CLEAN DEVELOPMENT MECHANISM
SMALL-SCALE PROGRAMME OF ACTIVITIES DESIGN DOCUMENT FORM
(CDM-SSC-PoA-DD) Version 01

CONTENTS

Annexes

NOTE:

(i) This form is for the submission of a CDM PoA whose CPAs apply a small scale approved methodology.

(ii) At the time of requesting registration this form must be accompanied by a CDM-SSC-CPA-DD form that has been specified for the proposed PoA, as well as by one completed CDM-SSC-CPA-DD (using a real case).

SECTION A. General description of small-scale programme of activities (PoA)

A.1 Title of the small-scale programme of activities (PoA):

The programme to introduce renewable energy system into Seoul

Version number: 01
Revised date: 2011/03/21

A.2. Description of the small-scale programme of activities (PoA):

Seoul Metropolitan Government (hereafter Seoul) is a member of C40 Climate Leadership Group and taking action against climate change aggressively. Seoul set up the goal to reduce energy consumption by 15% (compared with 2000 levels) and GHG emission by 25% (compared with 1990 levels) by 2020. To achieve this goal, Seoul planed to supply renewable energy to public sector to replace fossil fuel based energy and reduce GHG emission. The proportion of renewable energy among whole energy use of Seoul at 2007 is only 1.2%. Seoul set up the goal to enhance the proportion of renewable energy to 4% by 2015 and 10% by 2020.[1]

Seoul is utilizing various renewable energy sources but main source is concentrated in non-natural renewable energy source such as waste burning (64%) and biomass (34%). Natural renewable energy sources such as solar heat (1.3%), photovoltaic (0.3%) and geothermal (0.3%) takes only small share. [2] On the other hand, energy potential of natural renewable energy source is more than non-natural renewable energy source. (Solar heat 587,484,749 Gcal/year, Photovoltaic 682,641 Gcal/year, Geothermal 14,281,294 KTOE, Waste 20,281,036 Gcal/year and biomass 174,656,923 Gcal/year at 2009) In this background, development of natural renewable energy is needed. In addition, amount of renewable energy potential varies with region in Seoul because of different environment, and each public building has different environment for utilizing renewable energy also.[3] Therefore, each place should introduce appropriate renewable energy system considering its environment. From economic aspect of view, private entity can develop large scale renewable energy project for commercial purpose with economic feasibility, but small scale renewable energy project for public purpose (households/communities) is usually economically infeasible. This small project is economically unattractive, so private entity would not promote this project voluntarily. Therefore, Seoul promotes the program to supply various renewable energy systems to public buildings belonging to Seoul, to utilize natural renewable energy and approve equilibrium of energy mix for renewable source and reduce GHG emission by replacing existing energy based on fossil fuel.

Korean[4] government promotes some programs to propagate renewable energy system. Government compels public institute[5] to introduce renewable energy system and promotes supply program of renewable energy system. However, enforcement to introduce renewable energy system is only

[1] Source for this paragraphs: “Seoul renewable energy basic plan 2030”, Seoul Metropolitan Government, 2009

[2] Source: “Seoul renewable energy basic plan 2030”, Seoul Metropolitan Government, 2009

[3] Source: Korea renewable energy resource data centre, http://www. kredc.kier.re.kr

[4] Korea in this document only means Republic of Korea, does not mean Democratic People’s Republic of Korea.

[5] Public institute: National and local governments, government agencies, public enterprises

applicable to new public building[6], not to existing public building and supply program is just encouraged, optional and not mandatory to public institute.[7]
Though this circumstance, Seoul promotes a voluntary program to introduce natural renewable energy system to public building in Seoul. The program will bring replacement of existing energy based on fossil fuel and reduction of GHG emission by utilizing photovoltaic system, solar water heating system and geothermal heating/cooling system.

General operating and implementing framework of PoA
The programme of activities involves applying photovoltaic system, solar water heating system and geothermal heating/cooling system in public buildings belonging to Seoul. These renewable energy systems will replace existing energy source based on fossil fuel and reduce GHG emission.

Photovoltaic system supply electricity and replace existing supply from grid. It brings reduction of GHG emission from grid electricity generation. Solar water heating system supply hot water and replace existing boiler system using liquefied natural gas (LNG) line. It brings reduction of GHG emission by burning LNG. Geothermal heating/cooling system provide an optimal indoor temperature and replace existing heating system using LNG line and cooling system using grid electricity. It brings reduction of GHG emission from grid electricity generation and burning LNG.

Each renewable energy system is used for operating building such as electricity supply and heating/cooling. Produced energy by these systems is used for captive use of building.

Seoul introduces above renewable energy systems to public buildings in Seoul. Seoul has about 90 affiliated organizations and each organization includes several public buildings. About several hundreds of public building belonging to Seoul can be potential project site.

Each SSC-CPA is comprised of public buildings in Seoul which apply this program. Each public building included in a SSC-CPA will introduce one or more system above mentioned.

Korean government promotes subsidy program for renewable energy supply of local area. Local government which has renewable energy diffusion plan for public sector can apply to this subsidy program. If it is accepted, maximum 50% of project budget would be subsidized by the central government. This program is ‘renewable energy diffusion program for local area’ and implemented since 2007[8], so it is regarded as E- policy.[9] This PoA includes subsidized projects by this subsidy program.

Contribution to sustainable development
· Social aspect

[6] Public building: which built by public institute

Ex) community centre, sport centre, public office building, culture centre, public housing and etc.

[7] This policy is described in “Act on the Promotion of the Development, Use and Diffusion of New and Renewable Energy”.

[8] This policy is described in “Act on the Promotion of the Development, Use and Diffusion of New and Renewable Energy” and “Guideline for the support, install and management of new and renewable energy system”

[9] E- policy is that which give comparative advantage to less emissions intensive technologies or fuels . The impacts of these policies can be excluded in establishing a baseline scenario if they have been implemented since the adoption of the Marrakesh Accords (11/11/2001). EB 22, Annex 3

- This program will contribute to revitalization of renewable energy system industry by public purchase.
- This program will supply renewable energy systems to public buildings such as welfare centre, community centre, sport centre and child care centre. It contributes to enhancement of public welfare and publicizes renewable energy to citizen.
- This program will be a benchmark practice to reduce energy use of building and vitalize other similar sustainable activities in Korea.

· Environmental aspect

- Photovoltaic, solar heat and geothermal energy are natural renewable energy source and usable continuously without any environmental problem.
- Photovoltaic system and solar heat system do not emit any GHG for operation. Geothermal heating/cooling system use less electricity for operation compared with existing system. It brings reduction of GHG emission from grid electricity use.

· Economic aspect

- Introducing renewable systems by this program, each public building can save energy cost for operation.

Policy/measure or stated goal of the PoA

The objective of the PoA is supplying natural renewable energy system to public sector. Seoul will install photovoltaic system, solar water heating system and geothermal heating/cooling system to public buildings belonging to Seoul. This PoA will enhance energy independence of public buildings and reduce GHG emission from public buildings through avoidance of fossil fuel based energy use.
This PoA utilizes several kinds of renewable energy system to make the best use of renewable energy and disseminate widely considering various condition of public building. This PoA contributes to not only GHG emission reduction but also improvement of energy mix of Seoul. Utilizing several kinds of renewable energy, Seoul can secure various energy sources and be a clean city at the same time. For this purpose, Seoul promotes to introducing renewable energy system to public sector preferentially, with this PoA.

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

This PoA is a scheme developed by Seoul to introduce natural renewable energy to public building belonging to Seoul. There are no mandatory enforcements in Korea to enforce introduction of renewable energy system to existing public buildings.

A.3. Coordinating/managing entity and participants of SSC-POA:

1. Coordinating or managing entity of the PoA as the entity which communicates with the Board
   Seoul Metropolitan Government

2. 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.
   No any other participants

Name of Party involved	Private and or public entity(ies) project participants(as applicable)	Party involved wishes to be considered as project participant
Republic of Korea	Seoul Metropolitan Government	

A.4. Technical description of the small-scale programme of activities:

A.4.1. Location of the programme of activities:

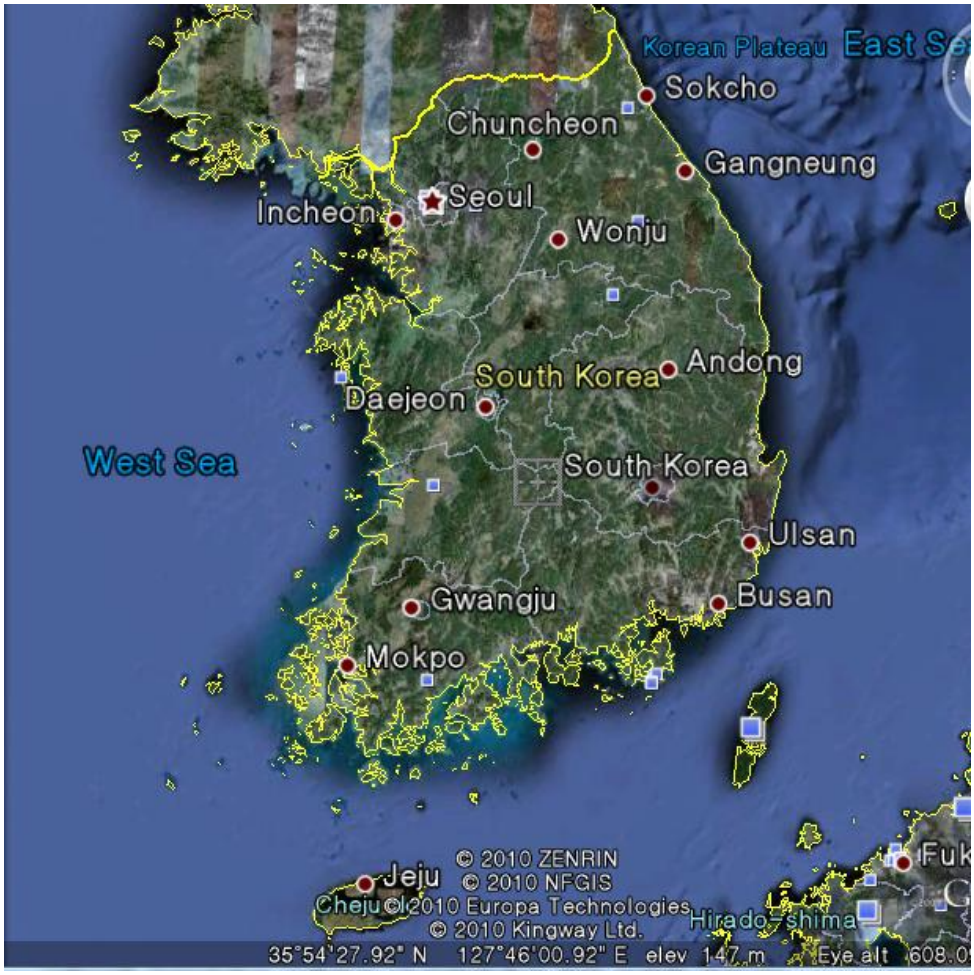
Republic of Korea

A.4.1.1. Host Party(ies):

Republic of Korea

A.4.1.2. Physical/ Geographical boundary:

All SSC-CPAs associated with this PoA will be implemented within the geographical boundary of Korea. Some buildings implementing this PoA are placed outside of geographical boundary of Seoul City but belonging to Seoul Metropolitan Government administratively. Therefore, the boundary of the PoA is defined as the Republic of Korea to include these buildings which belonging to Seoul Metropolitan Government administratively.



A.4.2. Description of a typical small-scale CDM programme activity (CPA):

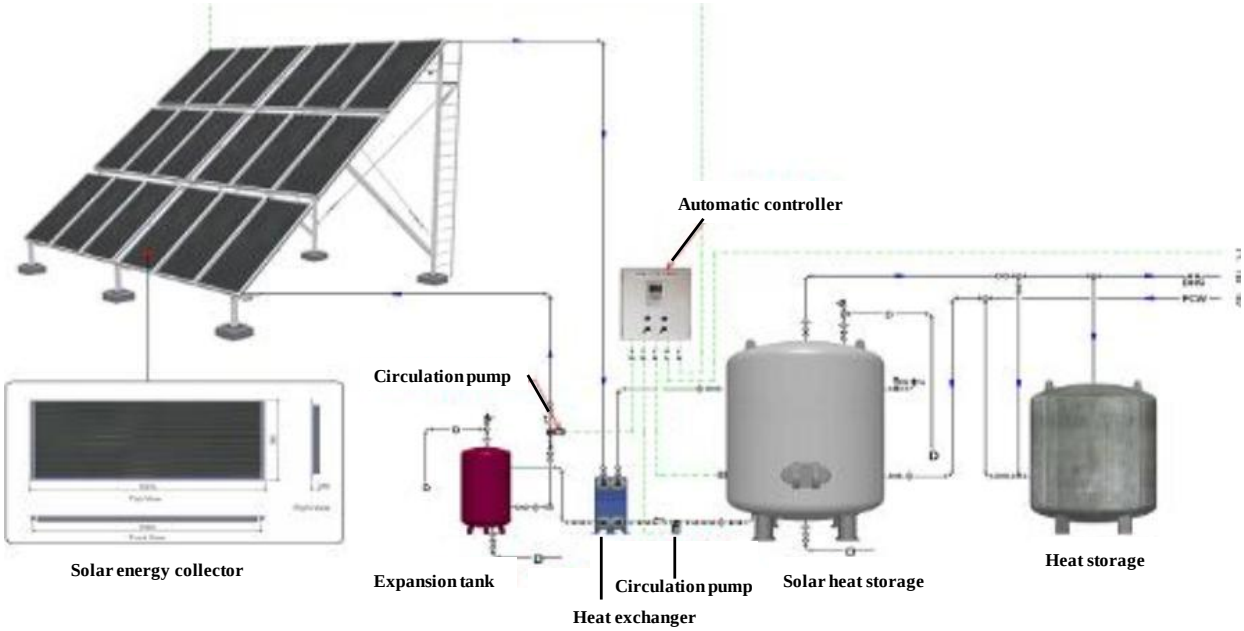
Each SSC-CPA will install renewable energy system to public buildings belonging to Seoul. Photovoltaic system, solar water heating system and geothermal heating/cooling system will be installed by each SSC-CPA and these systems will replace fossil fuel based energy use for building. Each SSC-CPA is comprised of public buildings in Seoul which apply this program and these buildings will introduce one or more system above mentioned. Photovoltaic system under each SSC-CPA should correspond to AMS-I.F (version 1) methodology. Solar water heating system and geothermal heating/cooling system under each SSC-CPA should correspond to AMS-I.C (version 18) methodology. The total generation capacity of systems under each SSC-CPA is limited to 15MW (=45MW thermal).

