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

PROJECT DESIGN DOCUMENT (PDD)

Title of the project activity	Samdal Wind Power Project
Version number of the PDD	6
Completion date of the PDD	04/12/2013
Project participant(s)	Hanshin Energy Co.,Ltd
Host Party(ies)	Republic of Korea
Sectoral scope and selected methodology(ies)	Sectoral sscope: 1-Energy industries Methodology: ACM 0002 ver.11-Consolidated methodology for grid-connected electricity generation from renewable sources
Estimated amount of annual average GHG emission reductions	54,276tCO_2e

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

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Samdal Wind Power Project is to build a wind power generating plant on Samdal-ri, Seongsan-eup, Seogwipo-si, Jeju Special self-governing province, the Republic of Korea. The project utilizes wind power which is generating no greenhouse gases emission into the atmosphere. The project is also supporting the government policy to promote new & renewable energy technology in Korea.

It is estimated that the proposed project will generate 88,948MWh per year. The main goals of the project are:

1) reducing the greenhouse gas emission in Korea
2) utilizing no greenhouse emission wind power to contribute to sustainable development of the local communities

The annual wind speed in the project area is around 7.1m/sec. The capacity of each turbine is 3.0MW at max and the total capacity consisting of 11 turbines for the project is 33MW. The utilization rate of the turbine is 30.7%, so the annual power generation is estimated about 88,948MWh. The project will achieve an ex-ante estimated average emission reduction of 54,276tCO_2 per year over the chosen 10-year renewable crediting period.

The project contributes to the sustainable development of Korea. It is as follow:

- By using electricity generated by wind, it helps to reduce the use of fossil fuel. In addition, it is free from emitting CO_2 and other gaseous pollutants such as NOx, SO_2, and PM.
- Renewable energy source provides future generation with environmentally friendly fuel alternatives that protect the environment.

A.2. Location of project activity

A.2.1. Host Party(ies)

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The Republic of Korea

A.2.2. Region/State/Province etc.

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Jeju special self-governing province

A.2.3. City/Town/Community etc.

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Seongsan-eup, Seogwipo-si

A.2.4. Physical/Geographical location

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Samdal-ri (33º22'N, 126º50'E).

A.3. Technologies and/or measures

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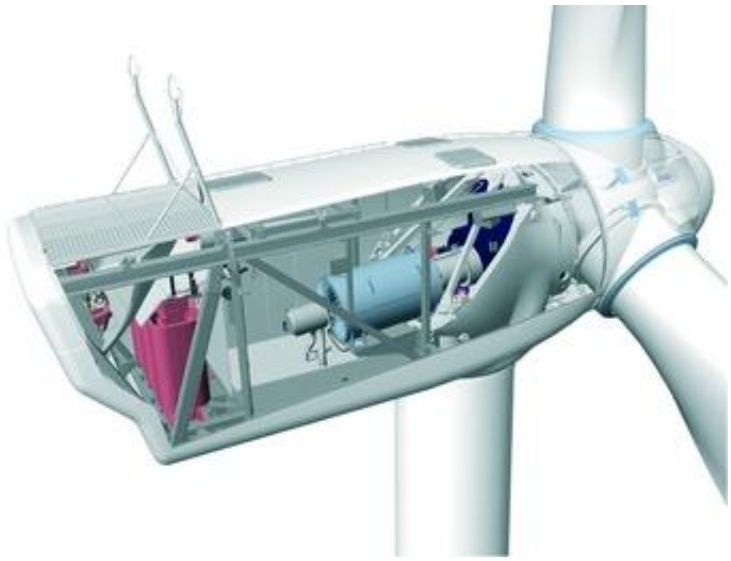
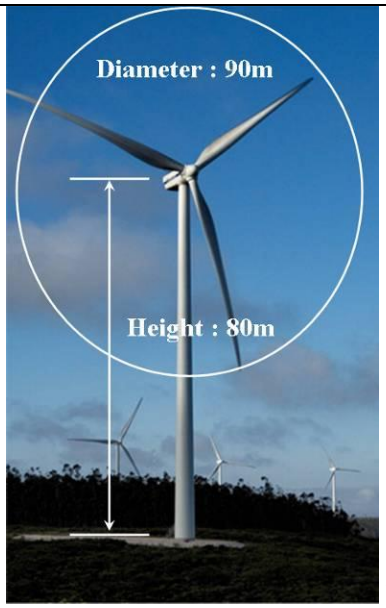
11 wind turbines are installed in August, 2009 and to be operated for Samdal Wind Power Project in September, 2009. Turbine models are V90-3.0MW produced by Vestas. V90-3.0MW has 3 blades

consisting of carbon fibre for the load-bearing spars, by which it is relatively lighter than similar V80 tower.



<Figure A-2 Schematic diagram of V90-3.0MW>

<Table A-1. Turbine specifications> Model No.	 V90-3.0MW
Rotor	
Diameter	90m
Area swept	6,362m^2
Normal resolutions	16.1 rpm
Operational interval	9.9~18.4 rpm
Number of blade	3
Power regulation	Pitch/OptiSpeed
Air brake	Full blade pitch by three separate hydraulic pitch cylinders
Tower	
Hub height	80m
Operational Data	
Cut-in wind speed	4m/sec
Nominal wind speed (3000kW)	15m/sec

Stop wind speed	25m/sec
Generator	
Type	Asynchronous with OptiSpeed
Rated output	3,060kW
Operational data	60Hz, 1,000V
Gear Box	
Type	One Planetary/helical three stages
Control	
Type	Microprocessor-based control of all the turbine functions with the option of remote monitoring. Output regulation and optimisation via OptiSpeed and OptiTip pitch regulation.
Weight (IEC)	
Hub height	80 m
Tower	160 t
Nacelle	70 t
Rotor	41 t
Total	271 t
t-metric ton	

A.4. Parties and project participants

Party involved (host) indicates a host Party	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Republic of Korea	Hanshin Energy Co.,Ltd	No

A.5. Public funding of project activity

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There is no public funding.

SECTION B. Application of selected approved baseline and monitoring methodology

B.1. Reference of methodology

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The methodology used for the project is: ACM0002 version 11, "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" For detailed information see:

http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

According to the requirements of the ACM0002 version 11 the project utilises the CDM consolidated "Tool for the demonstration and assessment of additionality" version 5.2, to prove the additionality of the project

B.2. Applicability of methodology

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To calculate the reduction of GHG emission from the power plant that utilizes wind power, ACM0002 version 11 "Consolidated baseline methodology for grid-connected electricity from renewable sources" will be used.

Samdal wind power project is about the installation of a wind power plant. This project is to generate electricity by the renewable energy sources and GHG reductions are claimed for displacing electricity generated from other fossil fuels. Generation electricity from the Samdal wind power plants is supplied to the grid which is purchased by in Korea Electric Power Corporation (KEPCO).

And thus ACM0002 was considered the most appropriate methodology for the project.

B.3. Project boundary

Source		GHGs	Included?	Justification/Explanation
Baseline scenario	CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity.	CO_2	Yes	Main emission source. CO_2 emission from electric power plant which uses fossil fuel in Jeju Special self-governing province and from inland.
		CH_4	No	Minor emission source.
		N_2O	No	Minor emission source.
Project scenario	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 project boundary for a wind power project that provides electricity to a grid encompasses the physical, geographical site of the renewable generation source.

For the baseline determination, project boundary is related to CO_2 emissions from power generation in a fossil fuel power plant replaced by this project activity. The spatial extent of the project boundary includes the project sites and all the power plants connected physically to the electricity system of Korea Electric Power Corporation (KEPCO).
For calculation of baseline GHG emissions from the project, the project boundary does not included emissions during plant construction, leakage from electricity transfer, and emission from transportation.

B.4. Establishment and description of baseline scenario

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When the baseline is determined for 'Renewable electricity generation for a grid', the definition of electricity grid (spatial, inter-grid electricity supply) is not clear such as the case of Jeju Special self-governing province (only for the electricity supply). Jeju Special self-governing province is only imported electricity from Inland, not export electricity to Inland.

Therefore Project boundary of Jeju Special self-governing province should be redefined. Electricity generation in Jeju special self-governing province is not enough to meet demand of Jeju Special self-governing province, so interconnection tie from inland must be needed, ACM0002 clearly states how to estimate the baseline as follows;

For the baseline determination, project boundary is related to CO_2 emissions from electricity generation

in a fossil fuel power plant that is displaced due to this project activity. The spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system that the CDM project power plant is connected to. Refer to the latest approved version of the "Tool to calculate the emission factor for an electricity system" for definition of an electricity system.

For the purpose of determining the Build Margin (BM) emission factor, as described below, the spatial extent is limited to the project electricity system, except where recent or likely future additions to transmission capacity enable significant increases in imported electricity. In such cases, the transmission capacity may be considered a build margin source, with the emission factor determined as for the OM imports below. But transmission capacity enables significant increase in imported electricity by 4th Power Supply Master Plan(2008.12.30). So BM emission factor is considered for inland and Jeju Special self-governing province. s

As well, the OM EF is estimated based on the 3-year generation-weighted average in accordance with the ACM0002.

B.5. Demonstration of additionality

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<Table B-1 The timeline of project implementation>

Date	Key event
05.06.2005	Established by YeongJu Wind Tech Corporation
05.08.2005	Contract of land lease(YeongJu Wind Tech Corporation)
01.11.2006	Feasibility Study Report of Wind Power (Korea Institute Energy Research)
18.12.2006	Established by Hanshin Energy Co., Ltd
19.12.2006	Notes related to the consideration of the decision by the Board of Directors
21.12.2006	Contract of Samdal wind power generation's joint venture (Transfer of ownership) (Namhai development Co., YeongJu Wind Tech Corporation, Hanshin Energy Co., Ltd)
01.03.2007	Submission to request for project development
01.07.2007	Request for estimation with consultants for CDM PDD service
01.10.2007	The first Contracts with consultants for CDM PDD service (LG International Corporation/Hanshin Energy Co., Ltd)
19.11.2007	Permit of project development approval (Ministry of Knowledge Economy)
29.12.2007	Contract of supply for wind power generation (Vestas Korea corporation/Hanshin Energy Co., Ltd) ; **Starting date**
28.02.2008	Permit of wind power project (Jeju Special self-governing province Government)
23.06.2008	Permit of modification for wind power project (Jeju Special self-governing province Government)
01.09.2008	Contract of land lease (Hanshin Energy Co., Ltd)
02.07.2008 ~31.07.2008	PDD publication for global stakeholder comments
02.02.2009	Starting construction works
09.02.2009	The second contracts with consultants for CDM PDD service (Ecoeye Co., Ltd/Hanshin Energy Co., Ltd)
15.05.2009	Modification of permit of for Samdal wind power project* (Jeju Special self-governing province Government)
31.08.2009	Launching commercial operation

Modification of permit for Samdal wind power project*: The wind turbine location need to change for

maximum efficiency. Therefore the modifications for wind power project were approved. The fifth and the eight unit of Wind turbine site were changed. As a result, wind farm area has been expanded. (29.146 m^2 →29.247m^2). Environmental impacts through the advance examination for the environmental aspects of project activities were analyzed (section D.1).
This project activity is the installation of a new grid-connected renewable power plant. The 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 source, as reflected in the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system"

The determination of project scenario additionality is performed using the CDM consolidated 'Tool for demonstration of additionality Ver.5.2', which applies the following steps:

Step 1. Identification of alternatives to the project activity consistent with mandatory laws and regulations

Sub-step 1a. Define alternatives to the project activity:

In the absence of the project reasonable and credible alternatives that are in accordance with current laws and regulations include:

(a) The proposed project itself, but not undertaken as a CDM project activity
(b) Construction of a power plant using other renewable energy, such as hydro power plants or biomass power generation with equivalent installed capacity or annual electricity generation.
(c) Equivalent electricity service provided by the Korea Electric Power Corporation

The conclusions to the specific analysis of each of the alternative scenarios, mentioned above, are the following:

(a) The proposed project itself, but not undertaken as a CDM project activity
: as shown in Step 2 investment analysis, if the proposed project would not be 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 (b) should be excluded among the realistic and credible alternative. IRR of the project with CERs is 4.66%, IRR of the project without CER is 2.84%)

(b) Construction of a power plant using other renewable energy, such as hydro power plants or biomass power generation with equivalent installed capacity or annual electricity generation.
: Besides wind energy, other kinds of energy like solar PV, geothermal, biomass and hydro are the possible grid-connected renewable energy technologies that could be applied in the Republic of Korea. Due to the technology development status and the high cost for power generation, solar PV, geothermal and biomass of the similar installed capacity as the proposed project are alternatives far from being attractive investment on the grid in Korea. But the utilization hours, the operation period and characteristics of the hydro power are different from those of the proposed project, and there is no available hydro resource for development on site of the proposed project. So hydropower plants are not able to provide the comparable output or service. Therefore the hydro and other kinds of renewable energy power plant are also not realistic alternative.

(c) Equivalent electricity service provided by the Korea Electric Power Corporation

: To satisfy the increase of the electricity demand, the power grid company can increase the output generation from operating unit and rely on some new built power plants connected to the grid, therefore comparable capacity or electricity generation addition provided by KEPCO can be taken as a realistic alternative for the project activity.

Outcome of step 1a
Alternative (c) is selected the realistic and credible alternative to the project and (a),(b) are excluded.

Sub-step 1b. Consistency with mandatory laws 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 (c) is realistic and feasible one that is in compliance with legal and regulatory requirement.

According to the EB 22th meeting Report, Annex 3, 1 page 'Clarifications on the consideration of national and/or sectoral policies and circus (paragraph 45 (e) of the CDM Modalities and Procedures) in determining a baseline scenario', which is *'"Type E-"national and/or Sectoral policies or regulations that have been implemented since the adoption by the COP of the CDM M&P (decision 17/CP.7, 11 November 2001) may not be taken into account in developing a baseline scenario (i.e. the baseline scenario should refer to a hypothetical situation without the national and/or Sectoral policies or regulations being in place)'*, this analysis is performed based on this hypothetical situation without regarding the 'Alternative Energy Development Promotion Act amended on March 2002.' Alternative Energy Development Promotion Act amended in March, 2002, MKE(Ministry of Knowledge Economy) of Korean Government issued the Public Notice No.2003-61 on October 9, 2003 and its amendment No. 2004-104 on October 19, 2004 which compensates the renewable energy electricity generation projects for the difference between the standard price applicable for the electricity generated using the alternative energy and the system marginal price of the grid promote such kinds of electricity generation.

(See more information at http://cdm.unfccc.int/EB/Meetings/016/eb16repan3.pdf, http://cdm.unfccc.int/EB/022/eb22_repan3.pdf)

According to the above decision, purchase price of electricity which excludes subsidy through compensation for difference between generation costs by MKE was used for the investment analysis.

