CLEAN DEVELOPMENT MECHANISM
SIMPLIFIED PROJECT DESIGN DOCUMENT
FOR SMALL-SCALE PROJECT ACTIVITIES (SSC-CDM-PDD)
Version 02

CONTENTS

Revision history of this document

Version Number	Date	Description and reason of revision
01	21 January 2003	Initial adoption
02	8 July 2005	• The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document. • As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <http://cdm.unfccc.int/Reference/Documents>.

SECTION A. General description of the small-scale project activity

A.1. Title of the small-scale project activity:

>>
Amurang Biomass Cogeneration Project
Version 5
23/10/07

A.2. Description of the small-scale project activity:

>>
The Amurang Biomass Cogeneration Plant Project (hereafter known as the "Project") will consist of a cogeneration facility that will combust waste biomass; the project is located in North Sulawesi, Indonesia. The combustion of the biomass will generate enough electricity and heat to meet the requirements of the Cargill copra crushing facility, which will process 500 tonnes of copra per day. The facility's main activities include the crushing of the dried coconut kernel (the "flesh" or "meat") –copra– to extract coconut oil and to make coconut expel. The cogeneration plant will replace a boiler and gensets which are currently running on diesel fuel. The Project activity will allow the facility to upgrade from processing 150 tonnes of copra per day to processing 500 tonnes per day, with no combustion of fossil fuels, except when necessary for back up or start up.

The Project will reduce emissions through the displacement of heat and electricity generated with fossil fuels. The project is estimated to reduce an estimated average of 30,263 tonnes of CO_2e per year.

By utilizing biomass to displace fossil fuels in power generation, the Project will greatly contribute to the development of Indonesia's renewable energy sources. The controlled combustion of biomass in the plant's boiler offers a more environmentally sound manner of disposal of biomass waste residues. In addition, the use of domestically available biomass energy helps to reduce the reliance on imported fossil fuels to meet the country's expanding energy requirements.

The Project will contribute to the host nation's sustainable development in the following ways:

- Generate clean energy.
- Generate additional income for coconut farmers through the sale of coconut waste.
- Create temporary and permanent jobs in the area.
- Demonstrate replicable clean energy technology.
- Optimise the use of natural resources and avoid new uncontrolled waste disposal sites.
- Increase diversity and security of electricity supply.
- Reduce greenhouse gas (GHG) emissions by displacing energy from fossil fuel thermal power plants.

A.3. Project participants:

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Please list project participants and Party(ies) involved and provide contact information in Annex 1. Information shall be indicated using the following tabular format.		
Name of Party involved	Private and/or public entity(ies) project participants (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant
Indonesia	PT Cargill Indonesia	No

Switzerland	Cargill International SA	No
United Kingdom	EcoSecurities Group plc.	No
(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required.		
Note: *When the PDD is filled in support of a proposed new methodology (forms CDM-NBM and CDM-NMM),* at least the host Party(ies) and any known project participant (e.g. those proposing a new methodology) shall be identified.		

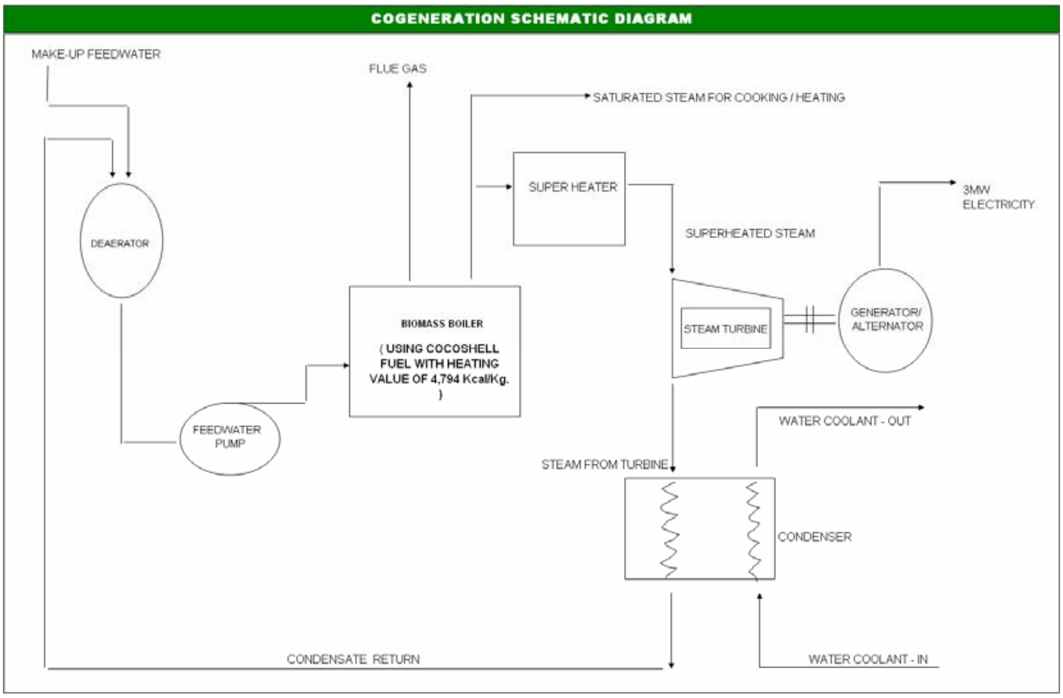
EcoSecurities Group plc is the official contact for the CDM project activity. Further contact information for the project participants are provided in Annex 1 of this document.

