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

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NOTE:

(i) This form is for the submission of a CDM PoA whose SSC-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):

Biomass Power Development Programme in Thailand
Version 05
Date: 4 October 2012

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

According to the Power Development Plan (PDP) by the EGAT, Thailand's demand for electricity will almost double from 146,182 GWh in 2009 to 287,589 GWh in 2025[1]. Against this backdrop, securing steady supply sources of electricity is a matter of vital importance for the Thai economy. In meeting this electricity demand, Very Small Power Producers (VSPP) scheme is expected to play a key role and is considered to be crucial.

In Thailand, the Ministry of Energy (MoE) has targeted to increasing the share of renewable energy in the national fuel mix to 8% by 2011[2]. The government has recognised the importance of reducing the greenhouse gas (GHG) emissions through promotion of renewable energy. The development of renewable energy is mainly promoted through Very Small Power Producers (VSPP) (<10MW) and Small Power Producer (SPP) (>10 MW to ≤90 MW) schemes. Under both the schemes, a higher tariff is granted for renewable energy systems by providing an "adder" in addition to the normal tariff for 7 to 10 years from the commercial operation date of the project[3]. The current existing installation of biomass power in Thailand is 1,610 MW as on June 2010, whereas the target for biomass power development is 2,800 MW by the year 2011 and 3,220 MW by 2016[4]. It has been assessed that there exist a potential for 4,400 MW[5] of biomass energy potential in Thailand. Thailand is an agricultural-based economy that produces various biomass resources such as agricultural residues, by-product residues which can be used for power generation.

Advance Carbon Securities Ventures (ACSV) Company Limited is the coordinating/managing entity (CME) for this PoA. It is responsible to communicate with CDM Executive Board and coordinate the work related to validation, verification, registration and issuance of carbon credits generated by the PoA.

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[1] EGAT, Summary of Thailand Power Development Plan 2010-2030, available online at http://www.egat.co.th/en/images/stories/pdf/Report%20PDP2010-Apr2010_English.pdf (accessed in December 2010), Thailand Power Development Plan, Appendix 5, System Planning Division, Electricity Generating Authority of Thailand (EGAT), Bangkok, 2010, p. 116.

[2] Lertsuridej, P. (2006): Policy on New and Renewable Energy Technology Promotion in Thailand, available online at http://www.energy-based.nrct.go.th/Article/Ts-3%20policy%20on%20new%20and%20renewable%20energy%20technology%20promotion%20in%20thailand.pdf (accessed in December 2008). Ministry of Energy, Thailand, Bangkok.

[3] Amranand, P. (2008): Alternative Energy, Cogeneration and Distributed Generation: Crucial Strategy for Sustainability of Thailand's Energy Sector, available online at www.eppo.go.th/doc/Piya-RE-in-Thailand.pdf (accessed in January 2009). Ed. EPPO, Energy Policy & Planning Office, Thailand, Bangkok.

[4] http://www3.dede.go.th/dede/fileadmin/upload/nov50/may53/6_5_53Bussiness.pdf (accessed in October 2010).

[5] http://www3.dede.go.th/dede/fileadmin/upload/pictures_eng/pdffile/AE_Target_in_2022.pdf (accessed in October 2010).N

Advance Clean Power Company Limited will act as the implementer of the first CDM program activity (SSC-CPA). Each biomass power project with capacity less than 10 MW is considered as one SSC-CPA. The PoA is a voluntary activity proposed by ACSV which is functioning as a CME of the PoA. The development of individual SSC-CPAs lies with the individual project developers (refer to figure 1 for more details). However, ACSV is responsible for liaison with other similar project developers for enabling them to join in the PoA and their participation in the PoA is voluntarily. ACSV is also responsible for collecting the information necessary for monitoring and overseeing the implementation of monitoring protocol in all the SSC-CPAs. The goal of is POA is to support sustainable development of the host country, therefore it is envisaged to include as many SSC-CPAs as possible.

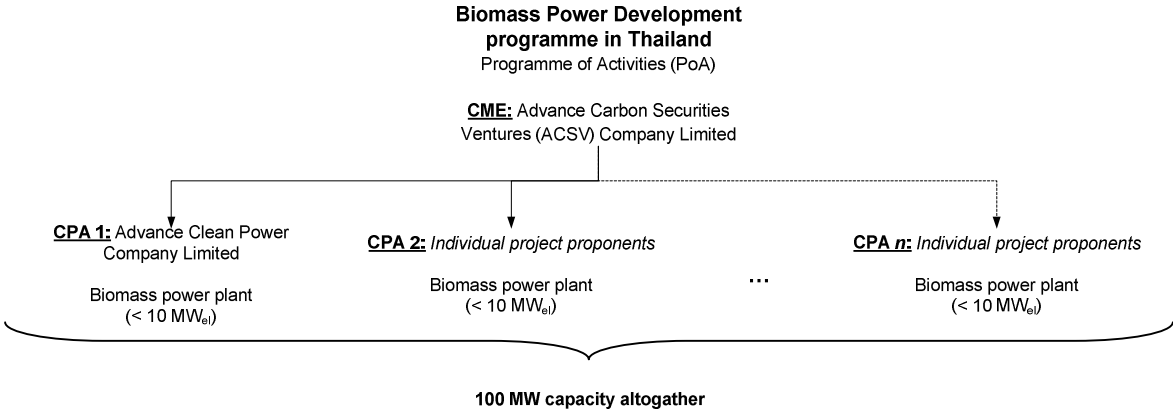

Figure 1: Approach of PoA

The use of biomass residue as a fuel, for power generation displaces an equivalent amount of grid power which would otherwise be produced by grid connected power plants. Grid power is comprised of a large share of fossil fuel based power generation systems. The total installed capacity of power plants in Thailand is 29,212 MW (as of December 2009). Of this total, based on the latest available data, renewable capacity comprised of 309.85 MW, which is about 1%[6]. Therefore, the PoA will contribute to the reduction of CO_2 emissions by replacing electricity generated from fossil fuel fired power plants in the electricity grid of Thailand. In addition contributes to the overall goal of policy objectives.

Implementation of biomass power plants is fully in compliance with existing laws. Power Development Plan (PDP) of Thailand was approved by the National Energy Policy Council (NEPC) on 4th June 2007 and by the Cabinet on 19th June 2007 (Report No. 912000-5006).

Contribution to the Sustainable Development of the Host Country

Letter of Approval[7] from the Thailand Greenhouse Gas Management Organization (TGO) acting as the Designated National Authority (DNA) of Thailand has been approved on the 21st September 2011. The

[6] EGAT, Summary of Thailand Power Development Plan 2010-2030, available online at http://www.egat.co.th/en/images/stories/pdf/Report%20PDP2010-Apr2010_English.pdf (accessed in December 2010), Thailand Power Development Plan, Appendix 3, System Planning Division, Electricity Generating Authority of Thailand (EGAT), Bangkok, 2010, p. 116.

[7] Letter of Approval with Reference Number: TGO No.02/610 attached in the folder for validation

LOA has been issued to Advance Carbon Securities Ventures Co., Ltd acting as the C/ME for this POA on the 7th October 2011 by the Permanent Secretary of Ministry of Natural Resource and Environment Thailand. The Letter of Approval confirms that the "Programme of Activities", as defined by the CDM Programme of Activities Design Document, Biomass Power Development Programme in Thailand, will assist Thailand in achieving sustainable development and Advance Carbon Securities Ventures (ACSV) Company Limited is the Coordinating/Managing Entity.

Social well being:

- The PoA will contribute to the creation of jobs that will lead to income generation. The biomass power projects will need to secure sufficient quantity of biomass and creates opportunities to women as well in the supply chain of biomass, in addition to the employment created during construction of power plants. Thus contribute to an increase in gender equity and hence prevent social disparities.

Economic well being:

- The projects that will be developed in the PoA will bring additional investments. In addition, will directly complement the efforts of Government of Thailand to reduce the country's dependency on imported fossil fuels by producing electricity from biomass residues and also contributes to saving of foreign exchange.

Environmental well being:

- The development of PoA results in utilization of surplus biomass residues which in the absence of the project activity were burnt or left to decay and thus leading to a sustainable usage of locally available resource.
- Some of the agricultural residues are subjected to field burning and contributes to the local emissions. Instead, the PoA encourages the biomass power project developers to use these residues for power generation, results in avoided emissions and improvement in air quality and human health. The PoA also reduces the demand for electricity generation through fossil fuels such as coal, lignite, gas and oil thereby reduces associated CO_2 emissions.

Technological well being:

- The PoA contributes to the country objective of renewable energy targets and demonstrates the approach to use biomass residues for power generation and are considered to be renewable resources.

In light of the information presented above, the PoA contributes to sustainable development of Thailand.

Confirmation that the implementation of the PoA is voluntary

The proposed PoA is a unilateral CDM POA implemented purely on a voluntary basis. There is no regulation that requires implementing such a programme or project. Therefore is also no regulation or mandatory enforcement of using biomass fuel to generate electricity in Thailand for small scale power producer in Thailand.

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

The Coordinating or Managing Entity (C/ME) of this POA is Advance Carbon Securities Ventures (ACSV) Company Limited and is responsible to communicate with CDM Executive Board. ACSV is a private entity registered under the law of Thailand and is the project participant of this SSC-POA. ACSV has obtained Letter of Approval (LOA) issued by the DNA of Thailand namely the Thailand Greenhouse Gas Management Organization (TGO) confirming the voluntary participation of ACSV as C/ME, and that the POA assists to Thailand's sustainable development. Contract Information of the project participant is provided in Annex I of this document.

Name of involved (*) party ((host) indicates the 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)
Thailand (host)	Advance Carbon Securities Ventures (ACSV) Company Limited	No

The implementer of each SSC-CPA will be the individual project proponent. Each project proponent refers to a legally registered business entity in Thailand, owns the assets of the project and also the beneficiary of the Power Purchase Agreement of the project. A project proponent may develop more than one biomass power plant projects in Thailand and therefore the project proponent must apply for inclusion of each individual project separately to join this POA and each project will be treated as a new SSC-CPA application by the C/ME. Each Project proponent will assign the mandate to ACSV to be the project participant on behalf in this POA.

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

A.4.1. Location of the programme of activities:

The geographical boundary of this POA is in within Thailand

A.4.1.1. Host Party(ies):

Thailand

A.4.1.2. Physical/ Geographical boundary:

The geographical boundary of the PoA is within Thailand (refer figure 2). The geographical boundary of the PoA is defined as the geographical area within which all the small-scale CDM program activities (SSC-CPAs) that are to be included in this POA will be implemented, taking into consideration all applicable national and/or sectoral policies and regulations of Thailand within Thai's boundary. All these projects will be implemented within the borders of Thailand. Therefore, the geographical boundary of the PoA is within Thailand.

Thailand stretches from latitude 5° 37' 00" to 20° 27' 00" N and longitude 97° 22' 00" to 105° 37' 00" E

Figure 2: Map of Thailand

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

Each CDM programme activity (CPA) is a small scale renewable energy biomass power plant with potential installed capacity of less than 10MW for each power plant unit. The project must be a Greenfield plant to be eligible to be included into this POA. A Greenfield power plant represents the installation of a new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the SSC-CPA project activity. Each SSC-CPA will uses only renewable biomass residues resulting from the agro related processing industries such as wood barks and wood branches from woodchip mills as fuel to produce and sale the generated electricity under the "Very Small Power Producer" (VSPP) scheme in Thailand. In the case of seasonal fluctuations, it is expected that a SSC-CPA can use other renewable residues such as rice husk, cane trash, parawood, palm fiber, palm shell, empty fruit bunch, palm trunk, palm leaf, tapioca rhizome, bagasse, corncobs, residual wood and other agricultural residues for example, rice straw and corn straw.

All SSC-CPA is expected to supply electricity to the national grid. A Power Purchase Agreement (PPA) is the legal agreement that a SSC-CPA requires from either the Provincial Authority of Thailand (PEA) or Metropolitan Electricity of Thailand (MEA) to supply electricity to the national grid within Thailand. Each SSC-CPA having the legal PPA shall qualify under the VSPP scheme introduced as part of Thailand's feed-in-tariff/adder policy for renewable energy projects. Each PPA will specify the amount of capped supply capacity. The rationale of the capped supply capacity to the national grid is because each SSC-CPA that supply to the national grid has to be connected to the national electricity distribution system that is available within Thailand. Each SSC-CPA can be connected to either a 22kV or 33kV distribution system[7] depending on the availability of the distribution connection line at the project site and approval of the distribution company PEA or MEA. A SSC-CPA that is connected to a 22kV distribution system are limited to 8MW of supply, whereas, if a project activity is connected to a 33kV system are limited to 10MW of supply capacity. The capped supply capacity for each SSC-CPA can be verified through each specific SSC-CPA's PPA.

The use of biomass residue as a fuel, for electricity generation, displaces an equivalent amount of grid power which would otherwise be produced by grid connected power plants. Grid power is comprised of a large share of fossil fuel based power generation systems. The emissions reductions from CPA 1 for example is expected to reduce 37, 941 tCO_2e per year[8] and replaces electricity generated from fossil fuel fired power plants in the electricity grid of Thailand.

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

The Renewable Energy Generation Technology applicable under this POA is focused on renewable biomass power generation technology for Greenfield plant that supplies electricity to the national grid of Thailand. There are two major types of renewable biomass generation systems that use biomass residues as fuel, the first system is known as biomass combustion and the second one is known as biomass gasification. SSC-CPA that employs the biomass combustion system will be eligible to be included into this POA.

SSC-CPA that employs Biomass combustion system will have the following major components:

1. a Boiler to generate steam from the thermal energy released in the combustion process, and
2. a Steam Turbine which converts the thermal energy into mechanical energy and
3. Generator Responsible for final conversion to electricity power

Figure 3 below provide a general illustration of the flow diagram of Biomass Combustion Process

[7] Distribution Utilities' Regulations for Synchronization of Generators with Net Output under 10 MW to the Distribution Utility System assessed online on 30 November 2011 via the following website, page 1, item 5.2; http://www.eppo.go.th/power/vsppeng/VSPP%20Synchronization%2010%20MW-eng.pdf

[8] The grid emission factor is 0.5812 tCO_2/MWh, as per the report from TGO, http://www.tgo.or.th/english/download/publication/GEF/2009/GEFReport_EN.pdf

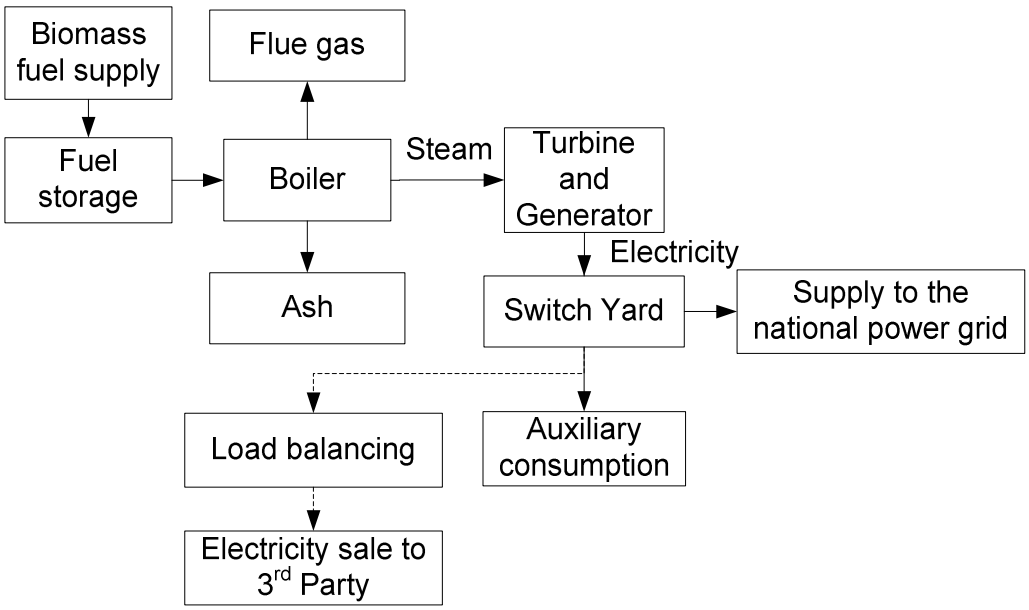

Figure 3: Flow diagram for the process (Flue gas is release to air accordance to Thai environmental law[9])

The expected output from the biomass fuelled power plant combustion system is the electricity power that will first used for internal auxiliary requirement, and secondly to optimum the capped supply capacity to the national grid and if there is any balancing electricity load available is anticipated that it will be sold to 3rd party that is currently purchasing electricity from the national or regional grid of Thailand.

Each SSC-CPA of this POA is required to provide the description of the technology, system and specification of the major components of the project in the respective CPA-DD as per the following specification requirement.

Equipment	Parameters (if applicable)
Boiler Specification (quantity)	Type
	Maximum Continuous Rating
	Steam pressure
	Steam temperature
	Efficiency of the boiler
	Feed water temperature
Generator Turbine Specification (quantity)	Type
	Steam temperature at turbine inlet
	Condenser Pressure
	Generator Rating

[9] Thus the PoA process design complies with Thai Environmental Law as indicated in: http://www.pcd.go.th/info_serv/en_reg_std_airsnd03.html

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

The criteria for inclusion and enrolling of a SSC-CPA in the PoA are defined below and is referenced against the requirement under "Standard for the Development of Eligibility Criteria for the Inclusion of a Project Activity as a CPA under the POA, EB65, Annex 3, Version 01.1, paragraph 13" . Each SSC-CPA is required to demonstrate and justify how it meets each inclusion clearly in each CPA-DD.

