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

CONTENTS

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.3, DPR Korea

Version: 1.0

Date: 16/12/2010

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

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The Ryesonggang Hydropower Plant No.3, DPR Korea (hereafter referred to as the project) is a reservoir type power plant, which will be built newly in Tosan County, North Hwanghae Province.

The purpose of this project activity is to generate a clean form of electricity using the potential energy available along the water flows of Ryesong River and supply the same to the Western Power Grid (WPG), DPR Korea.

The project with an installed capacity of 10 MW, 4 sets of generating facilities with a capacity of 2.5 MW respectively, will generate the electricity energy of 44 940 MWh and supply the electricity of 42 800 MWh to WPG in a year. The electricity generated at 6.6 kV would be boosted at the outdoor substation and be transmitted to 66 kV Namchon Substation, which is connected to WPG and located 17 km away from the dam /1/. The total GHG emission reductions are estimated to be 28 483.4 tCO_2e annually.

After all the turbines and generators are put into operation on 1 June 2012, the project will displace part of thermal power in WPG by making use of clean and renewable energy.

It clearly fits into the development priority of DPR Korea and regional development strategy of North Hwanghae Province /9,10,11,12,13/.

The project will make positive impacts on local community in social, economic and environmental aspects:

Tosan Electric Power Company (TEPC), which is the project participant, has stipulated social, economic, environmental and technological benefits as the indicators for sustainable development of the local area.

(a) Social benefits

- Several tens of people will be permanently employed for the project operation, and many jobs will be created transiently during the construction period of the project.
- The project will contribute to disseminating the advanced technologies among local residents and to raising their levels of cultural standards and skill.

(b) Economic benefits

- The project activity would increase the availability of power in pumping water for agricultural production and irrigation water resources.
- The project would facilitate interchange between township and the local area, other farm villages and the local area, including the marketing of their produce, by building a new road through the implementation of the project.
- The project will avoid the land loss and human life injury from flooding and secure the normal increase in agricultural production in the basin along Ryesong River.

(c) Environmental benefit

- The proposed project activity utilizes hydro potential available for power generation, which would reduce emissions of GHG and other pollutants being emitted from thermal power plants compared with a business-as-usual scenario by displacing part of electricity from fossil fuel-fired power plants in WPG.
- The project activity does not result in degradation of any natural resources and health standards at the local area.

(d) Technological benefit

- The project uses the best available technology in the small hydro power sector in DPR Korea.
- The project encourages setting up such new projects in future.

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)	Tosan Electric Power Company	No
Czech Republic	Topič Energo s.r.o.	No

Detailed contact information 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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Tosan county/Paekhwa-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 place is in Paekhwa-ri, Tosan County which is located at a distance of 158 km from Sariwon City, North Hwanghae Province and 218 km from the centre of Pyongyang, DPR Korea. The project site can be accessed through Pyongyang-Gaesong expressway. The nearest railway station is Kumchon Station. The detailed geographical coordinates of the dam are 38°19′42″ N latitude and 126°34′03″ E longitude. To visualize the exact location of the project, refer to the map in figure 1 and figure 2.

