



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

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**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):**

**Small Hydropower Programme in Colombia**

Version number of the document: 01

Date: 10/01/2012

History of the document:

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

The “Small Hydropower Programme in Colombia” aims to incentive the implementation of small scale hydropower plants in the Republic of Colombia. The Managing Entity will contribute to incentive the implementation of small hydropower plants in the Republic of Colombia, thus contributing to increase the share of renewable energy in the electricity mix of Colombia and to decentralize the management of primary energy sources.

Small promoters are the target group of the Programme. These promoters, who in general conditions have actual difficulties to implement such small projects, will take advantage of the Programme by facing together the barriers to the implementation of this type of projects.

Under the proposed Programme of Activities, promoters will be coordinated by the Coordinating/Managing Entity (CME) formed by Pacific Power Generation Corp.

Apart from the above contributions, the Programme of Activities will result on social benefits through the voluntary direct investment of a part of the incomes from the electricity sales given that the Managing Entity is committed to directly investment a part of the benefits derived from the sale of the CER. The final destination of the mentioned investment will be decided by the Managing Entity after considering the demands and the specific necessities from stakeholders and local communities, on the most convenient way of investing this part of benefits, in social and environmental development of the specific communities<sup>1</sup>.

The CME will also take an active role within the development of the Programme and the inclusion of new CDM Project Activities under the PoA. In this sense, the CME will make the most of the know-how and the experience not only from the technical point of view but also from the financial perspective.

By managing the development of the PoA, the CME will make up a joining effect of small projects, either with direct participation in the financial structure or only through the CDM coordination.

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<sup>1</sup> Some priority sectors have been already identified and will be considered by the Managing Entity, such as anti-erosion measures (tree planting in the same river bank), education and childhood development (construction of schoolhouses or library building, for example), industrial promotion (construction of local ecotourism tourist centres), etc. However, the local stakeholders’ demands will always be considered.



The possibility of participation of the Managing Entity in the financial aspects of the CPAs does not mean that projects under the Programme shall apply for financial aid to the CME. **Any project activity in line with the eligibility conditions could be included in the proposed Programme of Activities.**

The existence of the Programme and the role Managing Entity in the Programme will be deciding factors for promoters to get involved in small hydropower projects. The aggregating effect of the Programme will enable the Managing Entity creating a *critical mass* of projects to which legal, technical and financial advice will be provided and hence, the main barriers faced by small promoters will be overcome.

This critical mass of projects will also enable the CDM application; small hydro projects will be aggregated under the Programme and will receive the support from the Managing Entity, enabling the application for CDM and the obtaining of the post-financing aid by making the generated carbon credits bankable. The economical effort and the time gap required for individual CDM registration is hard enough to prevent the project promotion. By aggregating the projects under the Programme of Activities, the CDM development costs and institutional fees will be jointly faced and economies of scale will appear, hence making these potential carbon credits bankable under the Programme structure.

Also, the Programme will contribute to facilitate the access to funds for small promoters of hydropower plants by structuring the project under the Programme in different alternative structures. The experience of the Managing Entity from the financial and technical perspective will clearly be a deciding factor for small promoters to face the related risks of these projects.

The Managing Entity will contribute through the implementation and management of the Programme of Activities, to create the required conditions for small promoters to join together to supply electricity to shareholders with medium/large energy requirements and to negotiate the Power Purchase Agreements in favourable conditions. Small promoters are usually limited in the energy sale and the negotiation of PPAs due to the low energy exchange. But small project activities under the Programme of Activities may take advantage of the added value of the Managing Entity and join together to negotiate the electricity exchange with shareholders consumers.

#### **Policy/measure or stated goal of the PoA**

In this situation, the proposed Programme of Activities aims to constitute a determinant incentive for private project promoters to implement small hydropower projects in Colombia by becoming a springboard for small promoters to overcome the financial and structural barriers faced on the implementation of small hydropower plants. In doing this, the CME expects to contribute through the Programme of Activities to the implementation of small hydropower projects in Colombia accounting for 150MW in five years.

The expected schedule of implementation includes a portfolio of 150 MW with 20 projects to be implemented during a five-year period.

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

There is no regulation in Colombia mandating the implementation of small hydropower based projects for electricity generation. Moreover, there are no promotion tools for this technology and no regulation or mandate to develop small hydropower projects in the country.

Apart from this, the energy strategy of Colombia does not consider this technology as a priority, as derived from the Sectoral Plans and the Prospective for the Electricity Sector 201-2025 which do not



constrain the implementation of carbon intensive project activities and do not regulate the implementation of renewable energy projects, not even hydropower projects.

Thus, it is clear that this proposed SSC-PoA is a voluntary action by the CME, which is not obliged to develop this Programme under any regulation or mandate.

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

| Name of Party involved (*)<br>(host) indicates a host Party) | Private and/or public<br>entity(ies) project participants<br>(*) (as applicable) | Kindly indicate if the Party<br>involved wishes to be<br>considered as project<br>participant (Yes/No) |
|--|--|--|
| Republic of Colombia   | Managing Entity: Pacific Power<br>Generation Corp.                               | No   |

**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 Colombia

**A.4.1.2. Physical/ Geographical boundary:**

The Programme of Activities will be extended all over the Republic of Colombia.

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

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

The Programme will accept the inclusion of small hydro power plants in Colombia, under category I, “Renewable energy projects”, with installed capacity under or equal to 15MW and in compliance with the following criteria, eligible under the applicable small scale methodology AMS.I.D “Grid connected renewable electricity generation” version 17:

- a) Small hydropower plants in the Republic of Colombia:
  - i) Supplying electricity to the grid; or
  - ii) Supplying electricity to an identified consumer facility via national/regional grid through contractual arrangement;



- b) Run of river small hydro power plants: in this configuration, there will not be any reservoir or dam for water storage. The river flow will be diverted from the natural water course, maintaining the minimum ecological water flow to the natural river bed. After the generators and turbines, the water flow will be charged back in the river bed.
- c) Small hydropower plants in existing dams: small plants using existing dams will be considered eligible under the proposed Programme of Activities, under the following conditions:
- i) That the project plant will be implemented in an existing reservoir with no change in the volume of the reservoir;
  - ii) That the project plant will be implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the Project Emissions section, is greater than  $4 \text{ W/m}^2$ ;
- d) Small hydro power plants implemented in new dams: small hydro power plants under the proposed Programme of Activities may result in the implementation of new dams. In order to be eligible and in compliance with the applicable methodology, the power density of the power plant is greater than  $4 \text{ W/m}^2$ ;
- e) Small hydro power plants using the water slope in drinking water pipelines: the turbine will be installed in the existing pipeline or aqueduct used for drinking water conduction. The installation of the turbine in the existing pipe will generate renewable electricity and will also contribute to reduce the downstream pipe thickness and section by lowering the specific water load and stress;
- f) Retrofitted small hydropower plants: repairs, modifications and retrofitting of existing small scale hydropower plants will be eligible under the proposed Programme of Activities. The retrofitting shall result in an increase of plant efficiency, on a better performance or a higher power generation capacity. Retrofits shall only include measures that involve capital investments and not regular maintenance or housekeeping measures. As per paragraph 8 of the applicable methodology, the total output of the retrofitted or replacement unit shall not exceed the limit of 15 MW. In order to be eligible, at least three years of historical power generation will be provided.

Power will be generated by means of one or more hydropower turbines and one or more power generators. No equipment will be transferred from other facilities.

In any of the above considered configurations, the project design will be in accordance with the national regulation.

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

Any individual project shall comply with the following eligibility criteria in order to be included in the proposed Programme of Activities. **Any project activity in line with the eligibility conditions listed below could be included in the proposed Programme of Activities:**

- a) Comply with any of the following criteria:
- a. Be a **run-of-river type** hydropower plant: in accordance with the characterization and requirements of the World Commission on Dams;



- b. Be a **new small hydropower plant** built in an existing dam or reservoir, with no change in the volume of the reservoir;
- c. Be a **new small hydropower plant** built in an **existing dam or reservoir** The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the Project Emissions section, is greater than  $4 \text{ W/m}^2$ ;
- d. Be a **new small hydropower plant** built in a **new reservoir or dam** with a power density greater than  $4 \text{ W/m}^2$ ;
- e. Be a new small hydropower plant using the water head of the existing slope of a drinking water pipeline or aqueduct: the existing slope of a drinking water pipeline could be used as the water head for hydropower generation;
- f. Be a retrofitted small hydropower plant resulting in an increase of the plant efficiency, on a better performance or a higher power generation capacity. In any case, the total output of the retrofitted plant shall not exceed the limit of 15 MW;

All CPAs to be included under the Programme of Activities should also comply will all the following eligibility criteria:

- b) Be a small hydropower plants in the Republic of Colombia which starting date is later than the starting date of the Programme of Activities.
- c) Be eligible under version 17 of AMS.I.D. This will be verified by the Managing Entity for each CPA before inclusion under the Programme;
- d) Before final inclusion under the Programme, the project will have all the relevant permits and licensed required by the Colombian regulation for implementation;
- e) Be regulated under a Standard Agreement with the Managing Entity for inclusion under the Programme of Activities, where the Project Owners will recognise to be aware and agree to subscribe to the PoA managed by the Managing Entity;
- f) Be additional: any individual project activity under the proposed Programme will be financially additional, based on an investment analysis demonstrated as per indicated in section E.5.1;
- g) Only **new equipment** will be used in the small hydropower plants. No equipment will be transferred from other existing facilities;
- h) The total installed capacity in the case of **new hydropower plants** will be under or equal to 15MW;
- i) In the case of **retrofitted hydropower plants**, the total output of the retrofitted unit shall not exceed 15MW; A specific agreement will be entered between both parties, supplier and consumer, specifying that only the facility generating the electricity can claim ER from the electricity displaced;
- j) All individual project activities applying for inclusion under the proposed Programme of Activities will be in line with all the existing regulation applicable to small hydropower projects in Colombia at the moment of inclusion.