Step 2. Investment Analysis

The investment analysis for the project used 'Guidance on the assessment of investment analysis, (Ver. 2)'

Sub-step 2a: Determine appropriate analysis method

The CDM project contains income other than CERs. Therefore, Option I (Apply simple cost analysis) cannot be selected, so it is necessary to choose from either Option II (Apply Investment comparison analysis) or Option III (Apply benchmark analysis). According to the methodology for determination of additionality, if the alternative to the CDM project activity does not include investments of comparable scale to the project, then Option III must be used. Option III will be applied for this project.

Sub-step 2b: Option III- Apply benchmarking analysis

IRR (Internal Rate of Return) is selected for the economic analysis indicator. IRR can be compared to government bond rates increased by risk premium, required rate of return (RRR) on equity etc. to decide the possibility of project. In this project, 7.65% of benchmark is determined as rate of government bond(one year) add risk premium.

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

<Table B-3 Economic analysis>

Contents	Value	Remark
Analysis Period	20 years	Operating period Feasibility Study Report of Wind Power (Korea Institute Energy Research, November 2006)
Discount Rate	6%	Feasibility Study Report of Wind Power (Korea Institute Energy Research, November 2006)
Construction Period	2year	Including construction period & installing period Feasibility Study Report of Wind Power (Korea Institute Energy Research, November 2006)
Power generation Capacity (MW)	33	11 turbines (3MW of each turbine) are installed.
Plant load factor (%)	30.7	Feasibility Study Report of Wind Power (Korea Institute Energy Research, November 2006)
Net generation (MWh/yr)	88,948	Feasibility Study Report of Wind Power (Korea Institute Energy Research, November 2006)
Total investment cost (Million Won)	78,315.6	Feasibility Study Report of Wind Power (Korea Institute Energy Research, November 2006) - owner's capital : 19,579 - loan capital : 58,737
O&M Cost (Million Won/yr)	783	Feasibility Study Report of Wind Power (Korea Institute Energy Research, November 2006) - Administration cost included
Electricity tariff (Won/kWh)	74.8	Accurate account of unit price by Electric Power Statistics Information System(www.kpx.or.kr/epsis) : average in Nov.2005-Oct.2006)
Land lease cost (Million Won/yr)	200	Feasibility Study Report of Wind Power (Korea Institute Energy Research, November 2006)
Loan interest	5.74%	Feasibility Study Report of Wind Power (Korea Institute Energy Research, November 2006)

* Excel sheet on economic analysis calculation will be submitted to DOE.

Korea Institute Energy Research (KIER) is contributing to national economic growth by developing industrial core energy technology and deploying outcomes. KIER's function is following:

<Table B-4 KIER's function>

function	part
Energy Technology Development - Renewable energy technology development including PV, wind power, bio energy, fuel cell, hydrogen energy - CO_2 capture and GHGs treatment technology development	Meet the challenges of rapidly changing energy environment affected by climate change, high oil

- Clean use technology for fossil fuels including coal, non-conventional fuels - Energy efficiency related technology development in the area of industry, buildings, transportation, and electricity - Energy materials related technology development	price, etc.
Deployment of Energy Technology - Testing and certification, workforce training, technology support, and technology commercialization	Promote reasonable use of energy with deployment of promising energy technology
Policy Establishment of Energy Technology - Support for the establishment of national policies of energy technology	Lead national policy of energy technology

<Table B-5 Results of feasibility study>

	IRR of the project with no CER income	Benchmarks
Results (%)	3.82 %	7.65% Government bond_ one years_ average 2005.11~2006.10 (4.65%)+ risk premium(3%)

Based on result of analysis, IRR of the Project is 3.82% which is lower than benchmark value 7.65%. Therefore, this project cannot be considered financially and economically attractive. (C.f. IRR of the project with CERs is 5.97%)
According to "Guidelines on the assessment of investment analysis", risk premium applied in the determination of required return on equity shall reflect the risk profile of the project activity being assessed. Therefore Benchmark value is applied risk premium based on loan agreement by banking.

Sub-step 2d: Sensitivity analysis

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). Thus analysis of the proposed project is conservative.
Also, for more conservative analysis, sensitivity analysis on that indicator (total investment cost, net generation, electricity tariff, O&M cost) was performed more widely as in the range of ±15% conditions.
According to the sensitive analysis, the results come out as below.

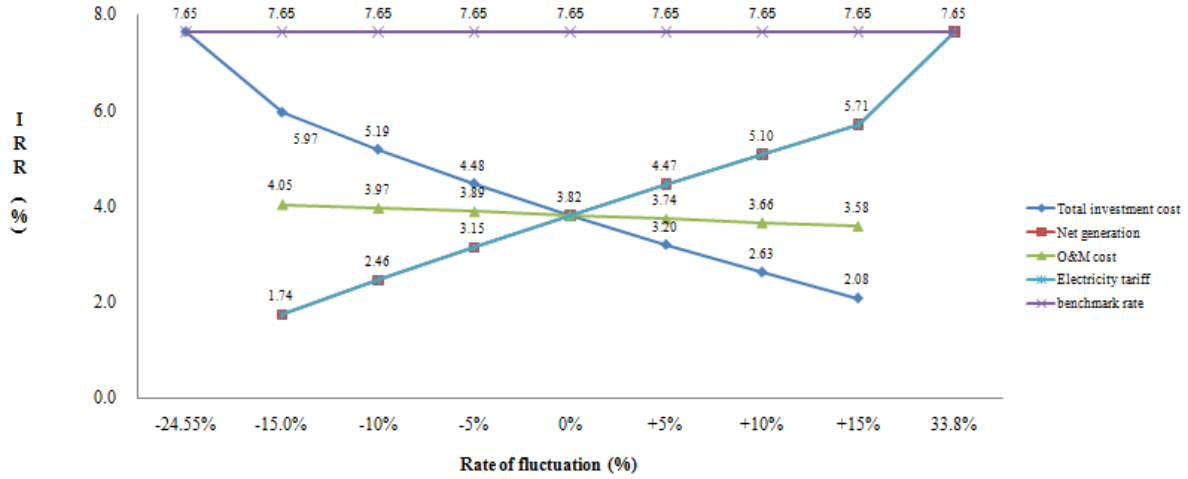
- ± 5, 10, 15 % decreased/increased of total *investment cost*
- ± 5, 10, 15 % decreased/increased of *Net generation*
- ± 5, 10, 15 % decreased/increased of E*lectricity tariff*
- ± 5, 10, 15 % decreased/increased of *O&M cost*

The parameters mentioned above significantly influences the value of IRR decreased. Those results of the sensitivity analysis of selected parameters are presented in Table B-6

<Table B-6 Results of sensitivity analysis>

	Fluctuation of IRR (%)								
Contents (%)	-24.55%	-15.0%	-10%	-5%	0%	+5%	+10%	+15%	+33.8%

Total investment cost	7.65	5.97	5.19	4.48	3.82	3.20	2.63	2.08	0.30
Net generation	0.29	1.74	2.46	3.15		4.47	5.10	5.71	7.65
O&M cost	4.19	4.05	3.97	3.89		3.74	3.66	3.58	3.29
Electricity tariff	0.29	1.74	2.46	3.15		4.47	5.10	5.71	7.65



<Figure B-1 IRR>

As shown in the table & figure above, the results from sensitivity analysis show that according to the fluctuations of total investment (-15% ~ +15%), IRR(without CERs) becomes 5.97~2.08% and according to the fluctuations of Net generation and electricity tariff(-15% ~ +15%), it becomes 1.74~5.71%. Also according to O&M Cost (-15% ~ +15%), it becomes 4.05~3.58%.

In order to further demonstrate the additionality of the proposed project activity, the situation at which the benchmark would be reached will be taken into account as below:

(1) When the static investments are reduced 24.55%, the IRR of the project would reach 7.65%, which is same with the benchmark of the project. For the wind farm project, the cost of turbines, technical construction and related accessories make up the main statistic investment. According to the contracts supplied by the project owner, investment on turbine, wind tower, main transformer, transformer chamber and construction is 70,281 million won, which consist 89.74% of total static investment. It is impossible to hit the benchmark by decreasing the investment.

(2) When the Net generations are increased 33.8%, the IRR of the project would reach 7.65%, which is same with the benchmark of the project. However, according to the Feasibility Study Report, the annual power generation is estimated by using professional software WasP designed for wind energy, which is used by developers, consultants and turbine manufacturers worldwide. Therefore, it is impossible to hit the by increasing annual Net generation by 33.8%.

(3) According to economic analysis sheets (11.2003~10. 2006), the maximum value of electricity tariff is

84.45won. It means that it is increased by 12.90%. And the average of electricity tariff is 61.53 won. It is decreased 17.74%. So it is difficult to increase the normal price up to 15%.

(4) When the O&M cost not includes, the IRR of the project would not reach 7.65%. It is obviously unlike to happen.

In conclusion of the sensitive analysis, as the financial parameter varies within reasonable range, the proposed project remains financially acceptable without CDM.

Therefore, as the results of sensitivity analysis show that IRR(without CERs) of the proposed project is lower than 7.65%, the benchmark rate(Government bond_ one year_ average 2005.11~2006.10(4.65%)+ risk premium(3%))).

Step 3. Barrier Analysis

This segment is skipped in accordance with the "Tool for demonstration of additionality Ver.5.2''

Step 4. Common Practice Analysis

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

Due to implementation of Government polices to promote the renewable energy(2002, MKE) and the development of renewable energy technology, at the end of 2003 several wind power plants started to be installed and operated in the Republic of Korea(Renewable energy supply statistic, 2008). According to this policy, Table B-7 shows that the wind power facility increases immediately since 2004. Nevertheless, the wind power capacity is much less than the total electricity capacity.

<Table B-7 Ratio of alternative power in republic of Korea>

year	2003	2004	2005	2006	2007
Total electricity installed capacity (million KWh)	60,719,720	64,552,574	67,075,240	70,079,042	73,061,719
wind power installed capacity (million KWh)	18,159	68,062	98,726	177,667	196,087
Wind power installed capacity Supply ratio (%)	0.03	0.11	0.15	0.258	0.27

(Source: Korea electric power corporation, 2008 and New & Renewable energy supply statistic, 2008)

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

Table B-8 presents the status of wind power projects with capacity of MW level like the proposed project in Korea.

<Table B-8 Status of wind farm installations in MW level>

Title	Capacity (MW)	Reductions ($tonCO_2/yr$) (ex-ante)	registered

Gangwon wind park project	98	149,536	20 Mar 06
Youngduk wind park project	39.6	60,071	02 Jun 06
Yangyang renewable energy project	3	8,620	10 Feb 07
Hangyeong second phase SS-wind power project	15	28,898	17 Oct 07
K water wind power project in Bang-a muri	3	4,013	06 Nov 07
Yeong Yang 61.5MW wind farm project	61.5	112,812	20 Feb 09
Renewable energy project	3.75	2,680	07 Apr 09
Taegisan wind power project	40	59,669	15 May 09

Four large-scale projects similar to the proposed project, of which capacity are beyond 15MW, Gangwon , Youngduk, Yeong Yang and Taegisan Wind project were registered as CDM project. Then four wind projects of which capacity is each under 15MW were registered as small scale CDM projects in Korea. Youngduk Wind Park Project is the most similar project to Samdal wind project in Korea as a commercial wind power plant. It is supposed to be established in May, 2008 with a capacity of 39.6MW. In Youngduk's case, Unison and the international investor for the project have considered CDM for their investment in the project.

B.6. Emission reductions

B.6.1. Explanation of methodological choices

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To calculate the Emission reduction, methodological tool "Tool to calculate the emission factor for an electricity system (ver. 2)" will be used. When the baseline is estimated for 'Renewable electricity generation for a grid', the definition of electricity grid (spatial, inter-grid electricity supply) is not clear such as the case of Jeju Special self-governing province (only for the electricity supply). Therefore project boundary of Jeju Special self-government province should be redefined. Methodological tool "Tool to calculate the emission factor for an electricity system" clearly states how to estimate the baseline as follows;

The ex-ante calculation of the emission reductions takes following steps:

<Table B-9 Parameter to calculate the Emission reduction>

Parameter	Value	Source
FC $_{i, m, y}$ is the amount of fuel i (in a mass or volume unit) consumed by relevant power sources m in year(s) y, m refers to the power sources delivering electricity to the grid, not including low-operating cost and must-run power plants, and including imports to the grid	Refer to <Table Annex 3-1>	Statistics of Electric Power in KOREA 2005-2007 (KEPCO 2006-2008)
Net Calorific Values by Power Plant	Refer to <Table Annex 3-2>	Caloric value sourced from Statistics of Electric Power in 2005-2007, (KEPCO 2006-2008)

		(Net Caloric Value = Caloric value net × caloric value conversion factor)
$EG_{m,y}$ (MWh) is the electricity delivered to the grid by source m	Refer to <Table Annex 3-3> <Table Annex 3-4>	Statistics of Electric Power in KOREA 2005-2007 (KEPCO 2006-2008)
Net Caloric Values Conversion Factor	Solid/Liquid fossil fuel : 0.95 Gaseous fuel : 0.90	2006 IPCC Guidelines for National Greenhouse Gas Inventories
$EF_{CO2,i,y}$ is Fuel CO_2 Emission Factor	Refer to <Table Annex 3-5>	2006 IPCC Guidelines for National Greenhouse Gas Inventories
$EF_{grid,OM,y}$ is Operating Margin Emissions Factor (in ton CO_2/MWh)	0.6819	Calculated
$EF_{grid,BM,y}$ is Build Margin Emissions Factor (in ton CO_2/MWh)	0.3950	Calculated
$EF_{grid,CM,y}$ is Baseline Emissions Factor (in ton CO_2/MWh)	0.6102	Calculated

Step 1. Identify the relevant electric power system

OM (Operating Margin) and BM (Build Margin) are calculated by using the data from existing power plants that provide electricity with the current grid-connected electricity generation, and with this result, the EF_y (Emission Factor) can be calculated. Specially, electricity generation in Jeju Special self-governing province is not enough to meet demand of Jeju Special self-governing province, so interconnection tie from inland must be needed. Jeju Special self-governing provinces only import electricity from Inland, not export electricity to Inland.

Step 2. Choose whether to include off-grid power plants in the project electricity system (optional). Project participants may choose between the following two options to calculate the operating margin and build margin emission factor:

Option Ⅰ: only grid power plants are included in the calculation
Option Ⅱ: both grid power plants and off-grid power plants are included in the calculation.

