



**PROGRAMME DESIGN DOCUMENT FORM FOR
SMALL-SCALE CDM PROGRAMMES OF ACTIVITIES (F-CDM-SSC-PoA-DD)
Version 02.0**

PROGRAMME OF ACTIVITIES DESIGN DOCUMENT (PoA-DD)

PART I. Programme of activities (PoA)

SECTION A. General description of PoA

A.1. Title of the PoA

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Programme of Activities to introduce renewable energy system into collective housing, Republic of Korea

Version: 8

Date: 03/12/2012

A.2. Purpose and general description of the PoA

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Policy/measure or stated goal of the PoA

The objective of this PoA is to reduce electricity based on coal or other carbon-intensive fossil fuels and thus to reduce the associated CO₂ emissions in Republic of Korea.

In Korea, the Government develops policies concerning the promotion of the technological development, use and distribution of renewable energy¹. However, the Government doesn't mandate the photovoltaic power plants to introduce renewable energy systems.

CME will implement to contribute to the preservation of the environment, the sound and sustainable development of the national economy, and the promotion of national welfare by diversifying energy sources through the promotion of technological development, use and distribution of solar energy. This PoA will contribute to activities aimed at growing and strengthening the solar industry in Republic of Korea.

Through this PoA, it helps to achieve the measure for efficient use of energy by introducing photovoltaic power plants to collective housing in order to promote the "Green Home 100 million distribution projects" of the government

General operating and implementing framework of PoA

The programme of activities (hereafter referred to as the "PoA") involve applying photovoltaic power plant system in collective housing. The programme is geographically located in Republic of Korea. These renewable energy systems will displace existing energy source based on fossil fuel and reduce GHG emissions. The PoA will be coordinated and managed by Korea Land & Housing Corporation² (hereafter referred to as LH Corporation). The generated electricity will be supplied to households displacing

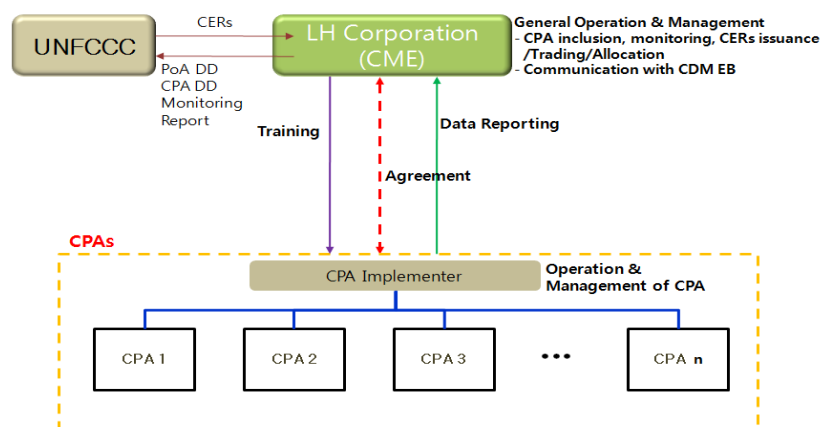
¹ It is based on "Act on the promotion of the development, use and diffusion of new and renewable energy". This act is enforced on 01/07/2005.

² Korea Land & Housing Corporation(LH Corporation) is one of the largest Korean Public Enterprise which has the role of improving national house life and efficient use of the country land with proper development, maintenance and management.

electricity supplied from KEPCO(Korea Electric Power Corporation, hereinafter referred to as KEPCO) grid.

This PoA will consist of project activities that install a new photovoltaic power plant on collective housing where there was no renewable energy power plant operation prior to the implementation of the project activity(Greenfield plant). The installed capacity of each CPA is less than or equal to 15MW.

LH Corporation as a CME will manage general operation of PoA. In Korea, public entities including CME as well as private entities that introduce the photovoltaic power generation to collective housing and satisfy the eligibility criteria of B.2 in Part I could be participated as a CPA implementer. The respective role for PoA operation is described in Section C of Part I and the framework is below.



<Figure A.1. General operating and implementing framework of PoA>

Confirmation that the proposed PoA is a voluntary action by the coordinating/managing entity

This PoA is a scheme developed by LH Corporation to introduce renewable energy system into collective housing. There are no mandatory law in Korea to enforce introduction of renewable energy system to collective housing.

Therefore, the PoA is a voluntary action, not required by law, undertaken by LH Corporation who is the coordinating/managing entity for the PoA and host country approval to this PoA will confirm a voluntary action.

Contribution to sustainable development

The proposed PoA will contribute to sustainable development such as acquaintance of advanced technological experiences and maintenance know-how, creation of job opportunities in the country as follows:

- Social/ Technological aspects
 - The proposed project can diversify sources of electric generation and be a model case as a PV power plant that utilizes solar energy.
 - The proposed project will contribute to revitalization of local energy industry under the corporation of a local government.
- Economical aspects
 - The proposed project will supply households with the available electric power and contribute to national energy supply.

- The proposed project will create job opportunities directly and indirectly through construction and operation of the plant.
 - The proposed project will improve the local residents' living standard.
- Environmental and National aspects
 - The photovoltaic power plant replaces coal-fired power plants and contributes to reduce GHG emissions of the nation.
 - The plant will contribute toward improvement of air quality and better living conditions of the country by reducing the air pollution.

A.3. CMEs and participants of PoA

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(a) CME of the PoA as the entity which communicates with the Board

Korea Land & Housing Corporation (LH Corporation)

(b) Project participants being registered in relation to the PoA. (Project participants may or may not be involved in one of the CPAs related to the PoA.)

Ecoeye Co., Ltd.

A.4. Party(ies)

Name of Party involved (host) indicates a host Party	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Republic of Korea (host)	<ul style="list-style-type: none">• Public entity :<ul style="list-style-type: none">- Korea Land & Housing Corporation(CME)• Private entity :<ul style="list-style-type: none">- Ecoeye Co., Ltd.	No

A.5. Physical/ Geographical boundary of the PoA

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All SSC-CPAs associated with this PoA will be implemented within the geographical boundary of Korea.



<Figure A.2. PoA boundary>

A.6. Technologies/measures

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The SSC-CPA comprises renewable energy generation units, such as photovoltaic power plants that supply electricity to users and will displace electricity from an electricity distribution system that is or would have been supplied by KEPCO grid.

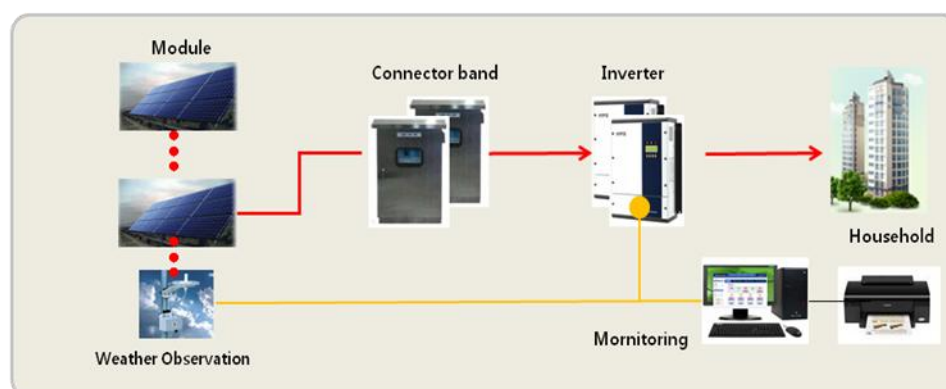
Each SSC-CPA will install renewable energy systems such as photovoltaic power plant systems on collective housing. These systems will reduce electricity based on fossil fuels in collective housing. Each SSC-CPA is comprised of collective housing in Republic of Korea. The renewable energy systems are newly constructed by one or more project owners.

All installed solar modules shall be certificated by Korea Energy Management Corporation (hereafter KEMCO) as renewable energy equipment.³ Though it ensures the performance and reliability of a renewable energy system in Korea, the renewable energy technologies employed in each SSC-CPA may differ slightly from one CPA to the next.

The photovoltaic power plant system under each SSC-CPA should correspond to AMS-I.F (version 2) methodology. The photovoltaic system converts solar radiation into electric energy and supplies electricity to the user or grid. It replaces electricity supplied from grid. The technology applied in the system is as follows:

- Solar module : Generate electricity from solar radiation
- Inverter : Invert generated DC electricity to AC electricity for use

³ Renewable energy equipment certification is based on “Act on the Promotion of the Development, Use and Diffusion of New and Renewable Energy”. KEMCO certifies renewable energy equipments to ensure performance of the system.



<Figure A.3. Photovoltaic power plant system>

A.7. Public funding of PoA

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The proposed PoA will not receive any public funds resulting from official development assistance from Parties included in Annex I.

SECTION B. Demonstration of additionality and development of eligibility criteria

B.1. Demonstration of additionality for PoA

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- (i) The proposed PoA is a voluntary coordinated action;

The proposed PoA is a voluntary coordinated action by LH Corporation to support development and implementation of renewable energy system. In Korea, there is no mandatory policy/regulation that introduces the renewable energy systems to collective housing.

- (ii) If the PoA is implementing a voluntary coordinated action, it would not be implemented in the absence of the PoA;

As the PoA consist of one or more small-scale projects as CPAs, the additionality is demonstrated at the CPA level using eligibility criteria derived by “Guidelines on the demonstration of additionality of small-scale project activities (EB 68, Annex 27, Version 09.0).

The paragraph 2 of this guideline describes that documentation of barriers⁴ is not required for the positive list of technologies and project activity types that are defined as automatically additional for project sizes up to and including the small-scale CDM thresholds (e.g. installed capacity up to 15 MW). The positive list comprises of:

- (a) The following grid-connected and off-grid renewable electricity generation

- (i) Solar technologies (photovoltaic and solar thermal electricity generation);
- (ii) Off-shore wind technologies;
- (iii) Marine technologies (wave, tidal);
- (iv) Building-integrated wind turbines or household rooftop wind turbines of a size up to 100 kW;

⁴ It is based on the paragraph 1 of the “Guidelines on the demonstration of additionality of small-scale project activities(EB 68, Annex 27, Version 09.0). The barriers are investment barrier, technological barrier, barrier due to prevailing practice and other barriers.

As the each CPA applies the positive list technology of off-grid photovoltaic electricity generation that are defined as automatically additional, CPAs would not be implemented in the absence of this PoA.

Assessment and demonstration of additionality for a typical SSC-CPA

As discussed above, the additionality is demonstrated at the CPA level.

“Guidelines on the demonstration of additionality of small-scale project activities(EB 68, Annex 27, Version 09.0)” suggests that the positive list of off-grid renewable electricity generation technologies are automatically defined as additional, without further documentation of barriers. The list includes the photovoltaic power generation activities that are off-grid renewable electricity generation with the installed capacity up to 15 MW, which corresponds to the typical CPA of this PoA.

Key criteria and data for assessing additionality of a SSC-CPA:

The SSC-CPA follows key criteria below for assessing additionality.

<Table B.1. Key criteria for assessing additionality >

Criteria	Description
1	Total installed capacity of photovoltaic power plants applied in the SSC-CPA is up to 15 MW.

If the SSC-CPA satisfies the Criteria 1 above, the SSC-CPA is automatically additional corresponding the positive list.

B.2. Eligibility criteria for inclusion of a CPA in the PoA

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The eligibility criteria for inclusion of CPA in the PoA:

The SSC-CPA to be included in the PoA should satisfy all assessment .

<Table B.2. Eligibility criteria>

No	Eligibility criteria
1	The CPA is performed within the Republic of Korea.
2	The CPA applies photovoltaic power plants to collective housing and the installed capacity is less than or equal to 15MW.
3	The CPA is not involved in another renewable energy project that is registered or under validation as a CDM project activity or as a CPA under another PoA, in accordance with the signed certificate by CPA implementer.
4	The solar modules obtain certification for new and renewable energy facilities from facility certification institution.
5	The CPA has the documentary evidence to check its start date and does not commence prior to the start date of validation for PoA (01/09/2011)

6	The CPA meets the applicability of AMS-I.F as described in B.2 of Part II in PoA-DD.
7	The CPA meets the requirements pertaining to demonstration of additionality in B.5 of Part II in PoA-DD.
8	The CPA performs local stakeholder consultation before the inclusion of SSC-CPA.
9	The CPA considers the environmental impacts analysis according to the regulation of the Republic of Korea.
10	The CPA has the documentary evidence to check project costs and does not result in a diversion of official development assistance from Annex I.
11	The CPA is applicable to use the simplified modalities and procedures for small-scale project activities through the de-bundling check.
12	The CPA makes the agreement with CME to involve the CPA in PoA and obtain CERs rights. In case that CPA implementer is same with CME, the agreement is not necessary.

Provisions for updating eligibility criteria

It is based on standard for "Demonstration of additionality, development of eligibility criteria and application of multiple methodologies for programme of activities, version 02.1(EB 70, Annex 5)". CME will follow the process below.

i) In case the version of AMS-I.F methodology applied by PoA is revised or replaced,

Whenever the EB meeting report is issued, CME will check whether the version of AMS-I.F methodology is revised or replaced or not. If the version of the methodology is revised or replaced, CME will follow the process below.

- If the version of the AMA-I.F methodology is revised or replaced, subsequent to being placed on hold, the CME shall update the eligibility criteria to the requirements of the revised or new methodologies with immediate effect. A new version of the PoA DD containing updated eligibility criteria validated⁵ by a DOE shall be submitted to the Board for approval.
 - (a) Once changes have been approved by the Board, the inclusion of all new CPAs shall be based on the updated eligibility criteria;
 - (b) CPAs that were included before the methodology was put on hold shall apply the revised version containing updated eligibility criteria only at the time of the renewal of the crediting period.
- CME will not take the action if the version of methodologies applied by the PoA is revised without being placed on hold or is withdrawn for the purpose of inclusion in a consolidated methodologies, unless otherwise indicated in the respective report of the meeting of the Board that has approved the new methodologies.

ii) In case of the renewal of the crediting period of a PoA (the renewal of the first CPA),

⁵ In this case, the stakeholder consultation is not required.

CME shall update the eligibility criteria as per the latest revised AMS-I.F methodology. A new version of the PoA-DD containing updated eligibility criteria validated⁶ by a DOE shall be submitted to the secretariat for approval by the Board in accordance with the renewal of PoA process as defined in the "Clean development mechanism project cycle procedure, version 03.1(EB 70, Annex 4)" and CME will follow the process below.