1. Each CPA proposed in this PoA must be located within the geographical boundary of Thailand. Thailand stretches from latitude 5° 37' 00" to 20° 27' 00" N and longitude 97° 22' 00" to 105° 37' 00" E.
2. Each CPA is a standalone biomass based power plant with a power generation capacity of less than 10 MW. Each SSC-CPA employs Biomass combustion system and will have the following major components that meets equipments specifications including compliance with testing/certification or manufacturer's standard (1) a Boiler to generate steam from the thermal energy released in the combustion process, and (2) a Steam Turbine which converts the thermal energy into mechanical energy (3) a Generator responsible for final conversion to electricity power (4) a biomass power plant transformer station and (5) distribution system including transmission line from the power plant to the PEA/MEA connection point (national grid). The technical specification of the major equipment used for each CPA must be provided in section A.4.1 of each CPA-DD.
3. Each CPA is a new installation of biomass based power plant and is connected to national power grid. Supply the generated electricity under a dedicated PPA from the PEA or MEA. Each SSC-CPA proposed in this POA can be uniquely identified to avoid double counting of emissions based on the information recorded in CPA database under ACSV's record keeping system, including specific geographic information and specific PPA number. The expected COD is also recorded to estimate the crediting period. The record keeping database of CPA must be reported in Section A.4.1 of each SSC-CPA-DD.
4. The start date of each CPA proposed into this POA must be justified through documentary evidence for demonstration of earliest real actions or implementation, such as signing date of major equipment contract.
5. Each CPA must meets all the criteria in the applied methodology AMS I.D Version 17 as applied in the latest valid POA-DD document
6. Each CPA must demonstrate additionality based on investment barrier analysis by justifying that the financial indicator represented by Project IRR of each SSC-CPA is below the determined applicable benchmark. Each SSC-CPA must comply with the key criteria and data for assessing additionality as per Section E.5.2 and Section E.5.1 of the latest valid POA-DD document
7. Each CPA must undertake local stakeholder consultation at CPA Level. Each CPA must describe the process and report the comments of the local stakeholder consultations at CPA level in each CPA-DD. Each subsequent CPA must provide the C/ME with the justification of passing the environmental impact assessment as accordance to the latest approved version of the POA-IEE-SD framework.
8. Each CPA must satisfy that the proposed CPA of a POA is not deemed to be a de-bundled component of a large scale activity and demonstrate the eligibility based on the de-bundling conditions as described in section A4.4.1 of the SSC-POA-DD. The result of the de-bundling should be reported in Section A.4.6 of each CPA-DD.

9. A proposed CPA must declare that it is not registered or in the process of registration as a standalone CDM project and it is also not registered CPA for other POA. The confirmation must be reported in Section A.4.7 of each CPA.
10. Proposed CPAs must declare that no ODA has been received for the implementation of the project and purchase of the CERs
11. Each CPA must demonstrate that it is aware that the project activity has apply to this POA and the initiative is voluntary
12. All biomass to be used in the proposed activity must be classified as renewable biomass as defined in Annex 18 EB 23, paragraph 4
13. Each CPA must conduct surveys with potential suppliers within or less than 200km radius and must demonstrate that the quantity of biomass available at the region is more than 25% of the total utilized including the proposed project activity. The information from the survey forms would confirm the availability of the residues and the existing conditions of the residues. The reference guide for this condition is based on the EB document "EB answer to SSC_329, for excluding of emissions from transportation and EB document "EB47 Version 03" on biomass leakage and project emissions for renewable energy project"
14. Fossil fuel is only allowed to power gen-set for emergency back-up purposes and/or for start-up purposes only. If fossil fuel is used for other purposes such as wheel loader, CPA must include the emissions as project emissions. If there are still other possible emissions more than 1% of the total emission reductions apart from fossil fuel consumption, the emissions shall be included.
15. Each CPA must acknowledge by signing the Memorandum of Understanding with the C/ME of this POA, ACSV in relation to the CERs ownership and assignment of mandate to C/ME to undertake the role for coordination, communication, transaction and distribution of CERs and CERs' revenue to respective CPA to support the implementation of each CPA project activity. This MOU confirms that the project implementer/proponent remain as the owner of the CERs issued until it is transacted to Annex I Party.
16. Each CPA must submit the CPA-DD together with the completed supporting documents and evidences as requested to C/ME for compliance check prior to submission to DOE and DNA
17. Each CPA implementer is a power plant producer under VSPP scheme in Thailand evidence through a dedicated power purchase agreement and a legal business registration certificate. Thus the PPA from PEA can prove that the CPA power plant design is legal.

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):

According to the 'Procedures for registration of a programme of activities as a single CDM project activity and issuance of CERs for a POA", Version 04.1 (EB55, Annex 38), a POA is deemed additional if it can be demonstrated that in the absence of the either (i) that the proposed voluntary measured would not be implemented, or (ii) the mandatory policy/regulation would be systematically not enforced and that non-compliance with those requirements is widespread in the country/region, or (iii) that the POA will lead to a greater lever of enforcement of the existing mandatory policy/regulation.

The PoA is a voluntary coordinated action by ACSV as the coordinating or managing entity
Each SSC-CPA for inclusion of this POA consist of a standalone Greenfield renewable biomass power project which will supply electricity generate to the national grid under VSPP Scheme in Thailand. Emission reductions are achieved through the replacement of an equivalent amount of grid based electricity generation. Therefore, the baseline scenario is the electricity delivered to the grid by SSC-CPA

that would otherwise have been generated by the operation of the grid connected power plants and by the addition of new generation sources into the grid.

As mentioned earlier, MoE has a target to increase the share of renewable energy in the national fuel mix to 8% by 2011 and is neither enforced nor mandatory at the moment. There exists a significant possibility for biomass power development in Thailand and the installation of biomass power is 1,610 MW as on June 2010 against a target of 2,800 MW by 2011[10] (further 3,700 MW biomass power by the year 2022). The promotion of biomass power will reduce the use of CO_2 emitting fossil fuels for electricity generation thereby reduces anthropogenic emissions of GHG. The implementation of the above target will not be met as there is a difference between what was achieved as on date and planned target. There have been instances of public protests by consumers and electrical contractors against imposition of the mandatory rule[11].

Financing renewable energy projects is relatively difficult for the local financial institutions in Thailand as they do not have a dedicated technical evaluation team to evaluate the project risk. Therefore, the risk of obtaining the required financing is still heavily lies with the borrower. The project cost for renewable energy projects, especially biomass power projects, is still consider high due to the import of components from abroad and limitations on the in-country production. This often leads to a situation wherein, local financial institutions provide a lower amount of the debt to equity ratio, discounted all the risks that they are not willing to undertake. Few financial institutions also increase the loan margin in order to compensate for the risks. Both the lower debt to equity ratio and higher interest rate has created a gap between the available funds and the total project cost, creating unnecessary financial barrier to the project developer of small scale renewable energy projects[12].

Realising these issues, government has introduced incentives for renewable power producers by providing "adder" under the VSPP scheme, and revolving fund with low interest rate in order to balance the overall interest rate of the projects. In addition, Development of Alternative Energy Development and Efficiency (DEDE) also promotes small equity funds to support renewable energy projects. The E+/E- policy, as per EB53 Annex 32, provides guidance for the suitability of tariffs applied in investment analysis of SSC-CPAs. In case of SSC-CPAs, the tariff considered in the investment analysis has been reference against the tariff rate published by PEA for VSPP power producer.

The VSPP scheme in Thailand was implemented after the year 2002 and is part of the Thai Feed-in-tariff policy. The feed-in-tariff is considered as E- policy in Thailand and is a voluntary incentive scheme to promote the development of renewable energy project of less than 10MW in Thailand to encourage the supply of green electricity to the Thailand electricity grid. Under the VSPP scheme, incentive in the form of adder on top of the normal tariff is offered to project developer for a period of 7 years.

Each SSC-CPA is expected to generate income from the sales of the electricity to the national grid either to PEA/MEA. On top of that, under the VSPP scheme, each SSC-CPA will also receives incentives in the

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[10] http://www3.dede.go.th/dede/fileadmin/upload/pictures_eng/pdffile/AE_Target_in_2022.pdf (accessed in October 2010).

[11] N. Tangwisutijit, Renewable Energy Not So Clean and Green After All?, available online at http://www.ipsnews.net/news.asp?idnews=48967, IPS News, IPS - Inter Press Service and IFEJ - International Federation of Environmental Journalists, for the Alliance of Communicators for Sustainable Development (www.complusalliance.org), 2009.

[12] Renewable Energy Projects and Key Financing Issues by Baker & McKenzie access online via http://www.conference.tgo.or.th/download/ppt/Training/210810/Law3.pdf

form of adder on top of the electricity tariff for a period of 7 years. SSC-CPA that is located at the most least developed provinces of Yala, Pattani and Narathiwat Provinces will receive special adder[13] due to the economic, political and social conditions of these provinces[14].

It is envisaged that even with the inclusion of the adder, the project financials are not attractive for the project developers to implement the projects in Thailand. The financial barrier for every CPA in all provinces will be assessed as described below.

Through the implementation of this PoA, SSC-CPAs will generate additional income from the carbon credits that would help the project developers to close the gap of the working capital fund during the course of its initial year of project operation and support the project developers to focus on fuel supply linkages, and ensure an effective operation of the power plant. The revenue from the sale of carbon credits is crucial as an incentive for the project developers to consider implementation of SSC-CPAs, which are otherwise difficult to implement based on the existing financial barriers in the Thai market.

Another major risk is lack of consistency in the policy decisions and electricity generation target for renewable energies. This variation is due to the political turmoil in recent years and subsequent changes in the positions lead the policy makers' tend to change the targets based on their understanding. Hence the policy/regulation is systematically not enforced and non-compliance is widespread. Since targets are not enforced, non-compliance is widespread and is expected to continue. Therefore, the proposed PoA will contribute to overcome the risks associated with the development of biomass power project development in Thailand and contributes towards achieving the targets set.

As per paragraph 73 of the EB47th meeting report 'additionality is to be demonstrated either at the POA level or at the SSC-CPA level". Each SSC-CPA under this POA is expected to receive revenues from the respective project activity and a therefore the additionality shall be demonstrated at the SSC-CPA level. As per "Guidelines on the demonstration of additionality of small-scale project activities (Version 09.0) ", at each CPA level, it should be demonstrated that the project activity would not occurred anyway due to at least one of these mentioned barriers either investment barrier, or technological barrier, or barrier due to prevailing practice or other specific barriers. The demonstration of additionality at the SSC-CPA level for this POA has been selected to be based on investment barrier analysis by comparing the Project IRR to an available, credible and applicable chosen financial benchmark. Further guidance on assessment and demonstration of financial additional of a typical SSC-CPA can be found in section E.5.1.

The Project IRR of each SSC-CPA activity is expected to include the revenues from selling of electricity and also the income from the adder from the VSPP scheme. The Project IRR after inclusion of income from adder and if is still below the chosen financial benchmark shows that the project is not financially attractive to implement and therefore the SSC-CPA would not implement the project. Through the implementation of this POA, SSC-CPA can generate additional revenues from the carbon credits. The revenue from the carbon credits improves the financial attractiveness of the project IRR to be above the financial benchmark and hence the SSC-CPA would implement the project activity under the POA.

In another word, in the absence of the registered POA, SSC-CPA under this POA will not have implemented the project activity and hence the reductions of GHG emissions from each SSC-CPA would not have occurred.

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[13] http://www.pea.co.th/vspp/vspp/Adder19082552.pdf

[14] http://www.safetravel.govt.nz/risklevels/high.shtml, http://www.nationmultimedia.com/business/Debt-relief-for-farmers-small-borrowers-30169968.html

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

A.4.4.1. Operational and management plan:

The operation and management plan for the PoA is to ensure that there is a systematic implementation of the PoA along with the streamlined monitoring protocol. It is essential that each SSC-CPA will monitor the data which will be useful for calculating and verifying the emission reductions achieved.

The preparation of the operational and management plan for the POA is the responsibility of the Coordinating/Managing Entity (C/ME). Advance Carbon Securities Ventures (ACSV) Co. Ltd is the C/ME of this POA and has obtained Letter of Approval (LOA) from DNA of Thailand. The company is a private entity legally registered under Thai Law and further registered as a Thai Consultant company with the Finance Ministry of Thailand. ACSV will play a significant role in encouraging the project proponent of each SSC-CPA to adhere to the inclusion criteria and monitoring plan.

The following are the main responsibilities of ACSV as the C/ME during the different stages of POA development:

Level of management	Operational and Management Resposibilities
At POA Level	To ensure all requirements for approval as a C/ME with Thai DNA is met. C/ME must obtain Letter of Approval from Thai DNA to be able to coordinate and manage the POA in Thailand To ensure that there are sufficient qualified or experience key personnel within the C/ME team to perform all the C/ME tasks. Records of arrangements for training and capacity development for C/ME personnel must be stored in the C/ME database as per EB65, Annex 4, Paragraph 17 (b). C/ME personnel will be sent for external training and workshops organized by reputable organizations related to CDM, CDM POA, Biomass technology and related issues. Other trainings include extensive on the job training and supervised by the experts within ACSV. To identify project activity to be included into this POA and thereafter invite the first prospect project proponent to join the POA as the first SSC-CPA To appoint environmental consultant to support for preparation of POA-IEE-SD framework report and a real case SSC-CPA-IEE-SD report to DNA Thailand as part of the requirement to obtain LOA Preparations of all design documents include POA-DD and the first SSC-CPA-DD for submission to DOE for validation. Responsibility include plan for capacity building to be a C/ME and

	support for preparation of the design documents and appointment of DOE. Coordination for all information, documents, and supporting evidences required for POA validation process Preparation of a manual that provide guidelines to C/ME to manage the inclusion of subsequent SSC-CPA as per EB 65, Annex 3, paragraph 17 (c) including setting up system for auditing the eligibility criteria especially double counting and de-bundling. The manual will provide room for C/ME to continue to study and improve the role as C/ME under this POA as per EB 65, Annex 3, paragraph 17 (f) Setting up information database that allows transparent and unambiguous management of information related to POA and its underlying SSC-CPA as per EB 65, Annex 3, paragraph 17 (f) C/ME at all times are responsible for communication with the CDM Executive Board with matters related to registration process, issuance process, distribution of CERs and change of project participant
Inclusion of SSC-CPA process and thereafter yearly Monitoring, Reporting and Verification process	As per EB 65, Annex 3, Para 17 (c), procedure for technical review of inclusion of CPA. The C/ME will assign competent personnel to evaluate the list of inclusion criteria and the related technical aspects of the proposed CPA. The result from this technical review will be used to evaluate on whether a CPA can be included into the POA. As a result of this, a set of technical review process, procedures and documentation will be developed such as the "Screening Form", to be use to determine the CPA eligibility of Inclusion into this POA. C/ME will continue to identify training programs, invitation for training workshops, and provide update about the development and status of POA and CPA. C/ME will also from time to time to contact the CPA to consult and provide update information to them, this is as per EB 65, Annex 3, Para 17 (f), measures for continuous improvement of the POA management system Ensuring that each subsequent SSC-CPA is fully aware of voluntary participation to this POA. C/ME prepares Non-Disclosure Agreement and Screening Form to be completed, signed and returns by each SSC-CPA to C/ME. C/ME will prepare contractual agreements including signing of a MOU between each SSC-CPA and C/ME related to CERs ownership and mandate to coordinate and manage the inclusion process including transaction of CERs and revenue on behalf of SSC-CPA. CERs revenue after deduct all the management and third party fees will be transferred back to SSC-CPA to support the

	implementation of the project activity C/ME to consult and support SSC-CPA to coordinate for information and supporting documents to complete specific SSC-CPA-DD. C/ME will consult SSC-CPA on all declaration documents that SSC-CPA will provide as part of the inclusion criteria. Completed SSC-CPA-DD and all evidences will be checked by C/ME's compliance team before appointment of DOE and submission of design documents to DOE for validation. C/ME will facilitate for the validation process of each SSC-CPA with DOE and further communicate with EB on matters related to issuance, distribution of CERs and participation for each SSC-CPA C/ME must submit to DNA Thailand by yearly the list of SSC-CPAs that have successfully included into the registered POA together with the respective SSC-CPA-DD to DNA Thailand. C/ME will communicate with DNA Thailand for matters related to local host country requirement for SSC-CPA. C/ME to prepare monitoring plan for each SSC-CPA and facilitate for verification and issuance process with DOE

The individual project proponents are responsible for the application, implementation and monitoring of its SSC-CPAs into this POA. Each SSC-CPA is required for the following responsibilities throughout the inclusion and monitoring process:

- to provide C/ME with the list of personnel that will be involved from each SSC-CPA and define together the roles of each personnel to support the inclusion and monitoring process
- to provide consent in using different types of agreements or forms provided to facilitate the CME activities with each SSC-CPA and allowing SSC-CPA to be included
- to provide all necessary required data as consulted and declaration forms to allow screening process and also for record keeping purposes to avoid double counting of emission reductions and checking of de-bundling criteria
- to provide CME with all the supporting documentation and support CME during the entire validation, monitoring, and verification process
- to adhere strongly to the monitoring plan,
- must notify CME of any changes or any up gradation of project during the crediting period in unavoidable circumstances such as natural calamities or disasters etc. Otherwise, the project proponent of a SSC-CPA must not implement any changes to the original plan or design of the SSC-CPA. A failure to abide this clause will automatically disqualify the SSC-CPA's eligibility under this PoA.

