CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-SSC-PDD)
Version 03 - in effect as of: 22 December 2006

CONTENTS

Annexes

Revision history of this document

Version Number	Date	Description and reason of revision
01	21 January 2003	Initial adoption
02	8 July 2005	• The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document. • As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <http://cdm.unfccc.int/Reference/Documents>.
03	22 December 2006	• The Board agreed to revise the CDM project design document for small-scale activities (CDM-SSC-PDD), taking into account CDM-PDD and CDM-NM.

SECTION A. General description of small-scale project activity

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

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Title: Ryesonggang Hydropower Plant No.5, DPR Korea

Version: 1.0

Date: 6/12/2010

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

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The Ryesonggang Hydropower Plant No.5, DPR Korea (hereafter referred to as the project) is a reservoir type power plant, which was proposed by Gangdong Hydro Power Construction Company (GHPCC) and will be built newly on the Ryesong River in Kumchon County, North Hwanghae Province.

The purpose of this project activity is to reduce the emissions of greenhouse gases in the Western Power Grid (WPG), DPR Korea using the potential of water available in the Ryesong River.

The greenhouse gas emissions of WPG will be reduced by replacing part of the electricity which is being produced in the WPG that include several coal-fired plants with the electricity produced by the proposed project.

The project consists of a dam, powerhouse and outdoor substation, and the reservoir is a daily regulating reservoir. The installed capacity of the project is 10 MW, which consists of 4 sets of generating facilities with a capacity of 2.5 MW each. The project will generate electric energy of 43 207.5 MWh and supply 41 150 MWh to WPG in a year. The electricity generated from the generators would be boosted to 66 kV at the outdoor substation and transmitted to Namchon substation, which is connected to the WPG and located at a distance of 7 km from the dam /1/. The total GHG emission reductions are estimated to be 27 385 tCO_2e annually. The project is planned to be put into operation on 1 May 2012.

The project contributes to sustainable development of local society and the host country as follows:

1. At national level

- Reduction of greenhouse gas emissions and other pollutants

2. At local level

- Creation of employment opportunities during the construction and operation period,
- Promotion of the standard of living and a cultured way of life by building new modern dwelling houses instead of old dwelling houses for residents in the submerged area,
- Dissemination of advanced technology to the local residents
- Prevention of land loss and human life from flooding and normal increase in agricultural production
- Increased output of agricultural production through the extension of irrigation
- Improvement of local transport by constructing a ring road.

In conclusion, the project activity strongly contributes to the sustainable development in DPR Korea.

A.3. Project participants:

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Name of Party involved(*) ((host) indicates a host party)	Private and/or public entity(ies) Project participants(*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant(Yes/No)
Democratic People's Republic of Korea (host)	Gangdong Hydro Power Construction Company	No
Czech Republic	Topič Energo s.r.o.	No

Detailed contact information for project participants is available in Annex 1.

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

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

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A.4.1.1. Host Party (ies):

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Democratic People's Republic of Korea

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

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North Hwanghae Province

A.4.1.3. City/Town/Community etc:

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Kumchon County/Ryongsong-ri

A.4.1.4. Details of physical location, including information allowing the unique identification of this small-scale project activity :

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The project is located at Ryesong River in the Kumchon county. The project has geographical coordinates with east longitude of 126º29′41″ and north latitude of 38º15′35″.

The dam is placed in the Ryongsong-ri, which is located at an approximate distance of 135 km from Sariwon City, North Hwanghae Province and 195 km from the centre of Pyongyang, DPR Korea south-eastward. The project site can be accessed through Pyongyang-Gaesong expressway. The nearest railway station is Kumchon Station. To visualize the exact location of the project, refer to the map in figure 1 and figure 2.

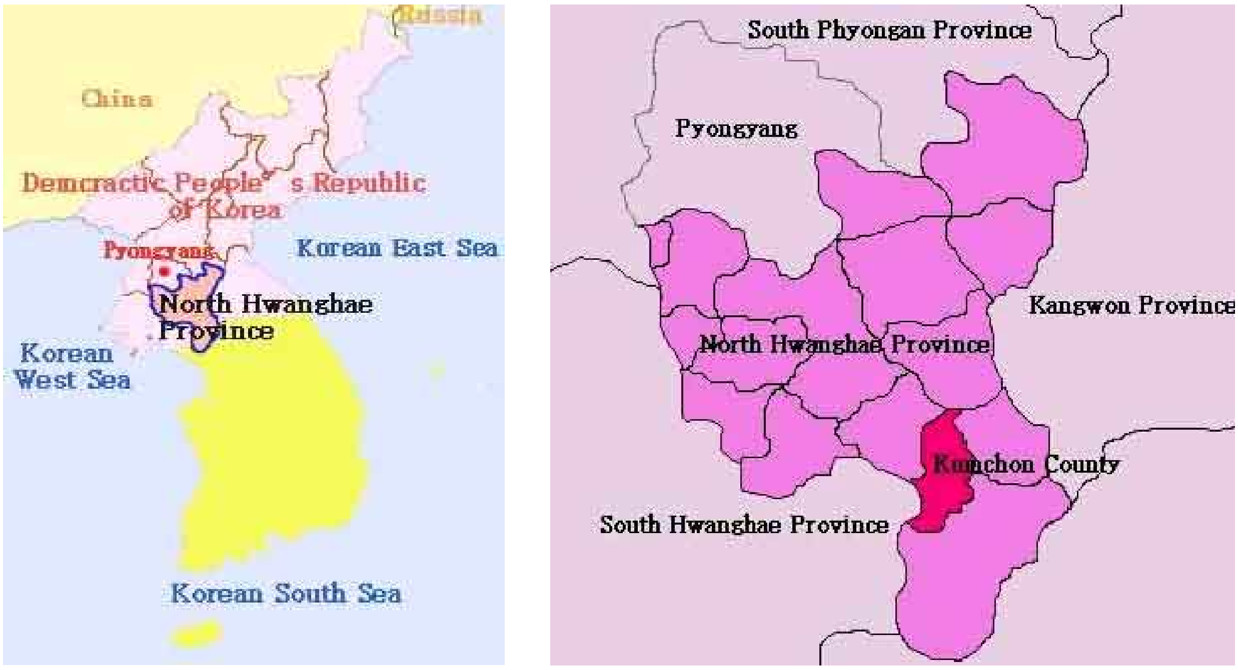

Figure 1. The map showing the location of Kumchon county

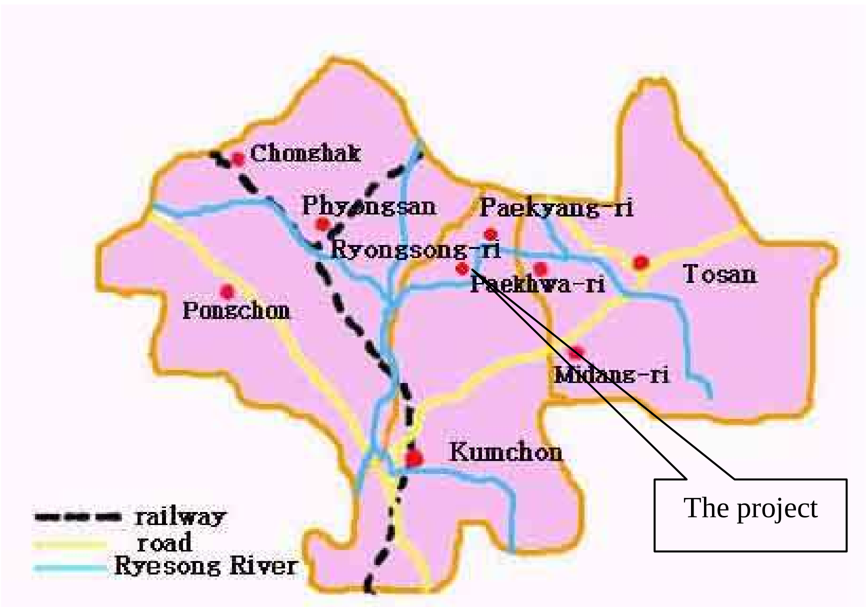

Figure 2. The map showing the location of project

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

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1. Type and category (ies) of the small-scale project activity

According to Appendix B to the *Simplified Modalities and Procedures for Small-scale CDM Project Activities*, the type and category of the project are defined as follows:

Type I: Renewable energy projects

Category I.D.: Renewable Energy Generation for a Grid

Sub-category: Hydro

Reference: AMS-I.D. version 16, EB 54

The project activity utilizes renewable hydro energy for electricity generation and exports the same to the regional grid system. Accordingly, the applicable methodology for the project activity shall be AMS-I.D. which includes small hydro electric power generation for a grid system.

