,357	39,013	0	0	45,675	42	0	45,718
#2	Heavy oil-thermal	44,654	0	15,031	12	0	0	9,879	9,307	0	0	41,361	38,967	0	0	46,939	34	0	46,973
Jeju #1	Heavy oil-thermal	36,266	0	12,564	12	0	0	9,932	8,885	0	0	41,583	37,200	0	0	39,445	32	0	39,478
#2	Heavy oil-thermal	532,700	0	129,516	0	0	0	9,929	0	0	0	41,571	0	0	0	406,498	0	0	406,498
#3	Heavy oil-thermal	502,189	0	122,866	48	0	0	9,925	8,938	0	0	41,554	37,422	0	0	385,471	130	0	385,601
Seoul #4	Gas-thermal	207,498	0	0	0	49,143	0	0	0	13,002	0	0	0	54,437	0	0	0	145,263	145,263
#5	Gas-thermal	444,324	0	0	1	108,761	0	0	9,070	13,008	0	0	37,974	54,462	0	0	3	321,637	321,640

*, **, ***: 2005 Statistics of Electric Power in Korea, KEPCO, 2006.5.

Operating Margin for 2005

Plant (m)	Fuel (i) Type	*Net Generation ($EG_{m,y}$) (MWh)	**Fuel consumption ($FC_{i,m,y}$)				***Calorific value (energy content)				Calorific value (energy content) ($CV_{i,y}$)				$FC_{i,m,y} * CV_{i,y} * EF_{CO2,i,y}$				$\sum_i FC_{i,m,y} * CV_{i,y} * EF_{CO2,i,y}$ (tCO_2)
			Bituminous coal (ton)	Heavy oil (kl)	Diesel Oil (kl)	LNG (ton)	Bituminous coal (kcal/kg)	Heavy oil (kcal/l)	Diesel Oil (kcal/l)	LNG (kcal/kg)	Bituminous coal (kJ/kg)	Heavy oil (kJ/l)	Diesel Oil (kJ/l)	LNG (kJ/kg)	Bituminous coal (tCO_2)	Heavy oil (tCO_2)	Diesel Oil (tCO_2)	LNG (tCO_2)	
Incheon #1	Gas-thermal	16,450	0	0	0	4,365	0	0	0	13,032	0	0	0	54,562	0	0	0	12,932	12,932
#2	Gas-thermal	37,727	0	0	0	8,505	0	0	0	13,025	0	0	0	54,533	0	0	0	25,185	25,185
#4	Gas-thermal	29,202	0	0	400	6,620	0	0	8,954	13,026	0	0	37,489	54,537	0	0	1,089	19,604	20,693
Namjeju D/P	Internal combustion	268,073	0	56,727	37	0	0	9,877	8,975	0	0	41,353	37,577	0	0	177,110	101	0	177,211
Jeju G/T	Internal combustion	5,069	0	0	2,869	0	0	0	8,919	0	0	0	37,342	0	0	0	7,778	0	7,778
Jeju D/P	Internal combustion	151,759	0	31,808	72	0	0	9,932	8,954	0	0	41,583	37,489	0	0	99,862	196	0	100,058
Pyongtaek C/C	Combined cycle	659,932	0	0	1	110,953	0	0	8,950	13,030	0	0	37,472	54,554	0	0	3	328,674	328,677
Ilsan C/C	Combined cycle	2,873,958	0	0	0	533,188	0	0	0	13,011	0	0	0	54,474	0	0	0	1,577,150	1,577,150
Bundang C/C	Combined cycle	3,742,073	0	0	0	671,994	0	0	0	13,025	0	0	0	54,533	0	0	0	1,989,872	1,989,872
Ulsan C/C	Combined cycle	3,131,075	0	0	0	470,131	0	0	0	12,750	0	0	0	53,382	0	0	0	1,362,734	1,362,734
Seoincheon C/C	Combined cycle	7,001,031	0	0	335	989,645	0	0	9,200	13,009	0	0	38,519	54,466	0	0	937	2,926,883	2,927,820
Shinincheon C/C	Combined cycle	10,543,280	0	0	0	1,458,815	0	0	0	13,013	0	0	0	54,483	0	0	0	4,315,784	4,315,784
Boryeong C/C	Combined cycle	8,221,926	0	0	0	1,161,510	0	0	0	13,030	0	0	0	54,554	0	0	0	3,440,721	3,440,721
Incheon C/C	Combined cycle	2,055,016	0	0	0	281,813	0	0	0	13,012	0	0	0	54,479	0	0	0	833,656	833,656
Busan C/C	Combined cycle	9,076,327	0	0	0	1,211,117	0	0	0	13,000	0	0	0	54,428	0	0	0	3,579,410	3,579,410
Hallim C/C	Combined cycle	100,346	0	0	29,686	0	0	0	8,973	0	0	0	37,568	0	0	0	80,967	0	80,967
GS Anyang C/C	Combined cycle	1,433,978	0	0	0	261,202	0	0	0	13,025	0	0	0	54,533	0	0	0	773,457	773,457
GS Bucheon C/C	Combined cycle	1,404,160	0	0	0	261,705	0	0	0	13,003	0	0	0	54,441	0	0	0	773,638	773,638
POSCO Power	Combined cycle	2,571,095	0	0	0	445,253	0	0	0	13,024	0	0	0	54,529	0	0	0	1,318,358	1,318,358
GS EPS Bugog	Combined cycle	2,189,808	0	0	0	297,976	0	0	0	13,756	0	0	0	57,594	0	0	0	931,870	931,870
Yulchon C/C	Combined cycle	1,300,627	0	0	159	194,534	0	0	10,930	13,023	0	0	45,762	54,525	0	0	528	575,955	576,483
	$\Sigma_m EG_{m,y}$ =	**195,045,066**																**$\Sigma_{i,m} FC_{i,m,y} * CV_{i,y} * EF_{CO2,i,y}$ =**	**142,804,311**

