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

CONTENTS

A. General description of project activity

B. Application of a baseline and monitoring methodology

C. Duration of the project activity / crediting period

D. Environmental impacts

E. Stakeholders' comments

Annexes

Annex 1: Contact information on participants in the project activity

Annex 2: Information regarding public funding

Annex 3: Baseline information

Annex 4: Monitoring plan

SECTION A. General description of project activity

A.1 Title of the project activity:

>> - Sungsan Wind Power Project
- Version 09
- 15 June 2011

A.2. Description of the project activity:

>>

-The purpose of the project activity

The Sungsan Wind Power Project is a wind power generating plant on the Jeju Island of the Republic of Korea. The project utilizes wind power which is generating zero greenhouse gas (GHG) emission into the atmosphere or water system without depleting any natural resources. The project is supporting the government policy of promoting new renewable energy technologies in the Republic of Korea and also contributing to reduce of the dependence on the imported fossil fuels which are composed of 97% of energy consumption in Korea (source the yearly book of KEPCO 2006).

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

The project contributes to the sustainable development of local communities with the creation of direct and indirect employments in the region. In addition, the local community is receiving benefits through the advanced technology transfer from the dispatched engineers by Vestas. The Sungsan Wind Power is used as eco-tourism site for the public which is also contributing to the local economy.

The proposed project generates approximately 49,406 MWh, which consists of first phase: 12MW(2MW x 6) and second phase: 8MW(2MW x 4), per year which is delivered into the sub-station about five km away from the project site and sold into Korea Power Exchange. It helps, therefore, to reduce GHG emissions versus the high-growth, coal-dominated business-as-usual scenario. The specific goals of the project are:

• to reduce greenhouse gas emissions in Korea
• to help stimulate the growth of the wind power industry in Korea

The project contributes to sustainable development in the following ways:

- Renewable energy sources present many environmental benefits. Compared to other energy sources, processing wind energy does not release pollutants into the air, nor does it emit residuals that can give harmful impacts on soil, water etc.
- Renewable energy sources provide future generations with environmentally friendly fuel alternatives that protect the environment.
- This project will cut GHGs and other emissions such as sulphur dioxide, nitrogen oxide, and particulates.
- methodology, SOx, NOx, and dust was estimated by using national database for national LCI (Source: Data of MOCIE[1] of the year 1998)

The Sungsan Wind Power Project creates jobs in the local area during the initial phase. Infrastructure, such as, access roads, power lines, and communication cables for constructions benefits the local economy.

[1] MOCIE : Ministry of Commerce, Industry, and Energy is a state administration authority which is responsible for trading, industry, technology, energy, resource in Korea .

A.3. Project participants:

>>

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

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

>> Republic of Korea

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

>> The proposed site is located in the Jeju Island of the Republic of Korea

A.4.1.3. City/Town/Community etc:

>> The proposed site is in Susan-Ri, Sung san-eup, Sogwip'o City.

A.4.1.4. Detail of physical location, including information allowing the unique identification of this project activity:

>> The project site is located on the Jeju Island of the Republic of Korea which is the northeast of the major city Jeju(126° 49′ 53″ longitude and 33° 26′ 26″ latitude) in Jeju Island. The project site is 20km north-easterly of Jeju City.

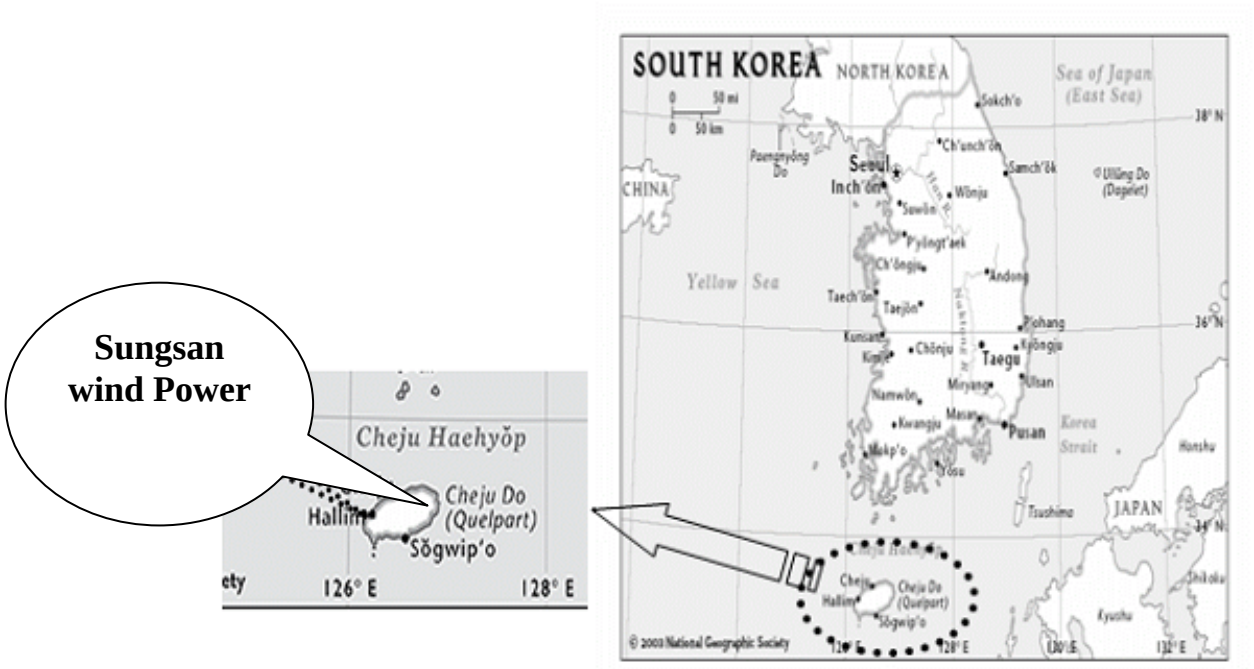


Figure 1. The location of Sungsan Wind Power Project

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

>> Renewable Electricity Generation for a Grid

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

>> The Sungsan Wind Power Project consists of 10 wind turbines and its turbine model is V80-2.0MW from Vestas (Table1). Each wind turbine has 3 blades and is the pitch-regulated, upwind type. (Figure 2).

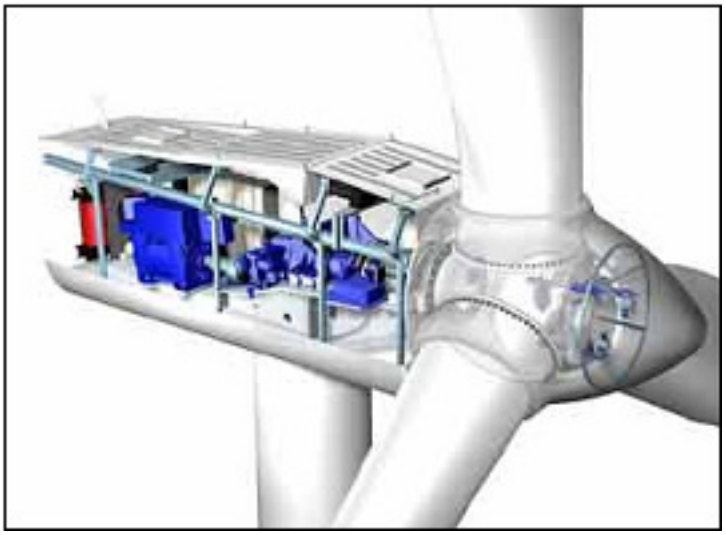
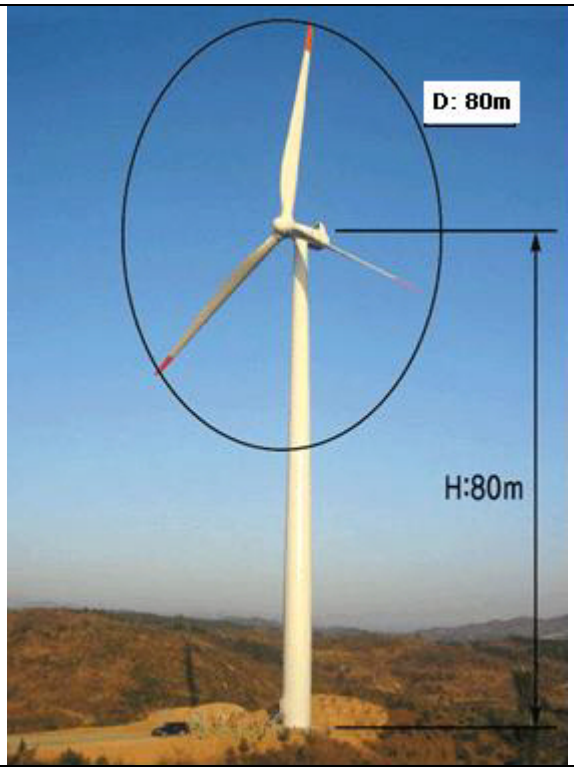


Figure 2. Inside structure of turbine

Capacity of each wind turbine is 2.0 MW, the total capacity of 10 wind turbines is 20 MW, and generates 49,406 MWh annually. The expected CO_2 reduction is 35,265 ton CO_2/year.

Table 1. Sungsan Wind Turbine Specification

Model		
Design Wind Speed (10 min. average)	Start up Wind Speed (m/s)	4
	Nominal Wind Speed (m/s)	15
	Stop Wind Speed (m/s)	25
Generator	Type	3-bladed upwind
	Rated Output	2000kW
Rotor	Diameter (m)	80
	RPM	16.7
	Hub Height(m)	80
	Swept area (m2)	5027
Gear Box		3Step planetary/1Step worm gear
Brake System	Aerodynamic	Full blade pitch
	Mechanical	Hydraulic fail-safe
Generator Specification		690V
		60Hz

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

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Table 2. Annual estimation of emission reductions

Years	Annual estimation of emission reductions in tones of CO_2 e
Year 1 2009	35,265ton CO_2
Year 2 2010	35,265ton CO_2
Year 3 2011	35,265ton CO_2
Year 4 2012	35,265ton CO_2
Year 5 2013	35,265ton CO_2
Year 6 2014	35,265ton CO_2
Year 7 2015	35,265ton CO_2
Total estimated reductions (Tones of CO_2 e)	246,854 ton CO_2
Total number of crediting years	7 years
Annual average over the crediting period of estimated reductions (tones of CO2e)	35,265ton CO_2

CO_2 emission reduction is calculated by net generation and emission factor (2005~2007) - referred to Table 5 of Annex 3.

A.4.5. Public funding of the project activity:

>> Sungsan Wind Power CDM project is funded by Korea Southern Power Co., Ltd. Therefore, this project is not funded by official development assistance or other sources as the financial obligations of Parties included in Annex I.

SECTION B. Application of a baseline and monitoring methodology

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

>> ACM0002. Ver.12-"Consolidated baseline methodology for grid-connected electricity generation from renewable sources."

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

>> The methodology is the approved consolidated baseline methodology (ACM0002) that can calculate a reduction of GHGs emission from the power plant that uses wind power- one of the renewable energy soured replacing fossil fuel fired power plants.

This Sungsan Wind Power Project is to provide electricity through grid-connected electricity generation by using natural wind power. Wind power is one of the renewable energy sources. Therefore, the methodology is applicable to the Sungsan Wind Power Project.

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

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To determine the baseline, The CO2 emissions from electricity generation in fossil fuel fired power displaced by this project activity has been taken into consideration for the project boundary.

The spatial extent of the project boundary includes the project site and all the power plants physically connected to the electricity system of Korea Electric Power Corporation (KEPCO). And it is also considered that the electricity system of KEPCO does not import or export electricity.

Project emission sources in this project boundary are the following.

	Source	Gas	Included?	Justification/Explanation
Baseline	**CO2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity**	CO_2	Yes	Conventional electricity generation from National Grid is based on fossil fuel power plants
		CH_4	No	Unidentified in the baseline methodology
		N_2O	No	Unidentified in the baseline methodology
Project Activity	**Electricity Generation from wind power**	CO_2	No	Zero-emission grid-connected electricity generation from renewable energy
		CH_4	No	Zero-emission grid-connected electricity generation from renewable energy
		N_2O	No	Zero-emission grid-connected electricity generation from renewable energy

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

>>>>

The Sungsan wind power Project focuses on an electric sector that is not dominated by power generation sources with zero or low operating costs such as hydro, geothermal, wind, solar, nuclear and low-cost biomass. Furthermore, the existing fuel mix is expected to remain unchanged during the entire crediting period.

This project does not modify or retrofit an existing electricity generation facility. Electricity would have been generated by the operation of grid-connected power plants and by the addition of new generation sources.

In absence of the proposed project, reasonable and credible alternatives that are in accordance with current laws and regulations include:
1) The proposed project not taken as CDM project;
2) Construction of a power plant using other source of renewable energy with equivalent amount of installed capacity or equivalent amount of annual electricity output; and
3) Supply of equivalent annual power output by the Grid where the proposed project is connected.

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

1) **The proposed project not taken as CDM project activity**:
This project does not execute as CDM project activity. Therefore, this alternative may be part of the baseline. However, as shown in the investment analysis (Step 2 of section B.5) the proposed project not undertaken as a CDM project activity and without CER income, is not financially attractive for the potential investors.

2) **Construction of a power plant using other source of renewable energy with equivalent amount of installed capacity or equivalent amount of annual electricity output**:
The company's business objective is to generate renewable electricity. The alternative of using hydro power (could be similar scale) is unrealistic, because the lay of the land is not appropriate in the proposed site and topographically, tidal source is not enough. Also, according to "Renewable Energy Feed-in Tariffs amendment report"(published by Ministry of Knowledge Economy, March 2006), the sunshine for solar energy source is not enough in Jeju Island.