2. Application of environmentally safe and sound technology

The project activity does not involve any greenhouse gas emissions or burning of any fossil fuels during power generation. The construction methodology of the plant will not permit a negative damage to the ecosystem, and the biodiversity in this area will be conserved.

The technology employed for the project activity is the current best practice in small hydro power sector in DPR Korea. Hydro turbines and generators used in the project are produced by Daean Heavy Machine Complex (DHMC) and Songchongang Electricity Machine Factory (SEMF), which are well-known in DPR Korea.

Equipment has already been commercialized in the hydropower equipment market of DPR Korea. The dam of the plant was designed by Central Electric Power Design Institute (CEPDI) and dam construction will be monitored by staffs assigned by the Ministry of State Construction Control and CEPDI thoroughly.

Hence, the technology applied for the project activity is environmentally safe and sound.

3. Technologies applied on the small-scale project activity /1/

The project is to build a reservoir type power plant with a total installed capacity of 10 MW (2.5 MW×4). Based on the Feasibility Study, the main components of the project are described as follows:

- Rock filled-dam and concrete gravity dam which is maximally 15.3 m high and, 354 m long at the top.
- The powerhouse installed with four turbine-generator units (2.5 MW×4)
- An outdoor substation with a main transformer and one set of 66 kV transmission line connected to 66 kV Namchon substation

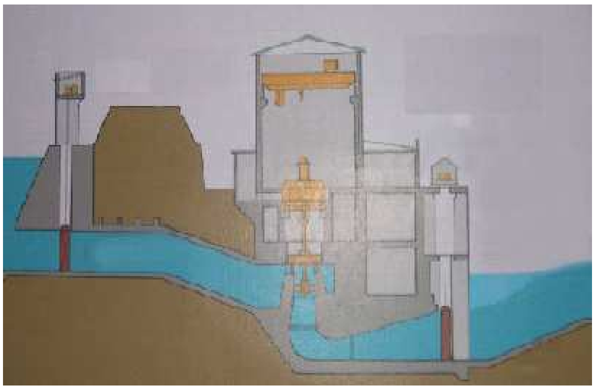

Figure 3. Schematic view of the project activity

The reservoir is a daily regulating reservoir. The powerhouse is located near the dam. The lengths of rock filled-dam and concrete dam are 134 m and 220 m respectively. The distance from outdoor substation to Namchon substation is 7 km.

Figure 3 shows the schematic view of the project activity and table 1 shows the parameters of the main equipment.

Table 1. Parameters of the main equipment

Item	Unit	Values
Turbines		
Type		370-vertical 275
Quantity	set	4
Diameter	m	2.75
Rated speed	rpm	150
Rated power	MW	2.72
Designed water head	m	8
Rated intake flow	m^3/s	39.9
Manufacturer		Daean Heavy Machine Complex
Generators		
Type		Synchronization-Verticality-Length 2.5 MW/48-6.6 kV
Quantity	set	4
Frequency	Hz	60
Rated power	MW	2.5
Manufacturer		Songchongang Electricity Machine Factory

4. Technology transfer

The main equipment, such as the turbines and generators, are manufactured in the host country. No technology transfer from other countries is involved in this project activity. DHMC and SEMF will be responsible for producing the facilities /3/.

A.4.3 Estimated amount of emission reductions over the chosen crediting period:

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The first crediting period of the project activity is 7 years, which is from 1 May 2012 to 30 April 2019. During the crediting period, the total estimated emission reductions are 191 695 t CO_2e. The annual and total emission reductions are explained in the following table 2:

Table 2. Estimation of emission reductions during crediting period

Years	**Annual estimation of emission reductions in (tCO2e)**
01/05/2012-31/12/2012	18 975
2013	27 385
2014	27 385
2015	27 385
2016	27 385
2017	27 385
2018	27 385
01/01/2019-30/04/2019	8 410
Total estimated reductions (tonnes of CO2e)	**191 695**
Total number of crediting years	**7**
Annual average over the crediting period of estimated reductions (tonnes of CO2 e)	**27 385**

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

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No public funding from parties included in Annex I of UNFCCC is available to the project activity.

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

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According to the Appendix C of the *Simplified Modalities and Procedures for Small-scale CDM Project Activities*, the project is not a debundled component of a larger project activity because there is no registered small-scale CDM project activity or an application to register another small-scale CDM activity:

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

SECTION B. Application of a baseline and monitoring methodology

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

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The methodology applied for the proposed project is the approved methodology for small-scale CDM project- "*AMS-I.D. Grid connected renewable electricity generation*" (version 16, EB54), "*ACM0002. Consolidated baseline methodology for grid-connected electricity generation from renewable sources*" (version12.1.0, EB 58) and "*Tool to calculate the emission factor for an electricity system* (version 02.1.0, EB 60)". For more information regarding the methodology, refer to the link: http://cdm.unfccc.int/methodologies/SSCmethodologies/approved.html.

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

B.2 Justification of the choice of the project category:

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The methodology "*AMS-I.D. Grid connected renewable electricity generation*" (version 16) is applicable to this small-scale CDM project activity because:

- The project activity is using hydropower, which is one of the several renewable energy projects that are eligible to use this methodology.
- The methodology applies to renewable energy generation units that supply electricity to an electricity grid, which is the case for Ryesonggang Hydropower Plant No.5.
- The capacity of the scheme is 10 MW, which is within the limit of 15 MW stipulated for the chosen (small-scale) methodology and this capacity will not change within the crediting period.
- The project is not a combined heat and power (co-generation) system.

Demonstration for being within the limits of SSC throughout the crediting period

The feasibility study carried out for this project demonstrates that the project activity will remain under the limits of SSC throughout the crediting period. The design discharge has been found out to be 159.6 m^3/s and gross head available has been estimated at 10 m /1/.

Based on the head and discharge data available, the optimum capacity of the power project has been determined as 10 MW. Keeping the above considerations in view, and also the maximum electricity generating capacity limited by the design of the plant and machinery and the license issued by the state authorities, there is no possibility of exceeding the limits of small-scale CDM project activity throughout the crediting period.

B.3. Description of the project boundary:

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Based on the methodology AMS-I.D. the project boundary encompasses the physical, geographical site of the renewable generation source. The electricity displaced by the project should be the electricity generated by WPG. Therefore, the boundary could be identified as WPG and the project (including a dam, powerhouse and outdoor substation). The spatial scope of the project boundary covers the project site and all power plants connected physically into WPG.