*, **, ***: 2005 Statistics of Electric Power in Korea, KEPCO, 2006.5.

$$EF_{grid,OMsimple,y} = \Sigma_{i,m} FC_{i,m,y} * CV_{i,y} * EF_{CO2,i,y} / \Sigma_m EG_{m,y} = \mathbf{0.7322}$$

Operating Margin for 2004(continued)

Plant (m)	Fuel (i) Type	*Net Generation ($EG_{m,y}$) (MWh)	**Fuel consumption ($FC_{i,m,y}$)				***Calorific value (energy content)				Calorific value (energy content) ($CV_{i,y}$)				$FC_{i,m,y} * CV_{i,y} * EF_{CO2,i,y}$				$\sum_i FC_{i,m,y} * CV_{i,y} * EF_{CO2,i,y}$ (tCO_2)
			Bituminous coal (ton)	Heavy oil (kl)	Diesel Oil (kl)	LNG (ton)	Bituminous coal (kcal/kg)	Heavy oil (kcal/l)	Diesel Oil (kcal/l)	LNG (kcal/kg)	Bituminous coal (kJ/kg)	Heavy oil (kJ/l)	Diesel Oil (kJ/l)	LNG (kJ/kg)	Bituminous coal (tCO_2)	Heavy oil (tCO_2)	Diesel Oil (tCO_2)	LNG (tCO_2)	
Honam #1	Coal-thermal	1,855,554	885,758	606	300	0	5,493	9,814	8,848	0	22,998	41,089	37,045	0	1,823,182	1,880	807	0	1,825,868
#2	Coal-thermal	1,625,399	783,300	1,714	335	0	5,430	9,817	8,850	0	22,734	41,102	37,053	0	1,593,798	5,319	901	0	1,600,018
Samchonpo #1	Coal-thermal	3,974,202	1,624,500	0	1,674	0	5,527	0	9,012	0	23,140	0	37,731	0	3,364,453	0	4,586	0	3,369,038
#2	Coal-thermal	3,839,080	1,564,986	0	744	0	6,275	0	9,010	0	26,272	0	37,723	0	3,679,844	0	2,038	0	3,681,882
#3	Coal-thermal	3,652,769	1,467,177	0	814	0	6,530	0	9,006	0	27,340	0	37,706	0	3,590,054	0	2,228	0	3,592,282
#4	Coal-thermal	3,811,371	1,538,768	0	785	0	6,507	0	9,004	0	27,244	0	37,698	0	3,751,969	0	2,148	0	3,754,117
#5	Coal-thermal	4,147,957	1,707,777	0	230	0	4,829	0	9,000	0	20,218	0	37,681	0	3,090,250	0	629	0	3,090,879
#6	Coal-thermal	4,185,213	1,734,977	0	652	0	4,773	0	9,000	0	19,984	0	37,681	0	3,103,062	0	1,784	0	3,104,845
Yongheng #1	Coal-thermal	2,986,382	1,114,254	0	27,916	0	5,892	0	8,927	0	24,669	0	37,376	0	2,460,097	0	75,749	0	2,535,846
#2	Coal-thermal	1,172,450	459,217	0	18,314	0	5,852	0	8,720	0	24,501	0	36,509	0	1,006,995	0	48,542	0	1,055,538
Boryeong #1	Coal-thermal	4,014,109	1,599,557	0	311	0	5,924	0	8,770	0	24,803	0	36,718	0	3,550,749	0	829	0	3,551,578
#2	Coal-thermal	3,915,285	1,555,055	0	616	0	5,922	0	8,910	0	24,794	0	37,304	0	3,450,797	0	1,668	0	3,452,465
#3	Coal-thermal	3,746,265	1,427,263	0	574	0	5,943	0	8,749	0	24,882	0	36,630	0	3,178,447	0	1,526	0	3,179,974
#4	Coal-thermal	4,097,489	1,560,014	0	179	0	5,945	0	8,749	0	24,891	0	36,630	0	3,475,246	0	476	0	3,475,722
#5	Coal-thermal	3,660,240	1,397,343	0	422	0	5,931	0	8,749	0	24,832	0	36,630	0	3,105,533	0	1,122	0	3,106,656
#6	Coal-thermal	4,093,207	1,559,785	0	350	0	5,937	0	8,749	0	24,857	0	36,630	0	3,470,060	0	931	0	3,470,991
Taean #1	Coal-thermal	3,780,097	1,438,094	0	999	0	5,980	0	8,765	0	25,037	0	36,697	0	3,222,506	0	2,662	0	3,225,167
#2	Coal-thermal	3,975,123	1,509,379	0	310	0	5,977	0	8,699	0	25,025	0	36,421	0	3,380,546	0	820	0	3,381,365
#3	Coal-thermal	3,732,363	1,415,585	0	390	0	5,975	0	9,004	0	25,016	0	37,698	0	3,169,415	0	1,067	0	3,170,482
#4	Coal-thermal	4,048,258	1,539,502	0	254	0	5,967	0	8,721	0	24,983	0	36,513	0	3,442,243	0	673	0	3,442,916
#5	Coal-thermal	4,091,406	1,547,217	0	329	0	5,996	0	8,912	0	25,104	0	37,313	0	3,476,307	0	891	0	3,477,198
#6	Coal-thermal	4,056,835	1,531,751	0	230	0	5,996	0	8,804	0	25,104	0	36,861	0	3,441,558	0	615	0	3,442,173
Hadong #1	Coal-thermal	3,688,313	1,389,739	0	533	0	6,032	0	9,002	0	25,255	0	37,690	0	3,141,231	0	1,458	0	3,142,689
#2	Coal-thermal	4,028,529	1,515,681	0	145	0	6,025	0	8,975	0	25,225	0	37,577	0	3,421,922	0	396	0	3,422,318
#3	Coal-thermal	3,997,064	1,501,027	0	670	0	6,046	0	8,983	0	25,313	0	37,610	0	3,400,650	0	1,829	0	3,402,479
#4	Coal-thermal	3,724,757	1,397,482	0	737	0	6,097	0	8,993	0	25,527	0	37,652	0	3,192,770	0	2,015	0	3,194,785
#5	Coal-thermal	4,013,845	1,501,672	0	318	0	5,982	0	8,983	0	25,045	0	37,610	0	3,366,098	0	868	0	3,366,966
#6	Coal-thermal	3,685,698	1,379,396	0	689	0	5,935	0	8,983	0	24,849	0	37,610	0	3,067,714	0	1,881	0	3,069,596