- (a) Once changes have been approved by the Board, the inclusion of all new CPAs shall be based on the revised eligibility criteria;
- (b) The subsequent CPAs requesting the renewal of the crediting period shall apply the revised version containing updated eligibility criteria.

B.3. Application of methodologies

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The project activity will displace electricity from an electricity distribution system that is or would have been supplied by at least one fossil fuel fired generating unit. i.e., in the absence of the project activity, the users would have been supplied electricity from one or more sources among a national or a regional grid, fossil fuel fired captive power plant and a carbon intensive mini-grid.

As the PoA produces electricity and displaces the electricity supplied from grid, AMS-I.F methodology is applicable to SSC-CPAs which introduce photovoltaic power plant system.

Methodology Title:

AMS-I.F – Renewable electricity generation for captive use and mini-grid (version 02)

SECTION C. Management system

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The operational and management for this PoA will be based on CDM OPERATION MANUAL for PoA and this manual involves the following procedures in order to implement and manage each CPA by CME.

- a. Roles, Responsibilities and Competencies
- b. CPA Management and Inclusion
- c. Training
- d. Monitoring
- e. Document and Data Control
- f. Internal Quality Audit
- g. Continuous Improvements of CDM Operation Manual

Since this manual is subject to continual improvement by the improvement annually, the requests of CPA implementer, replacement or inclusion of procedures, , internal audit and CAR/CL/FAR of DOE, its content and possibly even structure can be expected to vary over time. Nevertheless, any changes that a DOE might observe at inclusion of CPAs after validation of the PoA will be documented through the procedure for continuous improvement.

In this PoA, the role for operation of PoA is as below:

Coordinating/managing entity (LH Corporation)

⁶ In this case, the stakeholder consultation is not required

- CDM registration and verification, communication etc. with DOE and CDM EB
- Providing CPA implementers with guidance for proper CDM monitoring activity and other CDM-related process
- General management of monitoring parameter of all CPAs
- Inclusion of new CPAs
- Double counting check
- Ensure monitoring plan and establish the monitoring system
- Verification and storage of monitoring data
- Make the monitoring report
- CERs allocation with CPA implementer according to agreements, etc.

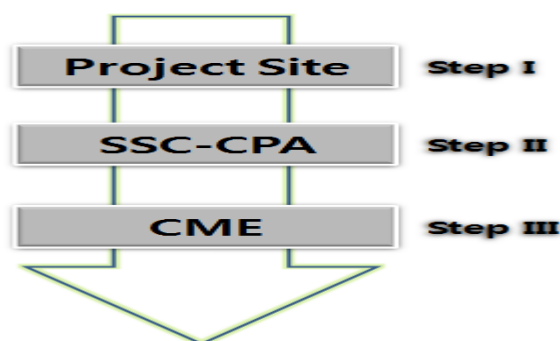
CPA implementer

- Construction and operation of photovoltaic power generation facility
- Direct CDM monitoring activity
- Data recording, collection, archive
- Data reporting
- Installation and management of monitoring equipment including QA/QC activities, etc.

In addition, CME will implement the following operational elements to ensure proper management and control this proposed PoA.

(i) A record keeping system for each CPA under the PoA

The CME has established a profound system in order to maintain robustness of record keeping. The flow of data under the PoA will occur at three different steps as follows:



<Figure C.1. Typical data flow >

As described in the above flow, the data generated at project site(Step I) will first flow to the SSC-CPA(Step II) and is then finally archived at the CME(Step III). In case the SSC-CPA is implemented by CME, the flow of data can be simplified.

Project Site(Step I) : The record keeping at the project site will be executed by using field instruments, software installed and/or manual data recording in register. Since the SSC-CPA under the PoA implements off grid photovoltaic power plant systems, the quantity of net electricity displaced by the project shall be monitored at each site. The quantity of net electricity which are the difference between the total quantity of electricity generated by project and the auxiliary electricity consumption shall be calculated by the metering system installed at the project site. Appropriate records supplied from each of the project sites will be kept for future verifications. In addition, details and calibration records of meter used for measurement of data will be kept for verification.

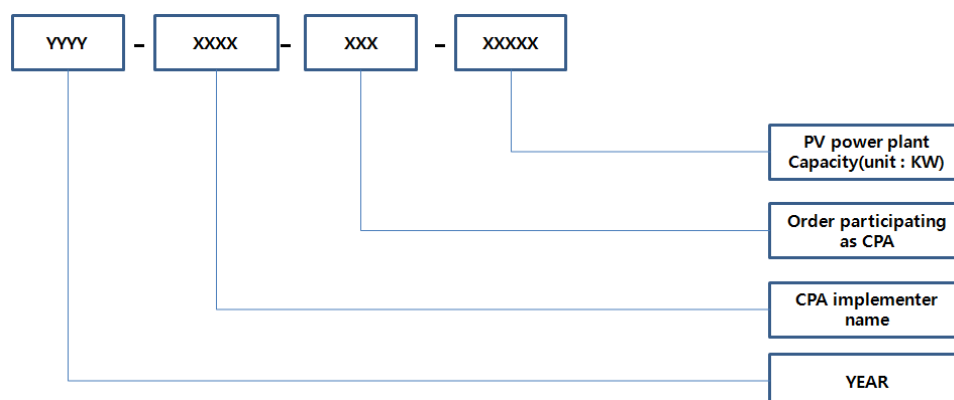
SSC-CPA(Step II) : The captured data at the project sites will be transferred to the database of the each SSC-CPA. At this step the data monitored at the project sites part of the SSC-CPA will be compiled.

CME(Step III) : Further the data is transferred from each SSC-CPA step to CME, which will archive it and make available to DOE for verification. Other records(meter details and implementing records) as relevant will be compiled by CME for the entire PoA at any given time.

In addition, CME will develop an electronic or manual monitoring database which contains all the basic information related to SSC-CPA subscribing to the PoA. Each SSC-CPA will be uniquely identified within the PoA monitoring database. The CME will be responsible for the management of the PoA monitoring database. All records will be stored at least for a period of two years after the end of the crediting period of each individual SSC-CPA. Relevant data capture, verification and storage procedures will be followed in maintaining the data to ensure its accuracy, validity and completeness.

SSC-CPA Unique Identification

CME will provide detailed monitoring manual to each CPA implementer, and the CPA will comply the manual for their monitoring work. In order to unambiguously identify each PV power plant participating in this PoA, CME will grant CPA implementer with ID in following forms according to the order participating as CPA and power plant capacity. The manual includes description, as below, for monitoring and more details for project activities.



<Figure C.2. ID forms of CPA implementer >

This ID numbering system will be used to record baseline and monitoring data on a continuous basis using a template of CDM Operation Manual with a database. And CME will document CPA detail information as follows:

- Name, address, details of CPA implementer
- Capacity of PV power plant
- Geographical coordinates of CPA(GPS information)
- The record of technical specification of each power plant participating in the CPA
- Monitoring data generated by CPA
- Implementing records for CPA operation

CME will be responsible for the management of records and data associated with each CPA. The database will be updated using the data supplied by the CPA implementer. And the manual includes description, as below, for monitoring and more details for each project characteristics.

CME(LH Corporation)

CME manages the whole monitoring process and takes the responsibility. CME designates a department for CDM operation. This department is qualified to manage data and records as it is part of its normal assignment. CME collects monitoring data from CPA implementer, verifies the data whether all variables are valid or not, and develops a monitoring report. Records from monitoring system will be kept during the entire crediting period of each CPA and the following two years. Also, records will be kept in system of a department for CDM operation. CME ensures reliability of data storage system and secures a copy of the original data to respond accidental situations

CPA implementer

CPA implementer should establish their monitoring system and process in accordance with CDM Operation Manual for PoA. The system should be available for recording all monitoring variables related to photovoltaic power plants. CPA implementer designates a department for CDM monitoring. This department manages the whole monitoring process and system and takes responsibility. Records from monitoring system will be kept during the entire crediting period of each CPA and the following two years. Also, records will be kept in department for CDM operation and submitted to CME by monitoring period. CPA implementer ensures reliability of monitoring system and secures the response for accidental situations.

(ii) A system/procedure to avoid double counting e.g. to avoid the case of including a new CPA that has been already registered either as a CDM project activity or as a CPA of another PoA.

The database described above will be used to perform a double counting check. Every new CPA will be compared to the list of project activities that are under validation or registered at the UNFCCC or VCS⁷. Before the inclusion of any CPA the CPA implementer will be made aware of the double counting principle and will be required to certify in writing that proposed CPA is not currently registered under the CDM of UNFCCC or any voluntary scheme nor is currently in the CDM pipeline going through the process of validation or registration.

Therefore, eligibility criteria No.3 of this PoA provide a strict restriction that will avoid double counting of a new CPA. This criteria is enforced as follows :

- Signed certificate by CPA implementer

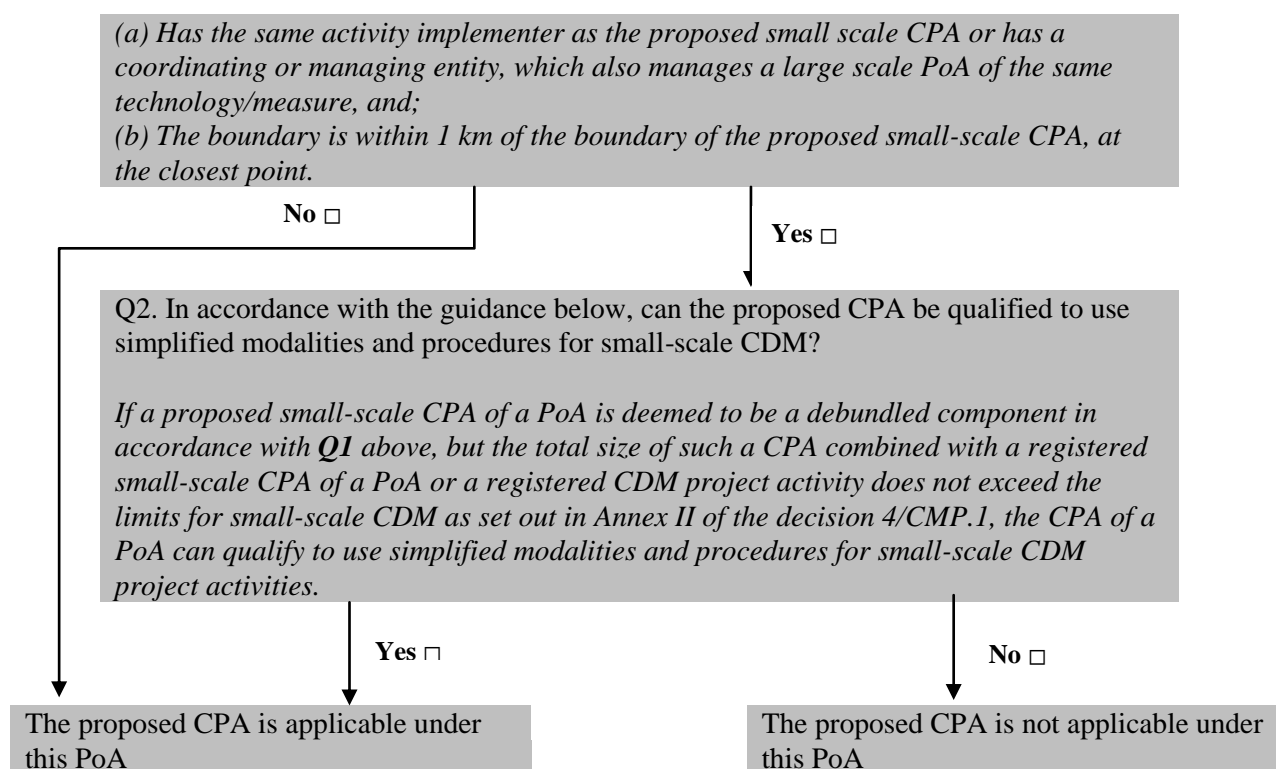
(iii) The SSC-CPA included in the PoA

The de-bundling check will be performed based on "Guidelines on assessment of debundling for SSC project activities, Version 03(EB 54, Annex 13)". CME will perform the de-bundling check using desk review of the above database and on-site visit. Every new CPA will be compared to the list of project activities that are under validation or registered at the UNFCCC. Before the inclusion of any CPA CME will be made aware of the de-bundling rules below.

Q1. In accordance with the guidance below, is the proposed CPA deemed to be a de-bundled component of a large scale activity?

A proposed small-scale CPA of a PoA shall be deemed to be a de-bundled component of a large scale activity if there is already an activity, which satisfies both conditions (a) and (b) below:

⁷ Verified Carbon Standard



<Figure A.5. De-bundling check list >

(iv) **The provisions to ensure that those operating the CPA are aware of and have agreed that their activity is being subscribed to the PoA.**

The acceptance and awareness of each CPA implementer is evidenced through the agreement between CME and CPA implementer before CPA inclusion in PoA.

(v) Monitoring Plan of the CPA under the PoA

For monitoring during the crediting period, each CPA will monitor the quantity of net electricity displaced in year y ($EG_{BL,y}$) as prescribed in paragraph 23 of AMS-IF methodology applied to PoA. The CME will submit CPAs for verification by the DOE pursuant to the sequence described below :

1. The CME will continuously update a list of all CPAs
2. The CME collects the monitoring information for all CPAs that will be verified and prepares one monitoring reports.

1- Maintenance of a list of verification procedures to be applied to each CPA

The CME will develop and continuously update a list of SSC-CPAs that clearly and uniquely identifies each CPA and lists further important information to build the basis in order to compile a monitoring report, such as the crediting period start date of each CPA.

2- Collection of monitored parameters and elaboration of the monitoring plan

Each monitoring report will compile all required monitoring information for a CPA that will be verified by the DOE. This report will unambiguously set out the data relating to the emission reductions generated by each specific CPA during the monitoring period consistent with the requirements of this PoA-DD and the corresponding CPA-DD.

The monitoring plan for parameters included in B.7.1 of Part II will be implemented for each CPA with

assistance from the CME as follows:

- The CPA will implement each CPA individually and monitor and record all parameters included in B.7.1 of Part II.
- The CME will provide the manual to each CPA on how monitoring should be conducted and data should be collected, transferred, archived in regards to emission reductions calculation.
- The CPA will provide data on monitored parameters included in B.7.1 of Part II to the CME.
- The CME will document and store all parameters included in B.7.1 of Part II provided by CPA, while primary data will be stored by CPA.
- The CME review relevant monitoring documents, prepare the monitoring report, and provide the latter to the DOE.

