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

CONTENTS

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

B. Duration of the small-scale programme of activities

C. Environmental Analysis

D. Stakeholder comments

E. Application of a baseline and monitoring methodology to a typical small-scale CDM Programme Activity (SSC-CPA)

Annexes

Annex 1: Contact information on Coordinating/managing entity and participants of SSC-PoA

Annex 2: Information regarding public funding

Annex 3: Baseline information

Annex 4: Monitoring plan

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):

Macedonian Microscale Grid-connected Hydroelectricity Programme
Version Number: 1.7
Date of document completion: 13/11/2012

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

The Macedonian Small Scale Grid-connected Hydroelectricity Programme (hereafter referred to as 'the PoA') aims to develop a series of micro scale (=<5MW) hydroelectric plants in the Republic of Macedonia. Therefore, it aims to contribute both to the grid's decarbonisation and the decentralization of generation capacities through the promotion of renewable energy.

A key component of global climate change mitigation efforts is the decarbonisation of national/regional grid power systems. Hydropower is the number one renewable energy in terms of global production: in 2010, total global power generation capacity reached an estimated 4,950 GW with hydroelectric renewable electricity generation technologies accounting for an estimated 1,010 GW[1]. Therefore, it has key role in the popularization of renewable energy as well as future energy security since it offers an excellent alternative to carbon-based sources of electricity.

However, global power generation is still dominated by fossil fuels as renewable electricity generation technologies face a number of financial and non-financial barriers, especially the small scale ones. According to the European Small Hydropower Association (ESHA)[2], the Macedonian small hydropower market faces the following barriers:

- Financial barriers: Lack of credit lines for small hydro makes the projects less attractive than other investment opportunities. The commercial credit lines are with interest rate of 8-9%;
- Regulatory and administrative barriers: Lack of one-stop-shop complicates and prolongs the procedure of obtaining all permits and approvals;
- Social barriers and acceptance: Very low understanding and awareness of benefits and costs associated with renewable power generation.

This PoA aims to assist the development of small hydro power plants (SHPPs) in the most economically vulnerable areas in Macedonia: rural, undeveloped areas with high rate of unemployment. The proposed project activity will contribute to the sustainable development of the local communities and the host Country as follows:

- By supplying reliable and zero emission electricity to the Macedonian Power Grid;
- By displacing electricity that would otherwise be generated by fossil fuel power plants thus avoiding environmental degradation and pollutants such as SOx, NOx, and dust;

[1] http://www.ren21.net/REN21Activities/Publications/GlobalStatusReport/GSR2011/tabid/56142/Default.aspx

[2] ESHA, 2008. SHERPA (Small Hydropower Energy Efficiency Campaign Action): Strategic Study for the Development of Small Hydro Power (SHP) in the European Union. Available at: <http://www.esha.be/fileadmin/esha_files/documents/SHERPA/COUNTRY_OVERVIEW_EU-27.pdf>.

- By alleviating power shortages and stimulating economy development in the local areas which are officially approved by the Macedonian government as undeveloped zones (incl. road infrastructure development);
- By creating job and training opportunities over the construction and operation period for the local people;
- By increasing the level of awareness on the topics of nature preservation and renewable resource utilization.

The proposed PoA is a voluntary action undertaken by the private Camco Carbon International Limited.

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

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity (ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
The Republic of Macedonia (Host Party)	Camco Carbon International Limited (private company)	No
The Netherlands	Camco Carbon International Limited (private company)	No
(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required.		

Camco Carbon International Limited will act as the coordinating/managing entity of this PoA (hereafter referred to as CME) and will be the focal point in any communication with the CDM Executive Board. In accordance with Glossary of CDM Terms (Version 07.0), Camco Carbon International Limited is authorized by all participating host country DNAs involved in this PoA and is nominated in the MoC statement as the entity that communicates with the Board and the Secretariat.

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

A.4.1. Location of the programme of activities:

A.4.1.1. Host Party(ies):

Republic of Macedonia

A.4.1.2. Physical/ Geographical boundary:

The geographical boundaries of the PoA are the sovereign borders of the Republic of Macedonia. The PoA will therefore be taking into consideration all applicable national and/or sectoral policies and regulations within that boundary, which will be reflected in the determination of the uniform baseline.

Figure 1: Map of FYRO Macedonia

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

This PoA aims to facilitate the development of small scale grid-connected hydropower technologies. A typical CPA included in this PoA will be:

- Newly build hydro power generation unit(s) using run-of-the-river equipment; and
- Supplying electricity to the Macedonian national grid; or supplying electricity to an identified consumer via national/regional grid by means of contractual agreement; and
- Having installed capacity less than or equal to 5MW (i.e., microscale).

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

The CPAs[3] under this PoA employ run-of-the river hydroelectricity generation technologies. Even though the detailed technical specifications will differ from a CPA to a CPA, the following general conditions will apply for all CPAs:

[3] The terms 'CPA' or the plural 'CPAs' are used throughout the whole document as an acronym for SSC-CPA or SSC-CPAs respectively.

The water flow from the intake point is diverted to the power plant, excluding the flow needed to ensure the biological minimum. The water is then conducted through a penstock to the power house, where one or more turbines and (a) suitable generator(s) are located. The plant is then connected to a nearby sub-station through a new or modified power line. A discharge channel returns the water to the natural river bed.

In the baseline scenario the electricity that is going to be delivered to the grid by the hydropower project activities would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources into the grid.

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

The eligibility criteria for CPA inclusion in the PoA have been developed in accordance with the "Standard for demonstration of additionality, development of eligibility criteria, and application of multiple methodologies for programme of activities" (version 01.0, EB 65).

To be eligible for inclusion each CPA needs to provide documented evidence that all eligibility criteria have been met. Moreover, each CPA shall include the following checklist in the CPA-DD to prove its compliance with the requirements of the PoA:

Eligibility criteria	CPA Justification	Source of CPA Justification
1. Project type, category, and technology fit		
1.1. The CPA installs =<5 MW and falls into the following type and categories as defined by Appendix B of the 'Simplified modalities and procedures for small scale CDM project activities': • Type I - Renewable energy project • Category: I.D. – Renewable energy technologies that supply electricity to a grid • Sub-category: Renewable energy generation units utilizing hydropower for electricity generation.		
1.2. The plant should be a run-of-river power plant. According to the World Commission of Dams (2000), a run-of-river hydro power plant is characterized as having "dams that created a hydraulic head in the river to divert some portion of the river flows. They have no storage reservoir or limited daily poundage."[4]		
1.3. The plant should be a Greenfield plant and must not involve retrofitting or modifying of an existing facility for renewable energy generation.		
1.4. To ensure there is no leakage, no energy generating equipment should be transferred from another activity to		

[4] World Commission on Dams (2000). Dams and development: a new framework for decision making. Earthscan Publications. London, U.K. http://www.unep.org/dams/WCD/report/WCD_DAMS%20report.pdf (accessed October 18, 2011)

the CPA and no existing equipment is going to be transferred to another activity.		
2. Eligibility as microscale project activity		
2.1. The CPA has installed capacity of <=5MW, in conjunction with the "General Guidelines to SSC CDM methodologies" (ver. 19).		
2.2. The project activities should remain under the threshold of 5MW each year of the crediting period. In cases where *ex ante* projected emissions reductions show an increase during the crediting period, project activities that go beyond the microscale limits in any year of the crediting period are not eligible.		
2.3. If multiple sites are included under a single CPA, the aggregate capacity of the CPA is under the 5MW constraint.		
3. Location, boundary, and additionality		
3.1 The CPA should be consistent with the geographical boundary set in section A.4.1.2 of the PoA-DD.		
3.2 The CPA should be able to demonstrate its additionality as described in Section E.5.1 of the PoA-DD.		
4. Methodological fit		
The CPA should meet all applicability conditions as listed in the most recent version of methodology AMS-I.D and explained in section E.2 of PoA-DD.		
5. Starting date		
The starting date of the CPA should be after the date of commencement of the PoA validation, i.e. the date when the PoA-DD is first published for global stakeholder consultation (in line with the CDM Glossary of Terms, Version 06). The owner of the CPA should be able to confirm the start date of the project activity through documentary evidence.		
6. Debundling Check		
The CPA should be able to demonstrate that it is not a debundled component of a larger project, as set out in section A.4.4.1 of the PoA-DD.		
7. Double Counting Check		
The CPA should be able to demonstrate that it does not allow double counting, as set out in section A.4.4.1 of the PoA-DD.		
8. Public funding		
The CPA should indicate if the project received any public funding from Annex I Parties. In case funding from Annex I Parties was received, affirmation that this funding does not result in a diversion of official development assistance should be given.		
9. **Environmental impact assessment**		
The CPA should provide a state approved environmental impact assessment (EIA) report or state issued letter of EIA exemption		

10. Stakeholder consultations		
The CPA should be able to provide relevant evidence that comments from local stakeholders were invited and compiled.		
11. Management and legal matters		
11.1. The CPA must comply with all testing and certification requirements for hydropower technologies in the host country of Macedonia.		
11.2. The CPA must agree to comply with the prescriptions of the operational and management procedures set out in section A.4.4.1 of the PoA-DD.		
11.3. The CPA must agree to adhere to the monitoring plan (section A.4.4.2 of the PoA-DD) and collect monitoring data (as specified by the parameters as listed in sections E.6.3 and E.7.1 of the PoA-DD).		
11.4. The CPA should be implemented as a voluntary initiative and not due to mandatory policies or regulations.		
11.5. The CPA should enter in a contractual agreement with the CME to regulate the ownership and transfer of the emission reductions.		