3) **Supply of equivalent annual power output by the Grid where the proposed project is connected**:
The installed capacity of the Korea Electric Power Corporation keeps increasing every year. The total installed capacity increased with new power plants installed and capacity additions from existing power plants. Hence, the alternative 3) is a feasible alternative. As a result, Power Grid from KEPCO is selected as the baseline for the proposed project.

In conclusion, the only practical and feasible baseline scenarios are alternative 3).

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

To determine the additionality, the *"Tool for the Demonstration and Assessment of Additionality"* approved by CDM EB (ver 05.2) is used. The CDM consolidated tool for demonstration of Additionality, includes the following steps:

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

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

The proposed alternatives are as follows,

Alternative 1. The construction of Sungsan Wind Power Project which generates electricity and is connected to a grid of KEPCO

Alternative 2. The construction of business-as-usual power plant (nuclear, coal, heavy oil, LNG and pumping) which is connected to a grid of KEPCO.

Sub-step 1b: Consistency with mandatory laws and regulations::

All alternatives comply with the laws and regulatory requirements for electricity generation in Korea.

According to the EB 26th meeting Report, Annex 3, 1 page 'Clarifications on the treatment of national and/or Sectoral policies and regulations 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[2].' (See more information at http://cdm.unfccc.int/EB/Meetings/016/eb16repan3.pdf) According to the above decision, purchase price of electricity which excludes subsidy through compensation for difference between generation costs by MOCIE was applied to the investment analysis.

Step 2. Investment Analysis

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) analysis was selected for the economic analysis indicator. The benchmark rate was derived from "Renewable Energy Feed-in Tariffs amendment report", published by Ministry of Knowledge Economy, March 2006, which is 7.00%

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

[2] 'Alternative Energy Development Promotion Act amended on March, 2002.' : Alternative Energy Development Promotion Act amended in March, 2002, the Ministry of Commerce, Industry and Energy (MOCIE) of Korean Government issued the Public Notice N0.2003-61 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.

. -Calculation : The Result of calculating IRR is followed.

Table 3. The Result of calculating IRR

Plant Name			
The Sungsan Wind Power plant	Total Expenses (unit: one million won)	42,300	
	Operation & Maintenance Cost Rate (unit: %)	2.5	
	Unit Cost of Purchase (unit: won/KWh)	76.47	
	Purchased Electricity (unit : MWh)	49,406	
	IRR (%)	Without CER	3.24
		With CER (10EURO/tCO2)	5.57
		With CER (20EURO/tCO2)	7.77
* Crediting period is for 21 years except construction period. * The benchmark rate of Sungsan Wind Power project is 7% which was applied based on "Renewable Energy Feed-in Tariffs amendment report", published by Ministry of Knowledge Economy, March 2006. * O&M cost rate, which is 2.5% of Total expense, was applied based on "Renewable Energy Feed-in Tariffs amendment report", published by Ministry of Knowledge Economy, March 2006. * Unit Cost of Purchase is 76.47 won/KWh based on average in 2006. * Other variables are adopted from the Feasibility Study Report. * Raw data (Excel sheet) for economical analysis & Calculation process is submitted to DOE (KEMCO).			

Here in Table 3, the unit price of electricity purchased by 76.47won/KWh is based on average in 2006 as the time of the investment decision taken by the project participant. In Korea, it shall be supplemented of the seller of electricity generated by new and renewable energy that the shortage corresponding with the difference between the settled price of electricity and the standard price which is stipulated on the legal basis of the Clause 1, Article 17 of the "Act on the Promotion of the Development and Use of New and Renewable Resources of Energy", if the settled price of electricity is lower than the standard price, according to the Clause 2, Article 17 of the same act stated previously stated on this paragraph. However, the settled price shall be recognized as an actual purchasing price, referring to EB 22 meeting report, "Clarifications on the consideration of national and/or sectoral policies and circumstances in baseline scenarios".

As a result of economical analysis, IRR is lower than the benchmark rate 7.00%. It means that it doesn't have economical attraction.

Sub-step 2d. Sensitivity analysis

The basis of sensitivity analysis is as follows:

- Result in accordance with the fluctuations of Unit Cost of Purchase
- Result in accordance with the fluctuations of investment cost
- Result in accordance with the fluctuations of O&M cost
- Result in accordance with the fluctuations of Electricity generation

Table.4 Results of Sensitivity analysis

1. the result of increase Electricity generation of wind power

increase of Electricity generation	Electricity generation	IRR(%)
-10%	44,466	1.57%
-5%	46,936	2.42%
-	49,406	3.24%
5%	51,877	4.04%
10%	54,347	4.82%

2.the result of increase of purchase price and unit price of wind power

increase of benefit rate(%)	Purchase price (won/KW)	IRR(%)
-10%	68.83	1.57%
-5%	72.65	2.42%
-	76.47	3.24%
5%	80.30	4.04%
10%	84.12	4.82%
16%	88.71	5.74%

3. the result of increase of investment costs

increase of investment costs rate(%)	investment costs (million won)	IRR(%)
-10%	38,070	4.99%
-5%	40,185	4.09%
-	42,300	3.24%
5%	44,415	2.46%
10%	46,530	1.73%

4. the result of increase of O&M costs

increase of operation costs rate(%)	O&M cost (million won)	IRR(%)
-10%	2.25%	3.69%
-5%	2.38%	3.47%
-	2.50%	3.24%
5%	2.63%	3.02%
10%	2.75%	2.79%

As the result of sensitivity analysis shows, Sungsan Wind Power Project is not financially attractive.

Step 4. Common Practice Analysis

Sub-step 4a. Other activities similar to the Sungsan Wind Power Project in Korea.

In Korea, wind power plants were started to be constructed in high gear since the end of 2003 due to development of the wind power technologies and policy of Korean government.
However, according to KEPCO, the total capacity facility of the wind power generation was 196.1MW and net generation during 2007 was 375,641MWh.[3]
And in 2007, total electric generation of Korea was 426,647,338MWh4 and wind power held only 0.09% of it, of which portion is very low.
Following table shows the annual wind power installations status in Korea until 2007

Table.5. Status of annual wind power installations

Year	~2000	2001	2002	2003	2004	2005	2006	2007	total
Capacity (MW)	5.9	2.0	4.8	5.5	49.9	30.7	78.9	18.4	196.1

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

In Korea, it is hard to find similar project to Sungsan Wind Power in terms of its capacity. However, there is the similar one to Sungsan Wind Power in Korea as a commercial wind power plant, that is, 'Gangwon Wind Park' in Gangwon Province. As well, 'Gangwon Wind Park Project (GaWip)' is under the process as a CDM project. It has started construction in May 2005 with the capacity of 98 MW. GaWip is developed by Unison Co., Ltd, the same company which promoted Sungsan Wind Power Project. In Gangwon's case, Unison and the international investor for the project have considered that the project has the potentiality of the CDM before their investment. Currently, GaWip is waiting for the national approval from Japan which is Annex I country, as well as for the national approval from Korea

In addition, 'Hankyeong Wind power plant' in Jeju Island is another wind power plant. It has established in March 2003 with 6 MW as the first phase of construction. The first phase wind power consists of 4 turbines with 1.5 MW. The second phase of construction was started in June 2006 with 15MW. Hankyeong Wind Power Plant is developed by Korea Southern Power Co., Ltd and the second phase wind power generates 39,689.1 MWh/yr. It is estimated that such clean renewable energy can supply electricity to 6,000 households which reduces 28,898.5 ton CO_2 per year. However, Hankyeong Wind Power Plant is a small scale plant constructed. Moreover, wind power plant is not yet common or widely spread in Korea.

Prior consideration

Date (dd/mm/yyyy)	Description
22/09/2004	Master plan of construction decided
/12/2004	Feasibility study of Large scale alternative power plant construction by Korea Institute of Energy Research
13/04/2005	Construction design outsourcing contract with KOPEC (Korea Power Engineering Company, Inc.)
25/04/2005	Scheme for wind power CDM was reported to the president
13/09/2005	MOU contract with CDM consultant (Ecoeye)
06/07/2006	Equipment Purchase Contract with VESTAS

[3] 2007 "Renewable energy statistics" (2008.12.9 http://www.knrec.or.kr)

(starting date)	
01/08/2008	Starting construction
20/03/2009	Commercial operation

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

>> For the baseline determination, project boundary is related to CO2 emissions from electricity generation in a fossil fuel power plant that is displaced due to this project activity.

The spatial extent of the project boundary includes the project site and all the power plants connected physically to the electricity system of Korea Electric Power Corporation (KEPCO).

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

Project Boundary

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

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

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

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

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

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

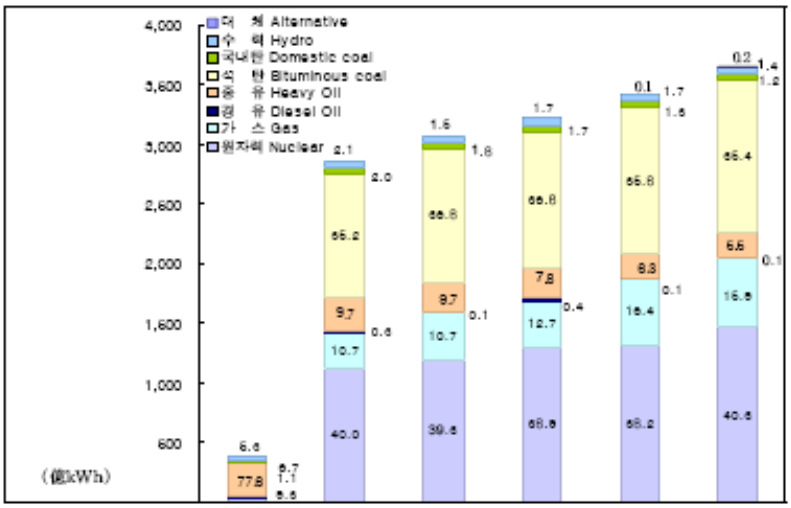
OM EF = OM(Inland)*0.4% + OM(Jeju Island)*0.6%

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

OM (Operating Margin) and BM (Build Margin) are calculated by using the data from existing power plants that provide electricity with the current grid-connected electricity generation, and with this result, the EFy (Emission Factor) can be calculated. The steps for the Baseline calculation methodology are as follows;

Step 1. Calculation of the Operating Margin emission factor (OM)
Based on ACM0002 (Version12), if low-cost/must-run resources constitute less than 50% of total grid generation in average of the five most recent years, simple OM can be chosen. ACM0002 says that hydro, geothermal, wind, low-cost biomass, nuclear and solar generation are included in must-run sources. In addition, domestic coal is supported by governmental fund as a must-run generation.

<Figure 3> is shown the yearly proportion of the generation of electricity based on the source of energy (Korea Electric Power Corporation, 2006). The rate of low cost/must run power generation does not exceed 50% of the total grid (the most recent 5-year (2001~2005) average data shows that the rate of low cost/must run is 43.01%) referred to the host country's gross electricity generation rate by energy sources (Source: KEPCO), and an hourly dispatched data is not available at this point of time. Therefore, Option (a) (Simple OM) has been chosen.



(単位 Unit : 百萬kWh million kWh)

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

Figure 3. Gross generation (Source: KEPCO in brief, 2006)

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

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

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

The CO_2 emission coefficient $COEF_i$ is obtained as

$COEFi = NCVi \cdot EFco2i \cdot OXIDi$

NCV_i is the net calorific value (energy content) per mass or volume unit of a fuel *i*,
$OXID_i$ is the oxidation factor of the fuel (see page 1.29 in the 2006 Revised IPCC Guidelines for default values),
$EF_{CO2,i}$ is the CO_2 emission factor per unit of energy of the fuel *i*.
Where available, local values of NCV_i and $EF_{CO2,i}$ should be used. If no such values are available, country-specific values (see e.g. IPCC Good Practice Guidance) are preferable to IPCC world-wide default values.

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

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

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

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

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

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

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

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

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

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

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

Table 5. Sample Plant group (m) for determining Build margin Emission factor

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

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

The calculation of BM $_y$ is as follows;

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

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

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

Step 3. – Calculation of the baseline emission factor (EF_y)

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

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

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

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

Data / Parameter:	**$F_{i,j,y}$**
Data unit:	Mass of Volume
Description:	Amount of fuel *i* consumed by relevant power sources j in year y
Source of data used:	Statistics of Electric Power in Korea from Korea Electric Power Corporation
Value applied:	Refer to Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Amount of fuel *i* (in a mass or volume unit) consumed by relevant power sources *j* in year *y*, where *j* refers to power sources delivering electricity to the grid, not including low-operating cost and must-run power plants, and including imports to grid. The procedures applied are provided below and in Annex 3.
Any comment:	Data used of 3 year vintage data (2003~2005) - The same value will be applied during the first crediting period without updating.

Data / Parameter:	**$GEN_{i,j}$**
Data unit:	MWh
Description:	Electricity delivered to the grid by source *j*
Source of data used:	Statistics of Electric Power in Korea from Korea Electric Power Corporation
Value applied:	Refer to Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	It is used to calculate OM emission factor
Any comment:	Data used of 3 year vantage data (2003~2005) - The same value will be applied during the first crediting period without updating.

Data / Parameter:	**NCV_i**
Data unit:	Kcal/kg
Description:	Net Calorific Value, energy content per mass or volume unit of fuel i
Source of data used:	Statistics of Electric Power in Korea from Korea Electric Power Corporation
Value applied:	Refer to Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Applied value was referred Statistics of Electric Power in KOREA (2003, 2004, 2005) (KEPCO)
Any comment:	Data used of 3 year vintage data (2003~2005) - The same value will be applied during the first crediting period without updating.

