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):

Sustainable Small Hydropower Programme of Activities (PoA) in Indonesia

Version 2.6
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Document history:
Version 1,14 December 2009
Version 2, 3 September 2010
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Version 2.2, 16 August 2011
Version 2.3, 5 December 2011
Version 2.4, 7 March 2012
Version 2.5, 10 April 2012
Version 2.6, 26 April 2012

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

1. General operating and implementing framework of PoA

The "Sustainable Small Hydropower Programme of Activities (PoA) in Indonesia", later on referred to as "The Sustainable Indonesian Hydro PoA or the SSC-PoA", will support the development of new small-scale grid connected hydropower plants across the Republic of Indonesia. Each small-scale CDM Programme Activity (referred later on as SSC-CPA) under this SSC-PoA will comprise one or more such hydropower plants and have a combined installed capacity of no more than 15 MW - the threshold for small-scale CDM projects. The Sustainable Indonesian Hydro PoA is a voluntary action being coordinated and managed by PT. Hydro Program International (referred later on as PT. HPI or the coordinating entity), the coordinating entity. PT. HPI will work closely with South Pole Carbon Asset Management Ltd (referred later on as SP), the developers of the hydropower plants (referred later on as the project implementer) and other organizations active in the hydropower sector in Indonesia[1] to facilitate the development of new power plants and their inclusion in this SSC-PoA. As a partner in developing the proposed SSC-PoA, GTZ cofinances the pilot PoA development together with South Pole Carbon Asset Management Ltd. based on the Public-Private Partnership agreement signed on 18 February 2008. The PoA development fund would only be utilized to develop PoA documentation from baseline calculation until PoA registration and to inform stakeholders of SSC hydro power plants on the opportunities and principles of the PoA.

2. Policy/measure or stated goal of the PoA

This SSC-PoA is motivated by the paradoxical situation of the hydropower industry in Indonesia. In spite of abundant hydropower resources, hydropower contributes only a small share to Indonesia's power

[1] Such partners include the Deutsche Gesellschaft für Technische Zusammenarbeit (referred as GTZ) and the Foundation of Indonesian Institute for Energy Economics (referred as IIEE).

generation. According to the Hydro Power Potential Study[2] conducted by PLN in 1982, the total potential capacity of hydropower resources in Indonesia is 75,000 MW. Yet, in 2008 the country had installed a total of 3,504 MW hydropower capacity, which represents a mere 4.7% of the technical potential and only 7.2% of the total Indonesian electricity generation capacity[3]. In response, in 2002 the Indonesian government through the Department of Energy and Mineral Resources issued a ministerial decree that obliges the State-Owned Electricity Company (referred to as PT. PLN) to buy electricity generated from renewable energy sources with an installed capacity lower than 1 MW[4] and then continued with an installed capacity between 1 MW to 10 MW[5] in 2006, However, this incentive has not been sufficient to kick-start the hydropower industry in Indonesia as the feed-in tariff price[6] is still low and does not encourage entities besides PT. PLN doing an investment in hydro power plant even though there was a new regulation issued in 2009[7] that provide a benchmark for feed-in tariff that must referred by PT. PLN. As a result, the development of new hydropower plants remains slow and lags besides its huge potential sources. As a vivid illustration of these constraints, the contribution of hydropower towards the Indonesian energy mix has been falling steadily; from 13% in 1998[8] to 7.2% in 2008[9].

The objective of the Sustainable Indonesian Hydro PoA is to develop a platform for supporting the development of sustainable small hydropower projects in Indonesia. To reach this goal PT.HPI will provide the following services:

- raise awareness among local stakeholders of climate change and hydropower. To ensure maximum stakeholder involvement, SSC-CPAs will be developed according to the Gold Standard requirements and will include significant public education and consultation components.
- raise awareness among Indonesian hydropower developers of opportunities for generating CDM revenues. To this end the coordinating entity, in collaboration with the Deutsche Gesellschaft für

[2] PT. PLN's National Generation Development Plan year 2009-2018 (Rencana Usaha Penyediaan Tenaga Listrik PT. PLN (Persero) tahun 2009 s.d. 2018), p. 82.

[3] PLN Annual Report 2008, (http://www.pln.co.id/pro00/images/stories/annual_report/Annual%20Report%202008.pdf, retrieved on November 26, 2010), p. 72-73.

[4] The Minister of Energy and Mineral Resources Decree No. 1122 K issued in 2002 about Guidance on the development of Small-Scattered Scale Electric Power Plant (http://www.esdm.go.id/prokum/kepmen/2002/kepmen-1122-2002.pdf, retrieved on August 19, 2010).

[5] The Minister of Energy and Mineral Resources Regulation No. 02 issued in 2006 about The Development of Medium Scale Renewable Energy Power Plants (http://www.esdm.go.id/prokum/permen/2006/permen-esdm-02-2006.pdf, retrieved on August 19, 2010).

[6] Based on Decree No. 1122 K issued in 2002 and Regulation No. 02 issued in 2006, feed-in tariff price is 0.6 x electricity base price provided by PT. PLN for low-tension voltage grid and 0.8 x electricity base price provided by PT. PLN for medium-tension voltage grid.

[7] The Minister of Energy and Mineral Resources Regulation No. 31 issued in 2009 about The Electricity Purchasing Price by PT. PLN from Small and Medium Scale Renewable Energy Power Plants or excess electric power (http://www.esdm.go.id/prokum/permen/2009/Permen%20ESDM%2031%202009.pdf, retrieved on September 01, 2010).

[8] PLN Annual Report 2002, (http://www.pln.co.id/pro00/images/stories/annual_report/Annual%20Report%202002.pdf, retrieved on November 26, 2010) ,p. 39.

[9] PLN Annual Report 2008, (http://www.pln.co.id/pro00/images/stories/annual_report/Annual%20Report%202008.pdf, retrieved on November 26, 2010), p. 72.

Technische Zusammenarbeit (referred as GTZ) and the Foundation of Indonesian Institute for Energy Economics (referred as IIEE), will conduct capacity building sessions across the country that explain the CDM and support entrepreneurs in integrating CDM into their hydropower projects in order to improve the financial viability of such projects.

- provide standardized and streamlined access to CDM services for the hydropower projects in Indonesia, including the smallest ones that otherwise would not be able to generate into CDM revenues. To this end PT. HPI will coordinate the inclusion of the CPA in the PoA; conduct the registration of the SSC-CPA as a Gold Standard activity (if applicable refer to the Gold Standard requirements); provide monitoring and verification services to all SSC-CPAs; and support the effective commercialization of CERs. Over time additional services will be added to support the effective development of the hydropower sector across Indonesia.

In this way the Sustainable Indonesia Hydro PoA will promote the development of renewable energy and facilitate the abatement of greenhouse gas emissions through replacement of fossil fuel based electricity.

The Sustainable Indonesian Hydro PoA contributes to the sustainable development of Indonesia, as determined by the sustainable development criteria of Indonesia[10].

Environmental sustainability

- The SSC-PoA encourages hydropower utilization to generate electricity, which otherwise would have been generated through power plants using most likely fossil fuels, thereby reducing associated emissions of local pollutant and greenhouse gases.
- As a hydropower project activity, each SSC-CPA uses a renewable energy source and does not produce any solid waste, which in turn reduces the problem of solid waste disposal encountered by most other power sources.
- Being a renewable energy source, hydropower used to generate electricity contributes to resource conservation.
- The eligibility criterion of SSC-CPAs having a capacity of less then 15 MW assures least impact to the environment. Providing carbon finance for such small-hydro power facilities will enhance their profitability towards alternative not sustainable electricity production alternatives.
  In summary, the SSC-PoA causes no negative impact on the surrounding environment; in the end it contributes to environmental well being within the Indonesian regions.

Economic sustainability

- The SSC-PoA increases employment opportunities in the area where the SSC-CPA is located, which will increase local communities' income.
- By generating additional electricity, the SSC-PoA enhances the local investment and business environment, and thereby improves the local economy.
- The SSC-PoA diversifies the sources of electricity generation, important for meeting growing energy demands and the transition away from diesel and coal-supplied electricity generation.
- By only allowing small-hydros, the SSC-PoA helps market players with few capital resources to realise their renewable energy projects which otherwise wouldn't have been able to invest due to too low profitability of such project.
- The decentralised electricity production through the SSC-PoA will help to enhance the grid stability and therefore decrease the regular electricity interruptions.

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[10] National Committee on CDM-Indonesian DNA for CDM website, http://pasarkarbon.dnpi.go.id/web/komnasmpb/cat/5/sustainable-development-criteria-.html, retrieved on November 19th, 2010

Social sustainability

- The SSC-PoA supports the development of hydropower resources in remote parts of the country will otherwise not be served by electricity grids, thereby providing access to power for populations that are socially disadvantaged.
- During civil works, the SSC-CPA is expected to generate considerable employment opportunities for the local population.
- Moreover, the SSC-PoA will generate demand for various kinds of mechanical work, which would generate employment on regular and permanent basis.

Technology sustainability

- The SSC-PoA supports technology and know-how transfer from other regions or even other countries through trainings and practical works.
- The SSC-PoA generates demand for local products when spare parts are needed.

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

The Sustainable Indonesian Hydro PoA is a voluntary action being coordinated and managed by PT.HPI. There are no mandatory laws or regulations in place in Indonesia that require hydropower plants to seek CDM services. Likewise, no mandatory laws or regulations exist requiring the coordinating/managing entity or any other party to develop an SSC-PoA for hydropower plants in Indonesia.

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

1. PT. HPI will be the Coordinating/Managing Entity[11] for the project activities under the Programme of Activities (PoA) and communicate with the CDM Executive Board.
2. Project participants being registered in relation to the proposed SSC-PoA are:

Name of Party involved ((host) indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
Indonesia (host)	PT. Hydro Program International (PT. HPI)	No
Switzerland	South Pole Carbon Asset Management Ltd.	No

Project participants may or may not be involved in the SSC-CPAs included in this SSC-PoA.

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

Small-scale hydropower plant will utilize river water flow to generate electricity without any significant environmental impact, as there will be no significant dam construction. The electricity generation will be then exported to the nearest grid through an interconnection point or sub-station as defined in the PPA. The technology employed by each small-scale hydropower plant in the proposed SSC-PoA may differ but nevertheless may comprise *inter alia* barrages, diversion tunnels, fore bays, spillways, pressure pipes,

[11] The Coordinating/Managing Entity shall be a project participant authorized by all participating host country DNAs involved and identified in the modalities of communication as the entity which communicates with the Executive Board, including on matters relating to the distribution of CERs.

powerhouses, and booster stations. In addition to that, the proposed SSC-PoA will include all hydro power technologies such as Pelton, Kaplan, etc.. Most of equipments i.e. generators will still be imported from Annex-I or Non Annex-I countries, which means a transfer of technology from those countries to the host country would happen thanks to the proposed SSC-PoA.

A.4.1. Location of the programme of activities:

The SSC-PoA covers the geographical region of Republic of Indonesia

A.4.1.1. Host Party(ies):

The Republic of Indonesia

A.4.1.2. Physical/ Geographical boundary:

The proposed SSC-PoA will be developed within one country only, Indonesia. The location of which the SSC-CPAs will be implemented is between the latitude of 6^{o} 00’ N to 11^{o} 00’ S and the longitude 97^{o} 00’ E to 141^{o} 00’ E[12].

A map indicating the location of the PoA is provided below.

Figure 1: The map of the Republic of Indonesia. Source: Google Earth

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

A typical SSC-CPA under this SSC-PoA comprises one or more small hydropower plants with an installed capacity not exceeding 15 MW. By hydropower, the PPs intend systems that harvest the force or energy of moving water. The hydropower plants are newly constructed by one or more third-party project owners and generate electricity from hydropower. As outlined in Section A.4.2.2, an SSC-CPA

[12] http://www.indonesia.go.id/id/index.php?option=com_content&task=view&id=112&Itemid=1722

participating in this SSC-PoA must not comprise an addition, retrofit or replacement activity in an existing hydro power plant.

Technology transfer
Constructing and operating a hydropower project require very specific and high-technology content equipment e.g. turbine, generator and alternator and some specific know-how on how to design and operate such plant. Only part of the equipment and know-how can be found locally, which implies that most of the equipment required for the SSC-CPA's construction will be imported from abroad (from Annex-I and non Annex-I countries). Thus, this results in a technology transfer (North-South as well as South-South).

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

The proposed SSC-PoA falls in the type I scope 1 (Energy industries (renewable - / non-renewable sources) category.

The SSC-PoA will employ all hydro technologies that harvest the kinetic or potential energy of water. The SSC-PoA may include technologies (but not limited to) as Pelton, Kaplan, Turgo, Francis turbines etc..

The technologies employed in each SSC-CPA may differ from one SSC-CPA to the next, and may comprise *inter alia* barrages, diversion tunnels, fore bays, spillways, pressure pipes, powerhouses, and booster stations. SSC-CPAs will transmit the generated electricity to a grid.