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;

This PoA is a voluntary coordinated action by the CME aiming to facilitate the development of small scale grid-connected run-of-the-river hydropower technologies in the Republic of Macedonia.

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

The “Standard for demonstration of additionality, development of eligibility criteria and application of multiple methodologies for programme of activities” (version 01.0, EB 65) states that “additionality should be demonstrated by establishing that in the absence of CDM, none of the implemented CDM Project Activities (CPA) would occur”.

According to Article 154 from the ‘Clear Development Mechanism Project Standard’ (EB 65, ver. 01.0): ”The coordinating/managing entity shall consider that a full additionality assessment is not required in the context of CPA. Instead, the confirmation of additionality for CPAs should be conducted by means of the eligibility criteria”. Therefore, the CPAs should demonstrate their additionality through fulfilling certain eligibility criteria for inclusion in the PoA.
Eligibility Criteria 3.2 is the relevant 'additionality test' for the CPAs (section A.4.2.2). This eligibility criteria is "derived from all the relevant requirements of the "Guidelines for demonstrating additionality of microscale project activities" (EB 68, ver. 04) in accordance with Article 8 of the “Standard for demonstration of additionality, development of eligibility criteria and application of multiple methodologies for programme of activities” (version 01.0, EB 65)

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

Not applicable

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

Not applicable

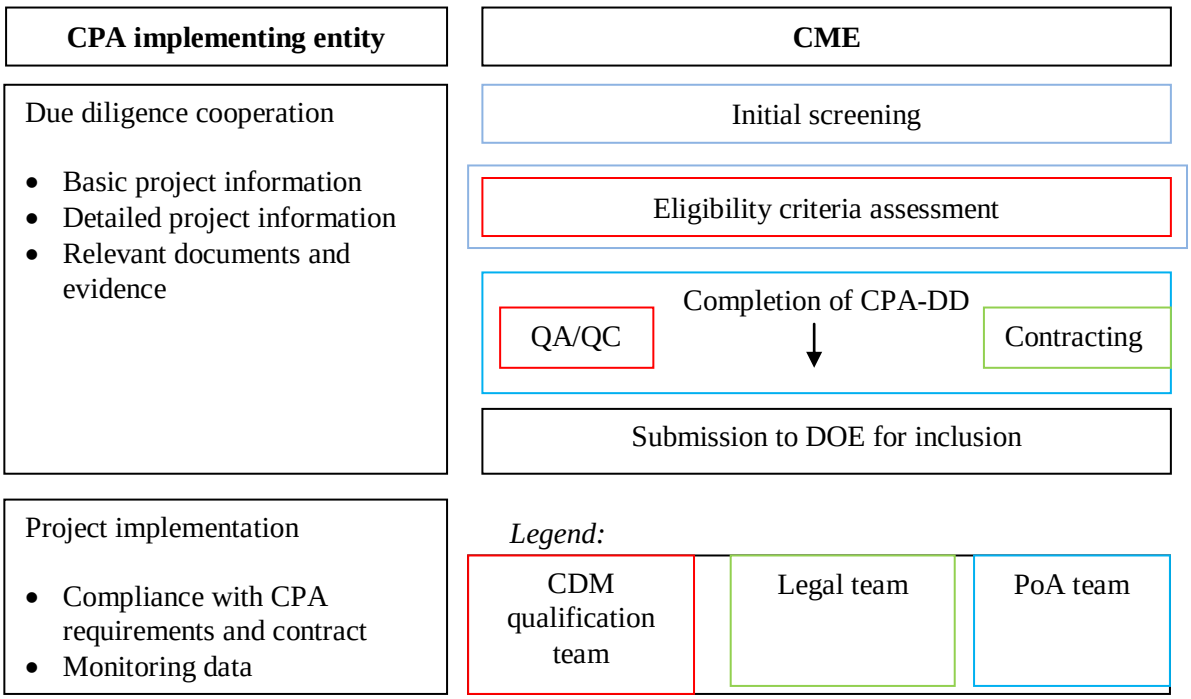
A.4.4. Operational, management and monitoring plan for the programme of activities (PoA):

A.4.4.1. Operational and management plan:

(i) Clear definition of roles and responsibilities of personnel involved in the process of CPA inclusion

The role of the **CME** is to assess and review potential CPAs and work with the implementing entity to perform eligibility assessment, complete the CPA-DD, and submit a CPA inclusion request to the DOE (as per the "Standard for demonstration of additionality, development of eligibility criteria and application of multiple methodologies for programme of activities" (version 01.0, EB 65)). The CME responsibilities are split across three teams within the organization: the PoA, CDM qualification, and Legal teams (see Figure 2). All three teams report to the **CME Regional Director** who has the overall responsibility for the inclusion process. A review of the teams' members and competencies (e.g. short profiles) will be available to the DOE at the time of PoA validation.

Figure 2: CPA inclusion process and team responsibilities



The role of the **CPA implementing entity** is to provide all necessary project information and documentation to the CME to facilitate the comprehensive assessment of the project's PoA eligibility and the completion of the CPA-DD.

(ii) Records and arrangements for training and capacity development for personnel

Training will be provided where applicable and a record will be kept and made available to the DOE upon request.

(iii) Measures for continual improvement of the PoA management

The PoA management process will be assessed annually with comments invited from all team members and participating CPA implementing entities to help identify any areas of improvement.

The annual assessment will take the form of a questionnaire that will be sent out electronically to all CME team members and on paper and/or electronically to participating CPA implementing entities.

(iv) Records and documentation control process for each CPA

The CME will maintain an electronic database which will include the following information for each CPA:

- Unique identification code[5];
- CPA title/name;
- Implementing entity – name, address, contact person and details;
- Installed capacity and other relevant technical specifications;
- Location of the CPA (e.g. GPS coordinates of the power house, river name);
- List of documents provided by the CPA and available to the CME;
- Project status – e.g. start date, timeline.

This information will be used both for internal management purposes and for external control by the DOE. Therefore, the electronic database will be the prime evidence that debundling and double counting are avoided.

(v) Procedures for inclusion of a CPA in the PoA

In order to be included in the PoA, the CME will assess the eligibility of each CPA to see if its characteristics fit the criteria set in section A.4.2.2. As per Figure 2, the procedures for inclusion of a CPA in the PoA are the following:

1. Initial screening
2. Eligibility checks (incl. technical review)
3. Preparation of the CPA-DD (incl. QA/QC and contracting)
4. Official submission to DOE for inclusion

The procedures included in the eligibility checks are as follows:

[5] The format of the identification code will be MAC [4 digit number, starting from 0001].

- The procedure for **additionality assessment** will include the following:
  - Review the geographical location of the CPA and ensure it is located in the Republic of Macedonia (see Eligibility Criteria #3). It will involve checking if the geographical coordinates of the plant.
  - Decision if Approach A or B, as set in Section E.5.2, is applicable for the particular CPA. In case of Approach A, no additional information will be reviewed – the CPA is automatically additional. In case of Approach B, additionality analysis as per the relevant guidance will be carried.
  - Once there is sufficient confidence in the project information and the CPA eligibility, the CME will proceed with the inclusion process.

- The procedure for **technical review** will assess the technical specifications of the CPA and their fit into the technical and methodological requirements of the PoA (see Eligibility Criteria #1, 2, and 4).

  The process will be done in cooperation with the CPA implementing entity in order to ensure that the CME takes an informed view of the validity and accuracy of the available CPA technical information. The CPA implementing entity will have to supply technical documentation which is available at the time, for example feasibility study, EIA, engineering design documents, hydrological studies, financial due diligence report.

  Once there is sufficient confidence in the project information and the CPA eligibility, the CME will proceed with the inclusion process.

