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

CONTENTS

Annexes

NOTE:

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

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

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

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

Programme of Activities (PoA) for Sustainable Renewable Energy Power Generation in Papua New Guinea (PNG)
Version: 1.7
Date: 22 November 2012

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

1. General operating and implementing framework of PoA

The 'Programme of Activities (PoA) for Sustainable Renewable Energy Power Generation in Papua New Guinea (PNG)' later on referred to as 'PoA', envisages to assist development of all small-scale renewable energy power plants (including wind[1]/ solar[2] /hydro/geothermal/tidal/wave/renewable biomass/biomass gasification) across Papua New Guinea (PNG). Each small-scale CDM Program Activity (referred later on as CPA) under this PoA will comprise one or more such renewable energy power plants (with similar technology) and will have a combined installed capacity of no more than 15 MW_e - the threshold for small-scale CDM projects. The PoA is a voluntary action being coordinated and managed by PNG Power Ltd (referred later on as the coordinating and managing entity or PPL), the coordinating and managing entity. PPL will also work closely with other developers of the renewable energy power plants (including wind (On shore / off shore) /solar (PV / Thermal) / hydro / geothermal / tidal / wave / renewable biomass / biomass gasification) and other organizations[3] active in the renewable energy sector in PNG to facilitate the development of new renewable energy power plants / expansion of renewable energy power plants or retrofit of power plant or replacement of a power plant and their inclusion in this PoA.

2. Policy/measure or stated goal of the PoA

The penetration of the supply of electric power to the population of Papua New Guinea is very limited. The national electrification rate in PNG is less than 10%. Approximately 90% of the population of PNG live in highly dispersed and culturally diverse rural settlements that are isolated from each other by rugged topography. There is presently no national grid system in PNG, although there are three regional level electricity distribution systems serving Port Moresby, Lae-Madang-Highlands areas and Gazelle Peninsula respectively[4]. The information regarding the centres served by these electricity systems and their installed capacity has been provided in Appendix 2. The remainder areas not served by these systems are served by smaller mini-grids. Smaller mini- grids mainly powered by diesel generators[5] are

[1] Includes wind diesel hybrid electricity generating systems

[2] Solar technologies means solar photovoltaic, solar thermal and solar diesel hybrid electricity generation including solar roof top or other solar household systems in this PoA

[3], Private Developers

[4] http://www.pngpower.com.pg/index.php/2012-01-10-06-42-16/information-on-regional-grids-in-png

[5] Except for the Kimbe system which is supplied by the Ru Creek Mini hydro system and the Bialla system is supplied by Lake Hargy mini hydro scheme (http://www.pngpower.com.pg/index.php/2012-01-10-06-42-16/information-on-regional-grids-in-png)

located around other populated areas (including provincial centres) and industrial sites. While PNG has adequate renewable energy but much of the resources are in remote locations with limited demand, and are not readily exploitable. The Geothermal Energy Association estimates PNG's geothermal potential at 21.92 terawatt-hours. Installed geothermal capacity in 2010 is 56 MW[6].

The hydropower resources (around 15,000 MW) currently, constitute for less than 2% (220 MW) of the technical potential. [7].Even though there is no systematic estimates of wind energy resources the best potentials were assessed in portions of Central, Western, Milne Bay and New Ireland provinces, and the Port Moresby area. Solar energy is among the largest potential sources in PNG. Average insolation in much of the country is 400–800 W/m2, with 4.5 to 8 sunshine hours a day[8].. The main practical biomass energy potential is in areas such as logging and agricultural production, using either the crop output or residues.

In PNG, several coastal and inland areas have wave energy and tidal potential although there is limited knowledge of its potential. One of the main reasons for this is lack of commercially viable proven technologies currently[9]

The development and distribution of power from these resources is difficult due to the low population densities, the rugged topography and low ability to pay. Electricity systems that do exist are isolated and clustered around the main population (provincial) centres. Small provincial and district centres have traditionally relied on diesel generation due to availability of fuel and known technology.[10].

The objective of the PoA is to support development and implementation of small renewable energy projects in PNG in order to improve power supply to provinces through less GHG intensive sources as compared to fossil fuel. Currently, there are no mandatory regulations or policies within the host country to generate electricity using renewable energy resources[11].

The 'Programme of Activities (PoA) for Sustainable Renewable Energy Power Generation in Papua New Guinea (PNG) contributes to the sustainable development of PNG and is in line with the goals and objectives of the 'Papua New Guinea Vision 2050[12]' and Papua New Guinea Development Strategic Plan (2010-2030)[13] which includes:

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[6] http://www.reeep.org/index.php?id=9353&text=policy&special=viewitem&cid=71

[7] Asian Development Bank TA 4932 - PNG: Power Sector Development Plan, Final Report, April 2009, Page 3.

[8] Pacific Regional Energy Assessment 2004 – Papua New Guinea National Report, http://www.sprep.org/att/publication/000487_PIREP_PNG_NatRept.pdf

[9] http://www.reeep.org/index.php?id=9353&text=policy&special=viewitem&cid=71

[10] Papua New Guinea: Preparing the Town Electrification Project, Initial Environmental Examination Report-Divune Hydropower Plant, May 2010. http://www.adb.org/Documents/IEES/PNG/41504/41504-02-png-iee-02.pdf

[11] Declaration by PNG Power Ltd submitted to DoE.

[12] Papua New Guinea VISION 2050, National Strategic Plan Taskforce, Government of Papua New Guinea, November 2009

[13] Papua New Guinea Development Strategic Plan (2010-2030), Department of National Planning and Monitoring, Government of Papua New Guinea, March 2010

- Human Capital Development, Gender, Youth and People Empowerment
- Wealth Creation
- Institutional Development and Service Delivery
- Environmental Sustainability and Climate Change
- Spiritual, Cultural and Community Development

3. One of the core objectives of the Development Strategic Plan includes 'Environment and Climate Change" which states that development plans in PNG will be pursued with consideration to environmental issues such that the health of the environment will not be compromised. Strategies under the extractive sectors as well as energy sectors are designed to be pursued with clear consideration for environmental sustainability as well as addressing the issues of climate change in ways that best suit PNG's developmental needs. Confirmation that the proposed PoA is a voluntary action by the coordinating/managing entity.

The proposed PoA is a voluntary action by PNG Power Ltd (PPL).

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

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) Project participants(*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant
Independent State of Papua New Guinea*	PNG Power Ltd (PPL) (Public)*	*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):

Independent State of Papua New Guinea

A.4.1.2. Physical/ Geographical boundary:

The geographical boundary for the PoA is Papua New Guinea.. The coordinate range of PNG is 0.00º to 14.00º latitude and longitude 141.00º to 160.00º.

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:

A typical CPA under this PoA comprises of one or more renewable energy power plants (including wind/solar/hydro/geothermal/tidal/wave/renewable biomass), but with similar technology and with an installed capacity not exceeding 15MW.

Each CPA under this PoA will include renewable electricity generation utilizing one of the following technologies:

a) Wind energy - Wind power is produced by using wind generators/turbines to harness the kinetic energy of wind. Wind turbines convert the kinetic energy in the wind into mechanical power. This in turn is converted into electricity using generators. This also includes wind diesel hybrid electricity generating systems, wind roof top system or other wind household system.

b) Solar - Solar power is the conversion of sunlight into electricity, either directly using photovoltaics (PV), or indirectly using thermal cycle. Solar thermal projects may be based on concentrated solar power systems use lenses or mirrors and tracking systems to focus a large area of sunlight into a small beam. Photovoltaic convert light into electric current using the photoelectric effect. This also includes solar diesel hybrid electricity generation including solar roof top or other solar household systems.

c) Hydropower - Hydropower or water power is power derived from the energy of falling water which is used for generating energy. Hydropower, or hydroelectricity, is electricity generated by the force of moving water in the penstock of a hydropower unit. Turbines are used to capture the

kinetic energy of water by converting it to electricity as the falling water spins the turbine. Hydropower plants may be located below reservoirs or built in rivers (called "run-of-the-river" units) with no water storage capacity. Broad categories include

i. Conventional hydroelectric, referring to hydroelectric dams.
ii. Run-of-the-river hydroelectricity, which captures the kinetic energy in rivers or streams, without the use of dams.
iii. Small hydro projects are 10 megawatts or less and often have no artificial reservoirs.
iv. Micro hydro projects provide a few kilowatts to a few hundred kilowatts to isolated homes, villages, or small industries.
v. Pumped-storage hydroelectricity stores water pumped during periods of low demand to be released for generation when demand is high

d) Geothermal energy – Geothermal energy is defined as heat from the Earth. It is a clean, renewable resource that provides energy. To generate electricity from geothermal resources, wells are drilled into a geothermal reservoir. The wells bring the geothermal water to the surface, where its heat energy is converted into electricity at a geothermal power plant. There are four commercial types of geothermal power plants: a. flash power plants, b. dry steam power plants, c. binary power plants, and d. flash/binary combined power plants.

e) Tidal – Tidal power, also called tidal energy, is a form of hydropower that converts the energy of tides into useful forms of power - mainly electricity. Although not yet widely used, tidal power has potential for future electricity generation. A tidal generator converts the energy of tidal flows into electricity. Greater tidal variation and higher tidal current velocities can dramatically increase the potential of a site for tidal electricity generation.

f) Wave - Wave power is the transport of energy by ocean surface waves, and the capture of that energy is to do useful work – for example, electricity generation, water desalination, or the pumping of water (into reservoirs). Machinery able to exploit wave power is generally known as a wave energy converter (WEC). Wave-power generation is not currently a widely employed commercial technology.

g) Renewable biomass (mainly following Rankine Cycle) - The term biomass encompasses a large variety of materials, including wood from various sources, agricultural residues, and animal and human waste and is classifies ad renewable energy source. Biomass can be converted into electric power through several methods (mainly following Rankine Cycle). The most common is direct combustion of biomass material, such as agricultural waste or woody materials. Different methods work best with different types of biomass. Typically, woody biomass such as wood chips, pellets, and sawdust are combusted or gasified to generate electricity. Compared to many other renewable energy options, biomass has the advantage of dispatchability, meaning it is controllable and available when needed, similar to fossil fuel electric generation systems.

h) Biomass Gasification – Gasification is a process that converts organic or fossil based carbonaceous materials into carbon monoxide, hydrogen and carbon dioxide. This is achieved by reacting the material at high temperatures (>700 °C), without combustion, with a controlled amount of oxygen and/or steam. The resulting gas mixture is called syngas (from synthesis gas or synthetic gas) or producer

gas and is used as fuel for energy generation purposes. . The power derived from gasification and combustion of the resultant gas is considered to be a source of renewable energy. Gasification Technology is widely used to generate electricity.

All the technologies described above could either be grid connected, connected to mini grid, individual users or off-grid.
The renewable energy plants are either

a) (Greenfield) and/or
b) involves capacity addition and/or
c) retrofit /replacement of existing plant

by one or more project owners and generate electricity. The renewable energy power generation technology employed in each CPA may differ from one CPA to the next, although each CPA will in general consist of components using similar technology (e.g only wind power, only hydro power, etc). For each component of the CPA a specific methodology will be used however the CPA may use a single or a combination of the methodologies (AMS I.A, AMS I.D and AMS I.F) i.e. the combinations of methodologies listed in this PoA may vary CPA wise as well as technology wise[14].

The CPA's will displace electricity from an electricity distribution system that is or would have been supplied by at least one fossil fuel fired generating unit i.e., in the absence of the project activity, the users would have been supplied electricity from one or more sources listed below:

- Electricity generation in national/regional grid
- Import of electricity from grid and/or captive fossil fuel electricity generation at the user end
- Electricity generation in mini grid system where in the baseline all generators use exclusively fuel oil and/or diesel fuel
- For off grid, fuel consumption of the technology in use or that would have been used in the absence of the project activity to generate the equivalent quantity of energy

Each CPA-DD will provide the detailed specification on the type of technology and measure employed in particular project or particular component of the CPA, as applicable.

The implementation of PoA could require technology transfer from an Annex-I country or non Annex-1 country depending on the type of the renewable energy CPA being implemented under the PoA.

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

The eligibility criteria for inclusion of a CPA in the PoA is being guided by the "Standard for demonstration of additionality, development of eligibility criteria and application of multiple methodologies for programme of activities", version 01, EB 65, Annex 3.

The CPA to be included in the proposed PoA shall meet the eligibility criteria as defined in the table below.

[14] Refer clarification to SCC 621

Table 1 CPA Eligibility Criterion

Sr. No	Eligibility Criteria	Para no[15]	Justification (at least one of the listed items unless specified)
1	The CPA shall either be a new renewable energy power plant that (a) install a new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity (Greenfield plant); (b) involve a capacity addition, (c) involve a retrofit of (an) existing plant(s); or (d) involve a replacement of (an) existing plant(s) OR a renewable energy plant under expansion or retrofit.	-	The following documents shall be provided ☐ Feasibility Study Report of the CPA that describes the CPA technology/ technologies, users of electricity generated and also the existing site/scenario, in case expansion or retrofit.
2	The CPA shall include only renewable power plants which utilize a single technology – wind, solar, hydro, geothermal, tidal, wave, renewable biomass and biomass gasification.	14c	The following documents shall be provided ☐ Feasibility Study Report of the CPA that describes the CPA technology or technologies involved
3	The CPA shall be located within the geographical boundary of Papua New Guinea	14a	At least one of the following documents shall be provided ☐ Business license of the CPA Implementer issued by PNG authorities. ☐ Declaration from the CPA implementer confirm that the boundary of the implemented CPA is within the geographical territory of PNG and including information regarding geographic reference (latitude and longitude), name and address of the SSC-CPA. ☐ Location of the project (s) on map with geographical coordinate's e.g Google maps or other appropriate maps.

[15] This column refers to paragraph of "Standard for demonstration of additionality, development of eligibility criteria and application of multiple methodologies for programme of activities", version 01, EB 65, Annex 3.

Sr. No	Eligibility Criteria	Para no[15]	Justification (at least one of the listed items unless specified)
			☐ Feasibility Study Report of the CPA
4	The CPA shall meet the applicability requirements of all the relevant CDM methodologies - AMS I.F. version 02 EB 61, AMS I.D version 17 EB 60, AMS I.A. version 14 EB 54 - as determined in section E.1 for the technologies included in the CPA.	14e	The following document shall be provided ☐ The CPA implementer will provide the necessary documents as per application of the relevant methodology as defined in the section E.2 below.
5	The CPA shall have an installed capacity of $\leq$ 15 MWe[16]	14k	One of the following documents shall be provided ☐ Feasibility Study Report of the CPA describing the CPA technology, capacity, location, etc. ☐ Award of contract to equipment provider for the CPA detailing technology, capacity, etc. ☐ Purchase order placed for key project related equipment (like generator) determining the project capacity.
6	Component (sub-project)of the CPA shall supply the renewable electricity generated to : Option 1 - The relevant and clearly identified electricity distribution system - national/regional/mini grid. OR Option 2 - Individual households/users or groups of households/users included in the project boundary of the CPA	14 i/14 c	For component (project) included in the CPA one of the two options shall be followed: ☐ For Option 1, confirm that a component of the CPA meets all the applicability conditions for AMS I.D version 17/AMS I.F version 02 ☐ For Option 2, confirm that a component of theCPA meets all the applicability conditions for AMS I.A version 14. For the individual households/users or groups of households/users included in the project boundary of CPA the baseline would be decided at the respective CPA level depending on the appropriate methodology. For confirming eligibility under Option 1 one of the following documents shall be provided:

[16] If a unit has both renewable and non-renewable components (e.g. a wind/diesel unit), the 15 MW applies only to the renewable component.

Sr. No	Eligibility Criteria	Para no[15]	Justification (at least one of the listed items unless specified)
			☐ Details on name and type of grid (national/regional/mini) system to which the electricity generated in the CPA shall be supplied should be provided in each CPA-DD. ☐ Power purchase agreement with the grid company (if available at the time of inclusion). The grid type and structure shall be justified by one of the following: ☐ Certificate by utility company clarifying the type of grid. ☐ Officially published data ☐ Published literature / journal/articles/ reliable websites For confirming eligibility under Option 2 the following documents shall be provided: ☐ Feasibility Study Report of the CPA that describes the CPA technology, users of electricity generated and also the existing site/scenario, in case expansion or retrofit. ☐ Govt. Approvals or approval from local authorities or any other related documents
7	The CPA shall in case of hydro power plants, not result in the construction of new reservoirs or in an increase in the capacity of existing reservoirs where the power density of the power plant is less than 4 W/m^2.	-	This criterion is only applicable for CPA's involving hydro power plants with reservoirs. The following documents shall be provided: ☐ Feasibility Study Report and/or other document for CPA mentioning the surface area of reservoir, technology, etc. Or ☐ Project reports submitted to Govt. authorities for approval. and ☐ Calculation of power density described

Sr. No	Eligibility Criteria	Para no[15]	Justification (at least one of the listed items unless specified)
			in the SSC-CPA-DD.
8	The CPA shall in case of biomass power plants; no other biomass other than renewable biomass is used in the project plant.	-	This criterion is only applicable for CPA's involving biomass power plant. The following documents shall be provided ☐ Declaration from CPA implementer on the types of biomass that will be utilized in the CPA. ☐ The biomass type (renewable /non renewable) shall be confirmed based on Biomass assessment survey[17] carried out for the region and 'Definition of renewable biomass' EB 23, Annex 18'.
9	The CPA shall in the case of project activities that involve capacity addition of renewable energy generation units at an existing renewable power generation facility; the added capacity of the units added by the project is lower than 15 MW and should be physically distinct from the existing units.	-	One of the following documents shall be provided: ☐ Feasibility Study Report of the CPA that describes the CPA technology/ technologies/ project capacities etc. ☐ Power purchase agreement with the grid company. ☐ Applicable Govt. approval and clearances (if applicable)
10	In the case of retrofit or replacement, to qualify as a small-scale project, the total output of the retrofitted or replacement unit is not exceeding the limit of 15 MW.	-	This criterion is only applicable for CPA's involving retrofit or replacement. One of the following documents shall be provided: ☐ Power purchase agreement with the grid company. ☐ Feasibility Study Report of the CPA that describes the CPA technology/ technologies/ project capacities etc. ☐ Applicable Govt. approval and clearances (if applicable)
11	If the unit added has both renewable and non-renewable components, the eligibility limit of 15 MW for a small-scale CDM project activity applies only to the renewable component. If the unit added co-fires fossil fuel, the capacity of the	-	This criterion is only applicable for CPA's involving capacity addition/expansion. The following document shall be provided ☐ Feasibility Study Report of the CPA that

[17] Also refer 'General Guidance on Leakage in biomass project activities (Attachment C to Appendix B of 4/CMP.1 Annex II)'

Sr. No	Eligibility Criteria	Para no[15]	Justification (at least one of the listed items unless specified)
	entire unit shall not exceed the limit of 15 MW.		describes the CPA technology/ technologies/ project capacities etc. ☐ Applicable Govt. approval and clearances (if applicable)
12	The CPA shall demonstrate additionality by meeting at least one of the criteria (criteria a – h) listed below :	14 f	
a)	The project activity involves technologies which are listed under the positive list of grid-connected/off grid renewable electricity generation technologies of Guidelines on the demonstration of additionality of small scale project activities (version 09, EB 68) and thus the project activity is considered automatically additional. The grid connected technologies currently listed under positive list are: A. (i) Solar technologies (solar and solar thermal electricity generation) (ii) Off-shore wind technologies (iii) Marine technologies (wave, tidal) (iv) Building-integrated wind turbines or household rooftop wind turbines of a size up to 100 kW B. The following off-grid electricity generation technologies where the individual units do not exceed the thresholds indicated in parentheses with the aggregate project installed capacity not exceeding the 15 MW threshold are considered automatically additional : (v) Micro/pico-hydro (with power plant size up to 100 kW); (vi) Micro/pico-wind turbine (up to 100 kW); (vii) PV-wind hybrid (up to 100 kW); (viii) Geothermal (up to 200 kW); (ix) Biomass gasification/biogas (up to 100 kW) C. Project activities solely composed of isolated units where the users of the technology/measure are households or communities or Small and Medium Enterprises (SMEs) and where the size of each unit is no larger than 5% of the small-scale CDM thresholds.	14k	The technology type used under the CPA can be confirmed from one of the following documents ☐ Feasibility Study Report of the CPA that describes the CPA technology, users of electricity generated and also the existing scenario, in case expansion or retrofit. ☐ Government approvals/clearances obtained for the projects under the CPA ☐ Award of contract to equipment provider (or Purchase order) for the CPA detailing technology, capacity, etc.