### Calculation of the power density and compliance with the eligibility criteria

Prior to inclusion of any CPA, in those cases resulting in new reservoirs or the increase of existing reservoirs, the Managing Entity will calculate the resulting power density according to the provisions in ACM0002 version 12.1. In cases in which power density is lower than  $4W/m^2$ , the proposed project will not be in compliance with the eligibility criteria of the PoA and, thus, will not be included.

In cases resulting in **new reservoirs or increase of existing reservoirs**, the information and evidences for the demonstration of the power density over  $4W/m^2$  will be made available for inspection by the DOE and information will be included in the CPA-DD.

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| <p><b>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):</b></p> |
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According to Annex 2 of EB 63, “*Standard for demonstration of additionality of GHG emission reductions achieved by a Programme of Activities*” v. 01.1, additionality shall be demonstrated by establishing that in the absence of the CDM, none of the implemented CDM project activity (CPA) would occur.

As per paragraph 73 of EB 47<sup>th</sup> Meeting Report, *in the context of programmes of activities, additionality is to be demonstrated either at the PoA level or at CPA level*. Hence, each individual Project Activity will demonstrate the additionality on a case-by-case basis based on the investment analysis. Individual CDM project activities (CPA) will demonstrate financial additionality based on the investment analysis, in line with the latest version of the tool for the assessment of the investment analysis.

Apart from the individual additionality of each CPA, the Programme of Activities will clearly contribute to promote the implementation of small hydropower projects in Colombia.

The explanation of the operation of the Colombian electricity sector and the prospective of the evolution of this market is the background of this Programme of Activities. In the absence of the PoA, the proposed voluntary coordinated action would not occur and the individual project activities would not be implemented.

The Managing Entity, through the voluntary coordination and development of this Programme of Activities, will provide the frame for small promoters to joint together and sell the electricity to large consumers and/or under self-consumption schemes. Small promoters, under the Programme, will be able to join other promoters and reach the critical size required for accessing large consuming facilities supply.

Apart from this, the Managing Entity will establish the framework for the generation of carbon credits creating a critical amount of CERs which could be bankable. Otherwise, small promoters will not be able to face the administrative costs related with the Clean Development Mechanism in a project-by-project structure and, moreover, will handle a low amount of CERs, thus with a low banking potential.

The proposed PoA will constitute an **additional incentive for small promoters** for whom the absence of any national policy promoting the small hydropower constitutes a **difficult barrier to be overcome**.



The possibility of inclusion under the Programme of Activities and the potential obtaining of Certified Emission Reductions are the required incentive for small promoters, who shall face, with better expectations, the bureaucratic and time consuming process of licences and permits approval. Otherwise, this process will constitute a strong barrier for small promoters.

The proposed PoA will also create the framework in which a power generation technology which is not a prevailing practice in Colombia, could become reinforced and promoted.

In order **not to exclude any potential project promoter**, the Managing Entity considers three possible structures of CPA which could take part in the Programme:

- (i) Small projects in which the Managing Entity is an investor;
- (ii) Small projects in which the Managing Entity provides project finance;
- (iii) Small projects in which no investment nor project finance is provided by the Managing Entity.

With this configuration, any small promoter in compliance with the eligibility criteria set in this PoA-DD, may take advantage of the proposed Programme of Activities.

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

**A.4.4.1. Operational and management plan:**

**Record keeping system for individual CPAs included in the Programme of Activities**

Each and every CPA will be univocally identified and the identification data will be maintained by the Managing Entity in electronic and paper mode in a “CPA Record” document. The following essential information of each individual CPA will be gathered by the Managing Entity:

- 1) Title/name of the individual CPA according to the CPA-DD;
- 2) Name of the CPA Implementer(s);
- 3) Type of hydropower plant;
- 4) Installed capacity of the hydropower plant;
- 5) Location and GPS coordinates;
- 6) Contact details of the CPA implementer or responsible person(s);
- 7) Date of inclusion in the Programme of Activities;

This information will be available for revision and internal coordination at the Managing Entity’s office.





**Procedure to avoid double accounting (inclusion of new individual CPAs)**

The inclusion of individual CPAs under the Programme of Activities will be subjected to the subscription of an inclusion agreement between the Managing Entity and the CPA Implementer, in which the following provisions will be included:

- a) Eligibility criteria and terms and conditions of participation in the Programme;
- b) That the proposed Project Activity is not registered or under validation under the Clean Development Mechanism as an individual project;
- c) That the proposed Project Activity is not included or in process of inclusion as an individual CPA in another Programme of Activities;
- d) That the Project Promoter is aware and voluntarily subscribing the inclusion of the Project Activity under the specific Programme of Activities;



### **Demonstration that the SSC CPA is not a de-bundled component of another CDM Programme of Activities or CDM Project Activity**

As per paragraph 8 of EB54, Annex 13<sup>2</sup>, “a proposed small-scale CPA of a PoA shall be deemed to be a de-bundled component of a large scale activity if there is already an activity, which satisfies both conditions (a) and (b) below:

- (a) Has the same activity implementer as the proposed small scale CPA or has a coordinating or managing entity, which also manages a large scale PoA of the same technology/measure, and;
- (b) The boundary is within 1 km of the boundary of the proposed small-scale CPA, at the closest point”.

No individual CPA included under the proposed Programme of Activities will be a debundled component of a large scale activity. In order to determine whether the CPA is a debundled component of another CDM project activity, a table will be included in each CPA-DD to be included under the PoA where the situation of other small hydropower activities within the region will be indicated.

Also, with the aim of ensuring the avoidance of double accounting, each project promoter will confirm that the individual CPA is not and will not be registered as an individual CDM project and that will not be included under any other Programme of Activities as an individual CPA.

This information shall be used to demonstrate that the individual CPAs are not de-bundled components of other CDM Project activity. The DOE may check in the inclusion process of new individual CPAs, whether these could be considered as a de-bundled component of a large scale activity.

#### **A.4.4.2. Monitoring plan:**

##### **Monitoring General Procedure**

Each CPA will include a specific monitoring plan and no sampling will be conducted for calculating the emission reductions attributable to each project plant.

##### **Roles and Responsibilities**

Each CPA Promoter will be responsible of taking the relevant data and information required for calculation of emission reductions.

Based on the terms and conditions of the inclusion agreement, the roles and responsibilities of further monitoring requirements will be determined. The usual and recommended information flow is detailed below.

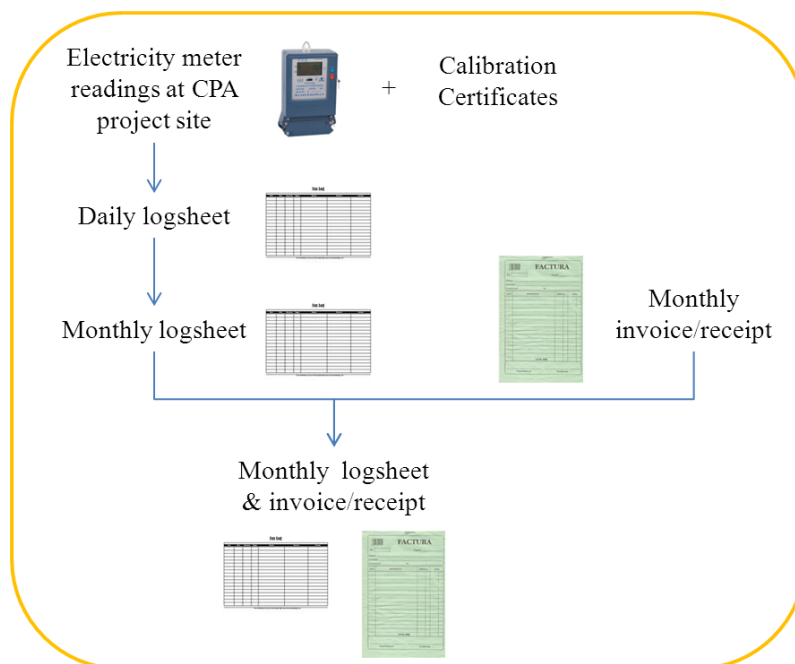
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<sup>2</sup> “Guidance for determining the occurrence of de-bundling under a Programme of Activities (PoA)” Paragraph 8.  
[http://cdm.unfccc.int/Reference/Guidclarif/ssc/methSSC\\_guid17.pdf](http://cdm.unfccc.int/Reference/Guidclarif/ssc/methSSC_guid17.pdf)



At CPA level, the Project Owner (PO<sub>i</sub>) will be responsible of daily readings record in daily logsheets, monthly logsheets records and invoice/sales receipts collection.

Each PO will monthly submit this information (daily reading records, monthly logsheets and sales receipts) to the focal point of the Managing Entity. When required, the PO will also submit the calibration certificates of the electricity meters.



**Monitoring procedures at CPA level**

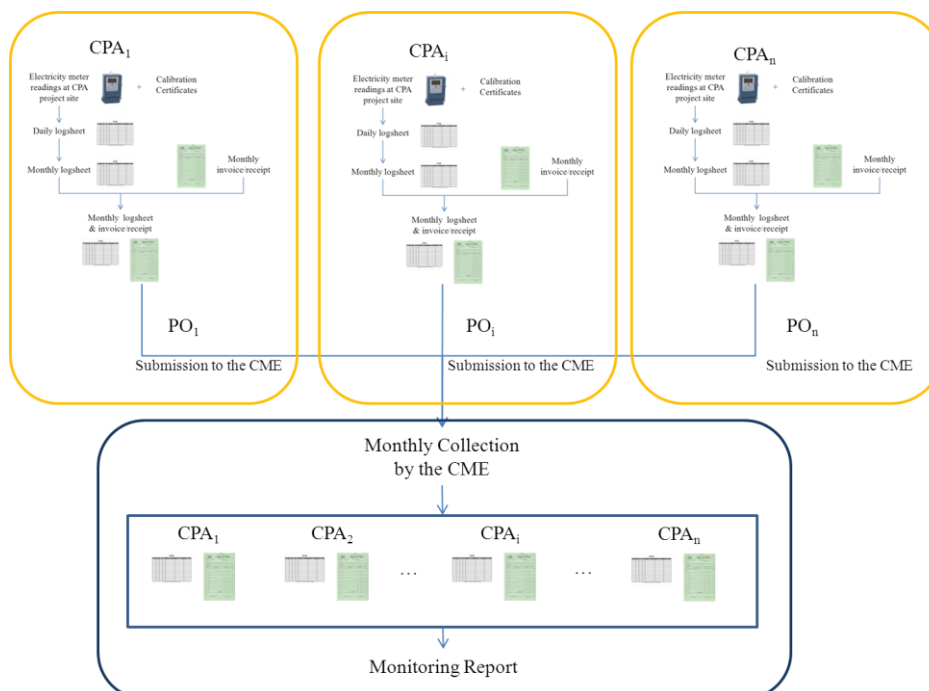
The Managing Entity will collect the information submitted by each PO and will check the completeness of data and store and archive the information. Also, original primary data will be gathered by the CPA Promoter in the specific project site and will be available for inspection by the Managing Entity and for revision during verification.