- The procedure to avoid **double-counting** will include cross referencing the CPA with the:
  i) existing CPAs in the electronic database;
  ii) UNFCCC CDM website project cycle and validation pages, available at:

  http://cdm.unfccc.int/Projects/projsearch.html
  http://cdm.unfccc.int/Projects/Validation/index.html

  iii) CDM PoA project database information provided by UNEP Risø Centre and the Institute for Global Environmental Strategies:

  http://cdmpipeline.org/
  http://www.iges.or.jp/en/cdm/report_cdm.html

  To hedge against future double counting and debundling accusations, the CPA would have to enter into contractual agreement with the CME (see Eligibility Criteria #11.5). The agreement's provisions will ensure that the CPA is exclusive to Camco Carbon International Limited. Namely, the CPA implementing entity would have to agree that it:
  - Will not register the CPA as a single CDM activity or as a CPA under another PoA;
  - Is aware of and have agreed that their activity is being subscribed to the PoA of the particular CME;
  - Will adhere to the contract for the ownership and transfer of the emission reductions under the Clean Development Mechanism of the UNFCCC.

- The procedure for **de-bundling check** will have to confirm that the CPA is not a debundled component of another CDM activity (Eligibility Criteria #8). The CME will assess the

evidence that proves that there is no registered small-scale CDM project activity or an application to register another small-scale CDM project activity:

- With the same implementing entity;
- In the same project category and technology/measure;
- Registered within the previous 2 years; and
- Whose project boundary is within 1 km of the CPA project boundary at the closest point.

Each CPA could provide a table showing the vicinity of each project's power house and water intake to any other small-scale hydro projects in the region.

- Prior to submitting the application for CPA inclusion to the DOE, the CME will also have to provide evidence the EIA and stakeholder consultations are finalized (Eligibility criteria #9 and 10).

A.4.4.2. Monitoring plan:

The CME of this PoA opts for a verification method that does not use sampling but verifies all CPAs. Therefore, monitoring will be carried out and verified independently on CPA level.

For each CPA, all parameters included in section E.7.1 will be monitored by the CPA implementing entity according to the procedures set out in E.7.2 using calibrated meters. The monitoring data periodically will be submitted to the CME, which will store the data in a safe electronic database (see section A.4.4.1.) The CPA implementing entities will store the primary data as a back-up in case there is a problem with the CME electronic database.

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

The PoA will not receive any public funding. In case funding from Annex I Parties is received on a CPA level, the CPA owner should provide confirmation that this funding does not result in diversion of official development assistance. The details of any public funding will be provided in section A.4.5 of the CPA-DD.

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

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

The starting date of the programme of activities is the date of submission of the POA-DD and specific CPA-DD for global stakeholder comments. This date is 07/03/2012.

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

28 years, 0 months

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 x

The local impacts of each small hydro CPA (e.g. depending on the location, capacity, and construction) justify a separated environmental assessment. The information will be included in Section C of the CPA-DD.

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

Not available on the PoA level.

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),:

All existing facilities in Macedonia possessing sources of environmental pollution must prepare and submit to the Ministry of Environment and Spatial Planning various ecological and technological studies, including analyses of the sources of pollution and measures for to reduce pollution to levels below "maximum permissible concentration" (MPC).

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 x

Since the CPAs are expected to be geographically spread across the whole territory of Macedonia, the local stakeholder consultation would be done on CPA rather than PoA level. That way the local stakeholder consultations will take into consideration to differences of circumstances and opinions of the communities in which each CPA is located.

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

The local stakeholder consultation will be done at the CPA level and this information will be included in section D.2 of the CPA-DD.

D.3. Summary of the comments received:

The local stakeholder consultation will be done at the CPA level and this information will be included in section D.3 of the CPA-DD.

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

The local stakeholder consultation will be done at the CPA level and this information will be included in section D.4 of the CPA-DD.

SECTION E. Application of a baseline and monitoring methodology

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

All CPAs under this PoA should follow the latest version of the following baseline and monitoring methodology:

AMS-I. D, "Grid connected renewable electricity generation"

At the time of inclusion of the first/specific CPA, the relevant version of the aforementioned methodology is 17 (EB 61, valid from June 17, 2011 onwards). More information regarding the methodology could be found on the following link:

http://cdm.unfccc.int/methodologies/DB/RSCTZ8SKT4F7N1CFDXCSA7BDQ7FU1X

If the applied methodology is revised without being placed on hold (i.e., if a new version is available) no action to update the PoA DD is required by the CME.

The methodology calls for the use of the "Tool to calculate the emission factor of an electricity system" to calculate the emission factor for the Macedonian Power Grid that is to be used for the baseline emission calculation. More information regarding the current version of the Tool (ver. 2.1.1) could be found at the following link:

http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v2.2.1.pdf

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

To be eligible for inclusion in the PoA each CPA will have to meet the applicability conditions of methodology AMS.-I.D (Eligibility Criteria #4). In accordance with ver. 17 of the Methodology, the relevant applicability conditions could be formulated as:

> *The plants should use hydro power to generate electricity and supply it to the Macedonian power grid.*

Since to be eligible for inclusion in the PoA all CPAs will be grid-connected Greenfield run-of-the river hydro plants with an installed capacity of <=5MW (Eligibility criteria #1), this applicability condition will be met.

The applicability conditions of the methodology which refer to the following points are not relevant to this PoA:

- hydro plants with reservoirs;

- units which have both renewable and nonrenewable components;
- power plants with an installed capacity in the range over 5 and 15 MW.
- the installation of additional power plant units, as well as
- the condition that combined heat and power (co-generation) systems are not eligible.

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

	Source	Gas	Included?	Justification/Explanation
Baseline	CO_2 emission from electricity generation in fossil fuel fired power plants that is displaced due to the project activity	CO_2	Yes	Main emission source
		CH_4	No	Excluded for simplification. This is conservative.
		N_2O	No	Excluded for simplification. This is conservative.
Project Activities	For hydro power plants, emissions of CH_4 from the Reservoir	CO_2	No	Excluded as there are no reservoirs at all power plants included in the bundle.
		CH_4	No	
		N_2O	No	

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

According to AMS-I.D (Version 17), the baseline scenario is the electricity delivered to the grid by the project activity that otherwise would have been generated by the operation of grid-connected power plants and by the addition of new generation sources. The baseline emissions are the product of the electrical energy baseline $EG_{BL,\ y}$ (expressed in MWh of electricity produced by the renewable generating unit) multiplied by the grid emission factor:

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

Where:

BE_y - Baseline Emissions in year y (t CO_2)

$EG_{BL,y}$ - Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year y (MWh)

$EF_{CO2,\ grid,\ y}$ - CO2 emission factor of the grid in year y (t CO_2/MWh)

Out of the two options that AMS-I.D (Version 17) indentified as possible to calculate the baseline emission factor for the grid, the PoA utilizes the first one:

a) A combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the "Tool to calculate the Emission Factor for an electricity system" (Version 02.2.1).

The information and data used to determine the baseline emissions will be included in each individual CPA-DD.

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:

The determination of additionality for a CPA under this PoA shall be performed as presented below, in accordance with the "Guidelines for Demonstrating Additionality of Microscale Project Activities" (Version 04). As long as a new CPA can demonstrate that it meets the conditions for one of the presented approaches, the CPA shall be deemed additional. The set of conditions for each approach and how demonstration of their fulfilment shall be performed at the time of inclusion of a CPA is summarized in the explanations below and further explained in Section E.5.2.

Approach A:

As explained in section A.4.3, additionality is to be demonstrated on a CPA level following the latest version of the "Guidelines for demonstrating additionality of microscale project activities": Version 04 adopted at the 68rd meeting of the CDM Executive Board.

According to the "Guidelines" project activities up to 5 megawatts that employ renewable energy as their primary technology are additional if any one of the below conditions are satisfied:

a) The geographic location of the project activity is in LDCs/SIDs or in a special underdeveloped zone of the host country.
b) The project activity is an off grid activity supplying energy to households/communities (less than 12 hrs grid availability per 24 hrs day is also considered as off grid for this assessment);
c) The project activity is for distributed energy generation with both conditions (i) and (ii) satisfied (see below);
   (i) Each of the independent subsystem/measure in the project activity is smaller than or equal to 750 kW electrical installed capacity;
   (ii)End users of the subsystem or measure are households/communities/ SMEs.
d) The project activity employs specific renewable energy technologies/measures recommended by the host country DNA and approved by the Board to be additional in the host country.

The Macedonian DNA, part of the Ministry of Environment and Spatial Planning, submitted a recommendation on specific renewable energy technologies to be considered additional in Macedonia to the UNFCCC Secretariat on 04/09/2012. According to the submission the DNA recommends to consider any renewable energy project up to 5 MW using hydro, geothermal, on-shore wind, and renewable biomass power to produce electricity and to deliver it to the national grid. The Executive Board approved the recommendation. Therefore, any grid-connected hydroelectricity producing CPA with installed capacity <=5 MW is deemed to be additional and is eligible for inclusion in this PoA in the period of validity of the automatic additionality.