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

An SSC-CPA to be included in the proposed SSC-PoA shall:

Topic	No.	Eligibility Criteria	Possible Verification source
Geographical boundary	1	Being setup within the geographical boundary of the PoA	Geographical co-ordinates of the CPA.
Double counting	2	CPA must be uniquely identified with the Geographical co-ordinates of the project location and should not result into double counting	- Unique geographical co-ordinates. - Confirmation from CPA owner on not applying as an individual CDM project neither being part of any other PoA. A check on the CDM website among registered projects and projects under Validation.
Technology	3	be a greenfield hydropower plant generating electricity with a capacity equal or below the type I small-scale threshold.	Detailed project report or equivalent
Start date	4	Either have: a. have a project start date after the PoA start date, 22 July 2007 and listed in the CPA list sent to the UNFCCC before 1 January 2010.	Start date of CPA can be verified from Equipment Purchase Contract in case available; can also be checked

		b. have a project start date after the validation start date of the Sustainable Small Hydropower Programme of Activities (PoA) in Indonesia, which is 22 December 2009.	during physical site visit for projects where construction has not started yet.
Compliance with applied methodology	5	Complies with all applicability conditions listed in the applied methodology AMS I.D version 17. Such requirements are listed in section E.2 of the PoA-DD.	All requirements listed in section E.2 are met by complying with eligibility criteria no. 3, 10, 11, 12 and 13.
Additionality	6	Demonstrates that it is in compliance with one of the CPA additionality test as described in section E.5.2 of the PoA-DD.	As per details in CPA-DD and corresponding supporting documents
Local stakeholder consultation	7	Conducts a local stakeholder consultation	As per provided description of local stakeholder invitation, summary of comments received and how they have been taken into account, in the CPA-DD section D.
Environmental Impact Analysis	8	Shall show, based on national environmental policies applicable at time of inclusion, whether an environmental impact analysis is required or not. If required, the CPA shall conduct an environmental impact analysis[13].	- Policies showing a non requirement of an environmental impact analysis or; - Environmental impact analysis report outlined in section C of the CPA-DD
Diversion of official development assistance	9	CPA should not result into the diversion of official development assistance	- Declaration from CPA implementer - Loan funding documents in case available
Target group	10	not be a capacity addition/retrofit/replacement activity at an existing power plant. In other words the CPA to be included would only comprise of Greenfield renewable energy power plants.	Detailed project report and physical site visit
	11	export the renewable electricity generated to a relevant and clearly identified grid within the geographical boundary of the host country[14]	Power Purchase Agreement/Detailed project report or equivalent
	12	If the power plant is a hydroelectric plant that	Calculations performed on

[13] At the date of registration of the proposed SSC-PoA, the rules governing Environmental Impact Assessment were laid out in the Minister of Environment Regulation No. 11 issued in 2006, which described that hydropower projects that do not exceed any of following limits: a) dam height < 15 m, b) flooded area < 200 m^2, c) installed capacity < 50 MW, will only need to have Environmental Management and Monitoring Plan (EMMP or in Indonesian: UKL/UPL).

[14] Is in line with applicable project types as listed in Table 2 of AMS I.D, version 17

		comprises a reservoir, the power density of the power plant shall be greater than 10 W/m2.	the basis of Detailed project report
Small-scale threshold	13	Generates electricity with a capacity equal or below the type I small-scale threshold	Detailed project report or equivalent
Debundling check	14	The CPA included in the PoA is not a de-bundled component of another CDM programme activity (CPA) or CDM project activity: CPA 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. If a proposed small-scale CPA of a PoA is deemed to be a debundled component, but the total size of such a CPA combined with a registered small-scale CPA of the PoA does not exceed the limits for small-scale CDM type I threshold, the CPA can be included in the PoA.	- If applicable, project list of same activity implementer as CPA implementer, applying the same technology/measure. - If applicable, list of CPAs of a large scale PoA with the same coordinating and managing entity applying the same technology/measure GPS coordinates of above projects near to the implemented CPA.
Other	15	have a contract of services and cessation of rights with the CME that governs the CPA's participation in the hydro PoA, and comply with the code of conduct of the CME	Contract with CME
Other	16	be in line with laws and regulations available at the time of inclusion of the CPA into the PoA.	As per description in PoA-DD and CPA-DD

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):

Demonstration that the proposed PoA is a voluntary coordinated action

The proposed SSC-PoA will provide a platform dedicated to providing capacity development services, raising awareness about hydropower opportunities coordinating CDM and carbon finance services to private hydropower developers. In doing so the SSC-PoA will facilitate access to carbon revenues to smaller hydropower producer and overcome financial, institutional and lack of prevailing practice barriers, which in turn will encourage renewable energy electricity generation in the country. There are no mandatory laws or regulations in Indonesia stipulating to have recourse to CDM to develop hydropower facilities. Likewise, no obligation exists for private entities to utilize or develop small hydropower projects. The proposed SSC-PoA can be therefore regarded as a voluntary coordinated action.

PoA timeline

The table below provides a brief timeline of the history of the SSC-PoA and of the 1st SSC-CPA, which are by the way intrinsically associated.

Event	Date
A proposal for a Public Private Partnership (PPP) regarding the micro-hydro PoA is submitted to GTZ Indonesia, and to the GTZ PPP facility in Germany.	22 July 2007
Agreement signed a term sheet between SP and Manggani to develop the CDM of Manggani under the future PoA or as a stand-alone activity.	21 August 2007
Manggani loan is granted.	22 November 2007
After intensive discussions, budget planning and contract negotiations, a 3 year PPP agreement regarding the development of a micro-hydro PoA is signed between GTZ and South Pole.	18 February 2008
A PoA consultation is held in Jakarta.	18 February 2009
PT. HPI is incorporated as per Indonesian laws.	17 March 2009
SSC-PoA documentation is uploaded to the UNFCCC server for public comments.	22 December 2009
Validation site visit.	11 February 2010
Registration (expected date).	11 June 2012

Table 1: PoA timeline

SP and GTZ started the discussion about setting-up a PoA to support small hydro resulting in a first real concrete proposal on 22 July 2007. During these initial discussions, SP and GTZ wanted to set-up two PoAs, one for off-grid and one for on-grid hydro projects (off-grid PoA idea has been abandoned since). In parallel, SP was in contact in 2007 with the owner of the Manggani (1st CPA proposed to this SSC-PoA) and offered "standard CDM" services or to develop the project under the PoA. Following the agreement with SP, Manggani loan was granted and project implementation of this first SSC-CPA could start. The submission of the agreement to GTZ for setting-up a PoA is the first real action taken by South Pole in the context of this PoA and can be considered as the start of the PoA.

Demonstration that the voluntary coordinated action would not be implemented in the absence of the PoA

The Indonesian energy sector has been opened to hydro IPPs in 1992. Yet at the date of submission of this PoA there were only nine operating small-scale hydropower projects developed by IPPs that have signed a PPA with PLN. The overall size of these twelve power plants represent less than 6 MW of installed capacity, just a small fraction of the total Indonesian capacity. This slow take-up of IPP projects stands in sharp contrast to the commercial potential for hydropower projects in the country and demonstrates the existence of major barriers.

International donors have extensively analyzed the barriers faced by the hydro IPP sector and many papers have been written on this issue[15]. These barriers are multiple and are located at different levels (developers, institutions, PLN). Most are linked to the immaturity of this new market, which is still slowly opening after long years of state monopoly, and can be split into two categories:

[15] Indonesia Energy Assessment, USAID, November 2008; GTZ, personal communication; and Participatory Capacity Needs Assessment in the Subsector of Micro/Mini Hydropower in Indonesia. Axel Biegert, April 2010

- The first type of barriers is a lack of prevailing practice. So far in Indonesia, only PT. PLN, the state-owned electricity company, has previous experience in building and operating hydro plants. Private players, who are new in this sector, have poor or no previous experience and face many problems to secure finance and/or to build and operate the hydro power plants properly.

- The second type of barriers is financial. Indonesia is a very heterogeneous territory with a lot of remote and underdeveloped zones where the cost of energy production can be very high. The very simple feed-in tariff structure in place cannot perfectly reflect the cost of production of hydropower IPPs, which can lead to financially unattractive projects.

These two barriers, discussed in detail below, are preventing the development of small-hydro IPP projects in Indonesia. By providing capacity building and a CDM and carbon finance platforms to small Indonesia hydro IPPs, the proposed SSC-PoA will support the hydro sector in overcoming these barriers. The SSC-PoA is thus deemed additional.

However, in view of the heterogeneity across hydropower projects in Indonesia the barriers described above will be tested individually for each SSC-CPA (see section E.5.1). Indeed, only the re-testing of the barriers will guarantee that every SSC-CPA included at any point in time in the SSC-PoA faces barriers and would not have occurred in the absence of CDM revenues.

Lack of prevailing practice: private players lack experience in building and operating hydro power plants

Hydropower generation is a well-established technology across the world. However in Indonesia, the construction and operation of hydropower plants remained for a long-time the monopoly of the state-owned electricity company PT. PLN[16]. Since the opening of the electricity market to IPPs, technical and operational know-how has not spread sufficiently in Indonesia. The lack of capacity among stakeholders (developers, regulator and investors) has been confirmed by many independent sources[17][18] as key barrier to developing IPP hydropower plants in Indonesia. Among other following key areas for capacity development are recommended:

- Lack of institutional capacity. Both central government and sub-national governments lack the capacity to formulate and effectively implement policies and regulations manufacturers
- Lack of equipment. Suppliers have only limited experience and capacities to supply the demand
- Lack of qualified staff, lack of training. Substantial skills, knowledge, and budget support are required to prepare, obtain financing, and implement energy projects. These resources are not readily available to central and sub-national governments and, to some extent, PLN regional units[19].

At the date of registration of this SSC-PoA, in Indonesia, there are only three small-scale IPPs in operation above the 1 MW threshold and most other plants are either less than 1 MW or financed by

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[16] Development of Mini/Micro Hydro Power Plant For Rural Electricity in Indonesia, Sarwono Hardjomuljadi and Sriyono D. Siswoyo, February 2008, page 5 (link: http://isjd.pdii.lipi.go.id/admin/jurnal/1608112.pdf), retrieved on January 11, 2011.

[17] Participatory Capacity Needs Assessment in the Subsector of Micro/Mini Hydropower in Indonesia. Axel Biegert, April 2010

[18] Indonesia Energy Assessment, USAID, November 2008, page 15

[19] Indonesia Energy Assessment, USAID, November 2008, page 11

international donors or both. The recourse to international donors and the almost insignificant capacity installed by IPPs when compared to the total installed capacity are clear signs that players in this market clearly lack experience.

No	Name of small hydro power plant	Installed capacity (kW)	Location	Managed by	Supported by	Remark
1	Cinta Mekar	120	Subang, West Java	KUD Cinta Mekar	UN-ESCAP and the Dutch Government	Active-connected to the PLN grid
2	Seloliman = Kalimaron	30	Mojokerto, East Java	Paguyuban Kalimaron	Yayasan Mandiri and GTZ MHPP	Active-connected to the PLN grid
3	Curug Agung	12	Subang, West Java	KUD	Yayasan Mandiri and GTZ MHHP	Active-connected to the PLN grid
4	Waikelosawah	14	Sumba Barat, East Nusa Tenggara	KUD Waikelosawah	e 7	Active-connected to the PLN grid
5	Dompyong[20]	25	East Java	KUD Tani Tentrem	Government of Indonesia and Germany	Under process to be connected to the PLN grid
6	Kampung Melong[21]	109	Subang, West Java	Koperasi P3TKEBT	Government of Indonesia through Energy and Electricity Technology Development Research Centre (P3TEK)	Active-connected to the grid
7	Anggrek Mekar Sari = Salido Kecil[22]	900	West Sumatera	Private entity, PT. Anggrek Mekar Sari	GTZ MHPP	
8	Kalumpang[23]	1000	Luwuk, Central Sulawesi	Private entity, PT. Buminata Cita Banggai Energy	IBRD/World Bank	Active-connected to the grid
9	Hangga-Hangga[24]	2500	Luwuk,	Private entity,	IBRD/World	Active-

[20] Retrieved from http://infodis.pln-jatim.co.id/v2/?mod=berita&pro=detail&id=12, on January 11, 2011

[21] Retrieved from http://www.tender-indonesia.com/tender_home/innerNews2.php?id=7468&cat=CT0009, on January 11, 2011

[22] Retrieved from http://www.mhpp.org/newsletter/MHPP-Newsletter-05th-030820.pdf, on January 11, 2011

[23] 10 MW Tangka/Manipi Hydro Electric Power Plant validated PDD, http://cdm.unfccc.int/filestorage/ZA7GJQEO4U0PCTL15YW236FKBSHMDR/Tangka%20Manipi%20PDD.pdf?t=R3Z8MTI5NDgxMDY2MS41NA==%7C5Q9ocLh3Im7ldJslvSgu1eUo5gc=, retrieved on January 11, 2011

[24] 10 MW Tangka/Manipi Hydro Electric Power Plant validated PDD, http://cdm.unfccc.int/filestorage/ZA7GJQEO4U0PCTL15YW236FKBSHMDR/Tangka%20Manipi%20PDD.pdf?t=R3Z8MTI5NDgxMDY2MS41NA==%7C5Q9ocLh3Im7ldJslvSgu1eUo5gc=, retrieved on January 11, 2011

			Central Sulawesi	PT. Buminata Cita Banggai Energy	Bank	connected to the grid
10	Mobuya[25]	3x1000	Kotamobagu, North Sulawesi	Private entity, PT. Cipta Daya Nusantara	Local bank (BNI)	Active-connected to the grid
11	Parluasan	2x2100[26]	North Sumatera	Private entity, PT. Inpola Meka Elektrindo	-	Under construction
12	Teluk Berasap	2x3000	Jambi	Private entity, PT. Mambruk Saran Interbuana	-	Under construction
13	Ranteballa	2x1200	South Sulawesi	Private entity, PT. Fajar Futura Energi Luwu	-	Under construction

Table 2: Operating small hydro power plants in Indonesia. **Source:** Development of Mini/Micro Hydro Power Plant For Rural Electricity in Indonesia, February 2008, page 10 (link: http://isjd.pdii.lipi.go.id/admin/jurnal/1608112.pdf), retrieved on January 11, 2011.

