



**CLEAN DEVELOPMENT MECHANISM  
FORM FOR SUBMISSION OF BUNDLED SMALL SCALE PROJECT ACTIVITIES  
(SSC-CDM-BUNDLE)**

**SECTION A. General description of the Bundle**

**A.1. Title of the Bundle:**

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K-water hydropower VIII

**A.2. Version and Date :**

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Version: 04

Date: 07/08/2012

**A.3. Description of the Bundle and the subbundles :**

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**Description of the project activity**

“K-water hydropower VIII”(hereinafter referred to as the proposed project) performed by Korea Water Resources Corporation (hereinafter referred to as K-water) is a renewable energy power generation project by means of installing a new run-of-river hydropower plant at a site there was no renewable energy power plant operating prior to implementation of the proposed project activity. The proposed project utilizing a renewable energy resource to generate electricity will contribute to reduction of GHG emission by substituting the electricity generated by fossil fuel consumption. The generated electricity from a hydropower plant will be transmitted to the grid of Korea Electric Power Corporation (hereinafter referred to as the KEPCO grid) which is a company in charge of exclusively managing the grid of Republic of Korea.

As a bundled CDM project, the proposed project activity consists of four hydropower plants named as Nakdan, Gumi, Chilgok and GangjeongGoryeong. Nakdan, Gumi, Chilgok hydropower plants are located in Gyeongsangbuk-do and have an installed capacity of 3,000kW respectively. And, GangjeongGoryeong hydropower plant having a installed capacity of 3,000kW is located in Daegu city.

After the implementation of the proposed project, the total amount of annual power generation supplied to the grid is expected to be 58,170 MWh and the estimated annual emission reduction will reach 38,654 tCO<sub>2</sub>.

**Purpose of the project activity**

The proposed project aims at meeting the increasing demand for utilizing renewable energy resources to generate electricity and supporting the social-economical development of the local areas and the host country by means of the construction of hydropower plants. As the proposed project will displace a part of the generated electricity from fossil fuel power plants, the proposed project will lead to avoidance of CO<sub>2</sub> emission and environmental pollution caused by fossil fuel consumption.



## CDM-SSC-BUNDLE

**The contribution of the project activity to sustainable development**

By using a source of renewable energy, the proposed project activity will contribute to sustainable development in Republic of Korea as follows:

- i. Social aspects
  - The proposed project would generate employment during construction and operation phase, resulting in social well being of the local people.
- ii. Economical aspects
  - The proposed project would bring economical benefits to host country by decreasing in import of fossil fuel for electricity generation.
  - Creation of new employment opportunities would result in economic well being of the local people.
- iii. Environmental aspects
  - Replacement of fossil fuel (Carbon intensive electricity source) by hydropower would lead to reduction of any GHG emission like CO<sub>2</sub>, SO<sub>2</sub>, NO<sub>x</sub>.
  - As a renewable energy source, the hydropower is harmless to environment and also can be used as continuous alternative energy resources for future development.
- iv. Technological aspects
  - The proposed project would contribute to transmitting the advanced technical know-how of plant operation to the operators on site and enhancing awareness about sustainable sources of energy generation in the nearby region.

**A.4. Project participants:**

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Name of the Party involved(*)((host)indicate a host party)	Private and/or public entity(ies) project participants(*) (as applicable)	Please indicate if the Party involved wishes to be considered as project participant (Yes/No)
Republic of Korea (host)	Public entity : Korea Water Resources Corporation(K-water)	No

**SECTION B. Technical description of the Bundle:****B.1. Location of the Bundle:****B.1.1. Host Party(ies):**

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Republic of Korea

**B.1.2. Region/State/Province etc.:**

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## CDM-SSC-BUNDLE

Project activity	Province
Nakdan hydropower plant	Gyeongsangbuk-do
Gumi hydropower plant	Gyeongsangbuk-do
Chilgok hydropower plant	Gyeongsangbuk-do
GangjeongGoryeong hydropower plant	Daegu city