Table 3. The GHG source and type in project boundary

Source		Gas	Included/Excluded	Justification/ Explanation
Baseline	Electricity production in WPG	CO_2	Included	Main emission sources.
		CH_4	Excluded	Excluded for simplification. This is conservative.
		N_2O	Excluded	Excluded for simplification. This is conservative.
Project Activity	Ryesonggang Hydro Power Plant No.5	CO_2	Excluded	The project does not lead to CO2 emission.
		CH_4	included	The emission from reservoir
		N_2O	Excluded	The project does not lead to CO2 emission.

B.4. Description of baseline and its development:

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The baseline of the project activity will be decided with the methodology AMS-I.D. (Version 16, EB 54)

In accordance with AMS-I.D. if the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is the electricity delivered to the grid by the project activity that otherwise would have been generated by the operation of grid-connected power plants and by the addition of new generation sources.

The baseline emissions are the product of electrical energy baseline $EG_{BL,y}$ expressed in MWh of electricity produced by the renewable generating units multiplied by the grid emission factor.

The emission factor can be calculated according to method 12(a) selected from the methodology AMS-I.D. (version 16) as a Combined Margin (CM), consisting of the combination of Operating Margin (OM) and Build Margin (BM) according to the procedures prescribed in the tool to calculate the emission factor for an electricity system. The boundary of the proposed project is WPG, so the boundary, when calculating the OM emission factor and BM emission factor, are set with in WPG.

In the absence of the project, electricity will continue to be generated by the existing power plants in WPG.

The key parameters used to determine the baseline emissions are furnished below.

Table 4. Data used to determine baseline emissions

Parameter	Source
Amount of fossil fuel consumed	Central Bureau of Statistics
The amount of electricity generation by the thermal power plants in WPG	Central Bureau of Statistics
Net calorific value of fuel consumed	2006 IPCC Guidelines
Net electricity delivered to the grid by the project activity	Feasibility Study Report
Emission factor of fuel consumed	2006 IPCC Guidelines
Emission factor of WPG	Calculation based on the data from Central Bureau of Statistics

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 small-scale CDM project activity:

The project is a small scale project activity. As such, the provisions of Attachment A to Appendix B of the *Simplified Modalities and Procedures for Small-scale CDM Project Activities* will apply to the project. The '*indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories*' require the project proponents to show that the project activity would not have occurred anyway due to *at least one* of the following barriers:

(a) Investment barrier

(b) Technological barrier

(c) Barrier due to prevailing practices/common practice

(d) Other barriers

The barriers specified in Attachment A to Appendix B are:

a) Investment barrier: A financially more viable alternative to the project activity would have led to higher emissions.

b) Technological barrier: A less technologically advanced alternative to the project activity involves lower risks due to the performance uncertainty or low market share of the new technology adopted for the project activity and so would have led to higher emissions.

c) Barrier due to prevailing practice: Prevailing practice or existing regulatory or policy requirements would have led to the implementation of a technology with higher emissions.

d) Other barriers: Without the project activity, for another specific reason identified by the project participant, such as institutional barriers or limited information, managerial resources, organizational capacity, financial resources, or capacity to absorb new technologies, emissions would have been higher.

The main barrier existing in the project is investment barrier.

1. CDM consideration

Local entities intended to build a hydropower plant in the proposed site but stopped short of application for the project as the financial barriers were too much a burden to tackle. After the "*Recommendation Letter of DNA*" (3 February 2009), several enterprises presented to the People's Committee of Kumchon County (PCKC) with proposals on "*Hydropower Plant Construction Application on Ryesong River*". Although GHPCC was not a local company, it was selected, based on its experience in hydropower construction, to continue the planning of Ryesonggang Hydropower Plant No.5.

The company requested Central Electric Design Institute to perform the feasibility study. The Feasibility Study Report (FSR) confirmed that the project faced difficulties because the dam should install more sluice gates than originally planned for the control of the floods. The increased investment cost put the company to consider the project anew. The company approached CDM experts of State Academy of Sciences (SAoS) and officers of General Bureau of Cooperation with International Organizations (GBCIO) and they visited proposed site of the plant to estimate the eligibility of CDM and confirmed the eligibility of CDM to the project.

Meanwhile, the Environmental Impact Assessment (EIA) was performed by the Environment & Development Center (EDC) and the result showed that the project has no negative impact on the local environment. According to voluntary participation to the CDM activity, the construction eligibility of the plant by CDM, result of EIA and contribution to sustainable development, the Ministry of State

Construction Control upon contact with DNA approved the project activity based on CDM. Following the approval of CDM project activity by the government and PDD development contract with SAoS, other contracts such as loan contract was made with relevant agencies on condition of CDM application. Table 5 shows the time schedule of the project.

Table 5. The main time schedule for the proposed project

Milestones	Date
Feasibility Study Report	01/07/2010
Visit report by CDM developing team	16/07/2010
EIA report	21/04/2010
Meeting of the People's Committee of Kumchon County	08/07/2010
Approval of the Ministry of State Construction Control	06/09/2010
PDD development contract	21/09/2010
Loan contract	14/10/2010
Construction Contract	22/09/2010
Start of project construction	30/09/2010
Turbine purchase contract	15/11/2010
Generator purchase contract	30/11/2010
Electricity purchase contract	09/12/2010

2. Investment barrier

Investment barrier is the main barrier the project faces. Without the revenue from CDM, the project has the basic difficulty of repaying the local bank within the agreed time schedule for lack of fund.

The purpose of this part is to determine whether the project is economically attractive or not through appropriate analysis method.

(1) Determination of appropriate analysis method

Though not applicable for a small scale project activity, "*Tool for the Demonstration and Assessment of Additionality* (version 05.2) stipulates that the project developer should identify the financial/ economic indicator, such as IRR, most suitable for the project type and decision context.

According to the "*Tool for the Demonstration and Assessment of Additionality* (version 05.2)", three options can be applied to conduct the investment analysis. They are: the simple cost analysis (Option I), the investment comparison analysis (Option II) and the benchmark analysis (Option III).

Since this project will generate financial/economic benefits other than CDM-related income, through the sale of generated electricity, Option I (Simple cost analysis) is not applicable.

The investment comparison analysis (Option II) is neither applicable for the proposed project because investment comparison analysis method is only applicable to projects whose alternatives are similar investment projects. Therefore Option II is not appropriate.

Then the benchmark analysis (Option III) will be used to identify whether the financial indicators, Financial Internal Return Rate (IRR) in this project is better than relevant benchmark value.

(2) Selection and Validation of Appropriate Benchmarks

EB 41, Annex 45, "*Guidance on the Assessment of Investment Analysis*", section 11 requires,

"In cases where a benchmark approach is used, the applied benchmark shall be appropriate to the type of IRR calculated. Local commercial lending rates or weighted average costs of capital (WACC) are appropriate benchmarks for a project IRR.

Required/expected returns on equity are appropriate benchmarks for equity IRR. Benchmarks supplied by relevant national authorities are also appropriate if the DOE can validate that they are applicable to the project activity and the type of IRR calculation presented."

Also section 12 requires: “In the cases of projects which could be developed by an entity other than the project participant, the benchmark should be based on publicly available data sources which can be clearly validated by the DOE.

Such data sources may include local lending and borrowing rates, equity indices, or benchmarks determined by relevant national authorities.”

According to “*Guideline for Determination of Main Parameters of Hydropower Plants*” (Ministry of State Construction Control, 2007), it stipulates that the project must be not implemented in cases where the IRR of hydropower project is less than 5%. Therefore, the threshold can be used as benchmark.

This benchmark fits the conditions above.

- This benchmark is used in the construction of hydropower plants in DPR Korea.
- This benchmark is a publicly available data source and can be clearly validated by the DOE.
- This benchmark is used in deciding the implementation of hydropower project among the project owners.