Data / Parameter:	**$OXID_i$**

Data unit:	-
Description:	Oxidation factor of the fuel
Source of data used:	IPCC 2006 Revised Guidelines
Value applied:	1
Justification of the choice of data or description of measurement methods and procedures actually applied :	Oxidation factor uses for the calculation of the CO_2 emission coefficient $COEF_i$
Any comment:	Default values in the IPCC 2006 Revised Guideline - The same value will be applied during the first crediting period without updating.

Data / Parameter:	**$EF_{co2,i}$**
Data unit:	-
Description:	CO2 emission factor of the fuel i
Source of data used:	IPCC 2006 Revised Guideline
Value applied:	Refer to Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Emission factor uses for the calculation of the CO_2 emission coefficient $COEF_i$
Any comment:	Default values in the IPCC 2006 Revised Guideline - The same value will be applied during the first crediting period without updating.

Data / Parameter:	Plant factor (run time)
Data unit:	%
Description:	Annual estimated operation rate (time)
Source of data used:	Feasibility Study Report
Value applied:	28.2%
Justification of the choice of data or description of measurement methods and procedures actually applied :	The Plant Factor is based on the Feasibility Study Report.
Any comment:	- The same value will be applied during the first crediting period without updating.

Data / Parameter:	$EF_{OM,y}$
Data unit:	tCO2/MWh
Description:	Operation Margin Emission Factor of the grid
Source of data used:	Calculated by using a factor of F, COEF and GEN
Value applied:	0.7188
Justification of the choice of data or description of	The emission factor has been calculated using the ex-ante method based on the most recent information available on plants already built at the time of PDD submission, because this has been considered the most appropriate method for

measurement methods and procedures actually applied :	the project development and for the emission reduction verification. The procedure applied are provided below and in Annex 3.
Any comment:	Data used of 3 year vantage data (2003~2005) - 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:	$EF_{BM,y}$
Data unit:	tCO2/MWh
Description:	Build Margin Emission Factor of the grid
Source of data used:	Calculated by using a factor of F, COEF and GEN
Value applied:	0.6987
Justification of the choice of data or description of measurement methods and procedures actually applied :	The emission factor has been calculated using the ex-ante method based on the most recent information available on plants already built at the time of PDD submission, because this has been considered the most appropriate method for the project development and for the emission reduction verification. The procedures applied are provided below and in Annex 3.
Any comment:	Data used vantage data 2005. Calculated as recently built power plants defined in the baseline methodology. - 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_y
Data unit:	tCO2/MWh
Description:	Emission factor ex-ante
Source of data used:	Calculated by using a factor of $EF_{OM,y}$ and $EF_{BM,y}$
Value applied:	0.7138
Justification of the choice of data or description of measurement methods and procedures actually applied :	The emission factor has been calculated using the ex-ante method based on the most recent information available on plants already built at the time of PDD submission, because this has been considered the most appropriate method for the project development and for the emission reduction verification. The procedures applied are provided below and in Annex 3.
Any comment:	Data used of 3 year vantage data (2003~2005) - The same value will be applied during the first crediting period without updating. - For detail calculation method, refer to Annex 3.

B.6.3 Ex-ante calculation of emission reductions:

>>

As described above, approved methodology ACM0002, ver12, has been used.

[Equation 1]

$$BE_y = EG_y * EF_y$$

= 49,406 MWh/year * EF_y

The EF_y is calculated by $EF_{OM,y}$ [Equation 2] and $EF_{BM,y}$ [Equation 3].

The $EF_{OM,y}$ is calculated as follows, using a 3-year average:

Due to the characteristic of Jeju island, EFOM is calculated as follows;

EFOM = EFOM(Inland)*40% + EFOM(Jeju Island)*60%

[Equation 2]

EFOM = EFOM(Inland)*40% + EFOM(Jeju)*60%

= 0.7188 tCO_2/MWh

The value of $F_{i,j,y}$, $COEF_{i,j}$ and $GEN_{j,y}$ refer to Annex 3.

The calculation of $EF_{BM,y}$ is as flows and the data for $EF_{BM,y}$ refers to Annex 3.

[Equation 3]

$$EF_{BM,y} = \frac{\sum_{i,m} F_{i,m,y} \cdot COEF_{i,m}}{\sum_{m} GEN_{m,y}} = 0.6987\ tCO_2/MWh$$

Based on the results derived from Equation2 and Equation 3, the baseline emission factor EF_y has been calculated using the following formula:

[Equation 4]

$$EFy = w_{OM} * EF_{OM} + w_{BM} * EF_{BM}$$
$$= 0.75 * EF_{OM} + 0.25 * EF_{BM}$$
$$= 0.7138\ tCO2/MWh$$

Emission reduction by the project is as follow.

[Equation 5]

$$ER_y = BE_y - PE_y - L$$
$$= 49{,}406 \text{ MWh/year} * 0.7138 \text{ tCO2/MWh}$$
$$= 35{,}265 \text{ tCO2/year}$$

· This project activities $RE_y = 0$ and $L_y = 0$ so, $ER_y = BE_y$

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

>>

Table 6. Annual estimation of emission reductions

Years	Annual estimation of emission reductions in tones of CO_2 e
Year 1 2009	35,265 ton CO_2
Year 2 2010	35,265 ton CO_2
Year 3 2011	35,265 ton CO_2
Year 4 2012	35,265 ton CO_2
Year 5 2013	35,265 ton CO_2
Year 6 2014	35,265 ton CO_2
Year 7 2015	35,265 ton CO_2
Total estimated reductions (Tones of CO_2 e)	**246,854ton CO_2**
Total number of crediting years	7 years
Annual average over the crediting period of estimated reductions (tones of CO2e)	**35,265 ton CO_2**

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

B.7.1 Data and parameters monitored:

Data / Parameter:	**EGy**
Data unit:	MWh
Description:	Generation of the project in year y
Source of data to be used:	Metering equipment and bills of electricity sales.

Value of data applied for the purpose of calculating expected emission reductions in section B.5	- Date will be measured by electricity meter connected to the grid - Data will be measured each hourly and recorded monthly
Description of measurement methods and procedures to be applied:	Electricity supplied by the project activity to the grid. Electricity generation will be measured hourly and recorded monthly. Double check by receipt of sales (which takes into account the transportation electric losses to the metering equipment).
QA/QC procedures to be applied:	- QA/QC procedure is prepared - The allowable error of the data : within ±0.5% The Measurement will be in compliance with the National Guidelines and requirement of the KPX(Korea Power Exchange) for accuracy and reliability. The calibration will be carried out according to relevant national standards and regulations by authorized organization. Double checked by receipt of sales.
Any comment:	The electricity generation will be checked every 5 minutes, and the data will be kept for two years after CERs are issued. * The amount of electricity consumed in the plant and electricity transmission to a grid will be measured by bidirectional meter. Also the received electricity as a driving force for starting the operation and in emergencies will be measured by electric power meter. * EG_y means a net amount of electricity transmitted to the grid excluding electricity consumed in the plant and received from grid. And the amount of electricity consumed in the plant and received from the gird will be deducted from the emission reduction of the proposed project according to the monitoring

B.7.2 Description of the monitoring plan:

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The project meets the applicability criteria under the monitoring methodology, ACM0002 version 12 "Consolidated baseline methodology for grid-connected electricity generation from renewable sources". This methodology is designed for power plants using wind resources, among others.

Information that needs to be monitored shall include the electricity generation from the proposed project activity, as mentioned above, measured from the control house on site.
Electricity generation will be measured hourly and recorded monthly. Additionally, total electricity generation and operation statue will draw up the monitoring report.

The monitoring plan has been developed based on approved methodology ACM0002, and more details are as follows:

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. According to the 'Law regarding measurement', the valid period for the authorized certification of wattmeter is 7 years. And, according to the 'Act on the operation of electricity market', the period of an error examination of wattmeter is 3 and a half years if the facility capacity is more than 1MW. The measurement equipment of the proposed project will be calibrated before installation. Then, within 3 and half years it will be re-calibrated.
1-3. According to the 'Act on operation of measurement', if the facility capacity exceeds 20MW, it should install two measurement equipments. The capacity of Sungsan wind power project is 20MW; therefore only one measurement equipment is installed.
1-4. Measurement equipment shall be electronic multipurpose meter of accuracy range ±0.5%.

2. The amount of electricity monitoring

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

3. Manager of monitoring and electricity safety

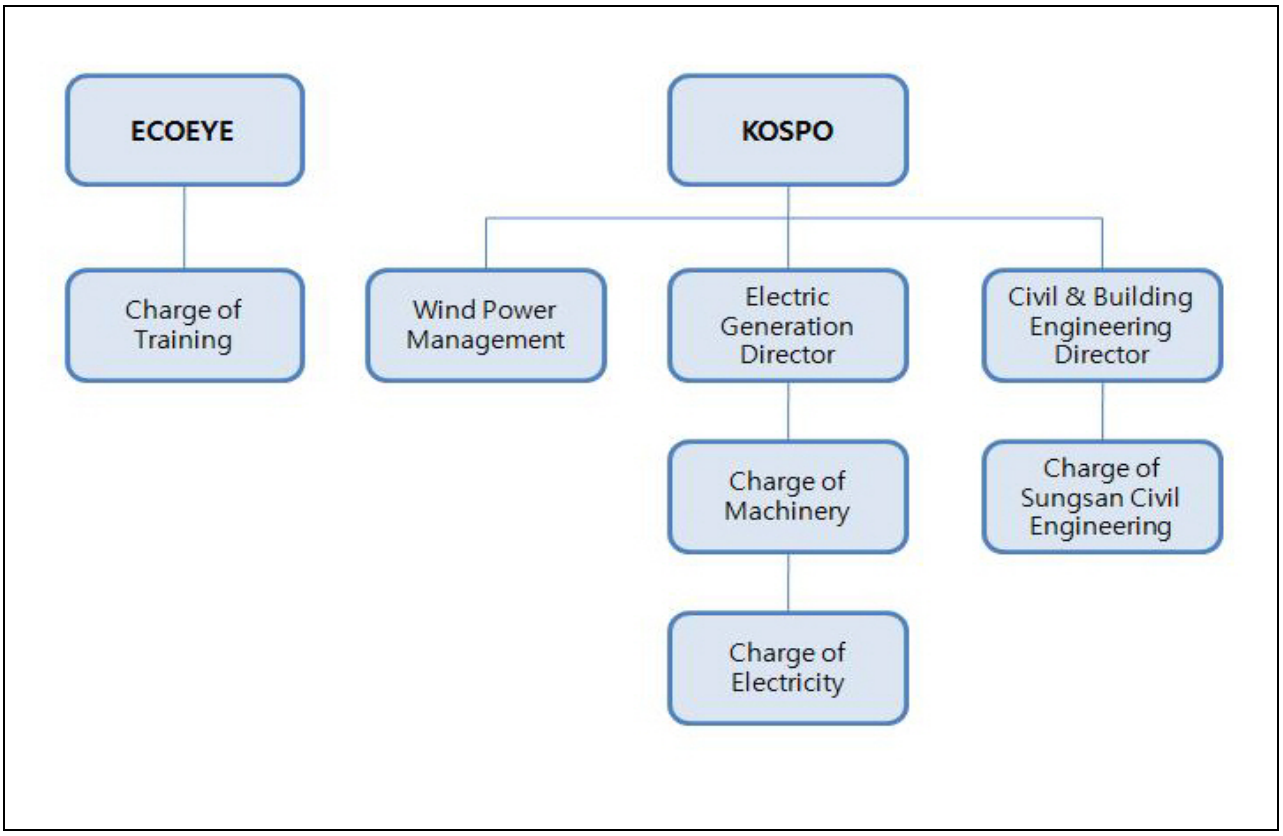
3-1. The person in charge of monitoring and electricity safety shall attend the following courses once a year.
- Course on 'Law regarding measurement'
- Course on 'Act on operation of electricity market
- Course on Electricity safety

3-2. In case of absence of the responsible person, the second responsible person shall be selected.
3-3. If the responsibility for monitoring and electricity safety is transferred to another person, it is needed to be approved by the final decision-maker.

4. Training

4-1.The project developers and manager will perform the training and maintenance over the equipment of Sungsan Wind Power plant. The training will be performed once a year and the contents will include the overall operation of the plant, such as plant O&M and generation and monitoring manual.
4-2. Some of the workers who have worked at Hangyeong second phase SS-wind power Project(CDM registration reference No.1000) will be also put in Sungsan Wind Power Project, and they will give the training about whole management of the project and CDM monitoring.

Description of the monitoring plan is as follows;



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

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This monitoring methodology is determined and planned by Ecoeye Co., Ltd. in 27/04/2009
The person involved in baseline study are listed as follows

- Mr. Jung, Jae-Soo, CEO of Ecoeye Co., Ltd.
  E-mail : civilenvi@ecoeye.com
  Tel : 82-31-710-7300

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

>> Starting date of Sungsan wind park project is 6th July 2006, which is shown in Equipment Purchase Contract with VESTAS.

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

>> The project will have the operational lifetime of approximately 20 years

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

C.2.1. Renewable crediting period

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

>> 01/06/2010 or the registration date, which is later.

C.2.1.2. Length of the first crediting period:

>> A crediting lifetime of 7 years has been selected for the project.