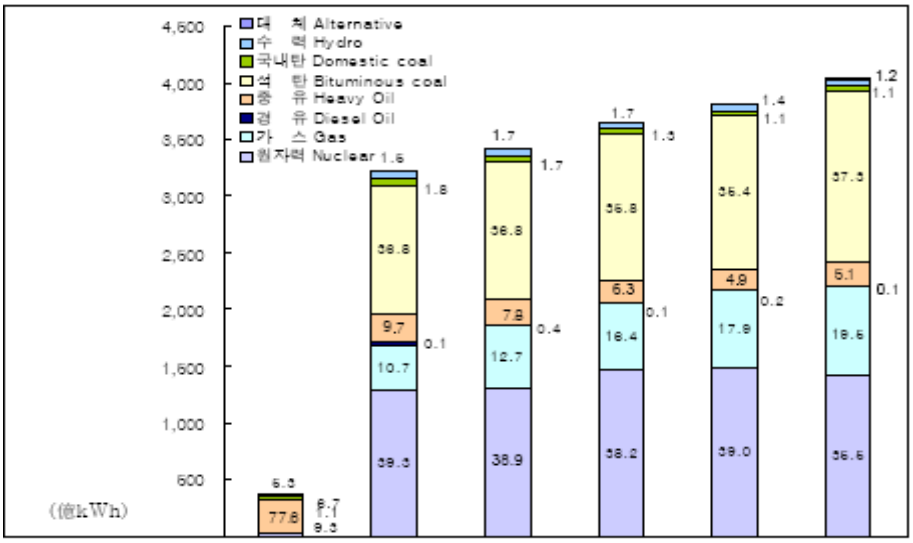
Option Ⅱ allows the inclusion of off-grid power generation in the grid emission factor. Option II aims to reflect that in some countries off-grid power generation is significant and can partially be displaced by CDM project activities, e.g. if off-grid power plants are operated due to an unreliable and unstable electricity grid. Option II requires collecting data on off-grid power generation as per Annex 2 and can only be used if the conditions outlined therein are met. In case of Korea does not collect data on off-grid power generation so PP selects option Ⅰ: only grid power plants are included in the calculation.

Step 3. Select a method to determine the operating Margin (OM)

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

(a) Simple OM ; or
(b) Simple adjusted OM ; or
(c) Dispatch data analysis OM ; or
(d) Average OM.

Based on ACM0002 (Version11), if low-cost/must-run resources constitute less than 50% of total grid generation in average of the five most recent years, simple OM can be chosen. ACM0002 says that hydro, geothermal, wind, low-cost biomass, nuclear and solar generation are included in must-run sources. In addition, domestic coal is supported by governmental fund as a must-run generation.
The rate of low cost/must run power generation does not exceed 50% of the total grid (the most recent 5-year (2003~2007) average data shows that the rate of low cost/must run is 41.49%) referred to the host country's gross electricity generation rate by energy sources (Source: KEPCO), and an hourly dispatched data is not available at this point of time. Therefore, Option (a) (Simple OM) has been chosen.



(單位 Unit : 百萬kWh million kWh)

區分 Item \ 年度 Year		1980	2003	2004	2005	2006	2007
水 力 Hydro		1,984	6,887	5,861	5,189	5,219	5,042
火 力 Thermal	國內炭Coal(Dom.)	2,481	5,398	4,603	4,484	4,812	4,470
	역 탄 Coal(Bitum.)	–	114,878	122,556	129,174	134,894	150,204
	重油 Oil(Heavy)	23,876	23,656	21,591	20,079	18,596	20,769
	輕油 Oil(Diesel)	421	2,870	474	412	599	446
	가 스 Gas	–	39,091	55,999	58,118	68,302	78,427
原子力 Nuclear		3,477	129,672	130,715	146,779	148,749	142,937
代替에너지 (alternative)		–	–	350	404	511	829
計 Total		37,239	322,452	342,148	364,638	381,181	403,124

<Figure B-2 Gross electricity generation in Korea during past 5 years>
(Korea Electric Power Corporation, 2008)

For the simple OM the emissions factor can be calculated using either of the two following data vintage;

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

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

PP selects *ex ante* option and that isn't changed during the crediting periods.

Step 4: calculate the operating margin emission factor according to the selected method

As described in ACM0002, the OM is calculated as the generation-weighed emissions per electricity unit of all generating units serving the system, excluding low-operating cost and must-run power plants. Low operating cost and must-run power plants include hydro, nuclear, low cost biomass, geothermal and domestic coal. The OM is calculated as follows, using a 3-year average. (selected option (a)).

(a) simple OM

The simple OM emission factor is calculated as the generation-weighted average CO_2 emissions per unit net electricity generation (t CO_2/MWh) of all generation power plants serving the system, not including low-cost / must-run power plants. It can be calculated:

Option A: Based on the net electricity generation and a CO_2 emission factor of each power unit; or

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

Republic of Korea has fuel consumption data is available for each power plant / unit. So Option A is selected.

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

$EF_{grid,OMsimple,y}$	=	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* (mass or volume unit)
$NCV_{i,y}$	=	Net calorific value (energy content) of fossil fuel type *i* in year *y* (GJ / mass or volume unit)
$EF_{CO2,i,y}$	=	CO_2 emission factor of fossil fuel type *i* in year *y* (tCO_2/GJ)
$EG_{m,y}$	=	Net 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) following the guidance on data vintage in step 2

Based on ACM0002, the emission factor is calculated using a 3-year average, based on the most recent statistics available at the time of PDD submission. The detailed baseline information used in the calculation is presented in Annex 3.

Step 5. – Identify the cohort of power units to be included in the Build Margin (BM)

According to ACM0002, the sample group of power unit *m* used to calculate the build margin consists of either:

(a) The set of five power units that have been built most recently; or
(b) The set of power capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently

Project participants should use the set of power units that comprises the larger annual generation.

For this project case, *Option 1* is taken to calculate the BM EF *ex-ante.*

In the case of Jeju Special self-governing province, the amount of electricity supply from inland (interconnection tie) is anticipated that the increases of electricity supply from Inland by 4th Power Supply Master Plan(2008.12.30).
Therefore, BM EF is considered for inland and Jeju Special self-governing province

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

<Table B-10 Sample plant group (m) for determination of BM Emission Factor>

Sample group(m) / **Classification**	**"the five power plants that have been built most recently" (in MWh)**	**"the power plants capacity additions in the electricity system that comprise 20% of the system generation (in GWh) and that have been built most recently."**	**Comments**
Electricity quantity	34	78,004,323	Total generation is 386,510,193 MWh in Republic of the Korea. (Korea Power Exchange (www.kpx.or.kr))
Proportion (ratio to total generation in Korea)	0.00001%	20.201%	
Selected Group	-	Selected	-

The annual generation of "the five power plants that have been built most recently" was 34MWh. The annual generation of **"**the power plants capacity additions in the electricity system that comprise 20% of the system generation (in GWh) and that have been built most recently.**"** was 78,004,323MWh. Therefore, the latter was chosen as a lager figure than the other one. The detailed data used in the calculation are presented in Annex 3.

Step 6. – Calculation of the Build Margin (BM) emission factor

The emission factor of BM is calculated using the following equation:

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

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

Step 7. – Calculate the Combined Margin (CM) emission factor

Based on the results derived from Step 1, and Step 2, $EF_{grid,CM,y}$ has been calculated using the following formula:

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

According to "Tool to calculate the emission factor for an electricity system", wind power generation project activities are w_{OM} =0.75 and w_{BM} = 0.25 for the first crediting period and for subsequent crediting periods. And $EF_{grid,OM,y}$, $EF_{grid,BM,y}$ are calculated as described in Steps 1 and 2 above and are expressed in tCO_2/MWh.

B.6.2. Data and parameters fixed ex ante

Data / Parameter	**EF_y**
Unit	tCO_2/MWh
Description	CO_2 emission factor of the Jeju special self-governing province.
Source of data	Calculated
Value(s) applied	0.6102
Choice of data or Measurement methods and procedures	This value was calculated according to "Tool to calculate the emission factor for an electricity system.(Ver.2)" Applied value was calculated by referring Statistics of Electric Power in 2005-2007, KEPCO 2006-2008 and Status of Generation facility (2008) (Korea Power Exchange). When the OM EF is estimated which reflect the value of OM EF supplied to Jeju Special self-governing province by using a weight average of OM(inland). Electricity generation in Jeju special self-governing province is not enough to supply Jeju Special self-governing province, so interconnection tie from inland must be needed.
Purpose of data	Calculation of baseline emissions.
Additional comment	-The same value will be applied during the first crediting period without update. -For detail calculation method, refer to Annex 3.

Data / Parameter	$EF_{OM,y}$
Unit	tCO_2/MWh
Description	CO_2 OM emission factor of the Jeju special self-governing province.
Source of data	Calculated
Value(s) applied	0.6819
Choice of data or Measurement methods and procedures	This value was calculated according to "Tool to calculate the emission factor for an electricity system.(Ver. 2)" Applied value was calculated by referring Statistics of Electric Power in 2005-2007, KEPCO 2006-2008 and Status of Generation facility (2008) (Korea Power Exchange). When the OM EF is estimated which reflect the value of OM EF supplied to Jeju Special self-governing province by using a weight average of OM(inland). Generation electricity in Jeju special self-governing province is not enough to supply Jeju Special self-governing province, so that to use interconnection tie from inland.
Purpose of data	Calculation of baseline emissions.
Additional comment	-This data will be calculated at the time of PDD submission and will not be changed during the first crediting period. - This value is ex-ante value which is calculated at the time of PDD submission and will be applied during the crediting period without update.

Data / Parameter	$EF_{BM,y}$
Unit	tCO_2/MWh
Description	CO_2 BM emission factor of The Republic of Korea grid.
Source of data	Electricity statistics on Electricity quantity from Korea Electric Power Corporation
Value(s) applied	0.3950
Choice of data or Measurement methods and procedures	This value was calculated according to "Tool to calculate the emission factor for an electricity system.(Ver. 2)" Applied value was calculated by referring Statistics of Electric Power in 2005-2007, KEPCO 2006-2008 and Status of Generation facility (2008) (Korea Power Exchange).
Purpose of data	Calculation of baseline emissions.
Additional comment	-This data will be calculated at the time of PDD submission and will not be changed during the first crediting period. - This value is ex-ante value which is calculated at the time of PDD submission and will be applied during the crediting period without update.

Data / Parameter	$FC_{i,m,y}$
Unit	mass or volume unit
Description	Amount of fossil fuel type i consumed by power plant / unit m in year y
Source of data	Statistics of Electric Power in 2005-2007, KEPCO 2006-2008
Value(s) applied	See the <Table Annex-1>
Choice of data or Measurement methods and procedures	Applied value was referred Statistics of Electric Power in 2005-2007, KEPCO 2006-2008.
Purpose of data	Calculation of baseline emissions.
Additional comment	- The same value will be applied during the first crediting period without updating.

Data / Parameter	$NCV_{i,v}$
Unit	kcal/mass or volume unit
Description	Net calorific value of fossil fuel type i consumed by power plant / unit m in year y
Source of data	Statistics of Electric Power in 2005-2007, KEPCO 2006-2008
Value(s) applied	See the <Table Annex-2>
Choice of data or Measurement methods and procedures	Applied value refers to Statistics of Electric Power in 2005-2007, KEPCO 2006-2008.
Purpose of data	Calculation of baseline emissions.
Additional comment	- $NCV_{i,v}$ is the value that the $GCV_{i,v}$ multiplied the Net caloric values conversion factor. - $GCV_{i,v}$ value refers to Statistics of Electric Power in 2005-2007, KEPCO 2006-2008 and Net caloric values conversion factor was referred 2006 IPCC Guidelines for National Greenhouse Gas Inventories. - The same value will be applied during the first crediting period without updating.

Data / Parameter	$EF_{CO2,i,y}$
Unit	tCO_2/TJ
Description	CO_2 emission factor of fossil fuel type i in year y
Source of data	2006 IPCC Guidelines on National GHG Inventories
Value(s) applied	See the <Table Annex-5>
Choice of data or Measurement methods and procedures	IPCC default values at the lower limit of the uncertainty at 95% confidence interval as provided in table 1.4 of Chapter1 of Vol.2(Energy)
Purpose of data	Calculation of baseline emissions.
Additional comment	- The same value will be applied during the first crediting period without updating

Fuel Type	Gasoline	Diesel oil	Residual fuel oil	LNG	Bituminous coal	Anthracite
EF $_{co2,i,y}$	67.5	72.6	75.5	54.3	89.5	94.6

The calculation of the OM and BM emission factors were submitted to DOE as an excel file. It's including following information:

- Information to clearly identify the plant
- The fuel type(s) used
- The quantity of net electricity generation in the relevant year(s)
- The fuel consumption of each fuel type in the relevant year(s)
- Information of a low-cost/must-run plant

B.6.3. Ex ante calculation of emission reductions

>>

Baseline emission

The capacity of the project is 33MW and expected electricity supplied to the grid by the project is 88,948MWh per year. As described above, approved methodology ACM0002 (ver. 11) has been used.

$$\mathbf{BE_y = EG_{PJ,y} \times EF_{grid,CM,y}}$$

$$= 88{,}948\ MWh/yr \times 0.6102 tCO_2/MWh$$

$$= \mathbf{54{,}276\ tonCO_2/yr}$$

where

BE_y = Baseline emission in year *y* (tCO_2/yr)

$EG_{PJ,y}$ = Quantjty of net electiricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year *y* (MWh/yr)

$EF_{grid,CM,y}$ = Combined margin CO2 emission factor gor grid connected power generation in year *y* calculate using the latest version of the "Tool to claculated the emission factor for an electricity system" (tCO_2/MWh)

The project activity is the installation of a new grid-connected renewable power plant at a site where no renewable power plant was operated prior to the implenmentation of the project activity.

$$\mathbf{EG_{PJ,y} = EG_{facility,y}}$$

where

$EG_{PJ,y}$ = Quantjty of net electiricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year *y* (MWh/yr)

$EF_{facility,y}$ = Quantjty of net electiricity supplied by the project plant/unit to the grid in year *y*

(MWh/yr)

Project emission

For most renewable energy project activities, $PE_y = 0$.

Leakage

No leakage emissions are considered. The main emissions potentially giving rise to leakage in the context of electric sector projects are emissions arising due to activities such as power plant construction and upstream emissions from fossil fuel use (e.g. extraction, processing, transport). These emissions sources are neglected.

