

**MONITORING REPORT FORM (CDM-MR)**
Version 01 - in effect as of: DD/MM/YYYY**CONTENTS**

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**MONITORING REPORT****Version 01 and date 04/08/2010****Title: Korea Water Resources Corporation (K-water) small-scale hydroelectric power plants project II****(the Seongnam II, the Dalbang-dam, the Juam-dam, Daecheong-dam small-scale hydroelectric)****UNFCCC Reference Number: 0801****2nd Monitoring Period: 01/06/2009 – 31/05/2010****SECTION A. General description of the project activity****A.1. Brief description of the project activity: >>**

>>

- The purpose of the project activity :

The aim of this bundled project activity is to generate electricity and to supply it to the grid using hydro power instead of the fossil fuel, which contributes to mitigation of climate change & sustainable development.

- Measures taken to reduce greenhouse gas emissions :

Since hydro power technology can generate electricity without emitting any greenhouse gas (hereinafter GHG), this project activity contributes to the reduction of GHG by alternating at least one of fossil fuel-fired power plants which would have generated electricity with emitting GHG.

- Installed technology and equipments :

This proposed project bundled four small-scale hydroelectric power plants - the Seongnam II, the Dalbang-dam, the Juam-dam and the Daecheong-dam small scale hydro power plant. And it consists in 2,320kW of facility capacity and power generation of 13,944MWh per year from the bundled four power plants.

| Item | Seongnam II | Dalbang-dam | Juam-dam | Daecheong-dam |
|---------------------------------|-------------|-------------|------------|---------------|
| Unit | 1 | 1 | 2 | 2 |
| Generation Capacity | 360 kW | 170 kW | 495 kW × 2 | 400kW × 2 |
| Total installed Capacity | 360 kW | 170 kW | 990 kW | 800kW |

- Relevant dates for the project activity:

| Item | Seongnam II | Dalbang-dam | Juam-dam | Daecheong-dam |
|-----------------------------------|--------------------|--------------------|--------------------|--------------------|
| Completion of Construction | 31/10/2008 | 18/02/2007 | 08/10/2007 | 18/07/2008 |
| Starting date of operation | 01/10/2008 | 12/02/2007 | 09/04/2007 | 20/06/2008 |
| Continued operation | 01/10/2008-Present | 12/02/2007-Present | 09/04/2007-Present | 20/06/2008-Present |

- Total emission reductions achieved in this monitoring period: 4,870 tCO₂

**A.2. 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) |
|---|---|--|
| Republic of Korea (Host) | Public entity : Korea Water Resources Corporation(K-water) | No |

A.3. Location of the project activity:

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The Seongnam II small-scale hydroelectric power plant:

Sasong-dong, Sujeong-gu, Seongnam city, GyeongGi-do, Republic of Korea Korea
(latitude of 37°24'48.28"N and longitude of 127°6'30.89"E)

The Dalbang-dam small-scale hydroelectric power plant:

Iro-dong, Donghae city, Gangwon-do, Republic of Korea Korea
(latitude of 37°30'16.16"N and longitude of 129°2'20.99"E)

The Juam-dam small-scale hydroelectric power plant:

Gwangcheon-ri, Juam-myeon, Suncheon city, JeollaNam-do, Republic of Korea
(latitude of 35°03'54.96"N and longitude of 127°14'13.93"E)

The Daecheong-dam small-scale hydroelectric power plant:

Nosan-ri, Hyeondo-myeon, Cheongwon-gun, Chungcheongbuk-do, Republic of Korea
(latitude of 36°27'03.29"N and longitude of 127°27'07.81"E)

A.4. Technical description of the project

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

Project Type: I - Renewable energy project

Project Category: D - Grid connected renewable electricity generation

2. Technology/Measure of the project activity

Bundled four small-scale hydroelectric power plants utilize potential energy of water. And this energy is converted to a kinetic energy, which generates electricity without emitting any GHG through rotating water turbines. The total installed capacity is 2.3MW. Refer to the diagrams and tables below.