*, **, ***: 2004 Statistics of Electric Power in Korea, KEPCO, 2005.5.

Operating Margin for 2004 (continued)

Plant (m)	Fuel (i) Type	*Net Generation ($EG_{m,y}$) (MWh)	**Fuel consumption ($FC_{i,m,y}$)				***Calorific value (energy content)				Calorific value (energy content) ($CV_{i,y}$)				$FC_{i,m,y} * CV_{i,y} * EF_{CO2,i,y}$				$\sum_i FC_{i,m,y} * CV_{i,y} * EF_{CO2,i,y}$ (tCO_2)
			Bituminous coal (ton)	Heavy oil (kl)	Diesel Oil (kl)	LNG (ton)	Bituminous coal (kcal/kg)	Heavy oil (kcal/l)	Diesel Oil (kcal/l)	LNG (kcal/kg)	Bituminous coal (kJ/kg)	Heavy oil (kJ/l)	Diesel Oil (kJ/l)	LNG (kJ/kg)	Bituminous coal (tCO_2)	Heavy oil (tCO_2)	Diesel Oil (tCO_2)	LNG (tCO_2)	
Dangjin #1	Coal-thermal	3,986,406	1,502,885	0	294	0	6,011	0	8,880	0	25,167	0	37,179	0	3,385,149	0	794	0	3,385,942
#2	Coal-thermal	4,038,457	1,523,605	0	211	0	6,000	0	8,889	0	25,121	0	37,216	0	3,425,539	0	570	0	3,426,109
#3	Coal-thermal	3,711,787	1,404,465	0	605	0	5,976	0	8,897	0	25,020	0	37,250	0	3,145,044	0	1,636	0	3,146,680
#4	Coal-thermal	3,801,495	1,434,844	0	528	0	5,966	0	8,898	0	24,978	0	37,254	0	3,207,696	0	1,428	0	3,209,124
Ulsan #1	Heavy oil-thermal	271,544	0	73,408	114	0	0	9,893	9,010	0	0	41,420	37,723	0	0	229,562	312	0	229,875
#2	Heavy oil-thermal	244,246	0	65,316	82	0	0	9,901	9,010	0	0	41,454	37,723	0	0	204,422	225	0	204,647
#3	Heavy oil-thermal	268,231	0	71,305	554	0	0	9,896	9,010	0	0	41,433	37,723	0	0	223,053	1,517	0	224,571
#4	Heavy oil-thermal	1,759,376	0	420,739	1,238	0	0	9,972	9,120	0	0	41,751	38,184	0	0	1,326,246	3,432	0	1,329,678
#5	Heavy oil-thermal	2,141,162	0	513,497	931	0	0	9,963	9,120	0	0	41,713	38,184	0	0	1,617,176	2,581	0	1,619,757
#6	Heavy oil-thermal	2,196,344	0	527,083	1,603	0	0	9,959	9,120	0	0	41,696	38,184	0	0	1,659,296	4,444	0	1,663,740
Youngnam #1	Heavy oil-thermal	973,872	0	347,107	837	0	0	7,432	8,865	0	0	31,116	37,116	0	0	815,452	2,255	0	817,707
#2	Heavy oil-thermal	665,973	0	248,049	274	0	0	7,679	8,876	0	0	32,150	37,162	0	0	602,104	739	0	602,843
Yosu #1	Heavy oil-thermal	723,968	0	181,712	571	0	0	10,011	8,924	0	0	41,914	37,363	0	0	575,030	1,549	0	576,579
#2	Heavy oil-thermal	1,304,109	0	316,523	436	0	0	10,009	8,956	0	0	41,906	37,497	0	0	1,001,440	1,187	0	1,002,627
Pyongtaek #1	Heavy oil-thermal	850,533	0	204,664	247	2,095	0	9,877	8,917	12,920	0	41,353	37,334	54,093	0	638,992	669	6,154	645,815
#2	Heavy oil-thermal	880,646	0	209,664	232	2,515	0	9,879	8,941	12,907	0	41,361	37,434	54,039	0	654,736	631	7,380	662,746
#3	Heavy oil-thermal	751,633	0	179,921	240	3,791	0	9,902	8,907	12,910	0	41,458	37,292	54,052	0	563,163	650	11,127	574,939
#4	Heavy oil-thermal	800,854	0	192,294	225	3,217	0	9,903	8,915	12,956	0	41,462	37,325	54,244	0	601,952	610	9,476	612,037
Namjeju #1	Heavy oil-thermal	50,294	0	16,510	6	0	0	9,900	9,333	0	0	41,449	39,075	0	0	51,667	17	0	51,684
#2	Heavy oil-thermal	48,714	0	16,040	13	0	0	9,901	8,846	0	0	41,454	37,036	0	0	50,201	35	0	50,236
Jeju #1	Heavy oil-thermal	44,659	0	15,306	7	0	0	9,897	8,961	0	0	41,437	37,518	0	0	47,884	19	0	47,904
#2	Heavy oil-thermal	486,401	0	118,473	73	0	0	9,912	8,936	0	0	41,500	37,413	0	0	371,202	198	0	371,400
#3	Heavy oil-thermal	509,330	0	124,160	41	0	0	9,919	8,928	0	0	41,529	37,380	0	0	389,295	111	0	389,406
Seoul #4	Gas-thermal	90,322	0	0	1	22,409	0	0	9,070	13,011	0	0	37,974	54,474	0	0	3	66,285	66,288
#5	Gas-thermal	480,919	0	0	3	117,908	0	0	9,070	13,014	0	0	37,974	54,487	0	0	8	348,848	348,856