A.4.2.1. Technology or measures to be employed by the SSC-CPA:

All introduced renewable energy system should be certificated by Korea Energy Management Corporation (hereafter KEMCO) as a renewable energy system. It ensures the performance and reliability of a renewable energy system in Korea.

Solar water heating system
Solar water heating system converts solar radiation into thermal energy for heating water and supplies hot water to user. It replaces existing boiler system using LNG line. This system is comprised of below devices.

- Solar energy collector: collect solar energy for heating from radiation
- Solar heat storage: store and supply hot water
- Expansion tank: store heat medium
- Heat exchanger: exchange heat between medium and water
- Circulation pump: circulate heat medium or water
- Automatic controller: control system work using temperature information of collector and storage

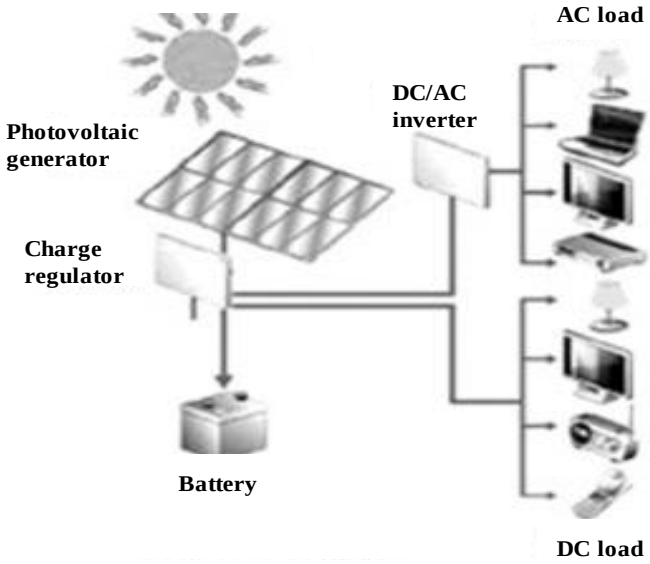


<Figure 1> Solar water heating system

Photovoltaic system

Photovoltaic system converts solar radiation into electric energy and supplies electricity to user. It replaces existing electricity supply from grid. This system is comprised of below devices.

- Photovoltaic generator: generate electricity from solar radiation
- Charge regulator: limit electric current flow into battery when it is full and prevent overcharge
- Battery: store generated electricity
- DC/AC inverter: invert generated DC electricity to AC electricity for use

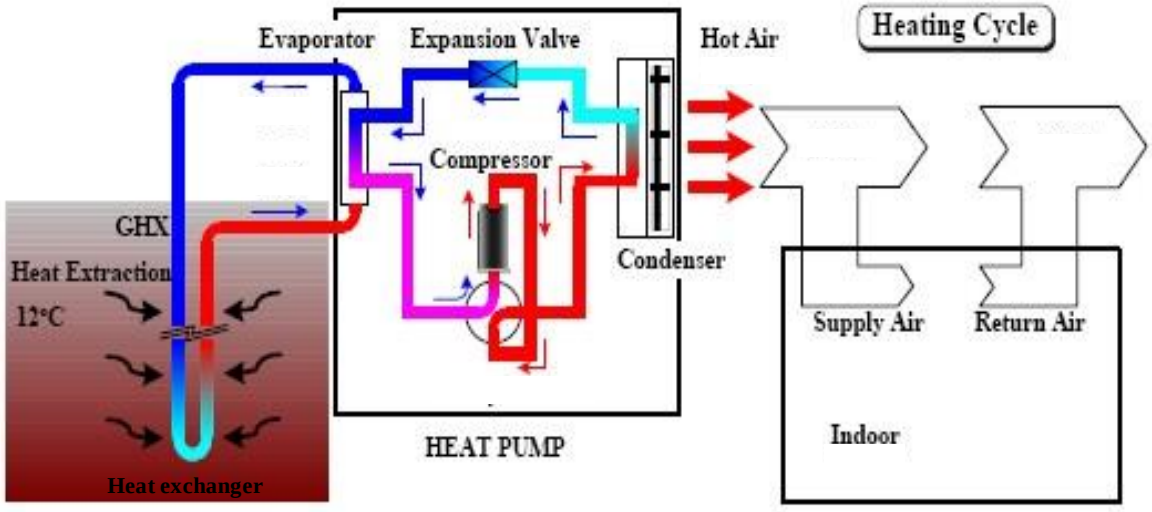


<Figure 2> Photovoltaic system (stand-alone type)

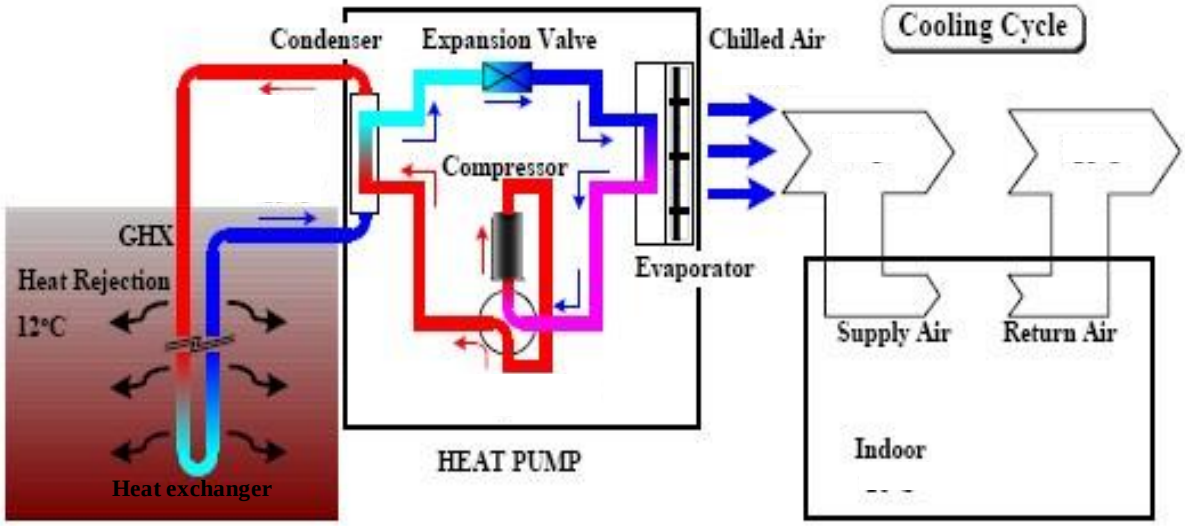
Geothermal heating/cooling system

Geothermal heating/cooling system exchanges heat between indoor and ground using reasonably constant ground temperature (about 12□C). This system extracts heat from ground and supply hot air to indoor. On the contrary to this, it rejects heat to ground and supply chilled air to indoor. It provides an optimal indoor temperature, and replaces existing heating system using LNG line and cooling system using grid electricity. This system is comprised of below devices.

- Heat exchanger: extract/reject heat from/to ground
- Heat pump: supply hot/chilled air to indoor



<Figure 3> Geothermal system (heating)



<Figure 4> Geothermal system (cooling)

A.4.2.2. Eligibility criteria for inclusion of a SSC-CPA in the PoA:

Eligibility Criteria:

SSC-CPA should result all assessment as "yes".

Check list for each CPA

A-No	Eligibility criteria	SSC-CPA Self Assessment

1	Is the SSC-CPA performed within the territory of the Republic of Korea?	□ within Korea □ out of Korea
2	Are public buildings included in the SSC-CPA belonging to Seoul?	□ Yes □ No
3	The SSC-CPA is a single project which is not registered large scale CDM or SSC-CPA in the other PoA or other carbon off-set program.	□ Yes □ No
4	Is the SSC-CPA available identified its location from GPS location?	□ Yes □ No
5	Confirmation that SSC-CPA is not a de-bundled component of another large-scale CPA or CDM project activity as per the latest guidance given in CDM EB.	□ Yes □ No
6	The SSC-CPA is a voluntary project which is not implementing any mandatory policy or regulation of the Government of the Republic of Korea.	□ Yes □ No
7	The total generation capacity of systems under SSC-CPA is below 15MW (=45MW thermal)	□ Yes □ No
8	Does the SSC-CPA fulfill the key criteria and data for assessing additionality of a SSC-CPA as per section E.5.2 to prove additionality?	□ Yes □ No

A.4.3. Description of how the anthropogenic emissions of GHG by sources are reduced by a SSC-CPA below those that would have occurred in the absence of the registered PoA (assessment and demonstration of additionality):

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

The proposed PoA is a voluntary coordinated action. There is no mandatory policy/regulation in Korea that requires Seoul to introduce renewable energy systems to public building.
There are two mandatory policies to introduce renewable energy systems to public sector in Korea. Public institutes must introduce renewable energy system when they construct new public building. However, it is only applicable to new public building, not to existing public building, so this policy has no influence to proposed PoA. Other policy is renewable energy system supply program. Public institute can promote several supply programs, but it is just encouraged and optional, not mandatory, they have no obligation to introduce renewable energy system.[10]
This PoA includes subsidized projects by national subsidy program. This program is 'renewable energy diffusion program for local area' and implemented since 2007, so it is regarded as E- policy.[11] Local

[10] These two policies are described in "Act on the Promotion of the Development, Use and Diffusion of New and Renewable Energy"

[11] This policy is described in "Act on the Promotion of the Development, Use and Diffusion of New and Renewable Energy" and "Guideline for the support, install and management of new and renewable energy system"

government which has renewable energy diffusion plan for public sector can apply to this subsidy program. If it is accepted, maximum 50% of project budget would be subsidized by government. Seoul developed renewable energy diffusion plan and applied this subsidy program voluntarily.

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

This PoA includes subsidized projects by national subsidy program which regarded as E- policy. Because renewable energy system for public sector needs large budget and it is financially unattractive, so Seoul applied to national subsidy program to develop the program and it was accepted. Without this PoA, renewable energy system would not be introduced into public building belonging to Seoul.

(iii) If the PoA is implementing a mandatory policy/regulation, this would/is not enforced;

There is no mandatory policy/regulation about this PoA.

(iv) If mandatory a policy/regulation is enforced, the PoA will lead to a greater level of enforcement of the existing mandatory policy/regulation.

There is no mandatory policy/regulation about this PoA.

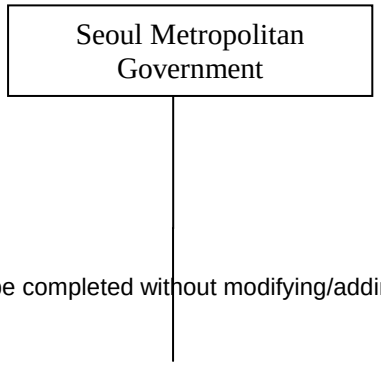
A.4.4. Operational, management and monitoring plan for the programme of activities (PoA):

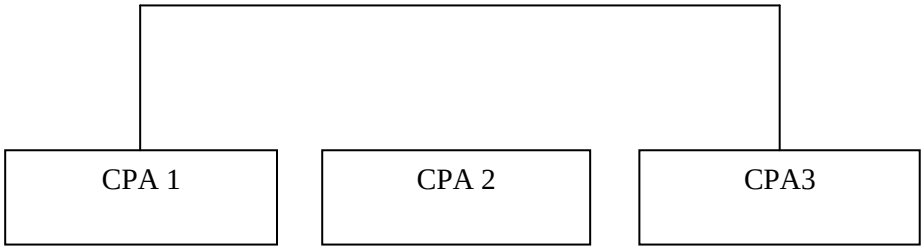
A.4.4.1. Operational and management plan:

Operational structure and task of each party is as below.

Coordinating/managing entity (Seoul)
- Manage PoA CDM registration process: validation and registration of PoA and SSC-CPA
- Inclusion of new SSC-CPAs: Check SSC-CPA eligibility criteria
- De-bundling check
- Establish monitoring plan and system
- Verification and storage of monitoring data
- Make the monitoring report
- CER allocation with SSC-CPA implementer according to agreement

SSC-CPA implementer (Seoul)
- Implement and manage the SSC-CPA
- Prove additionality of SSC-CPA
- Collect monitoring data and store data





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

Detailed monitoring manual for Seoul will be provided. Seoul should follow the manual for their monitoring work. The manual includes below description for monitoring and more details for each SSC-CPA project characteristics.

Coordinating/managing entity (Seoul)
Seoul manages the whole monitoring process and takes responsibility. Seoul designates a department for CDM data which is qualified to manage data and records as it is part of its normal assignment. Seoul collects monitoring data from each SSC-CPA, verifies the data whether all variables are valid or not, and makes a monitoring report. Electronic records will be kept during the entire crediting period of each SSC-CPA (10 years) and two years after the end of crediting period. Records will be kept in the monitoring task computer unit. Seoul ensures reliability of data storage system and secures alternative storing unit for accidental situation. Seoul should be noticed when an accident is happened in SSC-CPA level.

SSC-CPA implementer (Seoul)
Seoul performs monitoring process as a SSC-CPA implementer. Each introduced system include output data meter. These systems should be available for recording its all monitoring variables. Seoul collects monitoring data for SSC-CPA and store as above described. Seoul secures measure for accidental situation. If accident is happened, Seoul should apply appropriate solution.