The Managing Entity will provide each CPA Promoter with the procedures for the proper data collection, processing and archiving and with the calibration procedures in accordance with the best existing practices and the latest approved guidelines and procedures by UNFCCC. These Monitoring Procedures should be in accordance with the applicable version of the methodology AMS.I.D v.17. The Managing Entity, according to the terms and conditions of the inclusion agreement, will gather the information received from each CPA during the PoA crediting period plus two years. This information will be available at the specific project sites and at the Managing Entity's office and primary data will also be available at the Project Sites.

At the end of each monitoring period, the Managing Entity will inform the Project Owners of the CPAs to be included in the Monitoring Report about this situation and will prepare the Monitoring Report. The Managing Entity will also give the required support to the CPA promoters during verification.



The information flow is schematically indicated in the figure below:



The Managing Entity will monthly process all the information submitted by the Project Owners of each CPA in an excel sheet with different worksheets for each project activity.

Excel spreadsheets will correspond to one year of monitoring and will include the CPAs under operation in the relevant period included in the PoA.

### Monitoring Equipment

The metering equipment and its location within the hydropower plant will be detailed in each individual CPA. As a general approach, electricity supplied by the project to the grid or to the final consumer via regional/national grid, will be measured by means of calibrated electricity meters at the substation. These meters will have a minimum accuracy of 5%.

All metering devices will be calibrated in accordance with the applicable national standard and regulation and recalibrated at appropriate intervals according to manufacturer specifications, but at least once in three years, in accordance with the provisions in the methodology and the *General guidelines to SSC CDM methodologies*. The CPA Promoter only will be responsible of the proper operation and maintenance and of the proper and timely calibration of the metering equipment. The evidences of calibration will be periodically provided to the Managing Entity, as indicated in the schemes above.

### Quality Assurance & Quality Check for Monitoring

The Managing Entity will provide each CPA Promoter with the QA/QC procedures for monitoring and calibration, including the data collection and reporting procedures under the Programme of Activities.



The CPA Promoter only will be responsible of the proper implementation of the QA/QC Procedures, which will be periodically checked by the Managing Entity.

### **Verification and Monitoring Results**

The verification of emission reductions may take place either for individual CPAs or for several CPAs at the same time. However, no sampling will be conducted and the emission reductions will be individually verified for each CPA.

The verification status of each CPA will be indicated and updated in a “CPA Verification Record” which will be kept by the Managing Entity for all CPAs.

Monitoring results will be provided to the DOE for verification only by the Managing Entity representatives. This information will also be available in the project site for site inspection and should be consistent with the data provided by the Managing Entity.

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| <b>A.4.5. Public funding of the <u>programme of activities (PoA)</u>:</b> |
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No public funding is involved in this Programme of Activities. No diversion of ODA is involved in the development of this Programme of Activities.



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

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

As per CDM Glossary of terms, the starting date of a CDM Programme Activity is the date at which either the implementation or construction or real action of a Programme Activity begins.

Starting date of the Programme of Activities is the date of publication for Global Stakeholders' Comments at the UNFCCC website.

**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:**

Not applicable.



**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);**

Every CPA will have the relevant permits and licences ensuring the compliance with the relevant applicable regulation.

The proposed Programme of Activities is focused on the development of small hydro power plants; this means, with capacity lower than 15 MW based on a run-of-river design or being built on existing dams. The major impact of hydropower projects is the construction of new dams due to flooding of the nearby zone and the negative effect on the existing ecosystems. In the cases in which new dams are built, the relevant **Environmental Impact Assessment** will be required to be approved by the Government in order to include the individual CPA under the Programme.

Considering that the hydropower plants to be included under the proposed Programme of Activities will have an installed capacity under or equal to 15 MW, each project under the Programme will be in accordance with the rules and guidelines of the **World Commission on Dams**.





**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

In order to consider the specificities of each community and location, the proposed Programme of Activities intends to prepare and held the local stakeholders' meeting at CPA level.

By considering the local stakeholders' comments for each specific CPA, the Programme of Activities ensures that the impact of the specific hydropower plants in the neighbour communities will be considered.

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

Prior to the organization and preparation of the local stakeholders' meeting, it is essential to identify the relevant stakeholders.

As a general approach, the Local Authorities representatives, as the Environment and Natural Resources Secretariat (Secretaría del Medio Ambiente y los Recursos Naturales) which is also the Colombian Designated National Authority, local and national NGOs, representatives of the neighbour communities and individuals affected by the construction and operation of the small hydro power plants are possible stakeholders and may be invited to participate in the meeting.

**Invitation method**

The invitation method will be mainly by personal email or post mails which will be sent to authorities and NGOs. Apart from this, the celebration of the meeting will be announced in local and national newspapers and, if possible, in the internet.

**Meeting organization and consideration of comments**

Each local stakeholders' meeting will be set on a specific date. It is envisaged that the meeting would be celebrated prior to the starting date of the construction of the project but this will depend on each specific case.

If several CPAs are to be developed in the same region and in a near period of time, the Managing Entity could decide to celebrate only a local stakeholders' meeting, hence grouping the specific CPAs in one meeting.

The presentation of the specific CPA and the explanation to stakeholders shall include the following:

1. Presentation of the Managing Entity and the project promoters;
2. Brief explanation of the Programme of Activities: stated goal and contribution to sustainable development in Colombia of the Programme and the specific CPA.





3. Explanation of the project(s) to be included in the CPA(s) which will be discussed in the meeting: details of the proposed project(s) and contribution to sustainable development and environmental protection the low environmental impact due to the type of plant; contribution to social protection and development; potential employment creation, social responsibility commitment and proposed technical training for operators; economic development of the region and the communities due to the construction of the plant(s) and improvement of electricity transmission infrastructures and communication routes.
4. Additional contributions, if any: plantation of trees, economic help for schools, NGOs, community kitchens, etc.
5. After the explanation, a discussion and a space for questions, doubts and queries will be opened. Once the questions are solved and explained, a questionnaire will be distributed to the attendants.
6. All the comments will be registered and considered and the questionnaires will be gathered by the Managing Entity and will be made available for revision during inclusion of the CPA.

**D.3. Summary of the comments received:**

The comments received in each local stakeholders' meeting will be included in the specific CPA-DD.

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

The explanation of how the comments received were considered will be included in each 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:**

The proposed Programme of Activities will include small scale hydropower plants for self-consumption by shareholders consumers in two modalities: grid connected hydropower plants and may also include project activities in which the electricity generated could be directly supplied to the consumer shareholder via national/regional grid.

In both cases, the project will ultimately displace grid electricity. Hence, baseline emissions will be in both cases calculated as per AMS.I.D, based on the grid emission factor.

The applicability criteria will be complied by each individual CPA in a case-by-case basis.

**Provisions in case of withdrawal or held of the applied methodology**

According to paragraphs 18-21 of the *Procedures for registration of a Programme of Activities as a single CDM project activity and issuance of certified emission reductions for a Programme of Activities*<sup>3</sup>, the PP will take into account the following provisions:

- If AMS.I.D is put on hold or withdrawn, no new CPA will be included to the PoA in accordance with the timelines indicated in the latest version of the *Procedures for the revision of an approved small scale methodology by the Executive Board*<sup>4</sup>.
- If AMS.I.D, subsequent to being placed on hold or withdrawn, is revised or replaced by inclusion in a consolidated methodology, the PoA shall be revised accordingly. The changes will be documented in a new version of the PoA and validated by a DOE and approved by the Board. In case the methodology is only revised without being put on hold or withdrawn, these changes are not required and will not be conducted.
- In case of changes in the PoA and after approval by the Board, the inclusion of new CPAs will follow the latest version of the CDM-CPA-DD;
- In cases of withdrawal or held of the methodology, those CPAs included before the withdrawal will apply the latest version of the generic CDM-CPA-DD at the time of the renewal of the crediting period.

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<sup>3</sup> Procedures for registration of a Programme of Activities as a single CDM project activity and issuance of certified emission reductions for a Programme of Activities. EB55, Annex 38. [http://cdm.unfccc.int/Reference/Procedures/PoA\\_proc01.pdf](http://cdm.unfccc.int/Reference/Procedures/PoA_proc01.pdf)

<sup>4</sup> Procedures for the revision of an approved small scale methodology by the Executive Board, version 01. [http://cdm.unfccc.int/Reference/Procedures/methSSC\\_proc02\\_v01.pdf](http://cdm.unfccc.int/Reference/Procedures/methSSC_proc02_v01.pdf). According to this version, the PPs shall submit new CPAs within 4 weeks after the SSC methodology has been put on hold.