*, **, ***: 2004 Statistics of Electric Power in Korea, KEPCO, 2005.5.

Operating Margin for 2004

Plant (m)	Fuel (i) Type	*Net Generation ($EG_{m,y}$) (MWh)	**Fuel consumption ($FC_{i,m,y}$)				***Calorific value (energy content)				Calorific value (energy content) ($CV_{i,y}$)				$FC_{i,m,y} * CV_{i,y} * EF_{CO2,i,y}$				$\sum_i FC_{i,m,y} * CV_{i,y} * EF_{CO2,i,y}$ (tCO_2)
			Bituminous coal (ton)	Heavy oil (kl)	Diesel Oil (kl)	LNG (ton)	Bituminous coal (kcal/kg)	Heavy oil (kcal/l)	Diesel Oil (kcal/l)	LNG (kcal/kg)	Bituminous coal (kJ/kg)	Heavy oil (kJ/l)	Diesel Oil (kJ/l)	LNG (kJ/kg)	Bituminous coal (tCO_2)	Heavy oil (tCO_2)	Diesel Oil (tCO_2)	LNG (tCO_2)	
Incheon #1	Gas-thermal	47,491	0	0	0	10,523	0	0	0	13,038	0	0	0	54,587	0	0	0	31,191	31,191
#2	Gas-thermal	49,144	0	0	0	11,094	0	0	0	13,039	0	0	0	54,592	0	0	0	32,886	32,886
#3	Gas-thermal	19,018	0	0	149	4,235	0	0	8,951	13,038	0	0	37,476	54,587	0	0	405	12,553	12,958
Namjeju D/P	Internal combustion	274,089	0	57,808	80	0	0	9,901	8,867	0	0	41,454	37,124	0	0	180,924	216	0	181,140
Jeju G/T	Internal combustion	3,016	0	0	2,232	0	0	0	8,948	0	0	0	37,463	0	0	0	6,071	0	6,071
Pyongtaek C/C	Combined cycle	596,001	0	0	21	98,846	0	0	8,758	13,033	0	0	36,668	54,567	0	0	56	292,877	292,933
Ilsan C/C	Combined cycle	3,281,407	0	0	0	593,548	0	0	0	13,017	0	0	0	54,500	0	0	0	1,756,503	1,756,503
Bundang C/C	Combined cycle	3,650,122	0	0	0	653,880	0	0	0	13,026	0	0	0	54,537	0	0	0	1,936,383	1,936,383
Ulsan C/C	Combined cycle	2,329,524	0	0	0	347,076	0	0	0	12,920	0	0	0	54,093	0	0	0	1,019,458	1,019,458
Seoincheon C/C	Combined cycle	8,353,619	0	0	88	1,209,806	0	0	9,211	13,010	0	0	38,565	54,470	0	0	246	3,578,286	3,578,533
Shinincheon C/C	Combined cycle	11,596,955	0	0	0	1,587,638	0	0	0	13,017	0	0	0	54,500	0	0	0	4,698,340	4,698,340
Boryeong C/C	Combined cycle	6,979,928	0	0	0	988,548	0	0	0	13,025	0	0	0	54,533	0	0	0	2,927,235	2,927,235
Busan C/C	Combined cycle	9,884,075	0	0	2,687	1,298,418	0	0	9,250	13,004	0	0	38,728	54,445	0	0	7,555	3,838,606	3,846,161
Hallim C/C	Combined cycle	96,435	0	0	28,796	0	0	0	8,972	0	0	0	37,564	0	0	0	78,531	0	78,531
GS Anyang C/C	Combined cycle	1,506,070	0	0	0	270,559	0	0	0	13,025	0	0	0	54,533	0	0	0	801,165	801,165
GS Bucheon C/C	Combined cycle	1,425,073	0	0	0	258,596	0	0	0	13,013	0	0	0	54,483	0	0	0	765,035	765,035
KIE Co.	Combined cycle	2,809,983	0	0	0	467,583	0	0	0	13,023	0	0	0	54,525	0	0	0	1,384,369	1,384,369
GS EPS Bugog	Combined cycle	1,894,996	0	0	0	260,653	0	0	0	13,028	0	0	0	54,546	0	0	0	772,009	772,009
Yulchon C/C	Combined cycle	36,366	0	0	596	7,388	0	0	11,731	13,014	0	0	49,115	54,487	0	0	2,125	21,858	23,984
	$\Sigma_m EG_{m,y}$ =	**187,513,847**																$\Sigma_{i,m} FC_{i,m,y} * CV_{i,y} * EF_{CO2,i,y}$ =	**136,991,906**