Each SSC-CPA will follow the record keeping and monitoring requirements stipulated in applied methodologies and detailed in Section E below. Each SSC-CPA can introduce three types of systems applying two methodologies. Photovoltaic system records under each SSC-CPA should correspond to AMS-I.F (version 1) methodology. Records of solar water heating system and geothermal heating/cooling system under each SSC-CPA should correspond to AMS-I.C (version 18) methodology. In summary, the coordinating entity (Seoul) will ensure that each SSC-CPA will maintain appropriate records documenting the following variables:

- The geographical location of each SSC-CPA
- The system information and monitoring data of each introduced system

Data type	List of data

System information	A serial number system type location introduced date
Energy production/consumption	generated energy type and quantity consumed energy type and quantity

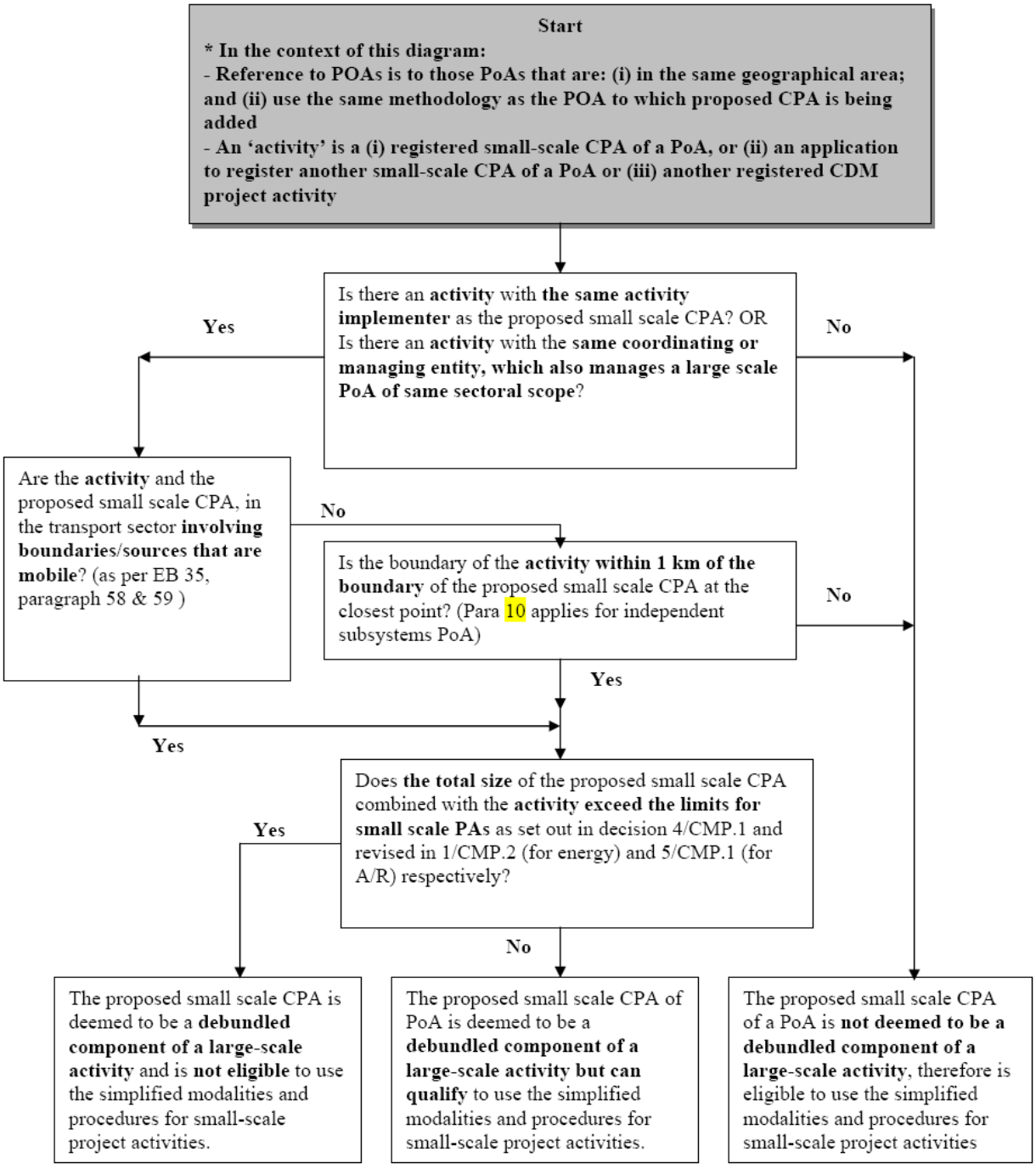
(ii) A system/procedure to avoid double accounting e.g. to avoid the case of including a new CPA that has been already registered either as a CDM project activity or as a CPA of another PoA,

Double counting can occur if a registered CDM project activity or a SSC-CPA of another PoA is sought to be registered under this PoA. To prevent such instances, Seoul seeks confirmation in SSC-CPA and also checks any-double counting using DISCOM, UNFCCC data.
In an instance where a SSC-CPA of another PoA or CDM project activity is already registered in the same geographic area as a proposed SSC-CPA, Seoul will not proceed with the submission for validation of the SSC-CPA. In the instance where a SSC-CPA of another PoA or CDM project activity is requesting registration, is under review or for which review or corrections have been requested, Seoul shall advice the investor concerned to wait for these processes to be resolved before proceeding submitting the SSC-CPA under this PoA.

(iii) The SSC-CPA included in the PoA is not a de-bundled component of another CDM programme activity (CPA) or CDM project activity.

Seoul checks the occurrence of de-bundling in each SSC-CPA according to the guidance for determining the occurrence of de-bundling under a PoA (EB 54, Annex13).

To make sure de-bundling check, Seoul checks accurate location of SSC-CPA using GPS information and serial number of a renewable system. Seoul will match GPS location information and serial number of a renewable system and this information will be stored.



(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 coordinating/managing entity is responsible for identifying, developing, registering and managing all SSC-CPAs to be included in the proposed PoA. This will mean that those operating the SSC-CPA will be aware and will have agreed that their activity is subscribed to the proposed PoA. Legal agreements have

been put in place with PoA distribution partners clearly stipulating that their activities are subscribed to the SSC-PoA.

A.4.4.2. Monitoring plan:

>> The following information shall be provided here:

(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.
(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;

All introduced system has input/output data meter and monitoring data will be sent to Seoul and Seoul manages the data. The SSC-CPA project database includes the following data-set that can unambiguously determine the emission reductions attributable to each SSC-CPA:

Data type	List of data
System information	A serial number system type location introduced date
Energy production/consumption	generated energy type and quantity consumed energy type and quantity

The coordinating entity will produce a monitoring report for the DOE to verify corresponding to the preceding monitoring period of each SSC-CPA. This report will unambiguously set-out the data relating to the emission reductions generated by that specific SSC-CPA during the monitoring period.

PoA record keeping procedures will prevent double counting across SSC-CPAs. The data-set corresponding to each SSC-CPA will be mutually exclusive of the data-set of another SSC-CPA under the PoA.

Verification of each SSC-CPA will be performed at the end of each monitoring period. The project database will record the start and end dates of each monitoring period, and record the emission reductions attributable to each monitoring period. Appropriate record keeping procedures will be implemented to ensure that each monitoring period data set can be transparently attributed to its corresponding SSC-CPA, preventing any occurrences of double counting. An audit of the project database will be able to determine the current status of each SSC-CPA – the duration of previous monitoring periods, groups delivering monitoring data and current verification activities.

A.4.5. Public funding of the programme of activities (PoA):

No public funding will be used for this PoA.

SECTION B. Duration of the programme of activities (PoA)

B.1. Starting date of the programme of activities (PoA):

2010/06/07

B.2. Length of the programme of activities (PoA):

28 years

SECTION C. Environmental Analysis

>>

C.1. Please indicate the level at which environmental analysis as per requirements of the CDM modalities and procedures is undertaken. Justify the choice of level at which the environmental analysis is undertaken:

1. Environmental Analysis is done at PoA level ☐√
2. Environmental Analysis is done at SSC-CPA level ☐

C.2. Documentation on the analysis of the environmental impacts, including transboundary impacts:

No significant negative environmental impacts were identified due to the introduction of photovoltaic system, solar water heating system and geothermal heating/cooling system.

C.3. Please state whether in accordance with the host Party laws/regulations, an environmental impact assessment is required for a typical CPA, included in the programme of activities (PoA),:

The government of Republic of Korea does not require any documentation of the environmental impacts of the project activity about introduce of small scale renewable energy system. Solar, wind, fuel cell energy system which capacity exceeds 100MW must submit documentation of the environmental impacts, but other renewable energy system has no obligation.[12]

SECTION D. Stakeholders' comments

>>

D.1. Please indicate the level at which local stakeholder comments are invited. Justify the choice:

1. Local stakeholder consultation is done at PoA level ☐
2. Local stakeholder consultation is done at SSC-CPA level ☐√

Note: If local stakeholder comments are invited at the PoA level, include information on how comments by local stakeholders were invited, a summary of the comments received and how due account was taken of any comments received, as applicable.

[12] This provision is described in Environmental Impact Assessment Act.

D.2. Brief description how comments by local stakeholders have been invited and compiled:

Not Applicable

D.3. Summary of the comments received:

Not Applicable

D.4. Report on how due account was taken of any comments received:

Not Applicable

SECTION E. Application of a baseline and monitoring methodology

This section shall demonstrate the application of the baseline and monitoring methodology to a typical SSC-CPA. The information defines the PoA specific elements that shall be included in preparing the PoA specific form used to define and include a SSC-CPA in this PoA (PoA specific CDM-SSC-CPA-DD).

E.1. Title and reference of the approved SSC baseline and monitoring methodology applied to a SSC-CPA included in the PoA:

The approved small-scale baseline and monitoring methodologies used are:

AMS I.C – Thermal energy production with or without electricity (version 18)
AMS I.F – Renewable electricity generation for captive use and mini-grid (version 1)

NOTE: The approved SSC baseline and monitoring methodology should be approved for use in a PoA by the Board.

E.2. Justification of the choice of the methodology and why it is applicable to a SSC-CPA:

This PoA applies several types of renewable energy system, because each public building has different condition to utilize renewable energy source. To disseminate renewable energy widely, appropriate system for each building should be introduced. For this reason, this PoA includes three types of renewable energy system. Photovoltaic and solar water heating systems are applicable to a place which can take enough solar energy (light/heat) and geothermal heating/cooling system is applicable to a place which has appropriate ground and enough underground space. If these conditions are not satisfied, these systems are not applicable. Beside this technical condition, economic condition and the other conditions are different to each public building and they needs appropriate renewable energy system considering various conditions.
Also, GHG emission reduction mechanisms of these systems are not same, so each system needs appropriate methodology for its baseline and monitoring. Therefore, one methodology cannot cover these different systems and this PoA needs multiple methodologies for baseline and monitoring. Two methodologies will be applied for baseline and monitoring. Applying multiple methodologies is essential to promote this PoA which introducing several kinds of renewable energy system. In other word, it is for effective utilization of several types of renewable energy source.

AMS I.C states:
This category comprises renewable energy technologies that supply users with thermal energy that displaces fossil fuel use. These units include technologies such as solar thermal water heaters and dryers, solar cookers, energy derived from renewable biomass and other technologies that provide thermal energy that displaces fossil fuel.

This methodology is applicable to SSC-CPAs which introduce solar water heating and geothermal heating/cooling system because these systems produce thermal energy and replace fossil fuel based energy. Introducing these systems replaces existing fossil fuel based energy and brings reduction of GHG emission. This process is described in AMS I.C methodology.

AMS I.F states:
This category 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 among a national or a regional grid, fossil fuel fired captive power plant and a carbon intensive mini-grid.

This methodology is applicable to SSC-CPAs which introduce photovoltaic system because this system produces electricity and replace grid electricity. Introducing this system replaces existing electricity supply from grid and brings reduction of GHG emission. This process is described in AMS I.F methodology.

NOTE: In the case of CPAs which individually do not exceed the SSC threshold, SSC methodologies may be used once they have first been reviewed and, as needed, revised to account for leakage in the context of a SSC-CPA.

E.3. Description of the sources and gases included in the SSC-CPA boundary

	Source	Gas	Included?	Justification
Baseline	Power Plants servicing the electricity grid	CO_2	Yes	
		CH_4	No	Minor Source
		N_2O	No	Minor Source
	LNG line	CO_2	Yes	
		CH_4	No	Minor Source
		N_2O	No	Minor Source
Project Activity	Power Plants servicing the electricity grid	CO_2	Yes	
		CH_4	No	Minor Source
		N_2O	No	Minor Source

E.4. Description of how the baseline scenario is identified and description of the identified baseline scenario:

As explained in the additionality section below, the followings are the alternatives to the proposed PoA of introduction of renewable energy systems:

Two alternatives to the proposed PoA have been identified:

I. The activity could occur without being registered as a PoA. In such a scenario the Seoul Local Government would purchase the renewable energy systems, but the time to introduce them for whole public buildings would be longer.
II. Continuation of the current practice is also a possible alternative scenario, i.e the continued use of existing fossil fuel based energy (grid electricity and LNG line).

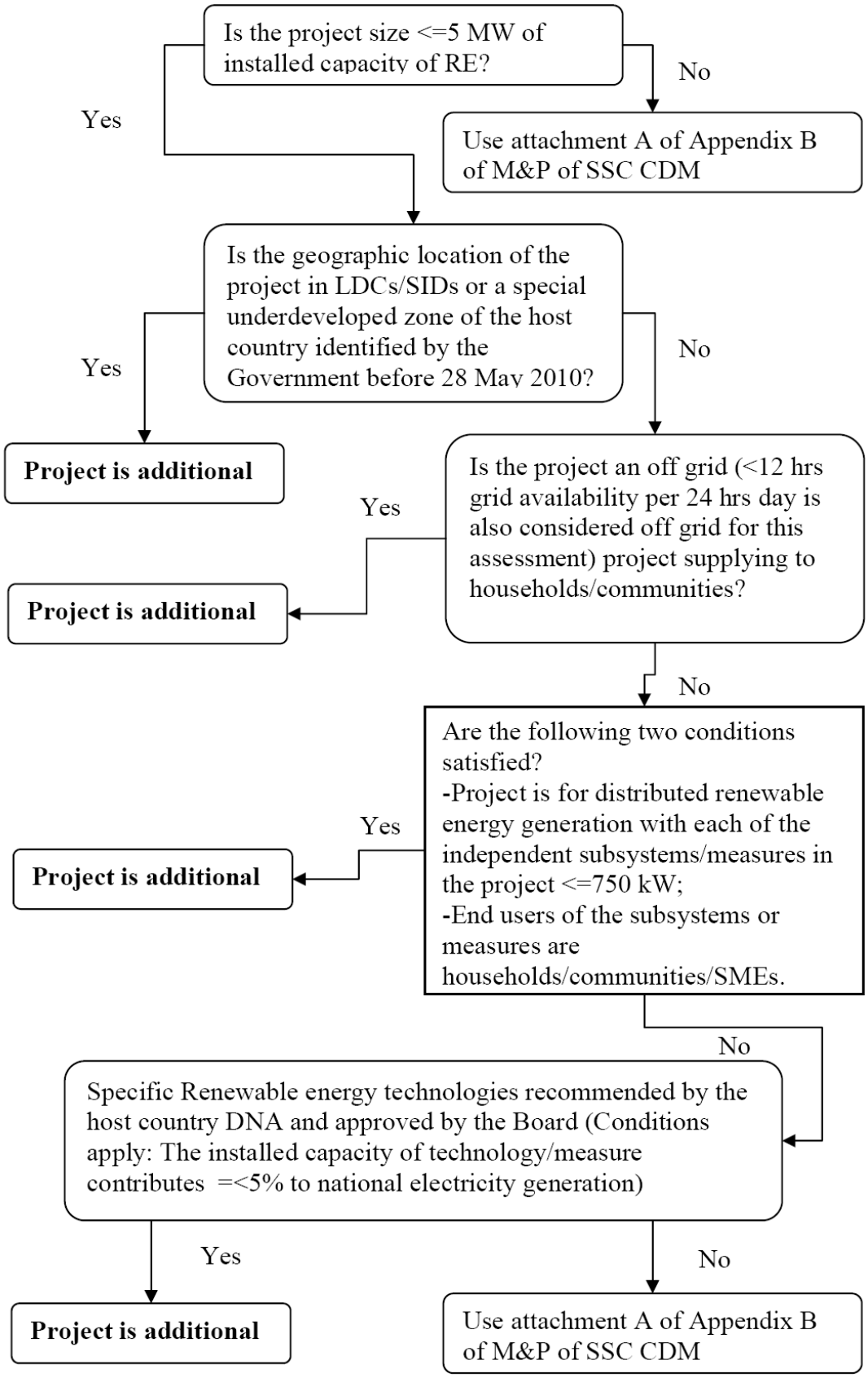
All the alternatives to the proposed project activity are consistent with current laws and regulations but these alternatives can't promote rapid uptake of renewable energy technology without this PoA, because install cost of these systems is much more expensive than existing energy supply systems.
The proposed PoA is therefore the only alternative amongst those considered that complies with mandatory regulations.