Ex-ante emission reduction

$\mathbf{ER_y = BE_y - PE_y}$
$= \mathbf{54,276\ tonCO_2/yr} - 0\ tonCO_2/yr$
$= \mathbf{54,276\ tonCO_2/yr}$

where

ER_y = Emission reduction in year *y* (tCO_2/yr)
BE_y = Baseline emission in year *y* (tCO_2/yr)
PE_y = Project emission in year *y* (tCO_2/yr)

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

Year	Baseline emissions (t CO_2e)	Project emissions (t CO_2e)	Leakage (t CO_2e)	Emission reductions (t CO_2e)
01/07/2011~31/12/2011	27,138	0	0	27,138
01/01/2012~31/12/2012	54,276	0	0	54,276
01/01/2013~31/12/2013	54,276	0	0	54,276
01/01/2014~31/12/2014	54,276	0	0	54,276
01/01/2015~31/12/2015	54,276	0	0	54,276
01/01/2016~31/12/2016	54,276	0	0	54,276
01/01/2017~31/12/2017	54,276	0	0	54,276
01/01/2018~31/12/2018	54,276	0	0	54,276
01/01/2019~31/12/2019	54,276	0	0	54,276
01/01/2020~31/12/2020	54,276	0	0	54,276
01/01/2021~30/06/2021	54,276	0	0	54,276
Total	542,760	0	0	542,760
Total number of crediting years	10years			
Annual average over the crediting period	54,276	0	0	54,276

B.7. Monitoring plan
B.7.1. Data and parameters to be monitored

Data / Parameter	$EG_{facility,y}$
Unit	MWh/yr
Description	The Quantity of net electricity generated supplied by the project plant to the grid in year *y*
Source of data	calculated as export of electricity($EG_{export,y}$) minus consumption of electricity($EG_{consumption,y}$)
Value(s) applied	88,948
Measurement methods and procedures	Automatically measured
Monitoring frequency	
QA/QC procedures	-
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	$EG_{export,y}$
Unit	MWh/yr
Description	The Quantity of annual electricity delivered to the grid by the proposed project
Source of data	Measure at Samdal wind power plants
Value(s) applied	88,948
Measurement methods and procedures	Automatically measured Main and Sub meter for EG export and Sub will be used when the Main is malfunction
Monitoring frequency	Continuously monitoring Hourly measurement. At least Monthly record
QA/QC procedures	Uncertainty of data is low. QA/QC procedure for this is planned. The allowable error of data must be within ±0.2%.(Act on operation of electricity market. 2006.09)
Purpose of data	Calculation of baseline emissions
Additional comment	Data will be automatically measured and recorded monthly. Data will be kept for two years after the last issuance of CERs for this project activity. Aggregated data will be transferred to KPX (Korea Power Exchange) daily. If the variables between the one recorded by the PP and another kept by KPX website, the data of kept by KPX is applied. Data will be aggregated weekly, monthly and yearly from KPX. Measured data will be double check against receipt of sales. In case break-down of the monitoring equipment, data of a comparator measurement is applied. (The comparator measurement allowable error of data must be within ±0.5%, although PP installed within ±0.2)

Data / Parameter	$EG_{consumption,y}$
Unit	MWh/yr
Description	The Quantity of annual electricity purchased from the grid by the proposed project
Source of data	Measure at Samdal wind power plants
Value(s) applied	0
Measurement methods and procedures	Data will be automatically measured and recorded monthly. Main meter is installed at substation. The allowable error of data must be within ±0.5 %
Monitoring frequency	Continuously monitoring Hourly measurement. At least Monthly record
QA/QC procedures	Uncertainty of data is low. QA/QC procedure for this is planned.
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	$EF_{grid,CM,y}$
Unit	tCO_2/MWh
Description	Combined margin CO2 emission factor for grid connected power generation on year *y* calculated using the latest version of the " Tool to calculate the emission factor for an electricity system"
Source of data	As per the "tool to calculate the emission factor for an electricity system"
Value(s) applied	0.6102
Measurement methods and procedures	As per the "tool to calculate the emission factor for an electricity system"
Monitoring frequency	-
QA/QC procedures	As per the "tool to calculate the emission factor for an electricity system"
Purpose of data	Calculation of baseline emissions
Additional comment	-

B.7.2. Sampling plan

>>

N/A

B.7.3. Other elements of monitoring plan

>>

The monitoring plan details the actions necessary to record all the variables and factors required by the methodology ACM0002, version 11. All data will be archived electronically, and backed up regularly. Moreover, data will be kept for two years after the last issuance of CERs for this project activity.

Project staff will be trained regularly in order to satisfactorily fulfill their monitoring obligations. The authority and responsibility for project management, monitoring, measurement and reporting will be formalized. Procedures for calibration of monitoring equipment, maintenance of monitoring equipment and installations, and for records handling will be established.

Monitoring plan

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

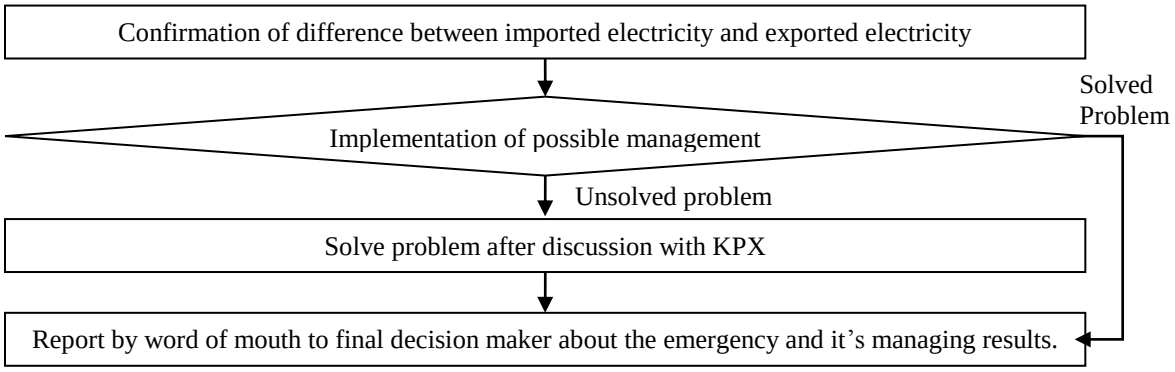
1. Monitoring equipment

1-1. Electricity measuring meters shall be set up transparently in accordance with "Law regarding measurement" and "Act on operation of electricity market" and shall be sealed after affirmation of Korea Power Exchange.
1-2. The meters shall be authorized through the due formal certifying process (the valid period for the authorized certification: 7 years.) (Act on operation of electricity market 7.3.8, 2009.1.1)
1-3. The exported meters shall be calibrated when they are installed, and re-calibrated every three years after the installation. (Act on operation of electricity market 7.3.1, 2009.1.1)
The watt-hour meter for electricity imported from the grid is not within the control of project participants and calibration frequency of the watt-hour meter in national standard is once in 7 years
1-4. The metering equipment measuring point must be installed and maintained. (Act on operation of electricity market 4.1.1, 2009.1.1)

1-5. Allowable error of the export meter is ±0.2% and imported meter is ±0.5%

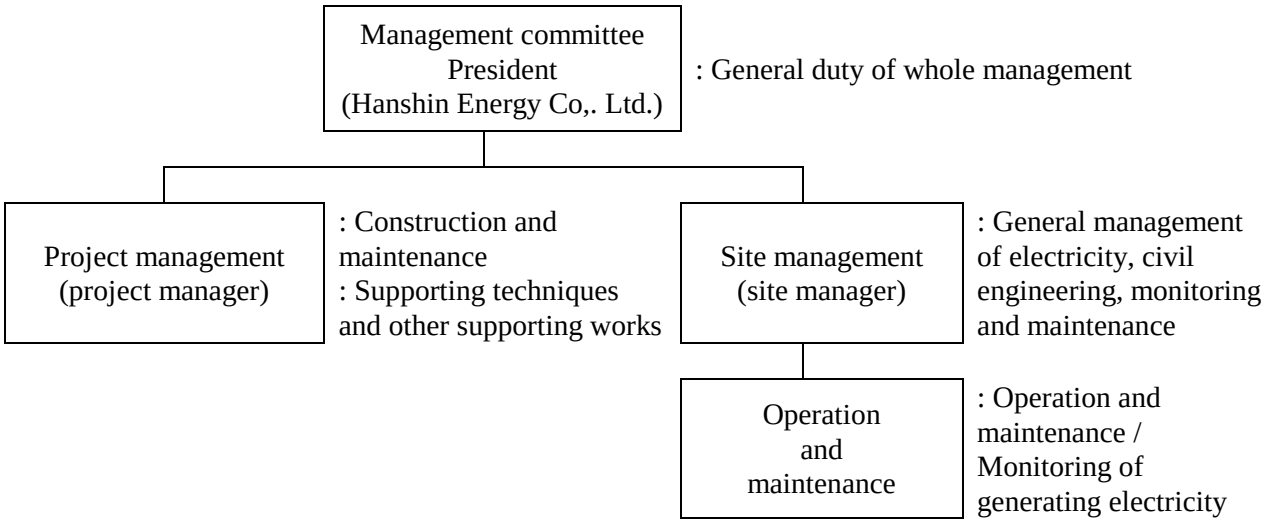
2. Monitoring of amount of electricity
2-1. The amount electricity transmitted to the grid shall be measured automatically by the established meters. The measured variables are simultaneously transferred to Samdal wind park central control system.
2-2. The measured amount of electricity shall be collected daily, weekly and monthly and shall be archived in electronic way.
2-3. The collected variables compared in clause 2-2. shall be compared with those of Korea Power Exchange.
2-4. If the two variables compared in clause 2-3. are different, the operation of condition of electricity meters and other equipments shall be examined. In case meters are improperly operated equipment, internal investigation and correction procedure shall be followed and be certified by the final decision-maker and Korea Power Exchange.

- Procedures for emergency preparedness:



3. Management of monitoring and electricity safety
3-1. The person in charge for monitoring and electricity safety shall attend the monitoring courses regularly.
Initial training for employees in site will be provided by the equipment supplier. If there are

additional employees or changes of operating manual, VESTAS will be responsible for training them. VESTAS will undergo training for operation of monitoring system, emergency preparedness and management of data following operating manual. Training will include an organized course of theoretical and practical components.
3-2. In case of absence of the responsible person, the second responsible person shall be selected.
3-3. If the responsibility for monitoring and electricity safety is transferred to another person, one shall be approval by the final decision-maker.
3-4. If metering equipment will be properly maintained and checked according to the national or professional requirement by qualified third party designated if being out of work.



SECTION C. Duration and crediting period
C.1. Duration of project activity
C.1.1. Start date of project activity
>>
29.12.2007 (Contract of supply for wind power generation)

C.1.2. Expected operational lifetime of project activity
>>
The project will have the operational lifetime of 20 years.

C.2. Crediting period of project activity
C.2.1. Type of crediting period
>>
Fixed

C.2.2. Start date of crediting period
>>
01 Jul 2011

C.2.3. Length of crediting period
10years

SECTION D. Environmental impacts

D.1. Analysis of environmental 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, the advance examination of the environmental impact 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".

The advance examination of the environmental impact of Samdal wind power was conducted by Evergreen Test Office Co., Ltd. in March 2007, March 2008 and February 2009.

They make the the advance examination of the environmental impact at 2007 about 13 wind turbines. But some wind turbines location was changed. And two wind turbines is accepted a list. As a result, they conducted the advance examination of the environmental impact of Samdal wind power about 11 wind turbines. Finally, it precedes third the advance examination of the environmental impact to guarantee the minimum interval of turbines and maximum efficiency.The advance examination of the environmental impact of business development through the approved permit approval.

The advance examination of the environmental impact covers the sectors of natural environment, residential environment, and social/economical environment as follows,

- Natural environment
  : Topography & Geology, Fauna & Flora
- Residential environment
  : Land use, Air quality, Water quality, Soil, Waste, Noise & Vibration, Landscape view

As a result, the construction and operation for the project were analyzed in the advance examination of the environmental impact. The specific contents are represented as follows:

In the construction phase

1. Natural Environment
   A. Topography & Geology
   The by-produced soil during the construction will be provided to the farms and industrial sites in the vicinity for free to impair the impact of hazardous damage.
   → PP will Eco-friendly construct by adequate protection equipment.
   B. Fauna & Flura
   The construction area in almost covered with grassland (especially, pampas grass) so it was estimated that construction & operation of the wind power would barely affect the fauna near the area. The wildlife is thought to be under partial influence due to the construction inevitably, however, the change of stronghold is only limited in a small area covering the project site. The inhabitation is far from the damage or influence from the site.
   →PP will avoid destruction outside the planned site by through supervision and minimize the night work.

2. Resident Environment
   A. Land use
   Permanently occupied land for the project is about 2.9 ha.
   →The site is designed to minimize the construction area to avoid unnecessary development. Also

they minimize geographical

B. Air quality

An atmospheric modeling indicated the elevated concentrations of air pollutants due to the construction wouldn't exceed the atmospheric environment criteria under legislation of MKE of the Republic of Korea Government. Air quality deterioration would be negligible.

C. Water quality

Water quality was estimated to be under little influence of sediment incoming into the surface water.
→PP will do the construction work according to the related regulations.

D. soil

It is expected that oil leakage and waste oil might contaminate the soil in the project site.
→To reduce the effect, it is planned to minimize the frequency of oil exchange for heavy equipment and to execute oil change at the gas station if possible. In case of inevitable oil exchange in the project site, the waste is collected and treated in the temporal on-site facility.

E. Waste

→Municipal wastes are on a plan to collect and recycle if possible. The other wastes are supposed to be treated in compliance with the Waste Treatment Plan under legislation of Seogwipo City.

F. Noise & vibration

In the area less than 47.5m, it was expected to exceed the Resident Noise Standard (70dB) during the construction process. The resident area around project site complied the Noise and vibration standard.
→PP will do the construction work according to the related regulation for 'construction noise, construction management tips(MKE, 1993.11)'

G. Landscape view

When the project is completed, the turbines newly set up will be a special and beautiful view, which could be developed to a new tourist site, and have positive social and economic impact to the local people.
→And the PP will try to minimize the damage of geographical feature. Also through underground construction of some transaction lines, influence on the scenery will be little.

In the operation phase

1. Ecological impact
   The birds near the project site are living in forestry and have no fixed migratory line. Therefore, the probability of birds colliding with turbine blades is not happen.

2. Noise
   The operating noise of wind turbines comes from the friction between wind and blades and from the running mechanical parts inside it. Since the project site is complied the national standard, the impact on local residents is insignificant.

3. Sanitary waste and municipal waste
   The sanitary waste from the management staff of the Project will be discharged into integrated waste treatment facilities. And the municipal waste from the management staff of the Project will be collected and treated by the environmental sanitation service agent.

D.2. Environmental impact assessment

>>

There is no significant issue. It will be monitored according to the advance examination of the environmental impact. If the critical issue occurs, it will be reported and discussed with Jeju Special self-governing province.

SECTION E. Local stakeholder consultation

E.1. Solicitation of comments from local stakeholders

>>

For the successful execution of the project, Hanshin Energy Co., Ltd. prepared presentation for the local residents around the province where the turbines would be installed.

Date : 01.Sep. 2008
Place : Samdal-ri office
Participants : local residents in Samdal-ri and officers of Samdal wind power project
Remarks : the officers made an presentation for the local residents and the contents are as follow

- Introduction of overall outline of Samdal wind power
- Construction schedule
- Discussion about the project with the local residents and Q&A

<Figure E- 1 Project presentation photo for residents and proceedings>

<Figure E-2 Project presentation material>

Figurer E-2 show project presentation photo for residents and proceedings. Samdal-ri resident inquired about noise and soil pollution.