3. Calculation and comparison

Based on the FSR of the project, the basic parameters for calculation of financial indicators are shown in table 6.

Based on the data given in table 6, calculating the total investment on the IRR without the sale revenue of CER, IRR is 3.63% which is lower than the 5% benchmark. Therefore, the project is unattractive and requires the additionality.

Table 6. Basic parameters for calculation of financial indicators of the Project

Parameters	Value	Source
Installed capacity(MW)	10	Feasibility study report
Net electricity supplied to WPG (MWh)	41 150	Feasibility study report
Total investment(10 000 KPW)	95 480	Feasibility study report
Annual loan rate (%)	3.6	Guideline for determination of main parameters of hydro power plants
Electricity price to be sold to the WPG (KPW/kWh)	1.98	Guideline for determination of main parameters of hydro power plants
Rate of depreciation of equipment (%)	5	Feasibility study report
Rate of depreciation of structure (%)	2	Feasibility study report
Rate of income tax (%)	30	Guideline for determination of main parameters of hydro power plants
Project lifetime(year)	23	Feasibility study report

With the sale revenue of CER, the IRR of the project on the total investment is 7.35% and thus exceeds the benchmark 5%. In this case, the project is attractive, which means the revenue of CDM is able to help the project to overcome the investment barrier.

Sensitivity analysis

This step is to confirm whether the conclusion regarding the financial attractiveness is robust to reasonable variations in the critical assumptions.

EB 41, Annex 45, “G*uidance on the Assessment of Investment Analysis*”, section 16 requires,

“Only variables, including the initial investment cost, that constitute more than 20% of either total project costs or total project revenues should be subjected to reasonable variation (all parameters varied need not necessarily be subjected to both negative and positive variations of the same magnitude), and the results of this variation should be presented in the PDD and be reproducible in the associated spreadsheets."

The following four parameters are selected as the critical sensitivity indicators to check the financial attractiveness of the project:

- Annual operational cost;
- Electricity supplied to the grid;
- Total investment; and
- Electricity price

Variations of ±10% (according to FSR) have been considered in the critical assumptions. Table 7 summarizes the results of the sensitivity analysis, while figure 4 provides a graphic depiction.

Table 7. Result of sensitivity analysis

	-10%	-5%	0%	5%	10%
Electricity supplied to the grid	2.93%	3.28%	3.63%	3.98%	4.32%
Total investment	4.36%	3.98%	3.63%	3.32%	3.05%
Annual operation cost	3.73%	3.68%	3.63%	3.58%	3.53%
Electricity price	2.93%	3.28%	3.63%	3.98%	4.32%

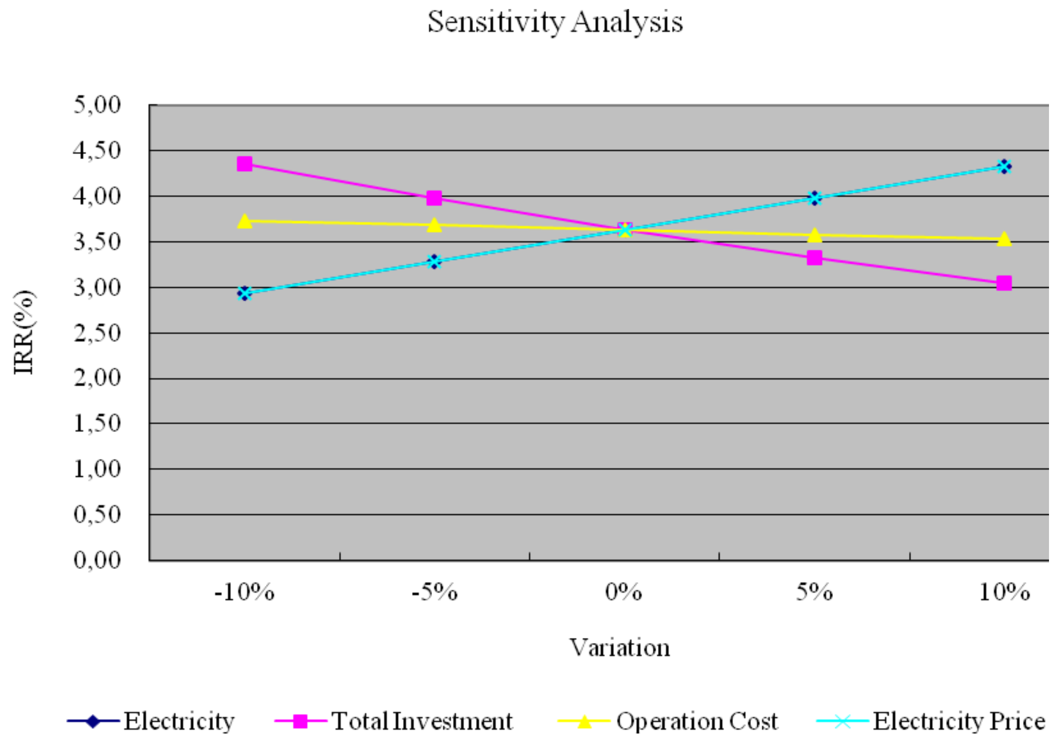

Figure 4. The IRR Sensitivity Analysis with the changes of Total Investment, Annual Operation Cost, Electricity Price or Electricity supplied to the grid

As shown in the table 7 and figure 4, four variations of ±10% have been considered. It can be determined that, the IRR will still remain lower than the 5% benchmark even with reasonable changes in the critical assumptions. Therefore, the conclusion that the project is additional is robust.

- **Total investment**

In general, when the total investment increases, the project IRR decreases.

With the variation of the total investment between -10% and +10%, the project IRR would also vary from the height of 4.36% down to 3.05%. This shows that although the total investment is decreased down to -10%, the project IRR would not still reach the 5% benchmark. Only when the total investment decreases by 17.25%, the IRR will reach the designated benchmark.

GHPCC is responsible for constructing the Ryesonggang Hydropower Plant No.5. One of the obstacles faced the company during the engineering works was predicted bedrock depth was exact as per FSR. Thus, the design of the plant was subjected to modification followed by natural increase of the investment. Such an unexpected obstacle may occur due to various unexpected causes in the future. In this situation, total investment will not decrease.

This shows that it is difficult to improve the project IRR by reducing the total investment.

- **Electricity supplied to the grid**

When the electricity supplied to the grid increases, the project IRR also increases.

If the electricity supplied to the grid changes by +10%, the project IRR would change from 2.93% to 4.32%. This is again smaller than the 5% benchmark. Meanwhile, it was calculated that when the annual net electricity supplied to the grid increases by more than 20.02%, the IRR will reach the benchmark.

The electricity output estimated in FSR is the expected value based on the hydro meteorological data for the past 30 years in the region. This value, however it may change, will not exceed the limit of 5%, regarding the experiences of the other plants so far.

From this, it is clear that it is impossible to improve the IRR by controlling the electricity supplied to the grid

- **Electricity price**

When the electricity price increases, the project IRR increases. According to the decision of the State Price Assessment Commission of DPR Korea, the net electricity price of the producer is 1.98 KPW/kWh in DPR of Korea. If the electricity price increases by 20.00%, the IRR will reach the benchmark. In DPR Korea, the price of electricity is unique and it is enacted by the government only.

By the way, the government has not changed the electricity price for households and industry so far. Even if the government may change the electricity price during the operation of project, that will not increase up to 20.00%. As a result, there will not be such a case that the project IRR improve with the increase of electricity price.

This shows that it is impossible to improve the project IRR by increasing the electricity price.