Sr. No	Eligibility Criteria	Para no[15]	Justification (at least one of the listed items unless specified)
b)	As per 'Guidelines for Demonstrating Additionality of Microscale Project Activities'(Version 04)' Project activities up to five megawatts that employ renewable energy technology are additional if - The geographic location of the project activity is in one of the least developed countries or the small island developing States (LDCs/SIDS) or in a special underdeveloped zone (SUZ) of the host country.	14k	According to the United Nations, PNG is classified as Small Island Developing State (SIDS)[18]. One of the following documents shall be provided to demonstrate that the project activity will have installed capacity up to 5 MW: ☐ Feasibility Study Report of the CPA that describes the CPA technology, users of electricity generated and also the existing scenario, in case expansion or retrofit. ☐ Government approvals/clearances obtained for the projects under the CPA ☐ Award of contract to equipment provider (or Purchase order) for the CPA detailing technology, capacity, etc.
c)	As per 'Guidelines for Demonstrating Additionality of Microscale Project Activities'(Version 04)' The project activity employs specific renewable energy technologies/measures recommended by the host country designated national authority (DNA) and approved by the Board to be additional in the host country.	-	In case this criteria is applicable, the following document shall be provided: ☐ Relevant approval from the CDM EB board for specific renewable energy technologies/measures recommended by the host country designated national authority (DNA).
d)	As per the Guidelines on the demonstration of additionality of small scale project activities (version 09, EB 68) Investment barrier: a financially more viable alternative to the project activity would have led to higher emissions	-	One or more of the following information, shall be provided in the CPA-DD to demonstrate the CPA faces investment barrier: ☐ The Project IRR for component/subproject of the CPA ☐ The project IRR is lower than applicable benchmark of the component/subproject of the CPA ☐ All the key parameters for calculating Project IRR along with benchmark adhere to

[18] http://www.un.org/special-rep/ohrlls/sid/list.htm

Sr. No	Eligibility Criteria	Para no[15]	Justification (at least one of the listed items unless specified)
			criteria listed in Appendix 5. CPA implementer will provide calculation spreadsheet wherein all the calculation algorithm and formula can be followed. The spread sheet will not be a protected sheet.
e)	As per the Non-binding best practice examples to demonstrate additionality for SSC project activities (EB 35 – Annex 34) Access-to-finance barrier- The project activity could not access appropriate capital without consideration of the CDM revenue.	-	One of the following documents shall be provided to demonstrate the access-to finance barrier to component of the CPA. . ☐ Statement from at least two financing banks that the revenue from the CDM is critical in the approval of the loan. ☐ Loan agreement demonstrating that the investment is done by a company which also purchases the CERs. ☐ Loan agreement demonstrating that a significant part of the project investment is provided upfront by a company as a pre-payment for expected CERs. ☐ Government / Bank / Development finance institute report indicating difficulty in access to finance or another document that is considered to be an appropriate evidence by the DOE
f)	As per the Guidelines on the demonstration of additionality of small scale project activities (version 09, EB 68) Technological barrier: a less technologically advanced alternative to the project activity involves lower risks due to the performance uncertainty or low market share of the new technology adopted for the project activity and so would have led to higher emissions.	-	One of the following documents shall be provided to demonstrate the technology barrier. . ☐ Analysis or assessment reports or other suitable evidence from relevant agency demonstrating non-availability of human capacity to operate and maintain the technology. ☐ Analysis or assessment reports or other suitable evidence from relevant agency demonstrating uunavailability of the technology and high level of technology risk.

Sr. No	Eligibility Criteria	Para no[15]	Justification (at least one of the listed items unless specified)
g)	As per the Guidelines on the demonstration of additionality of small scale project activities (version 09, EB 68) Barrier due to prevailing practice: prevailing practice or existing regulatory or policy requirements would have led to implementation of a technology with higher emissions.	-	One of the following options shall be followed to demonstrate the prevailing practice barrier. Option 1 ☐ Letter/report or other suitable evidence from relevant agency demonstrating a history of non- implementation of the technology/measures over a long time period. Option 2 ☐ Demonstrate that component of the CPA is not a common practice as per 'Guidelines on Common Practice' version 02, EB 69, Annex 08. The following criteria shall be met - The factor F ((penetration rate of the measure/technology) is greater than 0.2 and N_{all}[19] -N_{diff}[20] is greater than 3.
h)	Component of the CPA is a 'First of it's kind' project in the geographical area.	-	☐ Justification that the project is a 'First-of-its-kind' in the applicable geographical area, based on publicly available information and/or confirmation from government departments/ industry association/ international association on market penetration of technology ,, in accordance with criteria's mentioned in paragraph 5a,5b and 5c of 'Guidelines of First-of - its- kind project activities', EB 69, version 02. The criteria's are listed below: ☐ The project is the first in the applicable geographical area that applies a technology that is different from technologies that are implemented by any other project, which are able to deliver the same output and have

[19] Similar projects that are neither registered CDM project activities, project activities submitted for registration, nor project activities undergoing validation

[20] Similar projects that apply technologies that are different to the technology applied in the proposed project activity

Sr. No	Eligibility Criteria	Para no[15]	Justification (at least one of the listed items unless specified)
			started commercial operation in the applicable geographical area before the project design document (CDM-PDD) is published for global stakeholder consultation or before the start date of the proposed project activity, whichever is earlier; ☐ The project implements one or more of the measures; ☐ The project participants selected a crediting period for the project activity that is "a maximum of 10 years with no option of renewal".
13	Implement a record keeping system and a procedure to avoid double accounting as described in A 4.4.1 (ii) of PoA-DD	14 b	☐Confirmation that recording keeping system is in place (with GPS coordinates etc) and the CPA does not lead to double accounting of emission reductions.
14	The CPA shall establish procedures for De-bundling check for the CPAs as described in A 4.4.1 (iii)	14l	The following should be done ☐Confirmation that the SSC-CPA is not a de-bundled component of another SSC-CPA or CDM project activity as per guidance provided in section A.4.4.1 below or ☐Declaration from the CPA Implementer confirming that the CPA is not a de-bundled component of another CPA or CDM project activity as per latest guidance given by the CDM Executive Board
15	The CPA shall develop provisions to ensure that those operating the CPA are aware of and have agreed that their activity is being subscribed to the PoA as described in A 4.4.1 (iv)		☐Declaration from the CPA implementer that it is aware and has agreed that their activity is being subscribed to the PoA.
16	The CPA shall have a start date after the commencement of PoA validation, which is 12 July 2011.	14 d	One of the following documents shall be provided ☐Earliest date of award of contract to equipment supplier/contractor for the CPA ☐ Earliest purchase order placed for the project

Sr. No	Eligibility Criteria	Para no[15]	Justification (at least one of the listed items unless specified)
			☐Earliest construction contract for the project. ☐ If the project is at early stage (i.e. none of the above or other similar documents reflecting real action is available have been issued) undertaking from the CPA implementer that the start date of the CPA is after 12/07/2011.
17	Conduct local stakeholder consultation at CPA level and environmental analysis as required by the Host country regulations.	14 g	The following document shall be provided: ☐ Meeting minutes of the stakeholder consultation ☐ Photographs of the stakeholder consultation meeting conducted. ☐ Newspaper advertisement for stakeholder consultation meeting. ☐ Environmental permit or EIA report, only if required as per the Host Country regulations
18	Confirm that funding from Annex I parties, if any, do not result in a diversion of official development assistance.	14h	The following document shall be provided: ☐ Declaration from the CPA Implementer regarding the involvement of public funding or ODA from Annex I Parties Declaration from the CPA implementer. ☐ In case ODA is involved, confirmation from funding agency that this do not result in diversion of ODA. ☐ Confirmation in the SSC-CPA-DD regarding no involvement of public funding or ODA from Annex I Parties.
19	Confirm that the technology will not be substituted within the project period	-	☐Declaration from the CPA implementer that technology will not be substituted within the project period.
20	For CPA's requiring sampling, a sample plan shall be provided in the SSC-CPA-PDD	14j	☐Confirmation that a sampling plan has been included in SSC- CPA-DD in line with Annex 4 of PoA-DD (only where applicable).

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

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

The proposed PoA is a voluntary coordinated action by PPL to support development and implementation of renewable energy projects in PNG in order to improve power supply to rural provinces through renewable and less GHG intensive sources as compared to fossil fuel.

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

As per paragraph 73 of the 47th EB meeting report "additionality" is to be demonstrated either at the PoA level or at CPA level". The project participants choose to demonstrate additionality at the CPA level as per Annex 3 of EB 65. The CPAs under this PoA will consists of small scale and micro scale projects. The decision tree in figure 1 below need to be used for deciding on the option for demonstration of additionality:

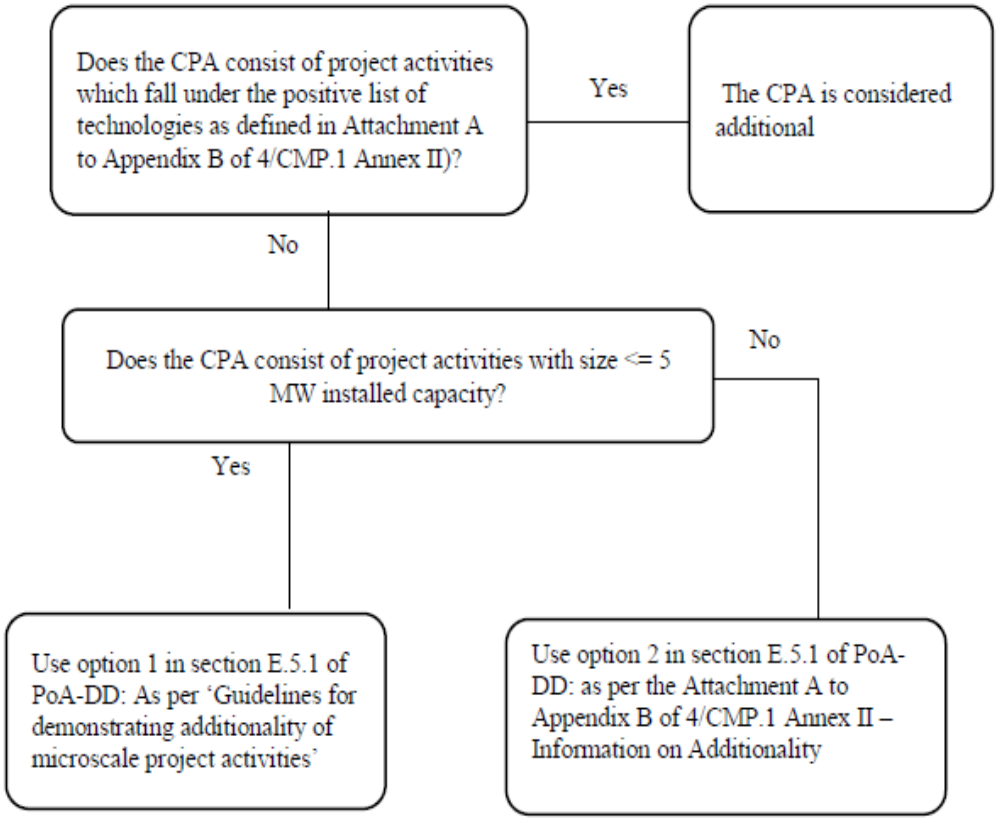

Figure 1 – Decision tree for demonstration of additionality

In case the component project activity involves technology which is listed under the positive list of grid-connected and off grid renewable electricity generation technologies of Guidelines on the demonstration of additionality of small scale project activities (version 09, EB 68), the project activity is considered automatically additional. The technologies currently listed under positive list are:

A) Grid and off grid connected renewable energy generation technologies

a) Solar technologies (solar and solar thermal electricity generation)
b) Off-shore wind technologies
c) Marine technologies (wave, tidal)
d) Building-integrated wind turbines or household rooftop wind turbines of a size up to 100 kW

B) Off-grid electricity generation technologies

The following off-grid electricity generation technologies where the individual units do not exceed the thresholds indicated in parentheses with the aggregate project installed capacity not exceeding the 15 MW threshold:

(i) Micro/pico-hydro (with power plant size up to 100 kW);
(ii) Micro/pico-wind turbine (up to 100 kW);
(iii) PV-wind hybrid (up to 100 kW);

(iv) Geothermal (up to 200 kW);
(v) Biomass gasification/biogas (up to 100 kW);

C) Project activities solely composed of isolated units where the users of the technology/measure are households or communities or Small and Medium Enterprises (SMEs) and where the size of each unit is no larger than 5% of the small-scale CDM thresholds.

In other cases one of the two options is followed.

I. **Demonstration of additionality for projects up to 5 MW installed capacity**

As per the paragraph 2 (a) of the "Guidelines for demonstrating additionality of Micro-scale project activities" EB 68 (version 4), project activities up to 5 megawatts that employ renewable energy as their primary technology are additional if the geographic location of the project activity is in LDCs/SIDs or in a special underdeveloped zone of the host country identified by the Government before 28 May 2010.

According to the United Nations, PNG is classified as Small Island Developing State (SIDS)[21]. Hence under the proposed PoA, renewable energy CPAs having up to 5 MW installed capacity are considered to be additional as per the "Guidelines for demonstrating additionality of Micro-scale project activities" EB 68 (version 4)"

Also as per paragraph 2 (d) of the "Guidelines for demonstrating additionality of Micro-scale project activities" EB 68 (version 4), project activities up to 5 megawatts that employ renewable energy as their primary technology are additional if the project activity employs specific renewable energy technologies/measures recommended by the host country designated national authority (DNA) and approved by the CDM Executive Board to be additional in the host country.

In the case that the host country DNA recommends a specific renewable technology that is approved by the CDM Executive Board to be additional in the host country than under the proposed PoA, renewable energy CPAs having up to 5 MW installed capacity of the recommended technology are considered to be additional.

II. **Demonstration of additionality for projects having more than 5 MW installed capacity**

Further for CPAs in the capacity range of greater than 5-and up to 15MW, the project proponent will follow the current SSC guidelines as per the Guidelines on the demonstration of additionality of small scale project activities (version 09, EB 68).
According to the guidelines, project participants shall provide an explanation to show that the project activity would not have occurred anyway due to at least one of the following barriers:

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

[21] http://www.un.org/special-rep/ohrlls/sid/list.htm

b) Technological barrier: a less technologically advanced alternative to the project activity involves lower risks due to the performance uncertainty or low market share of the new technology adopted for the project activity and so would have led to higher emissions;

c) Barrier due to prevailing practice: prevailing practice or existing regulatory or policy requirements would have led to implementation of a technology with higher emissions;

d) Other barriers: without the project activity, for another specific reason identified by the project participant, such as institutional barriers or limited information, managerial resources, organizational capacity, financial resources, or capacity to absorb new technologies, emissions would have been higher.

The demonstration of above mentioned barriers during CPA inclusion has been further elaborated in section E.5.1 below.

In the case of development of standardized baseline for renewable energy by the host country and approval by the CDM Executive Board, the same shall be utilized for assessment of baseline and demonstration of additionality.

Chronology of Events:

Date	Activity	Type of Evidence
03/04/2010	ADB, Technical Support Facility's mission to explore potential opportunities to develop the proposed small hydro projects supported by the ADB TA (7113-PNG) under CDM Programme of Activities.	Consultant's Back to Office Report (BTOR)
05/08/2010	CDM Prior consideration form submitted to UNFCCC and PNG DNA[22]	Copy of submitted CDM Prior Consideration Form Copy of acknowledgement from DNA, PNG on submitted CDM Prior Consideration Form
20/08/2010	PNG Power Ltd (PNG POWER LTD) Board of Directors pass resolution to develop the small hydro projects under the ADB financed Town Electrification Investment Programme under	PNG Power Ltd Board of Directors resolution.

[22] On 04th May 2011 the Management Committee of PNG Power Ltd decided to expand the scope of the PoA from small hydropower in Papua New Guinea to cover other renewable energy like wind, solar, geothermal, tidal, wave, renewable biomass and biomass gasification. The PoA title was thus revised to 'Programme of Activities (PoA) for Sustainable Renewable Energy Power Generation in Papua New Guinea (PNG)'. The Management Information paper and the PNG Power Ltd Management Committee endorsement for expansion of scope of PoA have been provided to DOE. Relevant clarification requested from UNFCCC (SSC_537, SSC_547 and SSC_621) with regards to the expansion of scope of PoA and use of multiple renewable technologies/methodologies in a CPA has been provided to the DOE.