E.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the SSC-CPA being included as registered PoA (assessment and demonstration of additionality of SSC-CPA): >>

E.5.1. Assessment and demonstration of additionality for a typical SSC-CPA:

In case of renewable energy project, it can demonstrate additionality by simple check.[13] This PoA is renewable energy project by introducing renewable energy system to public building, so additionality of SSC-CPA can be demonstrated by below process.

[13] This method is from EB 54, Annex 15.


Is the project size <=5 MW of installed capacity of RE?
No
Use attachment A of Appendix B of M&P of SSC CDM
Yes
Is the geographic location of the project in LDCs/SIDs or a special underdeveloped zone of the host country identified by the Government before 28 May 2010?
Yes
No
Project is additional
Is the project an off grid (<12 hrs grid availability per 24 hrs day is also considered off grid for this assessment) project supplying to households/communities?
Yes
Project is additional
No
Are the following two conditions satisfied?
-Project is for distributed renewable energy generation with each of the independent subsystems/measures in the project <=750 kW;
-End users of the subsystems or measures are households/communities/SMEs.
Yes
Project is additional
No
Specific Renewable energy technologies recommended by the host country DNA and approved by the Board (Conditions apply: The installed capacity of technology/measure contributes =<5% to national electricity generation)
Yes
Project is additional
No
Use attachment A of Appendix B of M&P of SSC CDM

If the additionality of SSC-CPA cannot be demonstrated through this process, SSC-CPA should follow below process.

The additionality of a typical SSC-CPA will be determined based on a simple cost and income analysis according to "Attachment A to Appendix B of the simplified modalities and procedures for SSC CDM project activities." which takes into account the costs and the income expected to be derived from the following items and activities[14]:

Project participants shall provide an explanation to show that the project activity would not have occurred anyway due to at least one of the following barriers:

(a) Investment barrier: a financially more viable alternative to the project activity would have led to higher emissions;
(b) Technological barrier: a less technologically advanced alternative to the project activity involves lower risks due to the performance uncertainty or low market share of the new technology adopted for the project activity and so would have led to higher emissions;
(c) Barrier due to prevailing practice: prevailing practice or existing regulatory or policy requirements would have led to implementation of a technology with higher emissions;
(d) Other barriers: without the project activity, for another specific reason identified by the project participant, such as institutional barriers or limited information, managerial resources, organizational capacity, financial resources, or capacity to absorb new technologies, emissions would have been higher.

E.5.2. Key criteria and data for assessing additionality of a SSC-CPA:

The SSC-CPA follows below process for assessing additionality.

Step I. Apply simple criteria

Preferentially, applying method in EB 54, Annex 15, the SSC-CPA should be consistent with below additionality criteria. (Refer above E.5.1)

- Size of project is same or less than 5 MW of installed capacity.
- Satisfy least one among below 4 criteria.
  1. Geographic location of the project is in LDCs/SIDs or a special underdeveloped zone of the host country identified by the Government before 28 May 2010.
  2. The project is an off grid (lower than 12 hours grid availability per 24 hours day is also considered off grid for this assessment) project supplying to households/communities.
  3. All of the following conditions are satisfied.
     - Project is for distributed renewable energy generation with each of the independent subsystems/measures in the project which capacity is same or below than 750 KW.
     - End users of the subsystem or measure are households/communities/SME.

[14] If each of the independent subsystems/measures included in the CPA of this PoA is no greater than 1% of the small scale thresholds defined by the methodology applied, than that CPA of PoA is exempted from performing de-bundling check and additionality demonstration(EB47, EB53).

4. Specific renewable energy technologies recommended by the host country DNA and approved by the Board (conditions apply: the installed capacity of technology/measure contributes same or below than 5% to national electricity generation)

Data for criteria

Criteria	Data
1	Total capacity of systems included in the SSC-CPA
2-1	Geographical location of the SSC-CPA
2-2	Grid on/off information for user
2-3	Maximum capacity of a renewable energy system in the SSC-CPA End user information of introduced renewable energy system in the SSC-CPA
2-4	Information for contribution of introducing technology to national electricity generation

If the SSC-CPA is satisfy above two criteria, the SSC-CPA is additional. If these criteria are not satisfied, the SSC-CPA should follow below process.

Step II. Barrier analysis

Applying "Attachment A to Appendix B of the simplified modalities and procedures for SSC CDM project activities", the SSC-CPA should be consistent with least one of below additionality criteria. (Refer above E.5.1)

1. The SSC-CPA has investment barrier.
2. The SSC-CPA has technological barrier.
3. The SSC-CPA has barrier due to prevailing practice.
4. The SSC-CPA has other barrier.

Data for criteria

Criteria	Data
1	Investment barrier analysis data
2	Technological barrier analysis data
3	Evidence for barrier due to prevailing practice
4	Evidence for other barrier

NOTE: Information provided here shall be incorporated into the PoA specific CDM-SSC-CPA-DD that shall be included in documentation submitted by project participants at registration of PoA.

E.6. Estimation of Emission reductions of a CPA:

E.6.1. Explanation of methodological choices, provided in the approved baseline and monitoring methodology applied, selected for a typical SSC-CPA:

This project activity replaces existing fossil fuel based energy with renewable energy. Each type of system has own baseline scenario as below.

Type	Producing energy	Replacing energy source	Energy source for operation
Photovoltaic	Electricity	National grid electricity	None
Solar water heating	Thermal	National LNG line	None
Geothermal heating/cooling	Thermal (heating)	National LNG line (boiler)	National grid electricity
	Thermal (cooling)	National grid electricity (air conditioner)	

Solar water heating and geothermal heating/cooling system produces thermal and replaces fossil fuel based energy. AMS I.C methodology is applicable to these baseline scenarios. This methodology requires that baseline emission is calculated by multiplying the produced energy quantity (thermal) by the emission factor (fossil fuel).
Photovoltaic system produces electricity and replaces grid electricity. AMS I.F methodology is applicable to this baseline scenario. This methodology requires that baseline emission is calculated by multiplying the produced electricity quantity by the grid emission factor.

E.6.2. Equations, including fixed parametric values, to be used for calculation of emission reductions of a SSC-CPA:

1. Determination of Grid Emissions Factor:

Emissions Factor is calculated according to "Tool to calculate the emission factor for and electricity system" version 2.

Step 1. Identify the relevant electric power system

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;

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

Project participants may choose between the following two options to calculate the operating margin and build margin emission factor:

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

In this PoA, Option I is applied. Only grid power plants are included in the calculation.

Step 3. Select an operating margin (OM) method

The calculation of the operating margin emission factor (*EFgrid,OM,y*) is based on one of the following methods:

(a) Simple OM, or

(b) Simple adjusted OM, or
(c) Dispatch data analysis OM, or
(d) Average OM.

Option (a) can be used 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. This project of the rate of low cost/must run power generation does not exceed 50% of the total grid (the most recent 5-year (2005~2009) average data shows that the rate of low cost/must run is 39.52%) referred to the host country's gross electricity generation rate by energy sources (Source: KEPCO), and an hourly dispatched data is not available at this point of time. Therefore, Option (a) (Simple OM) has been chosen.

	2005	2006	2007	2008	2009
Hydro	5,189	5,218	5,042	5,563	5,641
Coal(Dom.)	4,484	4,312	4,470	5,010	5,559
Coal(Bitum.)	129,174	134,894	150,204	168,498	187,657
Oil	20,491	19,195	21,215	15,425	19,912
Gas	58,118	68,302	78,427	75,809	65,273
Nuclear	146,779	148,749	142,937	150,958	147,771
alternative	404	511	829	1,092	1,791
Total	364,638	381,181	403,125	422,355	433,604

Yearly proportion of the Generation of Electricity based on the Source of Energy[15]

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

(a) Simple OM

The simple OM emission factor is calculated as the generation-weighted average CO_2 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. It may be calculated:

- Based on data on fuel consumption and net electricity generation of each power plant / unit[4] (Option A), or
- Based on data on net electricity generation, the average efficiency of each power unit and the fuel type(s) used in each power unit (Option B), or
- Based on data 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 (option C)

Fuel consumpsion data is available for each power plant/unit. Therefore Option A can be used.
Where Option A is used, the simple OM enission factor is calculated as follows;

[15] Source: Electricity statistics on Electricity quantity from Korea Electric Power Corporation, 2010

$$EF_{grid,OMsimple,Y} = \frac{\sum_{i,m} FC_{i,m,y} \times NCV_{i,y} \times EF_{CO2,i,y}}{\sum_{m} EG_{m,y}}$$

$FC_{i,m,y}$	=	Amount of fossil fuel type i consumed by power plant / 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)
$EF_{CO2,i,y}$	=	CO_2 emission factor of fossil fuel type i in year y (tCO_2/GJ)
$EG_{m,y}$	=	Net electricity generated and delivered to the grid by power plant / unit m in year y (MWh)
m	=	All power plants / units serving the grid in year y except low-cost / must-run power plants / units
i	=	All fossil fuel types combusted in power plant / unit m in year y
y	=	Either the three most recent years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex ante option) or the applicable year during monitoring (ex post option), following the guidance on data vintage in step 2

According to "Tool to calculate the emission factor for an electricity system (version 01.1)", the emission factor is calculated using a 3-year average, based on the most recent statistics available at the time of PDD submission. As a result, the OM emission factor ($EF_{grid,OM,y}$) is 0.6927 (tCO_2/MWh).

Step 5. Identify the cohort of power units to be included in the build margin

According to ACM0002, there are two options to choose in order to calculate the BM.

Option 1. Calculate the Build Margin emission factor $EF_{BM,y}$ *ex ante* based on the most recent information available on plants already built for sample group *m* at the time of PDD submission. The sample group *m* consists of either

- the five power plants that have been built most recently, or
- the power plants capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently.

Option 2. For the first crediting period, the Build Margin emission factor $EF_{BM,y}$ must be updated annually *ex post* for the year in which actual project generation and associated emissions reductions occur. For subsequent crediting periods, $EF_{BM,y}$ should be calculated *ex-ante*, as described in option 1 above. The sample group *m* consists of either

- the five power plants that have been built most recently, or
- the power plants capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently.

Project participants should use from these two options that sample group that comprises the larger annual generation.

Based on table "Yearly proportion of the Generation of Electricity based on the Source of Energy", in the case of fossil fuel (oil, LNC, and coal), the capacity of them is expected not to be fluctuated during crediting periods (2010~2016). In addition, low cost and must-run generation will posses less than 50%, therefore, CM (the value of 'OM+BM') will be constant. From this consideration, Option 1 is selected for this PoA.

To select the sample group *m*, "the five power plants that have been built most recently" and "the power plants capacity additions in the electricity system that comprise 20% of the system generation (in MWh) which have been built most recently" were compared and the results are as follows.

Sample Plant group (m) for determining Build margin Emission factor

Sample group(m) / Classification	**"the five power plants that have been built most recently"**	**"the power plants capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently."**	**Comments**
Electricity quantity	5,083MWh	83,919,673MWh	Total generation is 415,024,943 MWh in Korea (based on KEPCO's data of the year 2009)
Proportion (ratio to total generation in Korea)	0.00122%	20.220%	
Selected Group		O	

The annual generation of **"the power plants capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently."** was 83,919,673MWh (20.220%of total generation of the Korea), and the annual generation of "the five power plants that have been built most recently" was 5,083MWh. Therefore, the latter was chosen as a lager figure than the other one. The detailed data used in the calculation are presented in Annex 3.

Step 6. Calculate the build margin emission factor

The build margin emissions factor is the generation-weighted average emission factor (tCO_2/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:

$EF_{grid,BM,y}$	=	Build 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	=	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 0.6547 (tCO_2/MWh).

Step 7. – Calculate the combined margin (CM) emission factor

Based on the results derived from Step 1, and Step 2, $EF_{grid,CM,y}$ has been calculated using the following formula:

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

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 tCO_2/MWh.

Therefore baseline emission factor ($\boldsymbol{EF_{grid,CM,y}}$) for this project is = 0.6832 (tCO_2/MWh) as follows:

$$\boldsymbol{EF_{grid,CM,y,photo}} = \boldsymbol{w_{OM} \cdot EF_{grid,OM\,y} + w_{BM} \cdot EF_{grid,BM,\,y}}$$
$$= 0.75 \cdot 0.6927(tCO_2/MWh) + 0.25 \cdot 0.6547\ (tCO_2/MWh)$$
$$= \boldsymbol{0.6832}\ (tCO_2/MWh)$$

Other systems:
According to "Tool to calculate the emission factor for an electricity system", all other project activities are w_{OM} =0.5 and w_{BM} = 0.5 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 tCO_2/MWh.