According to the "Procedure for Submission and Consideration of Microscale Renewable Energy Technologies for Automatic Additionality" (ver. 01.0), the automatic additionality for micro grid

connected hydropower projects in Macedonia can be used as a additionality test for CPA inclusion for 3 years after its adoption by the EB.

However, after 3 years the Macedonian DNA may renew its recommendation on specific microgeneration technologies, subject to fulfilling the requirements of the Procedure, and therefore hydroelectric projects could get an extended approval by the EB. In case the automatic additionality is not extended after the first 3 years, new CPAs would have to demonstrate additionality using the prescriptions of **Approach B**. CPAs that have been added to the PoA in the period when automatic additionality is applicable remain additional for their entire crediting period.

Approach B:

In accordance with the "Guidelines on the demonstration of additionality of small-scale project activities" (ver. 09.0, EB69) and in line with the "Non-binding best practice examples to demonstrate additionality for SSC project activities", Approach B for additionality demonstration shall be based on investment barrier analysis.

The analysis should show that an investment barrier exists, i.e., there is a financially more viable alternative to the project activity that would have led to higher emissions. The baseline scenario described in section E.4. would lead to higher emissions than the implementation of a small-scale hydropower plant. Thus, if it can be demonstrated that the CPA is not financially attractive for a potential investor, it can be safely assumed that the baseline scenario would take place and lead to higher emissions.

As per AMS I.D "Grid connected renewable electricity generation" (ver.17), the baseline scenario is the electricity delivered to the grid by the project activity that otherwise would have been generated by the operation of grid-connected power plants and by the addition of new generation sources. According to the "Guidelines on the assessment of investment analysis", if the alternative to the project activity is the supply of electricity from a grid, a benchmark approach is considered appropriate. Therefore, the investment barrier analysis for CPAs in this PoA will comprise of a comparison of the CPAs' IRR to an appropriate benchmark. The IRR calculation, the benchmark selection, and sensitivity analysis shall be carried out as per relevant provisions of "Tool for the demonstration and assessment of additionality" (ver. 06.1.0)*"* and *"*Guidelines on the assessment of investment analysis*"* (ver. 05.0, EB 62, Annex 5).

In the general case, it shall be clearly demonstrated that the proposed CPA is not financially attractive without considering CER revenues – indeed, CER revenues help the CPA to reach return on investment that is not below the benchmark and is therefore suitable for a rational investor. If the CPA has an IRR (without CER consideration) below the benchmark and if this is supported by a solid sensitivity test, the project would be deemed to face investment barriers and would be considered additional. In this case the CME will be able to include the CPA in this PoA.

For a typical CPA in this PoA, the usual approach will be to calculate a Project IRR (both with and without CER revenues) and compare it to a benchmark that is based on standard parameters in the Macedonian market. Therefore, this approach is outlined in the present section. However, other approaches (e.g. benchmark including a WACC calculation for cost of equity) could also be utilized for certain CPAs.

Project IRR calculation

Project IRR shall not include the cost of financing expenditures (i.e. loan repayments and interest) and should reflect the period of expected operation of the underlying project activity (technical lifetime), whereas the *"Guidelines on the assessment of investment analysis"* (ver. 05.0) advise that a maximum period of 20 years is appropriate. The IRR calculation may include the cost of major maintenance and/or rehabilitation if these are expected to occur during the period of assessment. The calculation may be carried on a pre- or post-tax basis provided that the applied benchmark is also determined at the same way – either pre- or post-tax. In accordance with paragraph 5 of the Guidelines, taxation should only be included as an expense in the IRR calculation in cases where the benchmark is intended for post-tax comparisons. Furthermore, in cases where a post-tax benchmark is applied, actual interest payable shall be taken into account in the calculation of income tax (in line with Paragraph 11 of the Guidelines).

In line with paragraph 6 of the Guidelines, the input values shall be valid and applicable at the time when the investment decision was taken by the CPA implementing entity. The proposed list of inputs for the project IRR calculation is included in section E.5.2. of this PoA-DD.

Benchmark selection

As per the *"Guidelines on the assessment of investment analysis"* (ver. 05.0), local commercial lending rates or weighted average costs of capital (WACC) are appropriate benchmarks for a project IRR. For a benchmark based on parameters that are standard in the market, the cost of debt should be calculated as the cost of financing in the capital markets (e.g. commercial lending rates and guarantees required for Macedonia and the type of project activity concerned), based on documented evidence from financial institutions with regard to the cost of debt financing of comparable projects. In cases where this data is not available, the commercial lending rate in Macedonia shall be used to calculate the cost of debt (paragraph 16 of the Guidelines).

Benchmarks supplied by relevant national authorities are also appropriate if the DOE can validate that they are applicable to the project activity and the type of IRR calculation presented (paragraph 12 of the Guidelines).

If the preference is to carry out the investment analysis in nominal terms, the provided real term value can be transformed to nominal values by adding the inflation rate (e.g. from the inflation forecast of the Macedonian central bank for the duration of the crediting period, the target inflation rate, or the average forecasted inflation rate published by the IMF (International Monetary Fund World Economic Outlook) or the World Bank for the next five years after the start date of the CPA). In addition, if the calculation may be carried on a pre- or post-tax basis provided that the project IRR is also determined at the same way – either pre- or post-tax.

Sensitivity analysis

In line with Paragraph 20 of the "Guidelines on the assessment of investment analysis" (ver. 05) , a sensitivity analysis will be conducted by varying with +/-10% parameters that constitute more than 20% of either total project costs or total project revenue.

If the IRR exceeds the benchmark in one or more of the scenarios considered in the analysis, a clear explanation shall be presented to demonstrate that this situation is unlikely to happen.

For example, a generally unlikely scenario would be if total investment decreases with 10%. Investment costs impact the IRR of a project in an inverse way, i.e. the lower the CAPEX, the higher the IRR. The CAPEX of a hydropower project presented in a (pre-) feasibility study (especially for the purpose of winning a tender) tends to be an optimistic estimate based on past experience. Moreover, small-scale

projects rarely can afford very detailed feasibility studies customized to the precise project setting. Therefore, the actual costs incurred during the implementation of the projects tend to be higher, not lower than the ones initially estimated by the investor. In this sense, 10% decrease in investment costs is unlikely for small hydropower plants in Macedonia.

In addition, the analysis should include a consideration of the breakeven values for the selected parameters: i.e., the values of the parameters at which project IRR would equal the benchmark. Statements on the likelihood of reaching/not reaching the benchmark should be provided.

If the CPA has an IRR below the benchmark that is supported by a solid sensitivity analysis, the project is deemed to face an investment barrier and is therefore is considered additional and eligible for inclusion in this PoA.

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

Each CPA-DD will follow the framework outlined in section E.5.1. The key data and criteria needed for assessing the additionality of each small-scale CPA are summarized below:

Approach A:

Key criteria for assessing the additionality of the CPA using Approach A:	Key data needed for assessing the additionality argument
• The installed capacity of the potential CPA is/will be <=5 MW (i.e., does it fulfil PoA eligibility criteria # 1.1)	Technical specifications, sourced from final design; equipment purchase agreements**;** legally binding implementation/construction contracts to name just a few; any other documentation that can prove that the installed capacity is under the allowed eligibility maximum.
• The technology used in the potential CPA falls into the list of approved technology types (i.e., does it fulfil PoA eligibility criteria #1.2)	Technical specifications, sourced from basic/final design; equipment purchase agreements**;** and/or legally binding implementation/construction contracts, to name just a few
• The potential CPA is located on the territory of Republic of Macedonia (i.e., does it fulfil PoA eligibility criteria # 3.1).	Details of physical location, including information allowing the unique identification of the small-scale project activity (e.g. geographical coordinates, river on which the plant is located).

Approach B:

The demonstration of additionality through investment barrier analysis must be transparently documented within the project design document for each CPA that uses it (i.e. CPA-DD) and validated by the DOE. The input values shall be valid and applicable at the time when the investment decision was taken by the CPA implementing entity (in line with Paragraph 6 of the "Guidelines on the assessment of investment analysis", ver. 05.0").

Key criteria for assessing the additionality of the CPA using Approach B:	Key data needed for assessing the additionality argument
• The IRR of the project without CERs is under the chosen benchmark.	Analysis results based on IRR calculation and comparison with chosen benchmark selection. The key data needed is listed in the paragraph

	'IRR calculation' and 'Benchmark' below.
• The sensitivity analysis substantiates the conclusions reached from the IRR benchmark comparison.	Analysis result based on sensitivity analysis. The key data needed is listed in the paragraph 'Sensitivity analysis' below.

