CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT
FOR BUNDLED SMALL SCALE PROJECT ACTIVITIES
(SSC-CDM-BUNDLE)

SECTION A. General description of the Bundle

A.1. Title of the Bundle

Korea Water Resources Corporation (Kwater) small-scale hydroelectric power plants project Ⅱ (the SeongnamⅡ , the Dalbang-dam, the Juam-dam, Daecheong-dam small-scale hydroelectric power plants construction project)

A.2. Version and Date :

Version 1 (21 March 2006)

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

·The purpose of bundling and the subbundles :

Small-scale hydroelectric power plants construction by Kwater generates electricity as well as socio-economical benefits in local and national level. Construction of above mentioned dams contributes to effective development of hydroelectric power through utilizing environmental friendly energy sources such as surplus hydroelectric power from the existing dams and waterworks, and also abates global warming**.** In addition, it will cope with the increasing demand to electricity and reduce fossil fuels imports in Korea.

Kwater small-scale hydroelectric power plants project (the SeongnamⅡ , the Dalbang-dam, the Juam-dam, Daecheong-dam small scale hydro power plant construction project) consists in 2,330 kW of facility capacity, and power generation of 13,996MWh per year. Major project participant is Kwater.

The project activity contributes to sustainable development as follows:

- Power generation from small-scale hydroelectric power plants reduces consumption of fossil fuels, decreases imports of fossil fuel, and hence brings in national profits.
- As an alternative energy sources, small-scale hydroelectric power does not emit air pollutants or wastes.
- As a renewable energy source, hydroelectric power does not deplete natural resources and therefore it will be used as alternative energy sustainably by future generations.
- There are no Green House Gas (GHG) emissions.
- Construction of small-scale hydroelectricity power plants makes local people approach water for irrigation and household usage much easier and takes advantage of water resources more efficiently.
- Construction of the project and operation brings in reduction in below pollutants as much as the following:

  - CO_2 : 8,697 tons/yr
  - SOx : 16.0 tons/yr
  - NOx : 12.1 tons/yr
  - Dust : 0.8 tons/yr

Above mentioned emission reduction contributes to abatement of global warming as well as prevention of acidification and photochemical reaction.

Classification	Type	Category	Technology/Measure
The Seongnam‖ small-scale hydroelectric	Renewable energy projects	Grid connected renewable electricity generation	Type : Vertical Francis Capacity : 384kW×1ea
The Dalbang-dam small-scale hydroelectric	Renewable energy projects	Grid connected renewable electricity generation	Type : Horizontal Francis Capacity : 180kW×1ea
The Juam-dam small-scale Hydroelectric	Renewable energy projects	Grid connected renewable electricity generation	Type : Horizontal Francis Capacity : 537kW×2ea
The Daecheong-dam small-scale Hydroelectric	Renewable energy projects	Grid connected renewable electricity generation	Type : Propeller (Tubular) Capacity : 413kW×2ea

A.3. Project participants:

<Table 1> Project participants of KOSEP small-scale hydroelectric power plants project (the Samchonpo Thermal Power Plant and Younghung Thermal Power Plant small-scale hydroelectric power plants construction project)

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)
KOREA (host)	• Public entity: Korea Water Resources Corporation (Kwater) – major project participant

B. Technical description of the small-scale project activity :

B.1. Location of the small-scale project activity :

B.1.1. Host Party(ies) :

Republic of Korea

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

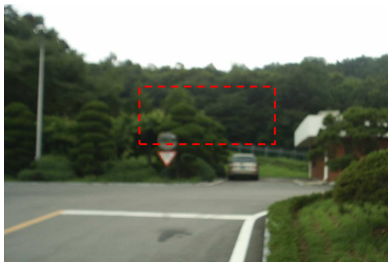
The Seongnam‖ small-scale hydroelectric power plant: GyeongGi-do
The Dalbang-dam small-scale hydroelectric power plant: Gangwon-do
The Juam-dam small-scale hydroelectric power plant: JeollaNam-do
The Daecheong-dam small-scale hydroelectric power plant: Chungcheongbuk-do

B.1.3. City/Town/Community etc:

The Seongnam ‖ small-scale hydroelectric power plant: Seongnam City
The Dalbang-dam small-scale hydroelectric power plant: Donghae City
The Juam-dam small-scale hydroelectric power plant: Suncheon City
The Daecheong-dam small-scale hydroelectric power plant: Cheongwon Gun

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

- The Seongnamll SSC-hydroelectric power plant plant

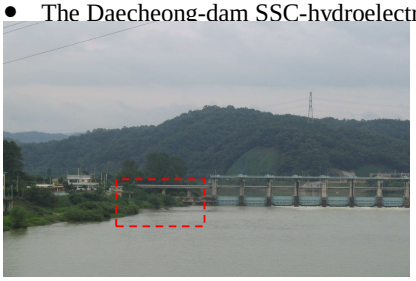


The generator will be constructed on the site in the dotted red line.