A.4. Technical description of the small-scale project activity:

>>
The cogeneration facility consists of a biomass boiler that produces steam for two purposes: driving a turbine to generate electricity and heating and processing within the copra crushing plant. The generation of energy from the Project will allow the facility to process 500 tonnes per day of copra.

Twenty-four (24) tons per hour of the steam produced by the biomass boiler will be superheated to 360º C at 30-bars pressure. This will be used to drive a condensing type steam turbine which will power a 3 MW_e electricity generator. The electricity will be used to power the process equipments like copra grinders, copra crackers, copra flakers, full pressing Anderson Expellers, air compressors, assorted pumps and blowers, truck lifters, bucket elevators, cookers, various conveyors, and cake coolers of the facility, as well as the office, the laboratory, and housing facilities.

The 7 ton/hr of saturated steam at 10 bars generated in the 4.3 $MW_{thermal}$ capacity heat component of the Project will be used to process copra and heat copra crude palm oil. In addition to the Project activity, a 4.5 ton per hour at 10-bars biomass steam boiler will serve as an alternative boiler or a back up to the cogeneration facility. When absolutely necessary, the fossil fuel boilers will also be available for backup.



Cogeneration

The cogeneration facility will combust coco shells and husks, with a back up of palm kernel shells, from North Sulawesi and East Kalimantan. The boiler combustion temperature will be 800 degrees Celsius. In the absence of the project activity the coco products would remain at coconut farms, unused, and the palm kernel shells would be incinerated and left to decay at the mills. Before being burned at the Project activity, the biomass fuel will be crushed to achieve greater combustion efficiency. The biomass will be stored in a covered shed to keep it dry. Ashes from the combustion of the biomass will be used as backfilling material or as fertilizer.

Project data

	Electricity	**Heat/Processing**
Boiler capacity	3 MW_e	4.3 MW thermal
Amount of energy produced	24 tons/hr	7 tons/hr
Boiler combustion temperature	800 degrees Celsius	
Type of steam	Superheated	Saturated
Steam pressure and temperature	30 bars at 360 degrees Celsius	10 bars at 180 degrees Celsius
Fuel	Coco shells, coco husks, (palm kernel shells)	
Energy usage	Expeller presses, conveyors, elevators, pumps, office, laboratory, housing, facility accessories	Heating and processing of copra

A.4.1. Location of the small-scale project activity:

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A.4.1.1. Host Party(ies):

>>
Indonesia

A.4.1.2. Region/State/Province etc.:

>>
North Sulawesi

A.4.1.3. City/Town/Community etc:

>>
Amurang

A.4.1.4. Detail of physical location, including information allowing the unique identification of this small-scale project activity(ies):

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The project is located at latitude: 1 deg/11 minutes / 29 seconds; longitude: 124 deg /33 minutes / 17.8 seconds. The closest airport is Manado International Airport. The estimated distance from Amurang to Manado Airport is 80 kilometers.