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>>

C.2.2.2. Length:

>>

SECTION D. Environmental impacts

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

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According to the provisions of Enforcement Decree of the Act on Assessment of Impacts of Works on Environment, Traffic, and Disasters, etc, any plant facility whose power source is solar power, wind power or fuel cell which is more than 100,000kW shall be carried out EIA (revised on 24 February 2001). As Sungsan Wind Power whose facility capacity is 20MW, it is not required to be performed EIA. Instead of EIA, Preliminary Environment Assessment was performed..

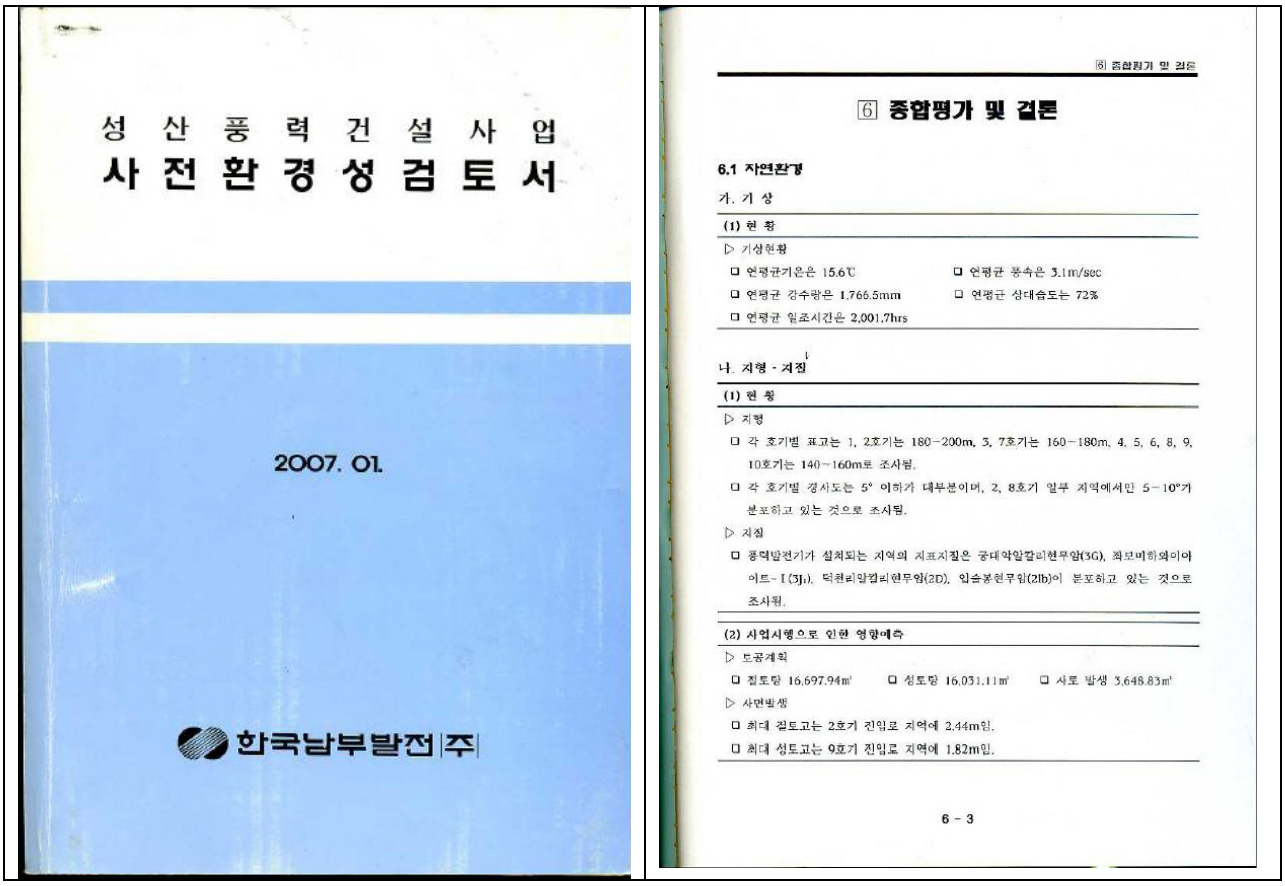


Figure 4. Prior Environment Review of Sungsan Wind Power Project

Table 7. Environment impacts

Contents	Assessment Results
Terrain	• Construction Plan -Amount of cutting ground : 16,697.94m3 -Amount of piling up ground : 16,031.11m3 -Amount of waste ground : 3,648.83m3 • Slope area -maximum cutting ground height is 2.44m at the slip road of turbine no.2. -maximum piling up ground height is 1.82m at the slip road of turbine no.9. • Slide stabilization -slide of cutting ground : 1: 1.0 for sandy soil 1: 0.3 for stone -slide of piling up ground : 1:1.5 • Treatment of waste ground -the waste ground caused by construction will be supplied to other construction and farm site.
Flora and Fauna	• Change of Flora and Fauna -the project site is almost grassland or cultivated land. Therefore the influence that affects flora and fauna is slight. Grassland and cultivated land

	in the project site will be changed to working site and slip road. • Change of existing amount of plant and net primary output -33.4ton of existing amount of plant and 16.5ton/yr of net primary output will decrease • Change of Fauna -Due to the construction, wild animals living near the project site will be affected. However, change of habitation of wild animals is limited to very small area; there is not much problem for habitation and moving of wild animals.
The Use of Land	• Designing the necessary facilities which are a slip road, working space, and the space for slide stabilization, therefore the use of land should be minimise. • There is no prevention area at the project site.
Waste Management	• No significant wastes will be created during the operational phase of the project. A number of waste streams will, however, be generated during construction of the wind power plant. It is expected that separate garbage box is set near the office in the site and reuse or recycle. The rest of waste is disposed in accordance with the City Policy. • Simple toilet will be installed temporarily and the waste will be treated by licensed treatment company. • Changing waste oil should be done though car service center. If there is some unavoidable reason, it will be performed at assigned site.
Noise and Vibration	• The potential impact associated with noise generated by the turbines is probably one of the most significant issues that need to be addressed in the development of a wind farm. • Construction Noise -It is anticipated that the noise within 47.5m will exceed Living noise regulatory (70dB(A), daytime) -It is anticipated that the noise of Residential area satisfies Living noise regulatory (70dB(A), daytime) • Construction Vibration -It is anticipated that the vibration of Residential area is under Living vibration regulatory. • Operation Noise -It is anticipated that noise caused by turbines satisfies Environmental Regulatory, therefore the influence of operating turbines is slight. • In order to minimise noise, construction should be performed in accordance with "Noise Control Scheme for Construction site, 11th,March, 1993,Ministry of Environment"
Quality of Air	• It is anticipated that Air Quality regulatory will be satisfied in the whole area of the project, therefore, influence cased by the project is slight. • Accordingly, during construction period, it periodically uses sprinklers, installs cover on top of the trailer of the construction vehicle and complies with the speed limit and the regulation of the construction vehicle.(under 20km/h)

Quality of Water	• Digging will be performed at each small area where 10 wind turbines are installed. Therefore, it is anticipated that landslide leakage caused by construction is very slight. -Amount of waste water : 0.48m3/day • In order to prevent landslide leakage, bypass waterway will be installed and construction time will be adjusted.

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

>>

Not significant.

SECTION E. Stakeholders' comments

>>

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

>>

No.	Document	Date	Contents	Remark	Attendant
1	Report	2007. 01.04	Report of requiring cooperation for Sungsan Wind Power EIA	KOSPO	Head director of Clean Energy department, Head director of Energy policy department, and 3 other employees of KOSPO
2	Conference Record	2007. 02.02	General Conference of Susan 2 Li	KOSPO	26 resident of Susan 2 Li, Chief of Construction department, Head chief of trial run of electricity department, director of wind power management department
3	Report	2007. 02.05	Interview report of Knowledge industrial director of Jeju	KOSPO	Knowledge industrial director, administrative official, junior official, Chief of Construction department, director of wind power management department
4	Conference Record	2007. 03.16	Record of the conference of Susan 2 Li	KOSPO	27 resident of Susan 2 Li
5	Official Document	2007. 11.07	Official document for Cooperation of Sungsan wind power project	Susan1Li → Jeju Province	

6	Official Document	2009. 01.10	Official document of the conference of Susan 2 Li	Susan 2 Li	
7	Conference Record	2009. 01.10	Record of the conference of Susan 2 Li	Susan 2 Li	23 resident of Susan 2 Li

E.2. Summary of the comments received:

>>

- General meeting of Susan 2 Li (2007,02,02)
  -Is there any negative influence for agriculture or other construction?
  -Detail of compensation
  -Any individual compensation beside the public compensation for the village?
  - Any influence for the landscape?

- Interview report of Knowledge industrial director of Jeju (2007.02.05)
  -Installation of wind turbines all around Jeju Island has some problems. There is abundant wind resource in Hangyeong site, but Sungsan project needs to be considered seriously.

- Conference of Susan 2 Li (2007.03.16)
  -Explanation of change of the project; 10 turbines are supposed to be installed, but only 7 turbines will be installed.
  -Rest of 3 turbines will be installed in the future only if there will be agreement of residents.

- Official document for Cooperation of Sungsan wind power project (2007.11.07)
  - Agreement was made though several discussion, therefore, cooperation for Sungsan wind power project is required.

- Conference of Susan 2 Li (2009.01.10)
  -Agreement of 7 wind turbines has made, but only 6 turbines are under construction. Therefore, rest of 4 turbines will be installed additionally.
  -the six turbines installation will be complete on 1st March and another 6months are needed to install other 4 turbines.
  -Land price decrease would occur.

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

>>

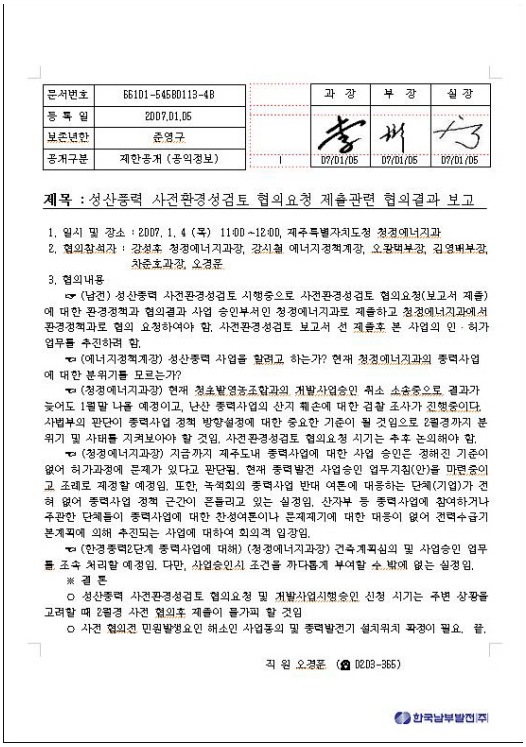
- General meeting of Susan 2 Li (2007,02,02)
  -Inconvenient for the resident, but there is no negative influence for agriculture or other construction
  -700 million won of special funding and 30 million won of annual funding for 20 year, total 1.3 billion won.
  -Except the windmills, every electric wire will be under the ground.
  => General opposite opinion is disappeared, but persuasion of the owners of land beside the windmills is important. A portion of funding needs to be divided for compensation for the land owners.

- Interview report of Knowledge industrial director of Jeju (2007.02.05)

- There is study going on about wind power at the sea

- Conference of Susan 2 Li (2007.03.16)
  -the funding will be decrease (490 million won of special funding) take the change into account.
  -the opinion of resident takes priority while construction.

- Conference of Susan 2 Li (2009.01.10)
  -There is no decrease of land price published due to wind turbine installation.
  -The opinion of installation of 10 wind turbines was asked and 21 residents out of 23 agreed to install the turbines.



문서번호	66101-54580113-48		과 장	부 장	실 장
등 록 일	2007.01.05				
보존년한	준영구				
공개구분	제한공개 (공익정보)		07/01/05	07/01/05	07/01/05

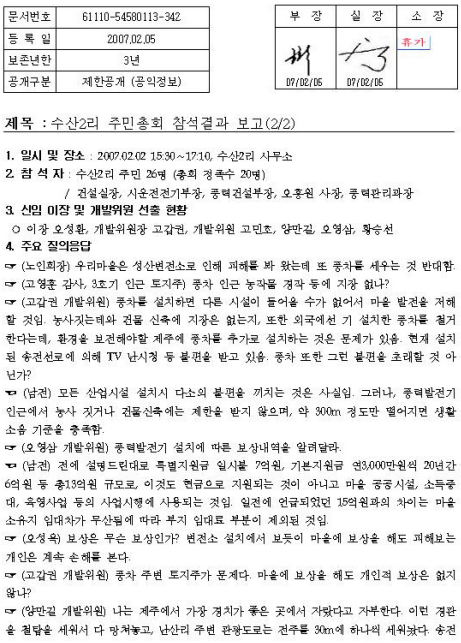
제목 : 성산풍력 사전환경성검토 협의요청 제출관련 협의결과 보고

1. 일시 및 장소 : 2007. 1. 4 (목) 11:00 ~12:00, 제주특별자치도청 청정에너지과
2. 협의참석자 : 강성호 청정에너지과장, 강시철 에너지정책계장, 오광덕부장, 김영배부장, 차준호과장, 오경훈
3. 협의내용
☞ (남전) 성산풍력 사전환경성검토 시행중으로 사전환경성검토 협의요청(보고서 제출)에 대한 환경정책과 협의결과 사업 승인부서인 청정에너지과로 제출하고 청정에너지과에서 환경정책과로 협의 요청하여야 함. 사전환경성검토 보고서 선 제출후 본 사업의 인·허가 업무를 추진하려 함.
☜ (에너지정책계장) 성산풍력 사업을 할려고 하는가? 현재 청정에너지과의 풍력사업에 대한 분위기를 모르는가?
☜ (청정에너지과장) 현재 청초발열농조합과의 개발사업승인 취소 소송중으로 결과가 늦어도 1월말 나올 예정이고, 난산 풍력사업의 산지 훼손에 대한 검찰 조사가 진행중이다. 사법부의 판단이 풍력사업 정책 방향설정에 대한 중요한 기준이 될 것임으로 2월경까지 분위기 및 사태를 지켜보아야 할 것임. 사전환경성검토 협의요청 시기는 추후 논의해야 함.
☜ (청정에너지과장) 지금까지 제주도내 풍력사업에 대한 사업 승인은 정해진 기준이 없어 허가과정에 문제가 있다고 판단됨. 현재 풍력발전 사업승인 업무지침(안)을 마련중이고 조례로 제정할 예정임. 또한, 녹색회의 풍력사업 반대 여론에 대응하는 단체(기업)가 전혀 없어 풍력사업 정책 근간이 흔들리고 있는 실정임. 산자부 등 풍력사업에 참여하거나 추관한 단체들이 풍력사업에 대한 찬성여론이나 문제제기에 대한 대응이 없어 전력수급기본계획에 의해 추진되는 사업에 대하여 회의적 입장임.
☜ (한경풍력2단계 풍력사업에 대해) (청정에너지과장) 건축계획심의 및 사업승인 업무를 조속 처리할 예정임. 다만, 사업승인시 조건을 까다롭게 부여할 수 밖에 없는 실정임.
※ 결 론
○ 성산풍력 사전환경성검토 협의요청 및 개발사업시행승인 신청 시기는 주변 상황을 고려할 때 2월경 사전 협의후 제출이 좋가피 할 것임.
○ 사전 협의전 민원발생요인 해소인 사업동의 및 풍력발전기 설치위치 확정이 필요. 끝.