Financial barrier: feed-in tariff is not reflecting the cost of production

Pricing of electricity for purchase by PT. PLN from private producers is one of the most significant barriers to renewable energy IPP. PT. PLN is purchasing electricity-based on a tariff formula that used the nationwide uniform tariff (TDL) as a reference. This results in a very simple feed-in tariff that cannot truly reflect the cost of supply, which differs widely from one island to the other of this heterogeneous archipelago of more than 17'000 islands of which 922 are permanently inhabited[27].

To illustrate the discrepancies in the cost of supply, PT. PLN as the state owned-electricity company could be a good example; PT. PLN that operates more than 600 independent grids that range from the large interconnected JAMALI (Jawa-Madura-Bali) covering the country's major region and power system to very small grids that cover a few villages[28]. As can be seen in Figure 2 cost of power generation varies tremendously across the country. These variations result from the technology and fuel used but also the result of the grid size and the remoteness of the island.

As for PT. PLN, the operating cost of IPP differs from region to region, from technology to technology and from scale to scale. The very simple feed-in tariff structure cannot perfectly therefore reflect

[25] Company information as South Pole CAM developed this project under VCS, http://www.markit.com/en/products/registry/markit-environmental-registry-public-view-reports.page#registered_projects

[26] Based on this article, Parluasan MHPP has installed capacity 2 x 2.1 MW (link: http://www.pln-jawa-bali.co.id/system.php?fnp=1&setdate=&sSession=TEMP-XXXXXX-nORwZADBbOBtCIYsWiJVKQRUAjTqZdMo&sys=Article&subsys=View&topicid=&id=516), retrieved on January 11, 2011

[27] Source: Wikipedia retrieved on June 15, 2010

[28] Electricity Industry in Indonesia after the Implementation of Electricity Law Number 20/2002: Proposed Agendas to Support Implementation of the Law (www.bappenas.go.id/get-file-server/node/2782/)

discrepancies between cost of production among IPPs[29], which can result in financial barriers. This investment barrier can be easily tested at SSC-CPA level to see whether the tariff provides sufficient resource to the IPP as can be seen in section E.5.2.

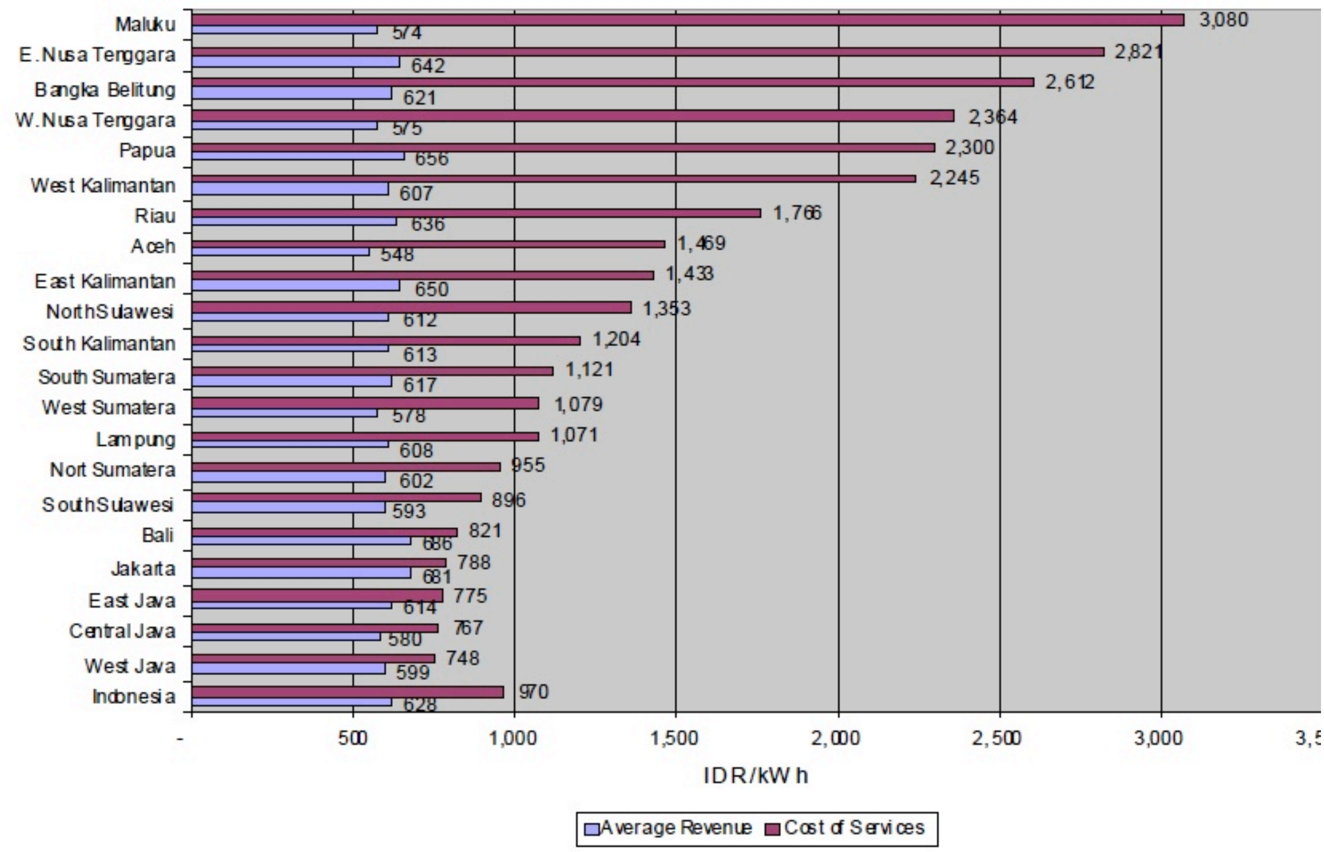

Figure 2: PLN's average revenue and cost of service for different regions of Indonesia in IDR/kWh.
Source: "Indonesia Energy Assessment", USAID, November 2008.

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

A.4.4.1. Operational and management plan:

The proposed SSC-PoA involves a range of operational activities in order to implement and manage each SSC-CPA by the coordinating entity PT. HPI and SSC-CPA owner (or the project implementer) within the Sustainable Indonesian Hydro PoA.

Entity	Management Responsibilities and Arrangements
PT. HPI (the coordinating entity)	• Maintain existing relationship with the project

[29] Indonesia Energy Assessment, USAID, November 2008, page 42

	implementers (e.g. conduct training for data monitoring). • Periodically collect monitoring data. • Prepare monitoring reports for emission reduction verification.
Project implementer/CPA operator	• Implement hydropower plant project activity (construction, daily operation, and maintenance of hydropower plant). • Prepare monitoring data.

In addition to the above management tasks, PT. HPI will implement the following operational elements to ensure proper management and oversight of the proposed SSC-PoA.

(i) A record keeping system for each SSC-CPA under the PoA
In order to unambiguously identify hydropower plant participating in the SSC-PoA a serial numbering system will be implemented that uniquely identify each hydropower plant through numbers for the SSC-CPA and the hydropower facility. This serial numbering system will be used to record baseline and monitoring data on a continuous basis using an Excel database. In this way, the SSC-PoA coordinating entity will be able to track the emission reduction of each hydropower plant over the full duration of the crediting period.

In summary, PT. HPI will record and document SSC-CPA detail information as follows:

- Name of the SSC-CPA and its installed capacity
- The name, address, and project owner details of each participating SSC-CPA
- The geographical coordinates of each SSC-CPA (GPS coordinates of the power house)
- The record of technology type (run-of river or reservoir utilization) employed in each hydropower plant participating in the SSC-PoA
- The verification status (number of verification and associated monitoring period)

PT. HPI will be responsible for the management of records and data associated with each SSC-CPA. The Excel database will be updated manually using the data supplied by the participating hydropower plants. It will form the basis for the verification of SSC-CPAs and be available for inspection by the DOE at any point in time.

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

The database described above will be used to perform a double accounting check. Every new SSC-CPA will be compared to the already existing database and the list of project activities that are under validation or registered at the UNFCCC. Moreover as shown below, the project implementers will be made aware of the double accounting principle and will certify that the proposed SSC-CPA is not registered under the Clean Development Mechanism of the UNFCCC or any voluntary scheme. Should such a case occur then the coordinating entity will not proceed with inclusion of the corresponding SSC-CPA in the proposed SSC-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.

As per *Guidelines on Assessment of De-bundling for SSC Project Activities* issued version 3 (EB 54 annex 13), only hydropower projects with a size greater than 150 kW will perform the de-bundling check.

The database described above will be used to perform the de-bundling check. Every new hydropower plant above the 150 kW included as an SSC- CPA will be compared to the already existing database and the list of project activities under-validation or registered at the UNFCCC to check whether there is already an activity that satisfies both conditions:

- has the same project implementer as the proposed small scale CPA or has a coordinating or managing entity which also manages a large scale PoA of the same project category and technology/measure, and;
- the boundary is within 1 km of the boundary of the proposed small-scale CPA, at the closest point

Moreover as shown below, the project implementers will be made aware of the de-bundling rules and will certify that the proposed SSC-CPA is not a de-bundled part of a bigger hydropower project. Should such a case occur then the coordinating entity would not proceed with inclusion of the corresponding SSC-CPA in the proposed SSC-PoA.

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

In order to avoid double accounting and to ensure that those operating the SSC-CPA are aware of and have agreed that their activity is being subscribed to the SSC-PoA, the project implementer of an SSC-CPA shall enter into a contractual arrangement with the coordinating entity including respective provisions that:

- The SSC-CPA has not been and will not be registered as a single CDM project activity nor as a CPA under another PoA.
- The project implementer is aware that the SSC-CPA will be subscribed to the present PoA.
- The project implementer (has not) is not (and will not) undertaking another hydropower project within one kilometre of the proposed CPA[30].
- The project implementer cedes its rights to claim and own emission reductions under the Clean Development Mechanism of the UNFCCC or any voluntary scheme to the managing entity of the present SSC-PoA.
- The project implementer certifies that the SSC-CPA is not registered under the Clean Development Mechanism of the UNFCCC or any voluntary scheme.

A.4.4.2. Monitoring plan:

The coordinating entity will submit CPAs for verification by the DOE pursuant to the sequence described below:

1- The coordinating entity will continuously update a list of all CPAs
2- The coordinating entity collects the monitoring information for all CPAs that will be verified and prepares one monitoring reports.
3- The DOE performs a desk review and on-site assessment of all CPAs.
4- The DOE verifies total emission reductions by the SSC-PoA

<u>1- Maintenance of a list of verification procedures to be applied to each CPA</u>

[30] Only for hydro plants with capacity above the 150 kW threshold

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

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

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

The monitoring plan for parameters included in section E.7.1 will be implemented for each CPA with assistance from the coordinating entity as follows:

- CPA owner will implement each CPA individually and monitor and record all parameters included in section E.7.1.
- The coordinating entity will provide guidance to CPA owner on how monitoring should be conducted and data should be collected in regards to emission reductions calculation.
- The CPA owners will provide data on monitored parameters included in section E.7.1 to the coordinating entity.
- The coordinating entity will document and store all parameters included in section E.7.1 provided by CPA owners in an electronic database, while primary data will be stored by CPA owner
- The coordinating entity review relevant monitoring documents, prepare the monitoring report, and provide the latter to the DOE.

3- Desk review and on-site assessment of the CPAs

The DOE performs a desk review of the monitoring information of all CPAs and performs on-site assessments if deemed as necessary as per procedures determined by the VVM or VVS.

At the end of the desk review and the on-site assessments, the coordinating entity shall provide updated monitoring reports elaborated in light of the DOE findings.

4- The DOE verifies total emission reductions by the PoA

The DOE approves the final monitoring report provided by the coordinating entity and certifies that (i) the list and type of data collected and provided within the monitoring report is consistent with the monitoring plan of each CPA (ii) ERs are estimated as described in this PoA-DD and the respective CPA-DD and are not miscalculated.

With the current version of the PoA-DD, all CPAs will need to undergo verification. However, in the case of an approved guideline/standard/procedure that addresses CPA level sampling in more detail or the concept has been further proven, the CME might develop a sampling plan that is in line with such guideline/standard/procedure. Such sampling plan shall be validated by a DOE and approved by the UNFCCC. Such sampling approach would be applied for the above step 3 and 4, step 1 and 2 will not be affected by a sampling approach.

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

The "Sustainable Small Hydropower Programme of Activities (PoA) in Indonesia" does not receive any public funding.

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

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

22nd July 2007[31]

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

28 years

SECTION C. Environmental Analysis

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

1. Environmental Analysis is done at PoA level ☐
2. Environmental Analysis is done at CPA level ☑

Local and focalized impacts of each hydropower project (depending on the location, capacity, and construction or not of dam among others) justify a separate environmental assessment for each SSC-CPA. Environmental analysis will therefore be conducted for each hydropower plant included in a SSC-CPA according to the applicable environmental policies at the time of inclusion of SSC-CPA to the SSC-PoA.

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),:

[31] See section A.4.3 for an explanation of the choice of the PoA starting date

Environmental impact assessments will be conducted for each SSC-CPA, if required according to the applicable laws and regulations at the time of inclusion of SSC-CPA to the SSC-PoA.

For info, at the date of registration of the proposed SSC-PoA, the rules governing Environmental Impact Assessments were laid out in the Minister of Environment Regulation No. 11 issued in 2006[32]. The regulation specifies that hydropower projects must conduct an Environmental Impact Assessment if they meet any of the following criteria:

1. Dam height ≥ 15 m
2. Flooded area ≥ 200 m^2
3. Installed capacity ≥ 50 MW

The Regulation also specifies that hydropower projects that do not exceed any of the above limits, the project owner shall develop and submit an Environmental Management and Monitoring Plan (EMMP). In addition, local and focalized impacts of each hydropower project (depending on the location and capacity) justify a separate environmental assessment.