- **Operation cost**

When the operation cost decreases, the project IRR increases.

With a decrease in the annual operation & maintenance cost by 10%, the IRR has very little change. But operation cost such as the number of workers and living expenses increase gradually. Therefore, the project IRR can not increase by adjusting the annual operation cost.

The results of sensitivity analysis confirm that the project faces financial barriers without CDM revenue.

Conclusion

Thus it can be concluded that the project faces several barriers, without CDM, which would prevent the construction and implementation of the specific project activity. CDM helps to overcome these barriers. If the project is not implemented, electric power will be supplied by the WPG, which partly depends on thermal power as its energy source. Thermal power has GHG emissions associated with it.

The proposed project activity will not be implemented without registering it as a CDM project and will not reduce GHG emissions below the baseline. Therefore, the specific project activity is additional.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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In order to calculate the baseline, project and leakage emissions and hence emission reductions, methodology AMS-I.D. (version 16, EB 54) is used in conjunction with the "Tool to calculate the emission factor for an electricity system (Version 02)". Below is a description of how the three types of emission (baseline, project and leakage) are calculated, along with key assumptions and rationale for methodological choices.

Baseline emissions

The baseline emissions are the product of electrical energy baseline $EG_{BL,y}$ expressed in MWh of electricity produced by the renewable generating unit multiplied by the grid emission factor.

$$BE_y = EG_{BL,y} \cdot EF_{CO_2,grid,y} \quad (1)$$

Where:

BE_y = Baseline emissions in year y (tCO_2)

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

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

The formula (1) is applied for calculating the baseline emissions of the proposed project.

The emission factor can be calculated in a transparent and conservative manner as follows:

(a) CM, consisting of the combination of OM and BM according to the procedures prescribed in the "*Tool to calculate the emission factor for an electricity system*".

OR

(b) The weighted average emissions (in tCO_2/MWh) of the current generation mix. The data of the year in which project generation occurs must be used.

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

Option (a) is used for the proposed project.

According to "*Tool to calculate the emission factor for an electricity system* (Version 02)", project applied the following seven steps to calculate the emission factor.

STEP 1. Identify the relevant electricity systems.

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

STEP 3. Select a method to determine OM.

STEP 4. Calculate OM emission factor according to the selected method.

STEP 5. Identify the group of power units to be included in BM.

STEP 6. Calculate BM emission factor.

STEP 7. Calculate CM emissions factor.

Step 1: Identify the relevant electricity systems

For determining the electricity emission factors, a project electricity system is defined by the spatial extent of the power plants that are physically connected through transmission and distribution lines to the project activity (e.g. the renewable power plant location or the consumers where electricity is being saved) and that can be dispatched without significant transmission constraints.

Similarly, a connected electricity system, e.g. national or international, is defined as an electricity system that is connected by transmission lines to the project electricity system. Power plants within the connected electricity system can be dispatched without significant transmission constraints but transmission to the project electricity system has significant transmission constraint.

If the DNA of the host country has published a delineation of the project electricity system and connected electricity systems, these delineations should be used. If this information is not available, project participants should define the project electricity system and any connected electricity system, and justify and document their assumptions in the CDM-PDD. The following criteria can be used to determine the existence of significant transmission constraints.

- In case of electricity systems with spot markets for electricity: there are differences in electricity prices (without transmission and distribution costs) of more than 5 percent between the systems during 60 percent or more of the hours of the year;
- The transmission line is operated at 90% or more of its rated capacity during 90% percent or more of the hours of the year.

Where the application of these criteria does not result in a clear grid boundary, participants must use a regional grid definition in the case of large countries with layered dispatch systems (e.g. provincial/regional/national). A provincial grid definition may indeed in many cases be too narrow given significant electricity trade among provinces that might be affected, directly or indirectly, by a CDM project activity. In other countries, the national (or other largest) grid definition should be used by default. Participants must document the geographical extent of the project electricity system transparently and identify all grid power plants/units connected to the system.

For the purpose of determining BM emission factor, 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.

For the purpose of determining OM emission factor, use one of the following options to determine the CO_2 emission factor(s) for net electricity imports from a connected electricity system within the same host country (ies):

(a) 0 tCO_2/MWh; or

(b) The weighted average OM)emission rate of the exporting grid, or

(c) The simple OM emission rate of the exporting grid, or

(d) The simple adjusted OM emission rate of the exporting grid.

In the present case, project electricity system is the project activity and the connected electricity system is WPG. The geographical extent of the project electricity system includes South Hwanghae Province, North Hwanghae Province, South Phyongan Province and Pyongyang City.

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 OM and BM 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.

For the proposed project, option I was chosen.

Step 3: Select a method to determine OM

The calculation of OM 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.

The dispatch data analysis OM emission factor is determined based on the grid power units that are actually dispatched at the margin during each hour where the project is displacing grid electricity. This approach is not applicable to historical data and, thus, requires annual monitoring of the dispatch data analysis OM emission factor. Thus, the application of method (c) is impossible for the project.

Similarly, the data of annual load duration curve required by method (b) also can not be obtained publicly. Therefore, method (b) is also not applicable here.

The method (d) is applicable only when the generations by low-cost/must-run resources constitute more than 50% of the generation of total grid. Low-cost/must-run plants are hydro power plants in DPR Korea. As shown in table 8, the electricity generation of hydro power plants constitutes less than 50% of total generation during the 2005-2009. Therefore, the method (d) is not applicable to calculate the $EF_{OM,y}$.

The simple OM method (a) can only be used if low-cost/must-run resources constitute less than 50% of total grid generation in: 1) average of the five most recent years, or 2) based on long-term averages for hydro electricity production. Therefore, the method (a) is applicable here.

Table 8. Electricity generation of low cost/ must run resources in DPR Korea between 2005-2009

Years	2005	2006	2007	2008	2009
Electricity generation of low cost/ must run resources	46.87	41.76	44.02	41.02	42.69

Data source: Central Bureau of Statistics, 2010

http://10.76.1.11

Step 4: Calculate OM emission factor according to the selected method

The simple OM emission factor is calculated as the generation-weighted average CO_2 emissions per unit net electricity generation (tCO_2/MWh) of all generating power plants serving the system, not including low-cost/must-run power plants/units.

The simple OM may 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.

Option B can only be used if:

(a) The necessary data for Option A is not available; and

(b) Only nuclear and renewable power generation are considered as low-cost/must-run power sources and the quantity of electricity supplied to the grid by these sources is known; and

(c) Off-grid power plants are not included in the calculation (i.e., if Option I has been chosen in Step 2).

For the calculation of OM emission factor of the proposed project, option B can be used.

Under this option, the simple OM emission factor is calculated based on the net electricity supplied to the grid by all power plants serving the system, not including low-cost/must-run power plants/units, and based on the fuel type(s) and total fuel consumption of the project electricity system, as follows:

$$EF_{grid,OMsimple,y} = \frac{\sum_i FC_{i,y} \times NCV_{i,y} \times EF_{CO2,i,y}}{EG_y} \qquad (2)$$

Where:

$EF_{grid,OMsimple,y}$ = Simple OM emission factor in year y (tCO_2/MWh)

$FC_{i,y}$ = Amount of fossil fuel type i consumed in the project electricity system 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_y = Net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost/must-run power plants/units, in year y (MWh)

I = All fossil fuel types combusted in power sources in the project electricity system in year y

y = The relevant year as per the data vintage chosen in Step 3

For this approach (simple OM) to calculate OM, the subscript *m* refers to the power plants/units delivering electricity to the grid, not including low-cost/must-run power plants/units, and including electricity imports to the grid. Electricity imports should be treated as one power plant *m*.