In addition, the following information for monitoring will be considered by CME:

- (i) **Description of the proposed statistically sound sampling method/procedure to be used by DOEs for verification of the amount of reductions of anthropogenic emissions by sources or removals by sinks of greenhouse gases achieved by CPAs under the PoA.**

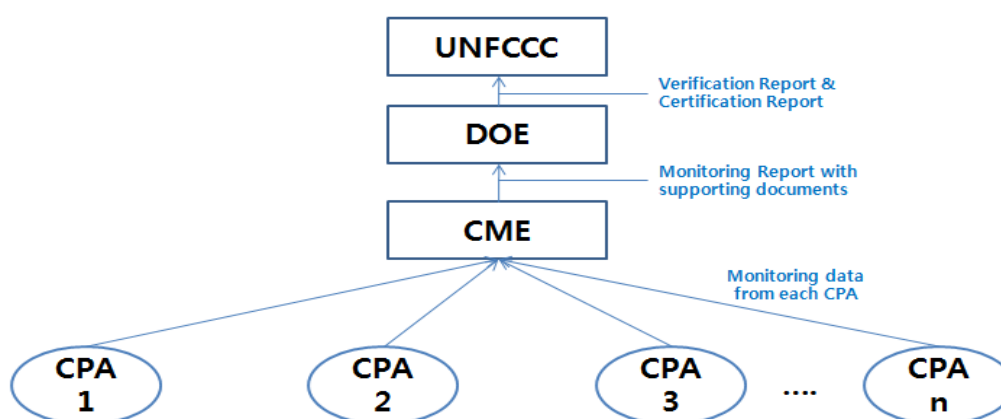
Monitoring and verification will be carried out for each CPA under the PoA. In addition, any sampling method or procedure is not utilized to implement the monitoring activity of the CPAs under the PoA.

For each CPA, all parameters included in B.7.1 of Part II will be monitored by the CPA Implementer according to the procedures and monitoring framework established in B.7.2 of Part II and will be submitted to the CME electronically or manually. The CME will store the data within the monitoring system. Primary data will be stored by the CPA Implementers.

- (ii) **In case the coordinating/managing entity opts for a verification method that does not use sampling but verifies each CPA (whether in groups or not, with different or identical verification periods) a transparent system is to be defined and described that ensures that no double accounting occurs and that the status of verification can be determined anytime for each CPA;**

Basically, all the monitoring data of each CPA will be directly measured by monitoring equipment (i.e. no monitoring parameter is monitored based on the sampling method). Periodically, each CPA will report its monitoring data to CME electronically or manually. In verification stage of the PoA, the collected data of all the CPAs under the PoA will be submitted to DOE for its investigation. The following picture describes on the structure of monitoring activity.

	Description of Monitoring activities	
CME	Monitoring Report & Verification Process	Management of database of the PoA
	Communication with DOE and UNFCCC	Preparation of monitoring guidelines
CPA	Records of monitoring data	Management of monitoring equipment



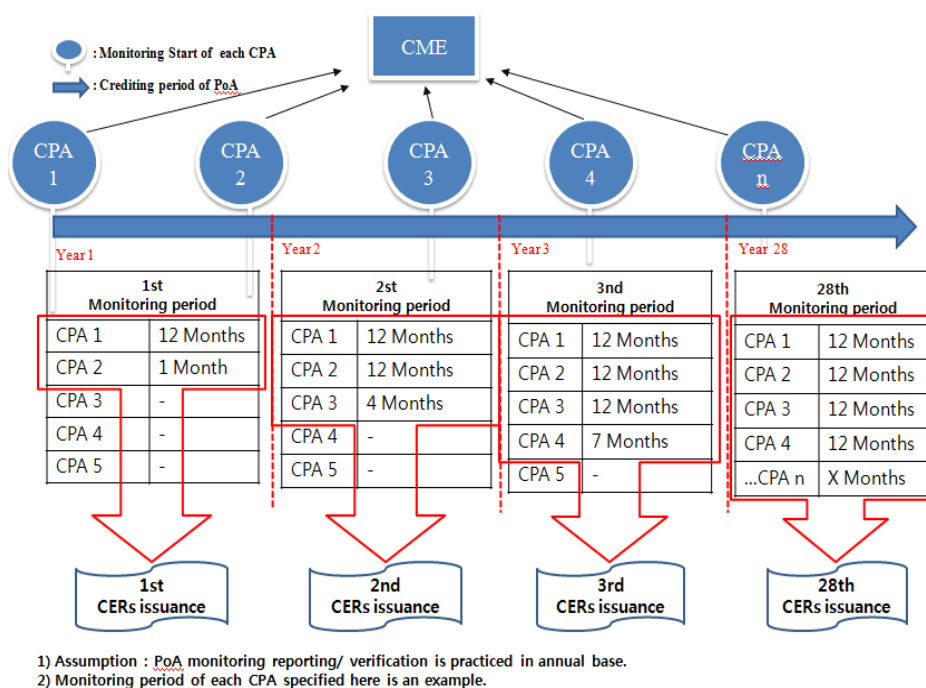
<Figure C.4. CME and CPA implementer's roles for monitoring>

The monitoring parameters described in B.7.1 of Part II below will be monitored and recorded as a database by each CPA independently. According to the monitoring plan specified in each CPA-DD, CPA collects the monitoring data and manages the monitoring equipment. In case of the parameters that are fixed throughout the crediting period (e.g. grid emission factor etc.), CME will be responsible for monitoring/updating them over the entire crediting period of the PoA

Monitoring equipment such as watt hour meter(including the measuring device in inverter) will be certified to national or IEC standards and managed by each CPA in accordance with the related CDM Guidelines. Basically, all the monitoring equipment will be calibrated or replaced with new one in accordance with “the standard for “Clean development mechanism project standard, version 02.1(EB 70, Annex 2)”.

Each CPA provides CME with its monitoring data and CME manages the database of all CPAs. Based on the monitoring records, CME will prepare monitoring report and it is responsible for DOE verification and communication with UNFCCC and new CPA inclusion.

After CDM registration of the PoA, preparing monitoring report and its verification will be done periodically. As a general guidance, the first monitoring period of a newly included CPA is the period from the start of that CPA crediting period (i.e. the inclusion is officially completed) to the end of each monitoring period of the PoA as a whole. However, latest CDM guide/regulation approved by CDM EB will be considered in the determination of each monitoring period of CPA and PoA.



<Figure C.5. Monitoring structure of the PoA>

Basically, CME will maintain the monitoring data of all the CPAs to the verifying DOE. Whether DOE adopts or not sampling-based approach in their verification implementation⁸ may be in accordance with the latest CDM regulation at the time of verification.

The list of CPAs and their verification status will be updated to ensure that no double accounting occurs and that the monitoring period of each CPA and the PoA is consecutive. For the specific information regarding monitoring measures and parameters, Please refer to B.7.1 of Part II below.

SECTION D. Duration of PoA

D.1. Start date of PoA

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01 September 2011⁹

D.2. Length of the PoA

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As per the standard for “Clean development mechanism project standard, version 02.1(EB 70, Annex 2)”, the length of the PoA is 28 years.

SECTION E. Environmental impacts

E.1. Level at which environmental analysis is undertaken

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The PoA consists of construction and operation of photovoltaic power generation in Korea. As the site-specific environmental conditions at individual CPAs could affect an Environmental Analysis, it will be carried out at the CPA level and reported in each CPA-DD.

⁸ such as the number of on-site/field checks

⁹ The start date of validation for PoA(the date of Public comment)

E.2. Analysis of the environmental impacts

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The environmental impacts analysis will be done at CPA level.

SECTION F. Local stakeholder comments**F.1. Solicitation of comments from local stakeholders**

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The each CPA operates within a geographically defined region. For this reason local stakeholder consultation is done on a CPA level to ensure that the stakeholders within the region actually affected by the project activity are adequately informed and consulted.

F.2. Summary of comments received

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Comments from local stakeholders will be conducted at CPA level.

F.3. Report on consideration of comments received

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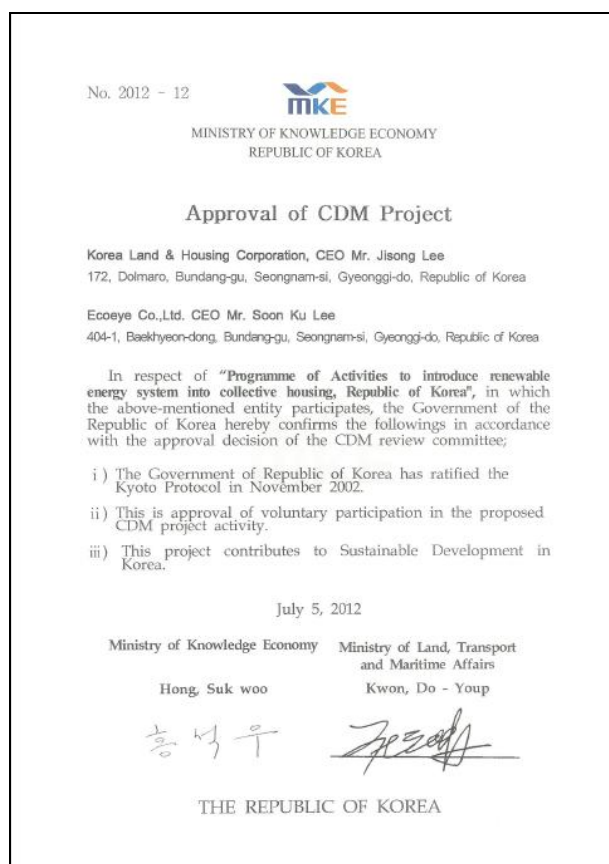
Report on consideration of comments will be conducted at CPA level.

SECTION G. Approval and authorization

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Approval date : July 5, 2012

Host country : Republic of Korea



<Figure G.1. LoA of Korea>

PART II. Generic component project activity (CPA)**SECTION A. General description of a generic CPA****A.1. Purpose and general description of generic CPAs**

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<The description here is the general guideline for the ease of CPA-DD preparation for CPA implementers. Therefore, there may be some discrepancies between this template and specific CPA-DD (i.e. CPA implementer may also revise the contents written in black colour considering their specific circumstance).>

This CPA is a part of “Programme of Activities to introduce renewable energy system into collective housing, Republic of Korea” (hereafter PoA).

This CPA aims to mitigate GHG emissions through renewable energy project using photovoltaic power plant systems on collective housing. The project activity using this system to generate electricity has a significant effect on reducing GHG emissions related to fossil fuel use. The CPA consists of **XX** photovoltaic power plants which are located on the **actual location** of the collective housing. Installed total capacities are **XX** KW. Renewable energy system’s formation is as follows:

<Table **A.1.** Photovoltaic power plant system>

No.	Plant name	Modules		
		Capacity(W)	Numbers	Total installed Capacity(KW)
Total				KW

SECTION B. Application of a baseline and monitoring methodology**B.1. Reference of the approved baseline and monitoring methodology(ies) selected**

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Methodology Title:

AMS-IF – Renewable electricity generation for captive use and mini-grid (version 02)

Reference :

Guidelines on the demonstration of additionality of small-scale project activities (EB 68, Annex 27, Version 09.0)

Methodological tool:

Tool to calculate the emission factor for an electricity system (Version 03.0.0)

Further information for the methodology can be found at:

<http://cdm.unfccc.int/methodologies/SSCmethodologies/approved>

There may be revisions of the methodology and tool above and the CPAs added in the future may refer to the latest version of this methodology and tool.

B.2. Application of methodology(ies)

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As all CPAs produce electricity and displace the electricity supplied from grid, AMS-I.F methodology is applicable to SSC-CPAs which introduce photovoltaic power plant system with a maximum output capacity of 15 MW. This process is described as follows:

<Table B.1. Applicability of AMS-I.F >

Table E.1: Applicability of AMS-I.F					SSC-CPA qualification Justification
AMS-I.F requirements					<u>Satisfied</u>
This methodology comprises renewable energy generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal and renewable biomass that supply electricity to user(s). The project activity will displace electricity from an electricity distribution system that is or would have been supplied by at least one fossil fuel fired generating unit i.e. in the absence of the project activity, the users would have been supplied electricity from one or more sources listed below: (a) A national or a regional grid (grid hereafter); (b) Fossil fuel fired captive power plant; (c) A carbon intensive mini-grid.					All CPAs comprise of photovoltaic power plant that will be supplied to households displacing electricity supplied from KEPCO grid.
For the purpose of this methodology, a mini-grid is defined as small-scale power system with a total capacity not exceeding 15 MW (i.e. the sum of installed capacities of all generators connected to the mini-grid is equal to or less than 15 MW) which is not connected to a national or a regional grid.					<u>N/A</u>
Illustration of respective situations under which each of the methodology (AMS-I.D, AMS-I.F and AMS-I.A2) applies is included in Table 2.					<u>Satisfied</u>
Table 2: Applicability of AMS-I.D, AMS-I.F and AMS-I.A based on project types					As all CPAs displace grid electricity consumption, AMS-I.F methodology is applicable.
	Project type	AMS-I.A	AMS-I.D	AMS-I.F	
1	Project supplies electricity to a national/regional grid		✓		
2	Project displaces grid electricity consumption (e.g. grid import) and/or captive fossil fuel electricity generation at the user end (excess electricity may be supplied to a grid)			✓	
3	Project supplies electricity to an identified consumer		✓		



	facility via national/regional grid (through a contractual arrangement such as wheeling)				
4	Project supplies electricity to a mini grid system where in the baseline all generators use exclusively fuel oil and/or diesel fuel			✓	
5	Project supplies electricity to household users (included in the project boundary) located in off grid areas	✓			
<p>Hydro power plants with reservoirs that satisfy at least one of the following conditions are eligible to apply this methodology:</p> <ul style="list-style-type: none"> • 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, as per definitions given in the project emissions section, is greater than 4 W/m²; • The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the project emissions section, is greater than 4 W/m². 					
<p>For biomass power plants, no other biomass other than renewable biomass are to be used in the project plant.</p>					
<p>This methodology is applicable for project activities 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).</p>					
<p>In the case of project activities that involve the capacity addition of renewable energy generation units at an existing renewable power generation facility, the added</p>					
					<u>N/A</u>
					As all CPAs do not apply hydro power plant, this condition is not applicable.
					<u>N/A</u>
					As all CPAs do not apply biomass power plants, this condition is not applicable.
					<u>Satisfied</u>
					As all CPAs install a new PV power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity (Greenfield plant), this condition is applicable.
					<u>N/A</u>
					As all CPAs install a new PV power plant at a