직 원 오경훈 (☎ 0203-365)

한국남부발전㈜

Figure 5 . Report of requiring cooperation for Sungsan Wind Power EIA



문서번호	61110-54580113-342
등 록 일	2007.02.05
보존년한	3년
공개구분	제한공개 (공익정보)

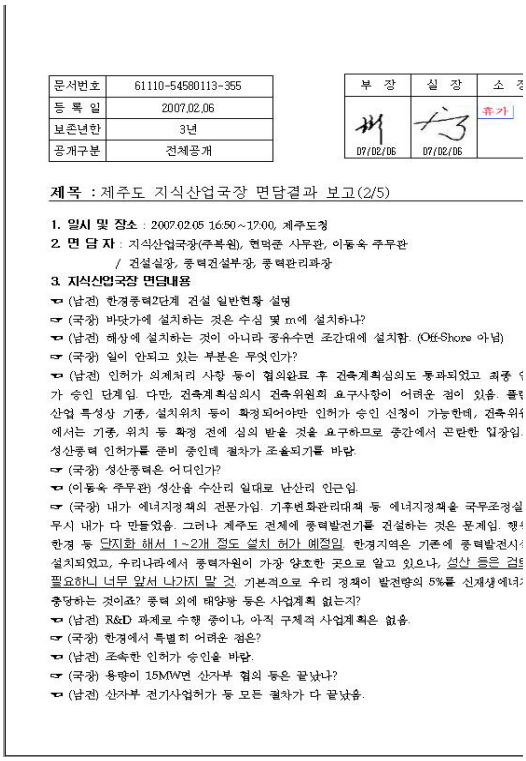
부 장	실 장	소 장
		휴가
07/02/05	07/02/05	

제목 : 수산2리 주민총회 참석결과 보고(2/2)

1. **일시 및 장소** : 2007.02.02 15:30~17:10, 수산2리 사무소
2. **참 석 자** : 수산2리 주민 26명 (총회 정족수 20명)
/ 건설실장, 시운전전기부장, 풍력건설부장, 오홍원 사장, 풍력관리과장
3. **산임 이장 및 개발위원 선출 현황**
○ 이장 오성환, 개발위원장 고갑권, 개발위원 고민호, 양만길, 오영삼, 황승선
4. **주요 질의응답**

☞ (노인회장) 우리마을은 성산변전소로 인해 피해를 봐 왔는데 또 풍차를 세우는 것 반대함.
☞ (고영훈 감사, 3호기 인근 토지주) 풍차 인근 농작물 경작 등에 지장 없나?
☞ (고갑권 개발위원) 풍차를 설치하면 다른 시설이 들어올 수가 없어서 마을 발전을 저해할 것임. 농사짓는데와 건물 신축에 지장은 없는지, 또한 외국에선 기 설치한 풍차를 철거한다는데, 환경을 보전해야할 제주에 풍차를 추가로 설치하는 것은 문제가 있음. 현재 설치된 송전선로에 의해 TV 난시청 등 불편을 받고 있음. 풍차 또한 그런 불편을 초래할 것 아닌가?
☜ (남전) 모든 산업시설 설치시 다소의 불편을 끼치는 것은 사실임. 그러나, 풍력발전기 인근에서 농사 짓거나 건물신축에는 제한을 받지 않으며, 약 300m 정도만 떨어지면 생활소음 기준을 충족함.
☞ (오영삼 개발위원) 풍력발전기 설치에 따른 보상내역을 알려달라.
☜ (남전) 전에 설명드린대로 특별지원금 일시불 7억원, 기본지원금 연3,000만원씩 20년간 6억원 등 총13억원 규모로, 이것도 현금으로 지원되는 것이 아니고 마을 공공시설, 소득증대, 육영사업 등의 사업시행에 사용되는 것임. 일전에 언급되었던 15억원과의 차이는 마을 소유지 임대차가 무산됨에 따라 부지 임대료 부분이 제외된 것임.
☞ (오성옥) 보상은 무슨 보상인가? 변전소 설치에서 보듯이 마을에 보상을 해도 피해보는 개인은 계속 손해를 본다.
☞ (고갑권 개발위원) 풍차 주변 토지주가 문제다. 마을에 보상을 해도 개인적 보상은 없지 않나?
☞ (양만길 개발위원) 나는 제주에서 가장 경치가 좋은 곳에서 자랐다고 자부한다. 이런 경관을 철탑을 세워서 다 망쳐놓고, 난산리 주변 관광도로는 전주를 30m에 하나씩 세워놨다. 송전

Figure 6 . Conference Record of Susan 2 Li



문서번호	61110-54580113-355
등 록 일	2007.02.06
보존년한	3년
공개구분	전체공개

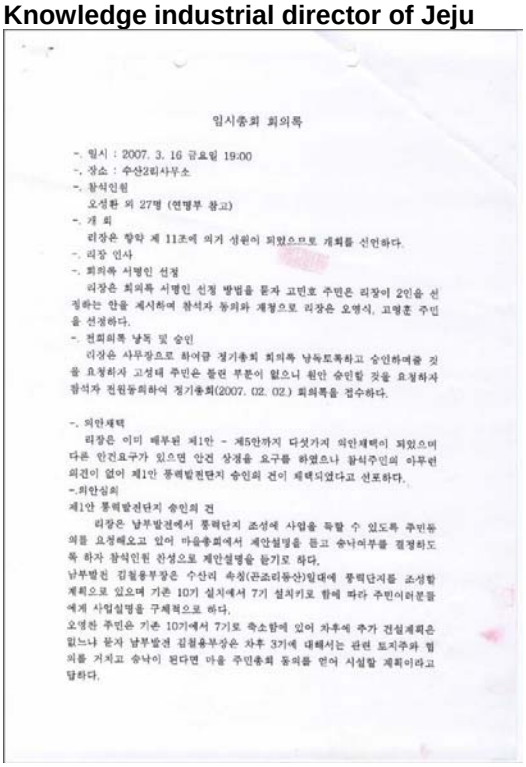
부 장	실 장	소 장
07/02/06	07/02/06	휴가

제목 : 제주도 지식산업국장 면담결과 보고(2/5)

1. 일시 및 장소 : 2007.02.05 16:50~17:00, 제주도청
2. 면 담 자 : 지식산업국장(주복원), 현덕준 사무관, 이동욱 주무관
/ 건설실장, 풍력건설부장, 풍력관리과장
3. 지식산업국장 면담내용

☜ (남전) 한경풍력2단계 건설 일반현황 설명
☞ (국장) 바닷가에 설치하는 것은 수심 몇 m에 설치하나?
☜ (남전) 해상에 설치하는 것이 아니라 공유수면 조간대에 설치함. (Off-Shore 아님)
☞ (국장) 일이 안되고 있는 부분은 무엇인가?
☜ (남전) 인허가 의제처리 사항 등이 협의완료 후 건축계획심의도 통과되었고 최종 인
가 승인 단계임. 다만, 건축계획심의시 건축위원회 요구사항이 어려운 점이 있음. 풍력
산업 특성상 기종, 설치위치 등이 확정되어야만 인허가 승인 신청이 가능한데, 건축위원
에서는 기종, 위치 등 확정 전에 심의 받을 것을 요구하므로 중간에서 곤란한 입장임.
성산풍력 인허가를 준비 중인데 절차가 조율되기를 바람.
☞ (국장) 성산풍력은 어디인가?
☜ (이동욱 주무관) 성산읍 수산리 일대로 남산리 인근임.
☞ (국장) 내가 에너지정책의 권문가임. 기후변화관리대책 등 에너지정책을 국무조정실
무시 내가 다 만들었음. 그러나 제주도 전체에 풍력발전기를 건설하는 것은 문제임. 행
한경 등 단지화 해서 1~2개 정도 설치 허가 예정임. 한경지역은 기존에 풍력발전시
설치되었고, 우리나라에서 풍력자원이 가장 양호한 곳으로 알고 있으나, 설산 등은 검
필요하니 너무 앞서 나가지 말 것. 기본적으로 우리 정책이 발전량의 5%를 신재생에너
충당하는 것이죠? 풍력 외에 태양광 등은 사업계획 없는지?
☜ (남전) R&D 과제로 수행 중이나, 아직 구체적 사업계획은 없음.
☞ (국장) 한경에서 특별히 어려운 점은?
☜ (남전) 조속한 인허가 승인을 바람.
☞ (국장) 용량이 15MW면 산자부 협의 등은 끝났나?
☜ (남전) 산자부 전기사업허가 등 모든 절차가 다 끝났음.

Figure 7 . Interview report of Knowledge industrial director of Jeju



임시총회 회의록

-. 일시 : 2007. 3. 16 금요일 19:00
-. 장소 : 수산2리사무소
-. 참석인원
오성환 외 27명 (연명부 참고)
-. 개 회
리장은 항락 제 11조에 의거 성원이 되었으므로 개회를 선언하다.
-. 리장 인사
-. 회의록 서명인 선정
리장은 회의록 서명인 선정 방법을 묻자 고민호 주민은 리장이 2인을 선
정하는 안을 제시하여 참석자 동의와 재청으로 리장은 오명식, 고명훈 주민
을 선정하다.
-. 전회의록 낭독 및 승인
리장은 사무장으로 하여금 정기총회 회의록 낭독토록하고 승인하여줄 것
을 요청하사 고성태 주민은 틀린 부분이 없으니 원안 승인할 것을 요청하사
참석자 전원동의하여 정기총회(2007. 02. 02.) 회의록을 접수하다.

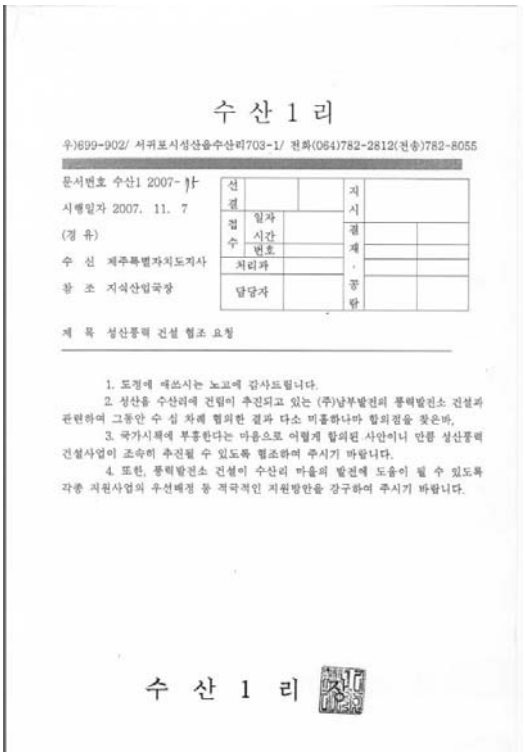
-. 의안채택
리장은 이미 배부된 제1안 - 제5안까지 다섯가지 의안채택이 되었으며
다른 안건요구가 있으면 안건 상정을 요구를 하였으나 참석주민의 아무런
의견이 없어 제1안 풍력발전단지 승인의 건이 채택되었다고 선포하다.
-.의안심의
제1안 풍력발전단지 승인의 건
리장은 남부발전에서 풍력단지 조성에 사업을 착할 수 있도록 주민동
의를 요청해오고 있어 마을총회에서 제안설명을 듣고 승낙여부를 결정하도
록 하자 참석인원 찬성으로 제안설명을 듣기로 하다.
남부발전 김철용부장은 수산리 속칭(곤조리등산)일대에 풍력단지를 조성할
계획으로 있으며 기존 10기 설치에서 7기 설치키로 함에 따라 주민이러분들
에게 사업설명을 구체적으로 하다.
오명찬 주민은 기존 10기에서 7기로 축소함에 있어 차후에 추가 건설계획은
없느냐 묻자 남부발전 김철용부장은 차후 3기에 대해서는 관련 토지주와 협
의를 거치고 승낙이 된다면 마을 주민총회 동의를 얻어 시설할 계획이라고
답하다.