The following sections will describe the operational and management arrangements established by the ACSV for the implementation of the PoA management system as per EB65, Annex 3, Paragraph 17 including:

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

The individual project proponents are responsible for the implementation and monitoring of their SSC-CPAs. ASCV in its position as a CME will closely coordinate with all the SSC-CPAs and responsible for managing centralised database. It also ensures that each SSC-CPA will have a proper collection and monitoring of data in place. The following table will be available in section A.4.1 of the Generic SSC-CPA-DD document and each SSC-CPA is report it in each SSC-CPA.

The C/ME will manage a record keeping system for each of the prospect SSC-CPA under review. The C/ME will also manage the information collected and stored it in the respective folder for each SSC-CPA and is available upon validation request.

The record keeping database for each prospect SSC-CPA should have the following information:

No.	Parameter
1	Unique prospect SSC-CPA identification number
2	Project Implementer/Proponent Name
3	Business Registration No
4	Power Purchase Agreement (PPA) Number
5	Company Name registered in the PPA
6	Location (district/province) as per PPA
7	GPS Coordinates
8	CEO of the project company
9	Type of technology/measure
10	Demonstration on whether technology transfer could happen
11	Maximum supply capacity to the grid as per PPA or approval letter from PEA
12	Signing date or expected signing date of major equipment contract
13	Expected Commercial Operation Date (COD) Date as per PPA or Project schedule
14	SSC-CPA crediting period start date and end date and rationale for the choice of period
15	Type of benchmark for financial decision making
16	Availability of information for demonstration of investment barriers
17	Type of on-site diesel usage
18	State the distance of main biomass suppliers that sufficient to cover up to above 1.25 times as per the guidance of Attachment C to Appendix B (general guidance on leakage from biomass projects) of the requirement including utilization of the project activity
19	Main biomass type

(ii) A system/procedure is followed 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 SSC-CPA of another Registered PoA:

ACSV setup specific SSC-CPA database as shown in (i) above that provides record of unique information of each proposed SSC-CPA. All the SSC-CPAs can be uniquely defined based on the information in the specific SSC-CPA record keeping database to avoid double counting. On top of that, each SSC-CPA will provide a declaration letter to ACSV that the project activity to be included into the POA is not registered as an individual CDM project or is part of another Registered PoA. ACSV will further confirm this through auditing it with the UNFCCC CDM and CDM POA database. ACSV will also cross check the information from Host Country i.e. TGO database, if such database is made available to C/ME in the future.

(iii) Procedure to determine that each SSC-CPA included in the PoA is not a de-bundled component of a large scale activity:

As per " EB 54, Annex 13, Paragraph 8 GUIDELINES ON ASSESSMENT OF DEBUNDLING FOR SSC PROJECT ACTIVITIES (Version 03), f*or the purposes of registration of a Programme of Activities (PoA), a proposed small-scale CPA of a PoA shall be deemed to be a de-bundled component of a large scale activity if <u>there is already an activity</u>, which satisfies both conditions (a) and (b) below:*

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

The following details the de-bundling check manual:

- Provision of a statement from C/ME confirming that it does not manages any large scale POA of the same technology/measure in Thailand. Further audit of the status of C/ME from Thai DNA website is available, as it list all LOA approved for CDM-POA in Thailand.
- Provision of a declaration letter from each SSC-CPA that the project proponent is aware of de-bundling conditions together with a screening form confirming that there is no other project activity with the same technology/measure within 1km of the SSC-CPA project site.
- C/ME will perform audit check against UNFCCC CDM and CDM POA database, should the same project proponent/implementer name appeared to be in any of the above databases and matches with the SSC-CPA under review, C/ME will check against the location coordinates of the project sites compared to the SSC-CPA under review, to ensure that the distance between the project sites implemented by the same project proponent is above 1km, and is not deemed to be a de-bundled component of a large scale activity.

The audit result will be presented in each SSC-CPA-DD.

(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 PoA:

To ensure that SSC-CPA is aware and agreed that their activity is being subscribed to the POA, each project proponent of respective SSC-CPA must acknowledge by signing and returning the following document to C/ME:

(a) Non-disclosure Agreement (NDA)
(b) Completed Screening Form by the CPA to C/ME related to the basic detail of the project to be subscribed to the POA
(c) Memorandum of Understanding between each SSC-CPA and C/ME related to ownership of CERs and mandate to C/ME as authorized representative with regards to coordination and communication with all matters related to the coordination and management of each SSC-CPA including the SSC-CPA application process, inclusion process, issuance and transaction of CERs with various external parties including Thai DNA, DOE, CDM EB and Annex I parties
(d) Provision of declaration letter the SSC-CPA to be included into the POA is not registered as an individual or is part of another Registered POA
(e) Provision of declaration letter of Non-ODA support for the project activity

All documents will be stored in the SSC-CPA database folder for validation request.

A.4.4.2. Monitoring plan:

Each SSC-CPA in the PoA will be monitored separately as mentioned above.. As mentioned under point (ii) in the above section, ASCV will maintain the data related to each individual project in its database and this is to ensure that there is no double counting. The monitored and verified data collected will be kept for a period of at least two years after the PoA crediting period.

ACSV opts for option (ii): the verification of each individual SSC-CPA without the use of sampling and a transparent system is defined for that purpose. This transparency will be maintained by each SSC-CPA at the individual project level when it comes to monitoring and verification. Please kindly refer to Section E.7.2 for more information of the detail process and procedure.

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

Each SSC-CPA to be included into this POA do not receive any public funding resulting from official development assistance from Annex I Parties. ACSV has provided a declaration letter confirming that the POA does not receive any public funding from official development assistance from Annex I Parties. On top of that each SSC-CPA will also require to provide a declaration letter confirming that the project does not receive any public funding resulting from official development assistance.

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

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

The starting date of the PoA is 1st of December 2012 or the PoA registration date

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

28 years

SECTION C. Environmental Analysis

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

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

The environmental analysis framework has been established for biomass power plant projects in Thailand based on the environmental analysis undertaken of on a real case study of the first SSC-CPA to the POA.

The environmental analysis of the small scale biomass power plant needs to be assessed at SSC-CPA level anyway because the development of each project activity will be at different location and may employ different operation methods that may cause different impact to the surrounding location of the project site and its local community. Moreover, all small scale biomass power plant projects in Thailand are required to carry out Initial Environmental Evaluation (IEE) report anyway to be submitted to the Department of Industrial Works (DIW) under the Ministry of Industry to obtain operational permit, a legal permit to allow each SSC-CPA to operate the power plant in Thailand.

The Environmental Impact Assessment is not required by Thai DNA for VSPP. However, As per the requirement of the Thai DNA, at POA level, the C/ME is required to prepare and submit a POA-IEE-SD Framework together with a real case IEE-SD report for the 1st SSC-CPA to obtain the Letter of Approval (LoA). The Letter of Approval confirms that the implementation of SSC-CPAs under the POA will support the sustainable development of Thailand and reduction of GHG emissions.

For subsequent SSC-CPAs, it is not required to submit a specific IEE-SD report to Thai DNA to obtain Host Country Approval. Moreover, since the subsequent CPA would be also <10MW as VSPP, there is no requirements from Thai government for Thai environmental impact assessment for VSPP. The CME will continuously check if there is any new in the future from Thai government for any requirements of EIA for VSPP. However, the C/ME is required to submit a report to the Thai DNA every year confirming the number of new CPAs that have join the POA.
The C/ME of this POA, ACSV has obtained the Letter of Approval (LOA) issued by Permanent Secretary of Ministry of Natural Resources and Environment on the 7th October 2011 and thus acknowledging that the implementation of the SSC-CPAs under the POA will contribute to sustainable development of Thailand thus it is indicated that the PoA and first CPA fulfil the related environmental law from Thailand.

Under the environmental assessment, "report to the Thai DNA every year for confirmation the number of new CPAs that have been included in the POA, and a justification document of any negative impact to the environment of new SSC-CPAs"

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

Since all the SSC-CPAs are of biomass power generation capacity below 10 MW and will be implemented within the boundary of Thailand, only IEE report is required to be submitted to Department of Industrial Works Thailand to obtain operation permit. EIA report is not required., Transboundary impacts is not applicable because all CPAs will be implemented within the boundary of Thailand.

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),:

As per the national law, the power projects below 10 MW will need an Initial Environmental Evaluation (IEE) which is also a requirement for the Thai DNA. Hence Environmental Impact Assessment is not required for SSC-CPAs to be included into the POA.

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SECTION D. Stakeholders' comments

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

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

The rationale for conducting local stakeholder at CPA level is due to the stakeholders varies at different project site of each SSC-CPA.

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

As mentioned, each SSC-CPA will organise a local stakeholder workshop. The process of obtaining the comments by local stakeholders is as follows.

(a) During the workshop, the CPA implementer will circulate questionnaires focussing on seven main aspects related to the project and
(b) those who still have doubts related to the project, must have a one-to-one discussion with the project staff

The invitation for the stakeholder's consultation session must be published through different media, such as announcement at the local places such as community centres, hospital, library through publishing pamphlets, and personal communication in the nearby communities of each SSC-CPA.

The topics that shall be covered during the stakeholder's consultation are:

- Briefly explain the objectives of this workshop, project and issues related climate change & SSC-CPA. The presentation covers,
  - The background on climate change, how does it influence
  - Project description including detailed process description
  - Benefits from the project to both community level and country level and its influence on environment, economy and social well being

- Towards the end of the workshop under each SSC-CPA, a questionnaire must be circulated by project proponent indicating the seven main questions as mentioned below:

  1) Will there be an increase in employment opportunities due to the SSC-CPA?
  2) Will there be a development in infrastructure facilities in the local area?
  3) Whether you are anticipated to face any type of pollution (Air / Water / Sound) or problems due to the project?
  4) Will there be an increase in the land values due to the implementation of SSC-CPA?
  5) Whether you have learnt or appraised of the technology is being implemented as part of the SSC-CPA?
  6) Whether the electricity infrastructure facilities are anticipated improve due to the implementation of CPA?
  7) Will there be a development foreseen in your local area due to the SSC-CPA?

D.3. Summary of the comments received:

Comments received during stakeholder consultation will be summarized in each SSC-CPA-DD. All area of concerns about the project activity will be addressed in the SSC-CPA-DD.
Assessment of the comments – The comments will be received in the form of filled in questionnaire. Each SSC-CPA or C/ME will carry out the assessment of the comments of each returned questionnaires in an assessment summary reports and a copy of the summary will be provided for validation upon request.

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

The summary of positive / negative comments will be addressed in each SSC-CPA-DD. If negative comments were received, the SSC-CPA must address the responses or provide mitigation plan clearly in each SSC-CPA-DD.

SECTION E. Application of a baseline and monitoring methodology

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

Methodology : AMS. I-D
Version : Version17, EB61
Title : Grid Connected Renewable Electricity Generation
Reference : http://cdm.unfccc.int/methodologies/SSCmethodologies/approved.html

The Approved baseline and monitoring methodology applied to all the SSC-PoA is AMS-I.D: Grid Connected renewable electricity generation (Version 17, EB 61).

The baseline scenario as appended in the methodology 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 for the SSC-CPA is the Thailand national electricity grid and therefore electricity generated and delivered to the grid by from the biomass power plant is multiplied by an emission factor (in tCO_2/MWh) of the national grid. The national grid emission factor is available online at Thailand Greenhouse Gas Management Organization (TGO) website[15] and TGO also functions as Designated National Authority (DNA).

ACSV will monitor the grid emission factor on a regular basis from TGO website and will ensure accurate accounting of the emission reduction figures for each SSC-CPAs. ACSV will ensure that the data files are stored in both hardcopy and softcopy form until two years after the end of crediting period.

As per the guidance of AMS-I.D., other tools used as required are listed below:

- Guidelines on assessment of debundling for SSC project activities (Version 03,Annex 13, EB 54)
- General guidance on leakage in biomass project activities (Version 03, Annex 28, EB 47)
- Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion (Version 02, Annex 11, EB 41)
- Tool to calculate the emission factor for an electricity system (Version 02.2.1, Annex 19, EB63)
- Guidance on the assessment of investment analysis (Version 05, Annex 5, EB 62)
- General guidelines to SSC CDM methodologies (Version 17, Annex 21, EB 61)
- Guidelines on the demonstration of additionality of small-scale project activities (Version 09, Annex 27, EB68)

Other standards and tools used for development of this POA:

- Standard for demonstration of additionality, development of eligibility criteria and application of multiple methodologies for Programme of Activities GHG (Version 01.0, Annex3, EB 65)

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

Each CPA falls within the scope of the small-scale CPA thresholds. Each SSC-CPA therefore justifies all the criteria set under Version 17 of AMS-I-D.

The following table 3 indicates the applicability of the methodology in the context of each SSC-CPA:

[15] Summary Report: The Study of emission factor for an electricity system in Thailand 2009, available online at http://www.tgo.or.th/english/download/publication/GEF/2009/GEFReport_EN.pdf (accessed in September 2010).

Table 3: Justification of the choice of SSC-CPA category

Criterion	Conditions	Applicability
Criterion 1	This methodology comprises renewable energy generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal and renewable biomass that: (a) Supplying electricity to a national or a regional grid; (b) Supplying electricity to an identified consumer facility via national/regional grid through a contractual arrangement such as wheeling	Each SSC-CPA installs renewable biomass based power plant that supply electricity to the national grid of Thailand.
Criterion 2	Illustration of respective situations under which each of the methodology (i.e. AMS-1.D, AMS-1.F, and AMS-1.A) applies is included in Table 2 of AMS-I.D version 17	Each SSC-CPA will supply electricity to the Thai national grid. SSC-CPA may supply electricity to an identified consumer facility that is currently using electricity from the national/regional grid through a contractual agreement.
Criterion 3	This methodology is applicable to project activities that (a) install a new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity (Greenfield plant); (b) involve a capacity addition[16]; (c) involve a retrofit[17] of (an) existing plant(s); or (d) involve a replacement[18] of (an) existing plant(s).	Each SSC-CPA is a Greenfield plant.
Criterion 4	Hydro power plants with reservoirs that satisfy at least one of the following conditions are eligible to apply this methodology: • The project activity is implemented in an existing reservoir with no change in	Not applicable

[16] 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.

[17] 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.

[18] 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.

	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.	
Criterion 5	If the unit has both renewable and non-renewable components (e.g. a wind/diesel unit), the eligibility limit of 15MW for a small-scale CDM project activity applies only to the renewable component. If the unit added fossil fuel[19], the capacity of the entire unit shall not exceed the limit of 15 MW.	Each SSC-CPA installs a biomass based power plant and the project does not have any non-renewable component in the project boundary. The installed capacity of the biomass power plant is below 10 MW.
Criterion 6	Combined heat and power (co-generation) systems are not eligible under this category.	Each SSC-CPA doesn't include co-generation activity.
Criterion 7	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[20] from the existing units	Not applicable to the SSC-CPA

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

[20] 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".

Criterion 8	In the case of retrofit or replacement,to qualify as a small-scale project, the total output of the retrofitted or replacement unit shall not exceed the limit of 15 MW.	Not applicable to the SSC-CPA

Each SSC-CPA shall justify all the criteria set under AMS-I.D Version 17 as demonstrated above in the Annex of each SSC-CPA-DD.

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

The GHG focused in all the SSC-CPAs is only CO_2. Each SSC-CPA will replace an equivalent amount of grid electricity which is produced based on fossil fuels. Table 4 indicates an overview of emissions included in or excluded from the project boundary.

Table 4: Overview of emissions sources included in or excluded from the project boundary

	Source	Gas	Included (yes/No)	Justification / Explanation
Baseline	Grid electricity generation	CO_2	**Yes**	**Main emission source.**
		CH_4	No	Excluded for simplification. This is conservative.
		N_2O	No	Excluded for simplification. This is conservative.
	Uncontrolled burning or decay of surplus biomass residues.	CO_2	No	It is assumed that CO_2 emissions from surplus biomass residues do not lead to changes of carbon pools in the LULUCF sector. In addition this POA does not consider the emissions reductions from the burning or decay of biomass residues. Thus it has been excluded for simplification.
		CH_4	No	Excluded. Not a significant source

	Source	Gas	Included (yes/No)	Justification / Explanation
		N_2O	No	Excluded for simplification. Emissions from natural decay of biomass are not included in GHG inventories as anthropogenic sources.
Project Activity	On-site fossil fuel and electricity consumption due to the project activity (stationary or mobile)	**CO_2**	**Yes**	**Main emission source.**
		CH_4	No	Excluded for simplification. This emission source is assumed to be very small.
		N_2O	No	Excluded for simplification. This emission source is assumed to be very small.
	Off-site transportation of biomass residues	CO_2	No	Excluded for simplification. The project emissions due to transport of biomass for each SSC-CPA is excluded for consideration based upon the eligibility criteria for inclusion to this POA that each SSC-CPA must demonstrate that the availability of biomass contracts, surveys and surplus availability study within 200 km of the project site demonstrating that the biomass residues availability is above 25% of the total utilized including the proposed SSC-CPA.
		CH_4	No	Excluded for simplification. This emission source is assumed to be very small.
		N_2O	No	
	Combustion of biomass residues for electricity generation	CO_2	No	It is assumed that CO_2 emissions from surplus biomass residues do not lead to changes of carbon pools in the LULUCF sector. Thus it is excluded.
		CH_4	No	Excluded for simplification. This emission source is assumed to be very small.
		N_2O	No	

	Source	Gas	Included (yes/No)	Justification / Explanation
	Waste water from the treatment of biomass residues	CO_2	No	Not a significant source. Thus it is excluded.
		CH_4	No	Since no wastewater will be generated from handling, storing, combustion and treatment of biomass residues in a biomass power plant, it is excluded for simplification.
		N_2O	No	

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

Each SSC-CPA involves the installation of a new renewable biomass power plant, therefore the baseline scenario is the electricity delivered to the grid by SSC-CPA that would otherwise have been generated by the operation of the grid connected power plants.

