



**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 IX

A.2. Version and Date :

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Version: 04

Date: 17/08/2012

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

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Project activity	Type	Category	Technology/Measure
Hydropower	AMS - I	D	Renewable energy technologies that supply electricity to a grid

Description of the project activity

“K-water hydropower IX”(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 five hydropower plants named as Dalseong, HapcheonChangnyeong, ChangnyeongHaman, Seungchon and Juksan. Dalseong hydropower plant having an installed capacity of 2,856kW is located in Gyeongsangbuk-do. HapcheonChangnyeong and ChangnyeongHaman hydropower plants are located in Gyeongsangnam-do and have an installed capacity of 5,000kW respectively. Seungchon hydropower plant having an installed capacity of 800kW is located in Gwangju city. And Juksan hydropower plant having an installed capacity of 1,220kW is located in Jeollanam-do.

After the implementation of the proposed project, the total amount of annual power generation supplied to the grid is expected to be 79,597 MWh and the estimated annual emission reduction will reach 52,892 tCO₂.



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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 CO₂ emission and environmental pollution caused by fossil fuel consumption.

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 CO₂, SO₂, NO_x.
 - 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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Project activity	Province
Dalseong hydropower plant	Gyeongsangbuk-do
HapcheonChangnyeong hydropower plant	Gyeongsangnam-do
ChangnyeongHaman hydropower plant	Gyeongsangnam-do
Seungchon hydropower plant	Gwangju city
Juksan hydropower plant	Jeollanam-do

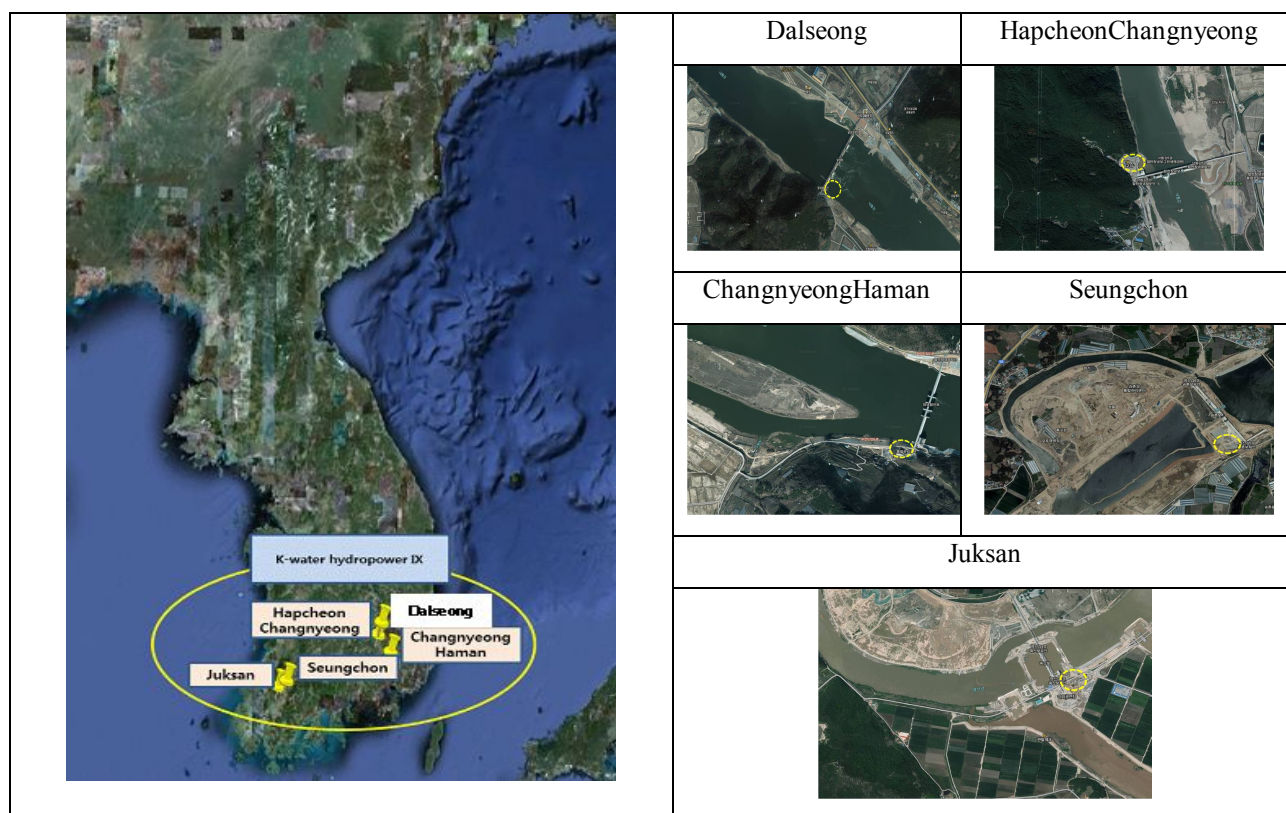
B.1.3. City/Town/Community etc:

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Project activity	City
Dalseong hydropower plant	Goryeong-gun
HapcheonChangnyeong hydropower plant	Hapcheon-gun
ChangnyeongHaman hydropower plant	Haman-gun
Seungchon hydropower plant	Nam-gu
Juksan hydropower plant	Naju-si

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

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<Figure B.1> The geographic location of each project site



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The proposed project of “K-water hydropower IX” has been performed on Nakdong River and Yeongsan 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
Dalseong	456, Inan-ri, Gaejin-myeon, Goryeong-gun, Gyeongsangbuk-do The latitude of 35.732421N° and the longitude of 128.414966E°
Hapcheon Changnyeong	222-3, Samhak-ri, Cheongdeok-myeon, Hapcheon-gun, Gyeongsangnam-do The latitude of 35.590132N° and the longitude of 128.354309E°
Changnyeong Haman	1352, Bongchon-ri, Chilbuk- myeon, Haman-gun, Gyeongsangnam-do The latitude of 35.377410N° and the longitude of 128.551046E°
Seungchon	495-4, Seungchon-dong, Nam-gu, Gwangju city The latitude of 35.067305N° and the longitude of 126.763390E°
Juksan	1175-77, Juksan-ri, Dasi-myeon, Naju-si, Jeollanam-do The latitude of 34.973441N° and the longitude of 126.631345E°

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:

- Type : I – Renewable Energy Projects
- Category : I .D – Grid connected renewable electricity generation

Since the total capacity of hydropower plants in a bundled CDM project activity is 14.876 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 or induction 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 installing and managing the Kaplan turbine.



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

<Table B.2> Dalseong hydropower plant

Classification		Unit	Value
Water Turbine	Type	-	Horizontal Shaft Bevel-Gear Bulb
	Capacity	kW	1,012
	Quantity	Unit	3
Generator	Type	-	3-Phase Synchronous generator
	Quantity	Unit	3
	Rated voltage	kV	0.69
	Output	kW	952
Transformer	Type	-	Mold-Type
	Capacity	kVA	1,250
	Quantity	Unit	3

<Table B.3> HapcheonChangnyeong hydropower plant

Classification		Unit	Value
Water Turbine	Type	-	Horizontal Shaft Kaplan Tubular
	Capacity	kW	2,768
	Quantity	Unit	2
Generator	Type	-	3-Phase Synchronous generator
	Quantity	Unit	2
	Rated voltage	kV	3.3
	Output	kW	2,500
Transformer	Type	-	Mold-Type
	Capacity	kVA	6,500
	Quantity	Unit	2

<Table B.4> ChangnyeongHaman hydropower plant

Classification		Unit	Value
Water Turbine	Type	-	Horizontal Shaft Kaplan Tubular
	Capacity	kW	1,325
	Quantity	Unit	4
Generator	Type	-	3-Phase Synchronous generator
	Quantity	Unit	4
	Rated voltage	kV	0.69
	Output	kW	1,250
Transformer	Type	-	Mold-Type
	Capacity	kVA	1,490
	Quantity	Unit	4

<Table B.5> Seungchon hydropower plant

Classification		Unit	Value
Water Turbine	Type	-	Horizontal Shaft Kaplan Tubular
	Capacity	kW	431



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	Quantity	Unit	2
Generator	Type	-	3-Phase Induction generator
	Quantity	Unit	2
	Rated voltage	kV	0.38
	Output	kW	400
Transformer	Type	-	Mold-Type
	Capacity	kVA	600
	Quantity	Unit	2

<Table B.6> Juksan hydropower plant

Classification		Unit	Value
Water Turbine	Type	-	Horizontal Shaft Kaplan Tubular
	Capacity	kW	670
	Quantity	Unit	2
Generator	Type	-	3-Phase Induction generator
	Quantity	Unit	2
	Rated voltage	kV	0.48
	Output	kW	610
Transformer	Type	-	Mold-Type
	Capacity	kVA	750
	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 528,920 tCO₂.