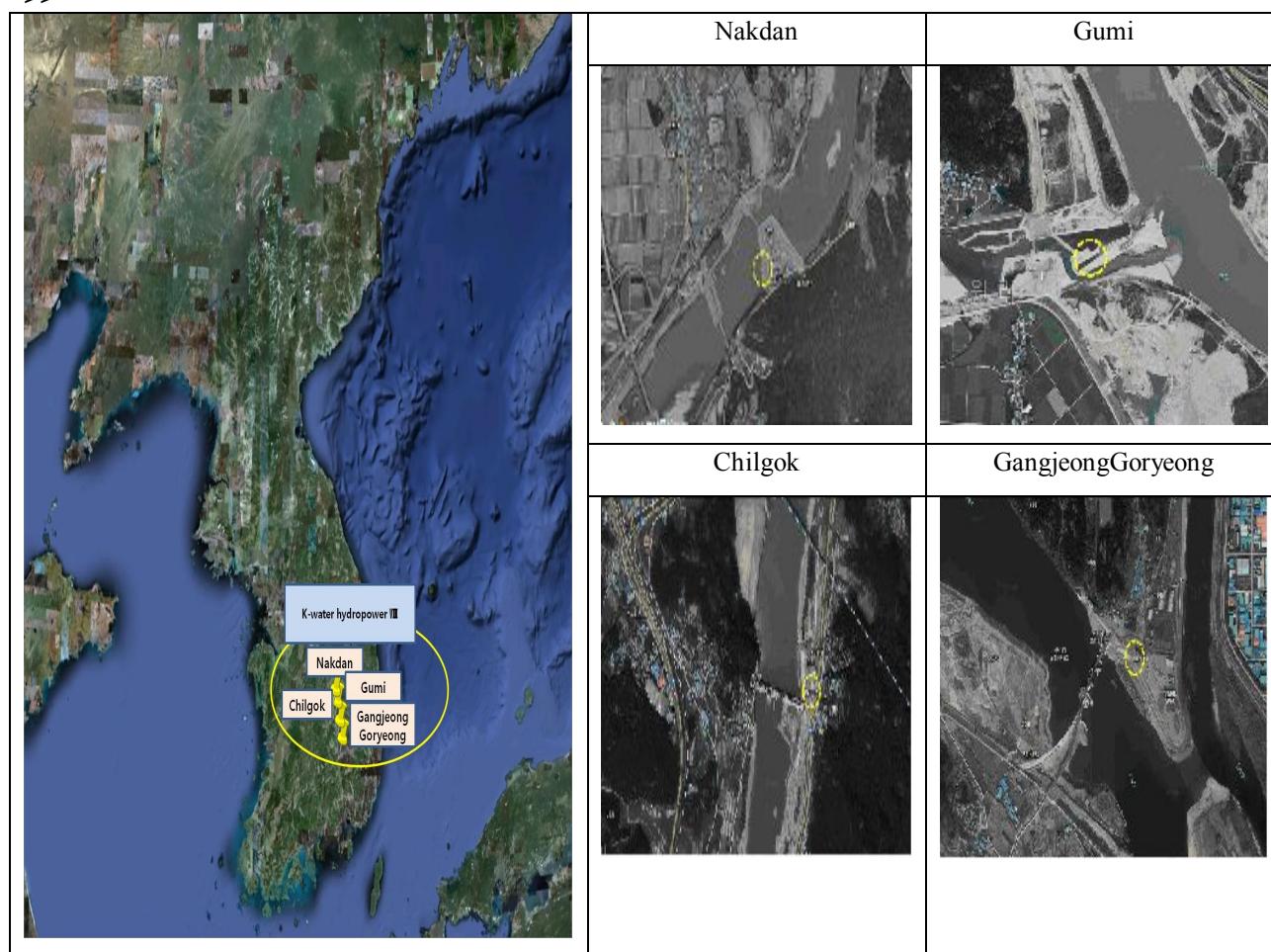
**B.1.3. City/Town/Community etc:**

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Project activity	City
Nakdan hydropower plant	Uiseong-gun
Gumi hydropower plant	Gumi-si
Chilgok hydropower plant	Chilgok-gun
GangjeongGoryeong hydropower plant	Dalseong-gun

**B.1.4. Details of physical location, including information allowing the unique identification of this Bundle:**

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&lt;Figure B.1&gt; The geographic location of each project site



## CDM-SSC-BUNDLE

The proposed project has been being performed on Nakdong River.

The <Figure B.1> shows the geographic locations of the power plant of each project site. The specific address of the power plant of each project site is described as below.

**<Table B.1> The address of the power plant of each project site**

Plant	Geo Coordination
Nakdan	806, Nakjeong-ri, Danmil-myeon, Uiseong-gun, Gyeongsangbuk-do The latitude of 36.359094° and the longitude of 128.306820°
Gumi	1057-26, Won-ri, Sunsang-eup, Gumi-si, Gyeongsangbuk-do The latitude of 36.238665° and the longitude of 128.348292°
Chilgok	627-1, Jungji-ri, Seokjeok-eup, Chilgok-gun, Gyeongsangbuk-do The latitude of 36.015443° and the longitude of 128.400404°
GangjeongGoryeong	806, Jukgok-ri, Dasa-eup, Dalseong-gun, Daegu city The latitude of 35.841659° and the longitude of 128.461459°

**B.2. Type(s), category(ies) and technology/(ies)/Measure/(s) of the bundle:**

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**The type and category**

According to Appendix B of ‘Simplified Modalities and procedures for small-scale clean development mechanism project activities’, the type and category of the proposed project are defined as follows:

- Project type : I - Renewable Energy Projects
- Project category : D - Electricity Generation for a system;

Since the total capacity of hydropower plants in a bundled CDM project activity is 12 MW, the proposed project satisfies the requirement that the total capacity of the proposed project should be 15 MW at the most for a small scale CDM project activity.