임시총회 참석인 명부

2007년 3월 16일

연번	성 명	날 인	연번	성 명	날인
1			17		
2			18		
3			19		
4			20		
5			21		
6			22		
7			23		
8			24		
9			25		
10			26		
11			27		
12			28		
13			29		
14			30		
15			31		
16			32		

Figure 8. Record of the conference of Susan 2 Li



수 산 1 리

우)699-902/ 서귀포시성산읍수산리703-1/ 전화(064)782-2812(전송)782-8055

문서번호 수산1 2007-

시행일자 2007. 11. 7

(경 유)

수 신 제주특별자치도지사

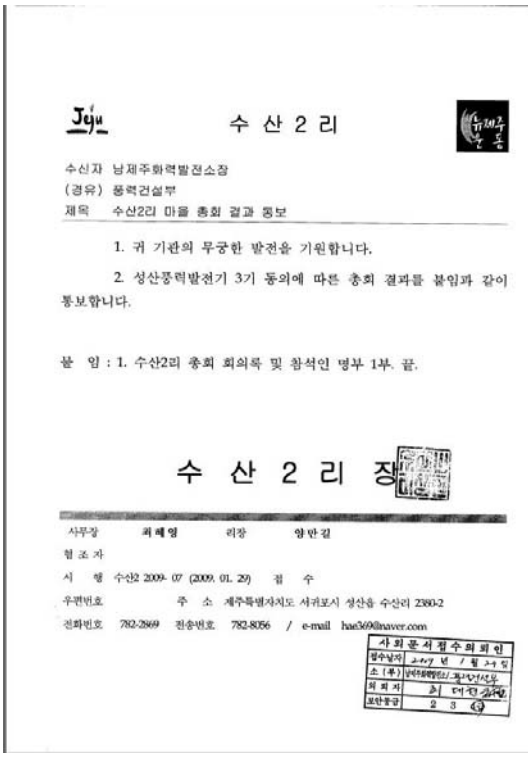
참 조 지식산업국장

제 목 성산풍력 건설 협조 요청

1. 도정에 대쓰시는 노고에 감사드립니다.
2. 성산을 수산리에 건립이 추진되고 있는 (주)남부발전의 풍력발전소 건설과 관련하여 그동안 수 십 차례 협의한 결과 다소 미흡하나마 합의점을 찾은바,
3. 국가시책에 부흥한다는 마음으로 어렵게 합의된 사안이니 만큼 성산풍력 건설사업이 조속히 추진될 수 있도록 협조하여 주시기 바랍니다.
4. 또한, 풍력발전소 건설이 수산리 마을의 발전에 도움이 될 수 있도록 각종 지원사업의 우선배정 등 적극적인 지원방안을 강구하여 주시기 바랍니다.

수 산 1 리 장

Figure 9. Official document for Cooperation of Sungsan wind power project



수 산 2 리

수신자 남제주화력발전소장
(경유) 풍력건설부
제목 수산2리 마을 총회 결과 통보

1. 귀 기관의 무궁한 발전을 기원합니다.

2. 성산풍력발전기 3기 동의에 따른 총회 결과를 붙임과 같이 통보합니다.

붙 임 : 1. 수산2리 총회 회의록 및 참석인 명부 1부. 끝.

수 산 2 리 장

사무장 최혜영 이장 양만길

협 조 자

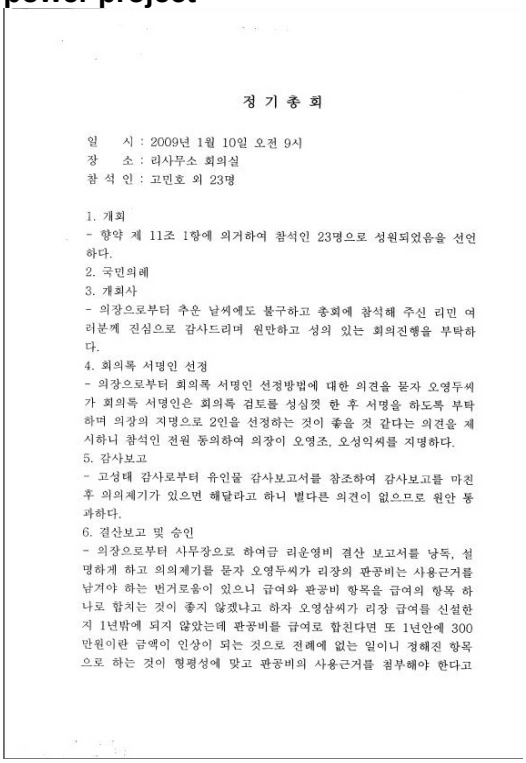
시 행 수산2 2009- 07 (2009. 01. 29) 접 수

우편번호 주 소 제주특별자치도 서귀포시 성산읍 수산리 2380-2

전화번호 782-2869 전송번호 782-8056 / e-mail hae369@naver.com

사회문서접수회의인

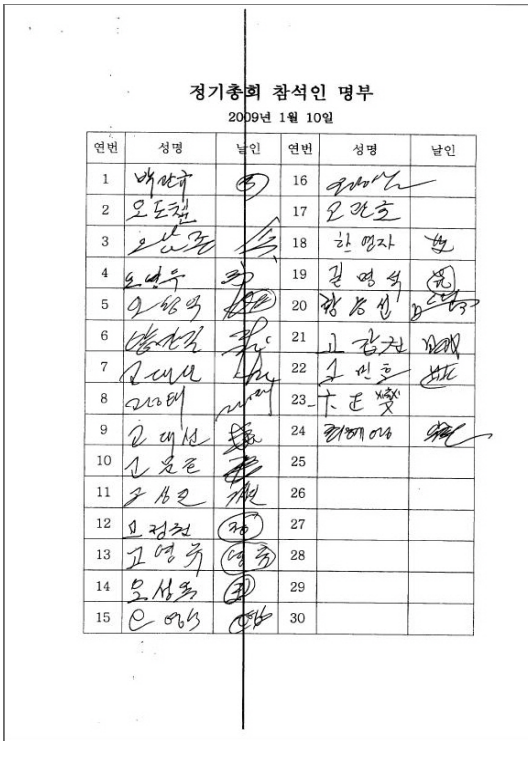
Figure 10. Official document of the conference of Susan 2 Li



정 기 총 회

일 시 : 2009년 1월 10일 오전 9시
장 소 : 리사무소 회의실
참 석 인 : 고민호 외 23명

1. 개회
- 향약 제 11조 1항에 의거하여 참석인 23명으로 성원되었음을 선언하다.
2. 국민의례
3. 개회사
- 의장으로부터 추운 날씨에도 불구하고 총회에 참석해 주신 리민 여러분께 진심으로 감사드리며 원만하고 성의 있는 회의진행을 부탁하다.
4. 회의록 서명인 선정
- 의장으로부터 회의록 서명인 선정방법에 대한 의견을 묻자 오영두씨가 회의록 서명인은 회의록 검토를 성실껏 한 후 서명을 하도록 부탁하며 의장의 지명으로 2인을 선정하는 것이 좋을 것 같다는 의견을 제시하니 참석인 전원 동의하여 의장이 오영조, 오성익씨를 지명하다.
5. 감사보고
- 고성태 감사로부터 유인물 감사보고서를 참조하여 감사보고를 마친 후 의의제기가 있으면 해달라고 하니 별다른 의견이 없으므로 원안 통과하다.
6. 결산보고 및 승인
- 의장으로부터 사무장으로 하여금 리운영비 결산 보고서를 낭독, 설명하게 하고 의의제기를 묻자 오영두씨가 리장의 판공비는 사용근거를 남겨야 하는 번거로움이 있으니 급여와 판공비 항목을 급여의 항목 하나로 합치는 것이 좋지 않겠냐고 하자 오영삼씨가 리장 급여를 신설한지 1년밖에 되지 않았는데 판공비를 급여로 합친다면 또 1년안에 300만원이란 금액이 인상이 되는 것으로 전례에 없는 일이니 정해진 항목으로 하는 것이 형평성에 맞고 판공비의 사용근거를 첨부해야 한다고



정기총회 참석인 명부

2009년 1월 10일

연번	성명	날인	연번	성명	날인
1	백만규		16		
2	오도철		17	오관호	
3	오남곤		18	김영자	
4	오영두		19	김영욱	
5	오형익		20	방용신	
6			21	고감천	
7			22	고민호	
8			23		
9	고대선		24		
10	고윤호		25		
11	고성은		26		
12	오경천		27		
13	고영국		28		
14	오성삼		29		
15	오영삼		30		

Figure 11. Record of the conference of Susan 2 Li

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	KOREA SOUTHERN POWER. Co., Ltd.
Street/P.O.Box:	YoungDong Street 411
Building:	
City:	GangNam Gu, Seoul City
State/Region:	
Postfix/ZIP:	135-791
Country:	The Republic of Korea
Telephone:	+82-70-7713-8000
FAX:	
E-Mail:	
URL:	http://www.kospo.co.kr/
Represented by:	
Title:	CEO
Salutation:	Mr.
Last Name:	Nam
Middle Name:	
First Name:	Ho Ki
Department:	
Mobile:	+
Direct FAX:	+
Direct tel:	+
Personal E-Mail:	

Organization:	ECOEYE. Co., Ltd.
Street/P.O.Box:	#607
Building:	Lordland Bldg
City:	Bundang Gu, Seongnam City
State/Region:	Gyeonggi Do
Postfix/ZIP:	463-810
Country:	The Republic of Korea
Telephone:	+82-31-710-7300
FAX:	+82-31-716-1848
E-Mail:	
URL:	http://www.ecoeye.com
Represented by:	
Title:	CEO
Salutation:	Mr.
Last Name:	Jung
Middle Name:	
First Name:	Jas Su
Department:	
Mobile:	+
Direct FAX:	+
Direct tel:	+
Personal E-Mail:	

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding in this project.

Annex 3

BASELINE INFORMATION

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

Plant (2003)		Amount of fossil fuel($FC_{i,m,y}$)			
		Coal(t)	Heavy oil(kl)	Diesel oil(kl)	L.N.G(t)
Honam	#1	633,609	3,528	409	-
	#2	832,014	641	366	-

Samchonpo	#1	1,535,849	-	1,144	-
	#2	1,680,305	-	657	-
	#3	1,634,224	-	838	-
	#4	1,710,195	-	299	-
	#5	1,430,182	-	2,118	-
	#6	1,436,503	-	1,570	-
Boryeong	#1	1,263,072	-	968	-
	#2	1,311,401	-	934	-
	#3	1,478,200	-	59	-
	#4	1,355,767	-	307	-
	#5	1,468,153	-	152	-
	#6	1,343,310	-	356	-
Taean	#1	1,466,761	-	319	-
	#2	1,333,563	-	730	-
	#3	1,459,118	-	193	-
	#4	1,358,587	-	628	-
	#5	1,243,228	-	994	-
	#6	1,335,853	-	1,011	-
Hadong	#1	1,476,164	-	390	-
	#2	1,377,617	-	445	-
	#3	1,362,366	-	613	-
	#4	1,483,166	-	302	-
	#5	1,375,276	-	435	-
	#6	1,473,500	-	223	-
Dangjin	#1	1,369,223	-	926	-
	#2	1,360,761	-	787	-
	#3	1,488,422	-	510	-
	#4	1,501,207	-	746	-
Ulsan	#1	-	113,103	484	-
	#2	-	104,734	1,061	-
	#3	-	109,039	500	-
	#4	-	361,447	1,450	-
	#5	-	484,842	1,740	-
	#6	-	327,005	1,525	-
Youngnam	#1	-	250,280	1,024	-
	#2	-	223,269	270	-
Yosu	#1	-	173,830	370	-
	#2	-	85,905	86	-
Pyongtaek	#1	-	343,765	167	2,727
	#2	-	325,723	195	2,402
	#3	-	329,779	111	2,238
	#4	-	361,331	123	2,370
Namjeju	#1	-	12,520	20	-
	#2	-	12,216	24	-
Jeju	#1	-	10,363	23	-
	#2	-	107,856	65	-
	#3	-	124,954	-	-
Seoul	#4	-	-	0.03	32,670
	#5	-	-	4	126,211
Incheon	#1	-	22,390	6	25,930
	#2	-	22,656	6	28,612
	#3	-	24,998	247	34,035
	#4	-	23,774	170	24,093

Pyongtaek C/C		-	-	96,032	76,012
Ilsan	C/C	-	-	40,006	530,874
Bundang	C/C	-	-	-	598,396
Ulsan	C/C	-	-	63,295	189,997
Seoincheon	C/C	-	-	44,792	1,012,670
Shinincheon	C/C	-	-	47,393	1,405,724
Boryeong	C/C	-	-	97,106	571,742
Busan	C/C	-	-	1,213	234,533
Hallim	C/C	-	-	16,286	-
Anyang	C/C	-	-	-	325,207
Bucheon	C/C	-	-	-	266,577
K I E Co.	C/C	-	-	103,057	381,684
L G Bugog	C/C	-	-	67,273	121,037
Namjeju	D/P	-	56,401	84	-
Total		**41,577,596**	**4,016,347**	**605,636**	**5,995,743**
Total(Land)		**41,577,596**	**3,692,037**	**605,420**	**5,995,743**
Total(Jeju island)		**-**	**324,310**	**216**	**-**