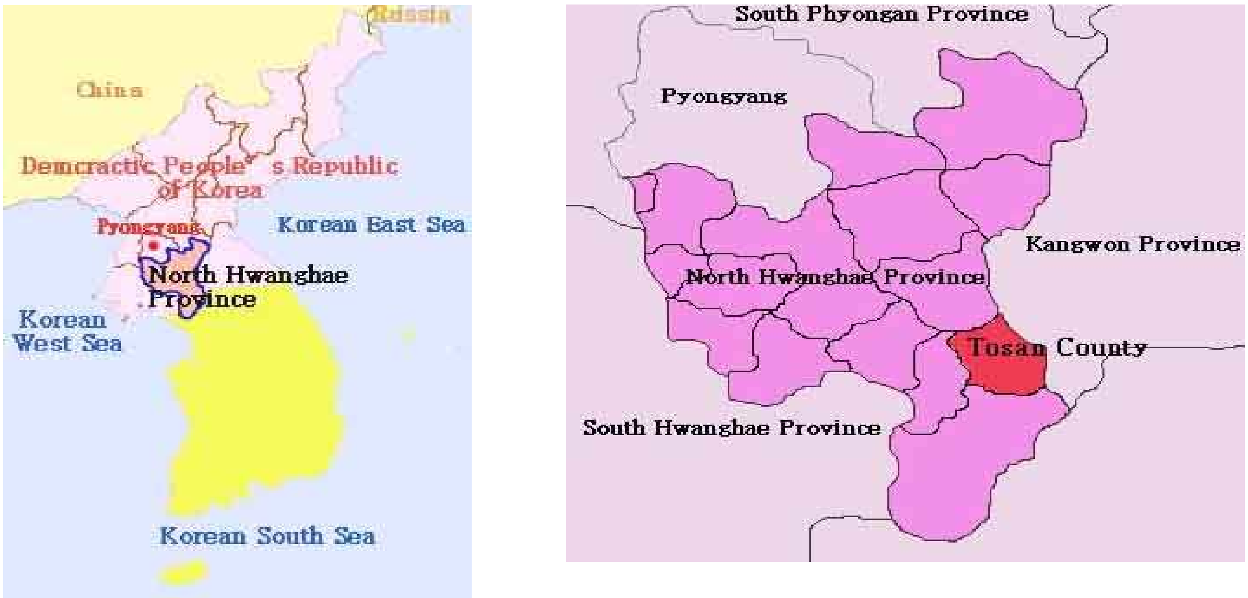

Figure 1. The map showing the location of Tosan county

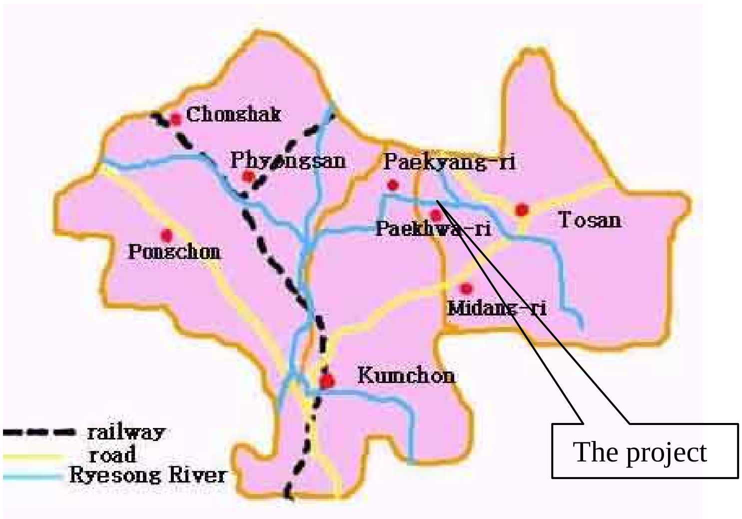

Figure 2. The map showing the location of the project

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 generated electricity 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 sound and safe technology

The project activity does not involve any greenhouse gas emissions or burning of any fossil fuels during the process of power generation. The technology employed for the project activity is the current best practice in small hydro power sector in DPR Korea. 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 construct a reservoir type power plant with a total generating capacity of 10 MW (2.5 MW×4). Based on feasibility study, the main components of the project are described as follows:

- A combination dam which are maximally 16 m in height, and 185.61 m rock filled-dam and 227.78 m concrete gravity dam in length at the top respectively
- 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

Table 1. Main 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	39.6
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 /6, 7/

The main equipment, such as turbines and generators, are manufactured in the host country. No technology from other countries is transferred in this project activity. Daean Heavy Machine Complex and Songchongang Electricity Machine Factory will be responsible for producing the equipment. These companies are well known as the specially producing base of machines and electric equipment in DPR

Korea.

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 June 2012 to 31 May 2019. During the period, the total estimated emission reductions are 199 381 tCO_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 (tCO_2e)
01/06/2012-31/12/2012	19 938
2013	28 483
2014	28 483
2015	28 483
2016	28 483
2017	28 483
2018	28 483
01/01/2019-30/05/2019	8 545
Total estimated reductions (tonnes of CO_2e)	**199 381**
Total number of crediting years	**7**
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	**28 483**

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 not a 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, EB 54) and "T*ool to calculate the emission factor for an electricity system* (version 02.1.0, EB 60)". For more information Refer to the link regarding the methodology:

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 project activity meets all the applicability conditions of the AMS-I.D. (version 16) as described below:

Applicability of AMS-I.D.