The baseline for the grid connected SSC-CPAs is the Thailand national electricity grid and therefore electricity generated from the biomass power plant is multiplied by an emission factor (in tCO_2/MWh) of the national grid. The emission factor is calculated as per Annex 19 Methodological Tool (Version 02.2.1) "Tool to calculate the emission factor for an electricity system" which had been approved by the CDM Executive Board on September 29, 2011 (EB 63).

Table 5: Key information used for the baseline determination

No.	Key information/data used for baseline	Reference
1.	Electricity generated	Monthly meter reading & log book of each SSC-CPA
2.	Grid emission factor	Emission factor will be provided by DNA of Thailand, as per the latest valid Tool to calculate the emission factor for an electricity system at the time of first submission to DOE for validation of CPA inclusion as per the latest registered PoA-DD. For example, the emission factor for CPA1 is sourced from Summary Report: The Study of emission factor for an electricity system in Thailand 2009, available online at http://www.tgo.or.th/english/download/publication/GEF/2009/GEFReport_EN.pdf

		issued by Thailand Greenhouse Gas Management Organization (TGO), Government of Thailand.

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

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

The assessment and demonstration of PoA additionality will be evaluated at the SSC-CPA level. This is in accordance with EB47th meeting report. However, each SSC-CPA follows the criteria defined at the PoA level to determine its additionality. The proposed SSC-CPA additionality is demonstrated as follows.

Demonstration and assessment of additionality: Step 1 (ensure the project activity consistent with

In line with the "Guidelines on the demonstration of additionality of small-scale project activities, Version 09, Annex 27, EB 68" the simplified modalities and procedures for small-scale CDM project activities", and "EB35, Annex 34, Non-binding best practice examples to demonstrate additionality for SSC project activities", The demonstration of additionality can be based on the investment barrier analysis. Each SSC-CPA shall demonstrate additionality based on investment barrier analysis by justifying that the financial indicator represented by IRR of each SSC-CPA is below the determined applicable benchmark. The use of investment analysis to demonstrate additionality is intended to assess whether or not a reasonable investor would or not decide to proceed with a particular project activity without the benefits of the CDM.

In view that each SSC-CPA under this POA would involve financial investment of a Greenfield biomass power generation project supplying electricity to the national grid, in the absence of this POA, the alternative to the project activity of each SSC-CPA would be the continue supply of electricity from the national grid which is outside the direct control of the project proponent. Thus, per paragraph 19, EB62, Annex 5, benchmark analysis is considered an appropriate approach for investment analysis of each SSC-CPA under this POA.

The financial indicator chosen to assess additionality for each SSC-CPA would be Project IRR. As per paragraph 11, of EB 62, Annex 5, due to the impact of loan interest and income tax calculations it is recommended that when a project IRR is calculated to demonstrate additionality a pre-tax benchmark be applied.

Hence, a SSC-CPA is deemed additional if the calculated Project IRR without CDM revenues even after considering the sensitivity analysis is below the applicable pre-tax benchmark based on investment analysis.

The objective of sensitivity analysis is to determine which scenarios the project activity would pass the benchmark. As per paragraph 20, EB62, Annex 5, sensitivity analysis should be conducted for variables including the initial investment cost, that constitute more than 20% of either total project costs or total project revenues, the result should be presented in each SSC-CPA-DD. Further to paragraph 21, EB62, Annex 5, as a general point of departure variations in the sensitivity analysis should at least cover a range

of +10% and -10%, unless it is deemed not appropriate in the context of the specific project circumstances. The sensitivity analysis should be clearly presented in the SSC-CPA-DD and be reproducible in the associated spreadsheets.

The guidance on the calculation of Project IRR and determination of an applicable benchmark shall be carried out as per the 'Guideline on the assessment of investment analysis, EB 62, Annex 5' and shall be demonstrated as following:

Assessment of Project IRR calculation

The following are the guidance as per EB62, Annex 5 for calculation and presentation of Project IRR

Parameter	Guidance as per EB62, Annex 5
Period of assessment	The period of assessment for each SSC-CPA would not be limited to the crediting period of the project activity. The Project IRR calculation shall a preference reflect the period of expected operation of the underlying project activity (technical lifetime) and if a shorter period is chosen to include the fair value of the project activity asset at the end of assessment period. The Project IRR calculation may include cost of major maintenance and/or rehabilitation if these are expected to incurred during the period of assessment. The technical lifetime of the project equipment can be source from technical proposal or feasibility study or 3rd party expert opinion or default factors for example from the latest version of the "Tool to determine the remaining lifetime of equipment,"
Fair Value	The fair value of the investment assets of each SSC-CPA should be included as cash inflow in the final year. The fair value should be calculated in accordance with local accounting regulations where available, or international best practice. The standard accounting in Thailand is accordance with local accounting regulations published by the Revenue Department of Thailand at http://www.rd.go.th/publish/6044.0.html. If proposed land cost is to be included in the financial calculation, the full amount will be included in the final year.
Taxation	Taxation should only be included as an expense in the Project IRR calculation in cases where benchmark or other financial indicator is intended for post-tax comparisons. The applicable benchmark used in this POA would focus on indicator that is for pre-tax comparisons only and therefore taxation is excluded as expenses in the IRR calculation.
Depreciation	Depreciation is not an actual expense incurred by the company and as such does not directly affect the financial viability of the project. To treat both the capital cost of the assets and their depreciation as an expense to the project would be double counting of this cost. Hence, depreciation expense should not be included in the Project IRR calculation of each SSC-CPA.
Input values	Input values used in all investment analysis should be valid and applicable at the time of the investment decision taken by each SSC-

	CPA. The investment decision date needs to be obtain from each SSC-CPA and normally can be source from the minutes of board/management meeting of the project proponent. The decision will therefore will be based on the relevant information available at the time of investment decision and not information available at an earlier or later point.
Special case where recommendation for project activity that ceases implementation after commencement to recommenced due to consideration of CDM revenues	In such circumstances, the investment analysis should reflect the economic decision making context at point of the decision to recommence the project. Capital expenditures should be included based on market fair value at the point of the decision to proceed with the investment, demonstrating the value through assessment done by chartered specialists.
Cost of financing expenditures	Loan repayments and interest should not be included in the calculation of Project IRR

Further to the guidance above, the following detail the main parameters required to derive the calculation of Project IRR for each SSC-CPA

Parameters	Unit	Description
Timeline		
CDM Prior Consideration	DD/MM/YY	Can be source from minutes of meetings either board meeting or management meeting (applicable for CPA1 only)
Investment Decision	DD/MM/YY	Can be source from signed major equipment contracts or other contracts with major expenses
Technical Lifespan	year	The technical lifetime of the project equipment can be source from technical proposal or feasibility study or 3rd party expert opinion or default factors from the "Tool to determine the remaining lifetime of equipment, Version 01"
Technical data		
Installed Capacity	MW	Can be sourced from related document such as technical proposal from equipment supplier
Supply Capacity	MW	Can be sourced from related document such as Power Purchase Agreement from PEA
Auxiliary consumption	MW	Can be sourced from related document such as technical proposal from equipment supplier
Running Hours	Hours	Can be sourced from related document such as technical proposal from equipment supplier
Plant Load Factor	%	Can be sourced from related document such as technical proposal from equipment supplier
Station requirement (Gross plant heat rate)	kJ/kWh	Can be sourced from related document such as technical proposal from equipment supplier

Financial Data		
Electricity tariff rate from PEA/MEA	THB/MWh	Can be source from PEA website http://www.pea.or.th/vspp/vspp/vspp_rate.pdf
Fuel transfer rate	THB/MWh	Can be source from EGAT website: http://www2.egat.co.th/ft/Web/TAB1.1%20may53_aug53.htm
Adder rate or Feed-in Tariff rate from EPPO under VSPP scheme	THB/MWh	Refer to announcement by Energy Policy & Planning Officer (EPPO)
Inflation rate	%	Can be source from Thai Government Official website: http://www.indexpr.moc.go.th/price_present/cpi/stat/others/report_core1.asp?tb=cpig_index_country&code=93&c_index%20=a.change_year
Project Investment Cost	THB	Total investment cost include and not limited to land cost, construction cost, project development cost such as consultancy fees, license fees, permit fees), major equipment costs, civil construction costs, land improvement cost, etc. Residual value needs to be included at the end of the technical lifetime as per the guideline appended above. The major project investment cost should be supported using proposal sourced from the prospect suppliers or feasibility study
Yearly O&M costs	THB/Year	Yearly O&M cost can be source from the feasibility study report or following average market value of the O&M cost as per the registered CDM project parameters in Thailand
Administration costs	THB/Year	Yearly Administration cost can be source from feasibility study report or following the average market value of the administration cost as per registered project parameters in Thailand.
Fuel expenses costs	THB/Year	Each SSC-CPA must demonstrate the total requirement of biomass fuel requirement of the power plant, and provide the cost per tons of the biomass fuel to derive the cost of fuel expenses per year.

The Project IRR of each SSC-CPA is carried based on project specific condition. The above indicates only the major parameters that each SSC-CPA must have to be able to calculate the Project IRR. The complete set of parameters that will be used, the input values and assumption to be used must be supported and make available during audit for including and validation.

As per paragraph 8, EB62, Annex 5, each SSC-CPA should supply spreadsheet versions of all investment analysis. All formulas used in the analysis shall be readable and all relevant cells are viewable and unprotected. The presentation of the investment analysis shall be in a transparent manner.

Assessment for selection of appropriate applicable benchmark

Assessment 1:
As per paragraph 11, of EB 62, Annex 5, due to the impact of loan interest and income tax calculations it is recommended that when a project IRR is calculated to demonstrate additionality a **pre-tax benchmark** be applied.

Thus, the benchmark selection for each SSC-CPA shall be based on pre-tax analysis

Assessment 2:
As per paragraph 12, EB62, Annex 5, there are three types of appropriate benchmark for Project IRR:
(a) Local commercial lending rates or
(b) Weighted average costs of capital (WACC) or
(c) National publicly available benchmark or
(d)Specific Benchmark (Official letter from financial institution or governmental institutions)

Assessment 3:
Benchmark shall be determined based on sources that are standard in the market, publicly available, and credible to use.

Assessment of Option (a): Specific Benchmark for Specific CPA (Official letter from financial institution or governmental institutions)
In the event that SSC-CPA is able to obtain an official letter[21] from the financial institution or government institutions indicating that the approval of funding to the project activity is subjected to carbon credit revenue, hence the SSC-CPA can be deemed additional. Therefore, an official letter from the financial institution or government institution granting the funding to the SSC-CPA given the reason is due to carbon credit revenue increases the financial attractiveness is a valid and credible source for assessment additionality of SSC-CPA under this POA.

Assessment of Option (b): National publicly available benchmark
Benchmark supplied by relevant national authorities for VSPP biomass power project industry is also appropriate if can be substantiated that it is applicable to the project activity and Project IRR calculated.

There is no benchmark applicable to the project activity to be compared to Project IRR as for this period under review. There is a published National Study of Hurdle Rate for SPP power projects prepared by a regulated financial institution in Thailand in 2008 namely Ayudhaya Securities. But the hurdle rate is for SPP power project and it is deemed not an appropriate benchmark for VSPP project.

Assessment of Option (c): Weighted Average Cost of Capital (WACC)
The WACC is defined as the average return expected from cost of debts and equity. The formula for WACC that will be used for assessment for each SSC-CPA is as follow:

$$R= ((Wd*Kd)*(1-T))+(We*Ke)$$

[21] Example from a similar CDM Registered project in Thailand, http://cdm.unfccc.int/filestorage/2/E/S/2ESFOP0BGJWD418UZIALTCY9MX63KV/Decha%20Translation%20from%20Sia%20City%20Bank.pdf?t=NDd8bHZpeGVtfDAVXsRP91FKMJhECfhzDzOI

The definition of the parameters and guidance for determination of the value is appended below and is as per the EB62, Annex 5.

Parameters		Guidance
Wd	Cost of Debts	The cost of debts can be assumed as the commercial lending rate in the country should debt finance structure of the project is not yet available. The commercial lending rate for project company that is not classified as corporate organization shall be based as the average rate between the MLR rate and ceiling rate for the period under review. In case debt finance structure is available, the SSC-CPA must provide prove of loan contract or letter from bank stating its intention to award the loan and the terms of loans including the lending rate.
We	Cost of Equity	Cost of equity should be determined either by (a) selecting the values provided in Appendix A, EB62, Annex 5 or by (b) calculating the cost of equity using best financial practices, based on sources which can be clearly validated, For example, a per the latest version of Appendix A, EB62, Annex 5, the default values for the expected return on equity in Thailand is 11.2%, If option B is to be used, ROE rate published from company with similar project experiences and listed in Thailand Stock Exchange may be used.
Kd and Ke	Debts financing structure (D:E Ratio)	The default values can be sourced from sources that can be validated for example as per the latest guidelines on the assessment of investment analysis (Version 05, Annex 5, EB 62),Paragraph 17, which state that the default debt/equity finance structure of 50% debt and 50% equity financing may be assumed.
T	Tax	Average tax rate over the technical lifetime of the project activity, based on applicable regulations in Thailand. The information of the tax exemption can be source from Board of Investment Thailand, the information for example maybe source online via website of: http://thailandboi.com/investment-zones.html. As an example under current regulation in, Thailand the Corporate Tax Rate in Thailand is 30%, however for project activity that is located at Board of Investment(BOI) Zone, the project activity is entitle to 0% tax for the first 8 years and subsequent 5 years at 15% tax and balance thereafter is 30% tax up to technical lifetime..

In view that Renewable Projects involve high investment cost and typically will be finance through a combination of both debts and equity, hence the benchmark based on WACC approach is considered valid and applicable to be use for investment analysis for comparison to Project IRR.

The WACC approach based on market data is consider a better option compared to the average publicly available commercial lending rate mainly because WACC provides the cost based on a balance of debts and equity structure. Whereas, the benchmark using average commercial lending rate is assumed that the entire investment cost will be raised from debts market.

Assessment of Option (d): Local Commercial Lending Rates

The information of local commercial lending rates can be sourced from the Bank of Thailand (BOT) website updated by monthly. Data since January 2005 are publicly available. BOT is the Central Bank in Thailand that that governs the decisions of the Monetary Policy Committee, and provides guidance to financial investment in Thailand. The criteria for lending can also be referenced in major bank websites of Thailand such as Kasikorn Bank and Bangkok Bangkok.

The type of lending rate available in BOT website are as follow and is compiled based on 5 major banks in Thailand which are Bangkok Bank, KrungThai Bank, The Siam Commercial Bank, Kasikorn Bank and Bank of Ayudhya as follow:

- Minimum Lending Rate (MLR): min
- Ceiling Rate: min
- Ceiling Rate: max

In the literature published by BOT, Kasikorn Bank and Bangkok Bank, it is mentioned clearly that MLR +0 is possible for corporate client with good outstanding credit record with the respective banks. The project proponent of SSC-CPA is consider a project company that develops Greenfield Renewable Power project and is not considered as corporate organization and therefore the expected commercial lending rates shall be based on the average of MLR rate and ceiling rate for the period under review. The source of data for MLR and Ceiling Rate is publicly available at the BOT website, the data are credible, and using the average result is deemed to be conservative.

Exception is given to project developed at the three least developed and troubled provinces of Yala, Pattani and Narathiwat in Thailand. The project company located at these three provinces are subject to extreme financial risks due to its unstable political, economic and social environment experienced since 2004[22]. Therefore given the nature of the extreme financial risk situation and yet the government is trying to revive the economic situation of these areas by offering special adder of the same Biomass technology, therefore it is reasonable to expect that the commercial lending rate for project to be implemented at these areas will be based on the average ceiling rate (between the maximum expected ceiling rate and the minimum ceiling rate for normal funding).

[22] News about the violence situation in Thailand's three southern border provinces, access online via: http://www.fpps.or.th/news.php?detail=n1149480173.news

Rationale of option (a), (b), (c), and (d):
Both options (d) and (c) use valid and publicly available market data. Option (d) based on commercial lending rate is more conservative (with the lowest rate for decision making) but this is a general lending rate for all type of power projects not specified to renewable power project only, thus it is not fully representative of the lending rate particularly for biomass power projects, however option (c) based on WACC approach is more reflective and applicable benchmark for decision making, the value is valid and applicable to use. Option (b) is not available now. Option (a) if available would be a valid and credible benchmark as it is directly applicable to the CPA implementer.

The guide for SSC-CPA to determine the appropriate applicable benchmark option to be selected for use for investment analysis is appended in Annex 7 of this POA-DD.

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

The key criteria for assessing additionality of a SSC-CPA as accordance to section E.5.1 and is to justify that the Project IRR of each SSC-CPA without consideration of the CDM revenues is below the applicable benchmark. In order to assess the additionality criteria, the following two main data must be available:

Project IRR without consideration of CDM Revenues: Calculation of the Project IRR of each SSC-CPA shall be carried out according to the procedures and requirements under Section E.5.1. Each SSC-CPA must supply spreadsheet versions of all investment analysis. All formulas used in the analysis shall be readable and all relevant cells are viewable and unprotected. The presentation of the investment analysis shall be in a transparent manner.