Therefore baseline emission factor ($\boldsymbol{EF_{grid,CM,y}}$) for this project is = 0.6737 (tCO_2/MWh) as follows:

$$\boldsymbol{EF_{grid,CM,y,other}} = \boldsymbol{w_{OM} \cdot EF_{grid,OM\,y} + w_{BM} \cdot EF_{grid,BM,\,y}}$$
$$= 0.5 \cdot 0.6927(tCO_2/MWh) + 0.5 \cdot 0.6547\ (tCO_2/MWh)$$
$$= \boldsymbol{0.6737}\ (tCO_2/MWh)$$

Based on the value obtained for the operating margin (0.6927 tCO_2/MWh) and build margin (0.6547

tCO_2/MWh) emissions factors, a **combined margin emissions factor of 0.6832 tCO_2/MWh (for photovoltaic system) and 0.6737 tCO_2/MWh (for other system)** 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

Solar water heating system

According to AMS I.C methodology, baseline emission of this system which produces thermal energy and replaces fossil fuel is calculated as below:

$$BE_{solar\ heating,y} = EG_{solar\ heating,y} * EF_{NG,CO2}$$

Where:

$BE_{solar\ heating,y}$	The baseline emissions from thermal energy displaced by the project activity (solar water heating system) during the year *y* (tCO_2)
$EG_{solar\ heating,y}$	The net quantity of thermal energy supplied by the project activity (solar water heating system) during the year *y* (TJ)
$EF_{NG,\ CO2}$	The CO_2 emission factor of the LNG; tCO_2 / TJ, obtained from reliable local or national data if available, otherwise, IPCC default emission factors are used

Ex-ante calculation for $EG_{solar\ heating,y}$ is as below:

$$EG_{solar\ heating,y} = SR * C_{solar\ heating} * D * E * JC$$

SR	Average solar radiation per day (kcal/m^2/day)
$C_{solar\ heating}$	Capacity of solar water heating system introduced by project (m^2)
D	Yearly days, 365 (day)
E	Efficiency of solar water heating system
JC	Unit conversion factor from kcal to TJ (TJ/kcal)

Geothermal heating and cooling system

According to AMS I.C methodology, baseline emission of this system which produces thermal energy and replaces fossil fuel and grid electricity is calculated as below:

$$BE_{geothermal,y} = EG_{geo,heating,y} * EF_{NG,CO2} + EG_{geo,cooling,y} * EF_{grid,CM,y,other}$$

Where:

$BE_{geothermal,y}$	The baseline emissions from heating/cooling energy displaced by the project activity (geothermal heating and cooling system) during the year *y* (tCO_2)
$EG_{geo,heating,y}$	The net quantity of heating energy supplied (displace LNG) by the project activity (geothermal heating and cooling system) during the year *y* (TJ)
$EF_{NG,\ CO2}$	The CO_2 emission factor of the LNG; tCO_2 / TJ, obtained from reliable local or

	national data if available, otherwise, IPCC default emission factors are used
$EG_{geo,cooling,y}$	The net quantity of cooling energy supplied (displace grid electricity) by the project activity (geothermal heating and cooling system) during the year *y* (MWh)
$EF_{grid,CM,y,other}$	The CO_2 emission factor of the national grid electricity for other system (tCO_2 /MWh)

Ex-ante calculation for $EG_{geo,heating,y}$ and $EG_{geo,cooling,y}$ is as below:

$$EG_{geo,fossil,y} = GH_{heating} * C_{geo,heating} * CR * JC$$

$GH_{heating}$	Yearly heating hour of geothermal heating and cooling system (hour)
$C_{geo,heating}$	Heating capacity of geothermal heating and cooling system introduced by project (RT)
CR	Unit conversion factor from RT to kcal (kcal/RT)
JC	Unit conversion factor from kcal to TJ (TJ/kcal)

$$EG_{geo,cooling,y} = GH_{cooling} * C_{geo,cooling} * WR$$

$GH_{cooling}$	Yearly cooling hour of geothermal heating and cooling system (hour)
$C_{geo,cooling}$	Cooling capacity of geothermal heating and cooling system introduced by project (RT)
WR	Unit conversion factor from RT to kW (kW/RT)

Photovoltaic system

According to AMS I.F methodology, baseline emission of this system which produces electricity and replaces grid electricity is calculated as below:

$$BE_{photovoltaicy} = EG_{photovoltaic,y} * EF_{grid,\ CO2}$$

Where:

$BE_{photovoltaic,\ y}$	Baseline Emissions of project activity (photovoltaic system) in year *y* (tCO_2)
$EG_{photovoltaic,y}$	Quantity of net electricity displaced as a result of the implementation of the CDM project activity (photovoltaic system) in year *y* (MWh)
$EF_{grid,CM,y,photo}$	The CO_2 emission factor of the national grid electricity for photovoltaic system (tCO_2 /MWh)

Ex-ante calculation for $EG_{photovoltaic,y}$ is as below:

$$EG_{BL,y} = C_{photovoltaic} * H * UC$$

Where:

$C_{photovoltaic}$	Capacity of photovoltaic system introduced by project (kW)
H	Yearly operating hours, 8760 (=365*24) (hour)
UC	Utilization coefficient of photovoltaic system

Total baseline emission

$$BE_{total,y} = BE_{solar\ heating,y} + BE_{geothermal,y} + BE_{photovoltaic,y}$$

3. Project Activity Emissions

Solar water heating system

According to AMS I.C methodology, project activity emission of this system is calculated by multiplying the quantity of consumed energy to operate the system by emission factor, but solar water heating system does not consume energy to operate. Therefore, project emission is zero.

Geothermal heating and cooling system

According to AMS I.C methodology, project activity emission of this system is calculated by multiplying the quantity of consumed energy to operate the system by emission factor as below:

$$PE_{geothermal,y} = PG_{geothermal,y} * EF_{grid,CM,y,other}$$

Where:

$PE_{geothermal,y}$	Project activity Emissions from grid electricity use of geothermal system in year *y* (tCO_2)
$PG_{geothermal,y}$	Quantity of net electricity consumed to operate geothermal system in year *y* (MWh)
$EF_{grid,CM,y,other}$	The CO_2 emission factor of the national grid electricity for other system (tCO_2/MWh)

Ex-ante calculation for $PG_{geothermal,y}$ is as below:

$$PG_{geothermal,y} = GH_{heating} * REC_{heating} + GH_{cooling} * REC_{cooling}$$

$GH_{heating}$	Yearly heating hour of geothermal heating and cooling system (hour)
$GH_{cooling}$	Yearly cooling hour of geothermal heating and cooling system (hour)
$REC_{heating}$	Rated electricity consumption of geothermal heating and cooling system for heating (kW)
$REC_{cooling}$	Rated electricity consumption of geothermal heating and cooling system for cooling (kW)

Photovoltaic system

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.

Total project activity emission

$$PE_{total,y} = PE_{geothermal,y}$$

4. Emission Reductions

$$ER_y = (BE_{total,y} - PE_{total,y}) - LE_y$$

Where:

ER_y	Emission reductions in year y (tCO_2e)
LE_y	Leakage emissions in year y (tCO_2e)

E.6.3. Data and parameters that are to be reported in CDM-SSC-CPA-DD form:

Data / Parameter:	$EF_{NG, CO2}$
Data unit:	tCO_2 / TJ
Description:	The CO_2 emission factor of the LNG
Source of data used:	IPCC 2006 Revised Guideline
Value applied:	56.1
Justification of the choice of data or description of measurement methods and procedures actually applied :	Emission factor used for the calculation of the CO_2 emission from LNG use
Any comment:	Default values in the IPCC 2006 Revised Guideline

Data / Parameter:	$EF_{grid, CO2}$
Data unit:	tCO_2 / MWh
Description:	The CO_2 emission factor of the national grid electricity
Source of data used:	SSC-CPA database
Value applied:	0.6832 for photovoltaic system 0.6737 for other systems
Justification of the choice of data or description of measurement methods and procedures actually applied :	Emission factor used for the calculation of the CO_2 emission from grid electricity use
Any comment:	Value will be revised at the point of renewal of the crediting period of the PoA

Data / Parameter:	SR
Data unit:	$kcal/m^2/day$
Description:	Average solar radiation per day of Seoul
Source of data used:	Korea Institute of Energy Research
Value applied:	3,115
Justification of the choice of data or	Korea Institute of Energy Research measured solar radiation for solar heating energy potential.

description of measurement methods and procedures actually applied :	
Any comment:	Value will be revised at the point of renewal of the crediting period of the PoA

Data / Parameter:	***E***
Data unit:	
Description:	Efficiency of solar water heating system
Source of data used:	Korea Energy Management Corporation
Value applied:	0.44
Justification of the choice of data or description of measurement methods and procedures actually applied :	Korea Energy Management Corporation surveyed for efficiency of solar water heating system in Korea.
Any comment:	Value will be revised at the point of renewal of the crediting period of the PoA

Data / Parameter:	***JC***
Data unit:	TJ/kcal
Description:	Unit conversion factor from kcal to TJ
Source of data used:	
Value applied:	$4.1868 * 10^{-9}$
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	Constant value

Data / Parameter:	$GH_{heating}$
Data unit:	hour
Description:	Yearly heating hour of geothermal heating and cooling system
Source of data used:	Korea Energy Management Corporation
Value applied:	900
Justification of the choice of data or description of measurement methods and procedures actually applied :	Korea Energy Management Corporation surveyed for heating hours per year for public building in Korea by “Study on improvement measure for energy use plan consultation system”.
Any comment:	

Data / Parameter:	$GH_{cooling}$
Data unit:	hour

Description:	Yearly cooling hour of geothermal heating and cooling system
Source of data used:	Korea Energy Management Corporation
Value applied:	900
Justification of the choice of data or description of measurement methods and procedures actually applied :	Korea Energy Management Corporation surveyed for cooling hours per year for public building in Korea by "Study on improvement measure for energy use plan consultation system".
Any comment:	

Data / Parameter:	***CR***
Data unit:	kcal/RT
Description:	Unit conversion factor from RT to kcal
Source of data used:	
Value applied:	3,024
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	Constant value

Data / Parameter:	***WR***
Data unit:	kW/RT
Description:	Unit conversion factor from RT to kW
Source of data used:	
Value applied:	3.57142
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	Constant value

Data / Parameter:	***JT***
Data unit:	TJ/toe
Description:	Unit conversion factor from toe to TJ
Source of data used:	
Value applied:	$4.1868 * 10^{-2}$
Justification of the choice of data or description of measurement methods and procedures	

actually applied :	
Any comment:	Constant value

Data / Parameter:	***UC***
Data unit:	
Description:	Utilization coefficient of photovoltaic system
Source of data used:	Korea Energy Management Corporation
Value applied:	0.155
Justification of the choice of data or description of measurement methods and procedures actually applied :	Korea Energy Management Corporation surveyed for Utilization coefficient of photovoltaic system in Korea.
Any comment:	Value will be revised at the point of renewal of the crediting period of the PoA

E.7. Application of the monitoring methodology and description of the monitoring plan:

D.7.1. Data and parameters to be monitored by each SSC-CPA:

Data / Parameter:	$EG_{solar\ heating,y}$
Data unit:	TJ
Description:	The amount of thermal energy produced by the project activity (solar water heating system) during the year *y*
Source of data to be used:	SSC-CPA database
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be filled by SSC-CPA
Description of measurement methods and procedures to be applied:	Each system has output meter, it measures the data value. The data will be recorded into the SSC-CPA database.
QA/QC procedures to be applied:	The measuring device will be recalibrated according to the instructions (schedules, procedures) for QA of the technology provider. There will be strict compliance to maintenance schedule recommended by the technology provider.
Any comment:	

Data / Parameter:	$EG_{geo,heating,y}$
Data unit:	TJ
Description:	The net quantity of heating energy supplied (displace LNG) by the project activity (geothermal heating and cooling system) during the year *y*
Source of data to be used:	SSC-CPA database

Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be filled by SSC-CPA
Description of measurement methods and procedures to be applied:	Each system has output meter, it measures the data value. The data will be recorded into the SSC-CPA database.
QA/QC procedures to be applied:	The measuring device will be recalibrated according to the instructions (schedules, procedures) for QA of the technology provider and/or grid operator. There will be strict compliance to maintenance schedule recommended by the technology provider.
Any comment:	

Data / Parameter:	$EG_{geo,cooling,y}$
Data unit:	MWh
Description:	The net quantity of cooling energy supplied (displace grid electricity) by the project activity (geothermal heating and cooling system) during the year *y*
Source of data to be used:	SSC-CPA database
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be filled by SSC-CPA
Description of measurement methods and procedures to be applied:	Each system has output meter, it measures the data value. The data will be recorded into the SSC-CPA database.
QA/QC procedures to be applied:	The measuring device will be recalibrated according to the instructions (schedules, procedures) for QA of the technology provider and/or grid operator. There will be strict compliance to maintenance schedule recommended by the technology provider.
Any comment:	

Data / Parameter:	$EG_{photovoltaic,\ y}$
Data unit:	MWh
Description:	Quantity of net electricity displaced as a result of the implementation of the CDM project activity (photovoltaic system) in year *y* (The amount of electricity produced by the project activity during the year *y)*
Source of data to be used:	SSC-CPA database
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be filled by SSC-CPA

Description of measurement methods and procedures to be applied:	Each system has electricity generation meter, it measures the data value. The data will be recorded into the SSC-CPA database.
QA/QC procedures to be applied:	The measuring device will be recalibrated according to the instructions (schedules, procedures) for QA of the technology provider and/or grid operator. There will be strict compliance to maintenance schedule recommended by the technology provider and/or the grid operator.
Any comment:	

Data / Parameter:	$PG_{geothermal,y}$
Data unit:	TJ
Description:	Quantity of net electricity consumed to operate geothermal heating and cooling system in year *y*
Source of data to be used:	SSC-CPA database
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be filled by SSC-CPA
Description of measurement methods and procedures to be applied:	Each system has electricity consumption meter, it measures the data value. The data will be recorded into the SSC-CPA database.
QA/QC procedures to be applied:	The measuring device will be recalibrated according to the instructions (schedules, procedures) for QA of the technology provider and/or grid operator. There will be strict compliance to maintenance schedule recommended by the technology provider and/or the grid operator
Any comment:	

E.7.2. Description of the monitoring plan for a SSC-CPA:

All introduced system has output data meter and monitoring data will be sent to Seoul and Seoul manages the data. The SSC-CPA project database includes the following data-set that can unambiguously determine the emission reductions attributable to each SSC-CPA:

Data type	List of data
System information	A serial number system type location introduced date
Energy production/consumption	generated energy type and quantity consumed energy type and quantity

Collection of the system information data

A serial number, system type, location and introduced date of each introduced system will be collected and recorded. This information will be used for identification of each introduced system. All introduced systems data will be collected when these are installed.