As per eligibility criteria (ii) of this SSC-PoA a typical SSC-CPA will not require an environmental impact assessment and only needs to develop an Environmental Management and Monitoring Plan (EMMP), as required under Indonesian law.

SECTION D. Stakeholders' comments

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

1. Local stakeholder consultation is done at PoA level ☑
2. Local stakeholder consultation is done at CPA level ☑

Local and focalized impacts of each hydro project (depending on the location, capacity, and construction or not of dam among others) justify an LSC at CPA level.

A stakeholder consultation at PoA level was organized to present and discuss the aims and the goals of this initiative and at the same time to meet the Indonesian DNA requirements to acquire the Letter of Approval. In addition to that, the PoA SC would also provide a forum for stakeholders at the national level and those that cannot attend every LSC for an SSC-CPA to express their opinion on the SSC-PoA. The PoA LSC[33], which adopted Gold Standard requirements was conducted on February 18, 2009 in Jakarta and was attended by representatives from the DNA, local policy makers, local authorities, local communities, as well as national and international NGOs.

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

A stakeholder consultation was held by the coordinating/managing entity, PT. HPI, in Hotel Ibis Jakarta on February 18, 2009. Public stakeholders were invited through written letters, E-mails and Mailing lists

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[32] The Minister of Environment Regulation No. 11 issued in 2006 about The Project Activity that Must Have Environmental Impact Assessment (Jenis Rencana Usaha dan/Atau Kegiatan yang Wajib Dilengkapi Dengan Analisis Mengenai Dampak Lingkungan Hidup).

(http://www.menlh.go.id/Peraturan/PERMEN/PermenLH11-2006.pdf, retrieved on October 28th, 2010)

[33] The PoA LSC report is available upon request.

of several associations sent out to local offices and organisation, such as DNA representative, local policy makers and representative of local authorities, local community representatives, and national and international NGOs.

About 50 people attended the event, and the representatives of South Pole Carbon Asset Management Ltd., Alin Pratidina and Renat Heuberger, gave an explanation of CDM in general, followed by a presentation from Paul Butarbutar, director of PT. HPI regarding the PoA and its social and environmental issues related to small hydropower plant development. Further explanation of PoA progress and current CDM PoA processes was given, followed by an open discussion session as summarised below.

D.3. Summary of the comments received:

Q: Mr. Ridzaluddin, local representative
Q1: For a CPA that plans to be included in the PoA, what will be the consequences if it is commissioned before the PoA is registered?

A1: Mr. Paul Butarbutar → The project can be registered as CPA only after the PoA itself is registered. The CPA that would like to be included in the registered PoA must not have an earlier project start date than the date when the PoA is registered. Therefore, we could not include CPA that has been commissioned before the PoA is registered.[34]

Q: Mr. Gunardi, DNA representative
1. *Did the PoA Stakeholder Consultation conducted in Jakarta already represent local affected people where mini hydro power plants built?*

A1: Mr. Renat Heuberger →There is still a debate regarding the way to carry out Stakeholder Consultations for PoAs (PoA SC), since the UNFCCC lets project participants decide by themselves. Therefore, we chose to conduct the PoA SC in Jakarta by inviting top-level stakeholders such as project owners, related NGOs, and Government. However, we will also conduct CPA SC at chosen CPA location.

2. *What are differences between the Gold Standard process and the normal CDM process?*

A2: Mr. Renat Heuberger → Basically, GS and CDM process will be run in parallel. However, the GS puts higher attention to sustainable development criteria such as Environment, Social, Technology and Economy, as written in the Sustainable Development Assessment Matrix. The SC must be conducted in line with specific rules, as referred to the Gold Standard version 2.
A2. Mr. Paul Butarbutar → By applying the GS, we want to bring up environmental integrity for the PoA and the CPAs, and give more benefits to local communities.

3. *What are the requirements to be a PoA Coordinator?*

A3. Mr. Renat Heuberger → Any Indonesian private or public entity could be PoA coordinator. For the Sustainable Small Hydropower PoA, PT. Hydro Power International has exclusively and voluntarily

[34] This statement has been formulated in February 2009, so before EB47 paragraph 72 statement in which the eligibility of CPAs with a project start date between 22 June 2007 and the commencement of PoA validation, which have commenced prior to 31 December 2009 has been allowed. This statement is therefore outdated and the PoA-DD has been modified to take into account this new guidance.

decided to be the PoA coordinator managing the PoA registration process from the beginning to the end without any other business.

4. *Is there any minimum CPA size (in term of CERs generated or installed capacity) and number to be included in the PoA?*

A4: Mr. Renat Heuberger → Actually, there is no limit of size and number of CPAs to be included in the PoA. However as this is a first trial, we will develop PoA for on-grid micro or mini hydro with certain eligibility criteria defined in the PoA, without forgetting off-grid CPAs in the future.

5. *Is there any validator who is willing to validate and verify the PoA, especially due to the liability clause issue?*

A5: Mr. Renat Heuberger → So far, we encounter problems to contract a Designated Operational Entity (DOE) due to the liability issue or other unclear guidance problems. However, in order to have the PoA online soon, South Pole Carbon Asset Management Ltd. becomes sole guarantor taking up all liabilities connected to the PoA registration. In the meantime, we also push EB that this issue must be clarified soon if the EB wants PoA flying in the future.

6. *How will the validation process be conducted due to geographical spread of CPAs across the host country?*

A6: Mr. Renat Heuberger → The validation process will be easier as soon as the PoA is registered. However, regulations regarding validation sampling for all CPAs must also be clarified soon. As the first PoA in Asia, we believe that we can help EB to further shape rules and regulations regarding the PoA thanks to our PoA process and inputs.

7. *Can individually owned power plants be included in the PoA? What are the requirements?*

A7: Mr. Paul Butarbutar → CPAs included can be owned either by single individuals or entities. For this reason, we are currently developing a new simplified CER agreement that allows individuals, cooperatives or small companies to join the PoA.

Q: Mr. Ambieya Pitoyo, local NGO

1. *How will the validation process be conducted for non-pilot CPAs?*

A1: Mr. Renat Heuberger → The validation process will be much easier for additional CPAs after the PoA is registered.

2. *Could you explain the PoA and CPA scheme in more details?*

A2: Mr. Paul Butarbutar → There will be two different Project Design Documents (PDD), the PoADD and CPADDs. Each CPA will have its own CPADD, describing additionality and baseline for each project and referring to the PoADD.

Q&A Session II

Q: Mr. Suwarna, local NGO

1. *Could you explain in more details what will be the role of PoA coordinator and what would be the minimum CPA size required?*

A1: Mr. Paul Butarbutar → PT.HPI will coordinate and manage the PoA registration and the CERs transfer rights from the Project Owners, to be able to sell them to South Pole. PT. HPI will be one of the project participants in the PoADD and will communicate with the EB and South Pole.

Q: Mr. Gunawan, local representative

1. *If there are off-grid micro hydro projects in the remote area with installed capacity between 10-200 kW, and they promote good social and economy impact to local stakeholders, how does PoA accommodate these projects because they really need fund from CERs?*

A1: Mr. Paul Butarbutar → We are still focusing on on-grid PoA because the baseline is easier to define and calculate unlike the off-grid PoA. However, in the future, we will develop the off-grid PoA because our cooperation with GTZ includes also off-grid PoA development. In the mean time, we would like to see lesson learnt from on-grid PoA registration process, which still faces hurdles and challenges.

Q: Mr. Dicky Hendarto (DNPI)

1. *In case there are lots CPAs coming online after the PoA registered, how will the validation process take place? Are there any specific period or CPAs number for starting the validation process especially after the PoA registered?*

A1: Mr. Paul Butarbutar → Random validation will be applied for CPAs joined after the PoA registered. There is no particular number or period for starting the validation process for these additional CPAs. For these CPAs validation, we will apply sound statistical sampling method to ensure CPAs accountability.

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

All comments were considered and there was no need to amend the SSC-PoA-PDD in order to take those comments in to account. Further, see summary of comments and answers above.

SECTION E. Application of a baseline and monitoring methodology

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

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

Name of approved baseline and monitoring methodology:

AMS-I.D.: Grid connected renewable electricity generation --- Version 17 (I.D./Version 17, Sectoral Scope: 01, EB 61).

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

The applicability criteria of AMS I.D. v17 are the following:	Methodology AMS I.D. v17 is applicable to an SSC-CPA under the proposed SSC-PoA because:

This methodology comprises renewable energy generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal and renewable biomass: 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.	An SSC-CPA will consist of a hydro power plant that supplies electricity to a regional or national grid of Indonesia, as per eligibility criteria no. 3 and 11 in section A.4.2.2 of the PoA-DD.
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[35]; (c) involve a retrofit[36] of (an) existing plant(s); or (d) involve a replacement[37] of (an) existing plant(s).	PoA is limited to greenfield projects as per eligibility criteria no. 10 in section A.4.2.2 of the PoA-DD.
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/m^2; • The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the Project Emissions section, is greater than 4 W/m^2.	A hydro SSC-CPA that comprises a reservoir will have a power density greater than 10 W/m^2, as per eligibility criteria no. 12 in section A.4.2.2 of the PoA-DD.
If the unit added has both renewable and non-	Each SSC-CPA has only renewable components, as

[35] A capacity addition is an increase in the installed power generation capacity of an existing power plant through: (i) the installation of a new power plant besides the existing power plant/units, or (ii) the installation of new power units, additional to the existing power plant/units. The existing power plant/units continue to operate after the implementation of the project activity.

[36] Retrofit (or Rehabilitation or Refurbishment). It involves an investment to repair or modify an existing power plant/unit, with the purpose to increase the efficiency, performance or power generation capacity of the plant, without adding new power plants or units, or to resume the operation of closed (mothballed) power plants. A retrofit restores the installed power generation capacity to or above its original level. Retrofits shall only include measures that involve capital investments and not regular maintenance or housekeeping measures.

[37] Replacement. It involves investment in a new power plant or unit that replaces one or several existing unit(s) at the existing power plant. The installed capacity of the new plant or unit is equal to or higher than the plant or unit that was replaced.

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[38], the capacity of the entire unit shall not exceed the limit of 15 MW.	per eligibility criteria no. 3 in section A.4.2.2 of the PoA-DD. A diesel genset might be used as for electricity generation for the own use within the project. The diesel consumption is considered as project emissions.
Combined heat and power (co-generation) systems are not eligible under this category.	Not applicable, the proposed SSC-PoA does not include combined heat and power systems, as per eligibility criteria no. 3 in section A.4.2.2 of the PoA-DD.
In the case of project activities that involve the addition of renewable energy generation units at an existing renewable power generation facility, the added capacity of the units added by the project should be lower than 15 MW and should be physically distinct[39] from the existing units.	Capacity additions are not eligible under the proposed SSC-PoA. The SSC-CPA would only involve greenfield project activity, as per eligibility criteria no. 10 in section A.4.2.2 of the PoA-DD.
Project activities that seek to retrofit or modify an 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.	An SSC-CPA will not retrofit or modify an existing facility for renewable energy generation. The SSC-CPA would only involve green field project activity, as per eligibility criteria no. 10 in section A.4.2.2 of the PoA-DD.
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.	Not applicable as per eligibility criteria no. 3 in section A.4.2.2 of the PoA-DD.
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 B7 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.	Not applicable as per eligibility criteria no. 3 in section A.4.2.2 of the PoA-DD.
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	Not applicable as per eligibility criteria no. 10 in section A.4.2.2 of the PoA-DD.

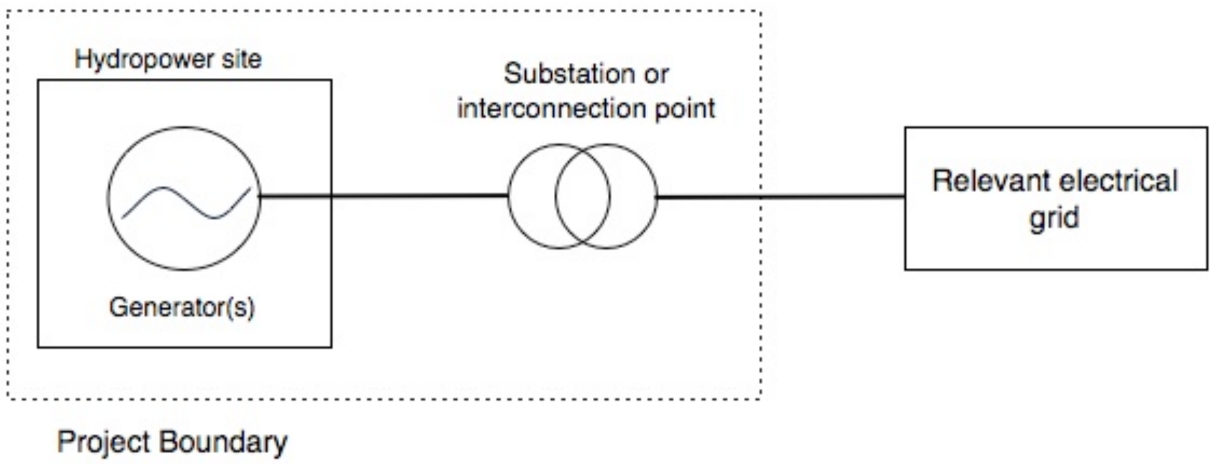
[38] Co-fired system uses both fossil and renewable fuels.

[39] Physically distinct units are those that are capable of generating electricity without the operation of existing units, and that do not directly affect the mechanical, thermal, or electrical characteristics of the existing facility. For example, the addition of a steam turbine to an existing combustion turbine to create a combined cycle unit would not be considered "physically distinct".

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.	