Step 5: Identify the group of power units to be included in BM

The sample group of power units *m* used to calculate the build margin consists of either:

(a) The set of five power units that have been built most recently; or

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

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

As a general guidance, a power unit is considered to have been built at the date when it started to supply electricity to the grid.

Power plant registered as CDM project activities should be excluded from the sample group m. However, if the group of power units, not registered as CDM project activity, identified for estimating BM emission factor includes power unit(s) that is (are) built more than 10 years ago then:

(i) Exclude power unit(s) that is (are) built more than 10 years ago from the group; and

(ii) Include grid connected power projects registered as CDM project activities, which are dispatched by dispatching authority to the electricity system.

Capacity additions from retrofits of power plants should not be included in the calculation of BM emission factor.

In the case of WPG, all the thermal power plants are excluded from the sample group of power units *m* used to calculate BM, because they are built more than 10 years ago.

Step 6: Calculate BM emission factor

The BM emission factor is the generation-weighted average emission factor (tCO_2/MWh) of all power units m during the most recent year y for which power generation data is available, calculated as follows:

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}} \quad (3)$$

Where:

$EF_{grid,BM,y}$ = BM 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 BM

y = Most recent historical year for which power generation data is available

CO_2 emission factor of power plants $FE_{EL,m,y}$ is considered as zero, because the plants included in BM are hydropower plants.

Step 7: Calculate CM emissions factor

The CM emissions factor is calculated as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM} \quad (4)$$

Where:

$EF_{grid,BM,y}$ = BM emission factor in year *y* (tCO_2/MWh)

$EF_{grid,OM,y}$ = OM emission factor in year *y* (tCO_2/MWh)

w_{OM} = Weighting of OM emissions factor (%)($w_{OM} = 0.5$)

w_{BM} = Weighting of BM emissions factor (%)($w_{BM} = 0.5$).

From the formula (1) and (4), the baseline emissions can be calculated.

Project emissions

For most renewable energy project activities, $PE_y = 0$. However, for the following categories of project activities, project emissions have to be considered following the procedure described in the most recent version of ACM0002 (version 12.1.o, EB 58).

- Emissions related to the operation of geothermal power plants (e.g. Non-condensable gases, electricity/fossil fuel consumption)
- Emissions from water reservoirs of hydro power plants

For the proposed project, emissions from water reservoirs of hydropower plant have to be considered.

According to the ACM0002 (version 12.1.0, EB 58), some project activities may involve project emissions that can be significant. These emissions shall be accounted for as project emissions by using the following equation.

$$PE_y = PE_{FF,y} + PE_{GP,y} + PE_{HP,y} \quad (5)$$

Where:

PE_y = Project emissions in year *y* (tCO_2e/yr)

$PE_{FF,y}$ = Project emissions from fossil fuel consumption in year *y* (tCO_2e/yr)

$PE_{GP,y}$ = Project emissions from the operation of geothermal power plants due to the release of non-condensable gases in year *y* (tCO_2e/yr)

$PE_{HP,y}$ = Project emissions from water reservoirs of hydro power plants in year *y* (tCO_2e/yr)

For the proposed project:

$$PE_{FF,y}=0,\ PE_{GP,y}=0 \quad (6)$$

If the power density (PD) of the project activity is greater than $4W/m^2$ and less than or equal to $10W/m^2$:

$$PE_{HP,y} = EF_{Res} \cdot TEG_y / 1\,000 \quad (7)$$

Where:

$PE_{HP,y}$ = Project emissions from water reservoirs (tCO_2e/yr)

EF_{Res} = Default emission factor for emissions from reservoirs of hydro power plants in year y ($kgCO_2e/MWh$)

TEG_y = Total electricity produced by the project activity, including the electricity supplied to the grid and the electricity supplied to internal loads, in year y (MWh)

Formula (7) should be applied for the proposed project, because PD of the project activity is $8.7W/m^2$.

According to this methodology, the PD of the project activity is calculated as follows:

$$PD = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}} \quad (8)$$

Where:

PD = PD of the project activity (W/m^2)\

Cap_{PJ} = Installed capacity of the hydro power plant after the implementation of the project activity (W)

Cap_{BJ} = Installed capacity of the hydro power plant before the implementation of the project activity (W). For new hydro power plants, this value is zero

A_{PJ} = Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full (m^2)

A_{BL} = Area of the reservoir measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m^2). For new reservoirs, this value is zero

For the proposed project, $Cap_{BJ} = 0$ and $A_{BL} = 0$, because the power plant and reservoir is new.

So the PD of the proposed project is calculated as follows:

$$PD = Cap_{PJ} / A_{PJ} \quad (9)$$

Leakage

If the energy generating equipment is transferred from another activity, leakage is to be considered.

For the proposed project, leakage is zero, because there is no transfer of energy generating equipment.

$$LE_y = 0 \quad (10)$$

Emission reductions

Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y - LE_y \quad (11)$$

Where:

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

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

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

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

For the proposed project, emission reductions are as follows;

$$BE_y = EG_y \cdot EF_{grid,CM,y} - PE_y \quad (12)$$

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

Data / Parameter:	$NCV_{i,y}$
Data unit:	**TJ/Gg**
Description:	Net calorific value (energy content) per mass or volume unit of a fuel *i*
Source of data used:	IPCC default values
Value applied:	Please refer to Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data is collected from the IPCC
Any comment:	

Data / Parameter:	$FC_{i,y}$
Data unit:	**Gg**
Description:	The amount of fuel *i* consumed in WPG in year y
Source of data used:	Central Bureau of Statistics
Value applied:	Please refer to Annex 3
Justification of the choice of data or	Data in CDM Website of DPR Korea.

description of measurement methods and procedures actually applied :	
Any comment:	To calculate OM emission factor.

Data / Parameter:	EG_y
Data unit:	**MWh**
Description:	Net electricity generation produced and delivered by all units connected in WPG in year y
Source of data used:	Central Bureau of Statistics
Value applied:	Please refer to Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data in CDM Website of DPR Korea.
Any comment:	Used in the step of OM

Data / Parameter:	$EF_{CO2,\,i}$
Data unit:	**tCO_2e/TJ**
Description:	The emission factor of fuel *i* in a mass or volume unit
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied:	-
Justification of the choice of data or description of measurement methods and procedures actually applied :	IPCC Default Value
Any comment:	To calculate OM and BM

B.6.3 Ex-ante calculation of emission reductions:

>>

The baseline emission factor is shown in the table 9

Table 9. Calculation of CM in WPG (tCO_2e/MWh)

OM	BM	CM
1.52	0	0.76

Because the net electricity supplied from the project to WPG is 41 150MWh, the project emission reductions are calculated as follows:

Baseline emissions

$$BE_y=EG_y*EF_{grid,\,CM,y}=41\,150*\,0.76=31\,274\ tCO_2e \qquad (13)$$

Leakage

As mentioned in the B.6.1

$$LE_y=0 \qquad (14)$$

Project emissions

$$PE_{HP,y}=3\ 888.6\ tCO_2e \qquad (15)$$

Emission reductions

Since a leakage is zero, CER estimated by the project in a year can find from following:

$$BE_y=EG_y*EF_{grid,\ CM,y}-PE_{HP,y}=27\ 385\ tCO_2e \qquad (16)$$

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

>>

Table10 shows the emission reductions of the project during the first crediting period.