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

**Applicability conditions for AMS.I.D.**

Grid connected small hydropower plants will comply with the following conditions:

| <b>Applicability criteria by the Methodology</b>   | <b>Compliance for each CPA</b>   |
|--|--|
| <p><i>This category comprises renewable energy generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal and renewable biomass that supply electricity to a national or a regional grid.</i></p> <p><i>Project activities that displace electricity from an electricity distribution system that is or would have been supplied by at least one fossil fuel fired generating unit shall apply AMS-I.F.</i></p>   | <p><i>The CPAs under the proposed Programme will be small hydropower plants in Colombia which will supply electricity to captive shareholders consumers under a “self-consumption” scheme.</i></p> <p><i>Hence, this condition is fulfilled for small hydropower plants connected to the grid.</i></p>   |
| <p><i>This methodology is applicable to project activities that</i></p> <ul style="list-style-type: none"> <li><i>(a) install a new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity (Greenfield plant);</i></li> <li><i>(b) involve a capacity addition;</i></li> <li><i>(c) involve a retrofit of an existing plant; or</i></li> <li><i>(d) involve a replacement of an existing plant</i></li> </ul> | <p><i>The small hydropower plants will be either:</i></p> <ul style="list-style-type: none"> <li><i>(a) new built power plants where there was no renewable energy power plant prior to the implementation of the project;</i></li> <li><i>(b) A retrofitted existing power plant;</i></li> </ul> <p><i>Thus, the applicability conditions of the methodology are fulfilled.</i></p> |



| <b>Applicability criteria by the Methodology</b>  | <b>Compliance for each CPA</b>  |
|---|---|
| <p><i>Hydro power plants with reservoirs that satisfy at least one of the following conditions are eligible to apply this methodology:</i></p> <p><i>(a) The project activity is implemented in an existing reservoir with no change in the volume of reservoir;</i></p> <p><i>(b) The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the Project Emissions section, is greater than 4 W/m<sup>2</sup>;</i></p> <p><i>(c) The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the Project Emissions section, is greater than 4 W/m<sup>2</sup>;</i></p> | <p><i>The types of hydropower plants under the proposed Programme of Activities will be either run-of-river type or will be dam/reservoir type. In case of run-of-river hydropower plants, this condition is not applicable.</i></p> <p><i>In case of dam type hydropower plants, the individual CPAs will be required to comply with the conditions indicated in the methodology in order to be eligible under the Programme of Activities:</i></p> <p><i>(a) Be implemented in an existing dam with no change in the volume of the reservoir;</i></p> <p><i>(b) Be implemented in a dam with change in the volume but power density over 4W/m<sup>2</sup>;</i></p> <p><i>(c) Result in new dams with power density over 4W/m<sup>2</sup>;</i></p> |
| <p><i>In the case of biomass power plants, no other biomass types than renewable biomass are to be used in the project plant.</i></p>   | <p><i>This is not applicable to the proposed Programme of Activities since no biomass power plant is to be implemented.</i></p>   |
| <p><i>If the new unit has both renewable and non-renewable components (e.g., a wind/diesel unit), the eligibility limit of 15 MW for a small-scale CDM project activity applies only to the renewable component. If the new unit co-fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15 MW.</i></p>   | <p><i>Only renewable components will be installed in the individual CPAs eligible under the Programme of Activities. The small hydropower plants included in the Programme of Activities as individual CPAs will not exceed the installed capacity limit of 15MW.</i></p>   |
| <p><i>Combined heat and power (co-generation) systems are not eligible under this category.</i></p>   | <p><i>This is not applicable to small hydropower plants.</i></p>  |
| <p><i>In the case of project activities that involve the addition of renewable energy generation units at an existing renewable power generation facility, the added capacity of the units added by the project should be lower than 15 MW and should be physically distinct from the existing units.</i></p>   | <p><i>This is not applicable to the proposed Programme of Activities. It is not envisaged to add renewable units at an existing power generation facility.</i></p>  |
| <p><i>In the case of retrofit or replacement, to qualify as a small-scale project, the total output of the retrofitted or replacement unit shall not exceed the limit of 15 MW.</i></p>   | <p><i>Retrofitting of existing small hydropower plants will not exceed the installed capacity limit of 15MW for small scale in the total output retrofitted.</i></p>  |



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

**Specific project boundaries**

As per the methodology AMS.I.D, the project boundary is defined as follows:

*“The spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system that the CDM project power plant is connected to”*

Hence, the project boundary encompasses the small hydropower plant where the electricity is generated and all the power plants connected to the Colombian grid.

The inclusion of the grid is effective through the consideration of the grid emission factor required for calculating emission reductions. With the consideration of the grid, all power sources connected are also considered in the spatial extent of the project boundary.

**Sources and gases included in the SSC CPA boundary**

The Programme of Activities will be extended to the electricity generation all over Colombia. The greenhouse gases emissions related to the generation of electricity are those from the combustion of fossil fuels in thermal generation power plants connected to the Colombian National Electricity Grid. Hence, CO<sub>2</sub> is the unique greenhouse gas targeted considered in this Programme.

|          | Source                 | Gas              | Included? | Justification / Explanation  |
|----------|------------------------|------------------|-----------|--|
| Baseline | Colombian Grid         | CO <sub>2</sub>  | Included  | According to AMS.I.D v.17, only CO <sub>2</sub> emissions from electricity generation should be accounted for. |
|          |                        | CH <sub>4</sub>  | Excluded  | According to AMS.I.D v.17  |
|          |                        | N <sub>2</sub> O | Excluded  | According to AMS.I.D v.17  |
| CPA      | Electricity Generation | CO <sub>2</sub>  | Excluded  | According to AMS.I.D v.17  |
|          |                        | CH <sub>4</sub>  | Excluded  | According to AMS.I.D v.17  |
|          |                        | N <sub>2</sub> O | Excluded  | According to AMS.I.D v.17  |



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

As per paragraph 10 of AMS.I.D, version 17, “*If the project activity is the installation of a new grid-connected renewable power plant/unit, 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*”.

As it has been demonstrated in section A.4.3, the individual CPAs would not occur in the absence of the Programme of Activities and the final consumers would be even supplied by the Colombian grid.

Hence, the baseline scenario for the proposed CPAs included under the proposed Programme of Activities is the Colombian Grid, with the following exception:

As per paragraph 14 of AMS.I.D, “*For project activities that involve retrofits or replacements of an existing facility for renewable energy generation **the baseline scenario is the continuing operation of the existing plant**. The methodology uses historical electricity generation data to determine the electricity generation of the existing plant in the baseline scenario, assuming that the historical situation observed prior to the implementation of the project activity would continue.*

*In the absence of the CDM project activity, the existing facility would continue to provide electricity to the grid  $EG_{BL,retrofit,y}$  at historical average levels  $EG_{historical,y}$  until the time at which the electrical generation facility would be likely to be replaced or retrofitted in the absence of the CDM project activity ( $DATE_{BaselineRetrofit}$ ).*

*From that point of time onwards, the baseline scenario is assumed to correspond to the project activity, and baseline electricity production is assumed to equal the project’s net electricity production and no emission reductions are assumed to occur”.*

Hence, two possible baseline scenarios shall be considered in the Programme of Activities, depending on the type of hydropower plant to be implemented.



**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:**

Following the guidance on EB47, paragraph 73, additionality is to be demonstrated at the CPA level.

The demonstration of individual CPA additionality will be based either on the investment analysis in accordance with the latest version of the “*Guidelines on the assessment of the investment analysis*” or on the simplified modalities for demonstrating additionality approved by the Board for individual CPAs up to five, according to paragraph 6 of the *General guidelines to SSC CDM methodologies*<sup>5</sup>.

***Demonstration of additionality for micro-scale project activities*** According to the *Guidelines for demonstrating additionality of microscale project activities*<sup>6</sup> (EB60, Annex 25), project activities up to 5 MW that employ renewable energy technology are additional if:

- 2.(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 (conditions apply: the total installed capacity of the technology/measure contributes less than or equal to 5% to national annual electricity generation).

Individual CPAs complying with this condition shall demonstrate the additionality based on this guideline.

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<sup>5</sup> “General guidelines to SSC CDM methodologies”. [http://cdm.unfccc.int/Reference/Guidclarif/ssc/methSSC\\_guid06.pdf](http://cdm.unfccc.int/Reference/Guidclarif/ssc/methSSC_guid06.pdf)

<sup>6</sup> Guidelines for demonstrating additionality of microscale project activities.  
[http://cdm.unfccc.int/Reference/Guidclarif/ssc/methSSC\\_guid22.pdf](http://cdm.unfccc.int/Reference/Guidclarif/ssc/methSSC_guid22.pdf)



### *Demonstration of additionality through investment analysis*

According to the Appendix B of the simplified modalities and procedures for small scale CDM project activities<sup>7</sup>, project participants shall provide an explanation to show that the project activity would not have occurred anyway due to:

(a) *Investment barrier: a financially more viable alternative to the project activity would have led to higher emissions;*

In those cases in which the additionality of the specific CPA is demonstrated based on the investment barrier, an investment analysis will be conducted in line with the provisions of the *Guidelines on the assessment of the investment analysis*<sup>8</sup>. According to the *Tool for the demonstration and assessment of additionality*, the investment analysis will determine whether the proposed project activity is:

- (a) Not the most economically or financially attractive; or
- (b) Not economically or financially feasible (without the revenue from the sale of certified emission reductions).

The investment analysis will be conducted according to the following sup-steps:

### *Determination of the appropriate analysis method*

Small hydropower projects do generate financial benefits from the sale of electricity and therefore *simple cost analysis* cannot be applied. Since the only alternative to the implementation of a specific CPA under the proposed Programme of Activities is the implementation without CDM revenues, the investment comparison analysis is not appropriate either.

So, for each individual CPA for which additionality is demonstrated based on the investment analysis, the appropriate analysis method will the benchmark analysis<sup>9</sup> (Option III).

In these cases, the most suitable financial indicator for the investment analysis will be the Internal Rate of Return (IRR), as the annualized effective compounded return rate which can be earned on the invested capital. The specific benchmark used for conducting the investment analysis of the individual CPAs will be selected for each CPA and properly justified based on any of the following justifications, which are in line with the tool:

- a) Government bond rates, increased by a suitable risk premium to reflect private investment and/or the project type, as substantiated by an independent (financial) expert or documented by official publicly available financial data;

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<sup>7</sup> Indicative simplified baseline and monitoring methodologies for selected small scale CDM project activity categories. [http://cdm.unfccc.int/Reference/Guidclarif/ssc/methSSC\\_guid05.pdf](http://cdm.unfccc.int/Reference/Guidclarif/ssc/methSSC_guid05.pdf)

<sup>8</sup> Guidelines on the assessment of the investment analysis. V 05. [http://cdm.unfccc.int/Reference/Guidclarif/reg/reg\\_guid03.pdf](http://cdm.unfccc.int/Reference/Guidclarif/reg/reg_guid03.pdf)

<sup>9</sup> According to the Guidelines on the assessment of the investment analysis, version 05 (EB62, Annex 5), in cases where a benchmark approach is used, local commercial lending rates or weighted average costs of capital (WACC) are appropriate benchmarks for a project IRR while required/expected returns on equity are appropriate benchmarks for an equity IRR. Benchmarks supplied by relevant national authorities are also appropriate if it can be demonstrated that they are applicable to the project activity and the type of IRR calculation presented





- b) A company internal benchmark (weighted average capital cost of the company), when project promoters can demonstrate that this benchmark has been consistently used in the past;
- c) Government/official approved benchmark where such benchmarks are used for investment decisions;
- d) Default values for the approximate expected return on equity for energy projects in Colombia. The expected return on equity is composed of four elements: (a) a risk free rate of return; (b) an equity risk premium; (c) a risk premium for Colombia; and (d) an adjustment factor to reflect the risk of projects in different sectoral scopes.