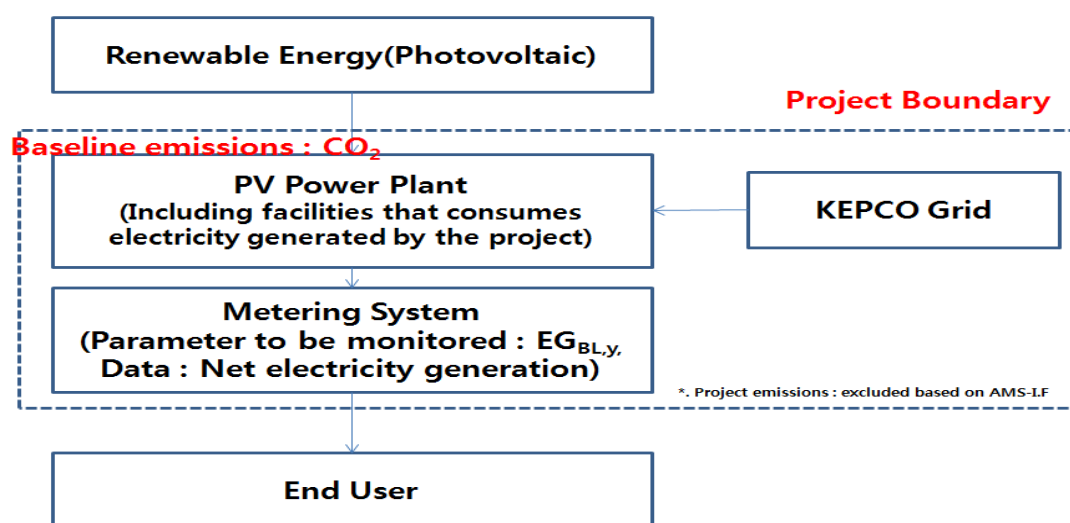
capacity of the units added by the project should be lower than 15 MW and should be physically distinct from the existing units.	site where there was no renewable energy power plant operating prior to the implementation of the project activity(Greenfield plant), this condition is not applicable.
In the case of retrofit or replacement, to qualify as a small-scale project, the total output of the retrofitted or replacement unit shall not exceed the limit of 15 MW.	<u>N/A</u> As all CPAs install a new PV power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity(Greenfield plant), this condition is not applicable.
If the unit added 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. If the unit added co-fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15 MW.	<u>N/A</u> As all CPAs install a new PV power plant that is equal to or less than 15MW, this condition is not applicable.
Combined heat and power (co-generation) systems are not eligible under this category.	<u>N/A</u> As all CPAs do not apply co-generation systems, this condition is not applicable.
If electricity and/or steam/heat produced by the project activity is delivered to a third party i.e. another facility or facilities within the project boundary, a contract between the supplier and consumer(s) of the energy will have to be entered that ensures that there is no double counting of emission reductions.	<u>N/A</u> As all CPAs use the produced electricity in collective housing within project boundary, this condition is not applicable.
In the specific case of biomass project activities the applicability of the methodology is limited to either project activities that use biomass residues only or biomass from dedicated plantations complying with the applicability conditions of AM0042.	<u>N/A</u> As all CPAs do not apply biomass project activities, this condition is not applicable.
In the specific case of biomass project activities the determination of leakage shall be done following the general guidance for leakage in small-scale biomass project activities (attachment C of Appendix B of simplified modalities and procedures for small-scale clean development mechanism project activities; decision 4/CMP.1) or following the procedures included in the leakage section of AM0042.	<u>N/A</u> As all CPAs do not apply biomass project activities, this condition is not applicable.
In case the project activity involves the replacement of equipment, and the leakage from the use of the replaced equipment in another activity is neglected, because the replaced equipment is scrapped, an independent monitoring of scrapping of replaced equipment needs to be implemented. The monitoring should include a check if the number of project activity equipment distributed by the project and the number of scrapped equipment correspond with each other. For this purpose scrapped	<u>N/A</u> As all CPAs install new PV power plants at a site where there was no renewable energy power plant operating prior to the implementation of the project activity(Greenfield plant), this condition is not applicable.

equipment should be stored until such correspondence has been checked. The scrapping of replaced equipment should be documented and independently verified.

B.3. Sources and GHGs

>>

As per stipulated in AMS-I.F (Version 02), the extent of CPA boundary includes facilities consuming electricity generated by this project. The project boundary is confined to physical, geographical site of renewable generating units. The boundary also extends to the project power plant and all power plants connected physically to the electricity system of KEPCO.



<Figure B.1. Project Boundary>

The gases and sources relevant to the CPA are listed below based on the AMS-I.F, Ver.2.

<Table B.2. Emission sources >

Source		Gas	Included?	Justification/Explanation
Baseline	CO ₂ emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity	CO ₂	Included	Major source of emissions in the baseline
		CH ₄	Excluded	Excluded for simplification. This is conservative
		N ₂ O	Excluded	Excluded for simplification. This is conservative
Project Activity	CO ₂ emissions from on-site consumption	CO ₂	Excluded	Based on AMS-I.F
		CH ₄	Excluded	Based on AMS-I.F
		N ₂ O	Excluded	Based on AMS-I.F

B.4. Description of baseline scenario

>>

The small scale methodologies applied to PoA define the indicative baseline scenario as follows:

According to AMS-I.F version 02, the baseline emissions are the quantity of net electricity displaced as a result of the implementation of the CPA in the year y, times the emission factor of a grid calculated as per procedures provided in AMS-I.D. i.e. the baseline emissions are calculated as follows:

$$BE_y = EG_{BL,y} * EF_{CO2,y}$$

Where :

BE_y	=	Baseline emissions in year y (tCO ₂)
$EG_{BL,y}$	=	Quantity of net electricity displaced as a result of the implementation of the CDM project activity in year y (MWh)
$EF_{CO2,y}$	=	Emission Factor of a grid calculated as per the procedures provided in AMS-I.D (tCO ₂ /MWh)

In paragraph 12 of AMS-I.D, ver.17, the emission factor can be calculated in a transparent and conservative manner as follows:

- (a) 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”;

OR

- (b) The weighted average emissions (in tCO₂/MWh) of the current generation mix. The data of the year in which project generation occurs must be used.

This PoA choose the condition (a) and a combined margin(CM) is calculated in B.6.1 of Part II according to “Tool to calculate the emission factor for an electricity system (version 03.0.0)”.

B.5. Demonstration of eligibility for a generic CPA

>>


This CPA satisfies all the eligibility criteria for inclusion in the PoA.

<Table B.3. Eligibility criteria>

No	Eligibility criteria	Means of evaluation / Evidence	Check if CPAs meet the condition
1	The CPA is performed within the Republic of Korea.	- Means of evaluation : Desk review and On-site visit - Evidence : GPS information, CPA-DD, etc	<input type="checkbox"/>
2	The CPA applies photovoltaic power plants to collective housing and the installed capacity is less than or equal to 15MW.	- Means of evaluation : Desk review and On-site visit - Evidence : Schematic diagram, plant design, project plan document, etc	<input type="checkbox"/>
3	The CPA is not involved in another renewable energy project that is registered or under validation as a CDM project activity or as a CPA under another PoA,	- Means of evaluation : Desk review and On-site visit - Evidence : Certificate of double counting check	<input type="checkbox"/>



	in accordance with the signed certificate by CPA implementer.		
4	The solar modules obtain certification for new and renewable energy facilities from facility certification institution.	- Means of evaluation : Desk review and On-site visit - Evidence : Certificate from facility certification institution.	<input type="checkbox"/>
5	The CPA has the documentary evidence to check its start date and does not commence prior to the start date of validation for PoA (01/09/2011)	- Means of evaluation : Desk review and On-site visit - Evidence : Agreement or contract for describing the start date	<input type="checkbox"/>
6	The CPA meets the applicability of AMS-I.F as described in B.2 of Part II in PoA-DD.	- Means of evaluation : Desk review and On-site visit - Evidence : CPA-DD	<input type="checkbox"/>
7	The CPA meets the requirements pertaining to demonstration of additionality in B.5 of Part II in PoA-DD.	- Means of evaluation : Desk review and On-site visit - Evidence : CPA-DD	<input type="checkbox"/>
8	The CPA performs local stakeholder consultation before the inclusion of SSC-CPA.	- Means of evaluation : Desk review and On-site visit - Evidence : Documents related to local stakeholder consultation	<input type="checkbox"/>
9	The CPA considers the environmental impacts analysis according to the regulation of the Republic of Korea.	- Means of evaluation : Desk review and On-site visit - Evidence : CPA-DD	<input type="checkbox"/>
10	The CPA has the documentary evidence to check project costs and does not result in a diversion of official development assistance from Annex I.	- Means of evaluation : Desk review and On-site visit - Evidence : Investment plan, Official notice, Similar evidence including the sources of funds, etc	<input type="checkbox"/>
11	The CPA is applicable to use the simplified modalities and procedures for small-scale project activities through the de-bundling check.	- Means of evaluation : Desk review and On-site visit - Evidence : Check of geographical area, Check of applied technology/measure, Check of project activities under validation or registered	<input type="checkbox"/>

12	The CPA makes the agreement with CME to involve the CPA in PoA and obtain CERs rights. In case that CPA implementer is same with CME, the agreement is not necessary.	- Means of evaluation : Desk review and On-site visit - Evidence : Agreement or Contract between CME and CPA implementer	
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Confirmation of additionality of the generic CPA for its inclusion into the PoA

As discussed in B.1 of Part I, the additionality is demonstrated at the CPA level.

In case of this CPA, it can demonstrate additionality using "Key criteria for assessing additionality" in B.1 of Part I.

Key criteria is as follow:

[Table B.4 Key criteria for assessing additionality]

Criteria	Description
1	Total installed capacity of photovoltaic power plants applied in the SSC-CPA is less than or equal to 15 MW.

Include the proper description at component project activities.

In conclusion, this CPA is additional.

B.6. Estimation of emission reductions of a generic CPA

B.6.1. Explanation of methodological choices

>>

The emission reductions to be achieved as a result of each CPA under the proposed PoA are calculated according to the approved methodology AMS-IF Ver.2 “Renewable electricity generation for captive use and mini-grid” .(Explanation of AMS-IF choice refer to B.2 of Part II.)

The typical CPA includes the installation of a new power plant at a site where there was no PV power plant operating prior to the implementation of the project activity (Greenfield plant). In the calculation of emission reductions of a CPA, the following methodological tools will be referred as suggested by the methodology;

<Table B.5. Referred tool for ER calculation>

No.	Name	Relevant parameter	Purpose of reference
1	Tool to calculate the emission factor for an electricity system(version 03.0.0)	EF _{CO₂,grid,y}	PoA will calculate its own emission factor using the tool

1. Determination of Grid Emissions Factor:

Emissions Factor is calculated according to “Tool to calculate the emission factor for an electricity system (version 03.0.0)”. CM as a baseline grid emission factor is calculated, which is based on OM and BM.

The emission factor will be calculated as following six steps:

- 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 the operating margin (OM)
- STEP 4. Calculate the operating margin emission factor according to the selected method
- STEP 5. Calculate the build margin (BM) emission factor
- STEP 6. Calculate the combined margin (CM) emissions factor

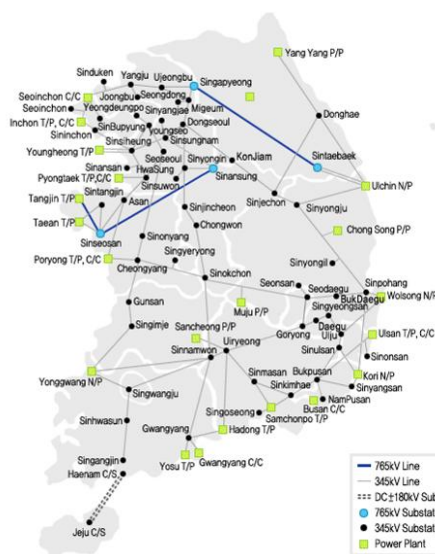
<Table B.6> Major parameter of emission factor Parameter

Items	Value	Source
FC _{i, m, y} is the amount of fuel <i>i</i> (in a mass or volume unit) consumed by a relevant power source <i>m</i> in year(s) <i>y</i> , which supplies electricity to the grid, not including low-operating cost and must-run power plants.	Refer to <Table Appendix 4-1>	Statistics of Electric Power in KOREA 2008-2010 (Source: KEPCO 2009-2011)
Net Calorific Values by Power Plant		Caloric value sourced from Statistics of Electric Power in 2008-2010 (Source: KEPCO 2009-2011) (Net Caloric Value = Caloric value net × caloric value conversion factor)
EG _{m, y} (MWh) is the electricity delivered to the grid by source <i>m</i>		Statistics of Electric Power in KOREA 2008-2010 (Source: KEPCO 2009-2011)
Net Caloric Values Conversion Factor	Solid/Liquid fossil fuel : 0.95 Gaseous fuel : 0.90	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Fuel CO ₂ Emission Factor (EF _{CO₂, i, y})	Refer to <Table Appendix 4-3>	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Operating Margin Emissions Factor (EF _{grid, OM, y}) (ton CO ₂ /MWh)	0.6933	Calculated
Build Margin Emissions Factor (EF _{grid, BM, y}) (ton CO ₂ /MWh)	0.6357	Calculated
Baseline Emissions Factor (EF _{grid, CM, y}) (ton CO ₂ /MWh)	0.6789	Calculated (for solar, wind power)

STEP 1. Identify the relevant electricity systems

OM (Operating Margin) and BM (Build Margin) are calculated by using the data from existing power plants that provide electricity with the current grid-connected electricity generation, and with this result, the EF_{grid, CM, y} (Baseline Emission Factor) can be calculated. The steps for the Baseline calculation methodology are as follows;

The electricity from the project activities is connected to KEPCO grid, which is the only one in Korea and so relevant electric power system is KEPCO grid.



<Figure B.2. The transmission map of Korea¹⁰>

STEP 2. Choose whether to include off-grid power plants in the project electricity system (optional)

According to “Tool to calculate the emission factor for an electricity system”(Version 03.0.0), there are two options to calculate the operating margin and build margin emission factor:

Option I : Only grid power plants are include in the calculation.

Option II : Both grid power plants and off-grid power plants are included in the calculation.

This project chooses option 1. Only grid power plants are including in the calculation.