Table 10. Estimate of emission reductions of the project during the first crediting period

Year	Estimation of project activity emissions (tCO_2e)	Estimation of baseline emissions (tCO_2e)	Estimation of Leakage (tCO_2e)	Estimation of overall emission reductions (tCO_2e)
01/05/2012-31/12/2012	2 916	21 892	0	18 975
2013	3 888	31 274	0	27 385
2014	3 888	31 274	0	27 385
2015	3 888	31 274	0	27 385
2016	3 888	31 274	0	27 385
2017	3 888	31 274	0	27 385
2018	3 888	31 274	0	27 385
01/01/2019-30/04/2019	972	9 382	0	8 410
Total emission reductions (tCO_2e)	**27 216**	**218 918**	0	**191 695**
Credible period (year)		**7**		
Annual average during the credible period (tCO_2e)		**27 385**		

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

B.7.1 Data and parameters monitored:

Data / Parameter:	EF_{CO2y}
Data unit:	**tCO_2e/kWh**
Description:	CO_2 emission factor of the grid electricity in year y
Source of data to be used:	CM emission factor of WPG in year y calculated using the "*Tool to calculate the emission factor for an electricity system*" (Version 02.1.0)
Value of data	**0.76**
Description of measurement methods and procedures to be applied:	Calculated as per "*Tool to calculate the emission factor for an electricity system*" (Version 02.1.0)
QA/QC procedures to be applied:	-
Any comment:	Refer to B.7.2. Description of the monitoring plan

Data / Parameter:	TEG_y
Data unit:	**MWh/y**
Description:	Total electricity produced by the project activity, including the electricity supplied to the grid and the electricity supplied to internal loads, in year y
Source of data to be used:	Measured by watt-hour meters in project activity site
Value of data	**43 207.5**
Description of measurement methods and procedures to be applied:	Measured continuously and recorded on a monthly basis
QA/QC procedures to be applied:	Measurements are undertaken using watt-hour meters. Calibration should be undertaken as prescribed by Quality Supervision Bureau, DPR Korea.
Any comment:	Refer to B.7.2. Description of the monitoring plan

Data / Parameter:	Cap_{PJ}
Data unit:	**MW**
Description:	Installed capacity of the hydro power plant after the implementation of the project activity
Source of data to be used:	Project site
Value of data	**10**
Description of measurement methods and procedures to be applied:	Determine the installed capacity based on recognized standards
QA/QC procedures to be applied:	-
Any comment:	Refer to B.7.2. Description of the monitoring plan

Data / Parameter:	A_{PJ}
Data unit:	**km^2**
Description:	Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full
Source of data to be used:	Measured by meters in project activity site
Value of data	**1.15**
Description of measurement methods and procedures to be applied:	Measured from topographical surveys and maps
QA/QC procedures to be applied:	-
Any comment:	Refer to B.7.2. Description of the monitoring plan

Data / Parameter:	EG_y
Data unit:	**MWh/y**
Description:	The net electricity delivered by the project

Source of data to be used:	Measured by meters in project activity site
Value of data	**41 150**
Description of measurement methods and procedures to be applied:	Measured continuously and recorded on a monthly basis
QA/QC procedures to be applied:	The meters will be periodically checked according to the relevant national electric industry standards and regulations; Power supplied to the grid and double checked according to electricity sales receipts.
Any comment:	Refer to B.7.2. Description of the monitoring plan

B.7.2 Description of the monitoring plan:

>>

Emission factor of the project in this PDD is determined ex-ante. Therefore the net electricity generation supplied to the grid by the project is defined as the key data to be monitored. The monitoring plan is drafted to focus on monitoring of this data.

1. Monitoring organization

Prior to the start of the crediting period, the monitoring team will be organized with clear roles and responsibilities for each staff involved in the CDM project. The CDM Manager will have the overall responsibility for the monitoring system on this project.

The CDM management structure of the project is shown in figure 5.

Figure 5. CDM management structure of the project

Responsibility of CDM manager:

- CDM management and resolution of the occurring problems
- Supervision of project operation and financial issues

Responsibilities of Monitoring and Recording Team under the CDM manager:

- Monitoring and management of the electricity export to and import from the grid daily
- Data collection monthly
- Collecting all the sale and purchase receipts or invoices
- Calibration of meters
- Daily confirmation of monitored data with Monitoring and Recording team under the Grid Company

Responsibility of Repair and Maintenance Team 1;

- Repair and maintenance of generating facility No.1 and No.2
- Calibration and replacement of monitoring instruments

Responsibility of Repair and Maintenance Team2:

- Repair and maintenance of generating facility No.3 and No.4

2. Monitoring equipment and its installation

Watt meters and computer recorders of electric power will be installed at two places; first one will be located at the powerhouse of the project and second one at the 66 kV Namchon substation. This equipment will measure and record the delivered or received electricity.

3. Calibration

The project owner and the grid company will sign an agreement to develop a set of quality control procedures regarding the measurement and calibration so as to maintain the accuracy of measurement.

All equipment will be calibrated by the Bureau of Quality Supervision, DPR Korea commissioned jointly by the project owner and the grid company every six months.

After calibration, the meters should be sealed by the project owner and Grid Company, each party should not unseal or change the meters when the other one is absent. If the recording difference between the meters of the project owner and Grid Company is lager than the allowable tolerance, the meters will be repaired or replaced by other calibrated meters.

4. Data Management

Data will be archived at the end of each month using the electronic spreadsheet described. The electronic files will be stored both on hard disk and CD-ROM. A hard copy printout will also be archived.

Physical documentation will be collected and stored by the project owner in a central place, together with the monitoring plan. In order to facilitate the auditor's reference, monitoring results will be indexed. All data records will be kept for a period of 2 years after the end of the crediting period.

5. Monitoring Report

The project owner will keep the sales receipts, and compile a monitoring report for DOE's verification at the end of the year. The monitoring report includes the monitoring and review report of the net electricity supplied by the project to the grid, the calculation of emission reduction and a record of calibration and maintenance.

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

>>

Date of completion: 1/12/2010

Name of person determining the baseline and monitoring methodology:

1. Mr. Hun Kim, Institute of Thermal Engineering, SAoS

Address: Moranbong district, Pyongyang, DPR Korea

E-mail Add: pptayang@star-co.net.kp,

Tel: 850-2-3818111/ext-8544

FAX: 850-2-3814410/2100

2. Mr. Ulsong Kim, Project Officer, SAoS,

Address: Moranbong district, Pyongyang, DPR Korea

E-mail Add: pptayang@star-co.net.kp

Tel: 850-2-3818111/ext-8544

FAX: 850-2-3814410/2100

(Not a project participant)

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:

>>
22/09/2010

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

>>
The expected operational lifetime of the project activity is 23 years, including the construction periods.

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:

>>
01/05/2012 (or earliest date after registration)

C.2.1.2. Length of the first crediting period:

>>
7 years

C.2.2. Fixed crediting period:

>>
Not applicable

C.2.2.1. Starting date:

>>
Not applicable

C.2.2.2. Length:

>>
Not applicable

SECTION D. Environmental impacts

>>

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

>>

Environment & Development Centre (EDC) has assessed the environmental impact on the proposed site, based on the "*Law of DPR Korea on Environmental impact Assessment*". Environmental Impact Assessment (EIA) was approved by the Environmental Protection Bureau of North Hwanghae Province on 13 May 2010.

The report assessed the influences on water environment, air environment, noise environment, ecosystem, society and economy by the project activity. Several preventive measures were suggested to eliminate the negative environmental effects. According to the EIA report, main sources of causing negative impact on the environment during the construction period were classified as life sewage, use of rolling stocks, earth excavation and stone extraction. But these are relatively insignificant factors which can be eliminated by relevant preventive and precautionary measures.

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:

>>

The project has no serious aspects which can deliver significant impacts on local environment, and thus, the EIA of the project has been approved by the local environmental protection authority.