The applicability conditions for simplified baseline methodology category AMS-I.D. are:

- The project should comprise renewable energy generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal and renewable biomass that supply electricity to a national or a regional grid.
- The project should be such that (a) install a new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity (Greenfield plant); (b) involve a capacity addition; (c) involve a retrofit of (an) existing plant(s); or (d) involve a replacement of (an) existing plant(s).
- Hydro power plants with reservoirs that satisfy at least one of the following conditions are eligible to apply this methodology
  - ✓ The project activity is implemented in an existing reservoir with no change in the volume of reservoir;
  - ✓ The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity is greater than 4 W/m^2;
  - ✓ The project activity results in new reservoirs and the power density of the power plant is greater than 4 W/m^2.
- If the new unit has both renewable and non-renewable components (e.g., a wind/diesel unit), the eligibility limit of 15 MW for a small-scale CDM project activity applies only to the renewable component.
- Combined heat and power (co-generation) systems are not eligible under this category.

For the proposed project:

- The proposed project activity is the hydropower project, which supplies electricity to WPG.
- Ryesonggang Hydropower Plant No.3 will be newly built at a site where there was no renewable energy power plant operating prior to the implementation of the project activity.

- The project activity results in a new reservoir and the power density of the power plant will be 5.5 W/m^2, which is greater than 4 W/m^2 and less than 10 W/m^2.
- The installed capacity of the project is 10 MW, which is smaller than 15 MW.
- The proposed project is not combined heat and power (co-generation) system.

Hence, the project qualifies for the application of methodology AMS-I.D. - Grid connected renewable electricity generation.

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 study has established the envisaged capacity of the project. The design discharge has been found out to be 159.6 m^3/s and gross head available has been estimated as 8 m /1/.

Based on the head available and discharge, 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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In accordance with AMS-I.D. the project boundary encompasses the physical and geographical site of the renewable generation source.

The project boundary is therefore the physical boundary, which includes a dam, outdoor substation, powerhouse and the transmission system till the evacuation point. The power generated from the project would be metered and accurately quantified. The electricity would be exported to WPG. Hence for the purpose of baseline calculations, WPG of DPR Korea is also included in the project boundary.

Table 3. Emission sources and gases included in the project boundary for the purpose of calculating project emissions and baseline emissions.

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.3	CO_2	Excluded	The project does not lead to CO_2 emission.
		CH_4	Included	Main emission from reservoir
		N_2O	Excluded	The project does not lead to CO_2 emission.

B.4. Description of baseline and its development:

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The baseline of the project activity will be decided as per 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 method12(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 OM emission factor and BM emission factor are set with in WPG.

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

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

Table 4. Data used to determine baseline emissions

Parameter	Source
Amount of fossil fuel consumed	Central Bureau of Statistics
Net calorific value of fuel consumed	Data of IPCC
Net electricity generated and delivered to the grid	Central Bureau of Statistics
Emission factor of fuel consumed	Data of IPCC
Date power plant was built	People’s Committee of North Hwanghae Province

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 an investment barrier.

1. CDM consideration

According to national energy law, local entities are entitled to build hydropower stations along the rivers. And the proposed project place was considered as a suitable place for such a construction. Yet nobody formerly intended to build a hydropower plant at this site for lack of investment and government rules which prohibits the construction of power plants with IRR below 5%. But the "*Recommendation Letter of DNA*" (3 February 2009) became the key incentive to the project owner. Prior to the starting of the project, the project owner consulted with State Academy of Sciences (SAoS) and relevant government bodies to have full grasp of CDM and its application. Based on its initial enlightenment, the project owner referred the feasibility study to the Central Electric Power Design Institute. The Feasibility Study Report (FSR) was completed in February 2010 and it was confirmed that the project IRR was only up to 3.93%, which was not attractive economically as the national benchmark is 5%. The project owner negotiated with the General Bureau for Cooperation with International Organizations (GBCIO), which is an authorized organization for CDM implementation from the DNA, and CDM experts in SAoS. CDM experts confirmed that the revenue from CDM would make the IRR to be up to 8.27%, which was higher than the national benchmark. Meanwhile, GBCIO ensured the selection of possible buyers and selling of CERs. After that, the project owner made an application to the Ministry of State Construction Control for its approval. The Ministry gave the construction permission on condition that it is implemented with CDM and local bank also signed a contract on condition that it is implemented through CDM.