Date : 23. Jul. 2007
Place : Seongeup 1-li office
Participants : local residents in Seongeup -li and officers of Samdal wind power project
Remarks : the officers made an presentation for the local residents and the contents are as follow

- introduction of overall outline of Samdal wind power
- construction schedule
- plan on how to use the abandoned stock farm

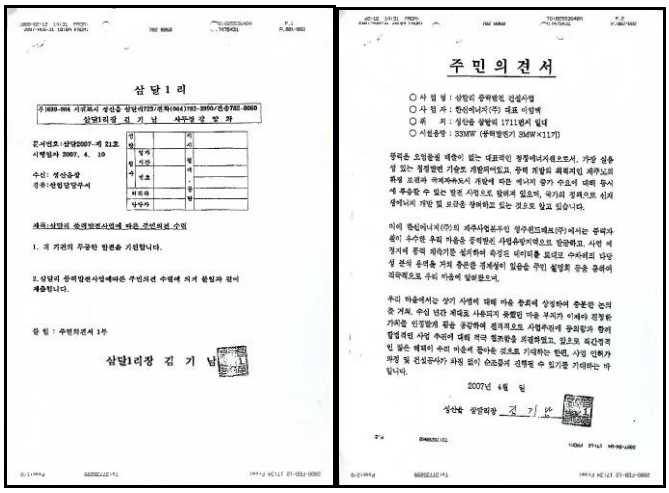
<Figure E-3 Project presentation photo for resident and proceedings>

Samdal wind power project is reported in the newspaper (03.07.2007, The Korea Economic Daily). The newspaper article inside informing the construction of Samdal wind power to Jeju Special self-governing province which gets the motion of the resident.

한국경제 【Biz@CEO】 한신에너지(주)··"제주發 `에너지 바람` 기대하세요" 입력시각 : 2007-07-03 15:51 < 이 기사는 Biz@CEO 기획특별판 입니다 > 한신에너지㈜(대표 이입택)는 국내 풍력발전 보편화의 견인차 역할을 자임하고 나선 기업이다. 국내에 '에너지 바람'을 일으키겠다는 포부로 현재 제주도에 33메가와트(MW)급 삼달풍력발전단지 건설을 추진하고 있다. 지난해 12월 사업허가 신청을 냈고,부지사용에 관한 주민의 동의도 얻은 상황이다. "국내 에너지자원의 안정적 확보를 위해 풍력발전 사업에 뛰어들었다"고 사업 동기를 밝힌 이입택 대표는 "블루오션을 개척한다는 자세로 향후 국내 전력량의 15%까지 풍력으로 공급할 수 있도록 노력할 것"이라고 말했다. 이 대표는 내년 9월 가동을 목표로 삼달풍력 사업승인과 한계용량 설정 문제 해결에 혼신을 다하고 있다. 그는 "추후 1단계와 2단계 공사를 통해 현재의 전력 연계선을 양방향 제어로 변경하면 270~300MW까지도 풍력발전을 수용할 수 있다"고 주장했다. 한신에너지㈜는 이번 삼달풍력발전단지 건설이 성공적으로 마무리되면 제주 가파도와 해남 및 진도 지역에 차례로 풍력발전단지를 세울 계획이다. 가파도에서는 지난 1년간 풍력자원 측정 작업을 진행해왔다. 원활한 사업 추진을 위해 투자회사를 구성할 계획이라는 이 대표는 "풍력산업 육성과 사업 확장을 위해 산·학·연 간 풍력산업 활성화 협의회 구성도 검토하고 있다"고 말했다 양승현 기자 yangsk@hankyung.com	Hanshin energy "wind power energy" in Jeju Special self-governing province 2007.07.03 Hanshin energy lead that wind power is becoming increasingly common. At present, they building 33MW samdal wind power plant in Jeju Special self-governing province. The previous year, they request permission to project. And they get resident's agreement. The company CEO said they want to operation of wind power project in next September. When they are successful in complete the project, they are planning the next project in Gapa-do, etc. They measured about wind resource of Gapa-do in the past year. (reporting seunghyun Yang)

<Figure E-4 Newspaper article of this project>

Figure E-5 shows that statement of Samdal-ri residents. They agree with the project.



삼 달 1 리

주 민 의 견 서

The statement of Samdal-ri residents

· Project : Samdal wind power construction project

· Organization : Hanshin energy Co., Ltd.

· Site : samdal-ri 1171 street, Seongsan-eup

· Facility Capacity : 33MW(3MW×11)

Wind energy as a power source is attractive as an alternative to fossil fuels, because it is renewable, clean, and produces no greenhouse gas emissions. And growing needs for energy is causing the install of wind power. Hanshinn energy notify about the project. The residents discuss the project as a result they agree with that Samdal wind power project.

<Figure E- 5 Statement of Samdal-ri residents this project>

The PP held two public hearings for the local residents and local government officials during the site visit. The local residents say that samdal wind power project is a positive role in regional development. local government officials say that samdal wind power project has no problem with the procedure.

E.2. Summary of comments received

>>

Besides presentation meetings above pictures, times of official meeting 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.

- Soil pollution due to construction impacts on farming
- Landscape, noise, frequency, availability and other questions about farming
- Information about financial aid
- Resolve complaints about the problem

E.3. Report on consideration of comments received

>>

The action result of the advance examination of the environmental impact (2007.06), PP was the construct of the wind turbines as below.

- Soil pollution due to construction impacts on farming

During the field work through the training of workers will not affect farming. The oil will be exchange in the maintenance shop during construction. The PP takes appropriate measures for protection of environmental scenery from its early stage of construction.

- Landscape, noise, frequency, availability and other questions about farming

Also for the matter of noises, the project developers informed that the noise level of the proposed plant become under 70dB(A), 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.

- Information about financial aid

PP promised to give financial support to local residents. On the matter of giving back to the community, the project developers explained that they expected the project would much contribute to tourism, create new jobs and stimulate local economy. The local residents discussed about this subject and Samdal local community agreed to progress this project. They expressed strong positive comments on the project of which effect would contribute to local economy and infrastructure. Hanshin Energy Co. Ltd. promised that the part of benefit by generating electricity would be re-distributed to Samdal area in terms of social welfare.

- Resolve complaints about the problem

Mr. Jung Soowon and Mr. Go Baechol claimed this project insisting on that their motel and land would be under significant side effect of the wind turbines. In addition, they are urging other residents in the neighboring villages to hinder this project from the beginning. Even though taking into the points of Mr. Jung and Mr. Go, The advance examination of the environmental impact indicates that their motel and land are far from noise & vibration.
The advance examination of the environmental impact assessment indicates that their motel and land are far from noise & vibration. Nevertheless to solve their complaints, Hanshin Energy Co., Ltd. suggested that they will purchase the motel and lands to Mr. Jung and Mr. Go owns in the project site. When the purchase price would be determined at reasonable price level, Hanshin Energy Co., Ltd. will purchase the land immediately. Also, the land will be used as a facility for the convenience of the local community

Hanshin Energy 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.

The PP will be conduct to manage and record the action depending on the advance examination of the environmental impact. Because project participants should be conduct about monitor depending on the advance examination of the environmental impact, for serious environmental impacts.

SECTION F. Approval and authorization

>>
N/A

- - - - -

Appendix 1: Contact information of project participants

Organization name	Hanshin Energy Co., Ltd
Street/P.O. Box	145
Building	Samha Building
City	Seoul
State/Region	Samsung-dong, Gangnam-gu
Postcode	135-090
Country	Republic of Korea
Telephone	(82-2)553-6260
Fax	(82-2)553-6404
E-mail	khs64@paran.com
Website	
Contact person	
Title	
Salutation	Mr.
Last name	Kim
Middle name	
First name	Hyung-suek
Department	
Mobile	(82)11-704-7950
Direct fax	(82-2)553-6404
Direct tel.	(82-2)553-6260
Personal e-mail	khs64@paran.com

Appendix 2: Affirmation regarding public funding

No Public Funding

Appendix 3: Applicability of selected methodology

N/A

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

BASELINE INFORMATION

Data for Operating Margin Factor

<Annex 3-1> Data on fuel consumption for plants in the Operating Margin

No.	Fuel Type	Plant		Amount of fossil fuel($FC_{i,m,y}$)			
				Coal (t)	**Heavy oil (kl)**	**Diesel oil (kl)**	**L. N. G (t)**
1	bituminous coal	Honam	#1	870,214	961	278	-
2			#2	912,497	338	185	-
3		Samchonpo	#1	1,534,223	-	1,220	-
4			#2	1,731,265	-	626	-
5			#3	1,723,152	-	377	-
6			#4	1,632,334	-	1,029	-
7			#5	1,516,654	-	1,415	-
8			#6	1,546,663	-	1,001	-
9		Yonghung	#1	2,081,972	-	4,541	-
10			#2	1,761,395	-	2,903	-
11		Boryeong	#1	1,440,343	-	761	-
12			#2	1,388,532	-	551	-
13			#3	1,589,150	-	90	-
14			#4	1,421,343	-	603	-
15			#5	1,587,999	-	156	-
16			#6	1,260,305	-	627	-
17		Taean	#1	1,508,570	-	621	-
18			#2	1,323,078	-	395	-
19			#3	1,494,175	-	650	-
20			#4	1,383,297	-	365	-
21			#5	1,411,398	-	742	-
22			#6	1,504,962	-	417	-
23		Hadong	#1	1,513,930	-	284	-
24			#2	1,410,099	-	792	-
25			#3	1,422,196	-	472	-
26			#4	1,511,054	-	567	-
27			#5	1,345,648	-	614	-
28			#6	1,520,774	-	331	-
29		Dangjin	#1	1,438,702	-	637	-
30			#2	1,437,473	-	632	-
31			#3	1,549,041	-	141	-
32			#4	1,544,010	-	134	-
33			#5	499,714	-	5,701	-

34			#6	38,671	-	1,779	-
35	heavy oil	Ulsan	#1	-	70,183	750	-
36			#2	-	67,296	585	-
37			#3	-	53,085	662	-
38			#4	-	375,417	1,971	-
39			#5	-	363,992	1,676	-
40			#6	-	352,776	1,708	-
41		Youngnam	#1	-	359,910	844	-
42			#2	-	190,085	584	-
43		Yosu	#1	-	106,919	434	-
44			#2	-	218,356	346	-
45		Pyongtaek	#1	-	293,214	118	3,553
46			#2	-	321,188	140	2,641
47			#3	-	308,042	132	1,784
48			#4	-	311,245	138	2,047
49		Namjeju	#1	-	14,628	15	-
50			#2	-	15,031	12	-
51		Jeju	#1	-	12,564	12	-
52			#2	-	129,516	-	-
53			#3	-	122,866	48	-
54	L.N.G	Seoul	#4	-	-	-	49,143
55			#5	-	-	1	108,761
56		Incheon	#1	-	-	-	4,365
57			#2	-	-	-	8,505
58			#3	-	-	372	746
59			#4	-	-	400	6,620
60	Combined Cycle	Pyongtaek C/C	C/C	-	-	1	110,953
61		Ilsan	C/C	-	-	-	533,188
62		Bundang	C/C	-	-	-	671,944
63		Ulsan	C/C	-	-	-	470,131
64		Seoincheon	C/C	-	-	335	989,645
65		Shinincheon	C/C	-	-	-	1,458,763
66		Boryeong	C/C	-	-	-	1,161,510
67		Incheon	C/C	-	-	-	281,813
68		Busan	C/C	-	-	-	1,211,144
69		Hallim	C/C	-	-	29,686	-
70		Anyang	C/C	-	-	-	261,202
71		Bucheon	C/C	-	-	-	261,705
72		POSCO POWER	C/C	-	-	-	445,253
73		G S Bugog	C/C	-	-	-	297,976
74		Yulchon	C/C	-	-	159	194,534
75	Internal combustion	Namjeju	D/P	-	56,727	37	-
76		Jeju	G/T	-	-	2,869	-
77		Jeju	D/P	-	31,808	72	-
total				**47,854,833**	**3,776,147**	**75,744**	**8,537,926**

total (Land)	**47,854,833**	**3,393,007**	**42,993**	**8,537,926**
total (Jeju island)	**-**	**383,140**	**32,751**	**-**

Source: Statistics of Electric Power in 2005, KEPCO 2006

No.	Fuel Type	Plant		Amount of fossil fuel($FC_{i,m,y}$)			
				Coal (t)	**Heavy oil (kl)**	**Diesel oil (kl)**	**L. N. G (t)**
1	bituminous coal	Honam	#1	781,139	1,113	279	-
2			#2	859,736	1,251	359	-
3		Samchonpo	#1	1,696,271	-	860	-
4			#2	1,508,082	-	1,362	-
5			#3	1,519,385	-	457	-
6			#4	1,521,263	-	1,818	-
7			#5	1,665,339	-	977	-
8			#6	1,770,348	-	428	-
9		Yonghung	#1	2,004,193	-	2,548	-
10			#2	2,129,118	-	2,545	-
11		Boryeong	#1	1,638,140	-	306	-
12			#2	1,389,425	-	1,137	-
13			#3	1,323,779	-	514	-
14			#4	1,610,928	-	82	-
15			#5	1,296,455	-	541	-
16			#6	1,553,273	-	518	-
17		Taean	#1	1,354,832	-	514	-
18			#2	1,532,209	-	162	-
19			#3	1,338,967	-	575	-
20			#4	1,548,909	-	133	-
21			#5	1,542,775	-	544	-
22			#6	1,294,577	-	1,113	-
23			#7	61,910	-	4,799	-
24		Hadong	#1	1,373,049	-	515	-
25			#2	1,543,074	-	293	-
26			#3	1,549,094	-	153	-
27			#4	1,376,612	-	796	-
28			#5	1,554,524	-	242	-
29			#6	1,371,801	-	690	-
30		Dangjin	#1	1,380,527	-	966	-
31			#2	1,570,077	-	161	-

32			#3	1,402,916	-	433	-
33			#4	1,386,317	-	1,549	-
34			#5	1,456,458	-	745	-
35			#6	1,216,582	-	3,051	-
36			#7	1,008	-	505	-
37	heavy oil	Ulsan	#1	-	72,243	605	-
38			#2	-	80,187	469	-
39			#3	-	96,459	518	-
40			#4	-	360,919	3,729	-
41			#5	-	375,985	3,678	-
42			#6	-	378,331	3,694	-
43		Youngnam	#1	-	107,090	1,016	-
44			#2	-	95,127	1,494	-
45		Yosu	#1	-	99,129	281	-
46			#2	-	215,957	291	-
47		Pyongtaek	#1	-	261,458	141	3,997
48			#2	-	277,025	166	5,687
49			#3	-	303,858	134	3,891
50			#4	-	245,602	103	3,473
51		Namjeju	#1	-	11,406	17	-
52			#2	-	9,772	14	-
53			#3	-	46,504	2,509	-
54		Jeju	#1	-	8,603	23	-
55			#2	-	113,679	64	-
56			#3	-	117,464	67	-
57	L.N.G	Seoul	#4	-	-	1	69,383
58			#5	-	-	1	152,891
59		Incheon	#1	-	-	-	6,945
60			#2	-	-	-	5,223
61			#3	-	-	311	15,426
62			#4	-	-	311	12,454
63	Combined Cycle	Pyongtaek C/C	C/C	-	-	45	84,054
64		Ilsan	C/C	-	-	1,384	556,504
65		Bundang	C/C	-	-	-	720,381
66		Ulsan	C/C	-	-	-	536,196
67		Seoincheon	C/C	-	-	1,066	1,199,196
68		Shinincheon	C/C	-	-	-	1,641,038