*, **, ***: 2004 Statistics of Electric Power in Korea, KEPCO, 2005.5.

$$EF_{grid,OMsimple,y} = \Sigma_{i,m} FC_{i,m,y} * CV_{i,y} * EF_{CO2,i,y} / \Sigma_m EG_{m,y} = \quad \mathbf{0.7306}$$

Plant/unit information

Power plant (m)				Plant factor(%)	Fuel (i) Type
	Commissioning	Capacity(MW)			
Honam	1985.03		#1	80.09	Coal-thermal
	1984.12		#2	87.87	Coal-thermal
	Total	500		83.98	
Samchonpo	1983.08		#1	90.53	Coal-thermal
	1984.02		#2	80.43	Coal-thermal
	1993.04		#3	81.46	Coal-thermal
	1994.03		#4	81.84	Coal-thermal
	1997.07		#5	89.36	Coal-thermal
	1998.01		#6	96.67	Coal-thermal
	Total	3,240		86.48	
Yongheng	2004.07		#1	80.45	Coal-thermal
	2004.11		#2	85.75	Coal-thermal
	Total	1,600		83.10	
Boryeong	1983.12		#1	96.93	Coal-thermal
	1984.09		#2	81.69	Coal-thermal
	1993.04		#3	81.45	Coal-thermal
	1993.06		#4	98.63	Coal-thermal
	1993.12		#5	80.25	Coal-thermal
	1994.04		#6	95.27	Coal-thermal
	Total	3,000		89.04	
Taean	1995.06		#1	85.21	Coal-thermal
	1995.12		#2	96.29	Coal-thermal
	1997.03		#3	84.18	Coal-thermal
	1997.07		#4	97.33	Coal-thermal
	2001.10		#5	96.44	Coal-thermal
	2002.05		#6	81.30	Coal-thermal
			#7	80.00	Coal-thermal
	Total	3,000		90.12	
Hadong	1997.07		#1	86.41	Coal-thermal
	1997.11		#2	96.95	Coal-thermal
	1998.07		#3	97.30	Coal-thermal
	1999.03		#4	86.64	Coal-thermal
	2000.07		#5	97.78	Coal-thermal
	2001.07		#6	86.33	Coal-thermal
	Total	3,000		91.90	

Power plant (m)				Plant factor(%)	Fuel (i) Type
	Commissioning	Capacity (MW)			
Dangjin	1996.06		#1	86.02	Coal-thermal
	1999.12		#2	98.21	Coal-thermal
	2000.09		#3	87.44	Coal-thermal
	2001.03		#4	86.23	Coal-thermal
	2005.10		#5	94.74	Coal-thermal
	2006.04		#6	92.40	Coal-thermal
			#7	63.80	Coal-thermal
	Total	3,000		88.84	
Ulsan	1970.12		#1	16.90	Heavy oil-thermal
	1971.03		#2	18.66	Heavy oil-thermal
	1973.07		#3	23.04	Heavy oil-thermal
	1979.12		#4	46.01	Heavy oil-thermal
	1980.09		#5	48.15	Heavy oil-thermal
	1981.01		#6	48.36	Heavy oil-thermal
	Total	1,800		38.18	
Youngnam	1972.12		#1	21.96	Heavy oil-thermal
	1970.12		#2	19.81	Heavy oil-thermal
	Total	400		20.88	
Yosu	1975.06	200	#1	24.10	Heavy oil-thermal
	1977.07	328.6	#2	33.40	Heavy oil-thermal
	Total	528.6		29.88	
Pyongtaek	1980.04		#1	38.19	Heavy oil-thermal
	1980.06		#2	40.53	Heavy oil-thermal
	1983.05		#3	44.16	Heavy oil-thermal
	1983.08		#4	35.84	Heavy oil-thermal
	Total	1,400		39.68	
Namjeju	1991.11	10	#1	46.23	Heavy oil-thermal
	1992.2	10	#2	39.04	Heavy oil-thermal
	2006.09	100	#3	28.96	Heavy oil-thermal
	Total	100		33.80	
Jeju	1982.12	10	#1	30.80	Heavy oil-thermal
	2000.03	75	#2	75.30	Heavy oil-thermal
	2000.12	75	#3	78.03	Heavy oil-thermal
	Total	1,690		73.80	