Table 5. The main time schedule for the proposed project

Milestones	Date
Submission of Feasibility Study Report	09/02/2010
Approval of Ministry of State Construction Control	02/08/2010
PDD development contract	03/08/2010
Loan contract	10/08/2010
Construction contract	12/08/2010
Turbine purchase contract	17/08/2010
Generator purchase contract	19/08/2010
Electricity purchase contract	12/08/2010
Start of project construction	05/09/2010

2. Investment barrier

Investment barrier is the main barrier the project may face. Without the revenue from CDM, the project would never be implemented.

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, as it is a small scale project activity, the "*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 "*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 also not 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, 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 the "*Guideline for Determination of Main Parameters of Hydropower Plants*" (Ministry of State Construction Control, 2006), it stipulates that the project should not be 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 publicly available data source and can be clearly validated by the DOE.
- This benchmark is used in deciding the implementation of hydropower projects among the project owners.

3. Calculation and comparison

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

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)	42 800	Feasibility study report
Total investment(10 000 KPW)	94 275	Feasibility study report
Annual loan rate (%)	3.6	Guideline for determination of main parameters of hydro power plants
The price of electricity to be sold to 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

When calculating the IRR of total investment without the sale revenue of CER as per the data given in table 6, the IRR is only 3.93% which is lower than the benchmark 5%. Therefore, the project is unattractive and requires the additionality.

With the sale revenue of CER, the IRR of the project on the total investment is 7.87% and exceeds the benchmark 5%. The project is then attractive, which means the revenue from CDM is able to help the project to alleviate the burden of investment barrier.

Sensitivity analysis

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

EB 41, Annex 45, "*Guidance 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 3 provides a graphic depiction.

Table 7. Result of sensitivity analysis

	-10%	-5%	0%	5%	10%
Electricity supplied to the grid	3.17%	3.55%	3.93%	4.30%	4.67%
Total investment	4.72%	4.31%	3.93%	3.59%	3.28%
Annual operation cost	4.03%	3.98%	3.93%	3.88%	3.82%
Electricity price	3.17%	3.55%	3.93%	4.30%	4.67%