STEP 3. Select a method to determine the operating margin (OM)

As described in “Tool to calculate the emission factor for an electricity system Version 03.0.0”, the OM emission factor is calculated as the generation-weighted emissions per electricity unit of all generating units serving the system, excluding low-operating cost and must-run power plants. Low-operating cost and must run power plants include hydro, nuclear, low cost biomass, geothermal and domestic coal.

Operating Margin emission factor ($EF_{grid,OM,simple,y}$) shall be calculated basis on one of the four following methods:

Option (a) Simple OM

Option (b) Simple adjusted OM

Option (c) Dispatch Data Analysis OM

Option (d) Average OM

If low-cost/must-run resources constitute less than 50% of total grid generation in average of the five most recent years, simple OM can be chosen.

<Table B.7. Gross electricity generation in the Republic of Korea during past 5 years (GWh)>

Year	2006	2007	2008	2009	2010	Sum
------	------	------	------	------	------	-----

¹⁰ Source: Korea power exchange

Item							
Hydro		5,219	5,042	5,563	5,641	6,472	27,937
Thermal	Coal (Dom.)	4,312	4,470	5,010	5,559	4,613	23,964
	Coal (Bitum.)	134,894	150,204	168,498	187,657	189,156	830,409
	Oil	19,195	21,215	15,425	19,912	25,356	101,103
	Gas	68,302	78,427	75,809	65,273	96,483	384,294
Nuclear		148,749	142,937	150,958	147,771	148,596	739,011
alternative		511	829	1,092	1,791	3,984	8,207
Total		381,181	403,124	422,355	433,604	474,660	2,114,924

Source : Korea electric power Corporation, 2011

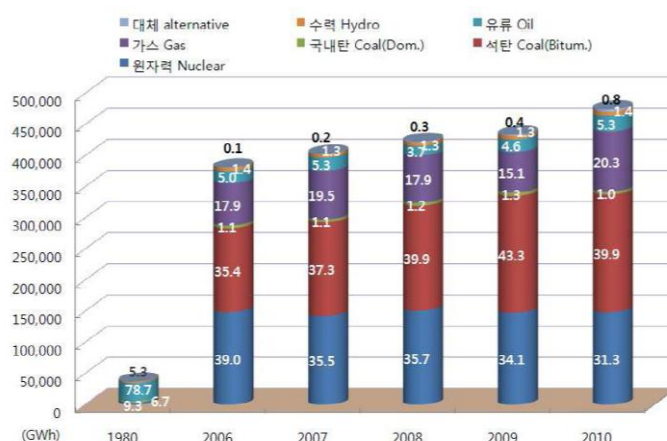
Referring to the gross electricity generation rate by energy sources of the host country (Republic of Korea), the rate of low cost/must run power generation does not exceed 50% of the total grid. Actually, the most recent 5-year (2006~2010) average data shows that the rate of low cost/must run is 37.78%. (Source: KEPCO) The low-cost/must-run plants –hydro, coal (dom), nuclear and alternative– are indicated in yellow.

Low-cost/ Must-run sources ratio

$$= \frac{[\text{Hydro (27,937)} + \text{Coal-Dom (23,964)} + \text{Nuclear (739,011)} + \text{Alternative (8,207)}]}{\text{Total generation (2,114,924)}} \times 100$$

$$= 37.78\%$$

Therefore, for this project case, “*Option (a) Simple OM*” is available.



<Figure B.3. Gross electricity generation in the Republic of Korea during past 5 years>
(Korea Electric Power Corporation, 2011)

For the simple OM, the emissions factor can be calculated using either of the two following data vintages:

- *Ex ante option*: If the ex ante option is chosen, the emission factor is determined once at the validation stage, thus no monitoring and recalculation of the emissions factor during the crediting period is required. For grid power plants, use a 3-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation. For off-grid power plants, use a single calendar year within the 5 most recent calendar years prior to the time of submission of the CDM-PDD for validation.

- *Ex post option*: If the ex post option is chosen, the emission factor is determined for the year in

which the project activity displaces grid electricity, requiring the emissions factor to be updated annually during monitoring. If the data required to calculate the emission factor for year y is usually only available later than six months after the end of year y , alternatively the emission factor of the previous year $y-1$ may be used. If the data is usually only available 18 months after the end of year y , the emission factor of the year proceeding the previous year $y-2$ may be used. The same data vintage (y , $y-1$ or $y-2$) should be used throughout all crediting periods.

For this project, *Ex-ante option* is chosen.

Step 4. Calculate the operating margin emission factor according to the selected method

(a) Simple OM option is chosen for the project as described in STEP 3 above.

The simple OM emission factor is calculated as the generation-weighted average CO₂ emissions per unit net electricity generation (tCO₂/MWh) of all generating power plants serving the system, not including low-cost/must-run power plants/units.

The simple OM may be calculated using one of the following options;

Option A: Based on the net electricity generation and a CO₂ 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.

For this project, option A is chosen to calculate the simple OM.

Where Option A is used, the simple OM emission factor is calculated as follows:

$$EF_{\text{gridOMsimple},y} = \frac{\sum_m EG_{m,y} \cdot EF_{EL,m,y}}{\sum_m EG_{m,y}}$$

Where:

$EF_{\text{gridOMsimple},y}$	Simple operating margin CO ₂ 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	All power units serving the grid in year y except low-cost / must-run power units
y	The relevant year as per the data vintage chosen in Step 3

Determination of $EF_{EL,m,y}$

For calculating $EF_{EL,m,y}$, Option A1 is chosen as follows;

Option A1. If for a power unit m data on fuel consumption and electricity generation is available, the emission factor ($EF_{EL,m,y}$) should be determined as follows:

$$EF_{EL,m,y} = \frac{\sum_i FC_{i,m,y} \cdot NCV_{i,y} \cdot EF_{CO2,i,y}}{EG_{m,y}}$$

Where:

- $EF_{EL,m,y}$ CO₂ emission factor of power unit m in year y (tCO₂/MWh)
 $FC_{i,m,y}$ Amount of fossil fuel type i consumed by power unit m 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)
 $EF_{CO2,i,y}$ CO₂ emission factor of fossil fuel type i in year y (tCO₂/GJ)
 $EG_{m,y}$ Net quantity of electricity generated and delivered to the grid by power unit m in year y
(MWh)
 m All power units serving the grid in year y except low-cost/must-run power units
 i All fossil fuel types combusted in power unit m in year y
 y The relevant year as per the data vintage chosen in Step 3

In the case of this project, the applied values of $EF_{CO2,i,y}$ are based on using conversion factor suggested in the 2006 IPCC Guidelines. And those of $NCV_{i,y}$ and $EF_{CO2,i,y}$ are country-specific. Actually, the calorific values are indicated as country-specific data of gross calorific value (GCV), and this was recalculated for this PDD as net calorific value (NCV) using conversion factor suggested in the 2006 Revised IPCC Guidelines. The detailed information used in the calculation is presented at tables in Appendix 4.

Determination of $EG_{m,y}$

For grid power plants, $EG_{m,y}$ should be determined as per the provisions in the monitoring tables.

Off-grid power plants are not considered in determination of $EG_{m,y}$.

As a result, the OM emission factor ($EF_{grid,OM,simple,y}$) is 0.6933 (tCO₂/MWh).

STEP 5. Calculate the build margin (BM) emission factor;

According to “Tool to calculate the emission factor for an electricity system (Version 03.0.0)”, there are two options to choose in order to calculate the BM.

Option 1. For the first crediting period, calculate the build margin emission factor *ex ante* based on the most recent information available on units already built for sample group m at the time of CDM-PDD submission to the DOE for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

Option 2. For the first crediting period, the build Margin emission factor ($EF_{grid,BM,y}$) shall be updated annually, *ex-post*, including those unit built up to the year of registration of the project activity or, if information up to the year of registration is not yet available, including those units built up to the latest year for which information is available. For the second crediting period, the build margin emissions

factor shall be calculated *ex ant*, as described in Option 1 above. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used.

For this project case, **Option 1** is chosen to calculate the BM emission factor.

The sample group of power units m used to calculate the build margin should be determined as per the following procedure as described in the methodology, consistent with the data vintage selected in the steps above:

- (a) Identify the set of five power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently (SET5-units) and determine their annual electricity generation (AEGSET-5-units, in MWh);
- (b) Determine the annual electricity generation of the project electricity system, excluding power units registered as CDM project activities (AEGtotal, in MWh). Identify the set of power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently and that comprise 20% of AEGtotal (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) (SET \geq 20%) and determine their annual electricity generation (AEGSET- \geq 20%, in MWh);
- (c) From SET5-units and SET \geq 20% select the set of power units that comprises the larger annual electricity generation (SETsample); Identify the date when the power units in SETsample started to supply electricity to the grid.

If none of the power units in SETsample started to supply electricity to the grid more than 10 years ago, then use SETsample to calculate the build margin. Ignore steps (d), (e) and (f).

Otherwise:

- (d) Exclude from SET_{sample} the power units which started to supply electricity to the grid more than 10 years ago. Include in that set the power units registered as CDM project activity, starting with power units that started to supply electricity to the grid most recently, until the electricity generation of the new set comprises 20% of the annual electricity generation of the project electricity system (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) to the extent is possible. Determine for the resulting set (SETsample-CDM) the annual electricity generation (AEGSET-sample-CDM, in MWh);

If the annual electricity generation of that set is comprises at least 20% of the annual electricity generation of the project electricity system (i.e. $AEGSET\text{-sample-CDM} \geq 0.2 \times AEG_{total}$), then use the sample group SETsample-CDM to calculate the build margin. Ignore steps (e) and (f).

Otherwise:

- (e) Include in the sample group SETsample-CDM the power units that started to supply electricity to the grid more than 10 years ago until the electricity generation of the new set comprises 20% of the annual electricity generation of the project electricity system (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation);
- (f) The sample group of power units m used to calculate the build margin is the resulting set (SETsample-CDM->10yrs).

Following the guidance above, the sample group of power units m is established to calculate the build margin.

< Table B.8. Calculation of the build margin (BM) emission factor >

Table B.10: Calculation of the build margin (BM), Emission factor

	Step Guidance	Result										
Step (a)	Identify the set of five power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently (SET _{5-units}) and determine their annual electricity generation (AEGSET-5-units, in MWh);	<div>- Five power units that started to supply electricity to the grid most recently (SET_{5-units}):<table><tr><td>1. Haengwon solar park</td><td>2010.11</td></tr><tr><td>2. Gunwi (small hydro power)</td><td>2010.11</td></tr><tr><td>3. Dangjin solar park</td><td>2010.10</td></tr><tr><td>4. Yeoicheon solar park</td><td>2010.10</td></tr><tr><td>5. Yeongheung-wind power</td><td>2010.10</td></tr></table></div> <div>- Total electricity generation in 2010: 7,788 MWh</div>	1. Haengwon solar park	2010.11	2. Gunwi (small hydro power)	2010.11	3. Dangjin solar park	2010.10	4. Yeoicheon solar park	2010.10	5. Yeongheung-wind power	2010.10
1. Haengwon solar park	2010.11											
2. Gunwi (small hydro power)	2010.11											
3. Dangjin solar park	2010.10											
4. Yeoicheon solar park	2010.10											
5. Yeongheung-wind power	2010.10											
Step (b)	Determine the annual electricity generation of the project electricity system, excluding power units registered as CDM project activities (AEG _{total} , in MWh). Identify the set of power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently and that comprise 20% of AEG _{total} (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) (SET _{≥20%}) and determine their annual electricity generation (AEGSET- _{≥20%} , in MWh);	<div>- AEG_{total}: 454,859,932 MWh</div> <div>- The set of power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently and that comprise 20% of AEG_{total}: Refer to the Annex 3.</div> <div>- AEG_{SET-_{≥20%}}: 92,307,726 MWh (20.29% of AEG_{total})</div>										
Step (c)	<div>From SET_{5-units} and SET_{≥20%} select the set of power units that comprises the larger annual electricity generation (SET_{sample}); Identify the date when the power units in SET_{sample} started to supply electricity to the grid.</div> <div>If none of the power units in SET_{sample} started to supply electricity to the grid more than 10 years ago, then use SET_{sample} to calculate the build margin. Ignore steps (d), (e) and (f).</div>	<div>- SET_{sample} : SET_{≥20%} because it is larger than SET_{5-units}.</div> <div>- Because none of the power units in SET_{sample} started to supply electricity to the grid more than 10 years ago, steps (d), (e) and (f) are ignored.</div>										
Step (d)~(f)	Ignored											

The build margin emissions factor is the generation-weighted average emission factor (tCO₂/MWh) of all power units m during the most recent year y for which power generation data is available, calculated as follows:

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}}$$

Where;

EF_{grid,BM}, Build margin CO₂ emission factor in year y (tCO₂/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} CO₂ emission factor of power unit m in year y (tCO₂/MWh)

m Power units included in the build margin

y Most recent historical year for which power generation data is available

According to the BM calculation formula and variables of above tables, $EF_{BM,y}$ is 0.6357 (tCO₂/MWh).

Step 6. – Calculate the combined margin (CM) emission factor

The calculation of the combined margin (CM) emission factor ($EF_{grid,CM,y}$) is based on one of the following methods:

- (a) Weighted average CM; or
- (b) Simplified CM.

The weighted average CM method (option A) is used for this project .

(a) Weighted average CM

The combined margin emissions factor is calculated as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM}$$

Photovoltaic system:

According to “Tool to calculate the emission factor for an electricity system”, all other project activities are $w_{OM}=0.75$ and $w_{BM}=0.25$ for the first crediting period and for subsequent crediting periods. And $EF_{grid,OM,y}$, $EF_{grid,BM,y}$ are calculated as described in Steps 1 and 2 above and are expressed in tCO₂/MWh.

Therefore baseline emission factor ($EF_{grid,CM,y}$) for this project is = 0.6789(tCO₂/MWh) as follows:

$$\begin{aligned} EF_{grid,CM,y} &= w_{OM} \cdot EF_{grid,OM,y} + w_{BM} \cdot EF_{grid,BM,y} \\ &= 0.75 \cdot 0.6933(\text{tCO}_2/\text{MWh}) + 0.25 \cdot 0.6357(\text{tCO}_2/\text{MWh}) \\ &= \mathbf{0.6789}(\text{tCO}_2/\text{MWh}) \end{aligned}$$

Based on the value obtained for the operating margin (0.6933 tCO₂/MWh) and build margin (0.6357 tCO₂/MWh) emissions factors, a **combined margin emissions factor of 0.6789 tCO₂/MWh** will be used for this PoA, until the renewal of the PoA crediting period is undertaken at which point the Emission Factor will be revised.