- The Dalbang-dam SSC-hydroelectric power plant

The generator will be constructed on the site in the dotted red line.

- The Daecheong-dam SSC-hydroelectric power plant



The generator will be constructed on the site in the dotted red line.

- The Juam-dam SSC-hydroelectric power plant

The generator will be constructed on the site in the red area.

<Figure 1> Location of small-scale power plant and brief description

B.2. Type and category(ies) and technology of the Bundle :

Type : type (i) – Renewable energy projects
Category : D – Grid connected renewable electricity generation

The project falls into 'Renewable energy project' of Type I of 'Appendix B of the simplified modalities and procedures for small-scale CDM project activities' in that Kwater small-scale hydroelectric power

plants project utilizes renewable energy source. Additionally, the project falls into ‘Electricity generation of a grid’ of category D, because electricity generated by renewable energy source is grid-connected.

Type (i) : the added capacity of the proposed projects in the sub bundle will not increase beyond 15MW

The added capacity of these two projects is 2,330kW and this CDM project is SSC project activity.(Gray part of Table1)

<Table1> Description of technology of the small-scale hydroelectric power plants

Classification		The Seongnam‖ small-scale hydroelectric	The Dalbang-dam small-scale hydroelectric	The Juam-dam small-scale Hydroelectric	The Daecheong-dam small-scale Hydroelectric
Wheel	Type	Vertical Francis	Horizontal Francis	Horizontal Francis	Propeller (Tubular)
	Output power	384 kW	180 kW	537 kW	413 kW
	Rotation	450 RPM	900 RPM	720 RPM	225 RPM
	Unit	1	1	2	2
	Total capacity	**384kW/ea×1ea + 180kW/ea×1ea + 537kW/ea×2ea + 413kW/ea×2ea = 2,330kW**			
Generator	Type	Three-phase induction	Three-phase induction	Three-phase induction	Three-phase induction
	Output power	360 KW	170 kW	500 kW	400 kW
	Rotation	450 RPM	900 RPM	720 RPM	225 RPM
Transformer	Type	Mold type	Mold type	Mold type	Mold type
	capacity	500 kVA	250 kVA	1,500 kVA	1,500 kVA
	Volatage	380 V / 22.9 kV	380 V / 22.9 kV	480 V / 22.9kV	0.6 kV / 22.9 kV
	Connect-ion type	□-Y	□-Y	□-Y	□-Y
	Unit	1	1	1	1

As the project activity generates electricity with cooling water of thermal power plants, there are no severe environmental impacts. Accordingly, technology adopted to this project is environmentally safe and sound.

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

60,879 tons of CO_2 emission reduction is estimated for the 7-year period.

Years	Annual estimation of emission reductions in tonnes of CO_2 e
Year 1 (2008.6.1 ~ 2009.5.31)	8,697
Year 2 (2009.6.1 ~ 2010.5.31)	8,697
Year 3 (2010.6.1 ~ 2011.5.31)	8,697
Year 4 (2011.6.1 ~ 2012.5.31)	8,697
Year 5 (2012.6.1 ~ 2013.5.31)	8,697
Year 6 (2013.6.1 ~ 2014.5.31)	8,697
Year 7 (2014.6.1 ~ 2015.5.31)	8,697
Total estimated reductions (tonnes of CO_2 e)	60,879
Total number of crediting years	7
Annual average over the creditng period of estimated reductions (tonnes of CO_2 e)	8,697

C. Duration of the project activity / Crediting period:

C.1. Duration of the Bundle

C.1.1. Starting date of the Bundle

Commercial start of plants is followed;

The Seongnamll small-scale hydroelectric power plant: 30/04/2008

The Dalbang-dam small-scale hydroelectric power plant: 28/02/2007

The Juam-dam small-scale hydroelectric power plant: 30/06/2007

The Daecheong-dam small-scale hydroelectric power plant: 30/04/2007

C.1.2. Expected operational lifetime of the small-scale project activity:

Expected lifetime of equipment is 30 years.