69		Boryeong	C/C	-	-	-	998,683
70		Incheon	C/C	-	-	-	484,606
71		Busan	C/C	-	-	-	1,396,417
72		Hallim	C/C	-	-	48,475	-
73		Anyang	C/C	-	-	-	230,969
74		Bucheon	C/C	-	-	215	225,713
75		POSCO POWER	C/C	-	-	-	408,018
76		G S Bugog	C/C	-	-	-	389,811
77		Yulchon	C/C	-	-	-	315,132
78	Internal combustion	Namjeju	D/P	-	51,347	111	-
79		Jeju	G/T	-	-	8,264	-
80		Jeju	D/P	-	52,907	-	-
total				**50,123,092**	**3,383,416**	**111,867**	**9,466,088**
total (Land)				**50,123,092**	**2,971,734**	**52,323**	**9,466,088**
total (Jeju island)				**-**	**411,682**	**59,544**	**-**

Source: Statistics of Electric Power in 2006, KEPCO 2007

No.	Fuel Type	Plant		Amount of fossil fuel($FC_{i,m,y}$)			
				Coal (t)	**Heavy oil (kl)**	**Diesel oil (kl)**	**L. N. G (t)**
1	bituminous coal	Honam	#1	866,853	889	281	-
2			#2	846,931	811	262	-
3		Samchonpo	#1	1,631,706	-	296	-
4			#2	1,804,695	-	384	-
5			#3	1,755,374	-	434	-
6			#4	1,543,140	-	677	-
7			#5	1,850,764	-	315	-
8			#6	1,714,320	-	619	-
9		Yonghung	#1	1,902,557	-	3,320	-
10			#2	2,296,289	-	1,779	-
11			#3	119,883	-	3,964	-
12			#4	-	-	-	-
13		Boryeong	#1	1,466,761	-	811	-
14			#2	1,655,488	-	169	-
15			#3	1,648,008	-	187	-
16			#4	1,347,303	-	646	-
17			#5	1,629,904	-	195	-
18			#6	1,490,809	-	387	-
19		Taean	#1	1,524,391	-	410	-
20			#2	1,434,221	-	374	-
21			#3	1,521,349	-	350	-
22			#4	1,320,380	-	422	-
23			#5	1,342,358	-	676	-
24			#6	1,535,931	-	491	-
25			#7	1,430,171	-	2,321	-
26			#8	919,055	-	3,636	-
27		Hadong	#1	1,582,726	-	178	-
28			#2	1,396,830	-	637	-
29			#3	1,424,033	-	375	-
30			#4	1,572,409	-	292	-
31			#5	1,486,776	-	452	-
32			#6	1,585,307	-	109	-
33		Dangjin	#1	1,512,904	-	269	-
34			#2	1,358,316	-	543	-
35			#3	1,516,065	-	119	-
36			#4	1,519,231	-	342	-
37			#5	1,279,796	-	1,038	-
38			#6	1,281,318	-	878	-
39			#7	1,059,612	-	6,681	-
40			#8	467,807	-	4,873	-
41	heavy oil	Ulsan	#1	-	107,844	406	-
42			#2	-	108,381	483	-
43			#3	-	120,571	576	-
44			#4	-	341,170	3,525	-

45			#5	-	370,712	4,711	-
46			#6	-	216,409	3,021	-
47		Youngnam	#1	-	174,082	1,232	-
48			#2	-	122,249	796	-
49		Yosu	#1	-	121,572	332	-
50			#2	-	257,420	367	-
51		Pyongtaek	#1	-	269,284	114	3,316
52			#2	-	359,870	140	6,339
53			#3	-	349,481	157	4,874
54			#4	-	255,443	117	4,047
55		Namjeju	#1	-	-	-	-
56			#2	-	-	-	-
57			#3	-	124,559	225	-
58			#4	-	127,900	341	-
59		Jeju	#1	-	1,049	4	-
60			#2	-	70,122	112	-
61			#3	-	98,846	34	-
62	L.N.G	Seoul	#4	-	-	1	75,080
63			#5	-	-	1	206,908
64		Incheon	#1	-	-	-	30,402
65			#2	-	-	-	31,528
66			#3	-	-	354	41,270
67			#4	-	-	201	18,892
68		Bundang	fuel cell	-	-	-	313
69	Combined Cycle	Pyongtaek C/C	C/C	-	-	67	151,414
70		Ilsan	C/C	-	-	-	635,260
71		Bundang	C/C	-	-	3	660,899
72		Ulsan	C/C	-	-	-	649,494
73		Seoincheon	C/C	-	-	-	1,495,687
74		Shinincheon	C/C	-	-	-	1,761,001
75		Boryeong	C/C	-	-	-	1,121,251
76		Incheon	C/C	-	-	-	494,690
77		Busan	C/C	-	-	-	1,552,997
78		Hallim	C/C	-	-	17,753	-
79		Anyang	C/C	-	-	-	289,384
80		Bucheon	C/C	-	-	-	269,651
81		POSCO POWER	C/C	-	-	-	660,445
82		G S Bugog	C/C	-	-	-	371,586
83		Yulchon	C/C	-	-	-	292,336
84		Kwangyang	C/C	-	-	-	-
85	Internal combustion	Namjeju	D/P	-	35,297	238	-
86		Jeju	G/T	-	-	850	-
87		Jeju	D/P	-	49,613	-	-
total				**55,641,771**	**3,683,574**	**76,353**	**10,829,064**
total (Land)				**55,641,771**	**3,211,485**	**57,034**	**10,829,064**
total (Jeju island)				-	**472,089**	**19,319**	-

Source: Statistics of Electric Power in 2007, KEPCO 2008

<Annex 3- 2> Net Calorific Values by power plant

No.	Fuel Type	Plant		Net Caloric value($NCV_{i,y}$)			
				Coal (kcal/kg)	**Heavy oil (kcal/l)**	**Diesel oil (kcal/l)**	**L. N. G (kcal/kg)**
1	bituminous coal	Honam	#1	5,122	9,343	8,369	-
2			#2	5,107	9,361	8,364	-
3		Samchonpo	#1	5,617	-	8,399	-
4			#2	5,628	-	8,439	-
5			#3	5,602	-	8,550	-
6			#4	5,603	-	8,496	-
7			#5	5,080	-	8,183	-
8			#6	5,107	-	8,550	-
9		Yonghung	#1	5,824	-	8,488	-
10			#2	5,750	-	8,500	-
11		Boryeong	#1	5,539	-	8,496	-
12			#2	5,525	-	8,496	-
13			#3	5,588	-	8,303	-
14			#4	5,596	-	8,311	-
15			#5	5,588	-	8,312	-
16			#6	5,606	-	8,312	-
17		Taean	#1	5,700	-	8,257	-
18			#2	5,709	-	8,250	-
19			#3	5,707	-	8,242	-
20			#4	5,699	-	8,270	-
21			#5	5,730	-	8,329	-
22			#6	5,716	-	8,256	-
23		Hadong	#1	5,703	-	8,493	-
24			#2	5,697	-	8,482	-
25			#3	5,698	-	8,533	-
26			#4	5,699	-	8,491	-
27			#5	5,695	-	8,526	-
28			#6	5,695	-	8,482	-
29		Dangjin	#1	5,664	-	8,392	-
30			#2	5,664	-	8,469	-
31			#3	5,638	-	8,402	-
32			#4	5,644	-	8,387	-
33			#5	5,809	-	8,459	-
34			#6	5,910	-	10,540	-
35	heavy oil	Ulsan	#1	-	9,405	8,660	-
36			#2	-	9,408	8,657	-
37			#3	-	9,413	8,663	-
38			#4	-	9,501	8,666	-
39			#5	-	9,493	8,666	-
40			#6	-	9,480	8,662	-
41		Youngnam	#1	-	7,108	8,495	-
42			#2	-	7,343	8,496	-

43		Yosu	#1	-	9,462	8,443	-
44			#2	-	9,447	8,442	-
45		Pyongtaek	#1	-	9,408	8,496	11,608
46			#2	-	9,410	8,513	11,585
47			#3	-	9,412	8,502	11,648
48			#4	-	9,414	8,502	11,604
49		Namjeju	#1	-	9,384	8,852	-
50			#2	-	9,385	8,842	-
51		Jeju	#1	-	9,435	8,441	-
52			#2	-	9,433	-	-
53			#3	-	9,429	8,491	-
54	L.N.G	Seoul	#4	-	-	-	11,702
55			#5	-	-	8,617	11,707
56		Incheon	#1	-	-	-	11,729
57			#2	-	-	-	11,723
58			#3	-	-	8,516	11,727
59			#4	-	-	8,506	11,723
60	Combined Cycle	Pyongtaek C/C	C/C	-	-	8,503	11,727
61		Ilsan	C/C	-	-	-	11,710
62		Bundang	C/C	-	-	-	11,723
63		Ulsan	C/C	-	-	-	11,475
64		Seoincheon	C/C	-	-	8,740	11,708
65		Shinincheon	C/C	-	-	-	11,712
66		Boryeong	C/C	-	-	-	11,727
67		Incheon	C/C	-	-	-	11,711
68		Busan	C/C	-	-	-	11,700
69		Hallim	C/C	-	-	8,524	-
70		Anyang	C/C	-	-	-	11,723
71		Bucheon	C/C	-	-	-	11,703
72		POSCO POWER	C/C	-	-	-	11,722
73		G S Bugog	C/C	-	-	-	12,380
74		Yulchon	C/C	-	-	10,384	11,721
75	Internal combustion	Namjeju	D/P	-	9,383	8,526	-
76		Jeju	G/T	-	-	8,473	-
77		Jeju	D/P	-	9,435	8,506	-

Source: Statistics of Electric Power in 2005, KEPCO 2006

No.	Fuel Type	Plant		Net Caloric value($NCV_{i,y}$)			
				Coal (kcal/kg)	**Heavy oil (kcal/l)**	**Diesel oil (kcal/l)**	**L. N. G (kcal/kg)**
1	bituminous coal	Honam	#1	5,164	9,319	8,471	-
2			#2	5,137	9,332	8,427	-
3		Samchonpo	#1	5,640	-	8,373	-
4			#2	5,645	-	8,373	-
5			#3	5,565	-	8,373	-
6			#4	5,568	-	8,363	-

7			#5	4,974	-	8,550	-
8			#6	4,992	-	8,550	-
9		Yonghung	#1	5,768	-	8,446	-
10			#2	5,782	-	8,454	-
11		Boryeong	#1	5,480	-	8,412	-
12			#2	5,478	-	8,496	-
13			#3	5,553	-	8,496	-
14			#4	5,533	-	8,496	-
15			#5	5,553	-	8,312	-
16			#6	5,542	-	8,312	-
17		Taean	#1	5,683	-	8,312	-
18			#2	5,679	-	7,952	-
19			#3	5,684	-	8,217	-
20			#4	5,680	-	8,232	-
21			#5	5,637	-	8,232	-
22			#6	5,662	-	8,232	-
23			#7	5,667	-	8,130	-
24		Hadong	#1	5,671	-	8,396	-
25			#2	5,661	-	8,482	-
26			#3	5,660	-	8,482	-
27			#4	5,671	-	8,384	-
28			#5	5,665	-	8,465	-
29			#6	5,669	-	8,456	-
30		Dangjin	#1	5,588	-	8,526	-
31			#2	5,611	-	8,529	-
32			#3	5,592	-	8,557	-
33			#4	5,581	-	8,564	-
34			#5	5,744	-	8,507	-
35			#6	5,814	-	8,536	-
36			#7	5,527	-	8,535	-
37	heavy oil	Ulsan	#1	-	9,419	8,664	-
38			#2	-	9,427	8,664	-
39			#3	-	9,423	8,664	-
40			#4	-	9,529	8,664	-
41			#5	-	9,531	8,664	-
42			#6	-	9,533	8,664	-
43		Youngnam	#1	-	9,631	8,403	-
44			#2	-	9,605	8,419	-
45		Yosu	#1	-	9,465	8,358	-
46			#2	-	9,456	8,356	-
47		Pyongtaek	#1	-	9,222	8,496	11,647
48			#2	-	9,233	8,496	11,647
49			#3	-	9,260	8,502	11,573
50			#4	-	9,208	8,502	11,667

51		Namjeju	#1	-	9,413	8,525	-
52			#2	-	9,413	8,504	-
53			#3	-	9,403	8,491	-
54		Jeju	#1	-	9,377	8,429	-
55			#2	-	9,454	8,524	-
56			#3	-	9,455	8,524	-
57	L.N.G	Seoul	#4	-	-	8,617	11,716
58			#5	-	-	8,617	11,594
59		Incheon	#1	-	-	-	11,732
60			#2	-	-	-	11,725
61			#3	-	-	8,533	11,716
62			#4	-	-	8,532	11,722
63	Combined Cycle	Pyongtaek C/C	C/C	-	-	8,503	11,727
64		Ilsan	C/C	-	-	8,540	11,715
65		Bundang	C/C	-	-	-	11,723
66		Ulsan	C/C	-	-	-	11,381
67		Seoincheon	C/C	-	-	8,740	11,723
68		Shinincheon	C/C	-	-	-	11,723
69		Boryeong	C/C	-	-	-	11,731
70		Incheon	C/C	-	-	-	11,698
71		Busan	C/C	-	-	-	11,715
72		Hallim	C/C	-	-	8,506	-
73		Anyang	C/C	-	-	-	11,725
74		Bucheon	C/C	-	-	10,381	11,712
75		POSCO POWER	C/C	-	-	-	11,728
76		G S Bugog	C/C	-	-	-	11,727
77		Yulchon	C/C	-	-	-	12,038
78	Internal combustion	Namjeju	D/P	-	9,734	8,462	-
79		Jeju	G/T	-	-	8,352	-
80		Jeju	D/P	-	9,136	-	-

Source: Statistics of Electric Power in 2006, KEPCO 2007

No.	Fuel Type	Plant		Net Caloric value($NCV_{i,y}$)			
				Coal (kcal/kg)	**Heavy oil (kcal/l)**	**Diesel oil (kcal/l)**	**L. N. G (kcal/kg)**
1	bituminous coal	Honam	#1	5,186	9,311	8,497	-
2			#2	5,190	9,311	8,493	-
3		Samchonpo	#1	5,545	-	8,373	-
4			#2	5,537	-	8,373	-
5			#3	5,525	-	8,349	-
6			#4	5,539	-	8,349	-
7			#5	4,866	-	8,550	-
8			#6	4,864	-	8,550	-