Prior to implementation of the proposed project activity, an equivalent amount of electricity will be supplied by the KEPCO grid which is dominated by traditional fossil fuel power plants, which is also the baseline scenario to the proposed project activity. After implementation of the proposed project activity, the hydro energy which is one of the renewable energy resources will be used to generate electricity transmitted to KEPCO grid.

**Technology/measure of the project**

The hydropower plant of the proposed project generates electricity by using running water from a weir to the powerhouse. The horizontal shaft Kaplan turbines coupled to synchronous generators will be used to convert the flow of water to electrical energy. The generated electricity by the proposed project will be transmitted to the KEPCO grid and will be measured automatically, respectively by each of installed watt-meter on site. By performing the proposed project, the advanced know-how of operating the Kaplan turbine made in overseas country is able to be spontaneously transferred by manufacturer’s experts specializing in



## CDM-SSC-BUNDLE

installing and managing the Kaplan turbine.

The specific technical data of the water turbine/generator and transformer units of each hydropower plant are listed in following table.

**<Table B.2> Nakdan hydropower plant**

Classification		Unit	Value
Water Turbine	Type	-	Horizontal Shaft Kaplan Tubular
	Capacity	kW	1,626
	Quantity	Unit	2
Generator	Type	-	3-Phase Synchronous generator
	Quantity	Unit	2
	Rated voltage	kV	3.3
	Output	kW	1,500
Transformer	Type	-	Mold-Type
	Capacity	kVA	2,000
	Quantity	Unit	2

**<Table B.3> Gumi hydropower plant**

Classification		Unit	Value
Water Turbine	Type	-	Kaplan Pit
	Capacity	kW	1,693
	Quantity	Unit	2
Generator	Type	-	3-Phase Synchronous generator
	Quantity	Unit	2
	Rated voltage	kV	6.6
	Output	kW	1,500
Transformer	Type	-	Mold-Type
	Capacity	kVA	2,000
	Quantity	Unit	2

**<Table B.4> Chilgok hydropower plant**

Classification		Unit	Value
Water Turbine	Type	-	Horizontal Shaft Kaplan bevel-gear
	Capacity	kW	1,582
	Quantity	Unit	2
Generator	Type	-	3-Phase Synchronous generator
	Quantity	Unit	2
	Rated voltage	kV	0.69
	Output	kW	1,500
Transformer	Type	-	Mold-Type
	Capacity	kVA	1,750
	Quantity	Unit	2

**<Table B.5> GangjeongGoryeong hydropower plant**

Classification		Unit	Value
Water Turbine	Type	-	Kaplan Pit



## CDM-SSC-BUNDLE

	Capacity	kW	1,649
	Quantity	Unit	2
Generator	Type	-	3-Phase Synchronous generator.
	Quantity	Unit	2
	Rated voltage	kV	3.3
	Output	kW	1,500
Transformer	Type	-	Mold-Type
	Capacity	kVA	2,000
	Quantity	Unit	2

**B.3 Estimated amount of emission reductions over the chosen crediting period:**

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The proposed bundled project adopts crediting period of 10 years and the total amount of emission reductions of the proposed bundled project during the crediting period are estimated to be 386,540 tCO<sub>2</sub>.

Year	Estimation of annual emission reductions (tCO <sub>2</sub> e)
Year 1	38,654
Year 2	38,654
Year 3	38,654
Year 4	38,654
Year 5	38,654
Year 6	38,654
Year 7	38,654
Year 8	38,654
Year 9	38,654
Year 10	38,654
Total emission reductions (tCO <sub>2</sub> e)	386,540
Total number of crediting years	10
Estimation of annual average emission reductions in the crediting period (tCO <sub>2</sub> e)	38,654

**SECTION C. Duration of the project activity / Crediting period:****C.1. Duration of the Bundle**

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**C.1.1. Starting date of the Bundle:**

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The starting date of activity is the date signed on the contract of turnkey-base project for each of hydropower plants.

Project activity	Starting Date
Nakdan hydropower plant	27/10/2009
Gumi hydropower plant	27/10/2009



## CDM-SSC-BUNDLE

Chilgok hydropower plant	27/10/2009
GangjeongGoryeong hydropower plant	23/10/2009

**C.2. Choice of crediting period and related information:****C.2.1. Renewable crediting period:****C.2.1.1. Starting date of the first crediting period:**

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Not applicable

**C.2.1.2. Length of the first crediting period:**

&gt;&gt;

Not applicable

**C.2.2. Fixed crediting period:****C.2.2.1. Starting date:**

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01/12/2012 or the registration date whichever is later.