Power plant (m)				Plant factor(%)	Fuel (i) Type
	Commissioning	Capacity(MW)			
Seoul	1971.04	137.5	#4	27.32	Gas-thermal
	1969.04	250	#5	32.89	Gas-thermal
	Total	387.5		30.91	
Incheon	1970.05		#1	1.57	Gas-thermal
	1974.12		#2	1.15	Gas-thermal
	1978.06		#3	2.92	Gas-thermal
	1978.12		#4	2.33	Gas-thermal
	Total	1,150		2.07	
Namjeju D/P	1992.02	40		71.72	Internal combustion
Jeju G/T	1977.12	165		3.42	Internal combustion
Jeju D/P	2005.07	40		76.68	Internal combustion
Pyongtaek C/C	1994.06	480		12.00	Combined cycle
Ilsan C/C	1996.03	900		39.11	Combined cycle
Bundang C/C	1997.03	900		52.17	Combined cycle
Ulsan C/C	1997.08	1,200		34.82	Combined cycle
Seoincheon C/C	1992.11	1,800		55.99	Combined cycle
Shinincheon C/C	1997.07	1,800		77.23	Combined cycle
Boryeong C/C	2002.08	1,800		45.80	Combined cycle
Incheon C/C	2005.06	503.5		84.47	Combined cycle
Busan C/C	2004.03	1,800		67.73	Combined cycle
Hallim C/C	1997.07	105		19.41	Combined cycle
GS Anyang C/C	1993.09	450		33.22	Combined cycle
GS Bucheon C/C	1993.11	450		32.21	Combined cycle
POSCO Power	2002.01	1,800		15.18	Combined cycle
GS EPS Bugog	2001.04	500.7		67.38	Combined cycle
Yulchon C/C	2005.07	525.5		50.70	Combined cycle

*, **, ***: 2006 Statistics of Electric Power in Korea, KEPCO, 2007.5.

Build Margin (BM) calculation

For the calculation of the Build Margin emission factor ($EF_{BM,y}$), the sample group *m* is selected according to Option 1.

Choice of Sample group m

2006 Net Generation (MWh)		Percentage	Remark
Grid total	365,368,967	100.00%	
Sample group m - five plants	22,522	0.01%	
Sample group m - 20% plants	**74,355,414**	**20.35%**	**Selected**

Carbon Emission Factor

CO_2 Emission Factor of fossil fuel type i (unit: tCO_2/GJ) ($EF_{CO2,i,y}$)

Bituminous coal	**0.089500**
Heavy Oil	**0.075500**
Diesel Oil	**0.072600**
LNG	**0.054300**

*Source:: IPCC 2006

IPCC default values at the lower limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter 1 of Vol. 2 of 2006 IPCC Guidances