Plant (2004)		**Amount of fossil fuel($FC_{i,m,y}$)**			
		Coal(t)	**Heavy oil(kl)**	**Diesel oil(kl)**	**L.N.G(t)**
Honam	#1	885,758	606	300	-
	#2	783,300	1,714	335	-
Samchonpo	#1	1,624,500	-	1,674	-
	#2	1,564,986	-	744	-
	#3	1,467,177	-	814	-
	#4	1,538,768	-	785	-
	#5	1,707,777	-	230	-
	#6	1,734,977	-	652	-
Yonghung	#1	1,114,254	-	27,916	-
	#2	459,217	-	18,314	-
Boryeong	#1	1,599,557	-	311	-
	#2	1,555,055	-	616	-
	#3	1,427,263	-	574	-
	#4	1,560,014	-	179	-
	#5	1,397,343	-	422	-
	#6	1,559,785	-	350	-
Taean	#1	1,438,094	-	999	-
	#2	1,509,379	-	310	-
	#3	1,415,585	-	390	-
	#4	1,539,502	-	254	-
	#5	1,547,217	-	329	-
	#6	1,531,751	-	230	-
Hadong	#1	1,389,739	-	533	-
	#2	1,515,681	-	145	-
	#3	1,501,027	-	670	-
	#4	1,397,482	-	737	-
	#5	1,501,672	-	318	-
	#6	1,379,396	-	689	-
Dangjin	#1	1,502,885	-	294	-
	#2	1,523,605	-	211	-
	#3	1,404,465	-	605	-

	#4	1,434,844	-	528	-
Ulsan	#1	-	73,408	114	-
	#2	-	65,316	82	-
	#3	-	71,305	554	-
	#4	-	420,739	1,238	-
	#5	-	513,497	931	-
	#6	-	527,083	1,603	-
Youngnam	#1	-	347,107	837	-
	#2	-	248,049	274	-
Yosu	#1	-	181,712	571	-
	#2	-	316,523	436	-
Pyongtaek	#1	-	204,664	247	2,095
	#2	-	209,664	232	2,515
	#3	-	179,921	240	3,791
	#4	-	192,294	225	3,217
Namjeju	#1	-	16,510	6	-
	#2	-	16,040	13	-
Jeju	#1	-	15,306	7	-
	#2	-	118,473	73	-
	#3	-	124,160	41	-
Seoul	#4	-	-	1.46	22,409
	#5	-	-	3	117,908
Incheon	#1	-	-	-	10,523
	#2	-	-	-	11,094
	#3	-	-	149	4,235
Pyongtaek C/C		-	-	21	98,846
Ilsan	C/C	-	-	-	593,548
Bundang	C/C	-	-	-	653,880
Ulsan	C/C	-	-	-	347,076
Seoincheon	C/C	-	-	88	1,209,806
Shinincheon	C/C	-	-	-	1,587,638
Boryeong	C/C	-	-	-	988,548
Busan	C/C	-	-	2,687	1,298,418
Hallim	C/C	-	-	28,796	-
Anyang	C/C	-	-	-	270,559
Bucheon	C/C	-	-	-	258,596
K I E Co.	C/C	-	-	-	467,583
L G Bugog	C/C	-	-	-	260,653
Yulchon	C/C	-	-	596	7,388
Namjeju	D/P	-	57,808	80	-
Jeju	G/T	-	-	2,232	-
Total		**45,512,055**	**3,901,899**	**103,835**	**8,220,326**
Total(Land)		**45,512,055**	**3,553,601**	**101,383**	**8,220,326**
Total(Jeju island)		**-**	**348,297**	**2,452**	**-**

Plant (2005)	**Amount of fossil fuel($FC_{i,m,y}$)**			
	Coal(t)	**Heavy oil(kl)**	**Diesel oil(kl)**	**L.N.G(t)**

Honam	#1	870,214	961	278	-
	#2	912,497	338	185	-
Samchonpo	#1	1,534,223	-	1,220	-
	#2	1,731,265	-	626	-
	#3	1,723,152	-	377	-
	#4	1,632,334	-	1,029	-
	#5	1,516,654	-	1,415	-
	#6	1,546,663	-	1,001	-
Yonghung	#1	2,081,972	-	4,541	-
	#2	1,761,395	-	2,903	-
Boryeong	#1	1,440,343	-	761	-
	#2	1,388,532	-	551	-
	#3	1,589,150	-	90	-
	#4	1,421,343	-	603	-
	#5	1,587,999	-	156	-
	#6	1,260,305	-	627	-
Taean	#1	1,508,570	-	621	-
	#2	1,323,078	-	395	-
	#3	1,494,175	-	650	-
	#4	1,383,297	-	365	-
	#5	1,411,398	-	742	-
	#6	1,504,962	-	417	-
Hadong	#1	1,513,930	-	284	-
	#2	1,410,099	-	792	-
	#3	1,422,196	-	472	-
	#4	1,511,054	-	567	-
	#5	1,345,648	-	614	-
	#6	1,520,774	-	331	-
Dangjin	#1	1,438,702	-	637	-
	#2	1,437,473	-	632	-
	#3	1,549,041	-	141	-
	#4	1,544,010	-	134	-
	#5	499,714	-	5,701	-
	#6	38,671	-	1,779	-
Ulsan	#1	-	70,183	750	-
	#2	-	67,296	585	-
	#3	-	53,085	662	-
	#4	-	375,417	1,971	-
	#5	-	363,992	1,676	-
	#6	-	352,776	1,708	-
Youngnam	#1	-	359,910	844	-
	#2	-	190,085	584	-
Yosu	#1	-	106,919	434	-
	#2	-	218,356	346	-
Pyongtaek	#1	-	293,214	118	3,553
	#2	-	321,188	140	2,641

	#3	-	308,042	132	1,784
	#4	-	311,245	138	2,047
Namjeju	#1	-	14,628	15	-
	#2	-	15,031	12	-
Jeju	#1	-	12,564	12	-
	#2	-	129,516	-	-
	#3	-	122,866	48	-
Seoul	#4	-	-	-	49,143
	#5	-	-	1	108,761
Incheon	#1	-	-	-	4,365
	#2	-	-	-	8,505
	#3	-	-	372	746
	#4	-	-	400	6,620
Pyongtaek C/C		-	-	1	110,953
Ilsan	C/C	-	-	-	533,188
Bundang	C/C	-	-	-	671,944
Ulsan	C/C	-	-	-	470,131
Seoincheon	C/C	-	-	335	989,645
Shinincheon	C/C	-	-	-	1,458,763
Boryeong	C/C	-	-	-	1,161,510
Incheon	C/C	-	-	-	281,813
Busan	C/C	-	-	-	1,211,144
Hallim	C/C	-	-	29,686	-
Anyang	C/C	-	-	-	261,202
Bucheon	C/C	-	-	-	261,705
POSCO POWER	C/C	-	-	-	445,253
G S Bugog	C/C	-	-	-	297,976
Yulchon	C/C	-	-	159	194,534
Namjeju	D/P	-	56,727	37	-
Jeju	G/T	-	-	2,869	-
Total		**47,854,833**	**3,744,339**	**75,672**	**8,537,927**
Total(Land)		**47,854,833**	**3,393,007**	**72,679**	**8,537,927**
Total(Jeju island)		**-**	**351,332**	**2,993**	**-**

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

<Table Annex 3-2> Net Caloric value

Plant (2003)		**Net Caloric value($NCV_{i,y}$)**			
		Coal (kcal/kg)	**Heavy oil (kcal/l)**	**Diesel oil (kcal/l)**	**L. N. G (kcal/kg)**
Honam	#1	5,408	9,366	8,402	-
	#2	5,372	9,406	8,405	-
Samchonpo	#1	5,554	-	8,559	-
	#2	5,552	-	8,561	-
	#3	5,569	-	8,501	-
	#4	5,562	-	8,543	-

	#5	5,477	-	8,550	-
	#6	5,476	-	8,550	-
Boryeong	#1	5,762	-	8,495	-
	#2	5,771	-	8,497	-
	#3	5,941	-	8,312	-
	#4	5,941	-	8,338	-
	#5	5,942	-	8,312	-
	#6	5,927	-	8,312	-
Taean	#1	5,872	-	8,562	-
	#2	5,882	-	8,562	-
	#3	5,878	-	8,562	-
	#4	5,888	-	8,562	-
	#5	5,848	-	8,562	-
	#6	5,859	-	8,562	-
Hadong	#1	5,842	-	8,494	-
	#2	5,836	-	8,535	-
	#3	5,838	-	8,466	-
	#4	5,838	-	8,509	-
	#5	5,841	-	8,428	-
	#6	5,835	-	8,397	-
Dangjin	#1	5,797	-	8,447	-
	#2	5,815	-	8,459	-
	#3	5,823	-	8,444	-
	#4	5,812	-	8,449	-
Ulsan	#1	-	9,368	8,567	-
	#2		9,364	8,595	-
	#3	-	9,369	8,583	-
	#4	-	9,425	8,664	-
	#5	-	9,417	8,664	-
	#6	-	9,425	8,664	-
Youngnam	#1	- -	8,736	8,547	-
	#2	-	8,591	8,543	-
Yosu	#1	-	9,480	8,527	-
	#2	-	9,484	8,521	-
Pyongtaek	#1	-	9,346	8,526	-
	#2	-	9,351	8,524	11,659
	#3	-	9,353	8,529	11,636
	#4	-	9,350	8,527	11,655
Namjeju	#1	-	9,360	8,455	-
	#2	-	9,360	8,510	-
Jeju	#1	-	9,509	8,776	-
	#2	-	9,448	8,482	-
	#3	-	9,446	8,482	-
Seoul	#4	-	-	8,617	11,712
	#5	-	-	7,139	11,703
Incheon	#1	-	9,337	7,150	11,716

	#2	-	9,341	8,537	11,716
	#3	-	9,331	8,543	11,715
	#4	-	9,339	8,539	11,714
Pyongtaek	C/C	-	-	8,479	11,723
Ilsan	C/C	-	-	8,517	11,719
Bundang	C/C	-	-	-	11,727
Ulsan	C/C	-	-	8,600	11,707
Seoincheon	C/C	-	-	8,694	11,699
Shinincheon	C/C	-	-	8,693	11,704
Boryeong	C/C	-	-	8,674	11,714
Busan	C/C	-	-	8,780	11,697
Hallim	C/C	-	-	8,516	-
Anyang C/C	(Other co.)	-	-	-	11,729
Bucheon C/C	(")	-	-	-	11,719
K I E Co.	(")	-	-	8,637	11,712
L G Bugog	(")	-	-	8,581	11,717
Namjeju	D/P	-	9,359	8,437	-

Plant (2004)		**Net Caloric value($NCV_{i,y}$)**			
		Coal (kcal/kg)	**Heavy oil (kcal/l)**	**Diesel oil (kcal/l)**	**L. N. G (kcal/kg)**
Honam	#1	5,219	9,323	8,406	-
	#2	5,158	9,326	8,407	-
Samchonpo	#1	5,251	-	8,562	-
	#2	5,961	-	8,560	-
	#3	6,203	-	8,556	-
	#4	6,182	-	8,554	-
	#5	4,587	-	8,550	-
	#6	4,534	-	8,550	-
Yonghung	#1	5,597	-	8,481	-
	#2	5,559	-	8,284	-
Boryeong	#1	5,628	-	8,332	-
	#2	5,626	-	8,464	-
	#3	5,646	-	8,312	-
	#4	5,648	-	8,312	-
	#5	5,635	-	8,312	-
	#6	5,641	-	8,312	-
Taean	#1	5,681	-	8,326	-
	#2	5,678	-	8,264	-
	#3	5,676	-	8,554	-
	#4	5,669	-	8,285	-

	#5	5,696	-	8,467	-
	#6	5,696	-	8,364	-
Hadong	#1	5,730	-	8,552	-
	#2	5,723	-	8,526	-
	#3	5,744	-	8,534	-
	#4	5,792	-	8,543	-
	#5	5,683	-	8,534	-
	#6	5,639	-	8,534	-
Dangjin	#1	5,711	-	8,436	-
	#2	5,700	-	8,444	-
	#3	5,677	-	8,452	-
	#4	5,668	-	8,454	-
Ulsan	#1	-	9,399	8,560	-
	#2	-	9,406	8,560	-
	#3	-	9,401	8,560	-
	#4	-	9,474	8,664	-
	#5	-	9,465	8,664	-
	#6	-	9,461	8,664	-
Youngnam	#1	-	7,060	8,422	-
	#2	-	7,295	8,432	-
Yosu	#1	-	9,511	8,478	-
	#2	-	9,508	8,508	-
Pyongtaek	#1	-	9,383	8,472	11,628
	#2	-	9,385	8,494	11,616
	#3	-	9,407	8,461	11,619
	#4	-	9,408	8,470	11,660
Namjeju	#1	-	9,405	8,867	-
	#2	-	9,406	8,404	-
Jeju	#1	-	9,403	8,513	-
	#2	-	9,417	8,489	-
	#3	-	9,423	8,482	-
Seoul	#4	-	-	8,617	11,710
	#5	-	-	8,617	11,712
Incheon	#1	-	-	-	11,734
	#2	-	-	-	11,735
	#3	-	-	8,504	11,734
Pyongtaek C/C		-	-	8,320	11,730
Ilsan	C/C	-	-	-	11,715
Bundang	C/C	-	-	-	11,723
Ulsan	C/C	-	-	-	11,628
Seoincheon	C/C	-	-	8,750	11,709
Shinincheon	C/C	-	-	-	11,716
Boryeong	C/C	-	-	-	11,723