**C.2.2.2. Length:**

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10 years

**SECTION D. Application of a monitoring methodology:**

<b>Data / Parameter:</b>	<b>EG<sub>BL,y</sub></b>
<b>Unit:</b>	MWh/y
<b>Description:</b>	Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year y
<b>Source of data:</b>	The data used in the PDD are obtained from the license for the electric generation business of the proposed project. Actual data will be obtained through on-site measurement.
<b>Value of data:</b>	<b>58,170 MWh/year</b> <ul style="list-style-type: none"> <li>- EG<sub>BL,y,Nakdan</sub> : 14,717 MWh/year</li> <li>- EG<sub>BL,y,Gumi</sub> : 14,767 MWh/year</li> <li>- EG<sub>BL,y,Chilgok</sub> : 15,279 MWh/year</li> <li>- EG<sub>BL,y,GangjeongGoryeong</sub> : 13,407 MWh/year</li> </ul>



## CDM-SSC-BUNDLE

Description of measurement methods and procedures to be applied:	Calculated monthly with on-site monitored data of $EG_{\text{export},y}$ and $EG_{\text{import},y}$ using the formula $EG_{\text{BL},y} = EG_{\text{export},y} - EG_{\text{import},y}$
QA/QC procedures to be applied:	A more detail QA/QC procedures are described in the monitoring plan section of this PDD.
Any comment:	-

<b>Data / Parameter:</b>	<b><math>EG_{\text{export},y}</math></b>
Unit:	MWh/y
Description:	Electricity supplied to the grid by the proposed project in year y
Source of data:	The data used in the PDD are obtained from license for the electric generation business of the proposed project. Actual data will be obtained through on-site measurement.
Value of data:	<b>58,170 MWh/year</b> <ul style="list-style-type: none"> <li>- <math>EG_{\text{export},y,\text{Nakdan}}</math> : 14,717 MWh/year</li> <li>- <math>EG_{\text{export},y,\text{Gumi}}</math> : 14,767 MWh/year</li> <li>- <math>EG_{\text{export},y,\text{Chilgok}}</math> : 15,279 MWh/year</li> <li>- <math>EG_{\text{export},y,\text{GangjeongGoryeong}}</math> : 13,407 MWh/year</li> </ul>
Description of measurement methods and procedures to be applied:	Continuously measured and hourly recorded by the watt-hour meter.
QA/QC procedures to be applied:	<b>Measuring equipment</b> <ul style="list-style-type: none"> <li>- The watt-hour meter shall be set up transparently in accordance with ‘Measures act’ and ‘Rules on the operation of electric utility market’.</li> <li>- The watt-hour meter shall be calibrated regularly in accordance with ‘Measures act’, ‘Rules on the operation of electric utility market’ and ‘General guidelines to SSC CDM methodologies’.</li> <li>- The amount of electricity supplied to the grid will be double checked by receipt of electricity sales.</li> <li>- The allowable error of data measured by the watt-hour meter must be within <math>\pm 0.5\%</math>.</li> </ul>
Any comment:	-

<b>Data / Parameter:</b>	<b><math>EG_{\text{import},y}</math></b>
Unit:	MWh/y
Description:	Electricity imported from the grid by the proposed project in year y





## CDM-SSC-BUNDLE

Source of data:	Assumed as zero in the PDD. Actual data will be obtained through on-site measurement.
Value of data:	0 <ul style="list-style-type: none"><li>- <math>EG_{Import,y,Nakdan}</math> : 0 MWh/year</li><li>- <math>EG_{Import,y,Gumi}</math> : 0 MWh/year</li><li>- <math>EG_{Import,y,Chilgok}</math> : 0 MWh/year</li><li>- <math>EG_{Import,y,GangjeongGoryeong}</math> : 0 MWh/year</li></ul>
Description of measurement methods and procedures to be applied:	Continuously measured and monthly recorded by the watt-hour meter of KEPCO.
QA/QC procedures to be applied:	<b>Measuring equipment</b> <ul style="list-style-type: none"><li>- The watt-hour meter shall be set up transparently in accordance with ‘Measures act’.</li><li>- The watt-hour meter shall be calibrated regularly in accordance with ‘Measures act’ and ‘General guidelines to SSC CDM methodologies’.</li><li>- The amount of electricity imported from the grid will be checked by receipt of KEPCO.</li><li>- The allowable error of data measured by the watt-hour meter must be within <math>\pm 1.0\%</math>.</li></ul>
Any comment:	-