BM for the proposed project activity

Build margin for 2006: 0.3859 tCO_2/MWh

$$EF_{BM} = 0.3859\ tCO_2/MWh$$

Build Margin for 2006

Plant (m)	Fuel (i) type	*Net Generation ($EG_{m,y}$) (MWh)	**Fuel consumption ($FC_{i,m,y}$)				***Calorific value (energy content)				Calorific value (energy content) ($CV_{i,y}$)				$FC_{i,m,y} * CV_{i,y} * EF_{CO2,i,y}$				$\sum_i FC_{i,m,y} * CV_{i,y} * EF_{CO2,i,y}$ (tCO_2)	$FE_{EL,m,y}$ (tCO_2/MWh)	$EG_{m,y} * EF_{EL,m,y}$ (tCO_2)
			Bituminous coal (ton)	Heavy oil (kl)	Diesel Oil (kl)	LNG (ton)	Bituminous coal (kcal/kg)	Heavy oil (kcal/l)	Diesel Oil (kcal/l)	LNG (kcal/kg)	Bituminous coal (kJ/kg)	Heavy oil (kJ/l)	Diesel Oil (kJ/l)	LNG (kJ/kg)	Bituminous coal (tCO_2)	Heavy oil (tCO_2)	Diesel Oil (tCO_2)	LNG (tCO_2)			
Cheongsong pumping#2	Hydro-pumping	21,542	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0
Bundang fuel cell	Fuel cell	290	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0
Solar park	Solar	106	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0
Namhae solar	Solar	297	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0
Hanlajeunggong solar	Solar	287	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0
Top infra	Solar	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0
Enepark	Solar	85	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0
Yongheng solar	Solar	242	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0
Cheongsong pumping#1	Hydro-pumping	39,965	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0
Namjeju #3	Heavy oil-thermal	179,033	0	46,504	2,509	0	0	9,898	8,938	0	0	41,441	37,422	0	0	145,501	6,816	0	152,318	0.8508	152,318
Yangyang pumping#4	Hydro-pumping	62,801	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0
Yangyang wind power	Wind	1,788	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0
Hadongho	Hydro	1,294	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0
Yangyang pumping#3	Hydro-pumping	93,471	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0
Goheung Solar	Solar	619	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0
Jangseong	Hydro	514	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0
Yangyang pumping#2	Hydro-pumping	97,896	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0
Dangjin #6	Coal-thermal	3,392,395	1,216,582	0	3,051	0	6,120	0	8,895	0	25,623	0	37,242	0	2,789,961	0	8,249	0	2,798,210	0.8248	2,798,210
Sinchang-wind power	Wind	2,969	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0
Yangyang pumping#1	Hydro-pumping	129,063	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0
Suncheon solar	Solar	1,247	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0
Samcheonpo solar	Solar	118	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0
Dangjin #5	Coal-thermal	3,946,931	1,456,458	0	745	0	6,046	0	8,955	0	25,313	0	37,493	0	3,299,676	0	2,028	0	3,301,704	0.8365	3,301,704
Yangyang-hydro	Hydro	5,143	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0
Taean solar	Solar	127	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0
Incheon C/C	Combined cycle	3,648,288	0	0	0	484,606	0	0	0	12,998	0	0	0	54,420	0	0	0	1432014	1,432,014	0.3925	1,432,014
Jeju D/P	Internal combustion	252,764	0	52,907	0	0	0	9,617	0	0	0	40,264	0	0	0	160,836	0	0	160,836	0.6363	160,836
Daegok	Hydro	1,740	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0
Donghwa	Hydro	2,434	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0
Ulchin #6	Nuclear	7,401,424	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0
Hanrye LFG	LFG	5,045	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0
Busan bio-gas	Biogas	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0
Yongdam	Hydro	23,972	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0

*, **, ***: 2006 Statistics of Electric Power in Korea, KEPCO, 2007.5.

Build Margin for 2006

Plant (m)	Fuel (i) type	*Net Generation ($EG_{m,y}$) (MWh)	**Fuel consumption ($FC_{i,m,y}$)				***Calorific value (energy content)				Calorific value (energy content) ($CV_{i,y}$)				$FC_{i,m,y} * CV_{i,y} * EF_{CO2,i,y}$				$\sum_i FC_{i,m,y} * CV_{i,y} * EF_{CO2,i,y}$ (tCO_2)	$FE_{EL,m,y}$ (tCO_2/MWh)	$EG_{m,y} * EF_{EL,m,y}$ (tCO_2)
			Bituminous coal (ton)	Heavy oil (kl)	Diesel Oil (kl)	LNG (ton)	Bituminous coal (kcal/kg)	Heavy oil (kcal/l)	Diesel Oil (kcal/l)	LNG (kcal/kg)	Bituminous coal (kJ/kg)	Heavy oil (kJ/l)	Diesel Oil (kJ/l)	LNG (kJ/kg)	Bituminous coal (tCO_2)	Heavy oil (tCO_2)	Diesel Oil (tCO_2)	LNG (tCO_2)			
Maebongsan-wind power	Wind	8,998	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0
Daegwanryung-wind power	Wind	3,451	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0
Yongheng #2	Coal-thermal	5,727,937	2,129,118	0	2,545	0	6,086	0	8,899	0	25,481	0	37,258	0	4,855,533	0	6,884	0	4,862,417	0.8489	4,862,417
Gunsan-wind power	Wind	6,069	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0
New solar energy	Solar	216	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0
Ulchin #5	Nuclear	7,879,757	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0
Yongheng #1	Coal-thermal	5,337,432	2,004,193	0	2,548	0	6,072	0	8,891	0	25,422	0	37,225	0	4,560,123	0	6,886	0	4,567,009	0.8557	4,567,009
Yulchon C/C	Combined cycle	2,276,276	0	0	0	315,132	0	0	0	13,376	0	0	0	56,003	0	0	0	958299	958,299	0.4210	958,299
Busan C/C	Combined cycle	10,455,401	0	0	0	1,396,417	0	0	0	13,017	0	0	0	54,500	0	0	0	4132454	4,132,454	0.3952	4,132,454
Hankyung-wind power	Wind	18,371	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0
Chunsang	Hydro	183	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0
Cheongju LFG	LFG	6,906	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0
Wunjeong LFG	LFG	17,419	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0
Daejon Geumgodong	LFG	12,768	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0.0000	0
Hoicheon ENC	LFG	4,501	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0.0000	0
Muju	Hydro	555	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0
Seohee-ENC(Sanggok)	LFG	33,895	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0
Sangwon ENC	LFG	17,353	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0
Yonggwang #6	Nuclear	7,969,957	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0
Taean #6	Coal-thermal	3,381,867	1,294,577	0	1,113	0	5,960	0	8,665	0	24,953	0	36,279	0	2,891,208	0	2,931	0	2,894,140	0.8558	2,894,140
Yonggwang #5	Nuclear	7,681,293	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0
Sanchong	Hydro	1,385	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0
Sanchong pumping #2	Hydro-pumping	204,444	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0
Milyang	Hydro	5,820	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0000	0
Taean #5	Coal-thermal	4,013,235	1,542,775	0	544	0	5,934	0	8,665	0	24,844	0	36,279	0	3,430,484	0	1,433	0	3,431,917	0.8551	3,431,917
	$\Sigma_m EG_{m,y}$=	**74,355,414**																		**$\sum_m EG_{m,y} * EF_{EL,m,y}$ =**	**28,691,317**