IRR calculation

The project IRR calculation of the CPA will be based on a list of economic parameters, provided by the CPA implementing entity, that were available at the time the investment decision was taken. This list of parameters includes but is not limited to the following items:

Item	Unit	Examples of sources of information	Comment
Technical project data			
Technical lifetime	Year	Information provided by technology provider/ manufacturer (e.g. equipment specifications); expert opinion (e.g. feasibility study); default factors (i.e., from the "Tool to determine the remaining lifetime of equipment" (ver. 01))	The Tool provides for 25 years lifetime of hydrogenation equipment, while the "Guidelines on the assessment of investment analysis" (ver. 05.0) advice that in general a maximum of 20 years is appropriate to be considered. Therefore, typically project duration of 20 years will be considered and the fair value of the project activity assets at the end of this assessment period will be added back in the last year as a cash item.
Installed capacity	MW	(Pre-)feasibility studies, project design documents, contracts for equipment purchase	
Plant Load Factor (PLF)	%	(Pre-)feasibility study where (a) PLF is provided to banks and/or equity financiers while applying the project activity for project financing, or to the government while applying the project activity for implementation approval; (b) PLF is determined by a third party contracted by the project participants (e.g. an engineering company);	Determined as per Guidelines for the reporting and validation of Plant Load Factors (ver. 01, Annex 11, EB 48).
Construction start	MM/YY	Project status reports,	

		engineering/equipment purchase/ civil work contracts	
Commissioning date	MM/YY	Commissioning certificate, commissioning plan	
Annual electricity generation sold to the grid	MWh/year, kWh/year	(Pre-)feasibility studies,	
Financial data			
Date of investment decision	DD/MM/YY	Purchase order of equipment; Minutes of the board meeting when the final investment decision was made; Bank loan approval	
Total investment	Euro	(Pre-) feasibility studies; purchase agreements, internationally accepted values (investment/installed MW).	
Electricity tariff (including subsidies)	Euros/kWh	Applicable electricity tariff as per current regulations at the time of investment decision, included in (pre)feasibility study,	The typical tariff will be the feed-in tariff.
Other yearly revenues	Euro	(Pre-) feasibility studies;	If applicable.
Yearly O&M costs	Euro	(Pre-)feasibility studies, default international values	The O&M costs might include cost items such as (but not limited to): management and administrative expenses, labour costs, consumables, equipment maintenance costs (including regular as well major maintenance costs that occur on a less frequent but periodic basis).
Yearly water concession fee	Euro	(Pre-)feasibility studies, tender contract	
Other yearly expenses	% of CAPEX, or euro/year	(Pre-)feasibility studies,	Cost items such as (but not limited to): insurance on investment; legal expenditures; land lease. If applicable.
Depreciation rates (e.g. civil works; equipment)	Years	(Pre-)feasibility studies, National laws and regulations	The fair value of the project at the end of the period of analysis will be calculated as a depreciated asset. According to current national

			legislation, energy production equipment is depreciated with 5%, civil engineering works – 3%, other non-material long term means – 10%.
Inflation rate	%/year	Inflation forecast of the central bank for the duration of the crediting period, the target inflation rate of the central bank, the average forecasted inflation rate for the host country published by the IMF or the World Bank for the next five years after the start of the project activity.	Used if calculations are carried in nominal terms.
Exchange rate	EUR/MKD	Official exchange rates	

For a specific CPA the list of parameters that is used for determining the project IRR may be different due to the particular circumstances of the project.

Benchmark selection

The cost of debt should be calculated as the cost of financing in the capital markets (e.g. commercial lending rates and guarantees required for Macedonia and the type of project activity concerned), based on documented evidence from financial institutions with regard to the cost of debt financing of comparable projects, or the commercial lending rate in Macedonia.

Sensitivity analysis

As a general approach, the following variables would be subjected to variation for sensitivity analysis:

- Electricity tariff;
- Annual electricity generation sold to the grid;
- Total O&M costs; and
- Total investment;

The range of variations considered should be reasonable in the particular CPA context. As a rule of thumb, variations should at least cover the range of +/-10%, unless it is deemed that another range is appropriate in the context of the specific project.

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:

The calculation of the GHG emission reductions by the proposed PoA follows the baseline methodology AMS I.D and the "Tool to calculate the emission factor for an electricity system". The emission calculation will happen on CPA level and be included in section B.5.1 of the CPA-DD.

Baseline scenario and emissions

As described in E.4, the **baseline scenario** is that the power generated by the CPA would have otherwise been generated by the operation of grid-connected power plants, or the addition of new generating sources, in the absence emissions of the project activity.

Therefore, the calculation of each CPA baseline emissions (BE_y) is based on the expected annual net electricity generation of each CPA and the grid GHG emission factor ($EF_{CO2, Grid,y}$) according to the formula:

BEy=EGy*EFgrid,y

The produced electricity (EG_y) for each CPA included in the PoA will be sourced from the project design documents and included in their CPA-DD. The calculation of the annual amounts of electricity supply in the project designs will be based on the water flows for each CPA individually.

The emission factor of the grid used in the baseline calculations ($EF_{CO2, Grid,y}$) is derived in accordance with the "Tool to calculate the emission factor for an electricity system". At the time of submitting the POA-DD and CPA-DD, the relevant version is 02.2.1, Annex 19, EB 63.

Grid emission factor

The grid emission factor is calculated in a transparent and conservative manner using the combined margin (CM) calculations described in the Tool. The combined margin (CM) is expressed as the combination of the operating margin (OM) and build margin (BM). According to the procedures prescribed in the latest version of the Tool (02.2.1), there are six steps to calculate the grid Emission Factor:

STEP 1. Identify the relevant electricity systems.
STEP 2. Choose whether to include off-grid power plants in the project electricity system (optional).
STEP 3. Select a method to determine the operating margin (OM).
STEP 4. Calculate the OM emission factor according to the selected method.
STEP 5. Calculate the build margin (BM) emission factor.
STEP 6. Calculate the combined margin (CM) emissions factor.

As per requirements, the calculations must be based on data from an official source (where available) and made publicly available. A detailed calculation of grid emission factor is presented below and the baseline information is made available in the Annex 3 of this PDD.

STEP 1. Identify the relevant electricity systems

The electricity generated by the Project activity will be delivered to the national grid of Macedonia, the only grid that exists in the country. This national electricity grid is a transmission and distribution line, to which all power plants in Macedonia are physically connected. Hence the national electricity grid is the Project electricity system.

The national grid of Macedonia is connected to the neighboring countries' electricity systems. From the options that the Tool specifies for how to treat emissions from connected electricity systems' imports, this Project uses the option of 0 tCO_2/MWh.

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

The project electricity system (i.e., the Macedonian Power Grid) includes only grid power plants and no off-grid generation (in accordance with Option I from the Tool).

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

According to the procedures set in the "Tool to calculate the emission factor for an electricity system" (version 02.2.1), the calculation of the Operating Margin emission factor ($EF_{grid,OM,y}$) is based on one of the following four methods:

1. Simple OM, or
2. Simple adjusted OM, or
3. Dispatch Data Analysis OM, or
4. Average OM.

For the purposes of this project activity, the Simple OM (1) method is applicable since less than 50% of the total generation in the project electricity system (i.e., Macedonian national grid) comes from low-cost/must run resources in average of the five most recent years (see Table E.6.1.1)

Table E.6.1.1: Rate of low cost/must-run sources based on electricity generation[6]

Year	2006[7]	2007[8]	2008[9]	2009[10]	2010[11]	Average

[6] Source of data are the annual reports from the Energy Regulatory Commission of Macedonia, available at the following website: http://www.erc.org.mk/vertikal.asp?verID=37

[7] Annual Report on the Work of Energy Regulatory Commission of Macedonia for 2006. Published March, 2007. Refer to page 26. Available at: http://www.erc.org.mk/Uploads/30.03.2007%20Izvestaj%20za%20rabotata%20na%20RKE%20vo%202006%20g%20-%20final.pdf (Accessed September, 2011).

[8] Annual Report on the Work of Energy Regulatory Commission of Macedonia for 2007. Published March, 2008. Refer to page 30. Available at : http://www.erc.org.mk/Uploads/31.03.2008%20Izvestaj%20za%20rabotata%20na%20RKE%20vo%202007%20g%20-%20final.pdf (Accessed September, 2011).