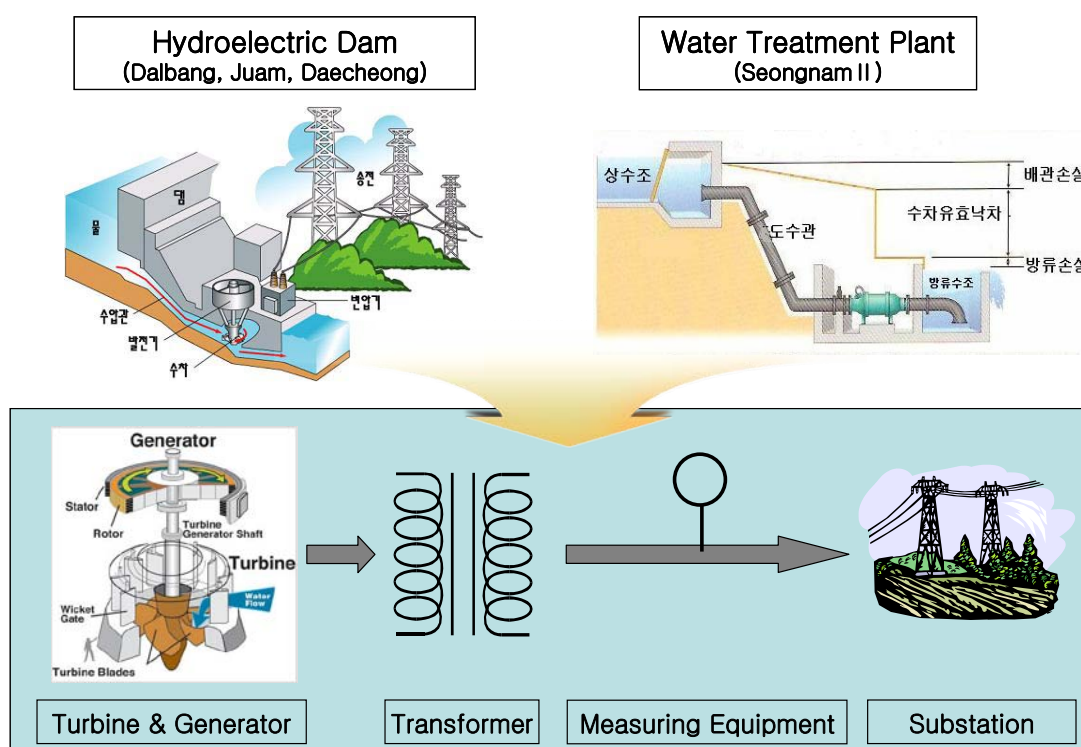


Figure 1. System Diagram of small-scale hydroelectric power plants

Table 1. Description of technology of the small-scale hydroelectric power plants

| Item | | The Seongnam II 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 |
| Generator | Type | Three-phase induction | Three-phase induction | Three-phase induction | Three-phase induction |
| | Output power | 360 kW | 170 kW | 495 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 |
| | Connection type | Δ -Y | Δ -Y | Δ -Y | Δ -Y |
| | Unit | 1 | 1 | 1 | 1 |

**A.5. Title, reference and version of the baseline and monitoring methodology applied to the project activity:**

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The baseline and monitoring methodology of the project referred Appendix B of the simplified modalities and procedures for small-scale CDM project activities.

Approved Methodology: AMS I.D - Grid connected renewable electricity generation (Version 9)

A.6. Registration date of the project activity:

>>

09/02/2007

A.7. Crediting period of the project activity and related information (start date and choice of crediting period):

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Starting date of the first crediting period: 01/06/2008

Length of the total crediting period: 7 years (01/06/2008 ~ 31/05/2015)

A.8. Name of responsible person(s)/entity(ies):

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The name of the responsible person/entity:

- **Deog-Je, Kim/Korea Water Resources Corporation (K-water)**
Tel. +82-42-629-2962 (kdj@kwater.or.kr)
- **Jung-Suk, Jang/Korea Water Resources Corporation (K-water)**
Tel. +82-42-629-2963 (detente41@kwater.or.kr)