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:

01/06/2008

C.2.1.2. Length of the first crediting period:

7 years

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

N/A

C.2.2.2. Length:

N/A

D. Application of a monitoring methodology and plan:

A. Application of a monitoring methodology

Name: monitoring methodology for Project activity AMS I.D "Grid connected renewable electricity generation"

Reference: Article 9 Type I.D. Appendix B of the simplified modalities and procedures for small-scale CDM project activities.

This bundle includes same type, same category and same technology. The project generates electricity by utilizing small-scale hydroelectric power. The generated electricity is connected to the grid. Therefore the project is included in the category of I.D. The electricity connected to the grid replaces electricity generated by the existing fossil fuel power plants. Accordingly, the reduction of fossil fuel leads to the reduction of CO_2 emission.

To accurately estimate emission reduction by the project, it is necessary to decide which GHGs emit in the boundary and transboundary and how to monitor GHGs emission. Decision on GHGs emission in the boundary and transboundary is done in the following ways:

- Direct emission in the boundary: Small-scale hydroelectric power plant utilizes clean hydro potential energy with the view of generating power, and hence there is no direct emission in the boundary.

- Indirect emission in the boundary: Indirect emission results from electricity used inside the boundary. For the purpose of estimating emission reduction, electricity consumed in the plants is excluded.

- Direct transboundary emission: Fuel transportation in the process of power generation or fuel consumption outside the boundary is not detected in the project activity. There is no direct transboundary emission.

- Indirect transboundary emission: there is zero indirect transboundary emission in the project.

- Leakage: No leakage is associated with the project.

According to the result of defining GHG emission in the project, the amount of emitted GHGs is not important factor for estimating emission reduction. The important factors for estimating emission reduction are emission factor for baseline and electricity generated from the project activity.

B. The monitoring plan is as fallows:

·According to EB21 report Annex21, "Different monitoring plans will be required for bundling and separate monitoring reports must be prepared". This monitoring will provide separate plan and report with SSC hydro power plants. The detail are as follows:

· The Seongnamll Management center

ID number	Data type	Data variable	Data unit	Measured (m), calculated (c), estimated (e),	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	For how long Is archived Data kept?	Comment
EGy*	Electricity quantity	Electricity supplied to the grid by the project	MWh	Directly measured	hourly measurement and monthly recording	100%	Electronic	During the crediting period and two years after	Data will be aggregated weekly, monthly and yearly Double checked against receipt of sales. Electricity transmission except Electricity consumed in the plant *

· The Dalbang-dam Management center

ID number	Data type	Data variable	Data unit	Measured (m), - alculated (c), estimated (e),	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	For how long Is archived Data kept?	Comment
EGy*	Electricity quantity	Electricity supplied to the grid by the project	MWh	Directly measured	hourly measurement and monthly recording	100%	Electronic	During the crediting period and two years after	Data will be aggregated weekly, monthly and yearly Double checked against receipt of sales. Electricity transmission except Electricity consumed in the plant *

· The Juam-dam Management center

ID number	Data type	Data variable	Data unit	Measured (m), calculated (c), estimated (e),	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	For how long Is archived Data kept?	Comment
EGy*	Electricity quantity	Electricity supplied to the grid by the project	MWh	Directly measured	hourly measurement and monthly recording	100%	Electronic	During the crediting period and two years after	Data will be aggregated weekly, monthly and yearly Double checked against receipt of sales. Electricity transmission except Electricity consumed in the plant *

· The Daecheong-dam Management center

ID number	Data type	Data variable	Data unit	Measured (m), calculated (c), estimated (e),	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	For how long Is archived Data kept?	Comment
EGy*	Electricity quantity	Electricity supplied to the grid by the project	MWh	Directly measured	hourly measurement and monthly recording	100%	Electronic	During the crediting period and two years after	Data will be aggregated weekly, monthly and yearly Double checked against receipt of sales. Electricity transmission except Electricity consumed in the plant *

·Quality control (QC) and quality assurance (QA) procedures

1. Monitoring equipment

1-1. Electricity measuring meters shall be set up transparently in accordance with “Law regarding measurement” and “Act on operation of electricity market” and shall be sealed after affirmation of Korea Power Exchange.
1-2. The meters shall be authorized through the due formal certifying process (the valid period for the authorized certification: 7 years.)
1-3. The meters shall be calibrated when they are installed, and re-calibrated every three years after installation.

2. The amount of electricity monitoring

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

3. Management of monitoring and electricity safety

3-1. The person in charge of monitoring and electricity safety shall attend the following courses three times per year.
- Course on ‘Law regarding measurement’
- Course on ‘Act on operation of electricity market
- Course on Electricity safety

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