Electricity generation at hydro power plants; GWh per year (low-cost/must run)	1707.3	1070.2	835.5	1265.4	2426.4	-
Electricity generation at thermal power plants; GWh per year	4946.1	5064	4998.1	4966.7	4291.6	-
Total electricity generation in Macedonian power grid; GWh per year	6653.4	6134.2	5833.6	6232.1	6718.0	-
Rate of low cost/must-run sources generation, %	25	17	14	20	36	22

For the calculation of the simple OM emission factor, the *ex-ante* option is selected. Since the emission factor has to be determined once at the validation stage, no monitoring and recalculation of the emissions factor during the crediting period is required. The data vintage prescribed by the Tool for the *ex-ante* option is a 3-year generation-weighted average. The most recent data available at the time of submission of the CDM-PDD to the DOE for validation is the 3-year generation-weighted average for 2008, 2009 and 2010.

STEP 4. Calculate the operating margin (OM) emission factor according to the selected method

According to the procedures set in the "Tool to calculate the emission factor for an electricity system" (version 02.2.1), the simple OM emission factor is calculated as weighted average CO_2 emissions per unit of grid electricity generation (tCO_2/MWh) of all generating power plants serving the system, excluding low-cost/must-run power plants units.

From the two Options presented by the Tool to calculate the simple OM, this project utilizes Option A: Calculation based on average efficiency and electricity generation of each plant. Since all of the necessary data for Option A is available (i.e., emission factors and electricity generation of each plant), Option B is ruled out.

According to the calculation set in Option A, the simple OM emission factor is calculated based on average efficiency and electricity generation of each plant:

[9] Annual Report on the Work of Energy Regulatory Commission of Macedonia for 2008. Published March, 2009. Refer to page 30-31. Available at : http://www.erc.org.mk/Uploads/IZVESTAJ%20ZA%20RABOTATA%20NA%20RKE%20VO%202008%20GODINA.pdf (Accessed September, 2011).

[10] Annual Report on the Work of Energy Regulatory Commission of Macedonia for 2009. Published March, 2010. Refer to page 50. Available at : http://www.erc.org.mk/Uploads/IZVESTAJ%20ZA%20RABOTATA%20NA%20RKE%20VO%202009%20GODINA%20-%2031.03.2010.pdf (Accessed September, 2011).

[11] Annual Report on the Work of Energy Regulatory Commission of Macedonia for 2010. Published March, 2011. Refer to page 46. Available at : http://www.erc.org.mk/Uploads/IZVESTAJ%20ZA%20RABOTATA%20NA%20RKE%20VO%202010%20GODINA.pdf (Accessed September, 2011).

$$EF_{grid,OMsimple,y} = \frac{\sum_m EG_{m,y}.EF_{EL,m,y}}{\sum_m EG_{m,y}}$$ (Equation 1 of the Tool)

Where:

$EF_{grid,OMsimple,y}$	= Simple operating margin CO_2 emission factor in year y (tCO_2/MWh)
$EG_{m,y}$	= Net quantity of electricity generated and delivered to the grid by power *unit m* in year *y*(MWh)
$EF_{EL,m,y}$	= CO_2 emission factor of power unit *m* in year *y* (tCO2/MWh)
m	= All power plants/units serving the grid in year *y* except low-cost/must-run power plants/units
y	= The relevant year as per the data vintage chosen in Step 3

For all power plants except Negotino, the $EF_{EL,m,y}$ is determined using Option A1 of the "Tool to Calculate the Emission Factor for an Electricity System".

$$EF_{EL,m,y} = \frac{\sum_i FC_{i,m,y} \times NCV_{i,y} \times EF_{CO2,i,y}}{EG_{m,y}}$$ (Equation 2 of the Tool)

Where:

$EF_{EL,m,y}$	= CO_2 emission factor of power unit *m* in year *y* (tCO_2/MWh)
$FC_{i,m,y}$	= Amount of fossil fuel type *i* consumed by power unit *m* in year *y* (mass or volume unit)
$NCV_{i,y}$	= Net calorific value (energy content) of fossil fuel type *i* in year *y* (GJ / mass or volume unit)
$EF_{CO2,i,y}$	= CO_2 emission factor of fossil fuel type *i* in year *y* (tCO_2/GJ)
$EG_{m,y}$	= Net quantity of electricity generated and delivered to the grid by power unit *m* in year *y* (MWh)
m	= All power units serving the grid in year *y* except low-cost/must-run power units
i	= All fossil fuel types combusted in power plant / unit *m* in year *y*
y	= The relevant year as per the data vintage chosen in Step 3

Since at the time of the PDD development only the net electricity generation and fuel type data for Negotino TPP was available, its emission factor is determined based on the CO2 emission factor of the fuel type used and the efficiency of the power plant (Option A2) according to the formula:

$$EF_{EL,m,y} = \frac{EF_{CO2,m,i,y} \times 3.6}{\eta_{m,y}}$$ (Equation 3 of the Tool)

Where:

$EF_{EL,m,y}$	= CO_2 emission factor of power unit *m* in year y (tCO_2/MWh)
$EF_{CO2,m,i,y}$	= Average CO_2 emission factor of fuel type *i* used in power unit *m* in year *y* (tCO_2/GJ)
$\eta_{m,y}$	= Average net energy conversion efficiency of power unit m in year y (ratio)
m	= All power units serving the grid in year *y* except low-cost/must-run power units
y	= The relevant year as per the data vintage chosen in Step 3

According to Annex 1 of the "Tool to calculate emission factor for an electricity system" (Version 02.2.1) an efficiency of 0.375 is taken for Negotino TPP ($\eta_{Negotino,y}$= *37.5%*).

According to the provisions of the *ex-ante* option for determining OM set in the "Tool to calculate the emission factor for an electricity system" (version 02.2.1), $EG_{m,y}$ is determined once for each crediting period using the most recent three historical years for which data is available at the time of submission of the PoA-DD to the DOE for validation. The 3-year vintage OM was calculated using the data of all operational fossil fuel fired power plants providing electricity to the Macedonian Power Grid for the years 2008, 2009 and 2010.

Therefore,

$EF_{grid,OM}$ = 0.833 tCO_2/MWh

A detailed calculation of the Operating Margin emission factor is presented in Annex 3 at the end of this document.

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

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

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

(Equation 13 of the Tool)

Where:

$EF_{grid,BMsimple,y}$	= 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* (tCO2/MWh)
m	= Power units included in the build margin
y	= Most recent historical year for which power generation data is available.

In terms of vintage of data, Option 1 was chosen for the Project. The details are as follows:

- For the first crediting period, the *ex-ante* calculation of the BM emission factor shall be based on the most recent information available on units already built for sample group *m* at the time of CDM-PDD submission to the DOE for validation. 3-year generation-weighted average for 2008, 2009 and 2010 is the most recent data available at the time of submission of the CDM-PDD to the DOE for validation.
- In the second crediting period, the BM emission factor shall be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. In the third crediting period, the BM emission factor calculated for the second crediting period shall be used. This option does not require monitoring the emission factor throughout the crediting period.

The sample group of power units *m* used to calculate the build margin consists of either:

a) The set of five power units, excluding power units registered as CDM, that started to supply electricity to the grid most recently ($SET_{5\text{-units}}$); or

b) The set of power units, excluding power units registered as CDM, that comprise 20% of the system annual generation (in MWh) and that have been built most recently ($SET_{\geq 20\%}$).

According to the provisions of the Tool the set of power units that comprises the larger annual electricity generation (SET_{sample}) should be selected between $SET_{5\text{-units}}$ and $SET_{\geq 20\%}$. The comparison shows that the group of five power plants that have been built most recently ($SET_{5\text{-units}}$) has the larger annual generation (the sample plants constitute about 65% of the total generation in Macedonia) and therefore this should be taken as the basis for calculating the build margin (SET_{sample}). The requirements of the Tool set out that the power units which started to supply electricity to the grid more than 10 years ago should be excluded from the SET_{sample}. Since the annual electricity generation of the resulting set ($SET_{sample\text{-}CDM\text{->}10yrs}$) constitutes less than 20% of the overall electricity generation of the Macedonian electricity system and there are no new CDM projects that can make up for the missing generation for the calculation, power units from the $SET_{CDM>10years}$ were added until the electricity generation of the new set comprised 20% or more of the annual electricity generation of the project electricity system.

As a conservative approach, for the power units included in the build margin *m* which correspond to the sample group ($SET_{sample\text{-}CDM\text{->}10yrs}$), only option A2 from the guidance in Step 4 (a) for the calculation of the simple OM can be used for calculation of the CO_2 emission factor of each power

unit *m* ($EF_{EL,m,y}$) and the default values provided in Annex 1of the Tool shall be used to determine the parameter $\eta_{m,y}$.

According to Annex 1 of "Tool to calculate emission factor for an electricity system" (Version 02.2.1) efficiency of 0.37 and 0.60 are taken for Bitola TPP and TE-TO Energetika plant correspondingly.