	CDM Programme of Activities.	
22/09/2010	Heads of Agreement Signed between ADB Future Carbon Fund (FCF) and PNG POWER LTD	Signed Heads of Agreement
04/02/2011	Call for EOI on validating the small hydro PoA	Newspaper advertisements
04/05/2011	Expanding the scope of PoA to cover all RE technologies and using combination of methodologies	Memo submitted by Strategy & Marketing Division, PNG Power to the CEO. Endorsed memo from CEO, PNG Power.
12/07/2011	Start of Global Stakeholder consultation process	UNFCCC website

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

There is no mandatory policy / regulation for implementation of renewable energy sources

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

There is no mandatory policy / regulation for implementation of renewable energy sources

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

A.4.4.1. Operational and management plan:

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

The Coordinating and managing entity PPL will maintain an electronic database of all the CPAs under the PoA which will include the below details:

- Name of the CPA
- Implementing entity of the CPA
- Contact Details of Implementing entity (Address / Contact person /Phone/e-mail/fax)
- Technology of the CPA
- Installed capacity of the CPA

- Location of the CPA (GPS coordinates)
- The record of technical specification of each renewable energy plant participating in the PoA

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

The electronic database described above will also be used to perform a double accounting check. Every new CPA will be compared to the already existing database and the list of project activities that are under validation or registered at the UNFCCC. Further, the project proponents will be made aware of the double accounting principle and will certify that the proposed CPA is not registered or included under the CDM of the UNFCCC. Should such a case occur then the coordinating and managing entity will not proceed with inclusion of the corresponding CPA in the proposed PoA.

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

The De-bundling check for the CPAs will be carried out according to the *Guidelines on Assessment of De-bundling for SSC Project Activities, Version 3,Annex 13,* EB 54, section II: Guidance for Determining the Occurrence of De-bundling under a Programme of Activities (PoA).

According to the guidelines, for the purposes of registration of a Programme of Activities (PoA), 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.

The electronic database described above shall be used to determine that a CPA is not a de-bundled component of another CDM project activity. Every new renewable energy power plant included as a CPA will be compared to the already existing database and the list of project activities under-validation or registered at the UNFCCC. Further, the project proponents will be made aware of the de-bundling rules and will certify that the proposed CPA is not a de-bundled part of a project. Should such a case occur then the coordinating and managing entity would not proceed with inclusion of the corresponding CPA in the proposed PoA.

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

In order to ensure that those operating the CPA are aware of and have agreed that their activity is being subscribed to the PoA, the project implementer of a CPA shall enter into a contractual

arrangement with the PPL, the coordinating and managing entity including respective provisions that:

- The CPA has not been and will not be registered as a single CDM project activity or as a CPA under another PoA.
- The project implementer is aware that the CPA will be subscribed to the present PoA.
- The project implementer subscribed under the PoA shall not undertake another renewable energy project under CDM within one kilometre of the proposed CPA. The de-bundling check as mentioned in (iii) above will be met as per the requirements.
- The project implementer in consultation with the coordinating and managing entity of the present PoA will arrive at an agreement on the rights to claim and own emission reductions..

The project implementer certifies that the CPA is not registered under the Clean Development Mechanism of the UNFCCC. Along with the above an operational and management system has been developed to ensure effective implementation of the programme.[23]

A.4.4.2. Monitoring plan:

Monitoring will be carried out for each individual CPA. For each CPA, all parameters included in section E.7.1 will be monitored by the implementing entity of the CPA according to the procedures and monitoring framework established in section E.7.2 and will be submitted to the coordinating and managing entity (PPL). The managing entity (PPL) will store the data in an electronic database. All primary data with regards to monitoring of individual CPAs will be stored by the respective implementing agencies.

Verification will occur either separately for each CPA or in groups. In any case, data shall be verified for each CPA and the verification status of each CPA will be recorded by the coordinating and managing entity in the database.

For CPA's involving household technologies (e.g solar rooftop, solar household system, etc) where in emission reduction will be calculated based on a sample survey a detailed sampling plan will be provided in the CPA-DD as per the 'Standard for Sampling and surveys for CDM Project Activities and Programme of Activities '- Annex 4, version 03, EB69', 'Guidelines for sampling and surveys for CDM project activities and programme of activities' – Annex 5, version 02, EB 69 and other relevant guidelines/procedure approved by CDM Executive Board. Please refer Appendix 4 below for sampling plan.

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

The "Programme of Activities (PoA) for Sustainable Renewable Energy Power Generation in Papua New Guinea (PNG) will not have any diversion of ODA.

[23] A copy of the management system has been provided to the DOE.

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

B.1. Starting date of the programme of activities:

30/09/2012 or date of Registration of the PoA, whichever occurs later

B.2. Length of the programme of activities:

28 years

SECTION C. Environmental Analysis

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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 ✓

Local and focussed impacts of each renewable energy project (depending on the location, capacity, and type of construction) justify a separate environmental assessment for each CPA. Environmental analysis will therefore be conducted for each renewable energy power plant included in a CPA according to the host country applicable environmental policies.

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

The environmental impacts analysis will be done at CPA level

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

Environmental impact assessments will be conducted for each CPA according to the applicable laws and regulations in PNG at the time of inclusion of CPA in the PoA.

Environmental impact assessment and management in PNG is provided for under the Environment Act of 2000[24] and its accompanying regulatory instruments including the Environment (Prescribed Activities) Regulation, 2002, and the Guideline for Conduct of Environmental Impact Assessment and Preparation of an Environmental Impact Statement, 2004. The Act and regulations are administered by the Department of Environment and Conservation (DEC).

The Environment (Prescribed Activities) Regulation 2002 categorizes projects as:

[24] http://www.dec.gov.pg/legislation.html

- "Prescribed Activities" in two schedules according to the anticipated potential environmental impact. Schedule 1 consists of Level 2 activities that are subdivided into two categories (Category A and B).

- Category B has 13 sub-categories with sub-category 10 addressing Energy Production.

- Item 10.1 in this sub-category includes Operation of renewable energy plants with a capacity of more than 2 MW.

- Projects that have more adverse environmental impact are designated in Schedule 2 as Level 3 Activities.

All renewable energy projects that meet any of these requirements are required to prepare a 'Notification of Preparatory Works' which is submitted to the Department of Environment and Conservation (DEC) who will review the Notification and then advise the level of investigation required.

If the subproject is classified as 2B then an Environmental Application is completed and sent to DEC for review. If it is approved DEC will issue an Environmental Permit which allows work to commence on the site.

The CPA's under the PoA will prepare a 'Notification of Preparatory Works' and will submit to DEC for their review and subsequent advise on level of investigation required. Further, if a CPA is classified as 2B, an Environmental Application for the CPA will be completed and submitted to DEC for approval and issuance of Environmental Permit.

SECTION D. Stakeholders' comments

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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 ✓

The stakeholder consultation process is not required by regulations or laws in PNG. Considering that the CPAs under this PoA will involve implementation of different renewable energy technologies at various locations in PNG, it is considered appropriate to conduct stakeholder consultation at CPA level.

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

This will be addressed at the individual CPA-DD level.

D.3. Summary of the comments received:

This will be addressed at the individual CPA-DD level.

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

This will be addressed at the individual CPA-DD level.

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 following methodologies will be applied individually or in combination within each CPA as well as across several CPAs in a PoA – AMS I.F version 02, EB 61; AMS I.D version 17, EB 60 ; AMS I.A version 14, EB 54. All the 3 methodologies have mutually exclusive applicability conditions with regards to grid connection (mini grid, regional/national grid or no grid connection).

The PoA proposes to use all the methodologies independently and in combination. The PoA will also use number of technologies using these methodologies and their combinations. However, each CPA will be dedicated to one technology type only. E,g

CPA 1 can be wind projects using AMS I D
CPA 2 can be wind projects using AMS I D and AMS I F
CPA 3 can be geothermal project using AMS I D
And so on….

CDM rules for use of multiple methodologies are explained in EB 65 Annex 3[25] 'Standard For Demonstration of Additionality, Development of Eligibility Criteria and Application of Multiple Methodologies for Programme of Activities'. Para 30 of the guideline has indicated that in case of any clarification, the PP can seek clarification from SSC WG / EB. A clarification was sought on this issue (SSC_621) and it was clarified that combinations indicated as above are permitted[26].

It is also concluded that there will be no exchange of energy (electrical/thermal) or mass transfer between different measures of the CPA. Hence, as per EB 68 Annex 3 paragraph 13 no cross effects between methodologies are expected to take place given the combination of methodologies applied under this PoA.

As per Annex 3, EB 65 paragraph 29 the following situations for applying combinations of technologies/measures and/or methodologies are eligible:

Situation	Justification
The same combination of technologies/measures under the same combination of methodologies applied consistently in each and every CPA of a PoA. For example, methane recovered from an anaerobic digester to treat animal manure under AMS-III.D is used for heat generation applying AMS-I.C.	The CPAs under this PoA will involve development of renewable energy power plants using different technologies - wind/ solar /hydro/ geothermal/ tidal/ wave/ renewable biomass/ biomass gasification i,e the technology included in CPA may vary from CPA to CPA. . However the methodology used (single or in

[25] http://cdm.unfccc.int/UserManagement/FileStorage/E6TY7DMI28WGCUV5J0K3LAOHBQ9RFN

[26] http://cdm.unfccc.int/UserManagement/FileStorage/E8BXL24KZN1J6IDOVW39TQ0PFCU5HA

	combination) will vary depending on the type of project (each component) included in the CPA. e.g one CPA may consist of hydro power projects only supplying to regional grid and hence following AMS I.D However the second hydropower CPA may consist of geothermal power projects supplying to regional grid or mini grid thereby following the combination of AMS I.D and AMS I.F[27]. All the above conditions are as per existing rules and have been clarified in SSC_621,
A single methodology is consistently applied in each CPA of a PoA but using multiple technologies/measures. For example, different waste water treatment technologies can be applied across CPAs of one PoA, using AMS-III.H;	PP has clarified above issue with the SSC WG under clarification number SSC_621 as indicated in Para 30 of the standard. Furthermore combination of AMS I A, AMS I D and AMS I F is also permitted under para 16 F of General Guidelines for SSC CDM Methodologies (Version 19). EB 69 Annex 27.
A principle technology/measure is applied consistently in each CPA using multiple combinations of methodologies. For example, waste water treatment projects with different ways of utilizing recovered methane (AMS-I.C for heat, AMS-I.D and AMS-I.F for electricity, or both), biomass/biogas projects with different fuel displacement (AMS-I.C and AMS-I.I for fossil fuel, AMS-I.E for non-renewable biomass, or both)	The PoA aims to assist development of different renewable technologies including wind (on shore / off shore) / solar (thermal / Photovoltic) / hydro/geothermal/tidal/wave/ renewable biomass (mainly Rankine cycle based) /biomass gasification. However, in each CPA the principle technology will be only one. It can only be Wind or only Solar or only Geothermal etc. Hence, this situation is applicable.
Combinations of technologies/measures and methodologies vary across CPAs of a PoA, i.e. the policy or goal can only be realized through the use of multiple and disparate methodologies. Therefore in such situations the CME shall demonstrate that the implementation of the activities is integrated through the design of the programme. This may include, for example, a range of activities within different sectors such as energy generation (e.g. wind electricity using AMS-I.D, solar water	The PoA aims to assist development of all small-scale renewable energy power plants (including wind/solar/hydro/geothermal/tidal/wave/renewable biomass/ biomass gasification) across Papua New Guinea (PNG). The CME, PNG Power Limited (PPL), is a fully integrated power authority and it is responsible for the generation, transmission, distribution and retailing of electricity throughout PNG and servicing individual electricity consumers.

[27] The combination of following methodologies – AMS I.A, AMS I.D and AMS I.F has been approved at EB67. Please refer EB 69 Annex 27 paragraph 16 f.
http://cdm.unfccc.int/UserManagement/FileStorage/NCLGIQTKVB3856UZP4O1AMDRF90XW7

Also refer to SSC_621 http://cdm.unfccc.int/methodologies/SSCmethodologies/clarifications/59531

heaters using AMS-I.J), energy efficiency (e.g. efficient lighting using AMS-II.J, building energy efficiency using AMS-III.AE, efficient street lighting using AMS-II.L), water management (e.g. efficient irrigation), waste management (e.g. landfill gas recovery using AMS-III.G, composting using AMS-III.F, recycling using AMS-III.AJ), transport (e.g. using AMS-III.C) and agriculture (using AMS-III.D for manure management).	The CME aims to work closely with other developers of the renewable energy power plants (including wind/solar/hydro/geothermal/tidal/wave/renewable biomass/ biomass gasification) to facilitate development of renewable energy in PNG. Each CPA under this PoA will develop a renewable technology individually (e.g. only hydro or only wind). Hence each CPA under this PoA will use one or a combination of the following three approved small scale methodologies- AMS I.A, AMS I.D and AMS I.F[28] depending on the types of projects (of a particular technology) included in a CPA. Thus it can be concluded that this situation is applicable to the PoA.

Each individual component of a CPA under the PoA will fall under one of the five types discussed below. The methodology selection will be carried out based on the table below:

	CPA Type[29]	AMS-I.A	AMS-I.D	AMS-I.F
1	CPA involves project(s) that supplies electricity to a national/regional grid		√	
2	CPA involves project(s) that displaces grid electricity consumption (e.g. grid import) and/or captive fossil fuel electricity generation at the user end (excess electricity may be supplied to a grid)			√
3	CPA involves project(s) that supplies electricity to an identified consumer facility via national/regional grid (through a contractual arrangement such as wheeling)		√	
4	CPA involves project(s) that supplies electricity to a mini grid[30] system where in the baseline all generators use exclusively fuel oil and/or diesel fuel			√
5	CPA involves project(s) that supplies electricity to household users (included in the project boundary) located in off grid areas	√		

Name of approved baseline and monitoring methodology:

AMS I.F. 'Renewable electricity generation for captive use and mini-grid'(I.F/version 02, Sectoral scope:01, EB 61).

[28] Response to clarification SSC_621

[29] For Greenfield project the provisions under AMS I.A will be followed to calculate the baseline emissions

[30] The sum of installed capacities of all generators connected to the mini-grid is equal to or less than 15 MW.

AMS I.D. 'Grid connected renewable electricity generation' (I.D/version 17, Sectoral scope:01, EB 60).

AMS I.A. 'Electricity generation by the user' (I.A/version 14, Sectoral scope:01, EB 54).

Considering that the PoA involves various renewable technologies with different grid scenario the methodologies listed above will be applied in combinations in individual CPAs as well as across several CPAs included in this PoA. For example:

- CPA 1 consisting of hydro power projects which supply electricity to regional grid applies AMS I.D
- CPA 2, consisting of wind power projects with certain projects supplying electricity to off grid households/SMEs and certain to grid, applies AMS I.A + AMS I.D
- CPA 3, consisting of hydro power projects with certain projects supplying electricity to off grid households/SMEs, certain projects supplying electricity to regional grid and others to mini- grid, applies AMS I.A + AMS I.D + AMS I.F.

A list of combination of RE technologies and methodologies that is covered under this PoA has been provided in Appendix 1.

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

For CPA's following AMS I.F. 'Renewable electricity generation for captive use and mini- grid (I.F/version 02, Sectoral scope:01, EB 61).

Para No	Applicability Criteria as per AMS I.F. ver 02	Project Scenario
1	This methodology comprises renewable energy generation units, such as Photovoltaic, hydro, tidal/wave, wind, geothermal and renewable biomass that supply electricity to user(s).	A typical CPA will comprise of a renewable energy generation unit/s that supplies electricity to the users.
2	The project activity will displace electricity from an electricity distribution system that is or would have been supplied by at least one fossil fuel fired generating unit i.e., in the absence of the project activity, the users would have been supplied electricity from one or more sources listed below: a) A national or a regional grid (grid hereafter); b) Fossil fuel fired captive power plant; c) A carbon intensive mini-grid.	The CPA will displace electricity from an electricity distribution system that is an existing mini grid or would have been supplied by at least one diesel or fossil fuel fired generating unit. In the absence of the CPA, the users would have been supplied electricity from a carbon intensive (fossil fuel based) mini-grid.
3	For the purpose of this methodology, a mini-grid is defined as small-scale power system with a total capacity not exceeding 15 MW (i.e., the sum of installed capacities of all generators connected to the mini-grid is equal to or less than 15 MW)	Under a typical CPA, the respective mini-grid would not be connected to a national or regional grid and the sum of

	which is not connected to a national or a regional grid.	installed capacities of all generators connected to the mini-grid would be equal to or less than 15 MW
4	Illustration of respective situations under which each of the methodology (AMS-I.D, AMS-I.F and AMS-I.A) applies is included in Table 2.	A typical CPA under this PoA will be eligible under one of the appropriate situation described in Table 2.
5	Hydro power plants with reservoirs that satisfy at least one of the following conditions are eligible to apply this methodology: • The project activity is implemented in an existing reservoir with no change in the volume of reservoir; • The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the Project Emissions section, is greater than 4 W/m2; • The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the Project Emissions section, is greater than 4W/m2.	Hydro power CPA's will be a small hydro power plant/unit either with run-of-river or reservoir. The hydro power will be either Run of the river Or a hydro power plant on existing reservoir with no change in volume. In case the project activity is implemented in existing reservoir with increase in volume than the power density will be more than 4 W per m^2. In case CPA is a project activity with new reservoir the power density of the power plant will be more than 4 W/m^2
6	For biomass power plants, no other biomass other than renewable biomass is to be used in the project plant.	Biomass power CPAs will ensure that renewable biomass will be used in the project plant. In the specific case of biomass CPAs the applicability of the methodology will be limited to either project activities that use biomass residues only or biomass from dedicated plantations complying with the applicability conditions of AM0042.
7	This methodology is applicable for project activities that: a) install a new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity (Greenfield plant); b) involve a capacity addition	A typical CPA can involve (a) installation of new renewable energy power plant. (b) capacity addition (c) retrofit of an existing plant(s) (d) replacement of an existing plant(s).

	c) involve a retrofit of (an) existing plant(s); or d) involve a replacement of (an) existing plant(s).	
8	In the case of project activities that involve the capacity addition of renewable energy generation units at an existing renewable power generation facility, the added capacity of the units added by the project should be lower than 15 MW and should be physically distinct from the existing units.	CPA's involving capacity addition of renewable energy generation units at an existing renewable power generation facility will ensure that the added capacity of the units added by the CPA is lower than 15 MW and be physically distinct from the existing units.
9	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.	CPA's involving retrofit or replacement will ensure that the total output of the retrofitted or replacement unit is not exceeding the limit of 15 MW
10	If the unit added has both renewable and non-renewable components (e.g., a wind/diesel unit), the eligibility limit of 15 MW for a small-scale CDM project activity applies only to the renewable component. If the unit added co-fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15 MW.	CPA's involving addition of both renewable and non-renewable components will consider the eligibility limit of 15 MW for a small-scale CDM project activity only to the renewable component.
11	Combined heat and power (co-generation) systems are not eligible under this category.	Combined heat and power systems are not considered in this PoA and hence, the condition is Not Applicable
12	If electricity and/or steam/heat produced by the project activity is delivered to a third party i.e. another facility or facilities within the project boundary, a contract between the supplier and consumer(s) of the energy will have to be entered that ensures that there is no double counting of emission reductions.	CPA's delivering electricity produced to another facility or facilities within the project boundary will enter into a contract between the supplier and consumer(s) of the electricity specifying that only the facility generating the electricity can claim emission reductions from the electricity displaced.
13	In the specific case of biomass project activities the applicability of the methodology is limited to either project activities that use biomass residues only or biomass from dedicated plantations complying with the applicability conditions of AM0042.	Biomass power CPA's will ensure that renewable biomass will be used in the project plant. In the specific case of biomass CPA's the applicability of the methodology will be limited to either project activities that use biomass residues only or biomass from dedicated plantations complying with the

		applicability conditions of AM0042.
14	In the specific case of biomass project activities the determination of leakage shall be done following the general guidance for leakage in small-scale biomass project activities (attachment C of Appendix B of simplified modalities and procedures for small-scale clean development mechanism project activities; decision 4/CMP.1) or following the procedures included in the leakage section of AM0042.	For biomass projects the determination of leakage will be done as per the general guidance for leakage in small-scale biomass project activities (attachment C of Appendix B of simplified modalities and procedures for small-scale clean development mechanism project activities; decision 4/CMP.1) or following the procedures included in the leakage section of AM0042.
15	In case the project activity involves the replacement of equipment, and the leakage from the use of the replaced equipment in another activity is neglected because the replaced equipment is scrapped, an independent monitoring of scrapping of replaced equipment needs to be implemented. The monitoring should include a check if the number of project activity equipment distributed by the project and the number of scrapped equipment correspond with each other. For this purpose scrapped equipment should be stored until such correspondence has been checked. The scrapping of replaced equipment should be documented and independently verified.	Considering the fact that accessibility to electricity is very low in PNG and also due to resource constraints, it is unlikely that the replaced equipment will be scrapped. However this applicability condition is no more a requirement for PoA's under Type I methodology as concluded in SSC-WG 34th meeting[31].