*, **, ***: 2006 Statistics of Electric Power in Korea, KEPCO, 2007.5.

$EF_{grid,BM,,y} = \Sigma_m EG_{m,y} * EF_{EL,m,y} / \Sigma_m EG_{m,y}$ = 0.3859

Plant/unit information

Plant (m)				
	Commissioning	Capacity(MW)	Plant factor(%)	Fuel (i) type
Cheongsong pumping#2	2006.12	300	3.78	Hydro-pumping
Bundang fuel cell	2006.10	0.25	42.47	Fuel cell
Solar park	2006.10	0.7	.	Solar
Namhae solar	2006.10	1	.	Solar
Hanlajeunggong solar	2006.10	1	.	Solar
Top infra	2006.09	1.50	.	Solar
Enepark	2006.09	0.3	.	Solar
Yongheng solar	2006.09	1	8.27	Solar
Cheongsong pumping#1	2006.09	300	0.48	Hydro-pumping
Namjeju #3	2006.09	100	28.96	Heavy oil-thermal
Yangyang pumping#4	2006.08	250	6.47	Hydro-pumping
Yangyang wind power	2006.08	3	15.38	Wind
Hadongho	2006.06	0.825	30.29	Hydro
Yangyang pumping#3	2006.06	250	7.04	Hydro-pumping
Goheung Solar	2006.06	0.8	.	Solar
Jangseong	2006.05	1.22	7.59	Hydro
Yangyang pumping#2	2006.04	250	5.67	Hydro-pumping
Dangjin #6	2006.04	500	92.40	Coal-thermal
Sinchang-wind power	2006.03	1.7	.	Wind
Yangyang pumping#1	2006.02	250	5.60	Hydro-pumping
Suncheon solar	2005.12	0.85	.	Solar
Samcheonpo solar	2005.12	0.1	13.00	Solar
Dangjin #5	2005.11	500	94.74	Coal-thermal
Yangyang-hydro	2005.10	1.4	41.91	Hydro
Taean solar	2005.10	0.12	12.11	Solar
Incheon C/C	2005.07	503.5	84.47	Combined cycle
Jeju D/P	2005.07	40	76.68	Internal combustion
Daegok	2005.07	0.3	68.14	Hydro
Donghwa	2005.07	1	27.78	Hydro
Ulchin #6	2005.04	1,000	85.21	Nuclear
Hanrye LFG	2005.04	0.92	.	LFG
Busan bio-gas	2005.03	2.1	.	Biogas
Yongdam	2004.12	4.1	68.50	Hydro

Plant (m)				
	Commissioning	Capacity(MW)	Plant factor(%)	Fuel (i) type
Maebongsan-wind power	2004.12	4.25	.	Wind
Daegwanryung-wind power	2004.12	2.64	.	Wind
Yongheng #2	2004.11	800	80.45	Coal-thermal
Gunsan-wind power	2004.11	3	.	Wind
New solar energy	2004.11	0.2	.	Solar
Ulchin #5	2004.07	1,000	90.56	Nuclear
Yongheng #1	2004.07	800	85.75	Coal-thermal
Yulchon C/C	2004.07	525.5	50.70	Combined cycle
Busan C/C	2004.03	1,800	67.72	Combined cycle
Hankyung-wind power	2004.03	6	33.57	Wind
Chunsang	2004.02	0.25	8.34	Hydro
Cheongju LFG	2004.02	1	.	LFG
Wunjeong LFG	2005.07	3.18	.	LFG
Daejon Geumgodong	2003.06	3.46	.	LFG
Hoicheon ENC	2003.05	2	.	LFG
Muju	2003.04	0.4	15.83	Hydro
Seohee-ENC(Sanggok)	2003.04	6	.	LFG
Sangwon ENC	2003.03	3	.	LFG
Yonggwang #6	2002.12	1,000	91.82	Nuclear
Taean #6	2002.05	500	81.30	Coal-thermal
Yonggwang #5	2002.05	1,000	88.88	Nuclear
Sanchong	2001.11	0.4	39.60	Hydro
Sanchong pumping #2	2001.11	350	6.68	Hydro-pumping
Milyang	2001.10	1.3	54.14	Hydro
Taean #5	2001.10	500	96.44	Coal-thermal

*, **, ***: 2006 Statistics of Electric Power in Korea, KEPCO, 2007.5.

Annex 4

MONITORING INFORMATION

Please refer to section B.7