2. Baseline Emissions

According to AMS-I.F methodology, baseline emission of this system displacing KEPCO grid electricity is calculated as below:

$$BE_y = EG_{BL,y} * EF_{CO2,y}$$

Where:

BE_y Baseline Emissions in year y (tCO₂)
 $EG_{BL,y}$ Quantity of net electricity displaced as a result of the implementation of the CDM project activity in year y (MWh)
 $EF_{CO2,y}$ Emission factor (tCO₂/MWh)
Emission factor of a grid shall be calculated as per the procedures provided in AMS-I.D

In Ex-ante calculations of emission reductions, $EG_{BL,y}$ will be estimated based on total installed capacity, operating days and utilization coefficient¹¹ of photovoltaic system using duration of sunshine.

3. Project Activity Emissions

According to AMS-I.F methodology, project activity emission of this system is zero because this system does not use any energy source for operation.

4. Leakage

As the energy generating equipment is not transferred from another activity, leakage is not to be considered.

5. Emission Reductions

$$ER = BE - PE - LE$$

Where:

ER_y Emission reductions in year y (t CO₂e/y)
 BE_y Baseline Emissions in year y (t CO₂/y)
 PE_y Project emissions in year y (t CO₂/y)
 LE_y Leakage emissions in year y (t CO₂/y)

B.6.2. Data and parameters that are to be reported ex-ante

¹¹ The utilization coefficient is based on the data available published from public entities.

Data / Parameter	$EF_{CO_2,y}$
Unit	tCO ₂ / MWh
Description	Emission factor
Source of data	Calculated
Value(s) applied	0.6789
Choice of data or Measurement methods and procedures	This value is calculated according to “Tool to calculate the emission factor for an electricity system (version 03.0.0).” Applied value was calculated by referring Statistics of Electric Power in KOREA (2008, 2009, 2010) (KEPCO) and Status of Generation facility (2011) (Korea Power Exchange).
Purpose of data	Calculation of baseline emissions
Additional comment	-This data will be calculated at the time of PDD submission and will not be changed during the first crediting period. - This value is ex-ante value which is calculated at the time of PDD submission and will be applied during the crediting period without update.

Data / Parameter	$EF_{grid,OM,simple,y}$
Unit	tCO ₂ /MWh
Description	Operating Margin emission factor
Source of data	Calculated
Value(s) applied	0.6933tCO ₂ /MWh
Choice of data or Measurement methods and procedures	This value is calculated according to “Tool to calculate the emission factor for an electricity system (version 03.0.0).” Applied value was calculated by referring Statistics of Electric Power in KOREA (2008, 2009, 2010) (KEPCO) and Status of Generation facility (2011) (Korea Power Exchange).
Purpose of data	Calculation of baseline emissions
Additional comment	-This data will be calculated at the time of PDD submission and will not be changed during the first crediting period. - This value is ex-ante value which is calculated at the time of PDD submission and will be applied during the crediting period without update.

Data / Parameter	$EF_{grid,BM,y}$
Unit	tCO ₂ /MWh
Description	Build Margin emission factor
Source of data	Calculated
Value(s) applied	0.6357tCO ₂ /MWh
Choice of data or Measurement methods and procedures	This value is calculated according to “Tool to calculate the emission factor for an electricity system (version 03.0.0).” Applied value was calculated by referring Statistics of Electric Power in KOREA (2008, 2009, 2010) (KEPCO) and Status of Generation facility (2011) (Korea Power Exchange).
Purpose of data	Calculation of baseline emissions
Additional comment	-This data will be calculated at the time of PDD submission and will not be changed during the first crediting period. - This value is ex-ante value which is calculated at the time of PDD submission and will be applied during the crediting period without update.

B.6.3. Ex-ante calculations of emission reductions

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1. Baseline Emissions

According to AMS-I.F methodology, baseline emission of this system displacing KEPCO grid electricity is calculated as below:

$$BE_y = EG_{BL,y} * EF_{CO_2,y}$$

Where:

BE_y	Baseline Emissions in year y (tCO ₂)
$EG_{BL,y}$	Quantity of net electricity displaced as a result of the implementation of the CDM project activity in year y (MWh)
$EF_{CO_2,y}$	Emission factor (tCO ₂ /MWh)
	• Emission factor of a grid shall be calculated as per the procedures provided in AMS-I.D

As per described in E.6.2 of PoA-DD, in ex-ante calculation of emission reductions, $EG_{BL,y}$ is estimated as follows :

$$\begin{aligned} EG_{BL,y} &= \text{XXXX kW} * 365 \text{ days/yr} * \text{XX hours/day}^{12} / 1000 \\ &= \text{XXXX MWh/yr} \end{aligned}$$

$$\begin{aligned} BE_y &= \text{XXXX MWh/yr} * 0.6789 \text{ tCO}_2/\text{MWh} \\ &= \text{XXXX tCO}_2/\text{yr} \end{aligned}$$

2. Project Activity Emissions

According to AMS-I.F methodology, project activity emission of this system is zero because this system does not use any energy source for operation.

3. Leakage

As the energy generating equipment is not transferred from another activity, leakage is not to be considered.

5. Emission Reductions

$$ER = BE - PE - LE$$

Where:

ER y	Emission reductions in year y (t CO ₂ e/y)
BE y	Baseline Emissions in year y (t CO ₂ /y)
PE y	Project emissions in year y (t CO ₂ /y)
LE y	Leakage emissions in year y (t CO ₂ /y)

Therefore, ER_y is XXXX tCO₂/yr.

¹² Include the description related to the data available published from public entities.

B.7. Application of the monitoring methodology and description of the monitoring plan

B.7.1. Data and parameters to be monitored by each generic CPA

Data / Parameter	$EG_{BL,y}$
Unit	MWh
Description	Quantity of net electricity displaced as a result of the implementation of the CDM project activity in year y
Source of data	Calculated
Value(s) applied	XXXX The actual net electricity will be monitored during monitoring period. For the purpose of present estimation, this value is estimated based on the total installed capacity, yearly operating hours and utilization coefficient of photovoltaic system.
Measurement methods and procedures	<p>$EG_{BL,y}$ means the quantity of net electricity supplied to households. The net electricity generation is the difference between the total quantity of electricity generated by this project and the auxiliary electricity consumption.</p> <p><u>As for the total quantity of electricity generated by this project,</u></p> <p>Measuring equipment : Watt hour meter (the measuring device in inverter) Measurement interval : Continuous</p> <p><u>As for the auxiliary electricity consumption (of connector bands and inverters),</u></p> <p>The auxiliary electricity consumption is calculated as follows:</p> <p>The auxiliary electricity consumption = Standby power¹³ (of connector bands and inverters) * Numbers * Hours).</p> <p>The auxiliary electricity consumption will be calculated during the monitoring period and the operating hours are considered as 24 hours per day.</p>
Monitoring frequency	Continuous monitoring, hourly measurement and at least monthly recording
QA/QC procedures	<ul style="list-style-type: none"> - Calibration frequency : According to national standards or manufacturer's specifications - Accuracy of measurement equipment : within $\pm 3.0\%$ (According to Guideline for the support on the new & renewable energy equipments)
Purpose of data	Calculation of baseline emissions
Additional comments	<ul style="list-style-type: none"> - Data will be at least recorded monthly and aggregated yearly. - Data will be kept at least for two years after the end of the last crediting period.

¹³ Standby power is the electric power consumed by electronic appliances while they are switched off or in a standby mode and is based on the letter (or evidence) from manufacturers.

B.7.2. Description of the monitoring plan for a generic CPA

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Monitoring will be carried out for each individual CPA. For each CPA, all parameters will be monitored by the implementing entity of the CPA according to the procedures and monitoring framework under the PoA and will be submitted to the managing entity.

The main monitoring data are electricity supplied to households displacing electricity supplied from KEPCO grid. To check the amount of generated electricity, the measuring device will be installed.

The monitoring plan has been developed based on approved methodology AMS- I.F. and more details are as follows:

- Monitoring equipment : Watt hour meter (the measuring device in inverter)
- Relevant laws and standards of Korea :
 - Electric Utility Act
 - Guideline for the support on the new & renewable energy equipments

< Data Recording & Archiving >

The generated electricity is continuously measured, recorded and electronically accumulated every month through monitoring system of PV power plants. All data collected will be kept at least for two years after the end of the last crediting period.

The net electricity generation is the difference between the total quantity of electricity generated by this project and the auxiliary electricity consumption.

The auxiliary electricity consumption will be conservatively calculated using recording annually the number of systems operating and estimating the annual hours of systems operating

Equation: The auxiliary electricity consumption = Standby power¹⁴ * Numbers * Hours

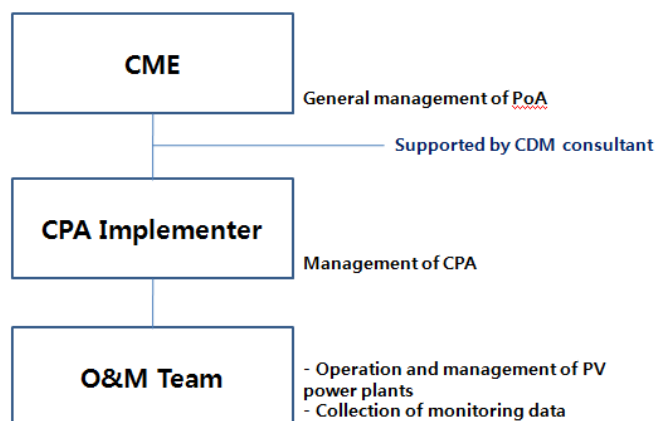
< Quality Assurance and Quality Control >

- Contingency plan :
 - In case of measurement equipment trouble or data transferring error, the person in charge of monitoring is responsible for prompt grasping the problem and restoring it in due course.
- Calibration :

Measuring equipment should be recalibrated at appropriate intervals according to national standards or manufacturer's specifications.

- Monitoring organization and responsibility :

¹⁴ Standby power is the electric power consumed by electronic appliances while they are switched off or in a standby mode and is based on the letter (or evidence) from manufacturers.



< Figure B.4. Monitoring organization >

Person in charge of O&M team in CPA implementer will operate and manage PV power plants and collect monitoring data. All collected data will be reported to CME as electronically or manually manner.

< Training >

CME will train its staff that will operate and maintain photovoltaic power plants. The training includes contingency plan, calibration, monitoring process, etc. The person in charge of monitoring will be trained according to CDM Operation Manual.

**Appendix 1: Contact information on entity/individual responsible for the PoA**

Organization	Korea Land & Housing Corporation
Street/P.O. Box	172, Dolmaro, Bundang-gu
Building	
City	Seongnam-si
State/Region	Gyeonggi-do
Postcode	463-755
Country	Republic of Korea
Telephone	+82-31-738-3706
Fax	+82-31-738-3988
E-mail	baba8181@lh.or.kr
Website	www.LH.or.kr
Contact person	Ms. Ji-Young Kim
Title	Assistant Manager
Salutation	Ms.
Last name	Kim
Middle name	
First name	Ji-Young
Department	Technology Standard Office
Mobile	+82-10-4706-2794
Direct fax	+82-31-738-3988
Direct tel.	+82-31-738-3706
Personal e-mail	baba8181@lh.or.kr



Organization	Ecoeye Co., Ltd.
Street/P.O. Box	404-1, Baekhyeon-dong, Bundang-gu
Building	
City	Seongnam-si
State/Region	Gyeonggi-do
Postcode	463-420
Country	Republic of Korea
Telephone	+82-31-710-7367
Fax	+82-31-716-1848
E-mail	leejh@ecoeye.com
Website	www.ecoeye.com
Contact person	Mr. Jeong-Hwan Lee
Title	Consultant
Salutation	Mr.
Last name	Lee
Middle name	
First name	Jeong-Hwan
Department	
Mobile	+82-10-2547-9960
Direct fax	+82-31-716-1848
Direct tel.	+82-31-710-7367
Personal e-mail	leejh@ecoeye.com

Appendix 2: Affirmation regarding public funding

There is no public funding from Annex I for this project.

Appendix 3: Application of methodology(ies)

Refer to section B.2 Application of methodology (ies)



Appendix 4: Further background information on ex ante calculation of emission reductions

Data used to determination of Grid emission factor

[Table Appendix 4-1] Calculation of Operating Margin Emission factor

year	Plant name		Amount of fossil fuel (FC _{i,m,y})				Net caloric value (NCV _{i,y})				Net electricity generated (EG _{m,y} , MWh)	Emission factor for each plant tonCO ₂ /MWh
			Coal (t)	Heavy oil (kl)	Diesel oil (kl)	L. N. G (t)	Coal (kcal/kg)	Heavy oil (kcal/l)	Diesel oil (kcal/l)	L. N. G (kcal/kg)		
2008	Honam	#1	793,048	808	177		5,089	9,310	8,464		1,614,014	0.9388
		#2	887,772	1,225	167		5,105	9,309	8,470		1,816,464	0.9371
	Samchonpo	#1	1,759,936		137		5,524		4,584		4,230,470	0.8612
		#2	1,628,693		1,065		5,506		8,370		3,931,527	0.8554
		#3	1,635,809		614		5,506		8,347		4,024,666	0.8389
		#4	1,662,981		726		5,524		8,352		4,118,892	0.8362
		#5	1,718,759		874		4,839		8,548		3,779,114	0.8253
		#6	1,844,647		448		4,836		8,552		4,071,070	0.8213
	Yonghung	#1	1,894,596		5,594		5,871		8,246		5,137,490	0.8141
		#2	1,881,013		3,033		5,870		8,445		5,112,704	0.8107
		#3	1,694,625		2,173		5,767		9,563		4,535,951	0.8087
		#4	1,217,547		769		5,771		8,414		3,193,481	0.8251
	Boryeong	#1	1,697,622		566		5,402		8,493		4,017,302	0.8558
		#2	1,328,646		196		5,442		8,497		3,247,137	0.8346
		#3	1,528,112		233		5,377		10,870		3,733,602	0.8249
		#4	1,694,212		339		5,387		8,553		4,162,971	0.8217
		#5	1,503,611		642		5,380		9,210		3,677,963	0.8247
		#6	1,704,157		301		5,386		8,667		4,170,094	0.8250
		#7	1,102,498		2,696		5,451		8,139		2,878,738	0.7846
		#8	227,312		1,060		5,401		4,824		748,005	0.6171
	Taeon	#1	1,493,418		589		5,636		8,368		3,894,659	0.8103