**SECTION B. Implementation of the project activity****B.1. Implementation status of the project activity**

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1. Relevant dates of the project activity:

| Item | Seongnam II | Dalbang-dam | Juam-dam | Daecheong-dam |
|----------------------------|--------------------|--------------------|--------------------|--------------------|
| Completion of Construction | 31/10/2008 | 18/02/2007 | 08/10/2007 | 18/07/2008 |
| Starting date of operation | 01/10/2008 | 12/02/2007 | 09/04/2007 | 20/06/2008 |
| Continued operation | 01/10/2008-Present | 12/02/2007-Present | 09/04/2007-Present | 20/06/2008-Present |

2. The information regarding the actual operations:

There were some events such as overhaul times, downtimes of equipment, exchange of equipment in several sites during the monitoring period from 01 June 2009 to 31 May 2010.

| Item | Seongnam II | Dalbang-dam | Juam-dam | Daecheong-dam |
|------------------------------|-------------|-------------|--|--|
| Overhaul | N/A | Feb. 2010 | generator I : Mar. 2010 generator II : Feb. to Mar. 2010 | N/A |
| Downtimes | N/A | N/A | 3 times (10/08/2009, 17/12/2009, 18/05/2010) | 1 times (the period of breakdown of runners in May 2010) |
| Exchange of equipment | N/A | N/A | Exchange of runners - generator I : Mar.2010 - generator II : Oct.2009 | Exchange of runners - generator I : May 2010 |

3. Events or situations which may impact on the applicability of the methodology:

Even though overhauls, troubles which cause downtimes, exchanges of equipment had been occurred in some small-scale hydroelectric power plants, there were no events may impact on the applicability of the methodology such as increases in capacity of facilities. And, the implementation of the project had been performed in good conditions generally and followed by the descriptions in the registered PDD.

B.2. Revision of the monitoring plan

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N/A

B.3. Request for deviation applied to this monitoring period

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N/A

B.4. Notification or request of approval of changes

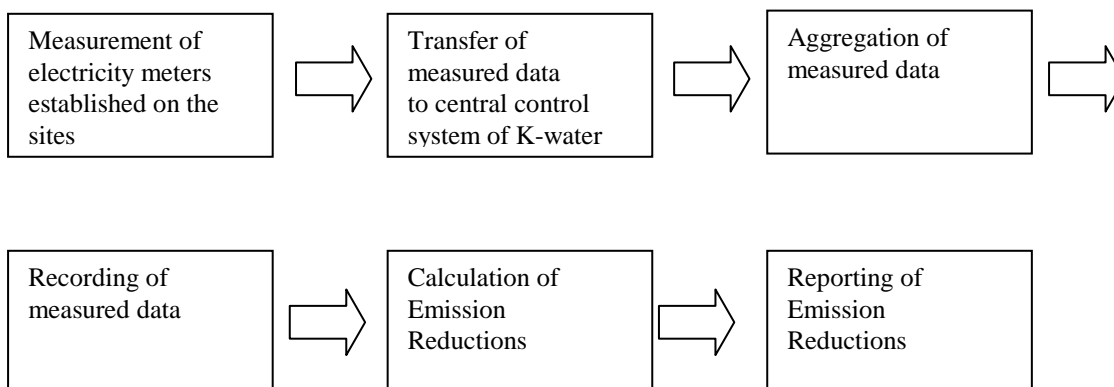
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Notification for changes in PDD has been approved on 18 Feb 2010 from UNFCCC secretariat. And there is no more notification or request of approval of changes during this monitoring period.