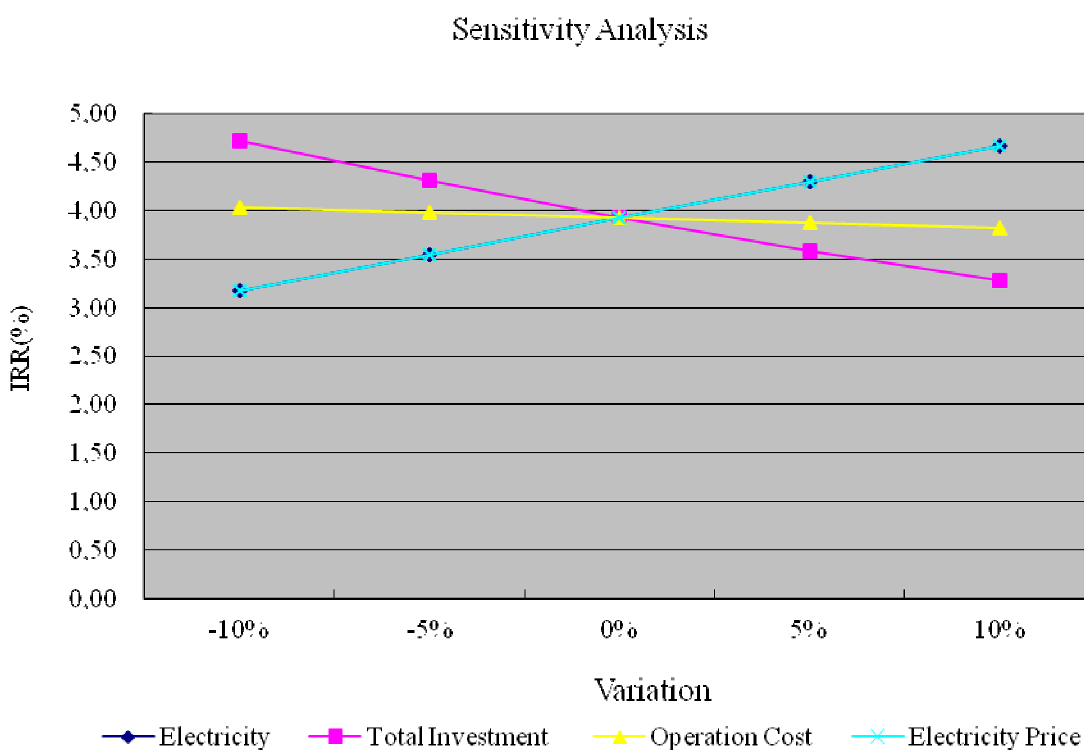

Fig3. The IRR Sensitivity Analysis with the changes of Total Investment, Annual Operation Cost, Electricity Price or Electricity supplied to the grid

As shown in the table 7 and figure 3, the considered four variations of ±10% gives the conclusion that the IRR will remain lower than the benchmark of 5% even with reasonable changes in the critical assumptions. Therefore, it can be concluded that the project's additionality is robust.

- **Total investment**

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

If the total investment increases from -10% to 10%, the project IRR would decrease from 4.72% to 3.28%. As a result, although the total investment changes in the range of ±10%, the project IRR would not reach the benchmark 5%. If the total investment decreases by 13.04%, the IRR will reach the benchmark. Pongsan Chemical Construction Company, which is responsible for building the Ryesonggang Hydropower Plant No.3, has no experience in building a hydropower plant and the skill of workers is very poor. Meanwhile, it is estimated that price of the construction materials, especially cement and structural steel, will increase because of increasing production costs and many construction projects in DPR Korea, and new technologies and methods will not come out to reduce the investment during construction period for lack of the competence of technological force of the project construction company.

In this situation, total investment seems to increase rather than 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 volume of electricity supplied to the grid changes by 10%, the project IRR would change from 3.17% to 4.67%. This is still smaller than the 5% benchmark. The IRR will reach the benchmark when the volume of the annual grid-in electricity increases by more than 14.64%. The electricity output estimated in the FSR is the expected value based on the hydro meteorological data for the past 30 years in the designated region.

The hydro meteorological data in the project region is the value reported from the Institute of Meteorology and Hydrology, which is the well-known institute in DPR Korea. So there will not be a so much change in water discharge during the operation of the plant. From this, it is clearly impossible to improve the IRR by controlling the volume of 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 price of electricity to be sold to WPG is 1.98 KPW/ kWh in the DPR Korea. If the electricity price increases by 14.64%, the IRR will reach the benchmark. In DPR Korea, the price of electricity is a unique price and is enacted by the government. By the way, the government has not changed the electricity price for households and industry so far. Even if the government changes the electricity price during the operation of the project, that seems to decrease rather than increase. As a result, there will not be such case that the project IRR will 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.

When the annual operation & maintenance cost decreases by 10%, the IRR has very little change. But the operation cost such as the number of worker 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

It can be concluded therefore that, without CDM, the project faces several barriers, 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 WPG, which partly depends on thermal power as its energy source. Thermal power has GHG emissions associated with it.

The specific 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 02.1.0, EB 60)". Below is a description of how the three types of emission (baseline, project and leakage) are calculated, along with the 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 the 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 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 participants shall apply 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.

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	42.14

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 the operating margin 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:

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

(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 BM 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.

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 $FE_{EL,m,y}$ can be considered as zero, because the plants included in BM are hydropower plants. So BM emission factor is zero.

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 12.1.0, 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_2/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 $5.5W/m^2$.

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:	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:	To calculate operation margin emission factor.

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:	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:	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:	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:	To calculate OM emission factor.