Determination of Applicable Benchmark: Each SSC-CPA must demonstrate the selection and value of the applicable benchmark is accordance to the procedures and requirement under Section E.5.1. All value used must be supported from publicly available and credible source as described in Section E.5.1.

Exception is given to value of benchmark should a SSC-CPA is able to provide a credible and valid official letter or document from the financial institutions or government institutions granting the funds to the project activity confirms that carbon credits supported the funding offer that would otherwise not approved. Each SSC-CPA should follow the guide in Annex 7 to demonstrate the selection of the appropriate applicable benchmark used to compare the Project IRR.

The project activity of each SSC-CPA is deemed additional if the Project IRR without consideration of CDM revenues is below the applicable benchmark or if SSC-CPA could provide evidence in the forms of an official letter from financial institutions or government institutions granting the funding offer is a result of carbon credit revenues.

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:

All the SSC-CPAs under this PoA shall apply small-scale baseline and monitoring methodology AMS-I.D, "Grid Connected renewable electricity generation" (Version 17, EB 61). The baseline for the biomass power plant is the Thailand national electricity grid and the emission factor (in tCO_2/MWh) of the national grid is calculated according the latest version of "Tool to calculate the emission factor for an electricity system". The equations used to determine the emission reduction is discussed in E.6.2.

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

The emission reductions estimated for each SSC-CPA are calculated by the difference between baseline emissions, project emissions and leakage. The formula for calculating the emission reductions is provided below:

ERy = BEy – PEy – LEy

Where,

ERy = Emission reductions in year y (t CO_2/y)
BEy = Baseline Emissions in year y (t CO_2/y)
PEy = Project emissions in year y (t CO_2/y)
LEy = Leakage emissions in year y (t CO_2/y)

BASELINE EMISSIONS

According to paragraph 11 of AMS-I.D, the baseline emissions are the product of net electricity supplied to the grid as a result of the CDM project implementation in MWh ($EG_{BL,y}$) multiplied by the grid emission factor (measured in tCO_2e/MWh).
The baseline scenario is electricity delivered to the grid by the project that would have otherwise been generated by the operation of grid connected power plants and by the addition of new generation sources.

$$BE_y = EG_{BL,y} * EF_{CO2,\ grid,y} \qquad (1)$$

where,

BE_y	=	Baseline emission in year *y* (tCO_2)
$EG_{BL,y}$	=	Quantity of net electricity supplied to the grid as a result of the implementation of the project activity in year *y* (MWh)
$EF_{CO2,\ grid,y}$	=	CO_2 emission factor of the grid in year *y* (tCO_2/MWh)

Grid Emission Factor ($EF_{CO2, grid,y}$)

The emission factor is calculated as per Annex 19, EB 63, Methodological Tool (Version 02.2.1) "Tool to calculate the emission factor for an electricity system" and follow the selection of option (a) i.e. combined margin emission factor for all the SSC-CPA baseline calculations. The ex-ante approach is selected and the emission factor is fixed for the whole crediting period of each SSC-CPA. The determination of the combined margin (CM) is available in Annex 3 of this POA-DD document.

For example of CPA1, the grid emission factor applied was based on grid emission factor taken from the report on the study of emission factor for Thai national grid in 2009, which is available at TGO (Thailand DNA) website (http://www.tgo.or.th/english/download/publication/GEF/2009/GEFReport_EN.pdf).

Net electricity generation and supplied to the grid ($EG_{actual,y}$)

Each SSC-CPA is consist of a renewable energy based project and uses biomass residues for electricity generation. No anthropogenic emissions would occur due to the utilization of biomass as it is considered a carbon neutral fuel. Therefore, as per monitoring requirement of AMS-I.D (version 17), net electricity supplied to the grid as a result of the implementation of the CDM project activity in year *y* (MWh) will be used for net electricity generation.

Where net electricity generation can be illustrated as follow:

$$EG_{actual,y} = EG_{export,y} - EC_{import,y} = EG_{BL,y}$$

Where,

$EG_{actual,y}$ = Quantity of net electricity supplied to the grid in year *y*
$EG_{BL,y}$ = Quantity of net electricity supplied to the grid as a result of the implementation of the project activity in year *y* (MWh)
$EG_{export,y}$ = Electricity export to the grid (monitored parameter)
$EC_{import,y}$ = Electricity import from the grid (monitored parameter)

PROJECT EMISSIONS
Project emissions from renewable energy project activities is normally considered zero.

However, should any of the following project emissions is emitted during the crediting period of each SSC-CPA, the emissions will be accounted and deducted from the baseline emissions.

Project emissions due to the combustion of fossil fuels other than diesel boiler ($PE_{FC,y}$):
The project emissions due to the combustion of diesel in the back up diesel generator and on-site usage such as wheel-loader or back-hoe are considered as zero due to the expected very limited amount of diesel consumption for the estimation of ex-ante calculations of emission reductions. The project emissions due to the combustion of diesel for on-site usage such as wheel-loader or back-hoe will be monitored ex-post.

$PE_{FC,y}$ = $FC_{i,jy}$ * $COEF_{i,,y}$
Where,

$FC_{i,y}$ = Quantity of fossil fuel combusted other than boiler during year, y (monitored parameter)
$COEF_{i,,y}$ = Carbon Dioxide Emission Coefficient of fossil fuel (based on " Tool to calculate project or leakage CO2 emissions from fossil fuel combustion" EB 41, Annex 11
= $EF_{CO2,i}$ (Carbon Emission Factor of fossil fuel) * NCV_i (Net Calorific Value of fossil fuel)
= 0 tCO_2/y

Project emissions due to the transportation of biomass residues ($PE_{T,y}$)**:**
According to the SSC WG 22, F-CDM-SSCwg ver 01 SSC_329, the project emissions due to transport of biomass to the project site can be neglected if these are transport over a distance of less than 200 kilometers. CME will confirm the biomass collection of CPA that it is located within 200 kilometers as per inclusion criteria, thus the $PE_{T,y}$ can be assumed to be zero for all the future included CPA.

Therefore, $PE_{T,y}$ = 0 tCO_2/yr

Where $PE_{T,y}$ = Project Emissions due to transportation

Total Project Emissions (*PE_y*):

$$PE_y = PE_{FC,y} + PE_{T,y}$$

However, should a SSC-CPA declare that there will be no installation of fossil fuel generation equipment then the project emissions from the use of fossil fuel will not need to be accounted.

LEAKAGE

As per AMS-I.D., leakage is to be considered only if the energy generating equipment is transferred from another project activity. Taking into consideration that there is no energy generating equipment is transferred from another project activity, no leakage emissions are considered. Hence,

LEy = 0 tCO_2/yr

As per attachment C to Appendix B of simplified baseline and monitoring methodologies for selected small scale CDM project activity categories, "General guidance on leakage in biomass project activities", version 03 (EB 47 annex 28), the emission source per type of biomass is given in the table 6 below:

Table 6: Emission source per type of biomass

Biomass type	Activity / source	Shift of pre-project activities	Emissions from biomass generation / cultivation	Competing use of biomass
Biomass from forests	Existing forests	-	-	x
	New forests	x	x	-
Biomass from croplands or grasslands (woody or non-woody)	In the absence of the project the land would be used as cropland / wetland	x	x	-
	In the absence of the project the land would be abandoned	-	x	-
Biomass residues or wastes	Biomass residues or wastes are collected and used	-	-	x

Since each SSC-CPA uses biomass residues as fuel, and they fall under the type of residues/wastes, competing use of biomass has been considered and demonstrated:

"In some cases, the biomass used in the project activity could be used for other purposes in the absence of the project. For example, biomass residues from existing forests could have been used as fuel wood or agricultural biomass residues could have been used as fertilizers or for energy generation. Competing uses for biomass are not relevant, where the biomass is generated as part of the project activity (new forests or cultivations)."

SSC-CPA uses biomass residues such as wood barks as fuel and these were not used as fuel wood or fertilizers. In the absence of the project activity, the biomass residues would have remained as wastes.

The project participant shall evaluate ex ante - if there is a surplus of the biomass in the region of the project activity, which is not utilised. If it is demonstrated (e.g., using published literature, official reports, surveys etc.) at the beginning of each crediting period that the quantity of available biomass in the region (e.g., 100 km radius), is at least 25% larger than the quantity of biomass that is utilised including the project activity, then this source of leakage can be neglected otherwise this leakage shall be estimated and deducted from the emission reductions.

Each SSC-CPA will conduct its fuel assessment and demonstrates that the quantity of available biomass in the region (e.g. 200 km radius) will exceed above 1.25 times of all the usage of biomass including the project activity and hence, leakage can be neglected as per guidance of Attachment C to Appendix B (General guidance on leakage in biomass project activities), refer to Annex 5 for biomass assessment study.

EMISSION REDUCTIONS

The emission reductions estimated from each SSC-CPA are calculated by the difference between baseline emissions, project emissions and leakage. The formula for calculating the emission reductions is provided below:

The formula for calculating the emission reductions is provided below:

ERy = BEy – PEy – LEy

Where,

ERy = Emission reductions in year y (t CO2/y)
BEy = Baseline Emissions in year y (t CO2/y)
PEy = Project emissions in year y (t CO2/y)
LEy = Leakage emissions in year y (t CO2/y)

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

Data / Parameter:	**$EF_{CO2, grid ,y}$**
Data unit:	tCO_2/MWh
Description:	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".
Source of data used:	Updated version of Summary Report: The Study of Emission Factor for an electricity system in Thailand, published by TGO publically. Example of Summary Report for 2009: Summary Report: The Study of emission factor for an electricity system in Thailand 2009, available online at http://www.tgo.or.th/english/download/publication/GEF/2009/GEFReport_EN.pdf
Value applied:	0.5812 (Value applied: Data from summary report 2009)
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data is publicly available
Any comment:	Fixed *ex-ante*.

Data / Parameter:	**$EF_{grid,OM, y}$**
Data unit:	tCO_2/MWh
Description:	Operating margin CO_2 emission factor in year *y*
Source of data to be used:	Updated version of Summary Report: The Study of Emission Factor for an electricity system in Thailand, published by TGO publically. Example of Summary Report for 2009: Summary Report: The Study of emission factor for an electricity system in Thailand 2009, available online at http://www.tgo.or.th/english/download/publication/GEF/2009/GEFReport_EN.pdf

Value applied:	0.6147 (Value applied: Data from summary report 2009)
Justification of the choice of data or description of measurement methods and procedures actually applied :	Calculated as per the data presented in the above source
Any comment:	Fixed *ex-ante*.

Data / Parameter:	**$EF_{grid,BM,y}$**
Data unit:	tCO_2/MWh
Description:	Build margin CO_2 emission factor in year *y*
Source of data to be used:	Updated version of Summary Report: The Study of Emission Factor for an electricity system in Thailand published by TGO publically. Example of Summary Report for 2009: Summary Report: The Study of emission factor for an electricity system in Thailand 2009, available online at http://www.tgo.or.th/english/download/publication/GEF/2009/GEFReport_EN.pdf
Value of data	0.54771 (Value applied: Data from summary report 2009)
Justification of the choice of data or description of measurement methods and procedures actually applied :	Calculated as per the data presented in the above source
Any comment:	Fixed *ex-ante*.

Data / Parameter:	**NCV_{diesel}**
Data unit:	MJ/litre
Description:	Net calorific value of fossil fuel type *diesel*
Source of data to be used:	Electric Power in Thailand 2010, Department of Alternative Energy Development and Efficiency, Ministry of Energy
Value of data	Diesel: 36.42
Justification of the choice of data or description of measurement methods and procedures actually applied :	Country specific data.
Any comment:	Fixed *ex-ante*.

Data / Parameter:	**$EF_{CO2,diesel}$**
Data unit:	tCO_2/TJ
Description:	Carbon dioxide emission factor of fossil fuel type *diesel*
Source of data to be used:	IPCC default values

Value applied:	Diesel: 74.8
Justification of the choice of data or description of measurement methods and procedures actually applied :	IPCC default values at the upper limit as provide in Table 1.4 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories.
Any comment:	Fixed *ex-ante .Conversion from kg/TJ to* tCO_2/TJ *has been applied.*

Data / Parameter:	**% M_k**
Data unit:	%
Description:	Moisture content of the biomass type k (wet basis)
Source of data to be used:	On-site measurements. Ex-ante estimates will be use during the crediting period
Value applied:	The value of used by each SSC-CPA will be reported in the specific SSC-CPA-DD
Justification of the choice of data or description of measurement methods and procedures actually applied :	On-site measurements and send to 3rd party laboratory. The moisture content of biomass of homogeneous quality shall be determined ex ante. The weighted average should be calculated and used in the calculations.
Any comment:	Fixed *ex-ante.*

Data / Parameter:	**$SHR_{biomass}$**
Data unit:	kJ/kWh
Description:	Efficiency of energy generation of biomass power plant
Source of data to be used:	Technology provider
Value applied:	The value of used by each SSC-CPA will be reported in the specific SSC-CPA-DD
Justification of the choice of data or description of measurement methods and procedures actually applied :	SHR can be obtained from technical study
Any comment:	Fixed *ex-ante.*

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:

Parameter:	**$EG_{actual,y}$**
Unit:	MWh/y
Description:	Quantity of net electricity supplied by the project activity to the grid during the year *y*
Source of data:	Plant records of electricity export to the grid via the PEA energy meter for export and electricity import from the grid via PEA energy meter for import. The quantity of net electricity supplied to the grid is the difference between the measured quantities of the electricity export to the grid and electricity import from the grid ($EG_{export,y} – EC_{import,y}$)
Value of data:	-
Brief description of measurement methods and procedures to be applied:	Continuously monitoring, hourly measurement and at least monthly recording. Measurements are undertaken using energy meters of PEA. There are 2 units of PEA energy meters to be installed and measured. 1 unit of energy meter is use only to record export of electricity to the grid, and another 1 unit of energy meter is use only to record the import of electricity from the grid. The quantity of net electricity supplied to the grid is the difference between the measured quantities of the electricity export to the grid and electricity import from the grid. Measurement results shall be cross checked with records for sold and purchased electricity (e.g. invoice issued by PEA and receipts for import of electricity billed by PEA). Further cross checking can be done through the measurement undertaken through the internal plant's main energy meter monitored by the project implementer. The internal plant's main energy meter is a bi-directional meter that will record the export, import and net supply of electricity in the same meter. In the event of 2 PEA meters malfunction, additional cross checking of the net electricity supplied to the grid as gross energy generation in the project activity power plant minus the internal auxiliary electricity consumption, power loss, any off-grid power supply and electricity import from the grid to the project power plant measured at the grid connection used for billing purposes.
QA/QC procedures to be applied (if any):	Calibration of PEA energy meters both export meter and import meter will be done as per the calibration requirement and standard set by the PEA or every three years once whichever is applicable.
Any comment:	The data will be kept in the plant for the crediting period + 2 years after it. The data will be maintained in both soft copy and hard copy format. In view that the PEA energy meters belong to PEA, therefore the calibration procedure would be depending on the calibration requirement and standard of the PEA company. If meter is in kWh conversion to MWh is required.

Parameter:	$EG_{export,y}$
Unit:	MWh/y
Description:	Quantity of electricity exported to the grid in year y
Source of data:	Plant records from the PEA export meter
Value of data:	-
Brief description of	Continuous monitoring, hourly measurement and at least monthly recording.

measurement methods and procedures to be applied:	PEA energy meter to measure export of electricity will be installed and the accumulative measurements will be recorded on a log sheet once per day. The PEA export meter measure the electricity supplied at the point of sale to the grid. The PEA export meter will be located at the purchasing point specified by PEA. The data is cross checked against the data recorded from the internal plant's main energy meter, it is a bilateral meter that records export, import and net supply. The data can be further cross checked against the export invoice billed to PEA
QA/QC procedures to be applied (if any):	The calibration of PEA energy meters will be done as per the standard and requirement set by PEA. The calibration of internal plant's main energy meter will be based on the recommendation of the manufacturer or at least three years once whichever is applicable.
Any comment:	The data will be kept in the plant for the crediting period + 2 years after it. The data will be maintained in both soft copy and hard copy format. KWh will be converted to MWh.

Parameter:	$EC_{import,y}$
Unit:	MWh/y
Description:	Quantity of electricity imported from the grid in year y.
Source of data:	Plant records.
Value of data:	-
Brief description of measurement methods and procedures to be applied:	Continuous monitoring, hourly measurement and at least monthly recording. A unit of PEA energy meter to measure import of electricity from the grid will be installed and the accumulative measurements will be recorded on a log sheet once per day. The import data measured from PEA energy meter can be cross checked against the data recorded from the internal plant's main energy meter, it is a bilateral meter measuring the import, export, and net quantity in the same meter. In case of PEA's energy meter is malfunction, the data from the internal plant's main energy meter will be use. The data can be further cross checked against the import invoice billed by PEA.
QA/QC procedures to be applied (if any):	The calibration of PEA's energy meter to measure import of electricity from the grid will be done as per the standard and requirement set by PEA. The calibration of internal plant's main energy meter will be based on the recommendation of the manufacturer or at least three years once whichever is applicable.
Any comment:	The data will be kept in the plant for the crediting period + 2 years after it. The data will be maintained in both soft copy and hard copy format. The import meter is a property of PEA and therefore the calibration requirement should follow the requirement set by PEA. Conversion to MWh if the energy meter is in kWh

Parameter:	$FF_{k,y}$
Unit:	Tonne/y
Description:	Quantity of biomass residue type *k* consumed in the project plant during year *y*.
Source of data:	Plant records / on-site measurements
Value of data:	-

Brief description of measurement methods and procedures to be applied:	Measured continuously or in batches and estimate using annual energy/mass balance. Quantity of biomass used will be measured using weigh scales and recorded in log book on daily basis. The data will be adjusted for the moisture content in order to determine the quantity of dry biomass. The biomass will be stored in a covered warehouse to ensure that it is protected from rain before sending it to the combustion system. If more than one type of biomass is consumed each shall be monitored separately. An annual energy balance will be performed in order to cross check the measurement of quantity of biomass residue consumed based on purchased quantities (e.g. with sales/receipts) and stock changes. The information of quantity of biomass consumed from sales/receipts and stock changes will be used to calculate the energy amount for annual energy balance. Consistency check of measurement ex-post with annual data on energy generation, fossil fuels and biomass used and the efficiency of energy generation as determined ex ante.
QA/QC procedures to be applied (if any):	The weighbridge will be calibrated as per the manufacturer's specification or at least three years once whichever is applicable. The data recorded at weigh bridge in log books can be crosschecked against the purchase receipts and inventory data.
Any comment:	The data will be kept in the plant for the crediting period + 2 years after it. The data will be maintained in both soft copy and hard copy format. Each biomass fuel consumed shall be monitored separately.