For CPAs following AMS I.D. 'Grid connected renewable electricity generation' (I.D/version 17, Sectoral scope:01, EB 61).

Para No	Applicability Criteria as per AMS I.D. ver 17	Project Scenario
1	This category comprises renewable energy generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal and renewable biomass	A typical CPA will comprise of a renewable energy generation unit/s that supplies electricity to

[31] Please refer SSC-WG 34th meeting recommendations to the EB and corresponding EB decision http://cdm.unfccc.int/Panels/ssc_wg/meetings/034/ssc_034_report.pdf and http://cdm.unfccc.int/methodologies/SSCmethodologies/clarifications/63945 As per the SSC-WG recommendation 'The SSC WG is of the opinion that under most circumstances, the replaced equipment would most likely replace less efficient equipment outside the project boundary, and therefore the scrapping requirement is not needed. The SSC WG consequently agreed to recommend removing this requirement in future revisions of these Type I methodologies'. Please refer Appendix 3. Further confirmation of this was made by version 19 of General Guidelines for SSC CDM methodologies EB 69 Annex 27 Para 16 (http://cdm.unfccc.int/filestorage/e/4/NCLGIQTKVB3856UZP4O1AMDRF90XW7.pdf/eb69_repan27.pdf?t=b0t8bWF5NHo2fDAW_9isluZUKLJsPiJLzSDw)

	a. Supplying electricity to a national or a regional grid; or b. Supplying electricity to an identified consumer facility via national/regional grid through a contractual arrangement such as wheeling	a national or a regional grid and/or supplying electricity to an identified consumer facility via national/regional grid through a contractual arrangement such as wheeling.
2	Illustration of respective situations under which each of the methodology (i.e. AMS-I.D, AMS-I.F and AMS-I.A) applies is included in Table 2.	A typical CPA under this PoA will be eligible under one of the appropriate situation described in Table 2.
3	This methodology is applicable to project activities that (a) install a new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity (Greenfield plant); (b) involve a capacity addition; (c) involve a retrofit of (an) existing plant(s); or (d) involve a replacement of (an) existing plant(s).	A typical CPA can involve (a) installation of new renewable energy power plant. (b) capacity addition (c) retrofit of an existing plant(s) (d) replacement of an existing plant(s).
4	Hydro power plants with reservoirs that satisfy at least one of the following conditions are eligible to apply this methodology: • The project activity is implemented in an existing reservoir with no change in the volume of reservoir; • The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the Project Emissions section, is greater than 4 W/m2; • The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the Project Emissions section, is greater than 4W/m2.	Hydro power CPA's will be a small hydro power plant/unit either with run-of-river or reservoir. The hydro power will be either Run of the river Or a hydro power plant on existing reservoir with no change in volume. In case the project activity is implemented in existing reservoir with increase in volume than the power density will be more than 4 W per m2. In case CPA is a project activity with new reservoir the power density of the power plant will be more than 4 W/m2
5	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 fuel5, the capacity of the entire unit shall not exceed the limit of 15 MW.	CPA's involving addition of both renewable and non-renewable components will consider the eligibility limit of 15 MW for a small-scale CDM project activity only to the renewable component.
6	Combined heat and power (co-generation) systems are not	Project activities applying

	eligible under this category.	combine heat and power will not be included in this PoA
7	In the case of project activities that involve the capacity addition of renewable energy generation units at an existing renewable power generation facility, the added capacity of the units added by the project should be lower than 15 MW and should be physically distinct from the existing units.	CPA's involving capacity addition of renewable energy generation units at an existing renewable power generation facility will ensure that the added capacity of the units added by the CPA is lower than 15 MW and be physically distinct from the existing units.
8	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.	CPA's involving retrofit or replacement will ensure that the total output of the retrofitted or replacement unit is not exceeding the limit of 15 MW
9	In the specific case of biomass project activities the applicability of the methodology is limited to either project activities that use biomass residues only or biomass from dedicated plantations complying with the applicability conditions of AM0042.	Biomass power CPA's will ensure that renewable biomass will be used in the project plant. In the specific case of biomass CPA's the applicability of the methodology will be limited to either project activities that use biomass residues only or biomass from dedicated plantations complying with the applicability conditions of AM0042.
10	In the specific case of biomass project activities the determination of leakage shall be done following the general guidance for leakage in small-scale biomass project activities (attachment C of Appendix B of simplified modalities and procedures for small-scale clean development mechanism project activities; decision 4/CMP.1) or following the procedures included in the leakage section of AM0042.	For biomass projects the determination of leakage will be done as per the general guidance for leakage in small-scale biomass project activities (attachment C of Appendix B of simplified modalities and procedures for small-scale clean development mechanism project activities; decision 4/CMP.1) or following the procedures included in the leakage section of AM0042.
11	In case the project activity involves the replacement of equipment, and the leakage from the use of the replaced equipment in another activity is neglected because the replaced equipment is scrapped, an independent monitoring of scrapping of replaced equipment needs to be implemented. The monitoring should include a check if the number of	Considering the fact that accessibility to electricity is very low in PNG and also due to resource constraints, it is unlikely that the replaced equipment will be scrapped.

	project activity equipment distributed by the project and the number of scrapped equipment correspond with each other. For this purpose scrapped equipment should be stored until such correspondence has been checked. The scrapping of replaced equipment should be documented and independently verified.	However this applicability condition is no more a requirement for PoA's under Type I methodology as concluded in SSC-WG 34th meeting[32].

For CPA's following AMS I.A. 'Electricity generation by the user' (I.A/version 14, Sectoral scope:01, EB 54).

Para No	Applicability Criteria as per AMS I.A. ver 14	Project Scenario
1	This category comprises renewable electricity generation units that supply individual households/users or groups of households/users included in the project boundary.	A typical CPA will comprise of a renewable energy generation unit/s supply individual households/users or groups of households/users included in the project boundary.
2	The applicability is limited to individual households and users that do not have a grid connection except when; a) A group of households or users are supplied electricity through a standalone mini-grid powered by renewable energy generation unit(s) where the capacity of the generating units does not exceed 15 MW (i.e., the sum of installed capacities of all renewable energy generators connected to the mini-grid is less than 15 MW) e.g., a community based stand-alone off-the-grid renewable electricity systems; or b) The emissions reduction per renewable energy based lighting system is less than 5 tonnes of CO_{2e} a year and where it can be shown that fossil fuel would have been used in the absence of the project activity by; (i) A representative sample survey (90% confidence interval, ±10% error margin) of target households; or	A typical CPA under Option C of methodology selection will adhere to the applicability conditions as indicated in (a) & (b).

[32] Please refer SSC-WG 34th meeting recommendations to the EB and corresponding EB decision http://cdm.unfccc.int/Panels/ssc_wg/meetings/034/ssc_034_report.pdf and http://cdm.unfccc.int/methodologies/SSCmethodologies/clarifications/63945 As per the SSC-WG recommendation 'The SSC WG is of the opinion that under most circumstances, the replaced equipment would most likely replace less efficient equipment outside the project boundary, and therefore the scrapping requirement is not needed. The SSC WG consequently agreed to recommend removing this requirement in future revisions of these Type I methodologies'. Please refer Appendix 3.

	(ii) Official statistics from the host country government agencies.	
3	The renewable energy generation units include technologies such as solar, hydro, wind, biomass gasification and other technologies that produce electricity all of which is used on-site/locally by the user, e.g., solar home systems, wind battery chargers . The renewable generating units may be new installations (Greenfield) or replace existing onsite fossil-fuel-fired generation. To qualify as a small-scale project, the total output of the unit(s) shall not exceed the limit of 15 MW.	A typical CPA will include technologies such as solar, hydro, wind, biomass gasification and other technologies that produce electricity all of which is used on-site/locally by the user, The units under a CPA will be new installations (Greenfield) or replace existing onsite fossil-fuel-fired generation. The total output of the unit(s) shall not exceed the limit of 15 MW.
4	Hydro power plants with reservoirs that satisfy at least one of the following conditions are eligible to apply this methodology: • The project activity is implemented in an existing reservoir with no change in the volume of reservoir; • The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the Project Emissions section, is greater than 4 W/m2; The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the Project Emissions section, is greater than 4W/m2.	Hydro power CPA's will be a small hydro power plant/unit either with run-of-river or reservoir. The hydro power will be either Run of the river Or a hydro power plant on existing reservoir with no change in volume. In case the project activity is implemented in existing reservoir with increase in volume than the power density will be more than 4 W per m2. In case CPA is a project activity with new reservoir the power density of the power plant will be more than 4 W/m2
5	Combined heat and power (co-generation) systems are not eligible under this category.	Project activities applying combine heat and power will not be included in this PoA
6	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.	CPA's involving addition of both renewable and non-renewable components will consider the eligibility limit of 15 MW for a small-scale CDM project activity only to the renewable component.
7	Project activities that involve retrofit or replacement of an	CPA's involving retrofit or

	existing facility for renewable energy generation are included in this category. To qualify as a small-scale project, the total output of the modified or retrofitted unit shall not exceed the limit of 15 MW.	replacement will ensure that the total output of the retrofitted or replacement unit is not exceeding the limit of 15 MW
8	In the case of project activities that involve the capacity addition of renewable energy generation units at an existing renewable power generation facility, the added capacity of the units added by the project should be lower than 15 MW and should be physically distinct from the existing units.	CPA's involving capacity addition of renewable energy generation units at an existing renewable power generation facility will ensure that the added capacity of the units added by the CPA is lower than 15 MW and be physically distinct from the existing units.
9	In the specific case of biomass project activities the applicability of the methodology is limited to either project activities that use biomass residues only or biomass from dedicated plantations complying with the applicability conditions of AM0042.	Biomass power CPA's will ensure that renewable biomass will be used in the project plant. In the specific case of biomass CPA's the applicability of the methodology will be limited to either project activities that use biomass residues only or biomass from dedicated plantations complying with the applicability conditions of AM0042.
10	In the specific case of biomass project activities the determination of leakage shall be done following the general guidance for leakage in small-scale biomass project activities (attachment C of Appendix B of simplified modalities and procedures for small-scale clean development mechanism project activities;) or following the procedures included in the leakage section of AM0042.	For biomass projects the determination of leakage will be done as per the general guidance for leakage in small-scale biomass project activities (attachment C of Appendix B of simplified modalities and procedures for small-scale clean development mechanism project activities; decision 4/CMP.1) or following the procedures included in the leakage section of AM0042.
11	In case the project activity involves the replacement of equipment, and the leakage from the use of the replaced equipment in another activity is neglected because the replaced equipment is scrapped, an independent monitoring of scrapping of replaced equipment needs to be implemented. The monitoring should include a check if the number of project activity equipment distributed by the project and the number of scrapped equipment correspond with each other. For this purpose scrapped equipment should be stored until	Considering the fact that accessibility to electricity is very low in PNG and also due to resource constraints, it is unlikely that the replaced equipment will be scrapped. However this applicability condition is no more a requirement for PoA's under

	such correspondence has been checked. The scrapping of replaced equipment should be documented and independently verified.	Type I methodology as concluded in SSC-WG 34th meeting[33].

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

The spatial extent of the project boundary includes the project power plant and all power plants connected physically to the distribution grid that the CPA is connected to.

The emissions and the gases in the project boundary source are:

- In case of AMS I F version 02- from fossil fuel fired power plants connected to the distribution grid that the CPA is connected to;

  In case of AMS I D version 17- from the generation mix of power plants connected to the national or regional grid
- In case of AMS IA Version 14- he physical, geographical site of the renewable energy generating unit and the equipment that uses the electricity produced

The table below illustrates which emissions sources are included and which are excluded from the project boundary for determination of both baseline and project emissions. The table will be updated accordingly in each CPA-DD depending on the technology/measure covered in each CPA.

[33] Please refer SSC-WG 34th meeting recommendations to the EB and corresponding EB decision http://cdm.unfccc.int/Panels/ssc_wg/meetings/034/ssc_034_report.pdf and http://cdm.unfccc.int/methodologies/SSCmethodologies/clarifications/63945 As per the SSC-WG recommendation 'The SSC WG is of the opinion that under most circumstances, the replaced equipment would most likely replace less efficient equipment outside the project boundary, and therefore the scrapping requirement is not needed. The SSC WG consequently agreed to recommend removing this requirement in future revisions of these Type I methodologies'. Please refer Appendix 3.

Source		Gas	Included?	Justification / Explanation
Baseline	CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity	CO_2	Yes	Main emission source
		CH_4	No	Minor emission source
		N_2O	No	Minor emission source
Project activity	For geothermal power plants, fugitive emissions of CH_4 and CO_2 from non-condensable gases contained in geothermal steam	CO_2	To be decided at CPA level	Main emission source
		CH_4	To be decided at CPA level	Main emission source
		N_2O	No	Minor emission source
	CO_2 emissions from combustion of fossil fuels for electricity generation	CO_2	To be decided at CPA level	Main emission source
		CH_4	No	Minor emission source
		N_2O	No	Minor emission source
	On-site fossil fuel Consumption	CO_2	To be decided at CPA level	Main emission source
		CH_4	No	Minor emission source
		N_2O	No	Minor emission source
	For hydro power plants, emissions of CH_4 from the reservoir	CO_2	No	Minor emission source
		CH_4	To be decided at CPA level	Main emission source
		N_2O	No	Minor emission source

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

As discussed earlier in A.2, the penetration of the supply of electric power to the population of Papua New Guinea is very limited. The national electrification rate in PNG is less than 10%. Approximately 90% of the population of PNG live in highly dispersed and culturally diverse rural settlements that are isolated from each other by rugged topography. There is presently no national grid system in PNG, although there are three main regional level electricity systems (with generation mix of diesel and hydro) serving Port Moresby, Lae-Madang-Highlands and Gazelle Peninsula areas respectively. Smaller mini-grids mainly powered by diesel generators are located around other populated areas and industrial sites. Small provincial and district centres have traditionally relied on diesel generation due to availability of fuel and known technology[34].

[34] Asian Development Bank TA 4932 - PNG: Power Sector Development Plan, Final Report, April 2009..

The baseline scenario for the CPAs under the PoA needs to be established based on methodology selected in section E.1 above. Depending on the technology and type of service the baseline scenario for the CPA's will be one of the following:

- Electricity generation in national/regional grid
- Import of electricity from grid and/or captive fossil fuel electricity generation at the user end
- Electricity generation in mini grid system where in the baseline all generators use exclusively fuel oil and/or diesel fuel
- For off grid, fuel consumption of the technology in use or that would have been used in the absence of the project activity to generate the equivalent quantity of energy

All the above baseline scenarios are in accordance with the existing legal requirements/laws. As mentioned in section A.2 there are no mandatory laws/regulations or policies within the host country to generate electricity using renewable energy resources.

The procedure for calculating baseline emissions is as discussed below:

AMS I.F. 'Renewable electricity generation for captive use and mini-grid'(I.F/version 02, Sectoral scope:01, EB 61).

Technologies applicable – wind (on shore / off shore), solar (thermal / Photovoltaic), hydro, geothermal, tidal, wave, renewable biomass (boiler based Rankine cycle), biomass gasification.

Baseline scenario 1: Displacement of electricity from mini-grids comprising of exclusively fuel oil/or diesel fuel based generation.

As per AMS I.F. version 02, paragraph 13:

'For a mini-grid system where all generators use exclusively fuel oil and/or diesel fuel, the baseline emissions is the annual electricity generated by the renewable energy unit times an emission factor for a modern diesel generating unit of the relevant capacity operating at optimal load as given in Table I.F.1'.

CPAs involving displacement of electricity from mini-grids comprising of exclusively fuel oil/or diesel fuel based generation will adopt the above baseline scenario.

Baseline scenario 2: Displacement of electricity from mini-grids comprising of a generation mix.
Further as per AMS I.F. version 02, paragraph 14, 'Baseline emissions for other systems are the product of amount electricity displaced with the electricity produced by the renewable generating unit and an emission factor'.

$BE_y = EG_{BL,y} * EF_{CO2,\ y,\ grid/mini\text{-}grid/captive}$

Where:

BE_y Baseline Emissions in year y (t CO2)

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

$EF_{CO2, y, grid/mini-grid/captive}$ Emission factor (tCO2/MWh)

For a mini-grid/grid system other than described as in paragraph 13 of AMS IF, the baseline emission factor shall be determined as per the weighted average emissions for the current generation mix following the procedure provided in AMS-I.D.