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 values
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 42,800 MWh, the project emission reductions are calculated as follows:

Baseline emissions

$$BE_y = EG_y \times EF_{grid,CM,y} = 42\ 800 \times 0.76 = 32\ 528\ tCO_2e \quad (13)$$

Leakage

As mentioned in the B.6.1

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

Project emissions

$$PE_{HP,y} = 4\ 044.6\ tCO_2e$$

(15)

Emission reductions

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

$$BE_y = EG_y \times EF_{grid,CM,y} - PE_{HP,y} = 28\ 483.4\ tCO_2e$$

(16)

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

>>

Table 10 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)
01/06/2012-31/12/2012	2 831	22 769	0	19 938
2013	4 044	32 528	0	28 483
2014	4 044	32 528	0	28 483
2015	4 044	32 528	0	28 483
2016	4 044	32 528	0	28 483
2017	4 044	32 528	0	28 483
2018	4 044	32 528	0	28 483
01/01/2019-30/05/2019	1 213	9 758	0	8 545
Total emission reductions (tCO_2e)	**28 308**	**227 695**	**0**	**199 381**
Credible period (year)	**7**			
Annual average during the credible period (tCO_2e)	**28 483**			

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	**44 940**
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	Measured by meters in project activity site

used:	
Value of data	**1.82**
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:	$EG_{facility,,y}$
Data unit:	**MWh/y**
Description:	Quantity of net electricity supplied to WPG in year y
Source of data to be used:	Measured by meters in project activity site
Value of data	**42 800**
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

B.7.2 Description of the monitoring plan:

>>

The monitoring plan is developed in accordance with the modalities and procedures for small-scale CDM project activities and is proposed for a grid-connected small hydroelectric project being implemented in Tosan County, North Hwanghae Province DPR Korea. The monitoring plan, which will be implemented by the project proponent, describes about the monitoring organization, parameters to be monitored, monitoring practices, quality assurance, quality control procedures, data storage and archiving.

The objective of the monitoring plan is to insure the complete, consistent, clear and accurate monitoring and calculation of the emissions reductions during the whole crediting period.

1. Monitoring Requirements

The monitoring plan includes monitoring of energy parameters such as gross energy, auxiliary consumption, energy export to WPG and energy import to the project activity from the grid. Emission reductions resulted from the project activity will be calculated based on the net energy export to the grid system in accordance with the calculation illustrated in Section B.6.3 of the PDD. Emission reductions generated by the project shall be monitored at regular intervals.

Monitoring equipment comprises of energy meters, which will monitor the energy fed by the plant to WPG.

2. Installation of meters and recording of data

Measuring meters will be installed at two places, in which first one will be located at the powerhouse of the proposed project and the other one at the 66 kV Namchon Substation. And the data to be monitored will be measured at two places respectively. The meters at two places will measure the electricity that is delivered to or received from the Grid respectively.

3. Monitoring Organization

A chief monitoring officer will be appointed by the project owner, who supervises and verifies the metering and recording, collects data (meter's data reading, sales/ billing receipts), calculates emission reductions and prepares a monitoring report.

4. Calibration

The verification of electric energy meter should be periodically carried out according to the electric industry standards or regulations of DPR Korea. After verification, meters should be sealed. Both meters shall be jointly inspected and sealed on behalf of the project owner.

All the meters installed shall be tested by the qualified metrical organization co-authorized by the project owner and the Grid Company.

5. Data Management

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

Physical documentation will be collected and stored by the project owner in his office, 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

In addition, the project owner will keep sales invoices for the power delivered to the grid as a crosscheck. At the end of each crediting year, a monitoring report will be compiled detailing the metering results and evidence (i.e. sales invoices). The monitoring report should include: the monitoring of the electricity supplied to the grid, emission reductions calculation report, repair records and calibration records of the monitoring equipment.

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: 10/12/2010

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:

>>
12 August 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:

>>
01/06/2012 (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

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

>>
According to the "*Law of DPR Korea on Environmental Impact Assessment*", environmental impact assessment report must be made for the project /9/.