Parameter:	**$FC_{diesel,y}$**
Unit:	Litres/year
Description:	Quantity of diesel combusted during year *y*.
Source of data:	Plant records/on-site measurement
Value of data:	-
Brief description of measurement methods and procedures to be applied:	Quantity of Diesel consumed should be measured by volumetric flow meters. In cases where fuel is supplied from small daily tanks, rulers will be used to determine volume of fuel consumed, with the following conditions: The ruler gauge must be part of the daily tank and calibrated as per the manufacturer's specification and have a book of control for recording the measurements.
QA/QC procedures to be applied (if any):	.The data recorded can be cross checked against the fuel purchase receipts.
Any comment:	The data will be kept in the plant for the crediting period + 2 years after it. The data will be maintained in both soft copy and hard copy format. Quantity of diesel combusted is excluding any that will be used by the boiler system, however, if diesel is anticipated to be combusted in the boiler system, it will be a small amount for start-up purposes only and will not be measured.

Parameter:	***$NCV_{biomass,k}$***
Unit:	kJ/kg (by mass)
Description:	Net calorific value of biomass residue type *k*
Source of data:	Measurement in laboratories according to relevant national/international standards.
Value of data:	All the individual fuels used in a SSC-CPA will be reported at the SSC-CPA level

Brief description of measurement methods and procedures to be applied:	Determine once in the first year of the crediting period. Measure quarterly, taking at least three sample for each measurement. The average value can be used for the rest of the crediting period. Measure the NCV based on dry basis. Check the consistency of the measurement results with, relevant data sources (e.g. values in the literature, values used in the national GHG inventory) and default value by IPCC).
QA/QC procedures to be applied (if any):	Measurement on dry basis will be conducted in laboratories according to relevant national/international standards. Consistency of the Measurement results will be checked by comparing with relevant data sources (e.g. values in the literature, values used in the national GHG inventory) and default values by the IPCC. If the measurement results are found to differ significantly from other relevant data sources, then additional measurements will be conducted e.g. the measurement result will be rejected if found differ significantly, the back-up set of samples collected during the same time as test samples will be used to measure again, and if the data is still significantly differ from other relevant data sources, the measurement data from the second set of samples will be used to calculate the average.
Any comment:	The data will be kept in the plant for the crediting period + 2 years after it. The data will be maintained in both soft copy and hard copy format.

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

The operational and management plan will follow as described in the section A.4.4.1. The monitoring plan will be undertaken by each SSC-CPA as described in Section A.4.2 of the latest valid POA-DD based on individual verification and implemented according to the following process and procedure:

The actions necessary to record monitoring parameters required by the methodology at the SSC-CPA level are described below. All data will be archived electronically and backed up regularly at each SSC-CPA level. The data will be kept for the full crediting period of SSC-CPA, plus two years after the end of the crediting period, or the last issuance of CERs for a SSC-CPA, whichever occurs later. The monitoring plan for this PoA has been developed to ensure that from the start, the SSC-CPAs are well organised in terms of the collection and archiving of complete and reliable data.

Data to be monitored:

The team responsible for monitoring will monitor,

The main parameter for baseline emissions calculation is net electricity supplied by the power plant to the Thai national grid (**$EG_{actual,y}$**). The quantity of biomass fuels used in the power plant is monitored but this information is not used in the baseline emissions calculation, it is used for cross checking purposes only as per the methodology.

Calibration:
All the measurement devises, energy meters, weighing machines etc will be taken care as per the technology supplier's maintenance protocol.

For PEA energy meters, both export meter and import meter will follow the maintenance protocol and calibration procedure of PEA.

Data and records management:

All data collected during the verification period will be stored in an electronic format that will be easily accessible to the verifier for independent checking i.e. DOE. All data will be archived electronically and backed up regularly at each SSC-CPA level. The data will be kept for the full crediting period of SSC-CPA, plus two years after the end of the crediting period, or the last issuance of CERs for a SSC-CPA, whichever occurs later. In the event that the main PEA energy meters both export and/or import data is malfunction, the data recorded from the internal plant's main energy meter that records the export, import and net of supply electricity can be referred with discounted power loss (if applicable), and all these data must be traceable. The power loss data is based on references from PEA distribution system which was published to be 5.1% for the period from 2007 to 2011, and published to be 5% for the period from 2012 to 2021, as per the information from the Thailand Power Development Plan (PDP) 2008 – 2021, published by EGAT[23]. In order to make it easy for the verifier to retrieve the documentation and information in relation to the project emission reduction verification, a document register will be maintained and continually updated. The document register will ensure adequate document control for CDM purposes.

This is under taken by the team responsible for monitoring as per requirements and a dedicated QA/QC Manager will be responsible for checking the data (according to a formal procedure) and will be responsible for managing the collection, storage and archiving of all data and records.

Quality Assurance and Quality Control procedures:
QA/QC procedures will ensure accuracy and reliability of the collected data through measurement control, document control and management review.

All monitoring instruments/ meters will undergo a proper and timely calibration by the qualified agency according to the standard procedures for calibration and equipment supplier's schedule. All PEA energy meters will undergo a proper calibration procedure as per the PEA requirement and schedule.

To ensure the quality of the recorded data, all relevant personnel will received the extensive on-the-job trainings such as from equipment supplier, CME, biomass power experts etc. which will include training on plant operations, data monitoring and report generation.

In addition, a proper maintenance of the power plant will be conducted according to the equipment suppliers' recommendations and the established operation and maintenance procedures and plan to ensure the efficiency of the power plant.

Uncertainties and Emergency Preparedness:
Uncertainties:

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[23] http://thailand.nlambassade.org/binaries/content/assets/postenweb/t/thailand/nederlandse-ambassade-in-bangkok/import/producten_en_diensten/handel_en_investeren/sector_rapportages/egat-powerdevelopmentplan/egat-powerdevelopmentplan/hippogallery%3Aasset

Any uncertainty like inconsistency/discrepancy of data parameters will be dealt with various corrective actions. These will be reported along with its time of occurrence, possible reasons and duration Uncertainty with metering (if any difference between recording of Main electricity meter and internal plant's main energy meter as cross check meter) will be dealt jointly both by SSC-CPA and PEA representative. Corrective actions will be undertaken after identification of reason for such uncertainty.

Emergency:

In the event of 2 PEA meters malfunction, additional cross checking of the net electricity supplied to the grid as gross energy generation in the project activity power plant minus the internal auxiliary electricity consumption, power loss, any off-grid power supply and electricity import from the grid to the project power plant measured at the grid connection used for billing purposes.

The plant will be equipped with Automatic Alarming System to detect any emergency. This will help the authority to take immediate preventive measures.

Emergency preparedness plans will be laid out to cope up with and control situations which can lead to unintended emissions like fire in the fuel yard and fuel spoilage due to water. Fire protection system will be adopted as per statutory requirements. These emergency situations will be taken care by putting up a fire safety system and a water drainage system in the fuel yard.

Expertise & Training:
The power plant will be managed and operated by a team of highly skilled professionals with prior knowledge and experience of power plant operation. All the personnel will receive an extensive on-the-job training which will include training on plant operations, data monitoring and report generation. An annual assessment of the training needs of all the plant personnel will be done and if required an extensive training program will be conducted on annual basis.

The monitoring team will undertake all the activities to ensure provision of accurate information for verification and certification in accordance with the above monitoring plan.

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

Date of completion: 5 January 2012.

Person/entity determining the baseline:
Mrs. Nicole Tan
Advance Carbon Securities Ventures Company Limited (ACSV),
122 North Sathorn Road. Silom,
Bangrak, Bangkok, 10500 Thailand
Mobile: +66 084 3601333 Email: nicole.t@advance-securities.com

Annex 1

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

Organization:	Advance Carbon Securities Ventures (ACSV) Company Limited
Street/P.O.Box:	122, North Sathorn Road, Silom
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URL:	N/A
Represented by:	Mrs. Nicole Tan
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

NO PUBLIC FUNDING HAS BEEN USED TO IMPLEMENT THIS POA AND EACH OF THE UNDERLYING SSC-CPAS

Annex 3

BASELINE INFORMATION

For this PoA, small-scale CDM methodology AMS-I.D i.e. "Grid connected renewable electricity generation" Version17, reference EB 54, is applicable. According to AMS-I.D, "For all other systems, the baseline is the kWh produced by the renewable generating unit multiplied by an emission coefficient (measured in kg CO_2e/kWh) calculated in a transparent and conservative manner as:

The national grid emission factor is available online at Thailand Greenhouse Gas Management Organization (TGO) website. TGO is functioning as Designated National Authority (DNA) of Thailand. The summary report on the study of emission factor for an electricity system in Thailand 2009 is available online at http://www.tgo.or.th/english/download/publication/GEF/2009/GEFReport_EN.pdf. The emission factor is calculated as per Annex 19 Methodological Tool (Version 02.2.1) "Tool to calculate the emission factor for an electricity system" which had been approved by the CDM Executive Board on September 29, 2011 (EB 63).

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 kg CO_2e/kWh) of the current generation mix. The data of the year in which project generation occurs must be used."

At the PoA level, for Biomass Power Development Programme in Thailand, it was selected to follow option (a) i.e. combined margin emission factor for all the CPA baseline calculations. The ex-ante approach is selected and the emission factor is fixed for the whole crediting period of a CPA.

Thus each SSC-CPA has selected option (a) i.e. combined margin emission factor is applied for the project baseline calculations. The ex-ante approach is selected and the emission factor is fixed for the whole crediting period. The ex-ante approach is considered conservative since the grid system in future is expected to become more carbon intensive as the projects planned to be established in the region are mostly thermal energy based.

The national grid emission factor is available online at Thailand Greenhouse Gas Management Organization (TGO) website. TGO is functioning as Designated National Authority (DNA) of Thailand. The summary report on the study of emission factor for an electricity system in Thailand 2009 is available online at http://www.tgo.or.th/english/download/publication/GEF/2009/GEFReport_EN.pdf. The emission factor is calculated as per Annex 19 Methodological Tool (Version 02.2.1) "Tool to calculate the emission factor for an electricity system, which had been approved by the CDM Executive Board (EB 63)". The procedures for calculation the national grid emission factor has been transparently documented and justified as follows:

Step 1: Identify the relevant electricity systems:
The electricity transmission system of Thailand is considered as a single system since the transmission lines are networked throughout the country and owned by the Electricity Generating Authority of

Thailand (EGAT). EGAT is the authority that controls electricity generation and distribution in Thailand, whereas the Metropolitan Electricity Authority (MEA) and the Provincial Electricity Authority (PEA) are the authorities that supply the electricity to the users in Bangkok and provinces, respectively. Therefore, the geographical extent of the project electricity system is the geographical extent of Thailand; imports from other countries are valued with 0 tCO2/MWh.

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

Under this step Option I is chosen to calculate the operating margin and build margin emission factor, which means that only grid power plants are included in the calculation.

Option II aims to reflect that in some countries off-grid power generation is significant and can partially be displaced by CDM project activities, e.g. if off-grid power plants are operated due to an unreliable and unstable electricity grid. Since this is not the case in Thailand and the data required to calculate with option II are not easily available, this option is not applied.

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

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

a) Simple OM
b) Simple Adjusted OM
c) Dispatch Data Analysis OM
d) Average OM

According to Thailand's data, the simple OM method (Ex ante Option) is the most appropriate method. This method requires the latest 3 years data including quantity of electricity generated, fuel types used and fuel consumption of each fuel type. This study used data obtained in the years 2007 – 2009 due to the following reasons:

1. In Thailand, the generated electricity that is transferred to the national grid is the only available data. Thus, it is not possible to obtain off-grid electricity generation data.

2. Low-cost/must-run (LC/MR) power plants include hydro and renewable power plants[24]. The quantity of electricity generated by these power plants is not included in the calculation because it is less than 50% of total grid generation.

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

(a) Simple OM

The simple OM emission factor is calculated as the generation-weighted average CO_2 emissions per unit net electricity generation (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:

Option A: Based on the net electricity generation and a CO_2 emission factor of each power unit;[25] 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.

[24] Low-cost/must-run resources are defined as power plants with low marginal generation costs or power plants that are dispatched independently of the daily or seasonal load of the grid. They typically include hydro, geothermal, wind, low-cost biomass, nuclear and solar generation.

[25] Power units should be considered if some of the power units at the site of the power plant are low-cost/must-run units and some are not. Power plants can be considered if all power units at the site of the power plant belong to the group of low-cost/must-run units or if all power units at the site of the power plant do not belong to the group of low-cost/must-run units.

The requirements to use option B:

a) The necessary data for option A are 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

Option B is used in accordance with the tool, as publicly available information is not complete and available on details for using option A. Generation and fuel use per plant is not available only net generation but not specified the fuel amount used.
Option B is chosen for the gross balance on the country generation and total fuel used. These data are available. The requirements to use option B are fulfilled.

Option B - Calculation based on total fuel consumption and electricity generation of the system
Under this option, the simple OM emission factor is calculated based on the net electricity supplied to the gid 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:

$$EF_{grid,OMsimple,y} = \frac{\sum_i (FC_{i,y} \bullet NCV_{i,y} \bullet EF_{CO2,i,y})}{EG_y} \quad (1)$$

where:

$EF_{grid, OM simple,y}$	=	Simple operating margin CO_2 emission factor in year y (tCO_2/MWh)
$FC_{i,y}$	=	Amount of fossil fuel type i consumed in the project electricity system 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)
EGy	=	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 (MWh)
I	=	All fossil fuel types combusted in power sources in the project electricity system in year y
Y	=	The relevant year as per the data vintage chosen

The values of CO_2 emission from combustion of fossil fuel (per unit of fossil fuel) are shown in Table 1. Net Calorific Value (NCV) is obtained from data provided by the Department of Alternative Energy Development and Efficiency, Ministry of Energy. The CO_2 Emission Factor of fossil fuel follows IPCC default values as specified in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

Table 1: Net Calorific Value and CO_2 emission per unit of each type of fossil fuel

Fuel type [A)]	Unit	Net Calorific Value [1)] (MJ/Unit)	CO_2 Emission [2)] (tCO_2/TJ)	CO_2 Emission ($kgCO_2$/Unit)
Natural gas	scf.	1.02	54.30	0.0554
Lignite	Ton	10,470.00	90.90	951.7230

Bituminous	Ton	26,370.00	89.50	2,360.1150
Bunker	Liter	39.77	75.50	3.0026
Diesel	Liter	36.42	72.60	2.6441

1) Electric Power in Thailand 2008/ Department of Alternative Energy Development and Efficiency, Ministry of Energy
2) IPCC default values at the lower limit as provide in Table 1.4 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories
A) See Table: Comparison of name of fuel type

The quantity of electricity generated and delivered to the national grid can be obtained from the Electricity Report 2007 – 2009 published by the Electricity Generating Authority of Thailand as shown in Table 2. Data are categorized by electricity generation system, type of power plant and quantity of electricity generated by LC/MR and Non LC/MR power plants. Type of power plant includes the power plant of the Electricity Generating Authority of Thailand, Independent Power Producers (IPPs) and Small Power Producers (SPPs).

Quantity and type of fossil fuel consumed in electricity generation are also obtained from the Electricity Report 2007 – 2009 published by the Electricity Generating Authority of Thailand as shown in Table 3.

VSPP power plants use renewable energy including biogas, biomass, hydro, wind and solar energy and are considered as low-cost/must-run power plants. However, a VSPP power plant is non-firm and can supply only a small quantity of electricity to the grid compared to other power plants. In 2009, the amount of electricity that VSPP power plants sold to the Provincial electricity Authority was 974.47 GWh [3)] (0.67% of the total electricity generated in 2009). Thus, this study does not include electricity generated by VSPP in the calculation of total electricity in the national grid. The total amount of electricity exported to the national grid (only Non LC/MR) in the years 2007 – 2009 was 406,291.70 GWh.