9		Yonghung	#1	5,745	-	8,390	-
10			#2	5,739	-	8,457	-
11			#3	5,823	-	7,877	-
12			#4	-	-	-	-
13		Boryeong	#1	5,519	-	8,496	-
14			#2	5,515	-	8,496	-
15			#3	5,519	-	8,655	-
16			#4	5,514	-	8,943	-
17			#5	5,520	-	8,655	-
18			#6	5,518	-	8,655	-
19		Taean	#1	5,733	-	8,174	-
20			#2	5,733	-	8,387	-
21			#3	5,734	-	8,388	-
22			#4	5,727	-	7,963	-
23			#5	5,686	-	8,361	-
24			#6	5,695	-	8,347	-
25			#7	5,717	-	8,044	-
26			#8	5,722	-	7,256	-
27		Hadong	#1	5,647	-	8,492	-
28			#2	5,645	-	8,456	-
29			#3	5,627	-	8,468	-
30			#4	5,638	-	8,519	-
31			#5	5,653	-	8,492	-
32			#6	5,640	-	8,495	-
33		Dangjin	#1	5,660	-	8,610	-
34			#2	5,663	-	8,606	-
35			#3	5,657	-	8,617	-
36			#4	5,658	-	8,636	-
37			#5	5,713	-	8,620	-
38			#6	5,737	-	8,613	-
39			#7	5,725	-	8,621	-
40			#8	5,742	-	8,596	-
41	heavy oil	Ulsan	#1	-	9,413	8,664	-
42			#2	-	9,420	8,664	-
43			#3	-	9,360	8,664	-
44			#4	-	9,508	8,664	-
45			#5	-	9,510	8,664	-
46			#6	-	9,502	8,664	-
47		Youngnam	#1	-	9,643	8,402	-
48			#2	-	9,643	8,404	-
49		Yosu	#1	-	9,464	8,368	-
50			#2	-	9,462	8,370	-
51		Pyongtaek	#1	-	9,445	8,534	11,651
52			#2	-	9,449	8,530	11,652
53			#3	-	9,447	8,518	11,651
54			#4	-	9,460	8,517	11,651

55		Namjeju	#1	-	-	-	-
56			#2	-	-	-	-
57			#3	-	9,412	8,200	-
58			#4	-	9,410	8,515	-
59		Jeju	#1	-	9,413	8,458	-
60			#2	-	9,420	7,907	-
61			#3	-	9,418	8,490	-
62	L.N.G	Seoul	#4	-	-	7,411	11,727
63			#5	-	-	8,617	11,727
64		Incheon	#1	-	-	-	11,727
65			#2	-	-	-	11,730
66			#3	-	-	8,514	11,731
67			#4	-	-	8,483	11,731
68		Bundang	fuel cell	-	-	-	-
69	Combined Cycle	Pyongtaek C/C	C/C	-	-	8,503	11,740
70		Ilsan	C/C	-	-	-	11,725
71		Bundang	C/C	-	-	8,716	11,728
72		Ulsan	C/C	-	-	-	11,610
73		Seoincheon	C/C	-	-	-	11,739
74		Shinincheon	C/C	-	-	-	11,735
75		Boryeong	C/C	-	-	-	11,735
76		Incheon	C/C	-	-	-	11,726
77		Busan	C/C	-	-	-	11,727
78		Hallim	C/C	-	-	8,533	-
79		Anyang	C/C	-	-	-	11,741
80		Bucheon	C/C	-	-	-	11,898
81		POSCO POWER	C/C	-	-	-	11,757
82		G S Bugog	C/C	-	-	-	11,734
83		Yulchon	C/C	-	-	-	11,732
84		Kwangyang	C/C	-	-	-	-
85	Internal combustion	Namjeju	D/P	-	9,419	8,323	-
86		Jeju	G/T	-	-	8,447	-
87		Jeju	D/P	-	9,396	-	-

Source: Statistics of Electric Power in 2007, KEPCO 2008

<Annex 3-3> Electricity delivered to the grid by power plants ($EG_{m,y}$) and *EF* for each plant

No.	Fuel Type	Plant		**Electricity generation ($EG_{m,y}$)**	**Results**
				(MWh)	**EF for each plant (tonCO2eq./MWh)**
1	bituminous coal	Honam	#1	1,787,715	0.9363
2			#2	1,875,790	0.9318
3		Samchonpo	#1	3,663,505	0.8824
4			#2	4,323,618	0.8448

5			#3	4,343,666	0.8330
6			#4	4,112,297	0.8341
7			#5	3,542,728	0.8159
8			#6	3,643,969	0.8130
9		Yonghung	#1	5,623,299	0.8101
10			#2	4,658,862	0.8163
11		Boryeong	#1	3,547,140	0.8433
12			#2	3,433,608	0.8377
13			#3	4,124,745	0.8068
14			#4	3,698,705	0.8061
15			#5	4,121,314	0.8069
16			#6	3,283,477	0.8068
17		Taean	#1	3,992,112	0.8075
18			#2	3,484,251	0.8126
19			#3	3,957,054	0.8079
20			#4	3,653,534	0.8088
21			#5	3,744,413	0.8099
22			#6	3,999,847	0.8062
23		Hadong	#1	3,997,914	0.8094
24			#2	3,732,583	0.8070
25			#3	3,769,077	0.8060
26			#4	3,989,315	0.8093
27			#5	3,553,901	0.8085
28			#6	4,037,763	0.8040
29		Dangjin	#1	3,797,307	0.8045
30			#2	3,798,078	0.8037
31			#3	4,081,017	0.8020
32			#4	4,079,557	0.8005
33			#5	1,318,670	0.8360
34			#6	96,365	0.9478
35	heavy oil	Ulsan	#1	262,393	0.8027
36			#2	255,812	0.7883
37			#3	200,518	0.7964
38			#4	1,549,091	0.7312
39			#5	1,500,935	0.7307
40			#6	1,454,644	0.7298
41		Youngnam	#1	1,022,470	0.7930
42			#2	531,006	0.8337
43		Yosu	#1	430,310	0.7458
44			#2	904,597	0.7218
45		Pyongtaek	#1	1,258,662	0.7005
46			#2	1,376,342	0.6994
47			#3	1,321,167	0.6975
48			#4	1,338,204	0.6964
49		Namjeju	#1	44,602	0.9738

50			#2	44,654	0.9993
51		Jeju	#1	36,266	1.0341
52			#2	532,700	0.7249
53			#3	502,189	0.7294
54	L.N.G	Seoul	#4	207,498	0.6301
55			#5	444,324	0.6515
56		Incheon	#1	16,450	0.7075
57			#2	37,727	0.6008
58			#3	-	-
59			#4	29,202	0.6396
60	Combined Cycle	Pyongtaek C/C	C/C	659,932	0.4482
61		Ilsan	C/C	2,873,958	0.4939
62		Bundang	C/C	3,742,073	0.4785
63		Ulsan	C/C	3,131,075	0.3917
64		Seoincheon	C/C	7,001,031	0.3764
65		Shinincheon	C/C	10,543,280	0.3684
66		Boryeong	C/C	8,221,926	0.3766
67		Incheon	C/C	2,055,016	0.3651
68		Busan	C/C	9,076,327	0.3549
69		Hallim	C/C	100,346	0.7665
70		Anyang	C/C	1,433,978	0.4854
71		Bucheon	C/C	1,404,160	0.4959
72		POSCO POWER	C/C	2,571,095	0.4615
73		G S Bugog	C/C	2,189,808	0.3830
74		Yulchon	C/C	1,300,627	0.3989
75	Internal combustion	Namjeju	D/P	268,073	0.6280
76		Jeju	G/T	5,069	1.4577
77		Jeju	D/P	151,759	-
total				**194,898,492**	**0.6896**
total (Land)				**193,212,834**	**0.6893**
total (Jeju island)				**1,685,658**	**0.7272**

Source: Statistics of Electric Power in 2005, KEPCO 2006

No.	Fuel Type	Plant		**Electricity generation ($EG_{m,y}$)**	**Results**
				(MWh)	**EF for each plant (tonCO2eq./MWh)**
1	bituminous coal	Honam	#1	1,622,639	0.9340
2			#2	1,782,016	0.9312
3		Samchonpo	#1	4,161,219	0.8621
4			#2	3,703,880	0.8622
5			#3	3,779,585	0.8386
6			#4	3,816,997	0.8328
7			#5	3,761,205	0.8260

8			#6	4,065,091	0.8150
9		Yonghung	#1	5,337,432	0.8129
10			#2	5,727,937	0.8065
11		Boryeong	#1	3,988,848	0.8434
12			#2	3,423,101	0.8340
13			#3	3,409,486	0.8083
14			#4	4,133,946	0.8080
15			#5	3,364,148	0.8023
16			#6	3,987,488	0.8093
17		Taean	#1	3,556,797	0.8115
18			#2	4,035,753	0.8080
19			#3	3,528,613	0.8086
20			#4	4,069,820	0.8101
21			#5	4,013,235	0.8124
22			#6	3,381,867	0.8130
23			#7	159,677	0.8976
24		Hadong	#1	3,607,063	0.8092
25			#2	4,068,036	0.8048
26			#3	4,079,158	0.8055
27			#4	3,631,374	0.8061
28			#5	4,092,625	0.8064
29			#6	3,610,222	0.8076
30		Dangjin	#1	3,598,820	0.8039
31			#2	4,115,891	0.8021
32			#3	3,666,490	0.8020
33			#4	3,610,984	0.8040
34			#5	3,946,931	0.7947
35			#6	3,392,395	0.7836
36			#7	1,474	2.3051
37	heavy oil	Ulsan	#1	275,016	0.7879
38			#2	306,668	0.7832
39			#3	376,132	0.7675
40			#4	1,511,557	0.7257
41			#5	1,583,846	0.7213
42			#6	1,589,838	0.7232
43		Youngnam	#1	359,205	0.9149
44			#2	323,595	0.9043
45		Yosu	#1	403,547	0.7367
46			#2	906,849	0.7127
47		Pyongtaek	#1	1,123,948	0.6878
48			#2	1,198,620	0.6875
49			#3	1,304,568	0.6899
50			#4	1,052,228	0.6884
51		Namjeju	#1	34,448	0.9864
52			#2	28,686	1.0148

53			#3	179,033	0.8082
54		Jeju	#1	24,748	1.0327
55			#2	462,023	0.7357
56			#3	479,676	0.7323
57	L.N.G	Seoul	#4	306,558	0.6029
58			#5	685,011	0.5883
59		Incheon	#1	32,932	0.5625
60			#2	24,366	0.5714
61			#3	78,669	0.5326
62			#4	62,414	0.5447
63	Combined Cycle	Pyongtaek C/C	C/C	497,441	0.4507
64		Ilsan	C/C	3,038,165	0.4890
65		Bundang	C/C	4,059,300	0.4729
66		Ulsan	C/C	3,608,435	0.3845
67		Seoincheon	C/C	8,726,521	0.3666
68		Shinincheon	C/C	11,797,500	0.3707
69		Boryeong	C/C	7,089,662	0.3757
70		Incheon	C/C	3,648,288	0.3533
71		Busan	C/C	10,455,401	0.3557
72		Hallim	C/C	175,356	0.7148
73		Anyang	C/C	1,286,480	0.4786
74		Bucheon	C/C	1,241,795	0.4845
75		POSCO POWER	C/C	2,338,128	0.4653
76		G S Bugog	C/C	2,911,683	0.3569
77		Yulchon	C/C	2,276,276	-
78	Internal combustion	Namjeju	D/P	239,690	0.6603
79		Jeju	G/T	15,986	1.3124
80		Jeju	D/P	252,764	0.6045
total				**206,605,295**	**0.6791**
total (Land)				**204,712,885**	**0.6786**
total (Jeju island)				**1,892,410**	**0.7302**

Source: Statistics of Electric Power in 2006, KEPCO 2007

No.	Fuel Type	Plant		**Net electricity generated ($EG_{m,y}$)**	**Results**
				(MWh)	**EF for each plant (tonCO2eq./MWh)**
1	bituminous coal	Honam	#1	1,806,765	0.9342
2			#2	1,773,852	0.9302
3		Samchonpo	#1	3,903,591	0.8687
4			#2	4,398,382	0.8515
5			#3	4,311,704	0.8432
6			#4	3,840,729	0.8344
7			#5	4,074,103	0.8285

8			#6	3,823,174	0.8177
9		Yonghung	#1	5,020,901	0.8174
10			#2	6,081,490	0.8127
11			#3	320,502	0.8457
12			#4	-	-
13		Boryeong	#1	3,604,642	0.8420
14			#2	4,120,511	0.8304
15			#3	4,214,892	0.8087
16			#4	3,438,773	0.8100
17			#5	4,162,530	0.8101
18			#6	3,817,024	0.8078
19		Taean	#1	4,055,394	0.8078
20			#2	3,796,670	0.8118
21			#3	4,039,811	0.8094
22			#4	3,504,214	0.8088
23			#5	3,523,988	0.8121
24			#6	4,036,733	0.8123
25			#7	3,868,817	0.7934
26			#8	2,528,587	0.7825
27		Hadong	#1	4,140,667	0.8089
28			#2	3,681,670	0.8030
29			#3	3,727,907	0.8057
30			#4	4,115,014	0.8075
31			#5	3,905,190	0.8067
32			#6	4,158,792	0.8057
33		Dangjin	#1	3,968,103	0.8088
34			#2	3,595,927	0.8020
35			#3	4,010,715	0.8014
36			#4	4,009,178	0.8037
37			#5	3,443,482	0.7965
38			#6	3,497,359	0.7883
39			#7	2,904,680	0.7886
40			#8	1,297,925	0.7853
41	heavy oil	Ulsan	#1	406,685	0.7916
42			#2	407,321	0.7955
43			#3	458,584	0.7812
44			#4	1,418,034	0.7296
45			#5	1,540,400	0.7315
46			#6	899,604	0.7314
47		Youngnam	#1	688,935	0.7748
48			#2	474,475	0.7896
49		Yosu	#1	497,053	0.7334
50			#2	1,071,405	0.7195
51		Pyongtaek	#1	1,147,515	0.7085
52			#2	1,553,162	0.7031
53			#3	1,502,099	0.7036

54			#4	1,095,986	0.7070
55		Namjeju	#1	-	-
56			#2	-	-
57			#3	484,459	0.7661
58			#4	500,222	0.7623
59		Jeju	#1	3,019	1.0372
60			#2	280,454	0.7455
61			#3	396,186	0.7430
62	L.N.G	Seoul	#4	357,572	0.5598
63			#5	962,861	0.5729
64		Incheon	#1	148,821	0.5446
65			#2	157,042	0.5354
66			#3	205,530	0.5400
67			#4	95,143	0.5350
68		Bundang	fuel cell	1,959	-
69	Combined Cycle	Pyongtaek C/C	C/C	909,449	0.4445
70		Ilsan	C/C	3,506,350	0.4829
71		Bundang	C/C	3,741,296	0.4710
72		Ulsan	C/C	4,383,453	0.3911
73		Seoincheon	C/C	10,895,505	0.3663
74		Shinincheon	C/C	12,533,994	0.3748
75		Boryeong	C/C	7,839,371	0.3816
76		Incheon	C/C	3,696,784	0.3567
77		Busan	C/C	11,616,221	0.3564
78		Hallim	C/C	61,752	0.7457
79		Anyang	C/C	1,615,090	0.4783
80		Bucheon	C/C	1,523,068	0.4789
81		POSCO POWER	C/C	3,788,598	0.4659
82		G S Bugog	C/C	2,767,811	0.3581
83		Yulchon	C/C	2,083,451	0.3743
84		Kwangyang	C/C	-	-
85	Internal combustion	Namjeju	D/P	164,390	0.6430
86		Jeju	G/T	1,294	1.6867
87		Jeju	D/P	235,626	0.6253
total				**230,642,417**	**0.6779**
total (Land)				**228,679,405**	**0.6774**
total (Jeju island)				**1,963,012**	**0.7410**