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

As per AMS I.D. v17, "the spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system[40] that the CDM project power plant is connected to". The project boundary encompasses the hydropower project site from the water intake to the substation or interconnection point where the electricity is delivered to the grid.



The greenhouse gases and emission sources included in or excluded from the project boundary are shown in the table below.

Table 3: Emissions sources included in or excluded from the project boundary

	Source	Gas	Included?	Justification/Explanation
Baseline	CO_2 emission 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.

40 Refer to the latest approved version of the "Tool to calculate the emission factor for an electricity system" for definition of an electricity system.

Project activity	Emissions of CH_4 from the reservoir.	CO_2	No	Minor emission source.
		CH_4	No	Minor 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:

The baseline scenario is the generation of electricity in one of the Indonesian grids by its existing power plants; the baseline scenario is therefore in line with all laws and regulations of Indonesia.

As per AMS I.D. 17 paragraph 10 and because the project activity is the installation of a new grid-connected renewable power plant/unit, the baseline scenario is that the electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources into the grid.

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.

$$BE_y = EG_{BL,y} * EF_{CO_2,grid,y} \quad \textbf{(1)}$$

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 (t CO_2e/MWh)

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:

Prior consideration of the CDM

The PoA is limited to the two types of projects:

1. CPAs complying with the exception stated in EB report 47, paragraph 72:

   Programmes commencing validation prior to 31 December 2009 may include CPAs with starting date prior to 31 December 2009. Therefore such programmes may include CPAs with a starting date between the PoA starting date, 22 June 2007, and the commencement of validation of the PoA, if a list of such specific CPAs is provided to validating DOE and UNFCCC secretariat prior to 31 January 2010.

2. CPAs that will be included later on in the PoA but for which the project start date shall be after PoA validation start (22 December 2009).

For project type 1 the following criteria apply as per "Guidance on the Demonstration and Assessment of Prior Consideration of the CDM", version 4[41]:

- For project activities with a starting date on or after 02 August 2008, the project participant must inform a host party DNA and the UNFCCC secretariat in writing of the commencement of the project activity and of their intention to seek CDM status. Such notification must be made within six months of the project activity start date.
- For project activities with a start date before 02 August 2008, for which the start date is prior to the date of publication of the PDD for global stakeholder consultation, are required to demonstrate that the CDM was seriously considered in the decision to implement the project activity.

For project type 2 the following criteria apply:

CPAs with start date after the publication of the global stakeholder consultation of the PoA do not have to follow the "Guidelines for the Demonstration and Assessment of Prior Consideration of the CDM" as per EB 60 Annex 26. However the start date shall be clearly defined as per CDM Glossary of Terms.

The limitation of the PoA to these two types of activities will ensure that the CDM has always been considered as per EB guidance.

Additionality

As explained in section A.4.3, the main barriers to the development of small IPP hydropower projects in Indonesia are lack of prevailing practice and financial barriers[42]. Each SSC-CPA is intrinsically different and can face one or a mix of these barriers. The retesting of these barriers would require specific assessments of each barrier for every SSC-CPA. The testing of the lack-of-prevailing-practice barrier at SSC-CPA level would be too subjective to allow for an unambiguous determination of additionality. In order to make the assessment of additionality as objective as possible, the PPs opt to test only for a subset of the barriers:

> Test a: Pursuant to EB 54, Annex 15, paragraph 2.a "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", an SSC-CPA will be considered additional if its installed capacity is equal or below the 5 MW threshold and if it is undertaken in an underdeveloped zone of Indonesia[43].
>
> Test b: The CME, in this sense PT. HPI, will test the financial additionality of the SSC-CPA through an investment analysis.

To be additional, each SSC-CPA will have to pass one of these two tests. The procedure for conducting the tests at SSC-CPA level is described in detail in section E.5.2.

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[41] EB 62, Annex 13 was the most recent version of this guidance, which could be applied for CPAs falling under this category (only CPAs with project start date up to commencement of the validation of the PoA, 22, December 2009).

[42] Indonesia Energy Assessment, USAID, November 2008; GTZ, personal communication; and Participatory Capacity Needs Assessment in the Subsector of Micro/Mini Hydropower in Indonesia, Axel Biegert, April 2010

[43] The special underdeveloped zone in Indonesia was based on The State Minister of Underdeveloped Zone Development Decree No. 001 issued in 2005. This list was published before 28 May 2010, which is valid for this SSC-PoA.

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

Test a: Is the installed capacity of the CPA below or equal to 5 MW, and is the SSC-CPA located in an underdeveloped area of Indonesia?

This additionality test is based on annex 15 of EB 54[44] according to which renewable energy projects are deemed additionaly if they have no more than 5 MW installed capacity and are located in a special underdeveloped zone of the host country. This EB guidance recognizes the specific barriers faced by very small projects and undertaken in underdeveloped areas - in line with the barriers described in section A.4.3.

For this test, the size of the renewable project is chosen as per the generator rated capacity. The definition of the special underdeveloped zone as per the list under the State Minister of Underdeveloped Zone Development Decree No. 001 about National Strategy for Underdeveloped Zone Development issued in 2005[45]. The list identified by the Government before 28 May 2010 as per paragraph 2-a of EB 54 annex 15 will remain unchanged during the lifetime of the SSC-PoA. The location of the SSC-CPA will be determined as the location of the powerhouse.

Test	Yes	No
SSC-CPA capacity is below or equal to 5 MW		
SSC-CPA is undertaken in a special underdeveloped zone as defined by State Minister of Underdeveloped Zone Development Decree No. 001 issued in 2005.		

Still as per Annex 15 of EB 54, if at the date of SSC-CPA inclusion, small-hydro is recommended by the Host country DNA and approved by the board, test a will be simplified as follows:

Test	Yes	No
SSC-CPA capacity is below or equal to 5 MW		
Indonesian DNA has recommended small hydro (hydro below 15 MW installed capacity) on the basis that it constitutes less than 5% of the national annual electricity generation and the request has been approved by the Executive Board of the CDM.		

Test b: Investment analysis

For qualifying SSC-CPAs that do not meet Test a described above, an investment analysis will be performed pursuant to Step 3 of the additionality tool (version 6.0). As each hydropower project generates financial benefits other than CDM-related income, the investment comparison analysis or benchmark analysis will be used to demonstrate additionality.

Since only newly built grid-connected hydropower plants are eligible for participation in the proposed SSC-PoA, "non-action from the project proponent(s)" is a credible and realistic alternative to the project

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[44] "Guidelines for demonstrating additionality of renewable energy projects =<5 MW and energy efficiency projects with energy savings <=20 GWh per year " (Version 01)

[45] The State Minister of Underdeveloped Zone Development Decree No. 001 issued in 2005 about National Strategy for Underdeveloped Zone Development, http://www.kemenegpdt.go.id/hukum/KEPMEN_001-2005.pdf, retrieved on October 28th, 2010.

scenario. The financial viability of the development and operation of each SSC-CPA will be compared with a scenario where the SSC-CPA owner does not undertake the project ("non-action") and deploys the financial resources that would have been used to finance the construction of the project for alternative investments. To this end the project IRR (without CDM revenues) will be compared with a benchmark rate for investment returns available to a local investor in Indonesia. This benchmark represents the minimum project IRR that is required for the project to be financially viable relative to the "non-action" scenario.

For this SSC-PoA, the financial analysis involving the calculation of the project internal rate of return (project IRR) has been selected to demonstrate the additionality of each SSC-CPA. Pursuant to the Guidelines on the Assessment of Investment Analysis (version 5, Para 11), the investment analysis uses pre-tax project IRR and benchmarks.

Project IRR calculation

Project IRR calculations will be based on a list of financial parameters provided by the CPA owner that were available at the time of making the investment decision. This list of parameters includes:

Table 4: Parameters for calculation of project IRR

	Unit	Comment
Technical lifetime	Year	As per manufacturer specification, as per expert's opinion. or as per *Tool to determine the remaining lifetime of equipment (Version 01), EB 50.*
Investment decision date	DD/MM/YY	
Construction start date	Year	
Date project starts operating	Year	
Annual electricity generation	MWh/year	As per Guidelines for the reporting and validation of plant load factors (version 01, EB 48, paragraph 3b), the plant load factor can be chosen as the value provided "to banks and/or equity financiers while applying the project activity for project financing" or as per independent expert opinion. Value is given at delivery or interconnected point as per PPA.
FINANCIALPARAMETERS		
	Unit	**Comment**
Electricity tariff	IDR/kWh	As per legislation at date of investment or as per PPA if signed at date of investment. The tariff will be indexed to inflation only if specified in the PPA or relevant policy.
Increase in electricity tariff	% per year	
Inflation	% per year	If not otherwise specified as per inflation rate during the month when the investment decision was made
Exchange Rate	Foreign currency/IDR	If some costs/revenues are provided in foreign currency the exchange rate as per date of investment decision shall be used to convert

		them into IDR.
COSTS AND EQUIPMENT		
	Unit	**Comment**
Total investments	IDR	If the construction is expected to last several years, a yearly breakdown of investments can be provided.
(Other revenues)	IDR	
Operation & Maintenance cost	IDR/year	If no specified otherwise, O&M will be indexed using the consumer price index.
(Other operating expenditure)	IDR/year	
Insurance	% of Capex p.a.	

In Indonesia, foreign currencies, such as the US$, are sometimes used in parallel with IDR in financial plans prepared by hydropower project developers. In order to conduct the financial analysis in one common currency and avoid a currency bias, all items denominated in foreign currencies will be converted to IDR using the average exchange rate during the twelve months preceding the date of the investment decision. Using the moving average of the exchange rate will smooth out temporary spikes in the exchange rate.

The parameters listed in
shall be obtained from documents provided by the SSC-CPA owner to financers or government agencies. Dates at which these documents were compiled will also be reported in the SSC-CPA-DD. If there is a substantial gap (> 1 year) between the date of the investment decision and the date at which the corresponding document was compiled, the respective item will be inflated accordingly using the Indonesian construction of electricity equipments price index or the Indonesian consumer price index as inflator[46].

A standardized Excel worksheet has been developed into which data received from the SSC-CPA owner will be entered, and which will in turn compute the project IRR from the pre-tax free cash flow. A copy of this Excel sheet has been provided to the DOE. The same Excel worksheet will be used for all SSC-CPAs to be included in the proposed SSC-PoA. Should the computation of the project IRR for a CPA deviate from this standard Excel table, any changes will be described and explained in the respective SSC-CPA-DD.

Benchmark calculation
Hydropower projects in Indonesia are typically financed using a combination of loan and equity financing, so an appropriate benchmark rate of return is determined as the Weighted Average Cost of Capital (WACC)[47]. It is defined as the average financial return expected across the different types of capital that finance a given project. For the purpose of this SSC-PoA a pre-tax WACC is chosen, which will be determined using the following rules:

- The WACC will be based on standard benchmark parameters that are commonly used in the Indonesian market. The choice of these market parameters will depend on the specific characteristics of the project type, but they will not be linked to the subjective profitability expectation or risk profile of a particular project developer.

[46] http://www.bps.go.id

[47] As per paragraph 12 of the Guidance on the Assessment of Investment Analysis (Version 05).

- All financial information used for the benchmark determination will be sourced from independently verifiable public sources and chosen as per the date of investment decision. In cases where some data is not available at the date of investment decision this data will be adjusted to the date of the investment decision using appropriate and publicly available inflators.
- The WACC will be derived from market equity returns and government bond rates that are adjusted by a suitable risk premium to reflect private investment in the electricity generation sector in Indonesia.

The post-tax WACC will be calculated as follows:[48]

$$WACC(post - tax) = CD \times (1 - T) \times \%Debt + CE \times \%Equity$$

The pre-tax WACC can in turn be determined by[49]:

$$WACC(pre - tax) = WACC(post - tax)/(1 - T)$$

The cost of equity is determined using the capital asset pricing model (CAPM)[50][51]:

$$CE = RFR + \beta \cdot (RP) + SP$$

Where:

$$\beta = \beta unlevered \times (1 + (1 - T) \times D/E)$$

Table 5: Parameters for pre-tax WACC calculation

Parameters	Description	Possible sources and explanation
RFR	Risk Free Rate in a mature equity market	US long –term government bond. U.S long-term government bond is considered as risk free instrument. Bond rate is taken as the 6 month average prior to the investment decision and for a duration equal to the technical lifetime of the project activity Source: http://www.treasury.gov/resource-center/data-chart-center/interest-rates/Pages/TextView.aspx?data=yieldYear&year=2010
ß *unlevered*	Beta (unlevered)	Calculated based on Indonesian stock market performances or based on literature values such as the Damadoran data source:

[48] Velez-Pareja, Ignacio and Tham, Joseph, "A Note on the Weighted Average Cost of Capital WACC" (August 7, 2005). Available at SSRN: http://ssrn.com/abstract=254587.

[49] Laurens Tijdhof, „WACC: Practical Guide for Strategic Decision-Making“

[50] Aswath Damadoran, „Estimating Equity Risk Premiums“, Stern school of business

[51] Ibbotson, “2009 Ibbotson Valuation Yearbook“.