Table 2: Quantity of electricity generated and delivered to the national grid [4)]

Generation System	**Grid Generation (GWh)**				
	EGAT	**IPP**	**SPP**	**Total**	**%**
2009					
Total	66,488.10	64,840.72	13,971.37	145,300.19	100.00
Non LC/MR	59,541.66	64,840.72	11,811.42	136,193.80	93.73
LC/MR [5)]	6,946.44	0.00	2,159.95	9,106.39	6.27
Thermal	23,463.69	12,388.03	2,225.63	38,077.35	
Combined-Cycle	33,164.46	52,452.69	8,752.19	94,369.35	
Gas Turbine	309.63	0.00	833.60	1,143.23	
Diesel Engine	1.44	0.00	0.00	1.44	
Hydropower	6,941.74	0.00	23.97	6,965.71	
Renewable Energy	4.70	0.00	2,135.98	2,140.68	
Electricity Import	2,602.43	0.00	0.00	2,602.43	
2008					
Total	63,719.02	67,420.14	14,092.83	145,232.00	100.00
Non LC/MR	56,791.19	67,420.14	11,904.81	136,116.14	93.72
LC/MR [5)]	6,927.83	0.00	2,188.03	9,115.86	6.28
Thermal	26,778.89	14,398.34	1,996.83	43,174.06	
Combined-Cycle	26,449.20	53,021.80	9,029.90	88,500.90	

Gas Turbine	659.33	0.00	878.07	1,537.41	
Diesel Engine	2.30	0.00	0.00	2.30	
Hydropower	6,926.02	0.00	28.77	6,954.79	
Renewable Energy	1.81	0.00	2,159.26	2,161.07	
Electricity Import	2,901.47	0.00	0.00	2,901.47	
2007					
Total	67,704.95	62,233.44	14,426.00	144,364.39	100.00
Non LC/MR	59,765.33	62,233.44	11,982.99	133,981.76	92.81
LC/MR [5)]	7,939.62	0.00	2,443.02	10,382.64	7.19
Thermal	30,265.00	17,453.59	2,168.76	49,887.35	
Combined-Cycle	24,124.09	44,779.85	8,935.60	77,839.54	
Gas Turbine	884.20	0.00	878.63	1,762.83	
Diesel Engine	1.17	0.00	0.00	1.17	
Hydropower	7,937.20	0.00	21.70	7,958.90	
Renewable Energy	2.42	0.00	2,421.32	2,423.73	
Electricity Import	4,490.87	0.00	0.00	4,490.87	

3) Provincial Electricity Authority: PEA
4) Electricity report 2007 – 2009/ Electricity Generating Authority of Thailand
5) LC/MR power plants include hydropower and renewable energy (including biomass, solar and geothermal power)

Table 3: Amount of fossil fuel consumed by power plants [6)]

Fuel type	Unit	Fuel Consumption			
		EGAT	IPP	SPP	Total
2009					
Natural Gas	scf.	369,146,214,392	459,228,417,361	140,550,086,056	968,924,717,809
Lignite	ton	15,818,265	0.00	0.00	15,818,265
Bituminous	ton	0.00	3,645,721	1,840,527	5,486,248
Bunker	liter	111,039,065	38,180,874	8,797,506	158,017,445
Diesel	liter	12,140,891	0.00	1,685,046	13,825,937
2008					
Natural Gas	scf.	340,739,529,461	490,866,999,785	145,410,364,035	977,016,893,281
Lignite	ton	16,407,465	0.00	0.00	16,407,465
Bituminous	ton	0.00	3,711,791	1,866,776	5,578,567
Bunker	liter	247,441,682	93,212,260	9,555,452	350,209,394
Diesel	liter	6,792,039	43,698,832	1,451,087	51,941,958
2007					
Natural Gas	scf.	342,335,310,261	454,590,745,280	145,512,075,117	942,438,130,658
Lignite	ton	16,060,766	0.00	0.00	16,060,766
Bituminous	ton	0.00	3,692,979	1,889,868	5,582,847
Bunker	liter	785,979,152	144,198,973	6,042,880	936,221,005
Diesel	liter	7,381,996	2,688,851	1,266,337	11,337,184

6) Electricity report 2007 – 2009/ Electricity Generating Authority of Thailand

Table 4 shows the calculated CO_2 emission from electricity generation in the years 2007 - 2009 categorized by fuel types. The total emissions during the 3-years period (2007-2009) were 249,762,588 tCO_2.
The Operating Margin Emission Factor (Ex ante option) calculated by using equation 1 is shown in Table 5. The value is 0.6147 tCO_2/MWh (614.70 gCO_2/kWh)

Table 4: CO_2 emission from electricity generation in the years 2007 - 2009

Fuel type	Fuel consumption		CO_2 Emission ($kgCO_2$/Unit)	CO_2 Emission ($kgCO_2$)
	Unit	Volume		
2009				
Total				82,178,673
Natural Gas	scf.	968,924,717,809	0.0554	53,664,864
Lignite	ton	15,818,265	951.7230	15,054,607
Bituminous	ton	5,486,248	2,360.1150	12,948,176
Bunker	liter	158,017,445	3.0026	474,469
Diesel	liter	13,825,937	2.6441	36,557
2008				
Total				84,083,369
Natural Gas	scf.	977,016,893,281	0.0554	54,113,058
Lignite	ton	16,407,465	951.7230	15,615,362
Bituminous	ton	5,578,567	2,360.1150	13,166,060
Bunker	liter	350,209,394	3.0026	1,051,551
Diesel	liter	51,941,958	2.6441	137,339
2007				
Total				83,500,546
Natural Gas	scf.	942,438,130,658	0.0554	52,197,878
Lignite	ton	16,060,766	951.7230	15,285,400
Bituminous	ton	5,582,847	2,360.1150	13,176,161
Bunker	liter	936,221,005	3.0026	2,811,130
Diesel	liter	11,337,184	2.6441	29,977

Table 5 Operating Margin Emission Factor (Ex ante option)

Year	CO_2 Emission (tCO_2)	Grid Consumption (GWh)	OM Emission Factor	
			(tCO_2/MWh)	(gCO_2/kWh)
2009	82,178,673	136,193.80	0.6034	603.40
2008	84,083,369	136,116.14	0.6177	617.70
2007	83,500,546	133,981.76	0.6232	623.20
Summary	249,762,588	406,291.70	0.6147	614.70

Step 5: Identify the group of power units to be included in the build margin
Group of power units that are included in the build margin must be identified. The sample group of power units used to calculate the build margin consists of either:

1) The set of five power units that have been built most recently; or

2) The set of power capacity additions in the electricity system that comprise 20% of the system generation and that have been built most recently sorted by Commercial Operation Date (COD) which is the date when the power plant starts to supply electricity to the grid.

The set of power units that comprises the larger annual generation must be used. According to Thailand's data, the first option can generate less electricity than the second option, thus this study uses the quantity of electricity generation of the second option as listed in Table 6. Fuel consumptions of these power plants are shown in Table 7.

Table 6: Electricity generation by the most recently built power plants [7)]

Power unit	Grid Generation [7)] (GWh)	COD
1. Bangpakong Power Plant (Unit 05)	1,918.11	16-Sep-09
2. South Bangkok Power Plant (Unit 03)	4,745.32	1-Mar-09
3. Chana Power Plant (Unit 01)	4,150.26	15-Jul-08
4. Ratchaburi Power Company Limited (RPCL) (Unit 1&2)	8,153.26	1-Jul-08
5. Gulf Power Generation Co., Ltd. (Unit 1&2)	9,338.68	1-Mar-08
6. BLCP Power Co., Ltd. (Unit 1&2)	10,018.13	1-Feb-07
Summary	38,323.76	
Percentage as of 2009 Grid Generation (145,300.19 GWh)	26.38	

7) Electricity report 2009/ Electricity Generating Authority of Thailand

Table 7: Fuel consumptions of the most recently built power plants as listed in Table 6 [8)]

Fuel type	Fuel consumption		CO_2 Emission ($kgCO_2$/Unit)	CO_2 Emission (tCO_2)
	Unit	Volume		
Total				20,991,690
Natural Gas	scf.	223,467,679,056	0.0554	12,376,981
Lignite	ton	–	951.7230	–
Bituminous	ton	3,645,721	2,360.1150	8,604,321
Bunker	liter	–	3.0026	–
Diesel	liter	3,929,038	2.6441	10,389

8) Electricity report 2009/ Electricity Generating Authority of Thailand

As shown in Table 6, electricity generated by the most recently built power plants is 38,323.76 GWh 26.38% of the total electricity generated in 2009 which is 145,300.19 GWh. Fuel consumptions of the most recently built power plants as listed in Table 7 emit CO_2 20,991,690 ton. The Build Margin Emission Factor calculated by using equation 1 is shown in Table 8. The value is 0.5477 tCO2/MWh (547.70 gCO_2/kWh).

Step 6: Calculate the build margin emission factor

Table 8 Calculation of Build Margin Emission Factor

Year	CO_2 Emission (tCO_2)	Grid Consumption (GWh)	BM Emission Factor	
			(tCO_2/MWh)	(gCO_2/kWh)
2009	20,991,690	38,323.76	0.5477	547.70

Step 7: Calculate the combined margin emissions factor
The Combined Margin Emission Factor can be calculated by using equation 2

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

where:

$EF_{grid,CM,y}$	=	Combined 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)
$EF_{grid,BM,y}$	=	Build margin CO_2 emission factor in year y (tCO_2/MWh)
W_{OM}	=	Weighting of operating margin emission factor
W_{BM}	=	Weighting of build margin emission factor

The following default value should be used for W_{OM} and W_{OM}:

Table 9: Weighting of operating and build margin emissions factor for general CDM projects and wind and solar power generation CDM projects

CDM project type	W_{OM}	W_{OM}
General project	0.50	0.50
Wind and solar power generation project	0.75	0.25

For this project activity, which is not a wind or solar power generation project activity, the following weights are chosen: $W_{OM} = 0.5$ and $W_{BM} = 0.5$.

Table 10: Calculated Combined Margin Emission Factor

CDM project type	Emission Factor (tCO2/MWh)		
	$EF_{grid,OM}$	$EF_{grid,BM}$	$EF_{grid,CM}$
General project	0.6147	0.5477	0.5812

Therefore, the baseline emission factor $EF_{CO2} = EF_{grid,CM,y} = 0.5812\ tCO_2/MWh$.

Reference Table Comparison of name of fuel type from different reports

Report [9)]	DEDE [10)] (Thailand)	IPCC [11)]
Natural Gas	Natural Gas (Dry)	Natural Gas
Lignite	Lignite (Mae Moh)	Lignite
Bituminous	Coal Import	Other Bituminous Coal
Bunker	Fuel Oil	Residual Fuel Oil
Diesel	Diesel	Diesel

9) The Study of emission factor for an electricity system in Thailand 2009
10) Electric Power in Thailand 2008/ Department of Alternative Energy Development and Efficiency, Ministry of Energy
11) 2006 IPCC Guidelines for National Greenhouse Gas Inventories

Annex 4

MONITORING INFORMATION

The monitoring plan will be undertaken by each SSC-CPA project as described in section A.4.2 and Section E.7 of this POA-DD.

Annex 5

Biomass assessment study template for Individual SSC-CPA

Objective:

Objective of biomass assessment study is to assess the availability of biomass supply from woodchip mills or agricultural processing mills or factories surrounding the power plant for its continued operation. This also enables a project to conform the requirements set under the "General guidance on leakage in biomass project activities (Version 03, EB 47)" and "Biomass Power Development Programme in Thailand" CDM SSC-PoA-DD.

Scope of Study:

The scope of this study is focused on documenting availability of biomass residues <*provide details of residues*> from <*details of surrounding woodchip mills or agro processing mills or factories*> mills/factories using <*provide details of raw material processed at woodchip mills or agro processing mills or factories*> or <*agricultural residues available near the power plant*>. The boundary of the study has been streamlined to the district of <*details of the location*> province and the supplier(s) located within 200 km radius from the project site. The report should provide clear supporting study evidence that the supply of biomass availability from woodchip mills or agro processing mills or factories are sufficient to cover up to 1.25 times of the requirement of the project.

Methodology:

The analysis of biomass assessment is based on the primary and secondary data as mentioned below.

- Primary data: obtain quotations from various biomass suppliers or woodchip mills or agro processing industries or factories surrounding the power plant location within 200 km radius
- Secondary data: The calorific values and will be obtained through published data from government agencies

Results:

1. Biomass required for power plant

SSC-CPA <*number of SSC-CPA*> is a project activity involves the implementation of <*the capacity of biomass power plant*> MW capacity renewable energy based power plant that will be using the residues from the nearby <*details of surrounding woodchip mills or agro processing mills or factories*>. The main residues that are used in the power plant are <*provide details of residues*>. The following table 7 showed the requirement of biomass quantities for this project.

Table 7: Biomass fuel required for the continued operation of the power plant

Type of Biomass Fuel	Consumption ratio (%) - (a)	Lower Heating Value (kJ/kg) – (b)	Specific Fuel Consumption (t/MWh) – (c)	Annual Fuel required (tonne/y) – (a)*(c)* gross electricity generation

<*biomass type 1*>	<*x% input from developer*>	Source: From Secondary Data	Calculated using net plant heat rate (kJ/kWh) / lower heating value	<*amount of fuel required annually*>
<*biomass type 2*>	<*x% input from developer*>	Source: From Secondary Data	Calculated using net plant heat rate (kJ/kWh) / lower heating value	<*amount of fuel required annually*>
...	**...**	**...**	**...**	**...**
Total	**100%**			**<*Sum of both above*>**

2. Biomass availability surrounding the power plant

The project developer approached number of suppliers surrounding the power plant and eventually will establish contract with <*insert the number of suppliers and their name*>. The table 8 below provides a summary of information received from the supplier(s) in the form of quotation and other information related to the transportation.

Table 8: Summary table of biomass availability information

Supplier name	**Distance between source and power plant**	**Total quantity of raw material processed (tonne/y)**	**Type of transportation**	**Existing supply to 3rd party users if any (tonne/y)**	**Capacity of residues production (tonne/y)**		**Availability of residues (tonne/y)**	
					Type 1	**Type 2**	**Type 1**	**Type 2**

<*Insert Google Map clearly indicating the power plant site and the supplier mill/factory location and distance*>

Conclusion:

The total requirement of biomass residues from <*type of biomass*> is/are approximately <*provide the amount*> tonne per annum. <*List the name of suppliers*> has the capacity to generate up to <*provide the amount*> tonne of this residues per annum, surplus amount of residues ($FF_{Surplus,y}$), which is enough to support up to <*should be at least 1.25 times*> tonnes/y, which is more than 1.25 times the requirement of fuel in the power plant per annum.

The total availability of the residues from <*number of main suppliers*> suppliers within 200 km radius has demonstrated that the amount of residues within this study is well above 25% of the quantity of biomass fuel requirement for the power plant project.

Appendix *(apply as needed)*:

Appendix A: Completed Survey Form

Information of Supplier 1	
Reference number	*<Quotation number/date/name of supplier>*
Supplier Name	*<Registered company or mill or factory name>*
Location of mill/factory	*<Details - to the extent of latitude and longitude>*
Distance to the power plant	*<xxx >* km
Raw materials processed at the mill/factory	*<ex: wood logs>*
Residues produced	*<Type 1: wood chip>* *<Type 2: wood bark>*
Production capacity of residues per year	<*type 1 residue: 300,000*> tonnes per year < *type 2 residue: 300,000*> tonnes per year
Sale of these residues to 3rd party or existing supply contract with other PP or buyers	<*type 1 residue: 300,000*> tonnes per year <*type 2 residue: 300,000*> tonnes per year
Remaining amount of these residues per year	<*type 1 residue: 300,000*> tonnes per year <*type 2 residue: 300,000*> tonnes per year
Current condition/waste disposal practice of remaining residue	<*narrate the scenario ex: dump surrounding the area*>
Mode of transport and fuel used to supply raw material and disposal/sale of residues	<*ex: 20 tonne capacity truck which uses NGV*>
Annual fleet of these vehicles	<*ex: a round trip distance of XXX km and each truck will make about 20 trips per month; the total number of trucks are XX number*>
Fill-up by supplier name and contact details	
Name	
Position	
Date	
Quotation reference	

Supporting Documents that needs to be attached together with survey form:

a) Quotation
b) Declaration/certification that the raw materials are not from forestry or illegal

Appendix B: Quotation(s)