Collection of the energy production/consumption data
This data will be collected and recorded as below:

Type	Generated energy	Consumed energy
Photovoltaic	Electricity	None
Solar water heating	Thermal	None
Geothermal heating/cooling	Thermal (heating) Thermal (cooling)	National grid electricity

All introduced systems have an energy production/consumption meter and it measures the data. This data will be collected and recorded for each monitoring period, and used to calculate emission reductions for that portion of the crediting period. The length of each monitoring period will not exceed one year

Monitoring period
Data will be collected for each monitoring period, and used to calculate emission reductions for that portion of the crediting period. The length of each monitoring period will not exceed one year.

E.8 Date of completion of the application of the baseline study and monitoring methodology and the name of the responsible person(s)/entity(ies)

The baseline study and monitoring methodology has been determined on dd/mm/yyyy by:

Name: Gwan Park
Company name: Ecoeye Co.,Ltd.
Title: Team Manager
E-mail: gpark@ecoeye.com

Name: Jongmin Jeong
Company name: Ecoeye Co.,Ltd.
Title: Consultant
E-mail: marenight@ecoeye.com

Annex 1

CONTACT INFORMATION ON COORDINATING/MANAGING ENTITY and PARTICIPANTS IN THE PROGRAMME of ACTIVITIES

Organization:	Seoul Metropolitan Government
Street/P.O.Box:	San 5-85, Yejang-dong, Jung-gu
Building:	
City:	Seoul
State/Region:	Seoul
Postfix/ZIP:	100-250
Country:	Republic of Korea
Telephone:	+82-2-2115-7436
FAX:	+82-2-2115-7799
E-Mail:	hgwon@seoul.go.kr
URL:	http://www.seoul.go.kr
Represented by:	
Title:	Deputy Director
Salutation:	Mr
Last Name:	Jung
Middle Name:	
First Name:	Hoe Gwon
Department:	Climate change & Air quality
Mobile:	
Direct FAX:	As above
Direct tel:	As above
Personal E-Mail:	As above

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding in this project.

Annex 3

BASELINE INFORMATION

<Table Annex 3 - 1> Data on fuel consumption for plants in the Operating Margin

Year	Plant		Coal(t)	Heavy oil(kl)	Diesel oil(kl)	L.N.G.(t)
2007	Honam	#1	866,853	889	281	
		#2	846,931	811	262	
	Samchonpo	#1	1,631,706		296	
		#2	1,804,695		384	
		#3	1,755,374		434	
		#4	1,543,140		677	
		#5	1,850,764		315	
		#6	1,714,320		619	
	Yonghung	#1	1,902,557		3,320	
		#2	2,296,289		1,779	
		#3	119,883		3,964	
		#4				
	Boryeong	#1	1,466,761		811	
		#2	1,655,488		169	
		#3	1,648,008		187	
		#4	1,347,303		646	
		#5	1,629,904		195	
		#6	1,490,809		387	
	Taean	#1	1,524,391		410	
		#2	1,434,221		374	
		#3	1,521,349		350	
		#4	1,320,380		422	
		#5	1,342,358		676	
		#6	1,535,931		491	
		#7	1,430,171		2,321	
		#8	919,055		3,636	
	Hadong	#1	1,582,726		178	
		#2	1,396,830		637	
		#3	1,424,033		375	
		#4	1,572,409		292	
		#5	1,486,776		452	
		#6	1,585,307		109	
	Dangjin	#1	1,512,904		269	
		#2	1,358,316		543	
		#3	1,516,065		119	
		#4	1,519,231		342	
		#5	1,279,796		1,038	
		#6	1,281,318		878	
		#7	1,059,612		6,681	
		#8	467,807		4,873	
	Ulsan	#1		107,844	406	
		#2		108,381	483	
		#3		120,571	576	
		#4		341,170	3,525	
		#5		370,712	4,711	
		#6		216,409	3,021	
	Youngnam	#1		174,082	1,232	
		#2		122,249	796	

	Yosu	#1		121,572	332	
		#2		257,420	367	
	Pyongtaek	#1		269,284	114	3,316
		#2		359,870	140	6,339
		#3		349,481	157	4,874
		#4		255,443	117	4,047
	Namjeju	#1				
		#2				
		#3		124,559	225	
		#4		127,900	341	
	Jeju	#1		1,049	4	
		#2		70,122	112	
		#3		98,846	34	
	Seoul	#4			1	75,080
		#5			1	206,908
	Incheon	#1				30,402
		#2				31,528
		#3			354	41,270
		#4			201	18,892
	Bundang	fuel cell				313
	Pyongtaek C/C	C/C			67	151,414
	Ilsan	C/C				635,260
	Bundang	C/C			3	660,899
	Ulsan	C/C				649,494
	Seoincheon	C/C				1,495,687
	Shinincheon	C/C				1,761,001
	Boryeong	C/C				1,121,251
	Incheon	C/C				494,690
	Busan	C/C				1,552,997
	Hallim	C/C			17,753	
	Anyang	C/C				289,384
	Bucheon	C/C				269,651
	POSCO POWER	C/C				660,445
	G S Bugog	C/C				371,586
	Yulchon	C/C				292,336
	Kwangyang	C/C				
	Namjeju	D/P		35,297	238	
	Jeju	G/T			850	
	Jeju	D/P		49,613		
2008	Honam	#1	793,048	808	177	
		#2	887,772	1,225	167	
	Samchonpo	#1	1,759,936		137	
		#2	1,628,693		1,065	
		#3	1,635,809		614	
		#4	1,662,981		726	
		#5	1,718,759		874	
		#6	1,844,647		448	
	Yonghung	#1	1,894,596		5,594	
		#2	1,881,013		3,033	
		#3	1,694,625		2,173	
		#4	1,217,547		769	
	Boryeong	#1	1,697,622		566	
		#2	1,328,646		196	
		#3	1,528,112		233	
		#4	1,694,212		339	

		#5	1,503,611		642	
		#6	1,704,157		301	
		#7	1,102,498		2,696	
		#8	227,312		1,060	
	Taean	#1	1,493,418		589	
		#2	1,570,393		146	
		#3	1,442,632		551	
		#4	1,582,461		122	
		#5	1,566,721		363	
		#6	1,419,495		626	
		#7	1,285,747		1,224	
		#8	1,553,992		635	
	Hadong	#1	1,478,000		355	
		#2	1,551,832		311	
		#3	1,573,892		474	
		#4	1,469,828		495	
		#5	1,592,246		256	
		#6	1,525,471		521	
		#7	310,138		2,900	
	Dangjin	#1	1,559,086		60	
		#2	1,621,753		136	
		#3	1,474,550		751	
		#4	1,457,994		771	
		#5	1,490,658		250	
		#6	1,509,171		132	
		#7	1,264,913		645	
		#8	1,494,311		314	
	Ulsan	#1		30,689	565	
		#2		29,228	562	
		#3		32,541	480	
		#4		228,138	4,016	
		#5		163,748	2,965	
		#6		225,645	3,757	
	Yeongnam	#1		59,763	1,476	
		#2		40,030	802	
	Yeosu	#1		32,576	202	
		#2		111,854	341	
	Pyeongtaek	#1		91,937	77	2,562
		#2		125,789	90	4,744
		#3		135,720	145	4,232
		#4		86,454	100	3,020
	Namjeju	#1				
		#2				
		#3		132,984	146	
		#4		119,301	127	
	Jeju	#1				
		#2		84,258	81	
		#3		89,652	101	
	Seoul	#4			1	55,095
		#5			0	138,068
	Incheon	#1				28,582
		#2				30,186
		#3			292	32,472
		#4			238	27,637
	Pyongtaek	C/C				150,276

	Ilsan	C/C				636,633
	Bundang	C/C				651,005
	Ulsan	C/C				655,938
	Seoincheon	C/C			721	1,436,788
	Shinincheon	C/C				1,607,180
	Boryeong	C/C				894,790
	Incheon	C/C				459,923
	Busan	C/C				1,456,370
	Hallim	C/C			6,883	
	Anyang	C/C				292,931
	Bucheon	C/C				302,746
	POSCO POWER	C/C				587,956
	GS Bugog	C/C				709,116
	Yulchon	C/C				347,123
	Kwangyang	C/C				
	Hyundai-Daesan					
	Namjeju	D/P		19,875	482	
	Jeju	G/T			503	
	Jeju	D/P		46,728		
2009	Honam	#1	923,895	471	167	0
		#2	853,508	818	201	0
	Samchonpo	#1	1,611,736	0	299	0
		#2	1,596,153	0	447	0
		#3	1,818,061	0	110	0
		#4	1,552,530	0	486	0
		#5	1,909,143	0	151	0
		#6	1,765,537	0	576	0
	Yonghung	#1	2,316,758	0	1,996	0
		#2	2,437,083	0	1,632	0
		#3	2,533,024	0	966	0
		#4	2,740,096	0	117	0
	Boryeong	#1	896,958	0	1,982	0
		#2	1,361,908	0	5,689	0
		#3	1,686,579	0	180	0
		#4	1,554,579	0	672	0
		#5	1,681,591	0	516	0
		#6	1,538,187	0	935	0
		#7	1,438,768	0	568	0
		#8	1,701,650	0	341	0
	Taean	#1	1,561,372	0	348	0
		#2	1,483,233	0	22	0
		#3	1,550,278	0	209	0
		#4	1,471,251	0	410	0
		#5	1,409,802	0	978	0
		#6	1,548,690	0	285	0
		#7	1,576,347	0	394	0
		#8	1,382,469	0	1,397	0
	Hadong	#1	1,647,434	0	341	0
		#2	1,551,648	0	648	0
		#3	1,554,931	0	473	0
		#4	1,634,941	0	226	0
		#5	1,543,027	0	547	0
		#6	1,637,877	0	286	0
		#7	1,500,309	0	72	0

	#8	1,169,132	0	692	0
Dangjin	#1	1,601,422	0	677	0
	#2	1,572,097	0	291	0
	#3	1,669,969	0	155	0
	#4	1,658,923	0	110	0
	#5	1,324,949	0	582	0
	#6	1,330,803	0	517	0
	#7	1,609,342	0	133	0
	#8	1,334,679	0	625	0
Ulsan	#1	0	30,963	35	0
	#2	0	27,250	41	0
	#3	0	7,139	35	0
	#4	0	253,330	2,938	0
	#5	0	313,474	2,805	0
	#6	0	288,842	2,460	0
Yeongnam	#1	0	108,767	764	0
	#2	0	104,675	647	0
Yeosu	#1	0	113,633	187	0
	#2	0	193,394	203	0
Pyeongtaek	#1	0	56,671	354	2,922
	#2	0	280,992	696	4,203
	#3	0	282,894	581	4,046
	#4	0	192,380	545	3,838
Namjeju	#1	0	0	0	0
	#2	0	0	0	0
	#3	0	140,564	143	0
	#4	0	153,841	89	0
Jeju	#1	0	0	0	0
	#2	0	82,010	103	0
	#3	0	91,221	72	0
Seoul	#4	0	0	0	36,893
	#5	0	0	0	91,258
Incheon	#1	0	0	0	15,168
	#2	0	0	0	15,317
	#3	0	0	47	2,411
	#4	0	0	0	0
Pyongtaek	C/C	0	0	0	80,050
Ilsan	C/C	0	0	0	595,190
Bundang	C/C	0	0	13,142	541,739
Ulsan	C/C	0	0	0	489,946
Seoincheon	C/C	0	0	0	1,061,332
Shinincheon	C/C	0	0	0	1,394,939
Boryeong	C/C	0	0	86	543,342
Incheon	C/C	0	0	0	806,154
Busan	C/C	0	0	0	1,247,488
Hallim	C/C	0	0	0	0
Anyang	C/C	0	0	0	202,108
Bucheon	C/C	0	0	0	230,085
POSCO POWER	C/C	0	0	0	342,724
GS Bugog	C/C	0	0	0	603,232
Yulchon	C/C	0	0	0	282,344
Kwangyang	C/C	0	0	0	0
Hyundai-Daesan	C/C	0	0	0	0
Namjeju	D/P	0	29,527	275	0
Jeju	G/T	0	0	626	0

	Jeju	D/P	0	72,724	0	0

<Table Annex 3 - 2> Net Caloric Value

Year	Plant		Coal (kcal/kg)	Heavy oil (kcal/l)	Diesel oil (kcal/l)	L.N.G. (kcal/kg)
2007	Honam	#1	5,186	9,311	8,497	
		#2	5,190	9,311	8,493	
	Samchonpo	#1	5,545		8,373	
		#2	5,537		8,373	
		#3	5,525		8,349	
		#4	5,540		8,349	
		#5	4,865		8,550	
		#6	4,864		8,550	
	Yonghung	#1	5,745		8,391	
		#2	5,739		8,457	
		#3	5,822		7,878	
		#4				
	Boryeong	#1	5,519		8,496	
		#2	5,515		8,496	
		#3	5,518		8,655	
		#4	5,513		8,944	
		#5	5,520		8,655	
		#6	5,518		8,655	
	Taean	#1	5,733		8,174	
		#2	5,733		8,387	
		#3	5,734		8,388	
		#4	5,727		7,963	
		#5	5,686		8,361	
		#6	5,695		8,347	
		#7	5,717		8,044	
		#8	5,722		7,256	
	Hadong	#1	5,647		8,492	
		#2	5,645		8,456	
		#3	5,627		8,469	
		#4	5,639		8,519	
		#5	5,652		8,492	
		#6	5,640		8,495	
	Dangjin	#1	5,660		8,610	
		#2	5,663		8,606	
		#3	5,657		8,617	
		#4	5,659		8,635	
		#5	5,713		8,620	
		#6	5,737		8,613	
		#7	5,725		8,621	
		#8	5,742		8,596	
	Ulsan	#1		9,413	8,664	
		#2		9,420	8,664	
		#3		9,360	8,664	
		#4		9,508	8,664	
		#5		9,511	8,664	
		#6		9,502	8,664	
	Youngnam	#1		9,643	8,402	
		#2		9,643	8,403	
	Yosu	#1		9,464	8,368	
		#2		9,462	8,370	