		Total Beta (*Unlevered*) from Damadoran (Stern University) for the relevant industrial sector of the year data before the investment decision was made as last year. It reflects a firm's total exposure to risk rather than just the market risk component. It is a function of the market beta and the portion of the total risk that is market risk. These betas might provide better estimates of costs of equity for undiversified owners of businesses. http://pages.stern.nyu.edu/~adamodar/ (Go to: "Updated Data"; and choose: "Total Beta by industry sector")
RP	Total Risk Premium	The Total Risk Premium includes an Equity Risk Premium and a Country Risk Premium. The reason behind this premium stems from the risk-return trade off, in which a higher rate of return is required to entice investors to take on riskier investments. http://pages.stern.nyu.edu/~adamodar/ (Go to: "Updated Data"; and choose "Risk Premium for other Markets")
SP	Size Premium.	Size premium is an investor's risk incurred when investing in a small project. Betas are generally calculated based on data for large corporations. However companies of different sizes face different levels of risk. The smaller the company the fewer the sources of capital and investors require additional returns to compensate for the lower marketability of shares. According to Ibbotson Associates' statistics for 2009 [52]for the New York Stock exchange reveals that risk premium increases as the size of a company reduces: The equity risk premium of the largest 10% of companies is -0.36% (i.e. the firms in the largest 10% have an equity risk premium that is 0.36% below average). The smallest 10% of companies (up to 128 million USD) have an equity risk premium of 5.81%. The usual way of accounting for this risk premium is to add this to the Cost of Equity (CE), as given in the equation for CE above. The Size risk premium can be sourced from the "*Ibbotson SBBI valuation yearbook"* published by Morningstar Inc The PP may be apply the SP in cases where project CAPEX is less than 100 million USD
CD (Cost of debt)	Interest Rate Loans by commercial banks for investment	Indonesian central bank. If majority of investment is to be done in local currency, commercial lending rate shall be denominated in local currency, otherwise in USD. Quotations upon the investment decision is made on can be used as evidence
% Debt (Debt ratio)	Average industry debt ratio	50%, as per EB 62, Annex 5, Paragraph 18
% Equity	Average industry equity ratio	50%, as per EB 62, Annex 5, Paragraph 18

[52] Ibbotson SBBI 2009 Valuation Yearbook, Chapter 7, page 96

Investment decision date	Date	As per guidance 6 of Guidance on the Assessment of Investment Analysis (Version 05). It will be usually considered as the date in which the main payment being made or financial closure, whichever is the earliest.
T	Tax rate applicable to hydro SSC hydro power plant operators	As per Indonesian tax regulator

If over the course of the lifetime of the SSC-PoA, data for a parameter or its source become unavailable or are replaced by a more relevant or updated parameter and/or source (example: a new tax regulation is published), then this parameter and/or sources will be revised accordingly for CPAs to be included, after prior agreement from the DOE. The same principle shall be applied for the general benchmark determination approach.

The determination of a pre-tax WACC is time consuming and costly especially for small projects with an already low IRR. For simplification, a CPA implementer might opt to stop the pre-tax WACC calculation after the determination of cost of debt (commercial lending rate) if already higher then the project IRR. Cost of debt can then be applied as alternative benchmark.

A WACC is per definition a more accurate benchmark then the commercial lending rate as typically investments are done with a debt and equity fraction. Due to the associated risk of an equity investment, return expectations are higher then for a loan. As a consequence, cost of equity will always be higher then cost of debt and cost of debt will always be lower then the WACC. Hence, if the commercial lending rate as a benchmark already proves additionality, the WACC will as well.

Sensitivity analysis
As specified in the excel spreadsheet provided to the DOE, a sensitivity analysis will be also conducted using assumptions that are conservative from the point of view of analysing additionality, i.e. the ”best-case” conditions for the project IRR were assumed by altering the following parameters by +/- 10%: (1) project revenues (which are dependent on the electricity tariff or the quantity of electricity revenues); (2) total investment, and (3) O&M expenditure.

The full results of each sensitivity analysis will be reported in the respective SSC-CPA-DD using the following format:

Table 6: Framework for reporting results of sensitivity analysis

	IRR	Variation that hits the benchmark	Likelihood of hitting the benchmark
Investment -10%			
O&M -10%			
Revenues +10%			

If the IRR exceeds the benchmark in one or more of the three scenarios considered for the sensitivity analysis, the CME shall provide evidences that this is unlikely to happen. If no sufficient proof is provided, the CPA will be considered as non-additional.

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:

As per paragraph 12 of AMS I.D. v17 the emission factor can be calculated 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 CO_2/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)[53] *and made publicly available.*

For all SSC-CPAs under this SSC-PoA option (a) will be used for calculating the baseline.

EF_{CO2} will be calculated as the Combined Margin (CM) emission factor determined using the *'Tool to calculate the Emission Factor for an electricity system'* version 02.2.1 as following:

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

Step 1. Identify the relevant electricity systems

[53] Plant emission factors used for the calculation of emission factors should be obtained in the following priority:

1. *Acquired directly* from the dispatch center or power producers, if available; or
2. *Calculated*, if data on fuel type, fuel Emission Factor, fuel input and power output can be obtained for each plant;
   If confidential data available from the relevant host Party authority are used, the calculation carried out by the project participants shall be verified by the DOE and the CDM-PDD may only show the resultant carbon emission factor and the corresponding list of plants;
3. *Calculated*, as above, but using estimates such as: default IPCC values from the 2006 IPCC Guidelines for *National* GHG Inventories for net calorific values and carbon emission factors for fuels instead of plant-specific values technology provider's name plate power plant efficiency or the anticipated energy efficiency documented in official sources (instead of calculating it from fuel consumption and power output). This is likely to be a conservative estimate, because under actual operating conditions plants usually have lower efficiencies and higher emissions than name plate performance would imply; conservative estimates of power plant efficiencies, based on expert judgments on the basis of the plant's technology, size and commissioning date; or
4. *Calculated*, for the simple OM and the average OM, using aggregated generation and fuel consumption data, in cases where more disaggregated data is not available.

According to the "Tool to calculate the emission factor for an electricity system" (version 02.2.1), a project electricity system has to be defined by the spatial extent of the power plants that are physically connected through transmission and distribution lines to the project activity and that can be dispatched without significant transmission constraints. Correspondingly, in this project activity the project electricity system[54] include the project site and all power plants attached to grid as defined by PT. PLN.

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

According to the latest version of the tool, project participants may choose between the following two options to calculate the operating margin and build margin emission factor:

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

For the proposed SSC-PoA, project participants choose to apply Option I, which only power plants connected to the grids as defined by PT. PLN.

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

The calculation of the operating margin emission factor ($EF_{grid,OM,y}$= EF_{CO2}) is based on one of the following methods:

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

Selection how to calculate the operating margin of each grid defined by PT. PLN as applied in the ex-ante calculation will be based on DNA published value or PLN statistic and other made publicly available documentation.

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

Calculation of the operating margin in the proposed SSC-PoA is calculated as the ex-ante with a 3-years generation-weighted average CO_2 emissions per unit of net electricity generation (tCO_2/MWh) of all generating power plants serving the system, not including low-cost/must-run power plants/units. The ex-ante calculation of the operating margin will be based on DNA published value or PLN statistic and other made publicly available documentation.

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

The build margin emissions factor is the ex-ante generation-weighted average emission factor (tCO_2/MWh) of all power units m during the most recent year y for which power generation data is

[54] Electricity system or national/regional grid definition that includes interconnected or isolated grids will be based on the latest PLN National Generation Development Plan (Indonesian: Rencana Usaha Penyediaan Tenaga Listrik PT. PLN Persero) available during future EF grid calculation for which have not yet been defined in the PoA-DD.

available based on DNA published value or PLN statistic and other made publicly available documentation.

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

a. Identify the set of five power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently ($SET_{5-units}$) and determine their annual electricity generation ($AEG_{SET-5-units}$, in MWh);
b. Determine the annual electricity generation of the project electricity system, excluding power units registered as CDM project activities (AEG_{total}, in MWh). Identify the set of power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently and that comprise 20% of AEG_{total} (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) ($SET_{\geq20\%}$) and determine their annual electricity generation ($AEG_{SET-\geq20\%}$, in MWh);
c. From $SET_{5-units}$ and $SET_{\geq20\%}$ select the set of power units that comprises the larger annual electricity generation (SET_{sample});
   Identify the date when the power units in SET_{sample} started to supply electricity to the grid. If none of the power units in SET_{sample} started to supply electricity to the grid more than 10 years ago, then use SET_{sample} to calculate the build margin. In this case ignore steps (d), (e) and (f).

   Otherwise:
d. Exclude from SET_{sample} the power units, which started to supply electricity to the grid more than 10 years ago. Include in that set the power units registered as CDM project activities, starting with power units that started to supply electricity to the grid most recently, until the electricity generation of the new set comprises 20% of the annual electricity generation of the project electricity system (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) to the extent is possible. Determine for the resulting set ($SET_{sample-CDM}$) the annual electricity generation ($AEG_{SET-sample-CDM}$, in MWh);
   If the annual electricity generation of that set is comprises at least 20% of the annual electricity generation of the project electricity system (i.e. $AEG_{SET-sample-CDM} \geq 0.2$ Å~ AEG_{total}), then use the sample group $SET_{sample-CDM}$ to calculate the build margin. Ignore steps (e) and (f).

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

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

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

a. Weighted average CM; or
b. Simplified CM

The weighted average CM method (option A) should be used as the preferred option.

The simplified CM method (option B) can only be used if:

- The project activity is located in a Least Developed Country (LDC) or in a country with less than 10 registered CDM projects at the starting date of validation; and
- The data requirements for the application of step 5 above cannot be met.

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM} \quad (2)$$

Where:

$EF_{grid,BM,y}$	Build margin CO_2 emission factor in year y (tCO_2/MWh)
$EF_{grid,OM,y}$	Operating margin CO_2 emission factor in year y (tCO_2/MWh)
w_{OM}	Weighting of operating margin emissions factor (%)
w_{BM}	Weighting of build margin emissions factor (%)

a. Weighted average CM

The combined margin is calculated using equation 4 above with following conditions:

First crediting period:

- w_{BM}= 0.5;
- w_{OM} = 0.5;

Second crediting period (unless otherwise specified in a newer version of the applied methodology at crediting period renewal of the PoA):

- w_{BM}= 0.75;
- w_{OM} = 0.25;

b. Simplified CM

The combined margin is calculated using equation 4 above with following conditions:

- w_{BM}= 0;
- w_{OM} = 1;

Under the simplified CM, the operating margin emission factor ($EF_{grid,OM,y}$) must be calculated using the average OM.

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

Emission factors calculated and provided by the DNA will be fixed *ex-ante* for the first crediting period of the PoA for all SSC-CPAs in the relevant grid. While renewing the crediting period of the PoA, grid emission factors will be renewed in parallel. The new values will be applied for all SSC-CPAs newly included or renewing their crediting period during the second crediting period of the PoA.

As an archipelago country, Indonesia does not have one main-connected grid. PT. PLN is operating more than 600 grids across the country. In order to cope with the numerous emission factors needed for this SSC-PoA, only emission factors of Sumatera and Java-Bali (Jamali) grids (and provided here in the PoA-DD) are determined at PoA level for the first crediting period of the SSC-PoA (See table below for a summary of EF values).

For SSC-CPAs connected to grids not included in the list below, the grid emission factors will be provided in the SSC-CPA-DD and calculated as per latest CDM guidance available at date of inclusion by using available data from the Indonesian DNA or self-calculated by PPs using PT. PLN's published data or other publicly-made documentation. Grid definition[55] will be based on PT. PLN grid boundary.

Table 7: Operating, build and combined margins CO_2 emission factor of the grids that will be fixed for the first crediting period.

Grid	$EF_{OM,y}$	$EF_{BM,y}$	$EF_{CM,y}$
Sumatera	0.906	0.581	0.743
Java-Bali (Jamali)	0.844	0.937	0.891

Sumatera Grid calculation (CPAs will only state the final $EF_{CM,y}$)

Data/Parameter:	ID.1 / $EF_{CM,y}$
Data unit:	tCO_2/MWh
Description:	$EF_{CM,y}$ is the combined margin CO_2 emission factor of power plants connected to the Sumatera electricity grid in year 'y', calculated ex-ante based on the weighted average of $EF_{OM,y}$ and $EF_{BM,y}$
Source of data to be used:	PT PLN (Persero) Pembangkitan Sumatera Bagian Selatan: Statistik 2005-2007 PT PLN (Persero) Pembangkitan Sumatera Bagian Utara: Statistik 2005-2007 PT PLN P3B Sumatera data
Value applied	$EF_{CM,y}$ = 0.743 tCO2/MWh
Justification of the choice of data or description of measurement methods and procedures actually applied :	No measurement required. Data is obtained based on analysis of PLN published information.
Any comment:	-

Data/Parameter:	ID.2 / $EF_{OM,y}$
Data unit:	tCO_2/MWh
Description:	$EF_{OM,y}$ is the average operating margin CO_2 emission factor of power plant connected to the Sumatera electricity grid in 3 recent years available data, calculated using simple OM method for each year in which the project generation occurs. During the crediting period, this factor is calculated based on ex-ante emissions by using year 2005, 2006 and 2007 data.
Source of data to be used:	PT PLN (Persero) Pembangkitan Sumatera Bagian Selatan: Statistik 2005-2007 PT PLN (Persero) Pembangkitan Sumatera Bagian Utara: Statistik 2005-2007 PT PLN P3B Sumatera data
Value applied	$EF_{OM,y}$ = 0.906 tCO_2/MWh

[55] Grids (whether they are an interconnected or isolated grids) or electricity systems definition will be referred to the latest available PLN National Generation Development Plan (Indonesian: Rencana Usaha Penyediaan Tenaga Listrik PT. PLN Persero).

Justification of the choice of data or description of measurement methods and procedures actually applied :	No measurement required. Data is obtained based on analysis of PLN published information.
Any comment:	All data relevant for the calculation of $EF_{OM,y}$ are updated annually. This includes each associated fuel emission factor and corresponding net calorific values, is re-defined annually.