Therefore,

$EF_{grid,\,BM,\,y}$ **= 1.024 tCO_2/MWh**

STEP 6. Calculate the combined margin emission factor

The combined margin emission factor is calculated using the weighted average CM method (Option A) as follows:

$$EF_{grid,\,CM,\,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM}$$ (Equation 14 of the Tool)

Where:

$EF_{grid,BM,y}$	= Emission factor of the build margin. (tCO_2/MWh)
$EF_{grid,OM,y}$	= Emission factor of the operating margin (tCO_2/MWh)
w_{OM}	= Weighting of the operating margin emission factor (50%)
w_{BM}	= Weighting of the build margin emission factor (50%)

Since all project activities included that will be included in this PoA are hydro and not wind and solar power generation project activities the default values for w_{OM} and w_{BM} should be taken as follows:

- w_{OM} = 0.5 and w_{BM} = 0.5 for the first crediting period , and w_{OM} = 0.25 and w_{BM} = 0.75 for the second and third crediting period, unless otherwise specified in the approved methodology which refers to this tool.

The combined margin emission factor $EF_{grid,CM,y}$ for the bundled project activities is then calculated as:

$EF_{grid,CM,y}$ = 0.833 × 0.5 + 1.024 × 0.5 = **0.953 tCO_2/MWh**

Project emissions

All CPAs will comprise of the installation of new renewable energy project activities (i.e., run-of-river hydro plants with no installed reservoirs). Therefore, the GHG emission from the project activity would be taken as zero (PE_y = 0).

Leakage

Since the technology used in this project is neither transferred to nor transferred from another activity (see Section A.4.2.2 and Eligibility Criteria 1.4), the leakage is considered to be zero ($L_y = 0$).

Therefore, the calculation of the emission reductions is as follows:

$ER_y = BE_y – PE_y – L_y = BE_y$

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

Baseline emissions of a CPA

$BE_y = EG_{CPA,y} * EF_{CO2,Grid,y} = EG_{CPA,y} * 0.953$

Where:

BEy = Baseline Emissions in year y (tCO2e)
EG_{CPA},y = Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year y (MWh)
0.953 = CO2 emission factor of the grid in year y (tCO2/MWh). The steps to calculate a grid emission factor are included in an Annex to this document.

Emission reductions of a CPA

The emission reductions will be calculated as follows: $ER_y = BE_y – PE_y – L_y = BE_y – 0 -0 = BE_y$

Where:

ER_y Emission reductions in year y (tCO_2e/y)
BE_y Baseline emissions in year y (tCO_2e/y)
PE_y Project emissions in year y (tCO_2e/y)
L_y Leakage emissions in year y (tCO_2e/y)

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

Data / Parameter:	**$EG_{m,y}$**
Data unit:	MWh
Description:	Net quantity of electricity generated and delivered to the grid by power unit *m* in year *y*
Source of data used:	Annual reports of the Energy Regulatory Commission of the Republic of Macedonia (2008, 2009, 2010)
Value applied:	See Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data is provided by a state official source and can be considered reliable.

Any comment:	The applied parameters are from publicly available sources.

Data / Parameter:	**$NCV_{i,y}$**
Data unit:	kgCO2/GJ
Description:	Net calorific value of fuel oil
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories, volume 2, chapter 1 (table 1.2, page 1.18) [12]
Value applied:	39.800 GJ/t for fuel oil
Justification of the choice of data or description of measurement methods and procedures actually applied :	The IPCC Guidelines are a reliable source for this value. The lower IPCC value of the uncertainty at a 95% confidence interval has been chosen, in accordance with the "Tool to calculate the emission factor for an electricity system" (Version 02.1.1).
Any comment:	

Data / Parameter:	**$NCV_{i,y}$**
Data unit:	GJ/ th m^3
Description:	Net calorific value of natural gas
Source of data used:	PDD of the registered Macedonian CDM project 'Skopje cogeneration project', p.35[13]
Value applied:	36 GJ/th m^3
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	

Data / Parameter:	**$NCV_{m,i,y}$**
Data unit:	GJ/t
Description:	Net calorific value of lignite used in plant *m* during year *y*
Source of data used:	ELEM annual reports (2008, 2009, 2010)
Value applied:	За Битола и Осломеј:

	2008	2009	2010
NCV на лигнит в Битола	8.079	7.290	7.448
NCVна лигнит в Oslomey	7.600	6.670	6.661

Justification of the choice of data or description of measurement methods and procedures actually applied :	For Bitola and Oslomey, data from ELEM annual reports was used and can be considered reliable as ELEM produces lignite for their own power plants. These values are more conservative than default value of 2006 IPCC Guidelines for National Greenhouse Gas Inventories ($NCV_{lignite}$ = 11.900 GJ/t)
Any comment:	

[12] Available at: http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol2.html (accessed October 18, 2011)
[13] Available at: http://cdm.unfccc.int/Projects/DB/SGS-UKL1237296816.11/view (accessed October 18, 2011)

Data / Parameter:	**$EF_{CO2,i,y}$**
Data unit:	$kgCO_2/GJ$
Description:	Average emission factor for fossil fuel *i* in year *y*
Source of data used:	Preparation of the GHG Inventory for the Second National Communication under UNFCCC, 2010. Final Version of the National Inventory Summary Report, p. 8, Table 1.2
Value applied:	109.237 $kgCO_2/GJ$ for lignite; 76.593 $kgCO_2/GJ$ for fuel oil
Justification of the choice of data or description of measurement methods and procedures actually applied :	These are state-specific values.
Any comment:	

Data / Parameter:	**$EF_{CO2,i,y}$**
Data unit:	$kgCO_2/GJ$
Description:	Average emission factor for fossil fuel *i* in year *y*
Source of data used:	2006 IPCC Guidelines for National GHG Inventories default values, Volume2, Table 2.2
Value applied:	54.300 $kgCO_2/GJ$ for natural gas
Justification of the choice of data or description of measurement methods and procedures actually applied :	The IPCC Guidelines are a reliable source for this value. The lower IPCC value of the uncertainty at a 95% confidence interval has been chosen, in accordance with the "Tool to calculate the emission factor for an electricity system" (Version 02.1.1).
Any comment:	

Data / Parameter:	**$\eta_{m,,y}$**
Data unit:	%
Description:	Coefficient of energy efficiency of power unit *m* in year *y*
Source of data used:	"Tool to calculate the emission factor for an electricity system" ver. 2.2.1, Annex 1, p.28
Value applied:	Default value of *37.5%* for Negotino TT, 37% fir Bitola, 60% for TE-TO
Justification of the choice of data or description of measurement methods and procedures actually applied :	The most appropriate default values are the one from Annex 1 of the "Tool to calculate the emission factor for an electricity system" (latest ver. is 2.2.1).
Any comment:	

Data / Parameter:	**$FC_{i,m,y}$**
Data unit:	for fuel oil and lignite); th. m^3 (for natural gas).
Description:	Fuel consumption for each power plant
Source of data used:	Annual report of the Energy Regulatory Commission of the Republic of Macedonia (2010), Elem Annual report (2008, 2009, 2010).

Value applied:	See Annex 3 of PoA-DD
Justification of the choice of data or description of measurement methods and procedures actually applied :	Statistics provided by the Energy Regulatory Commission of Macedonia.
Any comment:	

Data / Parameter:	**$EF_{grid,OM,,simple, y}$**
Data unit:	tCO_2/MWh
Description:	Operating Margin
Source of data used:	Own calculation based on official data published on the website of the Energy Regulatory Commission of Macedonia
Value applied:	0.833
Justification of the choice of data or description of measurement methods and procedures actually applied :	The Operating Margin (OM) parametric value is calculated according to the "Tool to calculate the emission factor for an electricity system" (latest ver. is 2.2.1). The electricity generation data for 2008-2010, included in annex 3, was used.
Any comment:	

Data / Parameter:	**$EF_{grid,BM,y}$**
Data unit:	tCO_2/MWh
Description:	Build Margin
Source of data used:	Own calculation based on official data published on the website of the Energy Regulatory Commission of Macedonia
Value applied:	1.024
Justification of the choice of data or description of measurement methods and procedures actually applied :	The Build Margin (BM) parametric value is calculated according to the "Tool to calculate the emission factor for an electricity system" (latest ver. is 2.2.1). The electricity generation data for 2008-2010, included in annex 3, was used.
Any comment:	

Data / Parameter:	**$EF_{grid,CM, y}$**
Data unit:	tCO_2/MWh
Description:	Combined Margin, expressing the emissions factor for the electricity displaced in the grid
Source of data used:	Own calculation based on official data published on the website of the Energy Regulatory Commission of Macedonia
Value applied:	0.953
Justification of the choice of data or description of measurement methods and procedures actually	The Combined Margin (CM) parametric value is calculated according to the "Tool to calculate the emission factor for an electricity system" (latest ver. is 2.2.1): calculating the OM and BM values using the electricity generation data for 2008-2010, included in Annex 3.

applied :	
Any comment:	

Data / Parameter:	**Electricity imports**
Data unit:	GWh
Description:	Electricity transfers from connected electricity systems
Source of data used:	The Energy Regulatory Commission of the Republic of Macedonia
Value applied:	Year/value: 2008, 2009, 2010 Import: 2758, 1716, 1602
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data is taken from an official source and can be considered reliable.