	Pyongtaek	#1		9,445	8,534	11,650
		#2		9,448	8,530	11,653
		#3		9,447	8,518	11,650
		#4		9,460	8,517	11,651
	Namjeju	#1				
		#2				
		#3		9,411	8,201	
		#4		9,410	8,515	
	Jeju	#1		9,412	8,458	
		#2		9,420	7,906	
		#3		9,419	8,490	
	Seoul	#4			7,411	11,727
		#5			8,617	11,727
	Incheon	#1				11,727
		#2				11,730
		#3			8,514	11,730
		#4			8,483	11,730
	Bundang	fuel cell				11,673
	Pyongtaek C/C	C/C			8,503	11,739
	Ilsan	C/C				11,725
	Bundang	C/C			8,716	11,728
	Ulsan	C/C				11,610
	Seoincheon	C/C				11,739
	Shinincheon	C/C				11,735
	Boryeong	C/C				11,735
	Incheon	C/C				11,726
	Busan	C/C				11,727
	Hallim	C/C			8,533	
	Anyang	C/C				11,741
	Bucheon	C/C				11,898
	POSCO POWER	C/C				11,756
	G S Bugog	C/C				11,734
	Yulchon	C/C				11,732
	Kwangyang	C/C				
	Namjeju	D/P		9,419	8,323	
	Jeju	G/T			8,447	
	Jeju	D/P		9,396		
2008	Honam	#1	5,089	9,311	8,484	
		#2	5,105	9,312	8,492	
	Samchonpo	#1	5,524		4,577	
		#2	5,506		8,373	
		#3	5,506		8,349	
		#4	5,524		8,349	
		#5	4,839		8,550	
		#6	4,836		8,550	
	Yonghung	#1	5,871		8,246	
		#2	5,870		8,446	
		#3	5,767		9,564	
		#4	5,771		8,416	
	Boryeong	#1	5,402		8,496	
		#2	5,442		8,496	
		#3	5,377		10,876	
		#4	5,387		8,558	
		#5	5,380		9,208	
		#6	5,386		8,655	

		#7	5,451		8,139	
		#8	5,401		4,824	
	Taean	#1	5,636		8,366	
		#2	5,639		8,398	
		#3	5,632		8,396	
		#4	5,638		8,224	
		#5	5,660		8,226	
		#6	5,662		8,341	
		#7	5,700		8,355	
		#8	5,666		8,393	
	Hadong	#1	5,579		8,377	
		#2	5,569		8,344	
		#3	5,575		8,475	
		#4	5,572		8,466	
		#5	5,573		8,487	
		#6	5,572		8,419	
		#7	5,798		7,546	
	Dangjin	#1	5,520		8,555	
		#2	5,501		8,537	
		#3	5,513		8,554	
		#4	5,503		8,464	
		#5	5,570		8,596	
		#6	5,562		8,537	
		#7	5,581		7,678	
		#8	5,566		8,543	
	Ulsan	#1		9,439	8,635	
		#2		9,444	8,664	
		#3		9,440	8,664	
		#4		9,516	8,662	
		#5		9,530	8,662	
		#6		9,513	8,662	
	Yeongnam	#1		9,674	8,446	
		#2		9,676	8,450	
	Yeosu	#1		9,449	8,352	
		#2		9,447	8,352	
	Pyeongtaek	#1		9,423	8,525	11,592
		#2		9,430	8,532	11,663
		#3		9,426	8,456	11,615
		#4		9,418	8,522	11,661
	Namjeju	#1				
		#2				
		#3		9,415	8,555	
		#4		9,356	8,557	
	Jeju	#1				
		#2		9,423	8,490	
		#3		9,421	8,490	
	Seoul	#4			8,617	11,739
		#5			8,609	11,734
	Incheon	#1				11,736
		#2				11,737
		#3			8,470	11,739
		#4			8,470	11,734
	Pyongtaek	C/C				11,744
	Ilsan	C/C				11,732
	Bundang	C/C				11,737

	Ulsan	C/C				11,648
	Seoincheon	C/C			-	11,739
	Shinincheon	C/C				11,739
	Boryeong	C/C				11,733
	Incheon	C/C				11,697
	Busan	C/C				11,730
	Hallim	C/C			8,536	
	Anyang	C/C				11,816
	Bucheon	C/C				11,191
	POSCO POWER	C/C				11,740
	GS Bugog	C/C				12,084
	Yulchon	C/C				11,737
	Kwangyang	C/C				
	Hyundai-Daesan					
	Namjeju	D/P		9,392	8,546	
	Jeju	G/T			8,457	
	Jeju	D/P		9,407		
2009	Honam	#1	5,012	9,323	8,510	
		#2	4,982	9,314	8,507	
	Samchonpo	#1	5,582		8,496	
		#2	5,543		8,446	
		#3	5,545		8,490	
		#4	5,557		8,384	
		#5	4,850		8,537	
		#6	4,854		8,557	
	Yonghung	#1	5,681		8,446	
		#2	5,654		8,218	
		#3	5,642		8,469	
		#4	5,647		6,764	
	Boryeong	#1	5,259		8,496	
		#2	5,292		8,385	
		#3	5,363		8,476	
		#4	5,337		8,551	
		#5	5,354		8,425	
		#6	5,378		8,363	
		#7	5,390		8,319	
		#8	5,384		8,661	
	Taean	#1	5,646		8,400	
		#2	5,651		8,248	
		#3	5,650		8,327	
		#4	5,641		8,351	
		#5	5,672		8,369	
		#6	5,688		8,393	
		#7	5,674		8,437	
		#8	5,676		8,385	
	Hadong	#1	5,469		8,416	
		#2	5,428		8,456	
		#3	5,462		8,442	
		#4	5,465		8,441	
		#5	5,467		8,434	
		#6	5,465		8,407	
		#7	5,614		8,497	
		#8	5,625		7,654	
	Dangjin	#1	5,425		8,602	

		#2	5,423		8,547	
		#3	5,431		8,575	
		#4	5,432		8,585	
		#5	5,445		8,553	
		#6	5,468		8,530	
		#7	5,478		8,564	
		#8	5,513		8,550	
	Ulsan	#1		9,415	8,767	
		#2		9,416	8,689	
		#3		9,399	8,631	
		#4		9,486	8,517	
		#5		9,488	8,619	
		#6		9,491	8,601	
	Yeongnam	#1		9,681	8,657	
		#2		9,684	8,709	
	Yeosu	#1		9,419	8,357	
		#2		9,427	7,792	
	Pyeongtaek	#1		9,456	11,684	11,446
		#2		9,388	11,900	11,480
		#3		9,378	11,595	11,598
		#4		9,399	10,619	11,617
	Namjeju	#1				
		#2				
		#3		9,387	8,510	
		#4		9,385	8,529	
	Jeju	#1				
		#2		9,360	8,495	
		#3		9,348	8,537	
	Seoul	#4				11,745
		#5				11,740
	Incheon	#1				11,738
		#2				11,739
		#3			8,550	11,753
		#4				
	Pyongtaek	C/C				11,740
	Ilsan	C/C				11,737
	Bundang	C/C				11,540
	Ulsan	C/C				11,558
	Seoincheon	C/C				11,740
	Shinincheon	C/C				11,739
	Boryeong	C/C				11,726
	Incheon	C/C				11,784
	Busan	C/C				11,747
	Hallim	C/C				
	Anyang	C/C				14,084
	Bucheon	C/C				14,232
	POSCO POWER	C/C				11,739
	GS Bugog	C/C				12,532
	Yulchon	C/C				11,744
	Kwangyang	C/C				
	Hyundai-Daesan	C/C				
	Namjeju	D/P		9,407	8,498	
	Jeju	G/T			8,503	
	Jeju	D/P		6,082		

<Table Annex3-3> Electricity delivered to the grid by power plant(*EG)* and *EF*

Year	Plant		Electricity generation (MWh)	*EF* (tonCO_2/MWh)
2007	Honam	#1	1,806,765	0.9343
		#2	1,773,852	0.9303
	Samchonpo	#1	3,903,591	0.8687
		#2	4,398,382	0.8515
		#3	4,311,704	0.8431
		#4	3,840,729	0.8345
		#5	4,074,103	0.8284
		#6	3,823,174	0.8177
	Yonghung	#1	5,020,901	0.8174
		#2	6,081,490	0.8128
		#3	320,502	0.8457
		#4		#DIV/0!
	Boryeong	#1	3,604,642	0.8421
		#2	4,120,511	0.8303
		#3	4,214,892	0.8086
		#4	3,438,773	0.8099
		#5	4,162,530	0.8101
		#6	3,817,024	0.8078
	Taean	#1	4,055,394	0.8078
		#2	3,796,670	0.8118
		#3	4,039,811	0.8094
		#4	3,504,214	0.8089
		#5	3,523,988	0.8121
		#6	4,036,733	0.8123
		#7	3,868,817	0.7934
		#8	2,528,587	0.7824
	Hadong	#1	4,140,667	0.8089
		#2	3,681,670	0.8030
		#3	3,727,907	0.8056
		#4	4,115,014	0.8075
		#5	3,905,190	0.8067
		#6	4,158,792	0.8057
	Dangjin	#1	3,968,103	0.8088
		#2	3,595,927	0.8019
		#3	4,010,715	0.8014
		#4	4,009,178	0.8037
		#5	3,443,482	0.7965
		#6	3,497,359	0.7882
		#7	2,904,680	0.7886
		#8	1,297,925	0.7853
	Ulsan	#1	406,685	0.7916
		#2	407,321	0.7955
		#3	458,584	0.7812
		#4	1,418,034	0.7296
		#5	1,540,400	0.7316
		#6	899,604	0.7314
	Youngnam	#1	688,935	0.7748
		#2	474,475	0.7896
	Yosu	#1	497,053	0.7334

		#2	1,071,405	0.7195
	Pyongtaek	#1	1,147,515	0.7085
		#2	1,553,162	0.7031
		#3	1,502,099	0.7037
		#4	1,095,986	0.7070
	Namjeju	#1	-	#DIV/0!
		#2	-	#DIV/0!
		#3	484,459	0.7661
		#4	500,222	0.7623
	Jeju	#1	3,019	1.0379
		#2	280,454	0.7455
		#3	396,186	0.7430
	Seoul	#4	357,572	0.5598
		#5	962,861	0.5729
	Incheon	#1	148,821	0.5446
		#2	157,042	0.5354
		#3	205,530	0.5399
		#4	95,143	0.5350
	Bundang	fuel cell	1,959	0.4243
	Pyongtaek C/C	C/C	909,449	0.4445
	Ilsan	C/C	3,506,350	0.4830
	Bundang	C/C	3,741,296	0.4710
	Ulsan	C/C	4,383,453	0.3911
	Seoincheon	C/C	10,895,505	0.3664
	Shinincheon	C/C	12,533,994	0.3748
	Boryeong	C/C	7,839,371	0.3816
	Incheon	C/C	3,696,784	0.3567
	Busan	C/C	11,616,221	0.3564
	Hallim	C/C	61,752	0.7457
	Anyang	C/C	1,615,090	0.4783
	Bucheon	C/C	1,523,068	0.4789
	POSCO POWER	C/C	3,788,598	0.4659
	G S Bugog	C/C	2,767,811	0.3581
	Yulchon	C/C	2,083,451	0.3743
	Kwangyang	C/C		
	Namjeju	D/P	164,390	0.6430
	Jeju	G/T	1,294	1.6864
	Jeju	D/P	235,626	0.6254
2008	Honam	#1	1,614,014	0.9388
		#2	1,816,464	0.9371
	Samchonpo	#1	4,230,470	0.8612
		#2	3,931,527	0.8554
		#3	4,024,666	0.8389
		#4	4,118,892	0.8362
		#5	3,779,114	0.8253
		#6	4,071,070	0.8213
	Yonghung	#1	5,137,490	0.8141
		#2	5,112,704	0.8107
		#3	4,535,951	0.8087
		#4	3,193,481	0.8251
	Boryeong	#1	4,017,302	0.8558
		#2	3,247,137	0.8346
		#3	3,733,602	0.8249
		#4	4,162,971	0.8217
		#5	3,677,963	0.8247

		#6	4,170,094	0.8250
		#7	2,878,738	0.7846
		#8	748,005	0.6171
	Taean	#1	3,894,659	0.8103
		#2	4,093,884	0.8106
		#3	3,763,910	0.8092
		#4	4,119,808	0.8116
		#5	4,089,287	0.8127
		#6	3,711,227	0.8119
		#7	3,482,731	0.7894
		#8	4,186,293	0.7885
	Hadong	#1	3,827,102	0.8076
		#2	4,012,667	0.8072
		#3	4,074,310	0.8073
		#4	3,804,790	0.8069
		#5	4,114,218	0.8084
		#6	3,953,083	0.8061
		#7	870,781	0.7814
	Dangjin	#1	3,991,074	0.8080
		#2	4,162,369	0.8032
		#3	3,800,792	0.8020
		#4	3,737,406	0.8050
		#5	3,908,658	0.7961
		#6	4,006,307	0.7852
		#7	3,336,619	0.7933
		#8	3,992,732	0.7807
	Ulsan	#1	114,753	0.8109
		#2	108,931	0.8146
		#3	123,706	0.7952
		#4	945,479	0.7370
		#5	678,426	0.7386
		#6	937,531	0.7343
	Yeongnam	#1	229,316	0.8135
		#2	149,357	0.8336
	Yeosu	#1	130,854	0.7475
		#2	454,052	0.7376
	Pyeongtaek	#1	386,361	0.7268
		#2	534,121	0.7260
		#3	576,432	0.7216
		#4	365,269	0.7272
	Namjeju	#1	-	
		#2	-	
		#3	559,817	0.7077
		#4	517,866	0.6819
	Jeju	#1	-	
		#2	336,676	0.7461
		#3	357,666	0.7472
	Seoul	#4	258,052	0.5698
		#5	596,641	0.6173
	Incheon	#1	141,085	0.5405
		#2	152,576	0.5279
		#3	162,092	0.5393
		#4	139,637	0.5324
	Pyongtaek	C/C	903,201	0.4442
	Ilsan	C/C	3,491,175	0.4864