Year	Estimation of annual emission reductions (tCO ₂ e)
Year 1	52,892
Year 2	52,892
Year 3	52,892
Year 4	52,892
Year 5	52,892
Year 6	52,892
Year 7	52,892
Year 8	52,892
Year 9	52,892
Year 10	52,892
Total emission reductions (tCO ₂ e)	528,920
Total number of crediting years	10
Estimation of annual average emission reductions in the crediting period (tCO ₂ e)	52,892

**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
Dalseong hydropower plant	27/10/2009
HapcheonChangnyeong hydropower plant	27/10/2009
ChangnyeongHaman hydropower plant	23/10/2009
Seungchon hydropower plant	16/10/2009
Juksan hydropower plant	16/10/2009

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:

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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:**Data / Parameter:**EG_{BL,y}



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Unit:	MWh/y
Description:	Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year y
Source of data:	The data used in the PDD are obtained from the electricity business license of the proposed project. Actual data will be obtained through on-site measurement.
Value of data:	79,597 MWh/year <ul style="list-style-type: none"> - $EG_{BL,y,Dalseong}$: 14,968 MWh/year - $EG_{BL,y,HapcheonChangnyeong}$: 25,357 MWh/year - $EG_{BL,y,ChangnyeongHaman}$: 28,937 MWh/year - $EG_{BL,y,Seungchon}$: 4,643 MWh/year - $EG_{BL,y,Juksan}$: 5,692 MWh/year
Description of measurement methods and procedures to be applied:	Calculated monthly with on-site monitored data of $EG_{export,y}$ and $EG_{import,y}$ using the formula $EG_{BL,y} = EG_{export,y} - EG_{import,y}$
QA/QC procedures to be applied:	A more detail QA/QC procedures are described in the monitoring plan section of this PDD.
Any comment:	-

Data / Parameter:	$EG_{export,y}$
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 the electricity business license of the proposed project. Actual data will be obtained through on-site measurement.
Value of data:	79,597 MWh/year <ul style="list-style-type: none"> - $EG_{export,y,Dalseong}$: 14,968 MWh/year - $EG_{export,y,HapcheonChangnyeong}$: 25,357 MWh/year - $EG_{export,y,ChangnyeongHaman}$: 28,937 MWh/year - $EG_{export,y,Seungchon}$: 4,643 MWh/year - $EG_{export,y,Juksan}$: 5,692 MWh/year
Description of measurement methods and procedures to be applied:	Continuously measured and hourly recorded by the watt-hour meter.



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QA/QC procedures to be applied:	Measuring equipment <ul style="list-style-type: none"> - The watt-hour meter shall be set up transparently in accordance with ‘Measures act’ and ‘Rules on the operation of electric utility market’. - 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’. - The amount of electricity supplied to the grid will be double checked by receipt of electricity sales. - The allowable error of data measured by the watt-hour meter must be within $\pm 0.5\%$.
Any comment:	-

Data / Parameter:	$EG_{import,y}$
Unit:	MWh/y
Description:	Electricity imported from the grid by the proposed project in year y
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"> - $EG_{Import,y,Dalseong}$: 0 MWh/year - $EG_{Import,y,HapcheonChangnyeong}$: 0 MWh/year - $EG_{Import,y,ChangnyeongHaman}$: 0 MWh/year - $EG_{Import,y,Seungchon}$: 0 MWh/year - $EG_{Import,y,Juksan}$: 0 MWh/year
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:	Measuring equipment <ul style="list-style-type: none"> - The watt-hour meter shall be set up transparently in accordance with ‘Measures act’. - The watt-hour meter shall be calibrated regularly in accordance with ‘Measures act’ and ‘General guidelines to SSC CDM methodologies’. - The amount of electricity imported from the grid will be checked by receipt of KEPCO. - The allowable error of data measured by the watt-hour meter must be within $\pm 1.0\%$.
Any comment:	-