CPAs involving displacement of electricity from mini-grids comprising of a generation mix will adopt the above baseline scenario.

For CPA's that displace grid electricity and fossil fuel fired on-site captive electricity, the baseline emission factor in the equation above should reflect the emissions intensity of the grid and the captive power plant in the baseline scenario i.e., the weighted average emission factor for the displaced electricity is calculated using values based on the historical, prior three year ratios of electricity from captive plants and the grid. For new facilities, the most conservative (lowest) of the emission factor for the two power sources should be used.

The emission factor for captive electricity generation shall be calculated as per the procedures described in the latest version of the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption"

For CPA's that involve retrofit of an existing facility and/or capacity addition at an existing facility, the baseline emissions shall be calculated following the applicable procedures prescribed in AMS-I.D with the exception that emission factor ($EF\ CO2, y, _{IF}$) is calculated as described above.

AMS I.D. 'Grid connected renewable electricity generation' (I.D/version 17, EB 61, Sectoral scope:01,).

Technologies applicable – wind (on shore / off shore), solar (thermal / Photovoltaic), hydro, geothermal, tidal, wave, renewable biomass (boiler based Rankine cycle), biomass gasification.

As per AMS I.D. version 17, paragraph 10:
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

This is also applicable in case the CPA consists of projects that supplies electricity to an identified consumer facility via national/regional grid (through a contractual arrangement such as wheeling).

The baseline emissions are the product of electrical energy baseline $EG_{BL,y}$ expressed in MWh of electricity produced by the renewable generating unit multiplied by the grid emission factor.

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

Where:

BE_y Baseline Emissions in year y ($t\ CO_2$)

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

$EF_{CO2, Grid,y}$ CO_2 emission factor of the grid in year y (tCO2/MWh)

The Emission Factor can be calculated in a transparent and conservative manner as follows:

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

OR

b) The weighted average emissions (in t CO2/MWh) of the current generation mix. The data of the year in which project generation occurs must be used.

Calculations shall be based on data from an official source (where available) and made publicly available.

CPA's involving Retrofits or Replacement

For CPA's 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 (AMS ID) 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 $_{Baseline\ Retrofit}$). 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.

Retrofit/capacity addition of hydro, solar, wind, geothermal, wave and tidal plants

The baseline emissions ($BE_{Retrofit, CO2, y}$) are thus calculated as follows:

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

Where:

$$EG_{Retrofit, BL, y} = EG_{PJ, Faciltiy, y} - (EG_{Historical} + \sigma_{Historical})$$

$$EG_{Retrofit, BL, y} = 0 \text{ on/after Date}_{BaselineRetrofit}$$

$EG_{Retrofit, BL, y}$ 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)

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

$EG_{Historical}$ 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 - a new methodology or methodology revision shall be proposed.

$\sigma_{Historical}$ 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)

$Date_{Baseline\ Retrofit}$ Point in time when the existing equipment would need to be replaced in the absence of the project activity (date)

In the case of wind, solar, wave or tidal power plants, it is assumed that the addition of new capacity or retrofitting of existing unit to increase capacity does not significantly affect the electricity generated by existing plant(s) or unit(s).In this case, the electricity produced by the added power plant(s) or unit(s) could be directly metered and used to determine EG BL,y. provided that the electricity produced by the added power plant(s) or unit(s) addition is separately metered. Project activities for capacity addition in hydro or geothermal shall use equation above replacing subscript .retrofit with capacity addition.

Retrofit of renewable energy units other than hydro, solar, wind, geothermal, wave and tidal plants:

Baseline emissions are calculated as:

$$BE_{Retrofit, CO2, y} = (EG_{PJ, Retrofit, y} - EG_{BL, Retrofit, y)} * EF_{CO2, grid}$$

Where:

$$EG_{BL, Retrofit, y} = MAX (EG_{Historical, y}, EG_{Estimated, y}) \text{ until } Date_{BaselineRetrofit}$$

$$EG_{Retrofit, BL, y} = 0 \text{ on/after } Date_{BaselineRetrofit}$$

Where:

$BE_{Retrofit, CO2, y}$ The baseline emissions in year y ($t CO_2$)

$EG_{PJ, Retrofit, y}$ Net electricity supplied by the plant/unit to the grid in year *y* (MWh)

$EG_{BL, Retrofit, y}$ Electricity that would have been supplied by the plant/unit to the grid in the absence of the project activity in year y (MWh)

$EG_{Historical}$ 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 (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 3 years of data is required. In the case that 3 years of historical data are not available 9- e.g., due to recent retrofits or exceptional circumstances - a new methodology or methodology revision shall be proposed

$EG_{Estimated}$ Estimated net electrical energy that would have been produced by the existing units under the observed availability of the renewable resource in year *y* (MWh)

$Date_{Baseline Retrofit}$ Point in time when the existing equipment would need to be replaced in the absence of the project activity (date)

Capacity addition with renewable energy units other than solar, wind, geothermal, wave and tidal plants:

For CPA's that involve the addition of renewable energy generation units at an existing renewable power generation facility, where the existing and new units share the use of common and limited renewable resources (e.g. biomass residues), the potential for the project activity to reduce the amount of renewable resource available to, and thus electricity generation by, existing units must be considered in the determination of Baseline Emissions, project emissions, and/or leakage, as relevant.

The baseline emissions ($BE_{add, CO2, y}$) are calculated as:

$$BE_{add, CO2, y} = (EG_{PJ, add, y} - EG_{BL, existing, y)} * EF_{CO2, grid}$$

Where:

$EG_{PJ, add, y}$ The total net electrical energy supplied to a grid in year *y* by all units, existing and new project units; (MWh)

$EG_{BL, existing, y}$ The estimated net electrical energy that would have been produced and supplied to a grid by existing units (installed before the project activity) in year *y* in the absence of the project activity, (MWh)

Where:

$EG_{BL, existing, y} = MAX (EG_{actual, y}, EG_{Estimated, y})$ until Date $_{Baseline\ Retrofit}$

And, $EG_{BL, existing, y} = 0$ on/after Date $_{Baseline\ Retrofit}$

Where:

$EG_{actual, y}$	The actual, measured net electrical energy produced and supplied to the grid by the existing units in year *y* (MWh)

AMS I.A. 'Electricity generation by the user' (I.A/version 14, Sectoral scope:01, EB 54).

Technologies applicable – wind (on shore / off shore), solar (thermal / Photovoltaic), hydro, geothermal, tidal, wave, renewable biomass (boiler based Rankine cycle), biomass gasification.

As per AMS I.A. version 14, paragraph 8:

The energy baseline is the fuel consumption of the technology in use or that would have been used in the absence of the project activity to generate the equivalent quantity of energy estimated using one of the following three options:

a. Option 1:

$$E_{BL,y} = \sum_i \left(n_i * EC_{i,y}\right) / \left(1 - l\right)$$

Where:

$E_{BL,y}$	Annual energy baseline; kWh
$\sum_i$	The sum over the group of *i* renewable energy technologies (e.g., renewable energy technologies for households, rural health centres, rural schools, grain milling, water pumping, irrigation, etc.) implemented as part of the project activity
n_i	Number of consumers supplied by installations of the renewable energy technology belonging to the group of *i* renewable energy technologies during the year
$EC_{i,y}$	Estimate of average annual individual energy consumption observed in closest grid electricity systems among rural grid connected consumers belonging to the same group of *i* renewable energy technologies. If energy consumption is metered, $EC_{i,y}$ is the average energy consumed by consumers belonging to the group of *i* renewable energy technologies; kWh
L	Average technical distribution losses that would have been observed in diesel powered mini-grids installed by public programmes or distribution companies in isolated areas, expressed as a fraction;

b. Option 2:

$$E_{BL,y} = \sum_i EG_{i,y} / (1 - l)$$

Where:

$E_{BL,y}$	Annual energy baseline; kWh
$\sum_i$	The sum over the group of *i* renewable energy technologies (e.g., renewable energy technologies for solar home systems, solar pumps) implemented as part of the project activity
$EG_{i,y}$	The estimated annual output of the renewable energy technologies of the group of *i* renewable energy technologies installed; kWh
L	Average technical distribution losses that would have been observed in diesel powered mini-grids installed by public programmes or distribution companies in isolated areas, expressed as a fraction[6];

c. Option 3: the baseline can be a trend-adjusted projection of historic fuel consumption in situations where an existing technology is replaced. For the specific case of lighting devices a daily usage of 3.5 hours shall be assumed, unless it is demonstrated that the actual usage hours adjusted for seasonal variation of lighting is different based on representatives sample survey (90% confidence interval ±10% error) done for minimum of 90 days.

For CPA's involving household technologies (e.g solar rooftop, solar household system, etc) where in emission reduction will be calculated based on a sample survey a detailed sampling plan will be provided in the CPA-DD as per the 'Standard for Sampling and surveys for CDM Project Activities and Programme of Activities', 'Guidelines for sampling and surveys for CDM project activities and programme of activities' and other relevant guidelines/procedure approved by CDM Executive Board.

For Option 1 and Option 2 above the emissions baseline is the energy baseline calculated in accordance with paragraphs 8a and 8b above times a default emission factor:

$$BE_{CO2,y} = E_{BL,y} * EF_{CO2}$$

Where:

$BE_{CO2,y}$	Emissions in the baseline in year *y*; tCO_2
$E_{BL,y}$	Annual energy baseline in year *y*; kWh
EF_{CO2}	CO_2 emission factor; tCO_2/kWh

For $EF_{CO2,y}$ ($EF_{CO2,y,\ Diesel}$) default value of 0.8 kg CO_2-e/kWh, which is derived from diesel generation units, may be used. A small-scale project proponent may, with adequate justification use a higher emissions factor from table I.F.1 under category AMS-I.F.

In the case of Option 3, the emissions baseline is the historic fuel consumption calculated in accordance with paragraph 8c above times the CO2 emission factor for the fuel displaced. IPCC default values for emission factors may be used.

$$BE_{CO2,y} = \sum_j FC_{j,y} * NCV_j * EF_{CO2,j}$$

Where:

$BE_{CO2,y}$	Emissions in the baseline in year *y*; tCO_2
$FC_{j,y}$	Amount of fuel consumption of fuel type *j*; mass or volume unit in year *y*
NCV_j	Net calorific value of fuel type *j*; gigajoule per mass or volume unit
$EF_{CO_2,j}$	CO_2 emission factor of fuel type *j*; tCO_2/GJ
J	Fuel type used for combustion

The baseline emissions of project activities that involve retrofit/replacement of an existing facility or capacity addition at an existing facility, shall be calculated following the procedures prescribed in AMS-I.D with the exception that the applicable emission factor (EF_{CO2}) is calculated as described in this methodology.

As per SSC 547, the baseline emissions calculation for Greenfield projects in a situation where there is no electricity usage prior to the project activity will be based on the methodology AMS I.A and the provisions under AMS-I.A would be followed for the baseline determination.

In the case of development of standardized baseline for renewable energy by the host country and approval by the CDM Executive Board the same shall be utilized for assessment of baseline and demonstration of additionality.

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:

As discussed in Section A.4.3, the additionality is demonstrated at the CPA level.

For CPAs which consist of project activities which fall under the positive list of technologies as defined in Guidelines on the demonstration of additionality of small scale project activities (version 09, EB 68) the projects are considered automatically additional. The technologies currently listed under positive list are:

D) Grid and off grid connected renewable energy generation technologies

e) Solar technologies (solar and solar thermal electricity generation)
f) Off-shore wind technologies
g) Marine technologies (wave, tidal)
h) Building-integrated wind turbines or household rooftop wind turbines of a size up to 100 kW

E) Off-grid electricity generation technologies

The following off-grid electricity generation technologies where the individual units do not exceed the thresholds indicated in parentheses with the aggregate project installed capacity not exceeding the 15 MW threshold:

(vi) Micro/pico-hydro (with power plant size up to 100 kW);
(vii) Micro/pico-wind turbine (up to 100 kW);
(viii) PV-wind hybrid (up to 100 kW);
(ix) Geothermal (up to 200 kW);
(x) Biomass gasification/biogas (up to 100 kW);

F) Project activities solely composed of isolated units where the users of the technology/measure are households or communities or Small and Medium Enterprises (SMEs) and where the size of each unit is no larger than 5% of the small-scale CDM thresholds.

For CPAs which do not fall under the positive list, additionality of the CPA will be demonstrated as per the options below (The decision tree for selection between Option 1 and Option 2 is provided in section A.4.3 above).

Option 1: For CPAs in the capacity range up-to 5 MW - As per "Guidelines for demonstrating additionality Guidelines for demonstrating additionality of Micro-scale project activities" EB 68 (version 4)**.**

As per the paragraph 2 of the guidelines:

Project activities up to five megawatts that employ renewable energy technology are additional if any one of the conditions below is satisfied:

(a) The geographic location of the project activity is in one of the least developed countries or the small island developing States (LDCs/SIDS) or in a special underdeveloped zone (SUZ)of the host country

(i) SUZ is a region in the host country (zone, municipality or any other designated official administrative unit) identified by the Government in official notifications for development assistance including for planning, management, and investment satisfying any one of the following conditions using most recent available data:

- The proportion of population with income less than USD 2 per day (PPP) in the region is greater than 50%;

- The GNI per capita in the country is less than USD 3000 and the population of the region is among the poorest 20% in the poverty ranking of the host country as per the applicable national policies and procedures;

(ii) In cases where, based on the recommendation of the designated national authority of the host country, the SUZ in the host country has been approved by Executive Board (hereinafter referred to as the Board) of the clean development mechanism (CDM), the list of such SUZ shall be maintained on the UNFCCC website (e.g. at <http://cdm.unfccc.int/DNA/submissions/index.html>). In the case of these SUZ listed on the CDM website there is no need for the project proponents to provide proofs as indicated in paragraph (a) above.

(b) The project activity is an off-grid activity supplying energy to households/communities (less than 12 hours grid availability per 24 hrs is also considered off-grid for this assessment);

(c) The project activity is designed for distributed energy generation (not connected to a national or regional grid) with both conditions (i) and (ii) satisfied;
(i) Each of the independent subsystems/measures in the project activity is smaller than or equal to 1500kW electrical installed capacity;
(ii) End users of the subsystems or measures are households/communities/small and medium enterprises (SMEs).

(d) The project activity employs specific renewable energy technologies/measures recommended by the host country designated national authority (DNA) and approved by the Board to be additional in the host country.

The following conditions shall apply for DNA recommendations:

(i) Specific renewable energy technologies/measures refers to grid connected renewable energy technologies of installed capacity equal to or smaller than 5 MW;
(ii) The ratio of installed capacity of the specific grid connected renewable energy technology in the total installed grid connected power generation capacity in the host country shall be equal to or less than 3 per cent;
(iii) Most recent available data on the percentage of contributions of specific renewable energy technologies shall be provided to demonstrate compliance with the 3 per cent threshold. In no case shall data older than three years from the date of submission be used;
(iv) Technologies/measures recommended by DNAs and approved by the Board to be additional in the host country remain valid for three years from the date of approval. However, additionality of eligible project activities applying the guidelines remains valid for the entire crediting period;
(v) DNA submissions shall include the specific grid connected renewable electricity generation technologies that are being recommended and provide the required data as indicated above (e.g. wind power, biomass power, geothermal power, hydropower).

According to the United Nations, PNG is classified as Small Island Developing State (SIDS)[35]. Hence under the proposed PoA, CPAs having up to 5 MW installed capacity are considered to be additional as per the above EB guidelines and further demonstration of the additionality with investment analysis or barrier analysis or both is deemed not necessary.

[35] http://www.un.org/special-rep/ohrlls/sid/list.htm

Also in the case that the host country DNA recommends a specific renewable technology that is approved by the CDM Executive Board to be additional in the host country than under the proposed PoA, renewable energy CPAs having up to 5 MW installed capacity of the recommended technology are considered to be additional as per the above EB guidelines. Hence, further demonstration of the additionality with investment analysis or barrier analysis or both is deemed not necessary.

***Option* 2**: **For CPAs in the capacity range 5-15 MW - as per the Guidelines on the demonstration of additionality of small scale project activities (version 09, EB 68)**
The Project's additionality will be demonstrated by applying the "Non-binding best practise examples to demonstrate additionality for SSC project activities" version 01, EB 35 and "Guidelines for objective demonstration and assessment of barriers" version 01, EB50. The "Tool for the demonstration and assessment of additionality" can also be used to demonstrate additionality but is not mandatory. As mentioned earlier the additionality will be assessed and demonstrated at the CPA level.

Every CPA will provide an explanation showing that the project activity would not have occurred otherwise due to at least one of the following barriers below and it is voluntarily coordinated and would not be implemented in the absence of CDM. The project participants of each CPA shall provide an explanation to show the project activity would not have occur anyway due to at least one of the following barriers:

According to Guidelines on the demonstration of additionality of small scale project activities (version 09, EB 68), project participants shall provide an explanation to show that the project activity would not have occurred anyway due to at least one of the following barriers:

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

Either investment comparison analysis or benchmark analysis will be carried out for each CPA to demonstrate that the project is less financially attractive than the baseline as per option below. Option 1
Demonstrate that the project IRR for the CPA is less than the applicable benchmark. The benchmark could be weighted average cost of capital, government/officially approved financial benchmark, company internal financial benchmark, or commercial lending rate. The appropriateness of using a particular benchmark will be demonstrated through appropriate evidences in the SSC-CPA-DD.

Option 2
Demonstrate that the cost of electricity generation of the CPA is more than the cost of electricity generation of the baseline scenario.

Each CPA is expected to have high investment cost in comparison to the revenue from generating electricity. Hence, the CPAs are expected to face investment barriers.

Option 3:
Demonstrate that the cost of electricity generation of the CPA is more than electricity selling price.

Please refer Appendix 5 for further information

b) Access-to-finance barrier

The project activity could not access appropriate capital without consideration of the CDM revenue.
It is envisaged that under this PoA, access to finance barrier may be demonstrated by following one of the options below

1) Statement from the financing bank that the revenue from the CDM is critical in the approval of the loan.
2) Loan agreement demonstrating that the investment is done by a company which also purchases the CERs.
3) Loan agreement demonstrating that a significant part of the project investment is provided upfront by a company as a pre-payment for expected CERs.

Considering the risk involved in investing in renewable energy projects in PNG it is likely that may projects will face this barrier.

c) Technological barrier: a less technologically advanced alternative to the project activity involves lower risks due to the performance uncertainty or low market share of the new technology adopted for the project activity and so would have led to higher emissions;

It is envisaged that under this PoA, technological barrier may be demonstrated by following one of the options below:

1) Demonstrating non-availability of human capacity to operate and maintain the technology.
2) Demonstrating unavailability of the technology and high level of technology risk.