		#2	1,570,393		146		5,639		8,420		4,093,884	0.8106
		#3	1,442,632		551		5,632		8,397		3,763,910	0.8092
		#4	1,582,461		122		5,638		8,223		4,119,808	0.8116
		#5	1,566,721		363		5,660		8,228		4,089,287	0.8127
		#6	1,419,495		626		5,662		8,338		3,711,227	0.8119
		#7	1,285,747		1,224		5,700		8,354		3,482,731	0.7894
		#8	1,553,992		635		5,666		8,396		4,186,293	0.7885
	Hadong	#1	1,478,000		355		5,579		8,379		3,827,102	0.8076
		#2	1,551,832		311		5,569		8,342		4,012,667	0.8072
		#3	1,573,892		474		5,575		8,480		4,074,310	0.8073
		#4	1,469,828		495		5,572		8,462		3,804,790	0.8069
		#5	1,592,246		256		5,573		8,491		4,114,218	0.8084
		#6	1,525,471		521		5,572		8,413		3,953,083	0.8061
		#7	310,138		2,900		5,798		7,545		870,781	0.7814
	Dangjin	#1	1,559,086		60		5,520		8,629		3,991,074	0.8080
		#2	1,621,753		136		5,501		8,536		4,162,369	0.8032
		#3	1,474,550		751		5,513		8,549		3,800,792	0.8020
		#4	1,457,994		771		5,503		8,467		3,737,406	0.8050
		#5	1,490,658		250		5,570		8,615		3,908,658	0.7961
		#6	1,509,171		132		5,562		8,543		4,006,307	0.7852
		#7	1,264,913		645		5,581		7,675		3,336,619	0.7933
		#8	1,494,311		314		5,566		8,550		3,992,732	0.7807
	Ulsan	#1		30,689	565			9,440	8,642		114,753	0.8109
		#2		29,228	562			9,444	8,667		108,931	0.8146
		#3		32,541	480			9,440	8,671		123,706	0.7952
		#4		228,138	4,016			9,516	8,662		945,479	0.7370
		#5		163,748	2,965			9,530	8,662		678,426	0.7386
		#6		225,645	3,757			9,513	8,661		937,531	0.7343
	Yeongnam	#1		59,763	1,476			9,674	8,446		229,316	0.8135
		#2		40,030	802			9,676	8,454		149,357	0.8336
	Yeosu	#1		32,576	202			9,449	8,371		130,854	0.7475
		#2		111,854	341			9,447	8,352		454,052	0.7376
	Pyeongtaek	#1		91,937	77	2,562		9,423	8,525	11,591	386,361	0.7268
		#2		125,789	90	4,744		9,430	8,529	11,664	534,121	0.7260

[illegible]



	Namjeju	D/P		19,875	482			9,392	8,548		93,201	0.6466
	Jeju	G/T			503				8,457		643	2.0110
	Jeju	D/P		46,728				9,407			223,630	0.6214
2008 Total			62,694,298	1,888,943	59,590	10,515,373					237,888,671	0.6874
2009	Honam	#1	923,895	471	167		5,012	9,323	8,510		1,843,823	0.9420
		#2	853,508	818	201		4,982	9,314	8,507		1,696,597	0.9409
	Samchonpo	#1	1,611,736		299		5,582		8,496		3,881,067	0.8689
		#2	1,596,153		447		5,543		8,446		3,869,863	0.8570
		#3	1,818,061		110		5,545		8,490		4,494,850	0.8404
		#4	1,552,530		486		5,557		8,384		3,873,780	0.8349
		#5	1,909,143		151		4,850		8,537		4,225,306	0.8213
		#6	1,765,537		576		4,854		8,557		3,902,690	0.8232
	Yonghung	#1	2,316,758		1,996		5,681		8,446		6,121,660	0.8065
		#2	2,437,083		1,632		5,654		8,218		6,309,794	0.8190
		#3	2,533,024		966		5,642		8,469		6,711,338	0.7983
		#4	2,740,096		117		5,647		6,764		7,183,514	0.8071
	Boryeong	#1	896,958		1,982		5,259		8,496		2,076,329	0.8538
		#2	1,361,908		5,689		5,292		8,385		3,148,655	0.8623
		#3	1,686,579		180		5,363		8,476		4,153,516	0.8162
		#4	1,554,579		672		5,337		8,551		3,823,603	0.8136
		#5	1,681,591		516		5,354		8,425		4,136,937	0.8159
		#6	1,538,187		935		5,378		8,363		3,802,516	0.8158
		#7	1,438,768		568		5,390		8,319		3,720,811	0.7814
		#8	1,701,650		341		5,384		8,661		4,417,673	0.7773
	Taeon	#1	1,561,372		348		5,646		8,400		4,087,057	0.8085
		#2	1,483,233		22		5,651		8,248		3,858,541	0.8139
		#3	1,550,278		209		5,650		8,327		4,041,441	0.8123
		#4	1,471,251		410		5,641		8,351		3,843,816	0.8094
		#5	1,409,802		978		5,672		8,369		3,689,068	0.8129
		#6	1,548,690		285		5,688		8,393		4,064,658	0.8122
		#7	1,576,347		394		5,674		8,437		4,232,409	0.7921
		#8	1,382,469		1,397		5,676		8,385		3,730,433	0.7891
	Hadong	#1	1,647,434		341		5,469		8,416		4,064,233	0.8310
		#2	1,551,648		648		5,428		8,456		3,799,030	0.8312



		#3	1,554,931		473		5,462		8,442		3,862,769	0.8242
		#4	1,634,941		226		5,465		8,441		4,049,790	0.8268
		#5	1,543,027		547		5,467		8,434		3,848,711	0.8217
		#6	1,637,877		286		5,465		8,407		4,085,588	0.8211
		#7	1,500,309		72		5,614		8,497		4,068,510	0.7757
		#8	1,169,132		692		5,625		7,654		3,153,402	0.7820
	Dangjin	#1	1,601,422		677		5,425		8,602		4,025,605	0.8092
		#2	1,572,097		291		5,423		8,547		3,964,389	0.8060
		#3	1,669,969		155		5,431		8,575		4,232,358	0.8031
		#4	1,658,923		110		5,432		8,585		4,195,301	0.8050
		#5	1,324,949		582		5,445		8,553		3,400,082	0.7956
		#6	1,330,803		517		5,468		8,530		3,471,850	0.7857
		#7	1,609,342		133		5,478		8,564		4,172,321	0.7918
		#8	1,334,679		625		5,513		8,550		3,531,321	0.7812
	Ulsan	#1		30,963	35			9,415	8,767		116,425	0.7923
		#2		27,250	41			9,416	8,689		104,292	0.7787
		#3		7,139	35			9,399	8,631		26,061	0.8174
		#4		253,330	2,938			9,486	8,517		1,058,708	0.7247
		#5		313,474	2,805			9,488	8,619		1,318,789	0.7185
		#6		288,842	2,460			9,491	8,601		1,215,616	0.7181
	Yeongnam	#1		108,767	764			9,681	8,657		437,034	0.7662
		#2		104,675	647			9,684	8,709		415,404	0.7755
	Yeosu	#1		113,633	187			9,419	8,357		466,519	0.7263
		#2		193,394	203			9,427	7,792		805,262	0.7163
	Pyeongtaek	#1		56,671	354	2,922		9,456	11,684	11,446	251,576	0.7085
		#2		280,992	696	4,203		9,388	11,900	11,480	1,211,425	0.6995
		#3		282,894	581	4,046		9,378	11,595	11,598	1,225,561	0.6947
		#4		192,380	545	3,838		9,399	10,619	11,617	834,285	0.6994
	Namjeju	#1										
		#2										
		#3		140,564	143			9,387	8,510		550,851	0.7579
		#4		153,841	89			9,385	8,529		603,417	0.7567
	Jeju	#1										
		#2		82,010	103			9,360	8,495		324,784	0.7479



		#3		91,221	72			9,348	8,537		356,297	0.7570
	Seoul	#4				36,893				11,745	157,606	0.6250
		#5				91,258				11,740	412,265	0.5908
	Incheon	#1				15,168				11,738	72,854	0.5556
		#2				15,317				11,739	76,672	0.5332
		#3			47	2,411			8,550	11,753	11,865	0.5533
		#4										
	Pyongtaek	C/C				80,050				11,740	483,959	0.4415
	Ilsan	C/C				595,190				11,737	3,270,241	0.4856
	Bundang	C/C			13,142	541,739				11,540	3,108,338	0.4572
	Ulsan	C/C				489,946				11,558	3,299,104	0.3902
	Seoincheon	C/C				1,061,332				11,740	7,503,395	0.3775
	Shinincheon	C/C				1,394,939				11,739	9,901,080	0.3760
	Boryeong	C/C			86	543,342				11,726	3,655,848	0.3962
	Incheon	C/C				806,154				11,784	6,075,599	0.3555
	Busan	C/C				1,247,488				11,747	9,268,113	0.3595
	Hallim	C/C										
	Anyang	C/C				202,108				14,084	1,301,286	0.4973
	Bucheon	C/C				230,085				14,232	1,556,502	0.4783
	POSCO POWER	C/C				342,724				11,739	1,859,273	0.4919
	GS Bugog	C/C				603,232				12,532	4,344,271	0.3956
	Yulchon	C/C				282,344				11,744	1,995,914	0.3777
	Kwangyang	C/C										
	Hyundai- Daesan	C/C										
	Namjeju	D/P		29,527	275			9,407	8,498		136,189	0.6499
	Jeju	G/T			626				8,503		842	1.9215
	Jeju	D/P		72,724				6,082			345,163	0.4050
2009 Total			70,242,669	2,825,580	55,323	8,596,729					247,025,690	0.7117
2010	Honam	#1	661,468	1,855	301		5,014	9,321	8,458		1,321,140	0.9454
		#2	722,994	897	350		5,057	9,322	8,482		1,462,407	0.9392
	Samchonpo	#1	1,899,819		518		5,385		8,466		4,433,574	0.8649
		#2	1,891,944		421		5,388		8,457		4,418,264	0.8647



		#3	1,581,512		1,261		5,373		8,478		3,766,380	0.8462
		#4	1,909,672		369		5,358		8,473		4,544,757	0.8439
		#5	1,949,826		293		4,714		8,563		4,174,333	0.8252
		#6	1,758,651		573		4,718		8,557		3,767,928	0.8256
	Yonghung	#1	2,201,446		2,189		5,432		8,387		5,558,681	0.8071
		#2	2,264,564		1,531		5,433		8,381		5,627,774	0.8199
		#3	2,778,041		739		5,386		8,391		6,887,344	0.8144
		#4	2,821,533		663		5,379		8,381		6,943,045	0.8193
	Boryeong	#1	1,771,953		732		5,176		8,402		4,012,817	0.8569
		#2	1,635,347		1,068		5,175		8,353		3,706,927	0.8562
		#3	1,618,460		464		5,206		8,321		3,855,846	0.8191
		#4	1,775,851		289		5,206		8,349		4,232,288	0.8188
		#5	1,604,934		911		5,201		8,313		3,817,181	0.8200
		#6	1,778,254		359		5,202		8,317		4,226,837	0.8203
		#7	1,670,727		662		5,244		8,322		4,189,558	0.7840
		#8	1,493,422		439		5,255		8,316		3,787,312	0.7767
	Taeon	#1	1,512,930		865		5,458		8,428		3,817,336	0.8111
		#2	1,626,596		518		5,427		8,429		4,058,392	0.8154
		#3	1,506,479		476		5,433		8,436		3,776,949	0.8123
		#4	1,656,710		296		5,456		8,422		4,165,579	0.8133
		#5	1,450,465		680		5,491		8,437		3,657,234	0.8166
		#6	1,319,263		1,094		5,486		8,428		3,339,271	0.8130
		#7	1,521,262		879		5,469		8,430		3,940,580	0.7918
		#8	1,674,579		240		5,456		8,431		4,335,230	0.7899
	Hadong	#1	1,651,998		386		5,263		7,561		3,948,643	0.8253
		#2	1,758,216		133		5,262		8,421		4,181,012	0.8292
		#3	1,760,793		94		5,264		8,671		4,229,016	0.8213
		#4	1,623,350		610		5,260		8,416		3,877,595	0.8255
		#5	1,762,407		369		5,259		8,643		4,210,179	0.8251
		#6	1,642,064		367		5,263		8,423		3,972,047	0.8155
		#7	1,314,119		674		5,528		8,474		3,497,189	0.7789
		#8	1,586,695		34		5,525		8,578		4,221,464	0.7782
	Dangjin	#1	1,802,866		89		5,140		8,294		4,240,235	0.8190
		#2	1,812,592		168		5,133		8,522		4,271,208	0.8163



		#3	1,660,911		430		5,140		8,532		3,924,887	0.8153
		#4	1,593,667		974		5,134		8,469		3,757,184	0.8167
		#5	1,676,374		332		5,198		8,533		4,133,329	0.7902
		#6	1,722,658		157		5,195		8,520		4,242,960	0.7904
		#7	1,572,939		347		5,207		8,534		3,870,155	0.7932
		#8	1,729,056		90		5,191		8,497		4,272,886	0.7872
	Ulsan	#1		59,593	278			9,420	8,369		220,710	0.8072
		#2		50,627	249			9,423	8,382		185,534	0.8162
		#3		70,519	286			9,352	8,361		261,312	0.8006
		#4		229,069	4,116			9,511	8,350		927,792	0.7535
		#5		204,124	4,395			9,526	8,350		823,717	0.7597
		#6		217,795	3,058			9,506	8,350		887,331	0.7463
	Yeongnam	#1		91,050	1,170			9,705	8,785		354,224	0.7974
		#2		80,387	786			9,702	8,696		304,146	0.8174
	Yeosu	#1		118,289	370			9,539	8,350		481,530	0.7426
		#2		236,662	278			9,543	8,345		956,556	0.7471
	Pyeongtaek	#1		188,829	121	3,409		9,435	8,542	11,693	794,103	0.7210
		#2		172,352	102	6,484		9,430	8,485	11,691	742,439	0.7156
		#3		194,662	115	4,814		9,443	8,517	11,702	830,437	0.7155
		#4		158,042	91	3,646		9,443	8,540	11,651	669,443	0.7195
	Namjeju	#1									-	-
		#2									-	-
		#3		151,950	105			9,410	8,505		594,537	0.7607
		#4		146,544	134			9,410	8,472		580,342	0.7517
	Jeju	#1									-	
		#2		76,706	78			9,379	8,440		298,469	0.7626
		#3		89,373	82			9,379	8,492		344,920	0.7688
	Seoul	#4				77,219				11,746	356,493	0.5784
		#5			1	169,145			6,650	11,746	815,062	0.5542
	Incheon	#1				95,108				11,747	477,252	0.5322
		#2				105,649				11,748	544,351	0.5184
		#3				-					-	-
		#4				-					-	
	Pyongtaek	C/C				237,805				11,691	1,472,808	0.4291