Data / Parameter:	**Py**
Data unit:	MW
Description:	Installed power capacity
Source of data used:	Plant design documents
Value applied:	-
Justification of the choice of data or description of measurement methods and procedures actually applied :	The value reflects the capacity to be installed at the power plant according to the plant design parameters.
Any comment:	The final installed capacity might differ from the value applied in the CPA-DD, as the technology provider might not have been chosen at the time of preparation of the CPA-DD.

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

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

Data / Parameter:	**EGy**
Data unit:	MWh
Description:	Electricity generated and delivered by the CPA to the Macedonian grid
Source of data to be used:	Directly measured by power meters
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be specified by each individual CPA.
Description of measurement methods and procedures to be applied:	The delivered electricity will be measured by power meters that would comply with local industry standards. The electricity will be measured continuously. EVN delivers the meters and the measuring transformers to the project site (already calibrated). EVN Macedonia is also responsible for calibration of the

	meters. A replacement power meter should be used during the calibration period. Invoices from the Distribution Company (e.g. EVN Macedonia) of electricity sale and purchase to the grid will be used. EVN Macedonia is the owner of power meters. In case both the CPA owner and the grid operator install power meters, the first will be used for cross checking. If values differ the value from the meter with the higher precision shall be used. The circuit for internal electricity supply of the plant will be connected between the transformer at the plant and the point of connection to the grid. Therefore, the electricity used internally in the plant will not be accounted for by the power meter. In case that the circuit for internal electricity supply connects behind the point of connection to the grid, and therefore behind the electricity meter, a separate meter for internal consumption will be installed. In this particular case the electricity consumed internally would have to be deducted from the electricity delivered to the grid.
QA/QC procedures to be applied:	QA: The equipment would be subject to calibration in compliance with the manufacture's specifications and /or grid operator. QC: There will be strict compliance with the maintenance schedule recommended by the technology provider and/or grid operator.
Any comment:	-

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

Each individual CPA will prepare a monitoring plan and it will be described in the CPA-DD. The plan will outline the procedures for monitoring and recording of all relevant parameters listed in section E.7.1The CME will qualify and assist with the implementation of the monitoring plan.
Net electricity generation supplied to the grid shall be recorded at least monthly. Metering data will be cross referenced with invoice data for electricity generation The CPA implementing entities will submit all relevant data to the CME that is required both for the periodic verification of emission reductions and upon request.

All data will be stored by the CME electronically for at least 2 years after the end of the crediting period for each CPA.

The CPA implementing entities will be responsible for arranging the maintenance and calibration of all metering devices to the industry standards in the host country, but not more rarely than in 3 year intervals

Quality Assurance and Quality Control measures will also be outlined at the CPA level to illustrate the coordinating efforts of the implementing entities in providing reliable and transparent monitoring data:to control and manage data reading, recording, auditing and archiving and to ensure the quality of all relevant project documents.

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)

Date of completion: 13/11/2012
Camco Carbon International Limited
Email: Project.participant.cee@camcoglobal.com

Annex 1

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

Organization:	Camco Carbon International Limited
Street/P.O.Box:	Green Street
Building:	Channel House
City:	St Helier
State/Region:	Jersey
Postfix/ZIP:	JE2 4UH
Country:	Channel Islands
Telephone:	+44 207 121 6100
FAX:	+44 207 121 6101
E-Mail:	
URL:	www.camcoglobal.com
Represented by:	
Title:	Managing Director
Salutation:	Mr
Last Name:	Houston
Middle Name:	
First Name:	Arthur
Department:	
Mobile:	
Direct FAX:	+44 2071216101
Direct tel:	+44 207 121 6100
Personal E-Mail:	Project.participant.cee@camcoglobal.com
Secondary Representative:	
Title:	Senior Associate – Operations
Salutation:	Mr
Last Name:	Ludlow
Middle Name:	
First Name:	Graeme
Department:	
Mobile:	
Direct FAX:	+44 2071216101
Direct tel:	+44 2071216100
Personal E-Mail:	Project.participant.cee@camcoglobal.com

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No official funds from any Annex 1 country are involved in this PoA.

Annex 3

Power plants connected to Macedonian power grid

№	Power Plants	Comissioning year	Low cost/ must run (Y/N)	Installed capacity, MW	Type	Main fuel	Power generation, GWh		
							2008	2009	2010
1	Bitola	1982-1988	N	675	thermal power plant	Lignite (coal)	4,215.90	4,197.13	3,699.90
2	Osomey	1980	N	125	thermal power plant	Lignite (coal)	661.42	591.42	577.54
3	Negotino	1978	N	210	thermal power plant	Fuel oil	120.84	178.16	0.00
4	TE-TO - Energetika	2010	N	30	thermal power plant	Natural gas	0.00	0.00	14.20
	ThPP - total:			**1040**			**4,998.16**	**4,966.71**	**4,291.64**
5	Mavrovo	1957-1959	Y	206.4	hydro		313.22	343.22	799.97
6	Shpilje	1969	Y	84	hydro		182.03	287.13	516.65
7	Globochica	1965	Y	42	hydro		120.24	182.12	290.96
8	Tikves	1968	Y	116	hydro		55.13	157.14	326.34
9	Kozjak	2004	Y	80	hydro		67.40	128.02	250.90
10	Small HPPs		Y	36	hydro		97.46	167.74	241.58
	HPP - total:			**564.4**			**835.48**	**1,265.37**	**2,426.40**
	Import						2,758.92	1,716.73	1,602.31
	Macedonia total:			**1604.4**			**8,592.55**	**7,948.81**	**8,320.35**

Calculation of operating margin (OM)

Simple OM emission factor, tCO2/MWh	**0.883**

Calculation of built margin (BM)

	$SET_{5\text{-unit}}$				
№	Power Plants	Comissioning year	Power generation, GWh	% from Macedonia total generation	Cumulative total,%
1	TE-TO - Energetika	2010	14.20	0.2%	
2	Kozjak	2004	250.90	3.7%	3.9%
3	Bitola	1982-1988	3,699.90	55.1%	59.0%
4	Osomey	1980	577.54	8.6%	67.6%
5	Negotino	1978	0.00	0.0%	67.6%
	Total		**4,542.54**		

	$SET_{\geq 20\%}$					
№	Power Plants	Comissioning year	Installed capacity, MW	Power generation 2010, GWh	% from Macedonia total generation	Cumulative total,%
1	TE-TO - Energetika	2010	30	14.20	0.2%	
2	Kozjak	2004	80	250.90	3.7%	3.9%
3	Bitola	1982-1988	675	3,699.90	55.1%	59.0%
	Total			**3,965.00**		
	Macedonia total			6,718.04		

№	Power Plants	2008			2009			2010		
		Power production, GWh	Emission factor, tCO_2/MWh	Emissions, th. tCO_2	Power production, GWh	Emission factor , tCO_2/MWh	Emissions, th. tCO_2	Power production, GWh	Emission factor, tCO_2/MWh	Emissions, th. tCO_2
1	TE-TO - Energetika	0.00	0	0	0.00	0	0	14.20	0.326	5
2	Kozjak	67.40	0	0	128.02	0	0	250.90	0	0
3	Bitola	4,215.90	1.063	4,481	4,197.13	1.063	4,461	3,699.90	1.063	3,932
	BM - total:	**4,283.30**	**1.046**	**4,481**	**4,325.15**	**1.031**	**4,461**	**3,965.00**	**0.993**	**3,937**

Emission factors comparison	Calculated through option A2 Step 4(a)	Calculated through option A1 Step 4 (a)	Ratio
TE-TO - Energetika	0.326	0.446	1.37
Bitola	1.085	1.322	1.22

BM emission factor, tCO2/MWh	**1.024**

Combined margin calculation

Indicator	First crediting period
Weighting of OM EF	0.5
Weighting of BM EF	0.5
CM emission factor, tCO2/MWh	**0.953**

Baseline emission factor

	First crediting period
Baseline emission factor tCO2/MWh	**0.953**

Annex 4

MONITORING INFORMATION

No additional information.