The proposed project activities will require special expertise or skilled worker with respect to design of the facility, operation, maintenance, operation control of the new renewable technologies. The expertise and skilled worker are not commonly available in the host country for various renewable technologies, thus requiring external support.

d) Barrier due to prevailing practice: prevailing practice or existing regulatory or policy requirements would have led to implementation of a technology with higher emissions;

It is envisaged that under this PoA, prevailing practice barrier may be demonstrated by following one of the options below:

1) Demonstrating project is a 'First-of-its-kind' in the applicable geographical area, in accordance with 'Guidelines of First-of - its- kind project activities', EB 69, version 02.
2) Demonstrating a history of non- implementation of the technology/measures over a long time period.
3) Demonstrating as per 'Guidance on Common Practice analysis' EB 69 version 02, that factor F[36] is greater than 0.2 and N_{all}-N_{diff} is greater than 3.

[36] Factor F represents the share of plants using technology similar to the technology used in the proposed project activity in all plants that deliver the same output or capacity as the proposed project activity

The investment barrier, access to finance barrier, technology barrier and barrier due to prevailing practice are the major barriers faced by the renewable energy sector in PNG and based on these barriers, it is sufficient to demonstrate the additionality of a typical CPA. Each CPA's additionality will be assessed individually.

For CPAs under option 2, additionality will be demonstrated by following the current SSC guidelines as per the Guidelines on the demonstration of additionality of small scale project activities (version 09, EB 68).

In the case of development of standardized baseline for renewable energy by the host country and approval by the CDM Executive Board, the same shall be utilized for assessment of baseline and demonstration of additionality.

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

As described in E.5.1., the additionality of a CPA, if not eligible under the positive list of technology discussed above , will be assessed and demonstrated based on the key criteria and data as in the ***option 1*** and ***option 2***.

In case of CPA activities up to 5 megawatts, the additionality will be demonstrated based on option 1, wherein, one of the conditions (mainly condition (a) in most of the cases) in paragraph 2 of the Guidelines for demonstrating additionality of Micro-scale project activities" EB 63 (version 3)will be satisfied.

For CPA activities in the capacity range of 5 – 15 MW, the additionality will be demonstrated by following the current SSC guidelines as per the Guidelines on the demonstration of additionality of small scale project activities (version 09, EB 68).

The relevant national and sectoral policies are given below:

- Independent State of Papua New Guinea; Statutory Instrument; No 29 of 2002
- Environment (Procedures) Regulation 2002
- Independent State of Papua New Guinea; Statutory Instrument; No 30 of 2002
- Environment (Prescribed Activities) Regulation 2002
- Guideline for Preparation of Environmental Inception Report; **DEC** Publication: *GL-Env/01/2004.*
- Guideline for Conduct of Environmental Impact Assessment & Preparation of Environmental Impact Statement ; DEC Publication: *GL-Env/02/2004.*
- Independent State of Papua New Guinea; Statutory Instrument; No. 64 of 2000; Environment Act 2000.
- Independent State of Papua New Guinea; Statutory Instrument; No. 12 of 2002; AN ACT entitled
- *Environment (Amendment) Act* 2002
- Electricity Industry Act (Chapter 78) consolidated to No 10 of 2002

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

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

The explanation of methodological choice and approach for baseline emissions under various scenarios has been explained in section E.4 above. The explanation is based on paragraph 13 & 14 of AMS I.F (version 02)/paragraphs 10,11 & 12 of AMS I.D (version 17)/paragraphs 8,9,10 & 11 of AMS IA (version 14). Each CPA will adopt the relevant baseline scenarios as discussed in section E.4.

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

Project emissions *(PEy)*

Emissions from Hydro Power project

For hydro power CPAs that result in new reservoirs and/or the increase of existing reservoirs, the power density (*PD*) of the CPA shall be calculated as per ACM0002, version 12.2.2, as follows:

$PD = Cap_{PJ} / A_{PJ}$

Where[37]:

PD	Power density of the CPA, in W/m^2.
Cap_{PJ}	Installed capacity of the hydro power plant after the implementation of the CPA (W).
A_{PJ}	Area of the reservoir measured in the surface of the water, after the implementation of the CPA, when the reservoir is full (m^2).

If the *PD* is greater than 4 W/m^2 and less than or equal to 10 W/m^2:

$PE_y = EF_{Res} * TEG_y / 1000$

Where:

PE_y	Emission from reservoir expressed as tCO2e/year
EF_{Res}	default emission factor for emissions from reservoirs.23
TEG_y	Total electricity produced by the CPA, including the electricity supplied to the grid and the electricity supplied to internal loads, in year *y* (MWh).

If *PD* is greater than 10 W/m^2, then:

$PE_y = 0$

Emissions from Geothermal project

For Geothermal CPA's, project emissions have to be considered following the procedure described in the most recent version of ACM0002.

[37] Since the eligibility requirements admit only Greenfield hydropower projects the parameters Cap_{BL} and A_{BL} defined in version 12.2.0 of ACM0002 are set equal to zero.

$PE_y = PE_{FF,y} * PE_{GP,y}$

Where:

PE_y	Emission from reservoir expressed as tCO2e/year
$PE_{FF,y}$	Project emissions from fossil fuel consumption in year y (tCO2/yr)
$P_{GPF,y}$	Project emissions from the operation of geothermal power plants due to the release of non-condensable gases in year y (tCO2e/yr)

$PE_{FF,y}$ shall be calculated as per the latest version of the .Tool to calculate project or leakage CO2 emissions from fossil fuel combustion.

$PE_{GP,y}$ is calculated as follows:

$PE_{GP,y} = (W_{steam,CO2,y} + W_{steam,CH4,y} + GWP_{CH4}) . M_{steam,y}$

Where:

$PE_{GPF,y}$	Project emissions from the operation of geothermal power plants due to the release of non-condensable gases in year y (tCO2e/yr)
$W_{steam, CO2, y}$	Average mass fraction of carbon dioxide in the produced steam in year y (tCO_2/t steam)
$W_{steam, CH4, y}$	Average mass fraction of methane in the produced steam in year y (tCH_4/t steam)
GWP_{CH4}	Global warming potential of methane valid for the relevant commitment period (tCO_{2e}/tCH_4)
$M_{steam,y}$	Quantity of steam produced in year y (t steam/yr)

For all technologies (wind/solar/hydro/geothermal/tidal/wave/renewable biomass/ biomass gasification)

a) CO_2 emissions from on-site consumption of fossil fuel

For CPA's involving on-site consumption of fossil fuels, CO_2 emissions due to the project activity will be calculated using the latest version of the Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion.

As per "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion"
(Version 2)

CO_2 emissions from fossil fuel combustion in process j are calculated based on the quantity of fuels combusted and the CO_2 emission coefficient of those fuels, as follows:

$$\mathbf{PE_{FC,j,y} = \Sigma\, FC_{i,j,y} * COEF_{i,y}}$$

$PE_{FC,j,y}$ = CO_2 emissions from fossil fuel combustion in process j during the year y(tCO_2/yr);

$FC_{i,j,y}$ = quantity of fuel type i combusted in process j during the year y (mass or volume unit/yr);
$COEF_{i,y}$ = CO_2 emission coefficient of fuel type i in year y (tCO_2/mass or volume unit)
I = fuel types combusted in process j during the year y

The CO_2 emission coefficient $COEF_{i,y}$ will be calculated as per option B below.

Option B: The CO_2 emission coefficient $COEF_{i,y}$ is calculated based on net calorific value and CO_2 emission factor of the fuel type i, as follows:

$$\mathbf{COEF_{i,y} = NCV_{i,y} * EF_{CO2,i,y}}$$

Where:

$COEF_{i,y}$ = Is the CO_2 emission coefficient of fuel type i (tCO_2/mass or volume unit);
$NCV_{i,y}$ = Is the weighted average net calorific value of the fuel type i in year y (GJ/mass or volume unit)
$EF_{CO2,i,y}$ = Is the weighted average CO_2 emission factor of fuel type I in year y (tCO_2/GJ)
I = Are the fuel types combusted in process j during the year y

b) CO_2 emissions from electricity consumption by the project activity

In case of plant maintenance/shut down, if electricity is imported from the grid relevant project emissions will be calculated as per the "*Tool to calculate baseline, project and/or leakage emissions from electricity consumption*" Version 1.

As per the "*Tool to calculate baseline, project and/or leakage emissions from electricity consumption"*

The tool is only applicable if one out of the following three scenarios applies to the sources of electricity consumption:

Scenarios	Applicability
Scenario A: Electricity consumption from the grid. The electricity is purchased from the grid only. Either no captive power plant is installed at the site of electricity consumption or, if any onsite captive power plant exists, it is not operating or it can physically not provide electricity to the source of electricity consumption.	To be specified in CPA
Scenario B: Electricity consumption from (an) off-grid fossil fuel fired captive power plant(s). One or more fossil fuel fired captive power plants are installed at the site of the electricity consumption source and supply the source with electricity. The captive power plant(s) is/are not connected to the electricity grid.	To be specified in CPA
Scenario C: Electricity consumption from the grid and (a) fossil fuel fired captive power plant(s). One or more fossil fuel fired captive power plants operate at the site of the electricity consumption source. The captive power plant(s) can provide electricity to the electricity consumption source. The captive power plant(s) is/are also connected	To be specified in CPA

to the electricity grid.	

As per the tool, project emissions from consumption of electricity are calculated based on the quantity of electricity consumed, an emission factor for electricity generation and a factor to account for transmission losses, as follows:

$$PE_{EC,y} = \sum_{j} EC_{PJ,j,y} \times EF_{EL,j,y} \times (1 + TDL_{j,y})$$

Where;

$PE_{EC,y}$	=	Project emissions from electricity consumption in year y (tCO2/yr)
$EC_{PJ,j,y}$	=	Quantity of electricity consumed by the project electricity consumption source j in year y (MWh/yr)
$EF_{EL,j,y}$	=	Emission factor for electricity generation for source j in year y (tCO2/MWh)
$TDL_{j,y}$	=	Average technical transmission and distribution losses for providing electricity to source j in year y

The emission factor and relevant parameters to be monitored will be determined as per the scenario identified above and as per the procedure provided in 'Tool to calculate baseline, project and/or leakage emissions from electricity consumption'

Leakage *(Ly)*

For CPA's not transferring energy generating equipment from another activity, the leakage is considered as zero.

In the specific case of biomass project activities the determination of leakage will be done following the general guidance for leakage in small-scale biomass project activities (attachment C of appendix B of simplified modalities and procedures for small-scale clean development mechanism project activities; decision 4/CMP.1) or following the procedures included in the leakage section of AM0042.

Emission reductions *(ERy)*

Emission reductions are calculated as follows:

ERy =BEy -PEy-Ly

Where:

ERy	Emission reductions in year *y* (tCO2e/y).
BEy	Baseline emissions in year *y* (tCO2e/y)
PEy	Project emissions in year *y* (tCO2/y).
Ly	Leakage emissions in year *y* (tCO2/y).

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

For CPA's applicable under AMS I.F. 'Renewable electricity generation for captive use and mini-grid'(I.F/version 02, Sectoral scope:01, EB 61.

Data / Parameter:	$EF_{CO2, y,grid/mini-grid/captive}$
Data unit:	tCO2e/MWh
Description:	Emission factor of the grid/mini-grid/captive where the renewable power is exporting (or would have exported) its electricity to.
Source of data used:	Calculated as described in E.4.
Value applied:	To be specified in each SSC-CPA
Justification of the choice of data or description of measurement methods and procedures actually applied :	For grid/mini grid the emission factor will be calculated as per procedure provided in AMS I.D i.e. conservative of emission factor as per latest version of "Tool to calculate the emission factor for an electricity system" or weighted average emissions (in tCO2/MWh) of the current generation mix. For captive the emission factor will be calculated as per the procedure provided in the latest version of "Tool to calculate baseline, project and/or leakage emissions from electricity consumption"
Any comment:	The procedure followed and relevant parameter monitored for calculating the emission factor shall be described in the CPA-DD

***For CPA's applicable under AMS* I.D**. 'Grid connected renewable electricity generation' (I.D/version 17, Sectoral scope: 01, EB 60).

Data / Parameter:	$EF_{CO2,y,grid}$
Data unit:	tCO2e/MWh
Description:	CO_2 emission factor of the grid (national or regional) in year y
Source of data used:	Calculated as described in E.4
Value applied:	To be specified in each SSC-CPA
Justification of the choice of data or description of measurement methods and procedures actually applied :	The grid emission factor will be calculated as per procedure provided in AMS I.D i.e conservative of emission factor as per latest version of "Tool to calculate the emission factor for an electricity system" or weighted average emissions (in tCO_2/MWh) of the current generation mix.
Any comment:	The procedure followed and relevant parameter monitored for calculating the emission factor shall be described in the CPA-DD

***For CPA's applicable under AMS* I.A**. 'Electricity generation by the user' (I.A/version 14, Sectoral scope:01, EB 54).

Data / Parameter:	$EF_{CO2,y}$ ($EF_{CO2,diesel}$)
Data unit:	tCO2e/MWh
Description:	CO_2 emission factor in year y for the baseline energy
Source of data used:	AMS I.A
Value applied:	0.8
Justification of the choice of data or description of	Default value for Option 1 and 2 of AMS I.A

measurement methods and procedures actually applied :	
Any comment:	-

Other parameters

Data / Parameter:	GWP_{CH4}
Data unit:	tCO2e/tCH4
Description:	Global warming potential of methane valid for the relevant commitment period
Source of data used:	IPCC
Value applied:	For the first commitment period: 21 tCO2e/tCH4.
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	

Data / Parameter:	EF_{Res}
Data unit:	kg CO2e/MWh
Description:	Default emission factor for emissions from reservoirs
Source of data used:	Default value as per EB23
Value applied:	90 kgCO2e/MWh.
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	For calculation of project emission (PE) in case of hydro projects; For CPAs that result in new reservoirs and/or the increase of existing reservoirs

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

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

For CPA's applicable under AMS I.F. 'Renewable electricity generation for captive use and mini-grid' (version 02, Sectoral scope:01, EB 61).

Data / Parameter:	EGBL,y
Data unit:	MWh/y
Description:	Quantity of net electricity displaced in year *y*
Source of data to be used:	Measured by energy meter(s)
Value of data applied for the purpose of	To be specified in each SSC-CPA

calculating expected emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	Continuous monitoring by at least 0.5 class accuracy meter integrated hourly and recorded monthly and yearly. If applicable, cross check net electricity supplied to a grid as gross energy generation in the project activity power plant minus the auxiliary/station electricity consumption, technical losses and electricity import from the grid to the project power plant measured at the grid interface/connection used for billing purposes. Data archiving would be done both electronically and on paper records. The Data will be stored for at least 2 years after last crediting period
Monitoring/Recording Frequency	Continuous monitoring, hourly measurement and at least monthly recording
QA/QC procedures to be applied:	If applicable, measurement results will be cross checked with records for sold/purchased electricity (e.g., invoices/receipts). Measuring equipment should be certified to national or IEC standards and calibrated according to the national standards and reference points or IEC standards and recalibrated at appropriate intervals according to manufacturer specifications, but at least once in three years.
Any comment:	Applicable to wind/solar/hydro/geothermal/tidal/wave/renewable biomass/ biomass gasification power plant(s) or unit(s)

Additional Parameters to be monitored in case of fossil fuel consumption in CPA as per 'Tool to calculate project or leakage CO2 emissions from fossil fuel combustion' (Applicable to wind/solar/hydro/geothermal/tidal/wave/renewable biomass power/ biomass gasification)

Data / Parameter:	$EF_{CO2,i,y}$
Data unit:	t CO_2/GJ
Description:	Weighted average CO_2 emission factor of fuel type i in year y
Source of data to be used:	The following data sources to be used a) Supplier data b) If (a) is not available, measurement by PP c) If (a)is not available, regional or national default values will be taken for liquid fuels d) If (a) is not available, IPCC default values at the upper limit of the uncertainty at a 95% confidence interval.
Value of data applied for the purpose of calculating expected	$EF_{CO2,i,y}$

emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	For a) and b): Measurements should be undertaken in line with national or international fuel standards at each fuel delivery. In case of (c), appropriateness of the values will be reviewed annually. In case of (d), any revisions of the IPCC Guidelines will be taken into account. The Data will be stored for atleast 2 years after last crediting period
QA/QC procedures to be applied:	For a) and b): Measurements should be undertaken in line with national or international fuel standards. For a): If the fuel supplier does provide the NCV value and the CO2 emission factor on the invoice and these two values are based on measurements for this specific fuel, this CO2 factor should be used. If another source for the CO_2 emission factor is used or no CO_2 emission factor is provided, options b), c) or d) should be used.
Any comment:	

Data / Parameter:	NCV_i
Data unit:	GJ per unit volume or mass unit
Description:	Weighted average net calorific value of fuel type i in year y
Source of data to be used:	The following data sources to be used a) Supplier data b) If (a) is not available, measurement by PP c) If (a) is not available, regional or national default values will be taken for liquid fuels d) If (a) is not available, IPCC default values at the upper limit of the uncertainty at a 95% confidence interval.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be specified in each SSC-CPA
Description of measurement methods and procedures to be applied:	For (a) and (b) Measurements to be undertaken in line with national or international fuel standards and at each fuel delivery. In case of (c), appropriateness of the values will be reviewed annually. In case of (d), any revisions of the IPCC Guidelines will be taken into account. The Data will be stored for atleast 2 years after last crediting period
QA/QC procedures to be applied:	Verify if the values under (a),(b) and (c) are within the uncertainty range of the IPCC default values as provided in Table 1.2, Vol. 2 of the 2006 IPCC Guidelines. If the values fall below this range collect additional information from the testing laboratory to justify the outcome or conduct additional measurements. The laboratories in a), b) or c) should have ISO17025 accreditation or justify that

	they can comply with similar quality standards.
Any comment:	

Data / Parameter:	$FC_{i,j,y}$
Data unit:	Mass or volume unit/y
Description:	Quantity of fuel type i combusted in process j during the year y
Source of data to be used:	On-site measurements
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be specified in each SSC-CPA
Description of measurement methods and procedures to be applied:	As per the .Tool to calculate project or leakage CO2 emissions from fossil fuel combustion. • Use either mass or volume meters. In cases where fuel is supplied from small daily tanks, rulers can be used to determine mass or volume of the fuel consumed, with the following conditions: The ruler gauge must be part of the daily tank and calibrated at least once a year and have a book of control for recording the measurements (on a daily basis or per shift); • Accessories such as transducers, sonar and piezoelectronic devices are accepted if they are properly calibrated with the ruler gauge and receiving a reasonable maintenance; • In case of daily tanks with pre-heaters for heavy oil, the calibration will be made with the system at typical operational conditions The Data will be stored for at least 2 years after last crediting period.
QA/QC procedures to be applied:	The consistency of metered fuel consumption quantities will be cross-checked by an annual energy balance that is based on purchased quantities and stock change. The calibrations would be done as per manufacturer's specifications The measuring equipment should be certified to national or IEC standards and calibrated according to the national standards and reference points or IEC standards and recalibrated at appropriate intervals according to manufacturer specifications, but at least once in three years.
Any comment:	

For CPA's applicable under AMS I.D. 'Grid connected renewable electricity generation' (I.D/version 17, Sectoral scope: 01, EB 61).