Data/Parameter:	ID.3 / $EF_{BM,y}$
Data unit:	tCO_2/MWh
Description:	$EF_{BM,y}$ is the build margin CO_2 emission factor of power plants in the sample group 'm' connected to the Sumatera electricity grid in year 'y'. During the crediting period, this factor is calculated based on ex-ante emissions by using year 2007 data.
Source of data to be used:	PT PLN (Persero) Pembangkitan Sumatera Bagian Selatan: Statistik 2005-2007 PT PLN (Persero) Pembangkitan Sumatera Bagian Utara: Statistik 2005-2007 PT PLN P3B Sumatera data
Value applied	$EF_{BM,y}$ = 0.581 tCO_2/MWh
Justification of the choice of data or description of measurement methods and procedures actually applied :	No measurement required. Data is obtained based on analysis of PLN published information.
Any comment:	All data relevant for the calculation of $EF_{BM,y}$ are updated annually. This includes each associated fuel emission factor and corresponding net calorific values, as well as sample group 'm' power plants (its associated generation and fuel consumption data), is re-defined annually.

Data / Parameter:	ID.4 / EG_y
Data unit:	MWh
Description:	Net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost / must-run power plants / units, in year y (2005-2007), including Sumatera Bagian Selatan and Sumatera Bagian Utara and also from IPP.
Source of data to be used:	PT PLN (Persero) Pembangkitan Sumatera Bagian Selatan: Statistik 2005-2007 PT PLN (Persero) Pembangkitan Sumatera Bagian Utara: Statistik 2005-2007 PT PLN P3B Sumatera data
Value applied	Data provided in the Sumatera grid calculation
Justification of the choice of data or description of measurement methods and procedures actually applied :	Official Statistical Data
Any comment:	To calculate the power delivered to the grid

Data / Parameter:	ID.5 / Net Calorific Value (NCV)
Data unit:	TJ/t fuel (Terra Joule/tonne fuel)
Description:	Net calorific value (energy content) per mass or volume unit of a fuel
Source of data to be used:	"Bahan Bakar Minyak, Elpiji dan BBG untuk kendaraan, rumah tangga, industri dan perkapalan", published by PERTAMINA 2003
Value applied	NCV for MFO is 41.02 and HSD is 42.73
Justification of the choice of data or description of measurement methods and procedures actually applied :	The NCV data of HSD and MFO are available. Therefore, IPCC's data is not used.
Any comment:	Data provided in the Sumatera grid calculation

Data / Parameter:	ID.6 / Density
Data unit:	kt/kl (kilo tonne/ kilo litre)
Description:	Liquid density of HSD and MFO
Source of data to be used:	"Bahan Bakar Minyak, Elpiji dan BBG untuk kendaraan, rumah tangga, industri dan perkapalan", published by PERTAMINA 2003
Value applied	Density value for MFO is 0.000990 and HSD is 0.000845
Justification of the choice of data or description of measurement methods and procedures actually applied :	The density data of HSD and MFO are available. Therefore, IPCC's data is not used.
Any comment:	Data provided in the Sumatera grid calculation

Data / Parameter:	ID.7 / Carbon Content
Data unit:	tC/TJ (tonne Carbon/Terra Joule)
Description:	Carbon content in the fuel per unit of energy
Source of data to be used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied	The carbon content of MFO is 21.1 and HSD is 20.20
Justification of the choice of data or description of measurement methods and procedures actually applied :	Use default data as per 2006 IPCC Guidelines for National Greenhouse Gas Inventories
Any comment:	Data provided in the Sumatera grid calculation

Data / Parameter:	ID.8 / Carbon oxidation factor $OXID_i$
Data unit:	---
Description:	
Source of data to be used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied	1

Justification of the choice of data or description of measurement methods and procedures actually applied :	Use default data as per 2006 IPCC Guidelines for National Greenhouse Gas Inventories
Any comment:	Data provided in the Sumatera grid calculation

Data / Parameter:	ID.9 / GEN_y
Data unit:	MWh
Description:	Electricity generated.
Source of data to be used:	PT PLN (Persero) Pembangkitan Sumatera Bagian Selatan: Statistik 2005-2007 PT PLN (Persero) Pembangkitan Sumatera Bagian Utara: Statistik 2005-2007
Value applied	Data provided in the Sumatera grid calculation
Justification of the choice of data or description of measurement methods and procedures actually applied :	All data of generated electricity for the most recent five years (2003-2007) in the Sumatera grid is used to calculate the ratio of Low Cost and Must Run Power Plants in the grid. Data for the most recent three years (2005, 2006 and 2007) in the grid is used to calculate the Operating Margin emission factor(s) ($EF_{OM,y}$).
Any comment:	Data provided in the Sumatera grid calculation

Data / Parameter:	ID.10 / $FC_{i,m,y}$
Data unit:	kl (kilo litre) , kt (kilo tonne), MMBTU (Million Metric British Thermal Unit)
Description:	Amount of fuel combusted per type of technology
Source of data to be used:	PT PLN (Persero) Pembangkitan Sumatera Bagian Selatan: Statistik 2005-2007 PT PLN (Persero) Pembangkitan Sumatera Bagian Utara: Statistik 2005-2007
Value applied	Data provided in the Sumatera grid calculation
Justification of the choice of data or description of measurement methods and procedures actually applied :	The most recent three years data (2005, 2006, and 2007) is used for calculating CO_2 emission.
Any comment:	Data provided in the Sumatera grid calculation

Data / Parameter:	ID.11 / Average electricity losses
Data unit:	%
Description:	The average electricity losses refer to parasitic power and electricity losses occurring in the sub-station.
Source of data to be used:	PT PLN (Persero) Pembangkitan Sumatera Bagian Selatan: Statistik 2005-2007 PT PLN (Persero) Pembangkitan Sumatera Bagian Utara: Statistik 2005-2007
Value applied	Data provided in the Sumatera grid calculation
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data for average electricity losses is used to calculate net electricity generated (electricity exported to the grid)

Any comment:	Data provided in the Sumatera grid calculation

Data / Parameter:	ID.12 / SFC (Specific Fuel Consumption)
Data unit:	l/kWh (litre/kilo Watt hour), MMBTU/kWh (million metric british thermal unit)
Description:	Fuel consumption per unit of energy
Source of data to be used:	PT PLN (Persero) Pembangkitan Sumatera Bagian Selatan: Statistik 2005-2007 PT PLN (Persero) Pembangkitan Sumatera Bagian Utara: Statistik 2005-2007
Value applied	SFC of Diesel Power Plant is 0.2795 l/kWh SFC of Combined Cycle Gas Turbine (CCGT) Power Plant is 0.008545 MMBTU/kWh
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data is used for estimating fuel consumption of IPP's Diesel Power Plants and CCGT Power Plant in the grid. The fuel consumption of IPP's power plant is not available for publication.
Any comment:	Data provided in the Sumatera grid calculation

Jamali Grid calculation (CPAs will only state the final $EF_{CM,y}$):

Data/Parameter:	ID.13 / $EF_{CM,y}$
Data unit:	tCO_2/MWh
Description:	$EF_{CM,y}$ is the combined margin CO_2 emission factor of power plants connected to the JAMALI electricity grid in year 'y', calculated ex-ante based on the weighted average of $EF_{OM,y}$ and $EF_{BM,y}$
Source of data to be used:	PLN
Value applied	$EF_{CM,y}$ = 0.891 tCO2/MWh
Justification of the choice of data or description of measurement methods and procedures actually applied :	No measurement required. Data is obtained based on analysis of PLN published information.
Any comment:	-

Data/Parameter:	ID.14 / $EF_{OM,y}$
Data unit:	tCO_2/MWh
Description:	$EF_{OM,y}$ is the average operating margin CO_2 emission factor of power plant connected to the JAMALI electricity grid in 3 recent years available data, calculated using simple OM method for each year in which the project generation occurs. During the crediting period, this factor is calculated based on ex-ante emissions by using year 2004, 2005 and 2006 data.
Source of data to be used:	PLN
Value applied	$EF_{OM,y}$ = 0.844 tCO_2/MWh

Justification of the choice of data or description of measurement methods and procedures actually applied :	No measurement required. Data is obtained based on analysis of PLN published information.
Any comment:	All data relevant for the calculation of $EF_{OM,y}$ are updated annually. This includes each associated fuel emission factor and corresponding net calorific values, is re-defined annually.

Data/Parameter:	ID.15 / $EF_{BM,y}$
Data unit:	tCO_2/MWh
Description:	$EF_{BM,y}$ is the build margin CO_2 emission factor of power plants in the sample group 'm' connected to the JAMALI electricity grid in year 'y'. During the crediting period, this factor is calculated based on ex-ante emissions by using year 2006 data.
Source of data to be used:	PLN
Value applied	$EF_{BM,y}$ = 0.937 tCO_2/MWh
Justification of the choice of data or description of measurement methods and procedures actually applied :	No measurement required. Data is obtained based on analysis of PLN published information.
Any comment:	All data relevant for the calculation of $EF_{BM,y}$ are updated annually. This includes each associated fuel emission factor and corresponding net calorific values, as well as sample group 'm' power plants (its associated generation and fuel consumption data), is re-defined annually.

Data/Parameter:	ID.16 / $FC_{i,j,y}$
Data unit:	kT
Description:	Consumption of fuel type 'i', in year 'y', for power plant in group 'j', where: Group 'j' is power plants in JAMALI grid excluding the low-cost/must-run sources (Whichever is larger compare to group 'm').
Source of data to be used:	PLN
Value applied	Data provided in the JAMALI grid calculation
Justification of the choice of data or description of measurement methods and procedures actually applied :	No measurement required. Data is obtained based on analysis of PLN published information.
Any comment:	-

Data/Parameter:	ID.17 / $FC_{i,m,y}$
Data unit:	kT

Description:	Consumption of fuel type ‘i’, in year ‘y’, for power plant in group ‘m’, where: Group ‘m’ is five most recently build power plants or power plants capacity additions that comprise 20% of system generation (whichever is larger compare to group ‘j’).
Source of data to be used:	PLN
Value applied	Data provided in the JAMALI grid calculation
Justification of the choice of data or description of measurement methods and procedures actually applied :	No measurement required. Data is obtained based on analysis of PLN published information.
Any comment:	-

Data/Parameter:	ID.18 / $\sum_j EG_{j,y}$
Data unit:	MWh
Description:	Generation data of power plants in sample group ‘j’ in year ‘y’, where: Group ‘j’ is power plants in JAMALI grid excluding the low-cost/must-run sources (Whichever is larger compare to group ‘m’).
Source of data to be used:	PLN
Value applied	Data provided in the JAMALI grid calculation
Justification of the choice of data or description of measurement methods and procedures actually applied :	No measurement required. Data is obtained based on analysis of PLN published information.
Any comment:	-

Data/Parameter:	ID.19 / $\sum_m EG_{m,y}$
Data unit:	MWh
Description:	Generation data of power plants in sample group ‘m’ in year ‘y’, where: Group ‘m’ is five most recently build power plants or power plants capacity additions that comprise 20% of system generation (whichever is larger compare to group ‘j’).
Source of data to be used:	PLN
Value applied	Data provided in the JAMALI grid calculation
Justification of the choice of data or description of measurement methods and procedures actually applied :	No measurement required. Data is obtained based on analysis of PLN published information.
Any comment:	-

Data/Parameter:	ID.20 / NCV_i
Data unit:	TJ/kt
Description:	Net calorific value of fuel type 'I' for purpose of calculating grid emission factor
Source of data to be used:	Publication from various country relevant sources or IPCC data
Value applied	HSD & Diesel Oil = 43 TJ/kt MFO = 40.4 TJ/kt Coal = 21.34TJ/kt Natural gas = 48 TJ/kt
Justification of the choice of data or description of measurement methods and procedures actually applied :	-
Any comment:	-

Data/Parameter:	ID.21 / EF_{CO2}
Data unit:	tCO_2/TJ
Description:	CO_2 emission factor of fuel type 'i' for purpose of calculating grid emission factor
Source of data to be used:	IPCC Guidelines for National Greenhouse Gas Inventories
Value applied	HSD & Diesel Oil = 74.1 tCO_2/TJ MFO = 77.4 tCO_2/TJ Coal = 96.1 tCO_2/TJ Natural gas = 56.1 tCO_2/TJ
Justification of the choice of data or description of measurement methods and procedures actually applied :	-
Any comment:	-

Diesel usage consumption calculation SSC-CPAs using diesel backup generators:

Data / Parameter:	ID.23 / $NCV_{i,y}$
Data unit:	GJ / kg
Description:	Weighted average net calorific value of the diesel fuel in year 'y'
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied:	0.043
Justification of the choice of data or description of measurement methods and procedures actually applied :	–

Any comment:	–

Data / Parameter:	ID.24 / $EF_{CO2,i,y}$
Data unit:	tCO_2 / GJ
Description:	Weighted average CO_2 emission factor of diesel fuel in year 'y'
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied:	0.074
Justification of the choice of data or description of measurement methods and procedures actually applied :	–
Any comment:	–

Data / Parameter:	ID.25 / Density
Data unit:	Kg/m^3
Description:	Density of diesel fuel
Source of data to be used:	Pertamina diesel fuel specification[56]
Value applied	0.815 kg/litre = 815 kg/m^3
Justification of the choice of data or description of measurement methods and procedures actually applied :	The density data of diesel fuel used in diesel generator is available. Therefore, IPCC's data is not used.
Any comment:	Data used to calculate $FC_{i,j,y}$ from litre to tonne.