Appendix C: Heating Value

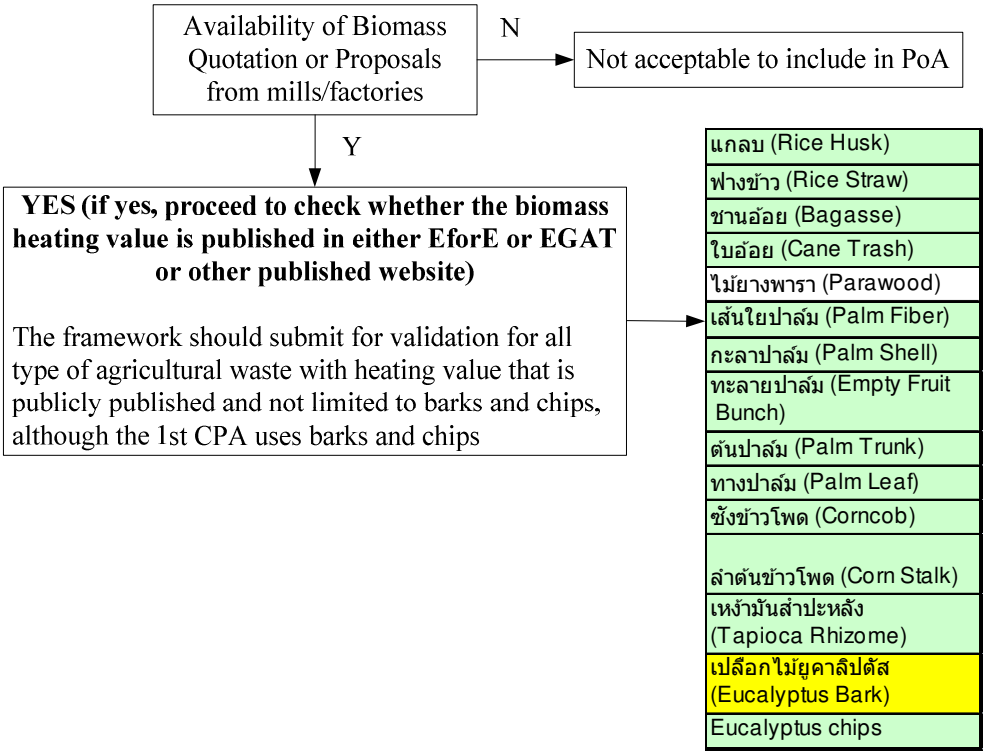

Table 9: Heating values of different biomass fuels

Type of fuel	Moisture %	Ash %	Volatile Matter %	Fixed Carbon %	Higher Heating Value kJ/kg	Lower Heating Value kJ/kg
Rice Husk	12	12.65	56.46	18.88	14,755	13,517
Rice Straw	10	10.39	60.7	18.9	13,650	12,330
Bagasse	50.73	1.43	41.98	5.86	9,243	7,368
Cane Trash	9.2	6.1	67.8	16.9	16,794	15,479
Parawood	45	1.59	45.7	7.71	10,365	8,600
Palm Fiber	38.5	4.42	42.68	14.39	13,127	11,400
Palm Shell	12	3.5	68.2	16.3	18,267	16,900
Empty Fruit Bunch	58.6	2.03	30.46	8.9	9,196	7,240
Palm Trunk	48.4	1.2	38.7	11.7	9,370	7,556
Palm Leaf	78.4	0.7	16.3	4.6	3,908	1,760
Corncob	40	0.9	45.42	13.68	11,298	9,615
Corn Stalk	41.7	3.7	46.46	8.14	11,704	9,830
Tapioca Rhizome	59.4	1.5	31	8.1	7,451	5,494
Eucalyptus Bark	60	2.44	28	9.56	6,811	4,917

Source:
(a) All the data are sourced from http://www.efe.or.th unless otherwise mentioned
(b) Heating value of wood bark is 4,917 kJ/kg and the source of data was from http://www.greenenergynet.net/tec_Biomass.html
(c) The heating value for wood chip is expected to be 8,514 kJ/kg and the source of data was from follow: http://www2.dede.go.th/Wboard/Question.asp?GID=2832

Annex 6

Environmental Analysis: IEE-SD criteria of a CPA

Standard IEE framework of PoA (refer Table 2 in Section C.2) as well as IEE-SD criteria template for SSC-CPAs (refer Table 10 below). The IEE-SD criteria for a SSC-CPA needs to be followed by a SSC-CPA and results will be reported at the SSC-CPA level.

Table 10: IEE-SD criteria of a SSC-CPA

Indicator	Scoring Criteria	Scoring Level
1) Natural Resources and Environment		
Environmental Indicators		
1) Reduction of greenhouse gases under the Kyoto Protocol **Note:** Greenhouse gases under the Kyoto Protocol are: 1. Carbon dioxide (CO_2) 2. Methane (CH_4) 3. Nitrous oxide (N_2O) 4. Hydrofluorocarbons (HFCs) 5. Perfluorocarbons (PFCs) 6. Sulphur hexafluoride (SF_6)	Project activity greenhouse gas emission (CO_2 equivalent) compared to the Baseline.	**Renewable Energy Project** 0 No changes in Greenhouse gases emission. +1 Greenhouse gases reduction is less than 50% of baseline emission. +2 Greenhouse gases reduction is not less than 50% of baseline emission. **Energy Efficiency Project** 0 No changes in greenhouse Gases emission. +1 Greenhouse gases reduction is less than 10% of baseline emission. +2 Greenhouse gases reduction is not less than 10% of baseline emission.
2) Air pollution **Note:** Air pollution emission standard refers to related national laws announced by concerned agencies such as Pollution Control Department, Department of Industrial Works etc. The air pollutants that will be considered through stack emission measurement or	Air pollutants emission of the project activity compared to the standard and baseline.	0 Air pollutants emission complies with the standard applied. +1 Air pollutants emission complies with the standard applied and is less than the baseline emission. **Note:** For a project activity that has started. 0 Air pollutants emission complies with the standard applied. +1 Air pollutants emission complies with the standard applied and decreases from the baseline emission less than

Indicator	Scoring Criteria	Scoring Level
ambient air emission compared to the baseline case. The pollutants include NOx, SO_2, H_2S and TSP.		20%. +2 Air pollutants emission complies with the standard applied and decreases from the baseline emission not less than 20%. Or not applicable
3) Noise Pollution **Note:** If the project activity is located within 500m from a community, the noise measurement should be made at the nearest community as follows: - 24 hours a-weighted equivalent continuous sound level (Leq24hr) - Maximum sound presssure level (Lmax) - Background noise level (L90) - Residual noise level (Leq) - Specific noise level (Leq)	Background noise and annoyance noise level of the project activity compared to the baseline, at the household/community within 500 m of the noise pollution source.	0 Noise level complies with the standard applied or prevention measures are in place to reduce the noise level to meet the standard. +1 Additional measures are in place to control the noise level, and the noise level is 1-5 dB(A) lower than the standard. +2 Additional measures are in place to control the noise level, and the noise level is more than 5 dB(A) lower than the standard. Or not applicable, in the case the noise pollution source of the project activity is more than 500 m from the household / community.
4) Odor **Note:** The indicator refers to odor and nuisance from odor control. The judgement is based on the assessor.	Odor management of the project activity compared to baseline.	-1 Project activity does create additional odor problems compared to the baseline. 0 There is no nuisance odor problem from the project activity. +1 There are additional mitigation measures to prevent nuisance odor problem from the project activity. Or not applicable.
5) Wastewater Management **Note:** The parameters for consideration of this indicator include BOD, COD, and temperature. The standards applied will depend on the project type, as announced by concerned agencies including but not limited to Pollution Control Department, Department of Industrial Works, Marine Department and Royal Irrigation Department.	Characteristics of wastewater effluent compared to the standards applied as well as the baseline.	0 Characteristics of wastewater effluent complies with the standard applied, or waste water is stored without being discharged outside the project boundary, or the concerned agencies have given permission to use the effluent which do not comply with the standard applied outside the project boundary. +1 Characteristics of wastewater effluent complies with the standard applied and is better than the baseline. +2 Treated wastewater effluent which its characteristic complies with the standard applied has been taken outside the project boundary for other utilization.

Indicator	Scoring Criteria	Scoring Level
		Or not applicable
6) Waste management **Note:** Waste means leftover materials or waste, and unused material from the project activity. This does not include hazardous waste.	Waste management of the project activity.	-1 Waste generated from the project activity is unmanaged. 0 Waste generated from the project activity is managed. +1 There is no waste discarded out of the project boundary and waste management measures are in place or waste can be used beneficially within the project boundary. +2 Waste is utilized outside project boundary under good management measures. Or not applicable
7) Soil Contamination **Note:** Soil contamination standard will follow the Notification of National Environment Board No. 25 (B.E. 2547 (2004)), issued under the Enhancement and Conservation of National Environmental Quality Act B.E. 2539 (1992) and other related laws.	Consideration of soil contamination within the project boundary.	-1 The project activity contaminates the soil. 0 There is no soil contamination or there are prevention/ reclamation measures. +1 Soil reclamation within the project area is in place. Or not applicable
8) Underground water Contamination **Note:** Especially underground water contamination by hazardous substances.	Underground water contamination as a result of the project activity.	0 There is no underground water contamination, or there are adequate prevention measures in place to prevent underground water contamination. +1 There are adequate prevention and monitoring measures in place. Or not applicable
9) Hazardous waste management **Note:** Hazardous waste means waste that poses substantial or potential threats to public health or the environment, as defined in the regulations.	Hazardous waste management compared to the baseline case.	0 There is a hazardous waste management measures complied with the concerned regulations. +1 There is a hazardous waste management measure complied with the concerned regulations and the amount of hazardous waste is reduced. Or not applicable
10) Water demand and utilization efficiency	Water demand and utilization efficiency of the project activity. Note: Other unmentioned cases will be based on the judgement of the assessor.	-1 The amount of water used in the project activity has an impact on the water resources utilization. 0 The amount of water used in the project activity does not have any impact on the water resources

Indicator	Scoring Criteria	Scoring Level
		utilization. +1 Wastewater is recycled for the use in the project activity, or the water demand of the project activity is reduced, or there is water storage facility developed. +2 There is a water storage facility developed that serves project activity and nearby communities as well. Or not applicable
11) Soil/coastal/river bank erosion	Soil/coastal/river bank erosion within the project boundary	-1 There is soil/ coastal/river bank erosion due to project activity. 0 There is no soil/ coastal/river bank erosion due to project activity, or adequate prevention measures are in place. Or not applicable.
Natural Resources Indicators		
12) Green area **Note:** Green area is defined as covers with perennial plants to act as carbon storage. Green area can be within or outside the project boundary. The tree must be planted by the project.	Green area compared to the baseline.	0 There is no increase in green area. +1 Green area has increased by at least 5% but not up to 10% of the total area of the project. +2 Green area has increased by at least 10% of the total area of the project.
(13) Other indicators that have significant impact	Consideration of other indicators that have significant impact on the environment.	-1 The indicator has impact on the environment. 0 The indicator does not impact on the environment.
2. Social Indicators		
1) Public participation **Note:** The public participation will be considered from the framework and level of public participation, especially by local stakeholder and representatives from public and private organizations, staffs, partner companies and academic.	Public participation (a guideline or manual for public participation is available)	-1 There is no public Participation forum. 0 There is a public participation forum, where information is given to the public only. +1 There is a public participation forum, where information is given and discussion takes place. +2 There is a public participation by setting up a multilateral committee, and community representatives are member of the committee.
2) Support of social, cultural, and sufficiency economy development activities.	Support social, cultural, and sufficiency economy development activity. (According to the definition	0 There is no additional Social development and public service activity. +1 There is an additional social development and public service activity.

Indicator	Scoring Criteria	Scoring Level
Note: There are developmental activities to support social, cultural, healthcare, public infrastructure and amenity. The sufficiency economy and social development activity does not have a negative score. The activity could be within or outside the project boundary.	of sufficiency economy and Corporate Social Responsibility Standard: CSR)	+2 There is an additional social development and public service activity by setting up a public fund and a multilateral committee, or social development services are provided following the Corporate Social Responsibility (CSR) guideline.
3) Workers and nearby community health	There is a management plan or activity to promote workers and nearby community health.	0 The project activity follows the labor protection act. +1 There is a project or activity that promotes better health, more than stated in the regulations, for workers. +2 There is a project or activity that promotes better health for workers and nearby community
3. Technology Development and/or Technology Transfer Indicators		
1) Technology Development	Technology development or imported technology. (Consideration will be made on the machinery and system)	0 Utilization of foreign technology without additional development in Thailand. +1 Utilization of technology that was researched and developed from foreign technology. +2 Utilization of locally developed technology.
2) End of project life plan or end of crediting period plan that the project activity has adopted. **Note:** In case that the project has impact on social development and environment at the end of the chosen crediting period, the project should prepare a plan to prevent and mitigate the expected impacts.	Operational plan for the end of the project life or the crediting period.	-1 The project activity has potential to cause an impact at the end of the crediting period. There is no mitigation plan. 0 There is no operational plan after the end of the crediting period, as the project still operates as before. +1 There is an appropriate operational plan after the end of the project life or the crediting period.
3) Capacity building for personnel	Training to improve efficiency of the personnel.	-1 There is no training plan to improve workers skills. 0 There is a plan for training And improving workers skills. +1 There is a plan to disseminate knowledge to the public.

Indicator	Scoring Criteria	Scoring Level
		Note: For a project activity that has started operation. -1 There was no training to improve workers skills. 0 There was training to improve workers skills. +1 There was activity to disseminate
4. Economic Indicators		
1) Employment **Note:** Employment means direct employment for the project activity, or indirect employment as a result of the project activity, for example, raw material delivery. Local employment means hiring of people who live in the province or nearby provinces.	Number of employments.	0 There is no additional employment within the project company. +1 There is additional employment within the project company. +2 There is additional employment in the area
2) Additional stakeholder income **Note:** The project developer must identify the stakeholders involved in the project activity, such as the farmers who sold raw materials and partner companies.	Income of stakeholders.	0 Income of stakeholders remains the same. +1 Income of stakeholders increases.
3) Renewable Energy Utilization **Note:** Renewable energy is defined as energy that replaces fossil fuel. There are two types of energy: 1) Alternative energy from finite sources such as coal, natural gas, nuclear, oil shale and tar sand, etc. 2) Alternative energy from renewable sources such as solar, wind, biomass, hydro and hydrogen, etc.	The use of renewable energy compared to the baseline.	0 The use of renewable energy remains the same. +1 The use of renewable energy increases up to 50% of the total energy consumed. +2 The use of renewable Energy increases more than 50% of the total energy consumed. Or not applicable
4) Energy efficiency	Percentage of project activity's energy efficiency.	0 The project activity's energy efficiency remains the same. +1 The project activity's Energy efficiency improves but not more than 10%. +2 The project activity's energy

Indicator	Scoring Criteria	Scoring Level
		efficiency improves more than 10%. Or not applicable.
5) Local content	The value of local content of the project activity. **Note:** local content applies to machinery and other equipments except raw material used in theproject activity.	0 The value of local content is less than 50%. +1 The value of local content is between 50-80%. + 2 The value of local content is more than 80%.

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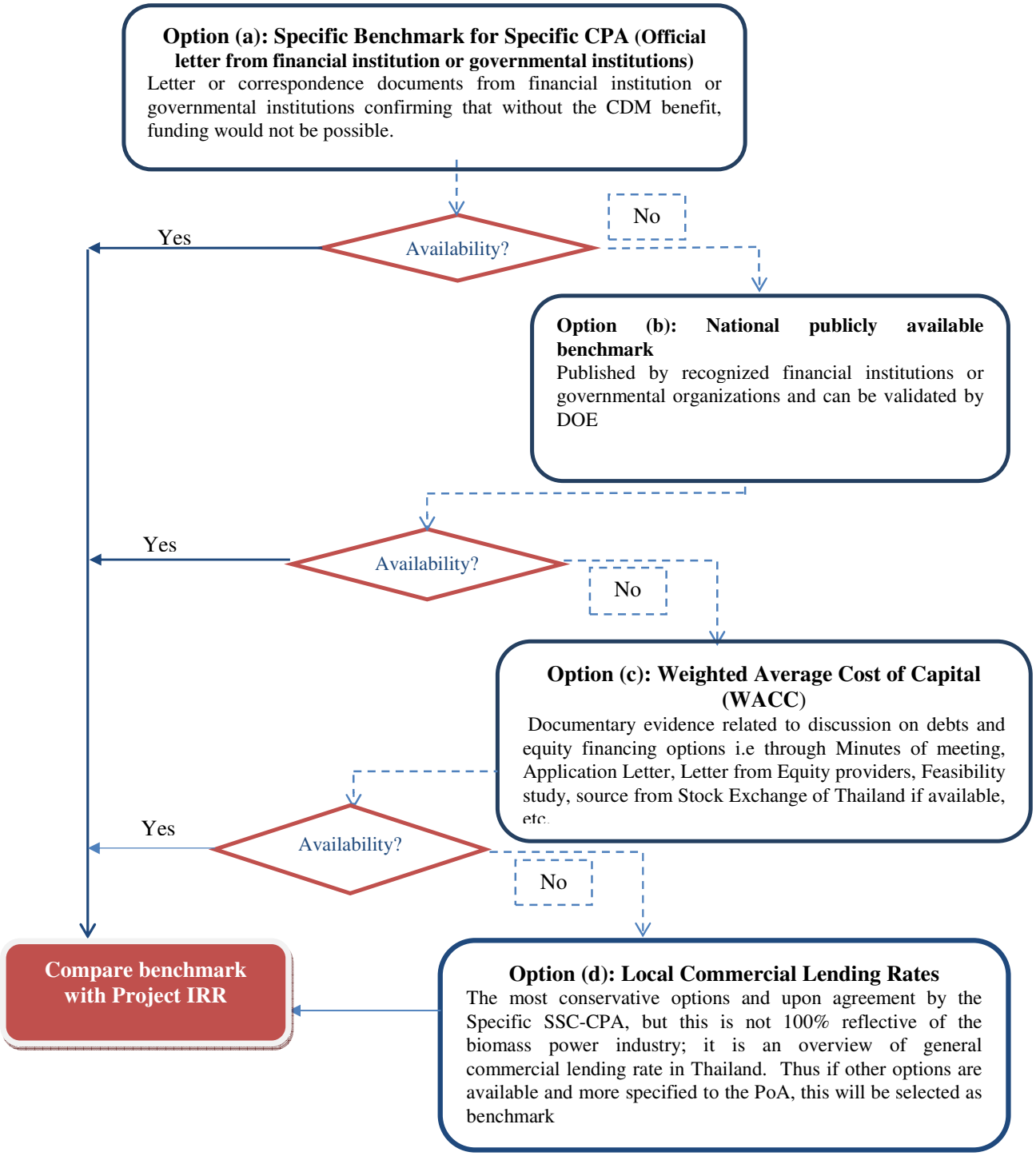
Annex 7

Guide for SSC-CPA to determine the appropriate applicable selection of benchmark option