According to the Guidelines on the assessment of the investment analysis, the default values for the expected IRR in real terms in Colombia in the energy sector is 11.2%. When Project Participants decide to apply default values for the benchmark selection, the benchmark will be calculated in nominal terms. This is in line with paragraph 7 of Appendix in the Guidelines on the Assessment of Investment Analysis (version 05, EB62, Annex 5), i.e. *“in situations where an investment analysis is carried out in nominal terms, project participants can convert the real term values provided in the table below to nominal values by adding the inflation rate. The inflation rate shall be obtained from the inflation forecast of the central bank of the host country for the duration of the crediting period”*.

For the individual CPAs to be included under this Programme of Activities, the benchmark for the demonstration of additionality through investment analysis will be calculated in nominal terms according to the latest available information from the Bank of Colombia for inflation in the long term.

#### ***Calculation and comparison of financial indicators***

A typical CPA will use the equity IRR to compare the attractiveness of the investment in the proposed CPA against a required rate of return. In doing this, and in line with the Guidelines for assessment of the investment analysis, only the portion of investment costs which is financed by equity should be considered as the net cash outflow.

In case other financial indicators were more suitable for the demonstration of the financial additionality of individual projects, the justification will be provided in the specific CPA.

The calculation and the complete investment analysis of a specific CPA will be provided in excel format, unprotected, together with the relevant documents of the specific CPA. Assumptions included in the investment analysis will be supported on available evidences or excluded from the analysis.

As a general approach, the following guidelines will be followed:

- Period considered for investment analysis: the period considered for conducting the investment analysis should not be limited to the crediting period of the specific CPA, but will be referred to the expected operational lifetime of the main equipment, based on the indications of the technological provider;
- If any rehabilitation or maintenance is expected to occur in the period considered for assessment, the calculation of the IRR may include the costs related to these;
- Plant load factor, defined ex-ante in the CDM-PDD according to one of the following options, according to the provisions in EB48, Annex 11:



- The PLF 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;
- The PLF determined by a third party contracted by the project participants (e.g. an engineering company);

Based on the above assumptions and approaches, the project promoters will calculate the Equity IRR based on the available data at the moment of the investment decision. Both, IRR without CDM expected incomes and IRR with expected CDM incomes, will be compared to the benchmark.

An investment analysis will be conducted for the specific proposed projects, including the variables and input data related with capital investment, O&M cost and the estimated savings or revenues. The following table presents the typical data used in the IRR calculation of the project and the main sources of this information. The calculation will be based on conservative assumptions all of which should be listed in the CPA DD of the specific project.

| <b>Financial data used in project IRR calculation</b> |   |
|---|---|
| <b>Item</b>   | <b>Main source of information</b>   |
| <b>Total investment (USD)</b>                         | Quotations, purchase agreements, feasibility reports, internationally accepted values (investment/installed MW), others.          |
| <b>Equity (USD)</b>                                   | Investment analysis, loan agreements (if applicable), others.   |
| <b>Expected project lifetime (years)</b>              | Technical specifications of main equipment, feasibility reports, others.  |
| <b>O&amp;M costs/year (USD)</b>                       | Quotations, O&M agreements, default international accepted values, feasibility reports, others.                                   |
| <b>Electricity tariff (USD/KWh)</b>                   | Power purchase agreements, national electricity tariffs.  |
| <b>Power generation (MWh/year)</b>                    | Feasibility reports, hydrological studies, others.  |
| <b>Plant load factor</b>                              | Hydrological studies by third parties, bank or equity financiers' confirmation, official values for the proposed type of project. |
| <b>VAT (%)</b>  | National regulation   |
| <b>Payback period (years)</b>                         | Financial analysis, feasibility reports, others.  |
| <b>Project IRR (without CER)</b>                      | Financial analysis  |



Project IRR (with CER benefits)

Financial analysis

### *Sensitivity analysis*

As per the Guidelines on the assessment of the investment analysis, only variables that constitute more than 20% of either total project costs or total project revenues should be subjected to reasonable variation and the results of this variation should be presented in the PDD and be reproducible in the associated spreadsheets.

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

- Electricity tariff;
- Net power generation;
- Total O&M Costs; and
- Total investment;

The range of variations considered should be reasonable in the project context. As a general point of departure, variations should at least cover a range of +/-10%, unless this is not deemed appropriate in the context of the specific project circumstances.

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

The key criteria and data for assessing additionality of the specific CPAs will be those resulting from the investment analysis, which will demonstrate that the Internal Rate of Return, either Project IRR or Equity IRR, are lower than the specific benchmark.

The investment analysis shall be supported on evidences valid at the moment of the investment decision. The criteria will be the comparison of the relevant IRR with the selected benchmark. Those project activities with an Internal Rate of Return lower than the selected benchmark, will be additional.

The eligibility criteria for project activities to be included under the proposed Programme of Activities are listed in section A.4.2.2 of the PoADD and the data required to be considered in the investment analysis and assessment of additionality are listed and explained in section E.5.1.



**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:**

Emission reductions of individual CPAs are calculated according the following formula:

$$ER_y = BE_y - PE_y - LE_y$$

Where:

$ER_y$  Emissions reductions in year y (tCO<sub>2</sub>e/y)

$BE_y$  Baseline Emissions in year y (tCO<sub>2</sub>e/y)

$PE_y$  Project Emissions in year y (tCO<sub>2</sub>e/y)

$LE_y$  Leakage emissions in year y (tCO<sub>2</sub>e/y)

**Project emissions**

According to paragraph 20 of AMS.I.D v.17, “for the following categories of project activities, project emissions have to be considered following the procedure described in the most recent version of ACM0002.

As per ACM0002 version 12.1, for hydro power project activities that result in new reservoirs and hydro power project activities that result in the increase of existing reservoirs, project proponents shall account for CH<sub>4</sub> and CO<sub>2</sub> emissions from the reservoir if the power density of the project activity is greater than 4W/m<sup>2</sup> and less or equal to 10 W/m<sup>2</sup>. In these cases, PE<sub>y</sub> will be calculated as:

$$PE_{HP,y} = \frac{EF_{Res} \cdot TEG_y}{1000};$$

Where:

$PE_y$  Project emissions in year y (tCO<sub>2</sub>e/y)

$EF_{Res}$  Default emission factor for emissions from reservoirs of hydro power plants in year y (kg tCO<sub>2</sub>e/MWh)

$TEG_y$  Total electricity produced by the project activity, including the electricity supplied to the grid and the electricity supplied to internal loads, in year y (MWh)



According to the provisions in ACM0002 version 12.1, project emissions from water reservoirs will be accounted in those cases in which the implementation of the proposed CPA **results in new reservoirs or increased volume of existing reservoirs**. Power density in those cases will be calculated as follows:

$$PD = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}};$$

Where:

$Cap_{PJ}$  Installed capacity of the hydro power plant after the implementation of the project activity (W)

$Cap_{BL}$  Installed capacity of the hydro power plant before the implementation of the project activity (W). For new hydro power plants, this value is zero

$A_{PJ}$  Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full ( $m^2$ )

$A_{BL}$  Area of the reservoir measured in the surface of the water, before the implementation of the project activity, when the reservoir is full ( $m^2$ ). For new reservoirs, this value is zero.

If the power density is over  $10W/m^2$ , project emissions are zero in line with ACM0002, version 12.1

$PE_y = 0$ ;

### Baseline emissions

In all possible cases except the retrofitting, the baseline emissions are calculated as follows.

As per AMS.I.D version 17, baseline emissions are calculated according to the following formula, in case that no retrofit takes place:

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

Where:

$EG_{BL,y}$  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 ( $t CO_2/MWh$ )

As per AMS.I.D, in the specific case of retrofit in hydro plants where power generation can vary significantly from year to year, due to natural variations in the availability of the renewable source (e.g., varying rainfall), the use of few historical years to establish the baseline electricity generation can therefore involve a significant uncertainty. The methodology addresses this uncertainty by adjusting the historical electricity generation by its standard deviation. This ensures that the baseline electricity generation is established in a conservative manner and that the calculated emission reductions are attributable to the project activity.



Without this adjustment, the calculated emission reductions could mainly depend on the natural variability observed during the historical period rather than the effects of the project activity.