	Ilsan	C/C				755,305				11,745	4,306,850	0.4683
	Bundang	C/C				725,097				11,747	4,311,466	0.4491
	Ulsan	C/C				846,672				11,576	5,709,782	0.3902
	Seoincheon	C/C			76	1,633,316			8,750	11,745	11,756,041	0.3710
	Shinincheon	C/C				1,349,902				11,747	9,595,856	0.3757
	Boryeong	C/C				1,016,783				11,747	7,053,566	0.3850
	Incheon	C/C				1,035,486				11,745	7,789,931	0.3549
	Busan	C/C			12	1,666,675			4,275	11,748	12,489,596	0.3564
	Hallim	C/C			12,737				8,536		45,450	0.7271
	Anyang	C/C				308,918				12,447	1,824,654	0.4791
	Bucheon	C/C				303,789				12,454	1,806,919	0.4760
	POSCO POWER	C/C				809,100				11,411	4,297,788	0.4884
	GS Bugog	C/C				807,082				11,756	6,053,971	0.3563
	Yulchon	C/C				372,560				11,748	2,680,710	0.3712
	Kwangyang	C/C									-	-
	Hyundai- Daesan	C/C									-	-
	Kunsan	C/C				398,151				11,746	2,937,873	0.3619
	Yungwol	C/C			263	182,365			8,499	11,750	1,281,206	0.3807
	Namjeju	D/P		20,334	369			9,385	8,493		91,340	0.6709
	Jeju	G/T			697				8,550		1,115	1.6246
	Jeju	D/P		85,093				9,371			405,634	0.6214
2010 Total			74,729,407	2,644,752	54,403	12,914,480					279,038,209	0.6820

** Operating Margin emission factor

Year	Electricity generation by OM plants	CO2 emissions by OM plants
2008	237,888,671	163,529,778
2009	247,025,690	175,798,820
2010	279,038,209	190,305,054
Total	763,952,570	529,633,652

$$EF_{\text{grid,OM,simple,y}} = 0.6933 \text{ tonCO}_2/\text{MWh}$$



[Table Appendix 4- 2] Sample group plants used in the Build Margin calculation and CO2 emission factor of Build Margin

Year	No.	Plant name		Technology	Type of Fossil Fuel	year operation	Net electricity Generated (EGm,y)	CO2 emission factor (EFEL,m,y) (tCO2/MWh)	EF for each plant (tonCO2eq./MWh)
2010	1	Haengwon solar park		solar		2010.11	-		
	2	Gunwi		small hydro power		2010.11	228		
	3	Dangjin solar park		solar		2010.10	265		
	4	Yeicheon solar park		solar		2010.10	5,057		
	5	Yeongheung-wind power		wind		2010.10	2,238		
	6	Hangwon		small hydro power		2010.10	1		
	7	Seolibong		small hydro power		2010.08	108		
	8	Kyeongcheon	#2	small hydro power		2010.07	-		
	9	Gunsan		Combined		2010.06	2,937,873	0.3619	0.0115
	10	Tapjeong		small hydro power		2010.03	-		
	11	Sinkori	#1	nuclear		2010.02	1,121,956		
	12	Pangweo		small hydro power		2010	2,154		
	13	Yeongwol		Combined		2010	1,281,206	0.3807	0.0053
	14	Dangjin		small hydro power		2010			
	15	Rural community corp.		small hydro power		2010	-		
	16	New solar energy and others				2010	-		
2009	1	Gosan		small hydro power		2009.12	-		
	2	Ilsan fuel cell		fuel cell		2009.09	18,492		
	3	Gosado solar		solar		2009.07			
	4	Pyeongrado solar		solar		2009.07			
	5	Yukdo solar		solar		2009.07			
	6	Yuldo solar		solar		2009.07			
	7	Hadong	#8	steam power	Bituminous coal	2009.06	4,221,464	0.7782	0.0356
	8	Daehanboryeong		small hydro power		2009.05	-		
	9	Hankukhaeyang		small hydro power		2009.05	-		
	10	Wooldolmok		small hydro power		2009.05	1,039		
	11	Dangsado solar		solar		2009.04			



	12	Hahwado solar		solar		2009.04			
	13	Hwangjedo solar		solar		2009.04			
	14	Seongsan-wind		wind		2009.04	-		
	15	Yeongwol solar		solar		2009.01	54		
	16	Boseong		small hydro power		2009	3,973		
	17	Seongju		small hydro power		2009	4,171		
	18	New solar energy and others				2009	-		
2008	1	Boryeong	#8	steam power	Bituminous coal	2008.12	3,787,312	0.7767	0.0319
	2	Hadong	#7	steam power	Bituminous coal	2008.12	3,497,189	0.7789	0.0295
	3	Yeongheung	#4	steam power	Bituminous coal	2008.12	6,943,045	0.8193	0.0616
	4	Kyeongcheon		small hydro power		2008.11	1,214		
	5	Seongnam 2		small hydro power		2008.10	-		
	6	Nulokdo solar		solar		2008.09	-		
	7	Jeju solar		solar		2008.09	57		
	8	Boryeong fuel cell		fuel cell		2008.09	1,999		
	9	Naeyeong solar		solar		2008.08	-		
	10	Yulhyeon		small hydro power		2008.07	1,248		
	11	Busan C/C solar		solar		2008.07			
	12	Hadong solar		solar		2008.07			
	13	Hongikdongjin		small hydro power		2008.06	-		
	14	Daecheongdaem		small hydro power		2008.06	-		
	15	Boryeong	#7	steam power	Bituminous coal	2008.06	4,189,558	0.7840	0.0356
	16	Yeongheung	#3	steam power	Bituminous coal	2008.06	6,887,344	0.8144	0.0608
	17	Kori-wind power		wind		2008.05	-		
	18	Samlangjin solar				2008.04	-		
	19	Boryeong solar		solar		2008.04	-		
	20	Boryeong		small hydro power		2008.03	-		
	21	Yeongheung		small hydro power		2008.03	-		
	22	Yeonggwang solar park				2008.03	-		



	23	Boryeong 2		small hydro power		2008.03	1,338		
	24	POSCO fuel cell		fuel cell		2008.03	-		
	25	Gunjang heat & power		combined		2008.01	-		
	26	Seocheon solar		solar		2008.01	-		
	27	New solar energy and others		solar		2008	-		
2007	1	Taeon		small hydro power		2007			
	2	Hanbit Sungsan the second solar		solar		2007.12	-		
	3	Taein gangjin solar		solar		2007.12	-		
	4	Suni gangjin solar		solar		2007.12	-		
	5	Korea yeongcheon solar		solar		2007.12	-		
	6	Solar yungam solar		solar		2007.12	-		
	7	Changwhan yeongduk solar		solar		2007.12	-		
	8	Samsung jindo		solar		2007.12	-		
	9	Hwaseong heat & power		combined		2007.12	-		
	10	Dangjin	#8	steam power	Bituminous coal	2007.12	4,272,886	0.7872	0.0364
	11	SP solar yonggwang		solar		2007.11	-		
	12	Dongyang energy sinan		solar		2007.11	-		
	13	Ef yungam solar		solar		2007.11	-		
	14	Dongwon gangjin solar		solar		2007.11	-		
	15	Solec yonggwang solar		solar		2007.11	-		
	16	Solar jungeub solar		solar		2007.11	-		
	17	Sinbuk yungam solar		solar		2007.11	-		
	18	Hyein haenam solar		solar		2007.11	-		
	19	Samlangjin solar		solar		2007.11	-		
	20	Hyosung daegi-wind power		wind		2007.11	-		
	21	Nonhyun heat & power		combined		2007.10	-		
	22	Wuriyungam solar		solar		2007.08	-		
	23	Hwasung solar		solar		2007.08	-		
	24	Yeongju the first solar		solar		2007.08	-		
	25	Muan solar		solar		2007.08	-		
	26	Jangheung solar		solar		2007.08	-		
	27	Gomun		small hydro power		2007.08	-		



	28	Taeon	#8	steam power	Bituminous coal	2007.08	4,335,230	0.7899	0.0371
	29	Dangjin	#7	steam power	Bituminous coal	2007.06	3,870,155	0.7932	0.0333
	30	Munkyoung solar		solar		2007.06	-		
	31	Younggwang solar park		solar		2007.06	-		
	32	Yungam Solar		solar		2007.06	-		
	33	Wonjungsu		small hydro power		2007.05	-		
	34	Baekgok		small hydro power		2007.05	1,144		
	35	damyangho		small hydro power		2007.05	1,727		
	36	Juam		small hydro power		2007.05	-		
	37	Namjeju	#4	thermal	heavy oil	2007.03	580,342	0.7517	0.0047
	38	Eco energy		solar		2007.03	-		
	39	hapcheon		small hydro power		2007.02	7,472		
	40	Jeonju-resource recovery facility				2007.02	-		
	41	Seoul Marin(suncheon)		solar		2007.02	-		
	42	Mirae energy		solar		2007.02	-		
	43	samcheonpo		small hydro power		2007.02	-		
	44	dalbang		small hydro power		2007.02	-		
	45	Taeon	#7	steam power	Bituminous coal	2007.02	3,940,580	0.7918	0.0338
	46	Yeongju the second solar		solar		2007.01	-		
	47	Hyundaedaesan		combined		2007.01			
2006	1	Cheongsong pumping	#2	pumping		2006.12	305,821		
	2	S&P Solar		solar		2006.10	-		
	3	Bundang fuel cell		fuel cell	LNG	2006.10	1,769		
	4	Namhae Solar		solar		2006.10	-		
	5	HanlaJeunggong Solar		solar		2006.10	-		
	6	Yungam Solar		solar		2006.09	-		
	7	Enepark		solar		2006.09	-		
	8	Yeongheung solar		solar		2006.09	1,160		
	9	Cheongsong pumping	#1	pumping		2006.09	301,551		
	10	Namjeju	#3	thermal	heavy oil	2006.09	594,537	0.7607	0.0049



2005	11	yangyang(pumping)	#4	pumping		2006.08	204,280		
	12	Donghae Solar		solar		2006.08	-		
	13	Kangwon-wind power		wind		2006.07	-		
	14	Woljeong-wind power		wind		2006.07	-		
	15	yangyang pump windpower		wind		2006.06	-		
	16	Hadongho		small hydro power		2006.06	2,923		
	17	yangyang (pumping)	#3	pumping		2006.06	194,083		
	18	Goheung Solar		solar		2006.06	-		
	19	Jangseong		small hydro power		2006.05	2,056		
	20	yangyang (pumping)	#2	pumping		2006.04	194,653		
	21	Dangjin	#6	thermal	Bituminous coal	2006.04	4,242,960	0.7904	0.0363
	22	Sinchang-wind power		wind		2006.03	-		
	23	yangyang (pumping)	#1	pumping		2006.02	122,320		
	1	Janghengdam		small hydro power		2005.12	-		
	2	Suncheon Solar		solar		2005.12	-		
	3	Samcheonpo solar energy		solar		2005.12	1,129		
	4	Dangjin	#5	steam power	Bituminous coal	2005.10	4,133,329	0.7902	0.0354
	5	yangyang pump small hydro		small hydro power		2005.10	-		
	6	Taeon solar energy		solar		2005.10	116		
	7	Jeju DP		internal combustion	heavy oil	2005.07	405,634	0.6214	0.0027
	8	WunjeongLFG		internal combustion	LFG	2005.07	-		
	9	Yulchon		combined	LNG	2005.07	2,680,710	0.3712	0.0108
	10	Incheon		combined	LNG	2005.07	7,789,931	0.3549	0.0300
	11	Daegok		small hydro power		2005.07	1,038		
	12	Donghwa		small hydro power		2005.07	3,289		
	13	Ulchin	#6	nuclear		2005.04	7,991,038		
	14	Hanrye		LFG	LFG	2005.04	-		
	15	Busan Bio-gas		internal combustion	LFG	2005.03	-		
	16	Sungnam		small hydro power		2004.12	-		
	17	Yungduk-wind power		wind		2004.12	-		
	18	Yongdam		small hydro power		2004.12	26,825		
	19	Maebongsan-wind power		wind		2004.12	-		



	20	Daegwanryeong-wind power		wind		2004.12	-		
	21	Yeongheung	#2	steam power	Bituminous coal	2004.11	5,627,774	0.8199	0.0500
	22	Yeongheung	#1	steam power	Bituminous coal	2004.07	5,558,681	0.8071	0.0486
BM TOTAL							92,307,726		0.6357

Source: Statistics of Electric Power in KOREA (2011) (KEPCO), Current status of power generating facility (2011, Korea power exchange)

$$EF_{\text{grid,BM,y}} = 0.6357 \text{ tonCO}_2/\text{MWh}$$

[Table Appendix 4- 3] Default CO2 Emission factor for combustion

Fuel type	Default carbon content (kg/GJ)	Default carbon oxidation factor	Effective CO2 emission factor (kg/TJ)		
			Default Value	96% confidence interval	
	A	B	$C=A*B*44/12*1000$	Lower	Upper
Motor Gasoline	18.9	1	69300	67500	73000
Aviation Gasoline	19.1	1	70000	67500	73000
Jet Gasoline	19.1	1	70000	67500	73000
Gas/Diesel oil	20.2	1	74100	72600	74800
Residual fuel oil	21.1	1	77400	75500	78800
Anthracite	26.8	1	98300	94600	101000
Other bituminous coal	25.8	1	94600	89500	99700
Natural Gas	15.3	1	56100	54300	58300

Chap.1 Introduction, Vol.2 Energy, 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf



Appendix 5: Further background information on the monitoring plan

Please refer to section B.7. of Part II.

History of the document

Version	Date	Nature of revision(s)
02.0	EB 66 13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the programme design document form for small-scale CDM programmes of activities" (EB 66, Annex 13).
01	EB33, Annex43 27 July 2007	Initial adoption.
Decision Class: Regulatory Document Type: Form Business Function: Registration		