SECTION C. Description of the monitoring system

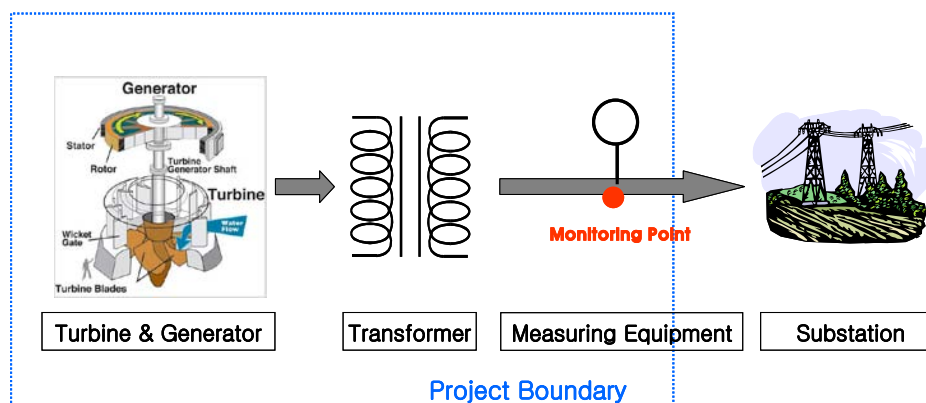
1. Data collection procedure

Data collection procedure is as follows;



| Procedure | Unit | methods | Frequency | Remarks |
|---------------------------------|------------------|-----------|--------------------------------------|---------|
| Data Measuring | kWh | Automatic | Hourly | |
| Measured Data Transfer | kWh | Automatic | Daily | |
| Measured Data Aggregation | kWh | Automatic | Weekly | |
| Measured Data Recording | kWh | Automatic | Monthly | |
| Emission Reductions Calculation | tCO ₂ | Manual | After the related monitoring periods | |
| Emission Reductions Reporting | tCO ₂ | Manual | After the related monitoring periods | |

2. Monitoring Points for the Project

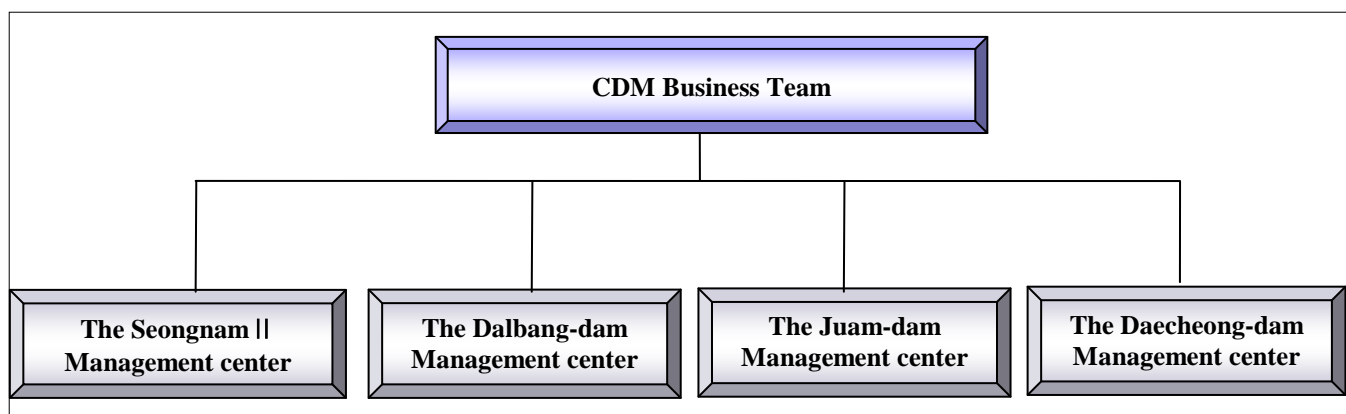


Monitoring Points are located at each places (Seongnam II, Dalbang, Juam, Daechong). Electricity monitored by wattmeter with accuracy range $\pm 0.5\%$ is delivered to the grid by the project.

3. QA/QC procedures

- Electricity measuring meters were set up transparently in accordance with “Law regarding measurement” and “Act on operation of electricity market” then sealed after affirmation of Korea Power Exchange.
- The meters were calibrated when they were installed, and re-calibrated every three years after installation.
- The amount of electricity transmitted to the grid is measured automatically by established meters. The measured data are simultaneously transferred to central control system of K-water and Korea Power Exchange.
- The collected data of K-water was double checked with those of Korea Power Exchange.