The baseline emissions ( $BE_{\text{retrofit CO}_2,y}$ ) are thus calculated considering the following, as per paragraph 14 of AMS.I.D:

*In the absence of the CDM project activity, the existing facility would continue to provide electricity to the grid BL retrofit y EG , , at historical average levels  $EG_{\text{historical},y}$  until the time at which the electrical generation facility would be likely to be replaced or retrofitted in the absence of the CDM project activity ( $DATE_{\text{BaselineRetrofit}}$ ).*

*From that point of time onwards, the baseline scenario is assumed to correspond to the project activity, and baseline electricity production is assumed to equal the Project's net electricity production and no emission reductions are assumed to occur.*

$$BE_{\text{retrofit},\text{CO}_2,y} = [EG_{\text{BL},\text{retrofit},y}] * EF_{\text{CO}_2}$$

And:

$$EG_{\text{BL},\text{retrofit},y} = EG_{\text{PJ},\text{facility},y} - (EG_{\text{historical}} + \sigma_{\text{historical}})$$

Where:

$$EG_{\text{BL},\text{retrofit},y} = 0 \text{ on/after } DATE_{\text{BaselineRetrofit}}$$

$EG_{\text{BL},\text{retrofit},y}$  Quantity of net electricity generation that is supplied to the grid as a result of the implementation of the CDM project activity in year y (MWh)

$EG_{\text{PJ},\text{facility},y}$  Quantity of net electricity generation supplied by the project plant/unit to the grid in year y (MWh)

$EG_{\text{historical}}$  Annual average historical net electricity generation by the existing renewable energy plant that was operated at the project site prior to the implementation of the project activity (MWh)

*Average of historical net electrical energy levels delivered by the existing facility, spanning all data from the most recent available year (or month, week or other time period) to the time at which the facility was constructed, retrofit, or modified in a manner that significantly affected output (i.e., by 5% or more) (MWh)*

*A minimum of 5 years (60 months) (excluding abnormal years) of historical generation data is required in the case of hydro facilities and for other facilities a minimum of 3 years (36 months) data is required.*

*In the case that 5 years of historical data are not available - e.g., due to recent retrofits or exceptional circumstances<sup>8</sup> - a new methodology or methodology revision shall be proposed.*

$\sigma_{\text{historical}}$  Standard deviation of the annual average historical net electricity generation by the existing renewable energy plant that was operated at the project site prior to the implementation of the project activity (MWh)

$DATE_{\text{BaselineRetrofit}}$  Point in time when the existing equipment would need to be replaced in the absence of the project activity (date)



### Calculation of the Emission Factor

The Emission Factor will be calculated in a transparent and conservative manner as follows, according to version 2.2.1 of the “*Tool to calculate the emission factor for an electricity system*”:

- (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 2.2.1,

OR

- (b) The weighted average emissions (in kg CO<sub>2e</sub>/kWh) of the current generation mix. The data of the year in which project generation occurs must be used.

Option A will be applied for the proposed Programme of Activities and for all CPAs under this PoA, using the Combined Margin calculated ex-ante, consisting of the combination of Operating Margin (OM) and Build Margin (BM) according to the procedures prescribed described in the “*Tool to calculate the emission factor for an electricity system*” (Version 2.2.1).

According to the tool, following steps should be applied for the calculation of the 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 operating margin emission factor according to the selected method.
- **STEP 5.** Calculate the build margin emission factor.
- **STEP 6.** Calculate the combined margin (CM) emissions factor.

#### ***Step 1: Identify the relevant electricity system***

The electricity system includes the spatial extent of the power plants that are physically connected to the project activity (e.g. the renewable power plant location or the consumers where electricity is being saved) and that can be dispatched without significant transmission constraints.

A connected electricity system, national or international, is defined as an electricity system that is connected by transmission lines to the project electricity system. Power plants within the connected electricity system can be dispatched without significant transmission constraints but transmission to the project electricity system has significant transmission constraint.

For the proposed Programme of Activities, the Colombian National Grid is the relevant electricity system, including the project sites and all the power plants connected to the Colombian National Grid.



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

According to the applicable tool, each CPA may choose between the following options to calculate the OM and BM emission factors:

***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;

Option I is chosen for the Programme of Activities and any individual CPA included under the Programme according the data availability.

***Step 3: Select a method to determine the operating margin (OM)***

The calculation of the operating margin emission factor ( $EF_{grid,OM,y}$ ) 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) ***Simple OM method*** is chosen because:

- i) Low-cost/must-run resources constitute less than 50% of total grid generation in average of the five recent years . More than 70% of the total generation is based on coal, diesel and natural gas.
- j) There is no sufficient data available for using the Dispatch Data Analysis option;

According to the latest official information by the Energy Secretariat, in the “Prospective of electricity sector, 2010-2025”, the generation sources in the last three years are shown in the following table:





The low cost/must run resources are below 50%.

As per the applicable tool, the emission factor can be calculated using either one of the following data vintages:

- **Ex ante option:** for grid power plants, use a 3-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation.
- **Ex post option:** If the ex post option is chosen, the emission factor is determined for the year in which the project activity displaces grid electricity, requiring the emissions factor to be updated annually during monitoring. If the data required to calculate the emission factor for year y is usually only available later than six months after the end of year y, alternatively the emission factor of the previous year y-1 may be used. If the data is usually only available 18 months after the end of year y, the emission factor of the year proceeding the previous year y-2 may be used. The same data vintage (y, y-1 or y-2) should be used throughout all crediting periods.

For the proposed Programme of Activities, the **ex-ante** option is chosen because the yearly statistics required for the calculation of the Operating Margin, are usually published more than a year after the reported year, which would lead to large delays between the monitoring and the verification and later issuance of CERs.

$EF_{grid,OMsimple,y}$  is calculated ex-ante using the data from 2007 to 2009, which is the most recent data available at the time of submission of the CDM-PoA-DD to the DOE for validation<sup>10</sup>. This data vintage remains fixed during the crediting period.

#### ***Step 4: Calculate the operating margin emission factor according to the selected method***

The simple OM emission factor is calculated as the generation-weighted average CO<sub>2</sub> emissions per unit net electricity generation (tCO<sub>2</sub>/MWh) of all generating power plants serving the system, not including low-cost/must-run power plants/units. Two options are available for calculation:

- **Option A:** Based on the net electricity generation and a CO<sub>2</sub> emission factor of each power unit;  
or
- **Option B:** Based on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system.

Option B, *Calculation based on total fuel consumption and electricity generation of the system*, is chosen for the proposed Programme of Activities because:

- i) Total net electricity generation of all power plants serving the system as well as the fuel types and total fossil fuel consumption of the electricity mix are available, while data required to calculate the Build Margin as per option A are not available;

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<sup>10</sup> Prospectiva del sector electric 2010-2025. SENER



- j) Only nuclear and renewable power units are considered low cost/must run and the net electricity supplied by these units to the grid is public and available;
- k) Off-grid power plants are not included in the calculation;

Under this option, the simple OM emission factor is calculated based on the fuel consumption and net electricity generation of each power unit, as follows

$$EF_{grid,OM\ simple,y} = \frac{\sum_i FC_{i,y} * NCV_{i,y} * EF_{CO_2,i,y}}{EG_y}$$

Where:

$EF_{grid,OM\ simple,y}$  Simple operating margin  $CO_2$  emission factor in year y ( $tCO_2/MWh$ )

$FC_{i,y}$  Amount of fossil fuel type i consumed in the year y;

$NCV_{i,y}$  Net calorific value of fossil fuel type i in year y;  $EF_{CO_2,i,y}$   $CO_2$  emission factor of fuel type i in the year y;

$EG_y$  Net electricity generated and supplied to the grid by all power sources serving the system, not including low cost/must run plants, in the year y;

y Relevant year;

i fossil fuel type combusted in power sources in the Colombian grid in the year y;

The calculation of the Operating Margin includes the imported electricity to the Colombian grid.



*Step 5: Calculate the build margin emission factor*

In terms of vintage of data, project participants can choose between one of the following two options:

- 1) Option 1: For the first crediting period, calculate the build margin emission factor ex ante based on the most recent information available on units already built for sample group m at the time of CDM-PDD submission to the DOE for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.
- 2) Option 2: For the first crediting period, the build margin emission factor shall be updated annually, ex post, including those units built up to the year of registration of the project activity or, if information up to the year of registration is not yet available, including those units built up to the latest year for which information is available. For the second crediting period, the build margin emissions factor shall be calculated ex ante, as described in Option 1 above. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used.

Option 1 has been chosen due to the same reasons why the Operating Margin has been calculated ex-ante.

Capacity additions from retrofits of power plants should not be included in the calculation of the build margin emission factor.

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

- (a) Identify the set of five power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently ( $SET_{5-units}$ ) and determine their annual electricity generation ( $AEG_{SET-5-units}$ , in MWh);
- (b) Determine the annual electricity generation of the project electricity system, excluding power units registered as CDM project activities ( $AEG_{total}$ , in MWh). Identify the set of power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently and that comprise 20% of  $AEG_{total}$  (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) ( $SET_{\geq 20\%}$ ) and determine their annual electricity generation ( $AEG_{SET \geq 20\%}$ , in MWh);
- (c) From  $SET_{5-units}$  and  $SET_{\geq 20\%}$  select the set of power units that comprises the larger annual electricity generation ( $SET_{sample}$ );
- (d) Identify the date when the power units in  $SET_{sample}$  started to supply electricity to the grid. If none of the power units in  $SET_{sample}$  started to supply electricity to the grid more than 10 years ago, then use  $SET_{sample}$  to calculate the build margin. In this case ignore steps (d), (e) and (f).



After following the indications in paragraphs (a), (b) and (c) above, it was found that the generation of  $SET_{5\text{-units}}$  is lower than the total production of  $SET_{\geq 20\%}$ . Also, it was checked that none of the units included in  $SET_{\geq 20\%}$  started operating and supplying electricity to the Colombian grid more than 10 years ago. Hence, the sample of units used to calculate the build margin is  $SET_{\geq 20\%}$ .

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:

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

Where:

|                         |   |
|-------------------------|---|
| $EF_{\text{grid,BM},y}$ | <i>Build margin CO<sub>2</sub> emission factor in year y (tCO<sub>2</sub>/MWh)</i>    |
| $EG_{m,y}$              | <i>Net electricity delivered to the grid by power unit m in year y (MWh)</i>          |
| $EF_{EL,m,y}$           | <i>CO<sub>2</sub> emission factor of power unit m in year y (tCO<sub>2</sub>/MWh)</i> |
| $m$                     | <i>Power units included in the build margin</i>                                       |
| $y$                     | <i>Most recent historical year for which power generation data is available</i>       |

and

$$EF_{EL,m,y} = \frac{EF_{CO_2,m,i,y} \cdot 3.6}{\eta_{m,y}}$$

Where:

|                   |   |
|-------------------|---|
| $EF_{CO_2,m,i,y}$ | <i>Average CO<sub>2</sub> emission factor of fuel type i used in power unit m in year y</i> |
| $\eta_{m,y}$      | <i>Average net energy conversion efficiency of power unit m in year y (ratio)</i>           |
| $m$               | <i>All power units serving the grid in year y except low-cost/must-run power units</i>      |
| $y$               | <i>the relevant year</i>  |



**Step 6: Calculate the combined margin emissions factor**

The combined margin is calculated according to the weighted average Combined Margin method, as per the following formula:

$$EF_{\text{GRID,CM}} = EF_{\text{GRID,OM}} * w_{\text{OM}} + EF_{\text{GRID,BM}} * w_{\text{BM}}$$

Where:

$w_{\text{OM}}$  Weighting of operating margin emissions factor (%)

$w_{\text{BM}}$  Weighting of build margin emissions factor (%)

According to the tool,  $w_{\text{OM}} = w_{\text{BM}} = 0.5$ , and  $w_{\text{OM}} = 0.25$  and  $w_{\text{BM}} = 0.75$  for the second and third crediting period.