	Bundang	C/C	3,748,232	0.4634
	Ulsan	C/C	4,454,326	0.3900
	Seoincheon	C/C	10,308,626	0.3720
	Shinincheon	C/C	11,531,252	0.3720
	Boryeong	C/C	6,126,641	0.3896
	Incheon	C/C	3,420,631	0.3575
	Busan	C/C	10,848,484	0.3580
	Hallim	C/C	23,547	0.7584
	Anyang	C/C	1,638,638	0.4802
	Bucheon	C/C	1,657,898	0.4646
	POSCO POWER	C/C	3,328,129	0.4715
	GS Bugog	C/C	5,509,092	0.3536
	Yulchon	C/C	2,488,267	0.3722
	Kwangyang	C/C		
	Hyundai-Daesan			
	Namjeju	D/P	93,201	0.6465
	Jeju	G/T	643	2.0096
	Jeju	D/P	223,630	0.6214
2009	Honam	#1	1,843,823	0.9420
		#2	1,696,597	0.9409
	Samchonpo	#1	3,881,067	0.8689
		#2	3,869,863	0.8570
		#3	4,494,850	0.8404
		#4	3,873,780	0.8349
		#5	4,225,306	0.8213
		#6	3,902,690	0.8232
	Yonghung	#1	6,121,660	0.8065
		#2	6,309,794	0.8190
		#3	6,711,338	0.7983
		#4	7,183,514	0.8071
	Boryeong	#1	2,076,329	0.8538
		#2	3,148,655	0.8623
		#3	4,153,516	0.8162
		#4	3,823,603	0.8136
		#5	4,136,937	0.8159
		#6	3,802,516	0.8158
		#7	3,720,811	0.7814
		#8	4,417,673	0.7773
	Taean	#1	4,087,057	0.8085
		#2	3,858,541	0.8139
		#3	4,041,441	0.8123
		#4	3,843,816	0.8094
		#5	3,689,068	0.8129
		#6	4,064,658	0.8122
		#7	4,232,409	0.7921
		#8	3,730,433	0.7891
	Hadong	#1	4,064,233	0.8310
		#2	3,799,030	0.8312
		#3	3,862,769	0.8242
		#4	4,049,790	0.8268
		#5	3,848,711	0.8217
		#6	4,085,588	0.8211
		#7	4,068,510	0.7757
		#8	3,153,402	0.7820

	Dangjin	#1	4,025,605	0.8092
		#2	3,964,389	0.8060
		#3	4,232,358	0.8031
		#4	4,195,301	0.8050
		#5	3,400,082	0.7956
		#6	3,471,850	0.7857
		#7	4,172,321	0.7918
		#8	3,531,321	0.7812
	Ulsan	#1	116,425	0.7923
		#2	104,292	0.7787
		#3	26,061	0.8174
		#4	1,058,708	0.7247
		#5	1,318,789	0.7185
		#6	1,215,616	0.7181
	Yeongnam	#1	437,034	0.7662
		#2	415,404	0.7755
	Yeosu	#1	466,519	0.7263
		#2	805,262	0.7163
	Pyeongtaek	#1	251,576	0.7085
		#2	1,211,425	0.6995
		#3	1,225,561	0.6947
		#4	834,285	0.6994
	Namjeju	#1		
		#2		
		#3	550,851	0.7579
		#4	603,417	0.7567
	Jeju	#1		
		#2	324,784	0.7479
		#3	356,297	0.7570
	Seoul	#4	157,606	0.6250
		#5	412,265	0.5908
	Incheon	#1	72,854	0.5556
		#2	76,672	0.5332
		#3	11,865	0.5533
		#4		
	Pyongtaek	C/C	483,959	0.4415
	Ilsan	C/C	3,270,241	0.4856
	Bundang	C/C	3,108,338	0.4572
	Ulsan	C/C	3,299,104	0.3902
	Seoincheon	C/C	7,503,395	0.3775
	Shinincheon	C/C	9,901,080	0.3760
	Boryeong	C/C	3,655,848	0.3962
	Incheon	C/C	6,075,599	0.3555
	Busan	C/C	9,268,113	0.3595
	Hallim	C/C		
	Anyang	C/C	1,301,286	0.4973
	Bucheon	C/C	1,556,502	0.4783
	POSCO POWER	C/C	1,859,273	0.4919
	GS Bugog	C/C	4,344,271	0.3956
	Yulchon	C/C	1,995,914	0.3777
	Kwangyang	C/C		
	Hyundai-Daesan	C/C		
	Namjeju	D/P	136,189	0.6499
	Jeju	G/T	842	1.9215
	Jeju	D/P	345,163	0.4050

<Table Annex3-4> Sample group plants used in the Build Margin calculation and CO_2 Emission Factor of the Build Margin

Year	No.	Plant name		Technology	Type of Fossile Fue	year operation	Net electricity generated (EGm,y)	CO_2 emission factor ($EF_{EL,m,y}$)	Results
							MWh in 2009	tCO2/MWh	EF for each plant (tonCO2eq./MWh)
2009	1	Gosan		small hydro power		2009.12	-		
	2	Ilsan fuel cell		fuel cell		2009.09	5,083		
	3	Gosado solar		solar		2009.07			
	4	Pyeongsado 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	3,153,402	0.7820	0.0294
	8	Daehanboryeong		small hydro power		2009.05			
	9	Hankukhaeyang		small hydro power		2009.05			
	10	Dangsado solar		solar		2009.04			
	11	Hahwado solar		solar		2009.04			
	12	Hwangjedo solar		solar		2009.04			
	13	Seongsan-wind		wind		2009.04	23,212		
	14	Yeongwol solar		solar		2009.01			
	15	Boseong		small hydro power		2009	2,469		
	16	Seongju		small hydro power		2009	1,294		
	17	New solar energy and others				2009			
2008	1	Boryeong	#8	steam power	Bituminous coal	2008.12	4,417,673	0.7773	0.0409
	2	Hadong	#7	steam power	Bituminous coal	2008.12	4,068,510	0.7757	0.0376
	3	Yeongheung	#4	steam power	Bituminous coal	2008.12	7,183,514	0.8071	0.0691
	4	Kyeongcheon		small hydro power		2008.11	464		
	5	Seongnam 2		small hydro power		2008.10			
	6	Nulokdo solar		solar		2008.09			
	7	Jeju solar		solar		2008.09	59		
	8	Boryeong fuel cell		fuel cell		2008.09	2,340		
	9	Naebyeong solar		solar		2008.08			
	10	Yulhyeon		small hydro power		2008.07	414		
	11	Busan C/C solar		solar		2008.07	391		
	12	Hadong solar		solar		2008.07	1,313		
	13	Hongikdongjin		small hydro power		2008.06			
	14	Daecheongdaem		small hydro power		2008.06			
	15	Boryeong	#7	steam power	Bituminous coal	2008.06	3,720,811	0.7814	0.0346
	16	Kori-wind power		wind		2008.05			

	17	Samlangjin solar				2008.04			
	18	Boryeong solar		solar		2008.04	648		
	19	Boryeong		small hydro power		2008.03			
	20	Yeongheung		small hydro power		2008.03			
	21	Yeonggwang solar park				2008.03			
	22	Boryeong 2		small hydro power		2008.03	1,231		
	23	POSCO fuel cell		fuel cell		2008.03			
	24	Gunjang heat & power		combined		2008.01			
	25	Seocheon solar		solar		2008.01	1,608		
	26	New solar energy and others		solar		2008			
2007	1	Yeongheung	#3	steam power	Bituminous coal	2007	6,711,338	0.7983	0.0638
	2	Taean		small hydro power		2007	4,838		
	3	Hanbit Sungsan the second solar		solar		2007.12			
	4	Taein gangjin solar		solar		2007.12			
	5	Suni gangjin solar		solar		2007.12			
	6	Korea yeongcheon solar		solar		2007.12			
	7	Solar yungam solar		solar		2007.12			
	8	Changwhan yeongduk solar		solar		2007.12			
	9	Samsung jindo		solar		2007.12			
	10	Hwaseong heat & power		combined		2007.12			
	11	Dangjin	#8	steam power	Bituminous coal	2007.12	3,531,321	0.7812	0.0329
	12	SP solar yonggwang		solar		2007.11			
	13	Dongyang energy sinan		solar		2007.11			
	14	Ef yungam solar		solar		2007.11			
	15	Dongwon gangjin solar		solar		2007.11			
	16	Solec yonggwang solar		solar		2007.11			
	17	Solar jungeub solar		solar		2007.11			
	18	Sinbuk yungam solar		solar		2007.11			
	19	Hyein haenam solar		solar		2007.11			
	20	Samlangjin solar		solar		2007.11			
	21	Hyosung daegi-wind power		wind		2007.11			
	22	Nonhyun heat & power		combined		2007.10			
	23	Wuriyungam solar		solar		2007.08			
	24	Hwasung solar		solar		2007.08			
	25	Yeongju the first solar		solar		2007.08			
	26	Muan solar		solar		2007.08			
	27	Jangheung solar		solar		2007.08			
	28	Gomun		small hydro power		2007.08			

	29	Taean	#8	steam power	Bituminous coal	2007.08	3,730,433	0.7891	0.0351
	30	Dangjin	#7	steam power	Bituminous coal	2007.06	4,172,321	0.7918	0.0394
	31	Munkyung solar		solar		2007.06			
	32	Younggwang solar park		solar		2007.06			
	33	Yungam Solar		solar		2007.06			
	34	Wonjungsu		small hydro power		2007.05			
	35	Baekgok		small hydro power		2007.05	393		
	36	damyangho		small hydro power		2007.05	1,025		
	37	Juam		small hydro power		2007.05			
	38	Namjeju	#4	thermal	heavy oil	2007.03	603,417	0.7567	0.0054
	39	Eco energy		solar		2007.03			
	40	hapcheon		small hydro power		2007.02	3,520		
	41	Jeonju-resource recovery facility				2007.02			
	42	Seoul Marin(suncheon)		solar		2007.02			
	43	Mirae energy		solar		2007.02			
	44	Seomjingang		small hydro power		2007.02	58,484		
	45	samcheonpo		small hydro power		2007.02			
	46	dalbang		small hydro power		2007.02			
	47	Taean	#7	steam power	Bituminous coal	2007.02	4,232,409	0.7921	0.0399
	48	Yeongju the second solar		solar		2007.01			
	49	Hyundaedaesan		combined		2007.01			
2006	1	Cheongsong pumping	#2	pumping		2006.12	249,748		
	2	S&P Solar		solar		2006.10			
	3	Bundang fuel cell		fuel cell	LNG	2006.10	1,666		
	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	1,224		
	9	Cheongsong pumping	#1	pumping		2006.09	282,812		
	10	Namjeju	#3	thermal	heavy oil	2006.09	550,851	0.7579	0.0050
	11	yangyang(pumping)	#4	pumping		2006.08	229,982		
	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	1,234		
	17	yangyang (pumping)	#3	pumping		2006.06	233,978		

	18	Goheung Solar		solar		2006.06			
	19	Jangseong		small hydro power		2006.05	1,187		
	20	yangyang (pumping)	#2	pumping		2006.04	145,645		
	21	Dangjin	#6	thermal	Bituminous coal	2006.04	3,471,850	0.7857	0.0325
	22	Sinchang-wind power		wind		2006.03			
	23	yangyang (pumping)	#1	pumping		2006.02	150,607		
2005	1	Janghengdam		small hydro power		2005.12			
	2	Suncheon Solar		solar		2005.12			
	3	Samcheonpo solar energy		solar		2005.12	125		
	4	Dangjin	#5	steam power	Bituminous coal	2005.10	3,400,082	0.7956	0.0322
	5	yangyang pump small hydro		small hydro power		2005.10			
	6	Taean solar energy		solar		2005.10	128		
	7	Jeju DP		internal combustion	heavy oil	2005.07	345,163	0.4050	0.0017
	8	WunjeongLFG		internal combustion	LFG	2005.07			
	9	Yulchon		combined	LNG	2005.07	1,995,914	0.3777	0.0090
	10	Incheon		combined	LNG	2005.07	6,075,599	0.3555	0.0257
	11	Daegok		small hydro power		2005.07	1,295		
	12	Donghwa		small hydro power		2005.07	1,461		
	13	Ulchin	#6	nuclear		2005.04	8,694,518		
	14	Hanrye		LFG	LFG	2005.04			
	15	Busan Bio-gas		internal combustion	LFG	2005.03			
2004	16	Sungnam		small hydro power		2004.12			
	17	Yungduk-wind power		wind		2004.12			
	18	Yongdam		small hydro power		2004.12	19,115		
	19	Maebongsan-wind power		wind		2004.12			
	20	Daegwanryeong-wind power		wind		2004.12			
	21	Yeongheung	#2	steam power	Bituminous coal	2004.11	6,309,794	0.8190	0.0616
	22	Yeongheung	#1	steam power	Bituminous coal	2004.07	6,121,660	0.8065	0.0588
Total							**83,919,573**		0.6547

Source: Statistics of Electric Power in KOREA (2010) (KEPCO), Current status of power generating facility (2010, Korea power exchange)

<Table Annex3-5> Default Values of Carbon content

Fuel	Default carbon content (kg/GJ)	Fuel	Default carbon content (kg/GJ)
Crude oil	20	Oil shale and Tar sands	29.1
Orimulsion	21	Brown Coal Briquettes	26.6
Natural gas liquids	17.2	Patent Fuel	26.6
Motor Gasoline	18.9	Coke Oven Coke and Lignite Coke	29.2
Aviation Gasoline	19.1	Gas Coke	29.2
Jet Gasoline	19.1	Coal Tar	22.0
Jet kerosene	19.5	Gas Works Gas	12.1
Other Kerosene	19.6	Coke Oven Gas	12.1
Shale oil	20	Blast Furnace Gas	70.8
Gas/Diesel oil	20.2	Oxygen Steel Furnace Gas	49.6
Residual fuel oil	21.1	Natural Gas	15.3
LPG	17.2	Municipal Wastes (non-biomass fraction)	25.0
Ethane	16.8	Industrial Wastes	39.0
Naphtha	20.0	Waste Oils	20.0
Bitumen	22.0	Peat	28.9
Lubricants	20.0	Wood/Wood Waste	30.5
Petroleum coke	26.6	Sulphite lyes (black liquor)	26.0
Refinery Feedstocks	20.0	Other Primary Solid Biomass	27.3
Refinery gas	15.7	Charcoal	30.5
Paraffin Waxes	20.0	BioGasoline	19.3
White Spirit & SBP	20.0	Biodiesels	19.3
Other Petroleum Products	20.0	Other Liquid Biofuels	21.7
Anthracite	26.8	Land fill Gas	14.9
Coking coal	25.8	Sludge Gas	14.9
Other bituminous coal	25.8	Other Biogas	14.9
sub-bituminous coal	26.2	Municipal Wastes (biomass fraction)	27.3
Lignite	27.6		

Annex 4

MONITORING INFORMATION

Standard monitoring form

Period: 20YY/MM

System information				Production energy		Consumption energy		Note
Serial number	Type	Location	Introduced date	Type	Production (KWh/TJ)	Type	Consumption (KWh/TJ)	
Total				Electricity		Electricity		
				Thermal		LNG		

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