4. Monitoring organization structure, roles and responsibilities



Department in charge of monitoring for the project and responsible department are as follows:

- Department in charge of monitoring (including Operation & Maintenance of facilities. etc.)
: the Seongnam II management center, Dalbang-dam management center, the Juam-dam management center, Daecheong-dam management center.
- Responsible department (project management, Emission Reductions calculation and reporting)
: CDM Business Team

5. Emergency procedure:

- In case unexpected accident which affects Emission Reductions is occurred, the person in charge of monitoring should report to the responsible department(CDM Business Team) and act according to the internal manual in emergency.
- In case meters are improperly operated or the transfer of data is in error, internal investigation and correction procedure shall be followed and be certified by the final decision-maker and Korea Power exchange.

**SECTION D. Data and parameters****D.1 Data and parameters determined at registration and not monitored during the monitoring period, including default values and factors**

| | |
|--|--|
| Data / Parameter: | EF _{OM} |
| Data unit: | tCO ₂ /MWh |
| Description: | operating margin emission factor |
| Source of data used: | calculated |
| Value(s) : | 0.7710 |
| Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations) | - This value was calculated according to <i>Tool to calculate the emission factor for an electricity system</i> . Applied value was calculated by referring Statistics of Electric Power in KOREA (2003, 2004, 2005) (KEPCO). - This value is used for CO ₂ emissions factor of grid (EF). |
| Additional comment: | This value is supposed to be calculated once at the time of PDD submission. |

| | |
|--|--|
| Data / Parameter: | EF _{BM} |
| Data unit: | tCO ₂ /MWh |
| Description: | build margin emission factor |
| Source of data used: | calculated |
| Value: | 0.4718 |
| Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations) | - This value was calculated according to <i>Tool to calculate the emission factor for an electricity system</i> . Applied value was calculated by referring Statistics of Electric Power in KOREA (2003, 2004, 2005) (KEPCO). - This value is used for CO ₂ emissions factor of grid (EF). |
| Additional comment: | This value is supposed to be calculated once at the time of PDD submission. |

| | |
|--|---|
| Data / Parameter: | EF |
| Data unit: | tCO ₂ /MWh |
| Description: | CO ₂ emissions factor of grid |
| Source of data used: | calculated |
| Value(s) : | 0.6214 |
| Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations) | - This value was calculated according to <i>Tool to calculate the emission factor for an electricity system</i> . Applied value was calculated by referring Statistics of Electric Power in KOREA (2003, 2004, 2005) (KEPCO). - This value is used for baseline emission calculations. |
| Additional comment: | This value is supposed to be calculated once at the time of PDD submission. |

D.2. Data and parameters monitored



▪ Seongnam II

| | |
|---|---|
| Data / Parameter: | EG _{1,y} |
| Data unit: | MWh |
| Description: | Electricity supplied to the grid from Seongnam II small-scale power plant |
| Measured /Calculated/Default: | Measured |
| Source of data: | Monthly records |
| Value(s) of monitored parameter: | Total electricity generation is 1,480,554kWh. |
| Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations) | This value is used for Baseline emission calculations. |
| Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity) | Measurement equipment: Watt-hour meter Accuracy: Allowable error range $\pm 0.5\%$ Serial number: 51001382 Calibration information - Number of meters: 1 meter - Calibration Frequency: within 3 years - Date of last calibration: 22/09/2008 - Validity period: 22/09/2008 – 21/09/2011 |
| Measuring/ Reading/ Recording frequency: | Measuring/Reading: hourly Recording: monthly |
| Calculation method (if applicable): | N/A |
| QA/QC procedures applied: | The amount of electricity transmitted to the grid was automatically measured and transferred to Korea Power Exchange (KPX) and K-water, so it was double checked by both entities. |