The EIA report was made by Environment & Development Centre (EDC) under the project owner's assignment and was approved by the Environmental Protection Bureau of North Hwanghae Province on 25 February 2010. According to "*Guideline for Project Selection, Assessment Grade and Scope Limitation of Environmental Impact Assessment*", 3-grade method was used to assess the environmental impact on the proposed site. The report estimated influences on the water environment, sound environment, ecosystem and social environment by the project activity and suggested the measures to eliminate the negative environmental effects.

The measures are as follows:

1. The measures for temporal environment protection during the construction

    The measures for waste water process in stone-processing factory

    The measures for waste water process in the concrete- mixing system

    The measures for waste water including oil from the maintenance of machines and trucks

    The measures for treatment of life sewage

    The measures for treatment of solid waste in the construction district

    The measures for protection of air environment

    The measures for protection of noise environment

2. The measures for environment protection during the operation period

    The measures for protection of water environment

    The measures for protection of ecosystem

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 impacts of the project on environment are not considered significant due to the mitigation measures described above.

SECTION E. Stakeholders' comments

>>

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

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The People's Committee of Tosan County (PCTC) was responsible to receive the comment from local stakeholders.

Announcement

The chairman of PCTC have announced the plan of the TEPC to build Ryesonggang Hydropower Plant No.3 starting from the second half of 2010 when it gets the relevant government approval in the meeting of managers of the agencies/enterprises and community leaders in the county on 17 August 2010.

The chairman explained the company's plan for the plant, its proposed location and the scale of the construction work. He also informed about the financial difficulty of the project and the company's discussion with SAoS and GBCIO on the application of CDM and its intention to apply for CDM. Project owner explained about the CDM and its procedures and additional benefits to the project in overcoming the financial barriers and assured the meeting that the project will bring benefits to all residents in the county, and confirmed that the residents living in the future submerged area will be moved to 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 Tosan county through the implementation of the project. TV informed the speech of the chairman of PCTC and the project owner on the construction of Ryesonggang Hydropower Plant No.3 to the residents in the county several times. An officer of PCTC called upon the residents in the submerged area to explain the plan of replacing the dwelling houses in detail.

Reception of the Comments

There is a department for appeals and complaints in PCTC to deal with the comments from local stakeholders. The comments are received in writing and solved in a week time. Anyone could put his comment in the reception 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.

PCTC distributed the questionnaires to the local residents on 13 October 2010 and received the comments from them on 2 November 2010.

The contents in questionnaires on residents to be resettled are as follows:

No	Contents	Yes	No	Don't know
1	The project contributes to the sustainable economic 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 animal spreads in the reservoir basin			
4	The dwelling houses are newly built for the residents in the area to be submerged.			
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 new jobs to local residents.			
10	The economic exchange is improved between adjacent 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 social and economic development of Tosan county.			

E.2. Summary of the comments received:

>>

All tresidents in Tosan county agreed to the implementation of the project. Some residents in the submerged area applied for the new permanent occupation after the plant put into operation.

Other comments were not raised. The summary of respondents is below.

Table 11. Summary of respondents

Item	Content	Frequency	%
Gender	male	16	59
	female	11	41
Ages	<30	2	7.5
	30-40	10	37

	>40	15	55.5
Education	Middle school	19	70.4
	University	8	29.6
Employment	Governmental officials	5	18.5
	Related employees	8	29.6
	Local residents	14	51.9

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

>>

The comments received show that the local residents have not any negative opinion. Meanwhile, the project owner took two measures for the application of new permanent occupation.

- Project owner selected 15 persons from the young and talented residents among applicants as the future workers of the plants.
- Project owner planned the training of the selected workers from July 2011 to December 2011 in the other plant on operation.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Tosan Electric Power Company
Street/P.O.Box:	Tosan County, North Hwanghae Province, DPR Korea
Building:	
City:	
State/Region:	
Postfix/ZIP:	
Country:	Democratic People's Republic of Korea
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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 (10^3 MWh)	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 (10^3 MWh)	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 (10^3 MWh)	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

Table 15. Information of electricity generated and fuels consumed by thermal power plants in 2008

Thermal Power Plant	Output (10^3 MWh)	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 (10^3 MWh)	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:

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

The BM emission factor is 0 tCO_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	

Source: http://10.76.1.11

Annex 4

MONITORING INFORMATION

NA

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