Data / Parameter:	$EG_{,facility,y}$ /
Data unit:	MWh/y
Description:	Quantity of net electricity supplied to the grid in year *y*

Source of data to be used:	Measured by energy meter(s)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be specified in each SSC-CPA
Description of measurement methods and procedures to be applied:	Continuous monitoring by at least 0.5 class accuracy meter integrated hourly and recorded monthly and yearly. Data archiving would be done both electronically and on paper records. The net electricity export/supplied to a grid is the difference between the measured quantities of the grid electricity export and the import. If applicable, cross check net electricity supplied to a grid as gross energy generation in the project activity power plant minus the auxiliary/station electricity consumption, technical losses and electricity import from the grid to the project power plant measured at the grid interface/connection used for billing purposes. The Data will be stored for at least 2 years after last crediting period
QA/QC procedures to be applied:	If applicable, measurement results will be cross checked with records for sold/purchased electricity (e.g., invoices/receipts). Measuring equipment should be certified to national or IEC standards and calibrated according to the national standards and reference points or IEC standards and recalibrated at appropriate intervals according to manufacturer specifications, but at least once in three years.
Any comment:	Applicable to wind/solar/hydro/geothermal/tidal/wave/renewable biomass/ biomass gasification power plant(s) or unit(s)

Data / Parameter:	$EG_{,add,y}$
Data unit:	MWh/y
Description:	The total net electrical energy supplied to a grid in year *y* by all units, existing and new project units
Source of data to be used:	Measured by energy meter(s)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be specified in each SSC-CPA
Description of measurement methods and procedures to be applied:	Continuous monitoring by at least 0.5 class accuracy meter integrated hourly and recorded monthly and yearly for each energy unit. Data archiving would be done both electronically and on paper records. The net electricity export/supplied to a grid is the difference between the

	measured quantities of the grid electricity export and the import. If applicable, cross check net electricity supplied to a grid as gross energy generation in the project activity power plant minus the auxiliary/station electricity consumption, technical losses and electricity import from the grid to the project power plant measured at the grid interface/connection used for billing purposes. The Data will be stored for at least 2 years after last crediting period
QA/QC procedures to be applied:	If applicable, measurement results will be cross checked with records for sold/purchased electricity (e.g., invoices/receipts). Measuring equipment should be certified to national or IEC standards and calibrated according to the national standards and reference points or IEC standards and recalibrated at appropriate intervals according to manufacturer specifications, but at least once in three years.
Any comment:	Applicable to wind/solar/hydro/geothermal/tidal/wave/renewable biomass/ biomass gasification power plant(s) or unit(s). This parameter is applicable in case of capacity addition

Data / Parameter:	$EG_{,actual, y}$
Data unit:	MWh/y
Description:	The actual, measured net electrical energy produced and supplied to the grid by the existing units in year *y* (MWh)
Source of data to be used:	Measured by energy meter(s)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be specified in each SSC-CPA
Description of measurement methods and procedures to be applied:	Continuous monitoring by at least 0.5 class accuracy meter integrated hourly and recorded monthly and yearly for each energy unit. Data archiving would be done both electronically and on paper records. The net electricity export/supplied to a grid is the difference between the measured quantities of the grid electricity export and the import. If applicable, cross check net electricity supplied to a grid as gross energy generation in the project activity power plant minus the auxiliary/station electricity consumption, technical losses and electricity import from the grid to the project power plant measured at the grid interface/connection used for billing purposes. The Data will be stored for at least 2 years after last crediting period.
QA/QC procedures to be applied:	If applicable, measurement results will be cross checked with records for sold/purchased electricity (e.g., invoices/receipts). Measuring equipment should be certified to national or IEC standards and calibrated according to the national standards and reference points or IEC

	standards and recalibrated at appropriate intervals according to manufacturer specifications, but at least once in three years.
Any comment:	Applicable to wind/solar/hydro/geothermal/tidal/wave/renewable biomass/ biomass gasification power plant(s) or unit(s). This parameter is applicable in case of capacity addition

***For CPA's applicable under AMS* I.A. 'Electricity generation by the user'**
(Version 14, Sectoral scope: 01, EB 54).

Data / Parameter:	$EG_{,i,y}$
Data unit:	MWh/y
Description:	The estimated annual output of the renewable energy technologies of the group of *i* renewable energy technologies installed
Source of data to be used:	Measured by energy meter(s)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be specified in each SSC-CPA
Description of measurement methods and procedures to be applied:	Continuous monitoring by at least 0.5 class accuracy meter integrated hourly and recorded monthly and yearly. Data archiving would be done both electronically and on paper records. The net electricity export/supplied to a grid is the difference between the measured quantities of the grid electricity export and the import. If applicable, cross check net electricity supplied to a grid as gross energy generation in the project activity power plant minus the auxiliary/station electricity consumption, technical losses and electricity import from the grid to the project power plant measured at the grid interface/connection used for billing purposes. Data will be stored for at least 2 years after last crediting period.
QA/QC procedures to be applied:	If applicable, measurement results will be cross checked with records for sold/purchased electricity (e.g., invoices/receipts). Measuring equipment should be certified to national or IEC standards and calibrated according to the national standards and reference points or IEC standards and recalibrated at appropriate intervals according to manufacturer specifications, but at least once in three years.
Any comment:	Applicable to wind/solar/hydro/geothermal/tidal/wave/renewable biomass/ biomass gasification power plant(s) or unit(s) For CPA's requiring sampling survey, sampling will be followed as described in Appendix 4 to determine the no. of devices operational.

Data / Parameter:	$w_{steam,co2,y}$
Data unit:	tCO_2/t steam
Description:	Average mass fraction of carbon dioxide in the produced steam in year y

Source of data to be used:	Project activity site
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be specified in each SSC-CPA
Description of measurement methods and procedures to be applied:	Non-condensable gases sampling should be carried out in production wells and at the steam field-power plant interface using ASTM Standard Practice E1675 for Sampling 2-Phase Geothermal Fluid for Purposes of Chemical Analysis (as applicable to sampling single phase steam only). The CO_2 and CH_4 sampling and analysis procedure consists of collecting non-condensable gases samples from the main steam line with glass flasks, filled with sodium hydroxide solution and additional chemicals to prevent oxidation. Hydrogen sulphide (H_2S) and carbon dioxide (CO_2) dissolve in the solvent while the residual compounds remain in their gaseous phase. The gas portion is then analyzed using gas chromatography to determine the content of the residuals including CH_4. All alkane's concentrations are reported in terms of methane. The measurements shall be performed at least every 3 months and more frequently, if necessary Data will be stored for at least 2 years after last crediting period.
QA/QC procedures to be applied:	Following ASTM Standard Practice E1675
Any comment:	

Data / Parameter:	$w_{steam,CH4,y}$
Data unit:	tCH_4/t steam
Description:	Average mass fraction of methane in the produced steam in year y
Source of data to be used:	Project activity site
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be specified in each SSC-CPA
Description of measurement methods and procedures to be applied:	As per the procedures outlined for $wsteam,CO_2,y$ Data will be stored for at least 2 years after last crediting period.
QA/QC procedures to be applied:	As per the procedures outlined for $wsteam,CO_2,y$
Any comment:	Applicable to geothermal power projects

Data / Parameter:	$M_{steam,y}$
Data unit:	t steam/yr
Description:	Quantity of steam produced in year y

Source of data to be used:	Project activity site
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be specified in each SSC-CPA
Description of measurement methods and procedures to be applied:	The steam quantity discharged from the geothermal wells should be measured with a venture flow meter (or other equipment with at least the same accuracy). Measurement of temperature and pressure upstream of the venture meter is required to define the steam properties. The calculation of steam quantities should be conducted on a continuous basis and should be based on international standards. The measurement results should be summarized transparently in regular production reports The measurements should be done on a daily basis. Data will be stored for at least 2 years after last crediting period.
QA/QC procedures to be applied:	Calibration: following the technical specification/requirement of the manufacturer but a least every three years.
Any comment:	

Additional parameters to be monitored in case of new hydro power plant

Data / Parameter:	A_{PJ}
Data unit:	m^2
Description:	Area of the single or multiple reservoirs measured in the surface of the water, after the implementation of the project activity, when the reservoir is full
Source of data to be used:	Project Site
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be specified in SSC-CPA
Description of measurement methods and procedures to be applied:	Measured from topographical surveys, maps, satellite pictures, etc. The parameter is determined on a yearly basis. Data will be stored for atleast 2 years after last crediting period.
QA/QC procedures to be applied:	-
Any comment:	For calculating the power density (PD)

Additional parameters to be monitored in case of biomass consumption in CPA

Data / Parameter:	$Q_{Biomass}$
Data unit:	Ton/y

Description:	Quantity of biomass consumed in year y
Source of data to be used:	Calculated
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be specified in each SSC-CPA
Description of measurement methods and procedures to be applied:	Use mass or volume based measurements. Adjust for the moisture content in order to determine the quantity of dry biomass. The quantity of biomass will be measured continuously or in batches. If more than one type of biomass fuel is consumed, each will be monitored separately. Data will be stored for at least 2 years after last crediting period.
QA/QC procedures to be applied:	Cross-checks on the measurements will be done with an annual energy balance that is based on purchased quantities (e.g. with sales receipts) and stock changes. The consistency of measurements ex post will be checked with annual data on energy generation, fossil fuels and biomass used and the efficiency of energy generation as determined ex ante. Measuring equipment should be certified to national or IEC standards and calibrated according to the national standards and reference points or IEC standards and recalibrated at appropriate intervals according to manufacturer specifications, but at least once in three years.
Any comment:	-

Data / Parameter:	$MC_{Biomass}$
Data unit:	% water
Description:	Moisture content of the biomass residues
Source of data to be used:	Measured
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be specified in each SSC-CPA
Description of measurement methods and procedures to be applied:	On-site measurements Ex ante estimates will be provided in the PDD and used during the crediting period. In case of dry biomass, monitoring of this parameter is not necessary The moisture content of biomass of homogeneous quality shall be monitored for each batch of biomass. The weighted average should be calculated for each monitoring period and used in the calculations Data will be stored for at least 2 years after last crediting period.

QA/QC procedures to be applied:	Measuring equipment should be certified to national or IEC standards and calibrated according to the national standards and reference points or IEC standards and recalibrated at appropriate intervals according to manufacturer specifications, but at least once in three years.
Any comment:	-

Data / Parameter:	$NCV_{Biomass, k}$
Data unit:	GJ/mass or volume unit
Description:	Net calorific value of biomass residue type k
Source of data to be used:	Measured
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be specified in each SSC-CPA
Description of measurement methods and procedures to be applied:	Measurement in laboratories according to relevant national/international standards. Measured quarterly, taking at least three samples for each measurement. The average value can be used for the rest of the crediting period. Measure the NCV based on dry biomass. Data will be stored for at least 2 years after last crediting period.
QA/QC procedures to be applied:	Check the consistency of the measurements by comparing the measurement results with, relevant data sources (e.g. values in the literature, values used in the national GHG inventory) and default values by the IPCC. If the measurement results differ significantly from previous measurements or other relevant data sources, conduct additional measurements.
Any comment:	Determined once in the first year of the crediting period

Additional parameters to be monitored in case of electricity consumption by the project activity (wind/solar/hydro/geothermal/tidal/wave/renewable biomass power/ biomass gasification)

Data / Parameter:	**$EC_{PJ,j,y}$**
Data unit:	MWh/y
Description:	Quantity of electricity consumed by the project electricity consumption source j in year y (Onsite electricity consumption of the project activity imported from the grid/min grid/off grid system during the year y)
Source of data to be used:	Electric meter readings located at the project site
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be specified in each SSC-CPA
Description of measurement methods and procedures to be applied:	Continuous monitoring by at least 0.5 class accuracy meter integrated hourly and recorded monthly and yearly. Data archiving would be done both electronically and on paper records.
QA/QC procedures to	If applicable, measurement results will be cross checked with records for

be applied:	purchased electricity (e.g., invoices/receipts). Measuring equipment should be certified to national or IEC standards and calibrated according to the national standards and reference points or IEC standards and recalibrated at appropriate intervals according to manufacturer specifications, but at least once in three years. Data will be stored for at least 2 years after last crediting period.
Any comment:	Applicable to wind/solar/hydro/geothermal/tidal/wave/renewable biomass/ biomass gasification power plant(s) or unit(s)

Data / Parameter:	**$TDL_{j,y}$**
Data unit:	-
Description:	Average technical transmission and distribution losses for providing electricity to source j in year y
Source of data to be used:	In case of Scenario A, one of the following option will be chosen – • Use recent, accurate and reliable data available within the host country; • Use as default values of 20% for (a) project electricity consumption sources; (b) baseline electricity consumption sources if the electricity consumption by all project and leakage electricity consumption sources to which scenario A or scenario C (cases C.I or C.III) applies is larger than the electricity consumption of all baseline electricity consumption sources to which scenario A or scenario C (cases C.I or C.III) applies. • Use as default values of 3% for (a) baseline electricity consumption sources; (b) project and leakage electricity consumption sources if the electricity consumption by all project and leakage electricity consumption sources to which scenario A or scenario C (cases C.I or C.III) applies is smaller than the electricity consumption of all baseline electricity consumption sources to which scenario A or scenario C (cases C.I or C.III) applies.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	To be specified in each SSC-CPA
Description of measurement methods and procedures to be applied:	For a): $TDL_{j,y}$ will be estimated for the distribution and transmission networks of the electricity grid of the same voltage as the connection where the proposed CDM project activity is connected to. The technical distribution losses should not contain other types of grid losses (e.g. commercial losses/theft). The distribution losses can either be calculated by the project participants or be based on references from utilities, network operators or other official documentation. Data will be stored for at least 2 years after last crediting period.
QA/QC procedures to be applied:	Annually. In the absence of data from the relevant year, most recent figures should be used, but not older than 5 years.
Any comment:	The parameter will be used to calculate relevant project emissions, if electricity is imported from the grid in case of a plant shutdown.

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

The purpose of the monitoring plan is to measure the gross/net electricity delivered to the mini-grid or national/regional and/or for captive use by the CPA.

To ensure that the data is reliable and transparent, the project entity will establish Quality Assurance and Quality Control (QA&QC) measures to effectively control and manage data reading, recording, auditing as well as archiving data and all relevant documents.

Data to be monitored is the gross/net electricity delivered to the local mini-grid/national or regional grid by the project. The monitoring data is derived from periodic electricity meter records kept by the project owners and/or the mini-grid/grid company. The manager of the renewable energy plant will be responsible for collecting the monitoring data and will provide the coordinating and managing entity with meter readings for electricity delivered and calibration certificates. Details of the CPA monitoring plan will be described for each CPA.

The data will be archived electronically and be stored for 2 years after the end of the crediting period of each CPA by the coordinating and managing entity.

The installation location of the meters will be detailed in each CPA. The project entity will implement QA&QC measures to calibrate and guarantee the accuracy of metering and safety of the project operation. The metering devices will be calibrated and inspected properly and periodically as per standard industry norms and requirements. The grid company and the project owners are responsible for operation and maintenance of their respective electricity meters.

In CPA's (e.g solar rooftop, etc) where certain key parameters will be determined based on a sample survey, the monitoring plan in CPA-DD will include a detailed sampling plan. The sampling plan will be developed as per the 'Standard for Sampling and surveys for CDM Project Activities and Programme of Activities', 'Guidelines for sampling and surveys for CDM project activities and programme of activities'and other relevant guidelines/procedure approved by CDM Executive Board. The sampling plan will include information on parameters for which sampling plan will be followed, sampling approach, confidence/precision criteria followed including justification, etc.

The responsibilities for verification of the projects are defined in each CPA. The CPA also defines the responsibility for providing the DOE with all required necessary information, before, during and in the event of queries, after the verification.

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

Date of completion of application of the baseline study and monitoring methodology: 02/07/2011. The persons responsible for completion of the baseline are not considered as Project Participants.

Name of the responsible person:
Srikanth Subbarao, CDM Regional Expert for Pacific, Technical Support Facility, Asian Development Bank, Manila. ssubbarao@cmp-adb.org

Darshak Y Mehta, CDM Validation Expert, Technical Support Facility, Asian Development Bank, Manila. dmehta@cmp-adb.org

Annex 1

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

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding from Parties included in Annex 1. There is no diversion of Official Development Assistance fund for the project activity.

Annex 3

BASELINE INFORMATION

Described in Section E.

Annex 4

MONITORING INFORMATION

Described in Section E.7.2.

Appendix 1: List of combination of RE technologies covered under this PoA

Methodology/Methodology Combination > / Technology ↓	AMS I.A	AMS I.D	AMS I.F	AMS I.A + AMS I.D	AMS I.A + AMS I.F	AMS I.D + AMS I.F	AMS I.A + AMS I.D + AMS I.F
Single Methodology in a CPA							
Wind (Onshore/Offshore)	✓	✓	✓				
Solar (PV/Thermal)	✓	✓	✓				
Hydro	✓	✓	✓				
Geothermal	✓	✓	✓				
Tidal	✓	✓	✓				
Wave	✓	✓	✓				
Biomass (boiler / rankine cycle based)	✓	✓	✓				
Biomass Gasification	✓	✓	✓				
Combination of Two Methodologies in a CPA							
Wind (Onshore/Offshore)				✓	✓	✓	
Solar (PV/Thermal)				✓	✓	✓	
Hydro				✓	✓	✓	
Geothermal				✓	✓	✓	
Tidal				✓	✓	✓	
Wave				✓	✓	✓	
Biomass (boiler / rankine cycle based)				✓	✓	✓	
Biomass Gasification				✓	✓	✓	
Combination of all the Three methodologies in a CPA							
Wind (Onshore/Offshore)							✓
Solar (PV/Thermal)							✓
Hydro							✓
Geothermal							✓
Tidal							✓
Wave							✓
Biomass (boiler / rankine cycle based)							✓
Biomass Gasification							✓

Appendix 2: Information on regional grids in PNG[38]

The Port Moresby system serves the National Capital District, the commercial, industrial and administrative centre of Papua New Guinea. The Port Moresby system also serves surrounding areas in the Central Province. The main source of generation is the Rouna system consisting of four hydro stations on the Laloki River, controlled water storage in Sirinumu Reservoir and a small generating set at the toe of Sirinumu dam. The total generation capacity from the Rouna Power Stations is 62.2MW.