▪ Dalbang-dam

| | |
|---|--|
| Data / Parameter: | EG _{2,y} |
| Data unit: | MWh |
| Description: | Electricity supplied to the grid from Dalbang-dam small-scale power plant |
| Measured /Calculated/Default: | Measured |
| Source of data: | Monthly records |
| Value(s) of monitored parameter: | Total electricity generation is 837,603kWh. |
| Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations) | This value is used for Baseline emission calculations. |
| Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity) | Measurement equipment: Watt-hour meter Accuracy: Allowable error range $\pm 0.5\%$ Serial number: 6063962 Calibration information - Number of meters: 1 meter - Calibration Frequency: within 3 years - Date of last calibration: 26/05/2009 - Validity period: 26/05/2009 – 25/05/2012 |
| Measuring/ Reading/ Recording frequency: | Measuring/Reading: hourly Recording: monthly |



| | |
|-------------------------------------|--|
| Calculation method (if applicable): | N/A |
| QA/QC procedures applied: | The amount of electricity transmitted to the grid was automatically measured and transferred to Korea Power Exchange (KPX) and K-water, so it was double checked by both entities. |

▪ Juam-dam

| | |
|---|--|
| Data / Parameter: | EG _{3,y} |
| Data unit: | MWh |
| Description: | Electricity supplied to the grid from Juam-dam small-scale power plant |
| Measured /Calculated/Default: | Measured |
| Source of data: | Monthly records |
| Value(s) of monitored parameter: | Total electricity generation is 3,191,633kWh. |
| Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations) | This value is used for Baseline emission calculations. |
| Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity) | Measurement equipment: Watt-hour meter Accuracy: Allowable error range $\pm 0.5\%$ Serial number: 6063960 Calibration information - Number of meters: 1 meter - Calibration Frequency: within 3 years - Date of last calibration: 22/09/2009 - Validity period: 22/09/2009 – 21-09/2012 |
| Measuring/ Reading/ Recording frequency: | Measuring/Reading: hourly Recording: monthly |
| Calculation method (if applicable): | N/A |
| QA/QC procedures applied: | The amount of electricity transmitted to the grid was automatically measured and transferred to Korea Power Exchange (KPX) and K-water, so it was double checked by both entities. |

▪ Daecheong-dam

| | |
|---|---|
| Data / Parameter: | EG _{4,y} |
| Data unit: | MWh |
| Description: | Electricity supplied to the grid from Daecheong-dam small-scale power plant |
| Measured /Calculated/Default: | Measured |
| Source of data: | Monthly records |
| Value(s) of monitored parameter: | Total electricity generation is 2,328,381kWh. |
| Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations) | This value is used for Baseline emission calculations. |
| Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of | Measurement equipment: Watt-hour meter Accuracy: Allowable error range $\pm 0.5\%$ Serial number: 4543285 |



| | |
|--|---|
| last calibration, validity) | Calibration information - Number of meters: 1 meter - Calibration Frequency: within 3 years - Date of last calibration: 23/04/2008 - Validity period: 23/04/2008 – 22/04/2011 |
| Measuring/ Reading/ Recording frequency: | Measuring/Reading: hourly Recording: monthly |
| Calculation method (if applicable): | N/A |
| QA/QC procedures applied: | The amount of electricity transmitted to the grid was automatically measured and transferred to Korea Power Exchange (KPX) and K-water, so it was double checked by both entities. |

**SECTION E. Emission reductions calculation****E.1. Baseline emissions calculation**

>>

According to the formula below, baseline emissions for this project is 4,870 tCO₂.

$$BE = EG \times EF$$

| | | |
|----|---|---|
| BE | = | Baseline emissions(tCO ₂) |
| EG | = | electricity transferred to a grid(MWh) |
| EF | = | Baseline emission factor(tCO ₂ /MWh) |