SECTION E. Stakeholders' comments

>>

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

>>

PCKC was responsible to receive the comments from local stakeholders.

Announcement

The chairman of PCKC convened the meeting of managers and community leaders within Kumchon county on 12 July 2010 and announced the plan to build Ryesonggang Hydropower Plant No.5.

The meeting invited the GHPCC president to introduce the proposed location and the scale of the project, financial situation, CDM and so on. Project owner (GHPCC) confirmed that all the residents living in the area to be flooded will be moved to the better houses to be newly built by project owner before the operation of the plant. And the project owner explained the social and economic benefits on Kumchon county with implementation of the project activity. The meeting decided to collect comments from local residents and mandated the Department of appeal and complaint to tackle the issue to the benefit of the stakeholders so that the project can be approved from the relevant government authorities.

The mass meeting was held in 13 September 2010 in Kumchon county under the auspices of PCKC where it was announced that the Ryesongang Hydropower Plant No.5 will be built from September 2010. All participants expressed their agreement and several participants spoke of their supportive opinion on behalf of their colleagues.

The local line radios informed the speech of the chairman of PCKC and the project owner on the construction of Ryesonggang Hydropower Plant No.5 which was renamed on the recommendation of National Nomenclature Committee to the residents in the county several times.

Reception of the Comments

There is a department of appeals and complaint in PCKC and compliant letter boxes in several places in the county to deal with the comments from local stakeholders. Several officers are stationed to receive the comments from local stakeholders all the time.

The comments are received in writing and solved in a week time. Anyone could put his comment in the department. Comments from local stakeholders will be kept in storage during the construction. Especially, Comments from the residents in the submerged area are received by questionnaires prepared for them.

PCKC distributed the questionnaires to the residents in the submerged area on 21 September 2010.

The contents of questionnaires are as follows

No	Contents	Yes	No	Don’t know
1	The project contributes to the sustainable economical development of the country.			
2	The project is suitable to the economic strategy and policy of the government.			
3	There are no rare or endangered animals and plants in the reservoir basin			
4	The dwelling houses are newly built for the residents in the flooded area.			
5	I lead a cultured life due to the construction of hydropower plant.			
6	The project gives the positive influence to my living conditions.			
7	The project improves the traffic conditions in the local areas.			
8	The advanced technologies are disseminated to the local residents due to the construction of the hydropower plant.			
9	The project owner offers the new jobs to the local residents.			
10	The economic exchange is improved between the near counties due to the construction of the hydropower plant.			
11	The project is built by applying the Clean Development Mechanism			
12	I agree the construction of hydropower plant.			
13	The project contributes to the economic development of Kumchon County.			

E.2. Summary of the comments received:

>>

All residents in Kumchon county agreed to the implementation of the project.

Received comments are shown as follows;

- It is said that the newly built houses are better than the existing houses in terms of square meters and structure. Then, how much money must the residents that will be moved there pay additionally?
- Do they have easier access to the traffic?
- Local governments down the stream agreed on condition of enough capacity of the dam to control the flood.
- What benefits are shared to the town residents during the operation of the plant?
- Some residents in submerged area applied for new jobs after the plant put into operation.

Summary of respondents are shown in the table 11.

Table 11. Summary of respondents

Item	Content	Frequency	%
Gender	Male	15	75
	Female	5	25
Ages	<30	14	70
	30-40	3	15
	>40	3	15
Education	Middle school	16	80
	University	4	20
Employment	Governmental officials	4	20
	Related employees	6	30
	Local residents	10	50

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

>>

The received comments were presented to the meeting of PCKC where raised issues and concerns were discussed and relevant measures were undertaken reasonably to their satisfaction. The comments received show that the local residents have no negative opinion.

The comments received were taken into account as follows;

- The newly built houses will be offered to all the residents in the submerged area without the consideration of price of the existing house, without any additional payment.
- The project activity will offer benefits to the town residents as well the residents of adjacent area.
- The project owner (GHPCC) will make a new road for the residents to have easier access to the township.
- The dam was mandated to have more sluice gates to have enough control of the floods.
- Project owner selected 15 young and talent residents from resident applicants as the workers of the plant

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Gangdong Hydro Power Construction Company
Street/P.O.Box:	Gangdong County, Pyongyang City, DPR Korea
Building:	
City:	
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding from Annex I Parties for the project.

Annex 3

BASELINE INFORMATION

Table 12. Information of electricity generated and fuels consumed by thermal power plants in 2005

Thermal Power Plant	Output (10^3MWh)	Anthracite Consumption (Gg)	Crude Oil Consumption (Gg)
Pyongyang	1 986	1 384	22.8
DongPyongyang	745	527	7.9
Chongchongang	263	202	2.3
Sunchon	759	555	5.7

Data source: Central bureau of statistics, 2006
http://10.76.1.11

Table 13. Information of electricity generated and fuels consumed by thermal power plants in 2006

Thermal Power Plant	Output (10^3MWh)	Anthracite Consumption (Gg)	Crude Oil Consumption (Gg)
Pyongyang	1 959	1 387	20.0
DongPyongyang	715	511	7.4
Chongchongang	272	213	3.9
Sunchon	829	608	9.0

Data source: Central bureau of statistics, 2007
http://10.76.1.11

Table 14. Information of electricity generated and fuels consumed by thermal power plants in 2007

Thermal Power Plant	Output (10^3MWh)	Anthracite Consumption (Gg)	Crude Oil Consumption (Gg)
Pyongyang	1 918	1 360	19.6
DongPyongyang	686	493	5.7
Chongchongang	293	187	4.7
Sunchon	798	594	12.6

Data source: Central bureau of statistics, 2008
http://10.76.1.11

Table15. Information of electricity generated and fuels consumed by thermal power plants in 2008

Thermal Power Plant	Output (10^3MWh)	Anthracite Consumption (Gg)	Crude Oil Consumption (Gg)
Pyongyang	1 929	1 375	21.8
DongPyongyang	778	564	6.7
Chongchongang	274	216	5.0
Sunchon	821	619	9.0

Data source: Central bureau of statistics, 2009
http://10.76.1.11

Table 16. Information of electricity generated and fuels consumed by thermal power plants in 2009

Thermal Power Plant	Output (10^3MWh)	Anthracite Consumption (Gg)	Crude Oil Consumption (Gg)
Pyongyang	1 993	1 427	22.1

DongPyongyang	815	558	7.0
Chongchongang	337	294	6.6
Sunchon	876	663	8.8

Data source: Central bureau of statistics, 2010
http://10.76.1.11

Table 17. Information of fuels consumed for power generation

	Emission factor (tCO_2/TJ)	Net Calorific Value, TJ/Gg
Anthracite	94.6	21.6
Crude oil	71.1	39.8

Data source: 2006 IPCC Guidelines for National Greenhouse Gas Inventories

According to electricity supplied to WPG, the OM of latest three years should be weighted average, so the weighted average OM is:

$$EF_{grid,OMsimple,y} = \frac{\sum_i FC_{i,y} \times NCV_{i,y} \times EF_{CO2,i,y}}{EG_y} = 1.52\ tCO_2e/MWh \quad (17)$$

The BM emission factor is $0tCO_2/MWh$.

The emission factors of each year and average emission factor in WPG are listed in table 18.

Table 18. Emission factor in WPG

	2007	2008	2009	Average
Emission factor	0.76	0.76	0.76	0.76

Table 19. Plants connected to WPG

Thermal power plants	Hydropower plants
Pyongyang	Daedonggang
DongPyongyang	Namgang
Chongchongang	Supung
Sunchon	

Data source: http://10.76.1.11

<u>Annex 4</u>

MONITORING INFORMATION

NA

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