PNG Power also operates a thermal power station at Moitaka, outside Port Moresby which is also used to supplement the supply from the Rouna Power Station with a generation capacity of 30MW.

PNG Power also purchases electricity from a privately owned power station at Kanudi. The Kanudi Power Station (diesel) completed in January, 1999 is owned and operated by an IPP, selling power exclusively to PNG Power. Kanudi adds another 24 MW to the Port Moresby system generation capacity and is being utilised as base load.

Ramu System
The Ramu system serves the load centres of Lae, Madang and Gusap in the Momase Region and the Highlands centres of Wabag, Mendi, Mt Hagen, Kundiawa, Goroka, Kainantu and Yonki. The economy of the regions supplied by the Ramu system is based on mining, oil, gas, coffee, tea, timber and industrial productions.

The main source of generation is the Ramu Hydro Power Station with an installed capacity of 75MW, comprising of five units of 15MW each. This station which was previously a run-of-river scheme became a storage scheme when the Yonki dam was commissioned in February, 1991. Additional hydro energy is supplied by Pauanda, a run-of-river station in the Western Highlands Province with 12MW. Power is also purchased when required from the privately owned Baiune Hydro Power Station at Bulolo in Morobe Province, and varies between 1 to 2 MW depending on availability.

Transmission line outages, energy and peak demands are met by diesel plants at Madang, Lae, Mendi and Wabag. These plants serve as stand-by units.

Gazelle Peninsula System
The Gazelle Peninsula system serves the townships of Rabaul, Kokopo and Keravat to service Gazelle's economy based on copra, coconut oil, cocoa, timber and fishing.

The Gazelle Peninsula system is powered by a 10MW hydro power system at Warangoi, Ulagunan Diesel Power Station with 8.4MW, and 0.5MW from Kerevat Diesel Power Station.

[38] As of July 2012 - http://www.pngpower.com.pg/index.php/2012-01-10-06-42-16/information-on-regional-grids-in-png

Appendix 3:
Applicability condition involving replacement of equipment

From:
Wavinya Malinda <WMalinda@unfccc.int>

To: jacharya@adb.org

Cc: Gajanana Hegde <GHegde@unfccc.int>, Janak Shrestha <JShrestha@unfccc.int>, Jane Stickdorn <JStickdorn@unfccc.int>, Julieta Nikova <JNikova@unfccc.int>, Kenjiro Suzuki <KSuzuki@unfccc.int>, Xing Zhang <XiZhang@unfccc.int>

Date: 04/20/2012 06:11 PM

Subject: Re: Revision in AMS I A, AMS I B, AMS I C, AMS I D and AMS I F following SSC_547 and guidance in EB 65 paragraph 102

Please confirm immediately the receipt of this message. Thank you.

Dear Stakeholder,

It is our understanding that the Board's clarification specified in paragraph 102 of the EB65 meeting report shall be in principle applicable to all current versions of the methodologies. See, for example, the SSC WG 36 has already agreed to recommend a revision of AMS-I.A reflecting the change above for approval to the Board. For other Type I methodologies such as AMS-I.B, AMS-I.C, AMS-I.D and AMS-I.F, as per the mandate by the Board, the SSC WG will implement the changes in future revision proposals of the methodologies.

Best regards,

CDM SSC Team

Appendix 4 : Sampling Plan

The section below provides information on the methodology to be followed for determining the sampling size for CPA's with certain technology/measures under this PoA. Detailed sampling plan will be provided in the CPA's where sampling survey will be required.

A) Sampling Design

(i) Sampling Objectives and Reliability

The objective is to obtain a reliable estimate of the following key variables over the course of the crediting period and meeting the 90/10 confidence/precision levels. . It is envisaged that sampling will be carried out for the following technology measures. In general the users would be renewable energy generated by individual / community users having small capacity

- Solar photovoltaic systems
- Biomass gasifier
- Roof top / standalone wind turbine
- Micro / pico hydro power plants

In case a CPA involves more than one technology listed above the sampling survey will be conducted for each technology included in the CPA.

It is envisaged that the key variable will be

- Number of devices in service and operating (ex-post)
- Number of devices (sample size) for which electricity generation is metered as a representative of the group

In case additional variables are identified during CPA validation stage, after taking into consideration CPA characteristics, the sampling plan will be adopted accordingly.

(ii) Target Population

The target population is the households/SMEs/communities/users that will participate in the CPA under this PoA. The device to be sampled will be drawn from the list of individual device/equipment users as contained in the CPA records (database) which is maintained by the CPA implementer.

(iii) Sampling Method

The required number of device to be selected for sampling of the required parameter will be determined by the CME according to the level of reliability required. The population within the sampling frame is expected to be homogenous, taking into consideration the key variable to be determined. Hence as per 'Guidelines for sampling and surveys for CDM project activities and programme of activities' version 02, EB 69 simple random sampling method will be adopted. If necessary or deemed to be appropriate by the CME, other sampling methods could also be applied with proper justification in line with 'Guidelines for sampling and surveys for CDM project activities and programme of activities' version 02, EB 69.

(iv) Sampling Size

To ensure a random selection, random number generators shall be applied. Each device in the target population will be uniquely identifiable by its Serial ID number. Each device can thus be allocated a Sample Selection Number in each monitoring period, starting at 1 and increasing up to the total number of device in the Database.

It is envisaged that the key parameter of interest will be – Number of devices in service and operating (ex-post) expressed in percentage or
The sample size for which metering of electricity system shall be done

The equation to give us the required sample size is:

$$n \geq \frac{1.645^2 N \times p(1-p)}{(N-1)\times 0.1^2 \times p^2 + 1.645^2 p(1-p)}$$

n	Sample size
N	Total number of households /users
p	Expected proportion (0.50)
1.645	Represents the 90% confidence required
0.1	Represents the 10% relative precision

However in survey's where the of the CPA relates to a mean value of interest the following equation shall be followed

$$n \geq \frac{1.645^2 NV}{(N-1)\times 0.1^2 + 1.645^2 V}$$

Where

$$V = \left(\frac{SD}{mean}\right)^2$$

n	Sample size
N	Total number of households /users
Mean	Expected mean
SD	Expected standard deviation
1.645	Represents the 90% confidence required
0.1	Represents the 10% relative precision

The sample survey shall be carried out as per the methodology requirement and the CPA characteristics. The information related to frequency of sample survey shall be provided in SSC-CPA-DD. Similar approach (equation) as described above shall be followed in the case of a baseline survey, required for a particular CPA.

The precision and expected variance will be established in accordance with the recommended values by UNFCCC, namely 90% precision and 10% margin of error.

(v) Sampling Frame

Sample frame will be developed from the data recorded by SSC-CPA implementer. The frame will consist of the recipient information in the project region.

a) Information recorded in database

The following minimum information on households/users that receive the device will be recorded

- A list of each household/user that received the device (house address, name of occupant);
- Date of installation of the device
- Serial Number and nominal power ratings of the device installed
- Date of collection of the device

b) Information on households included in *ex-post* monitoring survey

- A list of each household in the survey (house address, name of occupant).
- Information on when the household has been added to the survey and information on when it has been removed (if applicable).
- Information on any changes made to the device (exchange, repair, removed and installed elsewhere, etc).

B) Data to be collected

(i) Field measurement

Number of devices placed in service and operating (ex-post)

- Within 12 months of the start of distribution, on-site visual surveys of sample households shall be done to identify devices are installed and operating.
- Only devices bearing certain specific characters (to be decided at CPA level) can be counted as installed. While devices replaced as part of a regular maintenance or warranty program can be counted as operating, devices cannot be replaced as part of the survey process and counted as operating.
- In CPA's where measurements are conducted only during limited time periods and are to be scaled up to the whole year demonstrate in the CPA-DD that the parameter of interest is not subject to seasonal fluctuations or the time period selected is conservative or the necessary corrections are applied.
- The record keeping database will be used to record the results of all monitoring, thereby avoiding double counting, with all data stored to be kept for at least two years after the crediting period or the last issuance of CERs for the project activity.

(ii) Quality Assurance/Quality Control

Training will be given to staff responsible for the data collection system on the management system to be put in place as part of the overall PoA. This will include:

- Data to be recorded in the database
- How to identify and record the serial number on a device/equipment;
- How to fill out and where to submit copies of the installation records and any associated documentation;
- Procedure for dealing with a change in serial number or address of a device/equipment;
- Monitoring procedures, in accordance section E.6.3 and E.7.2 of the PoA-DD

On completion of training, trained staff will receive a letter confirming their attendance. The name, company and contact details of all attendees will be recorded as part of the CPA database. This will be used to confirm that the training has been completed and that staffs are qualified to carry out the data collection as required under the PoA.

In order to minimise errors, a quality control and assurance strategy plan will be established. This strategy includes a planning phase in which a clear definition of the target population, the issues and variables to be investigated, the sampling frame and sample size are determined. Also the design of a questionnaire that reflects the objectives of the survey and facilitates field operations and information processing is prepared.

In order to minimise errors, all personnel conducting field measurements, both for the collection of baseline data and annual monitoring of CPAs, on behalf of the programme, will receive training on the procedures to be used for data collection, including the format in which data should be collected, project background, basic functioning of the technology and any other relevant project background.

The potential for non-responses, refusals and related issues will be considered by the CME during sample selection. If the sampling results are insufficient to achieve the target reliability levels, the CME will address this by selecting a larger than necessary sample size before commencing monitoring. Non-response could be considered (e.g. 10%), when designing the sampling survey and determining the sample size. This will be further decided at CPA level.

To achieve good quality data, a standard form shall be designed ex-ant and assessed by the CME. All field personnel will be trained to decrease error. If it is necessary to engage third parties for carrying out field measurements, the CME will ensure that any such third parties are credible, experienced adequately trained for the tasks they are contracted for.In case of an outlier that is a result of a mistake (wrongly recorded, or wrongly entered onto the computer) it can be corrected and in case it is a real value it must be left as it is and included in the analysis. In case the data are highly skewed, then it should be transformed prior to the analysis using appropriate methods.

(iii) Analysis

Data will be used for the preparation of monitoring reports for each CPA. The results of all monitoring will be entered into the database. The raw data shall be scrutinised carefully prior to estimating the mean and checking its reliability. This shall be done using graphical summaries such as histograms, boxplots, normal probability plots, etc. These plots would show up outliers in the data or any skewness in the distribution of the data.

In case of highly skewed data which cannot be transformed prior to the analysis using appropriate methods additional sample shall be taken.

C) Implementation Plan

All sampling efforts will be conducted by staff/third party who have undergone training as part of the programme, as described above. The samplers will have understanding of the native language(s) in which the CPA has been implemented, or will be accompanied by interpreters, thereby allowing complete understanding of any responses given by users, and any questions therein.

The frequency of monitoring shall be specified in the CPA.

Appendix 5: Parameters for investment analysis

For CPAs demonstrating additionality by following one of the three options as mentioned under eligibility criteria 12 d (investment barrier) in section 4.2.2 of PoA DD, the following list of parameters shall be considered. The parameters listed below shall be obtained from corresponding list of documents.

Parameter	Unit	Reference Document/Comment
Technical Parameters		
Plant Capacity	MW	As per: ☐ Purchase order and/or ☐ Feasibility report and/or ☐ Project Preparatory Technical Assistance Report and/or ☐ Technical assistance report
Investment decision date	DD/MM/YYYY	☐ Board Decision or ☐ Loan Agreement or ☐ Main Equipment Purchasing Contract.
Construction start date (actual or expected)	DD/MM/YYYY	☐ Feasibility Study or ☐ Project Status Report or ☐ Notice to proceed for civil work or ☐ Civil work contract or ☐ Commissioning plan/schedule
Project Commissioning date (actual or expected)	DD/MM/YYYY	☐ Commissioning plan/schedule or ☐ Commissioning certificate
Plant load factor	%	As per 'Guidelines for the reporting and validation of plant load factors' (version 01, EB 48, paragraph 3b), the plant load factor shall be determined from below : ☐ The value 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;" or ☐ As per independent expert opinion (including feasibility report or technical assistance report) Or ☐ Calculated based on documents mentioned above.
Auxiliary consumption	MWh	As per: ☐ Feasibility report and/or ☐ Project Preparatory Technical Assistance Report and/or ☐ Technical assistance report Or ☐ Calculated based on documents mentioned above.
Annual Operating hours	8760 hours	-
Net electricity generation	MWh	☐Calculated based on parameters above or ☐Independent Expert Opinion or ☐ Financial report submitted to funding agency.
Technical lifetime of project		☐ As per manufacturer specification ☐ As per expert's opinion (Feasibility Study Report, Detail Engineering Design) or ☐ Default value as per 'Tool to determine the remaining lifetime of equipment' version 01, EB 50.
Other technical parameters		☐ Feasibility report and/or ☐ Project Preparatory Technical Assistance Report and/or ☐ Technical assistance report ☐ Biomass Assessment report
Financial Parameters		
Electricity Tariff		The tariff will be as per : ☐ The legislation at date of investment or
Escalation in Tariff	% per annum	

		☐ The PPA if available at the time of investment decision or ☐ Other formal authorized letter. The tariff will be escalated accordingly but only if specified.
Exchange rate		☐ Bank of Papua New Guinea. ☐ Multilateral agency like World Bank, ADB or IMF. ☐ Currency exchange rates in London ☐ Publication of currency brokerage houses ☐Published literature / journal/articles/ reliable websites
Inflation rate	%	☐ Bank of Papua New Guinea. ☐ Multilateral agency like World Bank, ADB or IMF, KFW, ☐ Academic journal ☐Published literature / journal/articles/ reliable websites
Tax rate	%	☐ As per the PNG government tax regulations. ☐ Feasibility report ☐ Project Preparatory Technical Assistance Report ☐ Technical assistance report
Other financial parameters		☐ Feasibility report ☐Loan documents ☐ Project Preparatory Technical Assistance Report ☐ Technical assistance report ☐ Any Similar activities or Past experience in similar activities ☐ Published literature / journal/articles/ reliable websites

Project Cost		
Total investment (including breakup if available)		☐ Purchase order or Feasibility report ☐ Project Preparatory Technical Assistance Report ☐ Technical assistance report.
Operation and Maintenance (O&M) cost		☐ Feasibility report ☐ Technical assistance report ☐ Board decision ☐ O&M contract ☐ Any Similar activities or Past experience in similar activities ☐ Technical Quotations
Other expenditures (if applicable and not covered under O&M cost)		☐ Feasibility report ☐ Technical assistance report ☐ Project preparatory technical assistance ☐ Industry practice or from experience in other project ☐ Published literature / journal/articles/ reliable websites
Increase in O&M cost	%	☐ Feasibility report ☐ Technical assistance report ☐ Project preparatory technical assistance ☐ Industry practice or from experience in other similar project ☐ Published literature / journal/articles/ reliable websites
Other revenues (if applicable)		☐ Feasibility report ☐ Technical assistance report ☐ Project preparatory technical assistance ☐ Industry practice or from experience in other similar project

		☐ Published literature / journal/articles/ reliable websites
Insurance cost per annum	% of capital expenditure	☐ Feasibility report ☐ Technical assistance report ☐ Project preparatory technical assistance ☐ Industry practice or from experience in other similar project ☐ Published literature / journal ☐ Any valid quotation from Insurance companies
Salvage Value	% of project cost	The fair value should be calculated in accordance with local accounting regulations or international best practice. The fair value calculations will include both the book value of the asset and the reasonable expectation of the potential profit or loss on the realization of the assets.
Fair Value (after deducting salvage value)	PGK	

To further check the robustness of the analysis, a sensitivity test shall be conducted only for variables, including the initial investment cost, that constitute more than 20% of either total project costs or total project revenues by varying the parameters by +/- 10%. Including but not limited to the following:

- Total Investment cost
- Project revenue
- O&M expenditure etc.

For example if in any of the case the IRR exceeds the benchmark,, the CME/CPA implementer shall provide evidence to demonstrate that it is unlikely to happen. In the absence of proper evidence the project will not be considered as additional.

Similarly if in case that the cost of electricity generation is lower than cost of electricity generation of baseline scenario or electricity selling price, the CME/CPA implementer shall provide evidence to demonstrate that it is unlikely to happen. In the absence of proper evidence the project will not be considered as additional.

Benchmark

The parameters used for determining the benchmark along with relevant supporting documents are listed in the table below. The CME will check the consistency of benchmark (pre-tax and post –tax benchmark) and the financial analysis.

One of the four benchmarks listed below shall be opted with proper justification:

Parameter	Unit	Reference Document/Comment
Commercial bank lending rate	**%**	☐ Bank documents, ☐ Reserve bank of PNG
Government declared specific benchmark	**%**	☐ Government circular or records
Weighted average cost of	**%**	☐ Calculated in line with the additionality tool

capital		
Company internal benchmark	**%**	☐ Company document

In case option 2 or option 3 under eligibility criteria 12d is opted, the benchmark above shall be considered as the discount rate while calculating cost of electricity generation.

Parameter	Unit	Reference Document/Comment
Debt to Equity ratio	Ratio	☐Technical Assistance report by multilateral or bilateral agency ☐ Approved feasibility report ☐ Financial institution or other appropriate publicly available document reflecting the general debt/equity ratio for the sector (or comparable projects) in the country. If none of this is available then ☐ As per EB 62, Annex 5, 50% debt and 50% equity should be considered.
Cost of debt	%	☐ Commercial bank lending rate as published by the relevant national authority in PNG ☐ Any International lending agency. ☐ Lending institutions for the project ☐ Actual cost of debt if debt already finalized ☐ Published literature / journal/articles/ reliable websites
Cost of equity	%	☐ Default value as per EB 62 Annex 5 ☐ Stock exchange of PNG ☐ Calculated as per additionality tool
Internal Benchmark		
Cost of Debt	%	☐ Stock exchange data ☐ Company reports ☐ Bank records ☐ Feasibility reports ☐ Technical Assistance report of multilateral institutes ☐ Bank appraisal report ☐ Published literature / journal/articles/ reliable websites
Cost of equity	%	