Data for Build Margin Emission Factor

<Table Annex 3-4> Sample group plants used in the Build Margin calculation and CO_2 Emission Factor

Year	No.	Plant name		Technology	Type of Fossile Fue	year operation	Net electricity generated (EGm,y)	CO_2 emission factor ($EF_{EL,m,y}$)	Results
							MWh in 2007	tCO2/MWh	EF for each plant (tonCO2eq./MWh)
2007	1	Hanbit Sungsan the second solar	-	solar	-	2007.12	-	-	-
	2	Taein gangjin solar	-	solar	-	2007.12	6	-	-
	3	Suni gangjin solar	-	solar	-	2007.12	11	-	-
	4	Korea yeongcheon solar	-	solar	-	2007.12	17	-	-
	5	Solar yungam solar	-	solar	-	2007.12	-	-	-
	6	Changwhan yeongduk solar	-	solar	-	2007.12	5	-	-
	7	Samsung jindo	-	solar	-	2007.12	9	-	-
	9	Hwaseong heat & power	-	combined	-	2007.12	439,258	-	-
	10	Dangjin	#8	steam power	Bituminous coal	2007.12	1,297,925	0.7853	0.0131
	11	SP solar yonggwang	-	solar	-	2007.11	38	-	-
	12	Dongyang energy sinan	-	solar	-	2007.11	268	-	-
	13	Ef yungam solar	-	solar	-	2007.11	40	-	-
	14	Dongwon gangjin solar	-	solar	-	2007.11	214	-	-
	15	Solec yonggwang solar	-	solar	-	2007.11	120	-	-
	16	Solar jungeub solar	-	solar	-	2007.11	92	-	-
	17	Sinbuk yungam solar	-	solar	-	2007.11	178	-	-
	18	Hyein haenam solar	-	solar	-	2007.11	364	-	-
	19	Samlangjin solar	-	solar	-	2007.11	646	-	-
	20	Hyosung daegi-wind power	-	wind	-	2007.11	42	-	-
	19	Nonhyun heat & power	-	combined	-	2007.10	3,523	-	-
	20	Wuriyungam solar	-	solar	-	2007.08	267	-	-
	21	Hwasung solar	-	solar	-	2007.08	309	-	-

	22	Yeongju the first solar	-	solar	-	2007.08	230	-	-
	23	Muan solar	-	solar	-	2007.08	622	-	-
	24	Jangheung solar	-	solar	-	2007.08	125	-	-
	25	Gomun	-	small hydro power	-	2007.08	2,996	-	-
	26	Taean	#8	steam power	Bituminous coal	2007.08	2,528,587	0.7825	0.0254
	27	Dangjin	#7	steam power	Bituminous coal	2007.06	2,904,680	0.7886	0.0294
	28	Munkyung solar	-	solar	-	2007.06	2,563	-	-
	29	Younggwang solar park	-	solar	-	2007.06	-	-	-
	30	Yungam Solar	-	solar	-	2007.06	770	-	-
	31	Wonjungsu	-	small hydro power	-	2007.05	-	-	-
	32	baegok	-	small hydro power	-	2007.05	1,001	-	-
	33	damyangho	-	small hydro power	-	2007.05	1,771	-	-
	34	Juam	-	small hydro power	-	2007.05	-	-	-
	35	Namjeju	#4	thermal	heavy oil	2007.03	500,222	0.7623	0.0049
	36	Eco energy	-	solar	-	2007.03	231,029	-	-
	37	hapcheon	-	small hydro power	-	2007.02	6,777	-	-
	38	Jeonju-resource recovery facility	-	-	-	2007.02	13,059	-	-
	39	Seoul Marin(suncheon)	-	solar	-	2007.02	1,223	-	-
	40	Mirae energy	-	solar	-	2007.02	165	-	-
	41	Seomjingang	-	small hydro power	-	2007.02	-	-	-
	42	samcheonpo	-	small hydro power	-	2007.02	-	-	-
	43	dalbang	-	small hydro power	-	2007.02	-	-	-
	44	Taean	#7	steam power	Bituminous coal	2007.02	3,868,817	0.7934	0.0394
	45	Yeongju the second solar	-	solar	-	2007.01	646	-	-
	46	Hyundaedaesan	-	combined	-	2007.01	68,061	-	-
	47	banwol	-	combined	-	2007.01	431,208	-	-
2	1	Cheongsong pumping	#2	pumping	-	2006.12	145,042	-	-
	2	Bundang fuel cell	-	fuel cell	LNG	2006.10	1,959	0.0000	-
0	3	Namhae Solar	-	solar	-	2006.10	1,462	-	-

0	4	HanlaJeunggong Solar	-	solar	-	2006.10	1,292	-	-
	5	Enepark	-	solar	-	2006.09	416	-	-
6	6	Yongheng solar	-	solar	-	2006.09	1,214	-	-
	7	Cheongsong pumping	#1	pumping	-	2006.09	164,069	-	-
	8	Namjeju	#3	thermal	heavy oil	2006.09	484,459	0.7661	0.0048
	9	yangyang(pumping)	#4	pumping	-	2006.08	91,270	-	-
	10	Donghae solar	-	solar	-	2006.08	-	-	-
	11	Kangwon-wind power	-	wind	-	2006.07	-	-	-
	12	yangyang pump windpower	-	wind	-	2006.06	-	-	-
	13	Hadongho	-	small hydro power	-	2006.06	1,832	-	-
	14	yangyang (pumping)	#3	pumping	-	2006.06	56,495	-	-
	15	Goheung Solar		solar	-	2006.06	1,233	-	-
	16	kwangyang C/C	#1, #2	-	-	2006.02, 2006.05	3,862,346	-	-
	17	Maebongsan-wind power	-	-	-	2006.05, 2004.12	11,058	-	-
	18	Jangseong	-	small hydro power	-	2006.05	648	-	-
	19	yangyang (pumping)	#2	pumping	-	2006.04	103,698	-	-
	20	Dangjin	#6	thermal	Bituminous coal	2006.04	3,497,359	0.7883	0.0353
	21	Sinchang-wind power	-	wind	-	2006.03	3,572	-	-
	22	yangyang (pumping)	#1	pumping	-	2006.02	106,973	-	-
2	1	Janghengdam	-	small hydro power	-	2005.12	-	-	-
	2	Suncheon Solar	-	solar	-	2005.12	1,259	-	-
	3	Samcheonpo solar energy	-	solar	-	2005.12	131	-	-
0	4	Dangjin	#5	steam power	Bituminous coal	2005.10	3,443,482	0.7965	0.0352
0	5	yangyang pump small hydro	-	small hydro power	-	2005.10	-	-	-
	6	Taean solar energy	-	solar	-	2005.10	118	-	-
5	7	Jeju DP	-	internal combustion	heavy oil	2005.07	235,626	0.6253	0.0019
	8	WunjeongLFG	-	internal combustion	LFG	2005.07	11,415	-	-
	9	Yulchon	-	combined	LNG	2005.07	2,083,451	0.3743	0.0100

	10	Incheon	-	combined	LNG	2005.07	3,696,784	0.3567	0.0169
	11	Daegok	-	small hydro power	-	2005.07	1,278	-	-
	12	Donghwa	-	small hydro power	-	2005.07	2,481	-	-
	13	Ulchin	#6	nuclear	-	2005.04	7,911,305	-	-
	14	Hanrye	-	LFG	LFG	2005.04	5,102	-	-
	15	Busan Bio-gas	-	internal combustion	LFG	2005.03	1,551	-	-
2004	1	Sungnam	-	small hydro power	-	2004.12	-	-	-
	2	Yungduk-wind power	-	wind	-	2004.12	-	-	-
	3	Yongdam	-	small hydro power	-	2004.12	24,928	-	-
	4	Maebongsan-wind power	-	wind	-	2004.12	11,058	-	-
	5	Daegwanryung-wind power	-	wind	-	2004.12	4,288	-	-
	6	Yongheng	#2	steam power	Bituminous coal	2004.11	6,081,490	0.8127	0.0634
	7	new solar energy	-	solar		2004.11	224		-
	8	Yongheng	#1	steam power	Bituminous coal	2004.07	5,020,901	0.8174	0.0526
	9	Ulchin	#5	nuclear	-	2004.07	8,025,928	-	-
	10	hanseok	-	small hydro power	-	2004.07		-	-
	11	Daegu dyeing	-	-	-	2004.02, 2004.07	21,817	-	-
	12	Yosu	#2	-	heavy oil	2004.03	1,071,405	0.7195	0.0099
	13	Busan	-	combined combustion	LNG	2003.05/2004.03	11,616,221	0.3564	0.0531
	14	Chunsang	-	small hydro power	-	2004.02	240	-	-
	15	Cheongju LFG	-	internal combustion	-	2004.02	5,808	-	-
	16	Daejon Geumgodong	-	internal combustion	-	2003.06	9,160	-	-
	17	Hoicheon ENC	-	internal combustion	-	2003.05	2,826	-	-
	18	Anheung	-	small hydro power	-	2004.02	1,946	-	-
2003	1	Andong	-	small hydro power	-	2003.09	-	-	-
	2	Gunsan-wind power	-	wind	-	2002.11/2003.09	7,958	-	-
	3	Sangwon ENC	-	internal combustion	-	2001.12/2003.03/2003.06	-	-	-
	4	Muju	-	small hydro power	-	2003.04	637	-	-
	5	Ducksong	-	small hydro power	-	2003.01		-	-

2002	1	Yonggwang	#6	nuclear	-	2002.12	7,859,224	-	-
Total							**78,004,323**	**-**	**0.3950**

Source: 2008 Facility by Electric Power souce, KPX

Source: Statistics of Electiric Power in Korea, KEPCO, 2008

Appendix 5: Further background information on monitoring plan

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

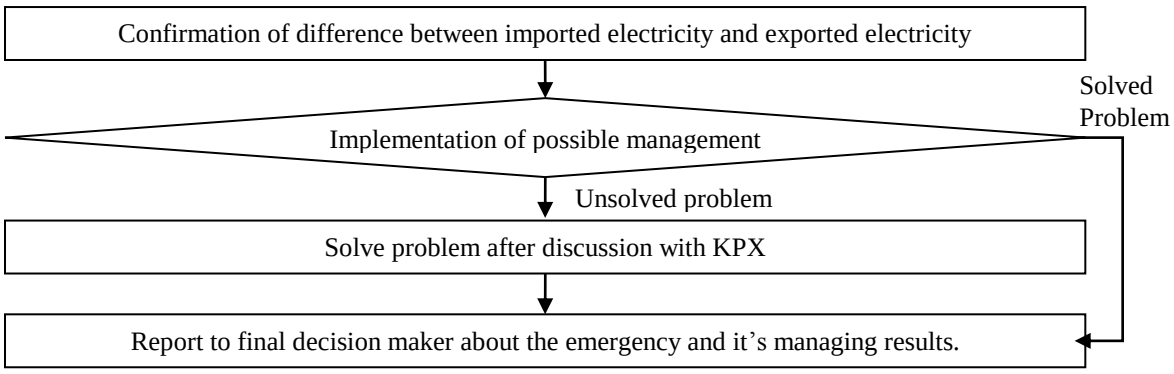
1. Monitoring equipment

1-1. Electricity measuring meters shall be set up transparently in accordance with "Law regarding measurement" and "Act on operation of electricity market" and shall be sealed after affirmation of Korea Power Exchange.
1-2. The meters shall be authorized through the due formal certifying process (the valid period for the authorized certification: 7 years.) (Act on operation of electricity market 7.3.8, 2009.1.1)
1-3. The meters shall be calibrated when they are installed, and re-calibrated every three years after the installation. (Act on operation of electricity market 7.3.1, 2009.1.1)
The watt-hour meter for electricity imported from the grid is not within the control of project participants and calibration frequency of the watt-hour meter in national standard is once in 7 years.
1-4. The metering equipment measuring point must be installed and maintained. (Act on operation of electricity market 4.1.1, 2009.1.1)

1-5. Allowable error of the export meter is ±0.2% and imported meter is ±0.5% .

2. Monitoring of amount of electricity
2-1. The amount electricity transmitted to the grid shall be measured automatically by the established meters. The measured variables are simultaneously transferred to Samdal wind park central control system.
2-2. The measured amount of electricity shall be collected daily, weekly and monthly and shall be archived in electronic way.
2-3. The collected variables compared in article 2-2. shall be compared with those of Korea Power Exchange.
2-4. If the two variables compared in article 2-3. are different, the operation of condition of electricity meters and other equipments shall be examined. In case meters are improperly operated equipment, internal investigation and correction procedure shall be followed and be certified by the final decision-maker and Korea Power Exchange.

- Procedures for emergency preparedness:



3. Management of monitoring and electricity safety

3-1. The person in charge for monitoring and electricity safety shall attend the monitoring courses regularly.

Initial training for employees in site will be provided by the equipment supplier. If there are additional employees or changes of operating manual, VESTAS will be responsible for training them. VESTAS will undergo training for operation of monitoring system, emergency preparedness and management of data following operating manual. Training will include an organized course of theoretical and practical components.

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

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

3-4. If metering equipment will be properly maintained and checked according to the national or professional requirement by qualified third party designated if it broke down.

Appendix 6: Summary of post registration changes

Corrections

- Main equipment of correction based on typing miss (A.3.Technologies and/or measures)
- EFy value of typing miss(B.6.2)

Permanent changes from registered monitoring plan or applied methodology

- In the section B.7.1 EGexport,y of incorrect description was revised(Description of measurement methods and procedures to be applied: Main meter is installed at substation-> Main and Sub meter for EG export and Sub will be used when the Main is malfunction)
- In the section B.7.1 $EG_{consumption,y}$ of allowable error ranges was revised (±0.2% -> ± 0.5%)
- In the section B.7.3 Description of other elements of monitoring plan (1. Monitoring equipment)
  (1-3. Imported meter of calibration frequency was revised. Three years-> 7years)
  (1-5. allowable error ranges was revised. ±0.2% -> ± 0.5%)

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History of the document

Version	Date	Nature of revision
04.1	11 April 2012	Editorial revision to change version 02 line in history box from Annex 06 to Annex 06b.
04.0	EB 66 13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the project design document form for CDM project activities" (EB 66, Annex 8).
03	EB 25, Annex 15 26 July 2006	
02	EB 14, Annex 06b 14 June 2004	
01	EB 05, Paragraph 12 03 August 2002	Initial adoption.
Decision Class: Regulatory **Document Type:** Form **Business Function:** Registration		