| Section | | Seongnam II | Dalbang-Dam | Juam-Dam | Daechyeong-Dam | Subtotal (kWh) | Baseline Emission Factor (tCO ₂ /MWh) | Baseline Emissions (tCO ₂) |
|---------|-------|-------------------|-------------------|-------------------|-------------------|----------------|--|--|
| | | Electricity (kWh) | Electricity (kWh) | Electricity (kWh) | Electricity (kWh) | | | |
| 2009 | JUN. | 81,550 | 106,401 | 6,549 | 37,387 | 231,887 | 0.6214 | 144.1 |
| | JUL. | 126,701 | 106,702 | 416,353 | 114,979 | 764,735 | 0.6214 | 475.2 |
| | AUG. | 129,429 | 130,986 | 667,408 | 245,581 | 1,173,403 | 0.6214 | 729.2 |
| | SEP. | 135,826 | 56,790 | 437,265 | 189,747 | 819,627 | 0.6214 | 509.3 |
| | OCT. | 114,062 | - | 87,686 | 63,631 | 265,379 | 0.6214 | 164.9 |
| | NOV. | 105,263 | 82,629 | 35,947 | 2,299 | 226,138 | 0.6214 | 140.5 |
| | DEC. | 113,352 | 58,053 | 80,313 | 105,249 | 356,966 | 0.6214 | 221.8 |
| 2010 | JAN. | 145,048 | 48,753 | 4,699 | 135,024 | 333,524 | 0.6214 | 207.3 |
| | FEB. | 136,110 | 69,805 | 1,143 | 201,001 | 408,060 | 0.6214 | 253.6 |
| | MAR. | 144,752 | 123,392 | 174,838 | 422,205 | 865,188 | 0.6214 | 537.6 |
| | APR. | 129,919 | 54,092 | 697,182 | 438,734 | 1,319,927 | 0.6214 | 820.2 |
| | MAY | 118,541 | - | 582,251 | 372,546 | 1,073,338 | 0.6214 | 667.0 |
| | TOTAL | 1,480,554 | 837,603 | 3,191,634 | 2,328,382 | 7,838,173 | 0.6214 | 4,870.6 |

E.2. Project emissions calculation

>>

GHG emissions due to the project activity are not occurred.

Project emission is zero;

PE = 0.

E.3. Leakage calculation

>>

Leakage due to the project activity is not occurred.

Project leakage is zero;

PL = 0.

E.4. Emission reductions calculation / table

>>

ER(Emission reductions) = BE – PE – PL = 4,870.6 – 0 – 0 = 4,870.6

(unit : tCO₂)

| | Period | Baseline Emissions | Project Emissions | Leakage | Emission Reductions |
|------|--------------|--------------------|-------------------|----------|---------------------|
| 2009 | JUN. | 144.1 | 0 | 0 | 144.1 |
| | JUL. | 475.2 | 0 | 0 | 475.2 |
| | AUG. | 729.2 | 0 | 0 | 729.2 |
| | SEP. | 509.3 | 0 | 0 | 509.3 |
| | OCT. | 164.9 | 0 | 0 | 164.9 |
| | NOV. | 140.5 | 0 | 0 | 140.5 |
| | DEC. | 221.8 | 0 | 0 | 221.8 |
| 2010 | JAN. | 207.3 | 0 | 0 | 207.3 |
| | FEB. | 253.6 | 0 | 0 | 253.6 |
| | MAR. | 537.6 | 0 | 0 | 537.6 |
| | APR. | 820.2 | 0 | 0 | 820.2 |
| | MAY | 667.0 | 0 | 0 | 667.0 |
| | Total | 4,870.6 | 0 | 0 | 4,870.6 |

∴ According to the table above, total emission reductions are 4,870 tCO₂.

**E.5. Comparison of actual emission reductions with estimates in the CDM-PDD**

>>

| Item | Values applied in ex-ante calculation of the registered CDM-PDD | Actual values reached during the monitoring period |
|---|---|--|
| Emission reductions (tCO ₂) | 8,664 | 4,870 |

This project was estimated to reduce 8,664 tCO₂e according to the registered CDM-PDD. But during the 2nd monitoring period from 1st June 2009 to 31th May 2010, the net electricity supplied to the grid was 7,838,173 kWh, which resulted in reducing of 4,870 tCO₂e. Therefore, the actual value was lower by 3,794 tCO₂e than the estimated value in CDM-PDD.

E.6. Remarks on difference from estimated value in the PDD

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The emission reductions totally depend on the electricity generation in this project and the amount of electricity generation was increased compared to those of 1st monitoring period but lower than the estimates in CDM-PDD as ever.

The key reasons are owing to the drought at the area of Juam-dam, Dalbang-dam and Daechong-dam which has been lasted from the 1st monitoring period. Therefore, the actual emission reductions are lower than the estimated value in the PDD and we confirm there is no significant increase during this monitoring period.