Emission Reductions for a CPA shall be calculated according to the following formula:

$$ER_y = BE_y - PE_y - LE_y \quad \textbf{(3)}$$

Where:

ER_y Emission reductions in year y (t CO_2/y)

BE_y Baseline Emissions in year y (t CO_2/y)

PE_y Project emissions in year y (t CO_2/y)

LE_y Leakage emissions in year y (t CO_2/y)

While for PE_y, as described in section A.4.4.2. that project emissions shall only accounted for CPAs, which has a diesel generator as a back-up according to the following formula:

[56] http://www.pertamina.com/index.php?option=com_content&task=view&id=3262&Itemid=697

$$PE_{FC,i,y} = \sum_{i} FC_{i,j,y} \times COEF_{i,y} \quad \textbf{(4)}$$

Where:

$PE_{FC,j,y}$	Are the CO_2 emissions from fossil fuel combustion in process j during the year y (tCO_2/yr)
$FC_{i,j,y}$	Is the quantity of fuel type I combusted in process j during the year y (tonne/yr)
$COEF_{i,y}$	Is the CO_2 emission coefficient of fuel type I in year y (tCO_2/tonne)
i	Are the fuel types combusted in process i during the year y

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

Where:

$COEF_{i,y}$	Is the CO_2 emission coefficient of fuel type I in year y (tCO_2/tonne)
$NCV_{i,y}$	Weighted average net calorific value of the diesel fuel in year 'y' (GJ/kg)
$EF_{CO2,I,y}$	Weighted average CO_2 emission factor of diesel fuel in year 'y' (t CO_2/GJ)
i	Are the fuel types combusted in process i during the year y

For CPAs that do not have a diesel generator as a back-up, PE_y are 0.

As per eligibility criteria no. 11, Power Density (PD) of a CPA with a reservoir shall be greaten then 10 W/m^2 leading to zero project emissions. Such criteria shall be checked as per formulas provided in methodology ACM0002, version 12.3.0:

$$PD = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}} \quad \textbf{(5)}$$

Where:

PD	=	Power density of the project activity (W/m^2)
Cap_{PJ}	=	Installed capacity of the hydro power plant after the implementation of the project activity (W)
Cap_{BL}	=	Installed capacity of the hydro power plant before the implementation of the project activity (W). For new hydro power plants and hence all CPAs, this value is zero
A_{PJ}	=	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 (m^2)
A_{BL}	=	Area of the single or multiple reservoirs measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m^2). For new reservoirs and hence all CPAs, this value is zero

For all CPAs LE_y are 0.

Baseline Emissions will be calculated as:

$$BE_y = EG_{BL,y} * EF_{CO_2,grid,y} \quad \textbf{(6)}$$

Where:

BE_y	Baseline Emissions in year y; t CO_2
$EG_{BL,y}$	Energy baseline in year y; MWh
$EF_{CO2,grid,y}$	CO_2 Emission Factor in year y; t CO_2/MWh

Where as $EF_{CO2,grid,y} = EF_{CM,y}$.

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

Data / Parameter:	ID.26 / Cap_{PJ}
Data unit:	W
Description:	Installed capacity of the hydro power plant
Source of data to be used:	Feasibility report, commissioning report or other relevant sources
Value applied	To be specified in each SSC-CPA at time of inclusion date
Justification of the choice of data or description of measurement methods and procedures actually applied :	The values reflect the expected capacity to be installed at the power plant according to the plant design parameters.
Any comment:	The final capacity that will be installed at the plant might differ from the value applied since the technology provided might not have been chosen at the time of preparation of the SSC-CPA DD.

If CPA includes a reservoir:

Data / Parameter:	ID.27 / 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:	Feasibility report, commissioning report or other relevant sources
Value applied	To be specified in each SSC-CPA at time of inclusion date
Justification of the choice of data or description of measurement methods and procedures actually applied :	The values reflect the expected capacity to be installed at the power plant according to the plant design parameters.

Any comment:	The final capacity that will be installed at the plant might differ from the value applied since the technology provided might not have been chosen at the time of preparation of the SSC-CPA DD.

If CPA is connected to a grid other then Sumatera and Jamali:

Data / Parameter:	ID.28 / $EF_{CO2,grid,y}$
Data unit:	tCO_2/MWh
Description:	Emission factor of the grid where the hydropower is exporting (or would have exported) its electricity to.
Source of data to be used:	Calculated as per “Tool to calculate the Emission Factor for an electricity system”,version 02.2.1
Value applied	To be specified in each SSC-CPA at time of inclusion date
Justification of the choice of data or description of measurement methods and procedures actually applied :	To be specified in each SSC-CPA at time of inclusion date
Any comment:	Determined ex-ante for all SSC-CPAs that are connected to Grids except Sumatera and Java-Bali Grid.

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:

Based on AMS I.D. v17, the following data and parameter will be monitored during the project crediting period:

Data / Parameter:	$EG_{BL,y}$
Data unit:	MWh
Description:	Electricity energy baseline in year *y*; (=Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year y)
Source of data to be used:	Measured by electricity 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:	The net electricity production will be measured continuously by a watt-hour meter with high accuracy as per government regulation at the interconnection point or sub-station as per agreed PPA. The net electricity production will be calculated by subtracting the electricity exported with the electricity imported by the SSC-CPA. The measurement of net electricity generation will be conducted on a continuous basis and recorded on at least monthly basis, where daily total electricity measurement will be available. The measurement results will be summarized transparently in regular monthly production reports and crosschecked with sales

	electricity receipts. A high level of accuracy determined by PT. PLN, if not defined by the Grid Code issued by the Department of Energy and Natural Resources, of the measurements will be achieved due to the use of high-precision equipment calibrated and tested according to recognized national standard in Indonesia, as stated in E.7.2.
QA/QC procedures to be applied:	The device will be recalibrated periodically according to the instructions as per local/national standard and requirements in place at the date of inclusion of the SSC-CPA into the SSC-PoA. For instance at the date the SSC-PoA is being validated, regulations are as per the Government of Indonesia Law no. 2 issued in 1981 about legal metrology.
Any comment:	

Data / Parameter:	$FC_{i,j,y}$
Data unit:	litre
Description:	diesel consumption from auxiliaries
Source of data to be used:	Diesel invoices
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:	Diesel consumption will be monitored through the collection of diesel invoices or by monitoring the number of operation hours of the diesel engine. In the latter case, the volume of fuel consumed will be calculated by multiplying the number operation hours by the specific consumption of the auxiliaries.
QA/QC procedures to be applied:	None
Any comment:	If the project emission of diesel fuel is less than 1% of total emission reduction, then this project emission could be excluded.

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

1. Monitoring Plan Objective and Organization

The purpose of the monitoring plan is to measure the net electricity delivered to the local electricity grid by the SSC-CPA. The net electricity will be calculated by subtracting the electricity exported with the electricity imported by the SSC-CPA, which is measured at the interconnection point or sub-station as per agreed PPA.

Details of the SSC-CPA monitoring plan will be described for each SSC-CPA but shall comprise the procedures outlined in this section.

2. Monitoring Data and archiving

Data to be monitored is the net electricity delivered to the local grid by the SSC-CPA. In Indonesia, procedures for meter reading are normally specified in the PPA. The detailed monitoring procedures will

therefore be established for each SSC-CPA on the basis of the PPA. As a general guidance, at PoA level the PPs can only state that the monitoring data will be derived from periodic electricity meter records kept by the project owners and/or the grid company, which will be crosschecked with actual sales electricity receipts signed by project owners and the grid company, in this case PT. PLN. The operator of the hydro plant will be responsible for collecting the monitoring data and will provide the coordinating entity with meter readings for electricity delivered and if applicable calibration certificates.

In case the main revenue meter of SSC-CPAs break down, the net electricity delivered to the local grid will be derived from a back-up revenue meter installed and operated by the project owners and/or the grid company. Furthermore, in the worst case, if there is no back-up revenue meter available at the interconnection point or sub-station, ME and the project owners will not claim any emission reductions during the breaking down of main revenue meter.

In Indonesia, it is a common practice that revenue coming from electricity generation are based on measurement at the interconnection point or sub-station, which is already considering technical transmission losses from power plant to the interconnection point. In case the metering equipment does not take into account the losses in the transmission lines, the CME will estimate in a conservative manner these losses (on the basis of an independent expert opinion) and discount the losses (as a percentage) from the total generation.

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

3. Calculation approaches

Calculation of ex-post emission reductions is carried out for each SSC-CPA as per following equation:

$$ER_{[CPA],y} = \left(EE_{[CPA],y} - EI_{[CPA],y}\right) * EF_{[CPA],CO_2}$$

Where:

$ER_{[CPA],y}$	Emission Reductions from [CPA] in year y; t CO_2
$EE_{[CPA],y}$	Electricity exported by [CPA] in year y; kWh
$EI_{[CPA],y}$	Electricity imported by [CPA] in year y; kWh
$EF_{[CPA],CO2}$	CO_2 Emission Factor of the grid where the [CPA] is connected; t CO_2e/kWh

4. Quality Assurance and Quality Control

The installation location of the meters is detailed in each SSC-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 local/national standard and requirements at the date of inclusion of the CPA into the PoA. For instance at the date the PoA is being validated, regulations are as per the Government of Indonesia Law no. 2 issued in 1981 about legal metrology. The grid company and the project owners are responsible for operation and maintenance of their respective electricity meters.

The meter(s) reading will be readily accessible for the Designated Operational Entity (DOE) carrying out the verification of monitoring data.

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

The baseline and monitoring sections have been prepared by South Pole Carbon Asset Management Ltd. (www.southpolecarbon.com) the 15/12/2009 and further been revised during the validation process. South Pole Carbon Asset Management Ltd. is assisting PT. Hydro Program International in project development and implementation.

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Annex 1

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

The PoA does not receive any public funding.

Annex 3

BASELINE INFORMATION

Please also refer to Section E.

Sumatera Interconnected Grid Emission Factor

The data of emission factor of Sumatera grid is published by Indonesia DNA, which was calculated by BPPT. The calculation of emission factor of Sumatera Grid was conducted based on "Tool to calculate the emission factor for an electricity system" Version 2.2.1. The determination of the emission factor is performed by following the steps below:

Step 1. Identify the relevant electricity systems.

According to PLN's actual grid structure, Sumatera grid covers NAD Province, North Sumatera Province, Riau Province, Jambi Province, West Sumatera Province, South Sumatera Province and Lampung Province. The first proposed CPA is located in West Sumatera Province, which is covered by Sumatera Grid. Thus, the relevant electric power system is Sumatera Grid.

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

Option I is chosen in this calculation which is only grid power plants are included in it.

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

The "Tool to calculate the emission factor for an electricity system" Version 02.2.1 offers four methods to calculate the operating margin (OM):

a. Simple OM; or
b. Simple adjusted OM; or
c. Dispatch data analysis OM; or
d. Average OM

From 2003 to 2007, the low-cost / must-run resources in Sumatera grid were 20.95%, 17.90%, 17.28% and 21.99% respectively. All were accounted less than 50% of the total amount in the Sumatera grid. According to the data, the simple OM method is selected for calculating the emission factor. For the simple OM, the emission factor can be calculated using either of the two following data vintages:

1. *Ex ante* option: this option does not require monitoring and recalculation of the emission factor during the crediting period because the emission factor is determined once at the validation stage. A 3-year generation-weighted average, based on the most recent data available at the time of the submission of the CDM-PDD to the DOE for validation.
2. *Ex post* option: the emission factor is determined for the year in which the project activity displaces grid electricity, requiring the emission factor to be updated annually during monitoring. If the data required calculating the emission factor for year y is usually only available later than six months after the end of the year y, alternatively the emission factor of the previous year y-1 may be used. If the data is usually only available 18 months after the end of year y, the emission factor of the year preceding the previous y-2 may be used. The same data vintage (y, y-1 or y-2) should be used throughout all crediting periods.

“Ex ante option: A 3-year generation-weighted average” has been selected for the calculation of this project activity.

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

The simple OM emission factor is calculated as the generation-weighted average CO_2 emissions per unit net electricity generation (tCO_2 / MWh) of all generating power plants serving the system, not including low-cost / must-run power plants/units. The simple OM may be calculated by choosing one of these below two options:

Option A: Based on the net electricity generation and a CO_2 emission factor of each power unit; or

Option B: Based on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system.

Option B can only be used if:

(a) The necessary data for option A is not available; and
(b) Only nuclear and renewable power generation are considered as low-cost / must-run power sources and the quantity of electricity supplied to the grid by these sources is known; and
(c) Off-grid power plants are not included in the calculation (i.e., if Option I has been chosen in Step 2).

The calculation of the simple OM emission factor uses option B, based on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system. The reason of choosing option B is because the necessary data needed in Option A is not available for all power plants in the Sumatera grid. Data on fuel consumption of each power plant owned by Independent Power Producer (IPP) is not publicly available. Thus, option B is selected.

The simple OM emission factor is calculated based on the net electricity supplied to the grid by all power plants serving the system, not including low-cost / must-run power plants / units, and based on the fuel type(s) and total fuel consumption of the project electricity system, as follows :

$$EF_{grid,OM\,simple,y} = \frac{\sum_m EG_{m.y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}}$$

Where :

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

$EG_{m.y}$ = Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)

$EF_{EL,m,y}$ = CO_2 emission factor of power unit m in year y (tCO_2/MWh)

m = All power units serving the grid in year y including low-cost/must-run power units

y = The relevant year as per data vintage chosen in Step 3

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

Where:

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

The net electricity generation data are obtained from the PT PLN Pembangkitan Sumbagut and PT PLN Pembangkitan Sumbagsel Statistics between 2005-2007 (published annually). The IPP's data are also obtained from PT PLN P3B Sumatera. The fuel consumption for power generation and net calorific values of each fuel type are taken from the Bahan Bakar Minyak, LPG dan BBG untuk Kendaraan, Rumah Tangga, Industri dan Perkapalan (published by Pertamina, May 2003).
The emission factors adopted are obtained from Table 1.3 and Table 1.4 of the 2006 IPCC Guidelines for National Greenshouse Gas Inventories Volume 2. Chap. 1, page 1.21-1.24.