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

According to paragraph 28 of the “*Procedures for registration of a Programme of Activities as a single CDM Project Activity and Issuance of Certified Emission Reductions for a Programme of Activities*”, version 04.1<sup>11</sup>, “the latest version of the *Procedures for Renewal of the Crediting Period of a Registered CDM project activity*” shall be applied, mutas mutandi, to a PoA every seven years from the start date of the crediting period”.

The latest version at the moment of validation of this Programme of Activities is version 05<sup>12</sup>. In Annex 1 of this procedure, “Tool to assess the validity of the original/current baseline and to update the baseline at the renewal of a crediting period” it is stated in step 1.4 that updates should be undertaken in the following cases:

- Where IPCC default values are used, the values should be updated if any new default values have been adopted and published by the IPCC;
- Where emission factors are used and determined only once for the crediting period, they should be updated, except if the emission factors are based on the historical situation at the site of the project activity prior to the implementation of the project and cannot be updated because the historical situation does not exist anymore as a result of the CDM project activity, which is not the current situation in this Programme of Activities.

<sup>11</sup> **Procedures for registration of a Programme of Activities as a single CDM Project Activity and Issuance of Certified Emission Reductions for a Programme of Activities**, versión 04.1. EB 55, Annex 38.  
[http://cdm.unfccc.int/Reference/Procedures/PoA\\_proc01.pdf](http://cdm.unfccc.int/Reference/Procedures/PoA_proc01.pdf)

<sup>12</sup> **Procedures for Renewal of the Crediting Period of a Registered CDM Project Activity**. Version 05. EB46, Annex 11.  
[http://cdm.unfccc.int/Reference/Procedures/reg\\_proc04.pdf](http://cdm.unfccc.int/Reference/Procedures/reg_proc04.pdf)



Hence, the grid emission factor will be updated every seven years in the Programme of Activities according to the applicable procedures. In any case, the CPAs included under the PoA will apply the grid emission factor of the latest version of the PoA-DD.

Below, the list of parameters fixed at the moment validation is given.

|   |   |
|---|---|
| <b>Data / Parameter:</b>  | <b>FC<sub>i,y</sub></b>   |
| Data unit:  | TJ/day  |
| Description:  | Amount of fossil fuel type i consumed in the project electricity system in year y |
| Source of data used:  |   |
| Value applied:  |   |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | Specific data from official public information has been used for the calculation. |
| Any comment:  | -   |

| <b>Data / Parameter:</b>  | <b>EF<sub>m,i,y</sub></b>  |                                 |   |          |      |             |      |                     |      |        |      |      |      |
|---|--|---------------------------------|---|----------|------|-------------|------|---------------------|------|--------|------|------|------|
| Data unit:  | tCO <sub>2</sub> /TJ   |                                 |   |          |      |             |      |                     |      |        |      |      |      |
| Description:  | CO <sub>2</sub> emission factor of fossil fuel type i used in year y;  |                                 |   |          |      |             |      |                     |      |        |      |      |      |
| Source of data used:  | IPCC 2006  |                                 |   |          |      |             |      |                     |      |        |      |      |      |
| Value applied:  | <table border="1"> <thead> <tr> <th>CO<sub>2</sub> emission factor</th> <th><b>EF<sub>CO<sub>2</sub>,i,y</sub> (tCO<sub>2</sub>/TJ)</b></th> </tr> </thead> <tbody> <tr> <td>Fuel oil</td> <td>75.5</td> </tr> <tr> <td>Natural Gas</td> <td>54.3</td> </tr> <tr> <td>Natural Gas Liquids</td> <td>58.3</td> </tr> <tr> <td>Diesel</td> <td>72.6</td> </tr> <tr> <td>Coal</td> <td>87.3</td> </tr> </tbody> </table> | CO <sub>2</sub> emission factor | <b>EF<sub>CO<sub>2</sub>,i,y</sub> (tCO<sub>2</sub>/TJ)</b> | Fuel oil | 75.5 | Natural Gas | 54.3 | Natural Gas Liquids | 58.3 | Diesel | 72.6 | Coal | 87.3 |
| CO <sub>2</sub> emission factor   | <b>EF<sub>CO<sub>2</sub>,i,y</sub> (tCO<sub>2</sub>/TJ)</b>  |                                 |   |          |      |             |      |                     |      |        |      |      |      |
| Fuel oil  | 75.5   |                                 |   |          |      |             |      |                     |      |        |      |      |      |
| Natural Gas   | 54.3   |                                 |   |          |      |             |      |                     |      |        |      |      |      |
| Natural Gas Liquids   | 58.3   |                                 |   |          |      |             |      |                     |      |        |      |      |      |
| Diesel  | 72.6   |                                 |   |          |      |             |      |                     |      |        |      |      |      |
| Coal  | 87.3   |                                 |   |          |      |             |      |                     |      |        |      |      |      |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | IPCC 2006 default values   |                                 |   |          |      |             |      |                     |      |        |      |      |      |
| Any comment:  | -  |                                 |   |          |      |             |      |                     |      |        |      |      |      |



| <b>Data / Parameter:</b>  | $\eta_{m,y}$  |            |                |    |       |    |        |    |        |    |        |
|---|---|------------|----------------|----|-------|----|--------|----|--------|----|--------|
| Data unit:  | -   |            |                |    |       |    |        |    |        |    |        |
| Description:  | Efficiency of power plant m in year y   |            |                |    |       |    |        |    |        |    |        |
| Source of data used:  | “Prospective of the electricity sector 2010-2025”   |            |                |    |       |    |        |    |        |    |        |
| Value applied:  | <table border="1"> <thead> <tr> <th>Technology</th> <th>Efficiency (%)</th> </tr> </thead> <tbody> <tr> <td>TH</td> <td>37.58</td> </tr> <tr> <td>GT</td> <td>40.67%</td> </tr> <tr> <td>CC</td> <td>52.86%</td> </tr> <tr> <td>IC</td> <td>45.07%</td> </tr> </tbody> </table> | Technology | Efficiency (%) | TH | 37.58 | GT | 40.67% | CC | 52.86% | IC | 45.07% |
| Technology  | Efficiency (%)  |            |                |    |       |    |        |    |        |    |        |
| TH  | 37.58   |            |                |    |       |    |        |    |        |    |        |
| GT  | 40.67%  |            |                |    |       |    |        |    |        |    |        |
| CC  | 52.86%  |            |                |    |       |    |        |    |        |    |        |
| IC  | 45.07%  |            |                |    |       |    |        |    |        |    |        |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | Specific data from official public information for different types of plants has been used for the calculation  |            |                |    |       |    |        |    |        |    |        |
| Any comment:  | -   |            |                |    |       |    |        |    |        |    |        |

|   |  |
|---|--|
| <b>Data / Parameter:</b>  | $EG_{,y}$ & $EG_{,m,y}$  |
| Data unit:  | GWh  |
| Description:  |  |
| Source of data used:  |  |
| Value applied:  |  |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | Specific data from official public information for different types of plants has been used for the calculation |
| Any comment:  | -  |



|   |  |
|---|--|
| <b>Data / Parameter:</b>  | $\omega_{OM}$  |
| Data unit:  | -  |
| Description:  | Weight for operating margin emission factor                              |
| Source of data used:  | Tool to calculate the emission factor for an electricity system, v.2.2.1 |
| Value applied:  | 0.5  |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | In line with AMS I.D version 17  |
| Any comment:  | -  |

|   |  |
|---|--|
| <b>Data / Parameter:</b>  | $\omega_{BM}$  |
| Data unit:  | -  |
| Description:  | Weight for build margin emission factor                                  |
| Source of data used:  | Tool to calculate the emission factor for an electricity system, v.2.2.1 |
| Value applied:  | 0.5  |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | In line with AMS I.D version 17  |
| Any comment:  | -  |

|   |   |
|---|---|
| <b>Data / Parameter:</b>  | $EF_{CM,v}$   |
| Data unit:  | tCO <sub>2</sub> /MWh   |
| Description:  | Combined margin CO <sub>2</sub> emissions factor  |
| Source of data used:  | Calculated  |
| Value applied:  |   |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | Ex ante calculation as per the <i>Tool to calculate the Emission Factor for an electricity system</i> ' version 2.2.1 |
| Any comment:  | -   |





|   |   |
|---|---|
| <b>Data / Parameter:</b>  | <b>EF<sub>OM,y</sub></b>  |
| Data unit:  | tCO <sub>2</sub> /MWh   |
| Description:  | Operating margin CO <sub>2</sub> emissions factor   |
| Source of data used:  | Calculated  |
| Value applied:  |   |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | Ex ante calculation as per the <i>Tool to calculate the Emission Factor for an electricity system</i> version 2.2.1 |
| Any comment:  | -   |

|   |   |
|---|---|
| <b>Data / Parameter:</b>  | <b>EF<sub>BM,y</sub></b>  |
| Data unit:  | tCO <sub>2</sub> /MWh   |
| Description:  | Build margin CO <sub>2</sub> emissions factor   |
| Source of data used:  | Calculated  |
| Value applied:  |   |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | Ex ante calculation as per the <i>Tool to calculate the Emission Factor for an electricity system</i> version 2.2.1 |
| Any comment:  | -   |

Emission reductions of individual CPAs are calculated according the following formula:

$$ER_y = BE_y - PE_y - LE_y$$

Where:

*ER<sub>y</sub>* Emissions reductions in year y (tCO<sub>2</sub>e/y)

*BE<sub>y</sub>* Baseline Emissions in year y (tCO<sub>2</sub>e/y)

*PE<sub>y</sub>* Project Emissions in year y (tCO<sub>2</sub>e/y)

*LE<sub>y</sub>* Leakage emissions in year y (tCO<sub>2</sub>e/y)



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

|   |   |
|---|---|
| <b>Data / Parameter:</b>  | <b>IC<sub>i</sub></b>   |
| Data unit:  | MW  |
| Description:  | Installed capacity of the hydropower plant  |
| Source of data used:  | Technical specifications of the power plant   |
| Value applied:  | Specific for each new CPA   |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | Installed capacity of the small hydropower plant according to the design parameters and technical specifications. |
| Any comment:  | -   |

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

According to AMS.I.D version 17, the following relevant parameters shall be monitored:

| <b>Parameter</b>                 | <b>Description</b>  | <b>AMS.I.D</b> | <b>Comments</b>  |
|----------------------------------|---|----------------|--|
| EF <sub>CO<sub>2</sub>,y</sub> : | CO <sub>2</sub> emission factor of the grid electricity in year y;  | Applicable     | -  |
| EG <sub>y</sub> :                | Net electricity supplied to the grid in year y  | Applicable     | -  |
| B <sub>y</sub>                   | Quantity of biomass consumed in year y  | Applicable     | -  |
| M <sub>b</sub>                   | Moisture content of the biomass residues  | Applicable     | -  |
| NCV <sub>biomass,k</sub>         | Net calorific value of biomass type k   | Applicable     | -  |
| σ <sub>historical</sub>          | Standard deviation of the annual average historical net electricity generation delivered to the grid by the existing renewable energy plant that was operated at the project site prior to the implementation of the project activity | Applicable     | Calculated from data used to establish EG <sub>historical</sub> . Parameter to be calculated as the standard deviation of the annual generation data used to calculate EG <sub>historical</sub> for retrofit or replacement project activities |



In the proposed Programme of Activities, only hydropower plants will be considered to be included. No biomass will be consumed in any of the specific Project Activities included in the Programme. Hence, the only parameters to be considered in the monitoring plan are the following, which will be specified for each CPA:

| Parameter                        | Description   | Comments   |
|----------------------------------|---|--|
| EF <sub>CO<sub>2</sub>,y</sub> : | CO <sub>2</sub> emission factor of the grid electricity in year y;  | Calculated ex-ante for the Programme of Activities. This parameter is updated with the renewal of the Programme of Activities' crediting period every seven years.                         |
| EG <sub>y</sub> :                | Net electricity supplied to the grid in year y  | To be monitored in any case.   |
| σ <sub>historical</sub>          | Standard deviation of the annual average historical net electricity generation delivered to the grid by the existing renewable energy plant that was operated at the project site prior to the implementation of the project activity | To be considered only in cases of retrofitting of existing hydropower units.<br><br>It is calculated from the data used to establish EG <sub>historical</sub> . No monitoring is required. |

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

|  |   |
|--|---|
| <b>Data / Parameter:</b>   | EG <sub>y</sub>   |
| Data unit:   | MWh   |
| Description:   | Quantity of net electricity supplied to the grid in year y  |
| Source of data to be used:   | Electricity meter   |
| Value of data applied for the purpose of calculating expected emission reductions in section B.5 | Specific for each individual project activity   |
| Description of measurement methods and procedures to be applied:                                 | Electricity supplied to the grid by the project activity will be continuous monitored by means of calibrated electricity meters at the substation with a minimum accuracy of 0.5s. Hourly measurements will be taken and at least monthly recording will be conducted.  |
| QA/QC procedures to be applied:  | Electricity meters will be calibrated according to national standards for calibration of electricity metering equipment and recalibrated at appropriate intervals according to manufacturer specifications, but at least once in three years, in line with the <i>General Guidelines to SSC CDM methodologies</i> .<br>Data and readings collected from the electricity meter will be cross checked with the electricity sales invoices/receipts. |
| Any comment:   | Data will be archived at least for two years after crediting period.  |



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

### Monitoring Organizational Structure

As it has been indicated in section A.4.4.2 of the PoADD, each specific CPA implementer will be responsible of collecting the relevant data for monitoring. All the relevant data and documents required for proper monitoring will be provided to the Managing Entity periodically.

In order to clarify the information to be provided and the periodicity of delivery, the Managing Entity will elaborate the standard procedures for collection, processing and archiving monitoring data, which will be provided to each and every specific CPA implementer. Apart from the procedures, the Managing Entity will be responsible of giving the CPA implementers a minimum training on CDM in order to clearly explain the requirements of monitoring and the importance of data collection.

The Managing Entity, however, will be the responsible entity for collection and join of the data corresponding to each specific CPA.

### Data collection and processing

Net electricity delivered to the grid<sup>13</sup> will be monitored by means of properly calibrated electricity meters. Electricity delivered to the grid will be continuously monitored and daily recorded in a logbook. At the end of every week, the meter readings will be typed into electronic format and will be gathered. At the end of every month, net electricity supplied to the grid will be gathered in electronic and paper mode and the electronic file will be sent via email to the Managing Entity.

In order to keep accuracy, meter readings will be cross checked with electricity invoices/receipts. A copy of these invoices/receipts will be attached to the meter readings file every month.

The Managing Entity responsible will check and archive all the information electronically at least 2 years after the end of the crediting period of each CPA. Also, each CPA will gather the information during the same period.

### QA/QC Procedures: Equipment location and specifications

The location of the metering equipment and the technical specifications will be indicated in each specific CPA.

The Managing Entity will maintain an equipment table registry for equipment, where model, type, serial number and installation date will be indicated.

### QA/QC Procedures: Equipment calibration

The specific CPA Implementers will be responsible of the proper calibration of the monitoring equipment.

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<sup>13</sup> In cases where electricity imported and exported from the grid are monitored, net electricity supplied to the grid will be calculated from the monitored data of electricity supplied to the grid and supplied from the grid. Documental evidence supporting both parameters' readings will be provided to the Managing Entity.



The Managing Entity will indicate the CPA implementer the required calibration frequency for each of the electricity meters involved in the monitoring. Also, the CME will keep a *Calibration Registry* for calibration follow up, in order to notify each CPA implementer with the sufficient time, the requirement of calibration. Calibration frequency and standards to be applied will be determined in the PoA-DD and each CPA-DD according to the CDM guidelines, the national standards and regulation and the technical specifications of each electricity meter.

For each CPA, the Managing Entity will keep a “*Calibration Registry*” where dates of last calibration and dates of next calibration will be indicated. According to this table, the Managing Entity will notify the CPA implementers with 30 days in advance, the requirement of calibration of the monitoring equipment.

The CPA implementer is the only responsible of carrying out the calibration according to the requirements. Once the calibration is done, the CPA implementers will provide a copy of the calibration certificate to the Managing Entity, who will update the “*Calibration Registry*”.

### **Roles and responsibilities for verification**

The Managing Entity will conduct the verification based on the data and information provided by the specific CPA implementers. The responsibilities of each person and entity involved in the Programme of Activities will be indicated specifically in each CPA.

### **Procedures in case of damaged metering equipment**

In case metering equipment is damaged and no reliable readings can be recorded the project entity will estimate net supply by the proposed project activity according to the following procedure:

1. In case metering equipment operated by project entity is damaged only: The metering data logged by the grid company, evidenced by sales receipts/billing invoices will be used as record of net power supplied to the grid for the days for which no record could be recorded.
2. In case metering equipment operated by the grid company is damaged only: The metering data logged by the project entity, will be used as a record of net power supply to the grid for the days for which no sales receipts/billing invoices could be provided.
3. In case both metering equipment operated by project entity and Grid Company are damaged: The project entity and the grid company will jointly calculate a conservative estimate of power supplied to the grid. A statement will be prepared indicating.
  - a. The background to the damage to metering equipment.
  - b. The assumptions used to estimate net power supply to the grid for the days for which no record could be recorded.
  - c. The estimation of power supplied to the grid. The statement will be signed by both a representative of the project entity as well as a representative of the grid company.



### Emergencies to monitoring

In case of emergencies (conditions under which the PO has not been able to monitor due to an unexpected accident), the project entity will not claim emission reductions due to the project activity for the duration of the emergency. The project entity will follow the below procedure for declaring the emergency period to be over:

1. The project owner will ensure that all requirements for monitoring of emission reductions have been re-established.
2. The monitoring officer and the head of operations of the hydropower station will both sign a statement declaring the emergency situation to have ended and normal operations to have resumed.

|   |
|---|
| <b>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)</b> |
|---|

**Date of completion of the baseline study and monitoring methodology:** 15/12/2011

**Responsible entity of the development of the baseline study:**

**Zero Emissions Technologies, S.A.**

Campus Palmas Altas  
C/ Energía Solar, 1  
41014 Sevilla  
Spain

Contact details:

Antonio Marín Écija  
[zeroemissions@abengoa.com](mailto:zeroemissions@abengoa.com)

This entity is different from the Managing Entity.



Annex 1

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

|                  |  |
|------------------|--|
| Organization:    |  |
| Street/P.O.Box:  |  |
| Building:        |  |
| City:            |  |
| State/Region:    |  |
| Postfix/ZIP:     |  |
| Country:         |  |
| Telephone:       |  |
| FAX:             |  |
| E-Mail:          |  |
| URL:             |  |
| Represented by:  |  |
| Title:           |  |
| Salutation:      |  |
| Last Name:       |  |
| Middle Name:     |  |
| First Name:      |  |
| Department:      |  |
| Mobile:          |  |
| Direct FAX:      |  |
| Direct tel:      |  |
| Personal E-Mail: |  |



**Annex 2**

**INFORMATION REGARDING PUBLIC FUNDING**

This information is provided in section A.4.5 of the PoA-DD.





Annex 3

**BASELINE INFORMATION**

Data and information used for the calculation of the grid emission factor.



**Annex 4**

**MONITORING INFORMATION**

Information related with monitoring in the PoA is provided in section A.4.4.2