Busan	C/C	-	-	8,788	11,703
Hallim	C/C	-	-	8,524	-
Anyang	C/C	-	-	-	11,723
Bucheon	C/C	-	-	-	11,712
K I E Co.	C/C	-	-	-	11,720
L G Bugog	C/C	-	-	-	11,725
Yulchon	C/C	-	-	11,145	11,712
Namjeju	D/P	-	9,406	8,424	-
Jeju	G/T	-	-	8,501	-

Plant (2005)		**Net Caloric value($NCV_{i,y}$)**			
		Coal (kcal/kg)	**Heavy oil (kcal/l)**	**Diesel oil (kcal/l)**	**L. N. G (kcal/kg)**
Honam	#1	5,122	9,343	8,368	-
	#2	5,107	9,362	8,364	-
Samchonpo	#1	5,618	-	8,399	-
	#2	5,628	-	8,439	-
	#3	5,602	-	8,550	-
	#4	5,603	-	8,496	-
	#5	5,079	-	8,183	-
	#6	5,107	-	8,550	-
Yonghung	#1	5,824	-	8,488	-
	#2	5,750	-	8,500	-
Boryeong	#1	5,539	-	8,496	-
	#2	5,525	-	8,496	-
	#3	5,588	-	8,303	-
	#4	5,596	-	8,311	-
	#5	5,588	-	8,312	-
	#6	5,606	-	8,312	-
Taean	#1	5,700	-	8,257	-
	#2	5,708	-	8,249	-
	#3	5,707	-	8,242	-
	#4	5,699	-	8,270	-
	#5	5,730	-	8,242	-
	#6	5,716	-	8,256	-
Hadong	#1	5,703	-	8,493	-
	#2	5,697	-	8,481	-
	#3	5,698	-	8,533	-
	#4	5,699	-	8,491	-
	#5	5,695	-	8,526	-
	#6	5,695	-	8,481	-
Dangjin	#1	5,664	-	8,392	-
	#2	5,664	-	8,469	-
	#3	5,638	-	8,402	-
	#4	5,644	-	8,387	-

	#5	5,809	-	8,458	-
	#6	5,910	-	10,540	-
Ulsan	#1	-	9,405	8,660	-
	#2	-	9,408	8,657	-
	#3	-	9,413	8,663	-
	#4	-	9,501	8,666	-
	#5	-	9,494	8,666	-
	#6	-	9,480	8,662	-
Youngnam	#1	-	7,108	8,495	-
	#2	-	7,342	8,496	-
Yosu	#1	-	9,462	8,442	-
	#2	-	9,447	8,441	-
Pyongtaek	#1	-	9,407	8,496	11,608
	#2	-	9,409	8,513	11,585
	#3	-	9,412	8,502	11,647
	#4	-	9,413	8,502	11,604
Namjeju	#1	-	9,384	8,853	-
	#2	-	9,385	8,842	-
Jeju	#1	-	9,435	8,441	-
	#2	-	9,433	-	-
	#3	-	9,429	8,491	-
Seoul	#4	-	-	8,617	11,707
	#5	-	-	-	11,729
Incheon	#1	-	-	-	11,723
	#2	-	-	8,516	11,727
	#3	-	-	8,506	11,723
	#4	-	-	8,503	11,727
Pyongtaek C/C		-	-	-	11,710
Ilsan	C/C	-	-	-	11,723
Bundang	C/C	-	-	-	11,475
Ulsan	C/C	-	-	8,740	11,709
Seoincheon	C/C	-	-	-	11,712
Shinincheon	C/C	-	-	-	11,727
Boryeong	C/C	-	-	-	15,134,475
Incheon	C/C	-	-	-	3,666,951
Busan	C/C	-	-	-	15,744,517
Hallim	C/C	-	-	266,363	-
Anyang	C/C	-	-	-	3,402,185
Bucheon	C/C	-	-	-	3,402,859
POSCO POWER	C/C	-	-	-	5,798,855
G S Bugog	C/C	-	-	-	4,099,008
Yulchon	C/C	-	-	1,740	2,533,378
Namjeju	D/P	-	560,302	332	-
Jeju	G/T	-	-	25,589	-

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

<Table Annex 3-3> Electricity supplied to the grid by power plant($EG_{m,y}$) and EF for each plant**df(2003**

Plant (2003)		**Net electricity generated**	**EF for each plant**
		$EG_{m,y}$(MWh)	**(tonCO2/MWh)**
Honam	#1	1,372,873	0.9437
	#2	1,784,483	0.9402
Samchonpo	#1	3,745,916	0.8540
	#2	4,110,134	0.8510
	#3	4,051,427	0.8423
	#4	4,250,404	0.8388
	#5	3,606,167	0.8155
	#6	3,609,696	0.8178
Boryeong	#1	3,237,526	0.8432
	#2	3,380,013	0.8398
	#3	4,090,927	0.8045
	#4	3,754,883	0.8041
	#5	4,063,865	0.8044
	#6	3,709,092	0.8046
Taean	#1	3,995,111	0.8080
	#2	3,651,716	0.8055
	#3	3,994,351	0.8048
	#4	3,708,360	0.8087
	#5	3,370,362	0.8090
	#6	3,637,652	0.8069
Hadong	#1	3,995,331	0.8090
	#2	3,739,800	0.8059
	#3	3,694,945	0.8071
	#4	4,029,035	0.8054
	#5	3,733,243	0.8066
	#6	4,013,010	0.8030
Dangjin	#1	3,677,169	0.8095
	#2	3,685,913	0.8050
	#3	4,034,969	0.8052
	#4	4,096,642	0.7986
Ulsan	#1	430,067	0.7817
	#2	404,834	0.7726
	#3	414,630	0.7820
	#4	1,507,363	0.7169
	#5	2,025,171	0.7149
	#6	1,363,879	0.7173
Youngnam	#1	890,011	0.7795
	#2	753,536	0.8055
Yosu	#1	703,557	0.7418
	#2	328,981	0.7835
Pyongtaek	#1	1,465,460	0.6933
	#2	1,393,188	0.6960
	#3	1,400,056	0.7008
	#4	1,539,552	0.6980
Namjeju	#1	38,080	0.9741
	#2	36,860	0.9823
Jeju	#1	30,288	1.0304
	#2	439,474	0.7333
	#3	513,880	0.7260
Seoul	#4	132,599	0.6560

	#5	503,383	0.6671
Incheon	#1	225,023	0.6007
	#2	242,806	0.5895
	#3	267,999	0.6158
	#4	214,153	0.6294
Pyongtaek C/C		863,292	0.5214
Ilsan	C/C	3,097,425	0.4901
Bundang	C/C	3,344,852	0.4770
Ulsan	C/C	1,557,954	0.4308
Seoincheon	C/C	7,012,289	0.4010
Shinincheon	C/C	10,459,986	0.3696
Boryeong	C/C	4,436,234	0.4009
Busan	C/C	1,574,883	0.3981
Hallim	C/C	55,044	0.7658
Anyang	C/C	1,793,725	0.4835
Bucheon	C/C	1,454,854	0.4882
K I E Co.	C/C	2,683,591	0.4795
L G Bugog	C/C	1,221,992	0.4074
Namjeju	D/P	265,063	0.6303
Total		**166,911,025**	**0.7140**
Total(Land)		**165,587,380**	**0.7139**
Total(Jeju island)		**1,323,645**	**0.7305**

Plant (2004)		**Net electricity generated**	**EF for each plant**
		$EG_{m,y}$(MWh)	**(tonCO2/MWh)**
Honam	#1	1,855,554	0.9349
	#2	1,625,399	0.9351
Samchonpo	#1	3,974,202	0.8053
	#2	3,839,080	0.9111
	#3	3,652,769	0.9342
	#4	3,811,371	0.9358
	#5	4,147,957	0.7078
	#6	4,185,213	0.7048
Yonghung	#1	2,986,382	0.8066
	#2	1,172,450	0.8553
Boryeong	#1	4,014,109	0.8405
	#2	3,915,285	0.8377
	#3	3,746,265	0.8064
	#4	4,097,489	0.8059
	#5	3,660,240	0.8064
	#6	4,093,207	0.8057
Taean	#1	3,780,097	0.8106
	#2	3,975,123	0.8080
	#3	3,732,363	0.8069
	#4	4,048,258	0.8080
	#5	4,091,406	0.8074

	#6	4,056,835	0.8061
Hadong	#1	3,688,313	0.8095
	#2	4,028,529	0.8070
	#3	3,997,064	0.8087
	#4	3,724,757	0.8148
	#5	4,013,845	0.7968
	#6	3,685,698	0.7912
Dangjin	#1	3,986,406	0.8069
	#2	4,038,457	0.8060
	#3	3,711,787	0.8053
	#4	3,801,495	0.8019
Ulsan	#1	271,544	0.8043
	#2	244,246	0.7960
	#3	268,231	0.7953
	#4	1,759,376	0.7180
	#5	2,141,162	0.7187
	#6	2,196,344	0.7196
Youngnam	#1	973,872	0.7976
	#2	665,973	0.8600
Yosu	#1	723,968	0.7566
	#2	1,304,109	0.7304
Pyongtaek	#1	850,533	0.7210
	#2	880,646	0.7145
	#3	751,633	0.7260
	#4	800,854	0.7254
Namjeju	#1	50,294	0.9763
	#2	48,714	0.9797
Jeju	#1	44,659	1.0191
	#2	486,401	0.7254
	#3	509,330	0.7263
Seoul	#4	90,322	0.6605
	#5	480,919	0.6528
Incheon	#1	47,491	0.5911
	#2	49,144	0.6023
	#3	19,018	0.6143
Pyongtaek C/C		596,001	0.4424
Ilsan	C/C	3,281,407	0.4817
Bundang	C/C	3,650,122	0.4774
Ulsan	C/C	2,329,524	0.3938
Seoincheon	C/C	8,353,619	0.3855
Shinincheon	C/C	11,596,955	0.3646
Boryeong	C/C	6,979,928	0.3775
Busan	C/C	9,884,075	0.3502

Hallim	C/C	96,435	0.7736
Anyang	C/C	1,506,070	0.4788
Bucheon	C/C	1,425,073	0.4832
K I E Co.	C/C	2,809,983	0.4434
L G Bugog	C/C	1,894,996	0.3666
Yulchon	C/C	36,366	0.5965
Namjeju	D/P	274,089	0.6279
Jeju	G/T	3,016	1.9124
Total		**187,513,847**	**0.6876**
Total(Land)		**186,097,345**	**0.6872**
Total(Jeju island)		**1,416,502**	**0.7363**

Plant (2005)		**Net electricity generated**	**EF for each plant**
		$EG_{m,y}$(MWh)	**(tonCO2/MWh)**
Honam	#1	1,787,715	
	#2	1,875,790	
Samchonpo	#1	3,810,079	
	#2	4,323,618	
	#3	4,343,666	
	#4	4,112,297	
	#5	3,542,728	
	#6	3,643,969	
Yonghung	#1	5,623,299	
	#2	4,658,862	
Boryeong	#1	3,547,140	
	#2	3,433,608	
	#3	4,124,745	
	#4	3,698,705	
	#5	4,121,314	
	#6	3,283,477	
Taean	#1	3,992,112	
	#2	3,484,251	
	#3	3,957,054	
	#4	3,653,534	
	#5	3,744,413	
	#6	3,999,847	
Hadong	#1	3,997,914	
	#2	3,732,583	
	#3	3,769,077	
	#4	3,989,315	
	#5	3,553,901	
	#6	4,037,763	
Dangjin	#1	3,797,307	
	#2	3,798,078	
	#3	4,081,017	
	#4	4,079,557	

	#5	1,318,670	
	#6	96,365	
Ulsan	#1	262,393	
	#2	255,812	
	#3	200,518	
	#4	1,549,091	
	#5	1,500,935	
	#6	1,454,644	
Youngnam	#1	1,022,470	
	#2	531,006	
Yosu	#1	430,310	
	#2	904,597	
Pyongtaek	#1	1,258,662	
	#2	1,376,342	
	#3	1,321,167	
	#4	1,338,204	
Namjeju	#1	44,602	
	#2	44,654	
Jeju	#1	36,266	
	#2	532,700	
	#3	502,189	
Seoul	#4	207,498	
	#5	444,324	
Incheon	#1	16,450	
	#2	37,727	
	#3	-	
	#4	29,202	
Pyongtaek C/C		659,932	
Ilsan	C/C	2,873,958	
Bundang	C/C	3,742,073	
Ulsan	C/C	3,131,075	
Seoincheon	C/C	7,001,031	
Shinincheon	C/C	10,543,280	
Boryeong	C/C	8,221,926	
Busan	C/C	2,055,016	
Hallim	C/C	9,076,327	
Anyang	C/C	100,346	
Bucheon	C/C	1,433,978	
K I E Co.	C/C	1,404,160	
GS Bugog	C/C	2,571,095	
Yulchon	C/C	2,189,808	
Namjeju	D/P	1,300,627	
Jeju	G/T	268,073	
Total		**194,893,306**	0.6891
Total(Land)		**193,459,753**	0.6888
Total(Jeju island)		**1,433,553**	0.7351

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

<Table Annex 3-4> Data for the formula of Build Margin Emission Factor

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

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

<Table Annex 3-5> Fuels CO_2 Emission factor

Fuel Type	$EF_{CO2,i,y}$ (tCO2/TJ)
Gasoline	**67.5**
Diesel oil	**72.6**
residual fuel oil	**75.5**
LNG	**54.3**
bituminous coal	**89.5**
Anthracite	**94.6**

Source: 2006 IPCC Guidelines (IPCC default value at the lower limit of the uncertainty at a 95% confidence interval data)

Annex 4

MONITORING INFORMATION

Refer to section B.7.2