A.4.2. Type and category(ies) and technology of the small-scale project activity:

>>
The category for the project activity according to the UNFCCC's published simplified procedures for small-scale activities is Type I.C. (AMS-I.C.) – Thermal energy for the user- version 09, 23 December 2006. The Project conforms to the project category since, for Type I.C., the Project utilizes a renewable energy technology that has a generation capacity of less than 15 MW and the capacity for the boilers do not exceed 45 MW thermal.

A.4.3. Brief explanation of how the anthropogenic emissions of anthropogenic greenhouse gas (GHGs) by sources are to be reduced by the proposed small-scale project activity, including why the emission reductions would not occur in the absence of the proposed small-scale project activity, taking into account national and/or sectoral policies and circumstances:

>>
The Project activity consists of the installation of a 3 MW electricity capacity and 4.3 MW thermal capacity biomass cogeneration plant to power a copra crushing facility in Indonesia. The project will directly reduce greenhouse gas emissions by burning biomass instead of diesel in the plant's boilers; instead, a renewable waste product will be burned in an efficient cogeneration facility. The project will reduce greenhouse gas emissions by an estimated average of 30,263 tonnes of CO_2e per year.

Please refer to section B.3 for more details about why emission reductions would not occur in the absence of the project activity.

A.4.3.1 Estimated amount of emission reductions over the chosen crediting period:

>>

Please indicate the chosen crediting period and provide the total estimation of emission reductions as well as annual estimates for the chosen crediting period. Information on the emissions reductions shall be indicated using the following tabular format.

For type (iii) small-scale projects the estimation of project emissions is also required.

Years	Annual estimation of emission reductions in

	tonnes of CO2e
2008	30,263
2009	30,263
2010	30,263
2011	30,263
2012	30,263
2013	30,263
2014	30,263
*After the initial 7-year crediting period, the baseline will be reassessed, generating a new estimate of emissions reductions yet to be determined.	
Total estimated reductions (tonnes of CO2e)	211,841
Total number of crediting years	7*3=21
I. ANNUAL AVERAGE OVER THE CREDITING PERIOD OF ESTIMATED REDUCTIONS **(TONNES OF CO2E)**	30,263

A.4.4. Public funding of the small-scale project activity:

>>
This project has not received and is not seeking public funding.

A.4.5. Confirmation that the small-scale project activity is not a debundled component of a larger project activity:

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Based on the information provided in Appendix C, this Project is not a debundled component of a larger project activity since the project participants have not registered or operated another project in the region surrounding the project boundary.

SECTION B. Application of a baseline methodology:

B.1. Title and reference of the approved baseline methodology applied to the small-scale project activity:

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- AMS I.C., version 09, 23 December 2006, "Thermal energy for the user."
  - Reference to AMS I.D., version 10, 23 December 2006, "Grid connected renewable electricity generation."

B.2 Project category applicable to the small-scale project activity:

>>

The baseline calculation for the Project follows the procedures as outlined in Appendix B (version 07, 28 November 2005) of the simplified modalities and procedures for small-scale CDM project activities for categories:

- AMS-I.C. – *Thermal energy for the user*
  - "This category comprises renewable energy technologies that supply individual households or users with thermal energy that displaces fossil fuels."

The Project category is applicable because it all the boilers affected by the project activity combined do not exceed 45 $MW_{thermal}$.The alternative to the project would be to continue with the business-as-usual scenarios, which is continued fossil fuel-fired electricity generation

B.3. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered small-scale CDM project activity:

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The most realistic baseline scenarios have been identified as below and the baseline scenario has been selected.

Step 1. Identification of alternatives to the project activity consistent with current laws and regulations

Define realistic and credible alternatives to the project activity(s) that can be (part of) the baseline scenario through the following sub-steps:

Sub-step 1a. Define alternatives to the project activity:

1. Continuation of the current situation of generating heat and electricity using diesel oil
2. Generation of heat using diesel and purchasing electricity from the national PLN grid
3. Project activity undertaken without being registered as a CDM project activity

Outcome of Step 1a: Identified realistic and credible alternative scenario(s) to the project activity

1. The continuation of business as usual, Scenario 1, is a realistic and credible alternative scenario.
2. Scenario 2 is not realistic as there is not a sufficient amount of power in the existing grid to meet existing industrial and domestic needs, therefore it would not be possible for the plant to secure a sufficiently large or reliable electricity supply from the grid[1].
3. Scenario 3 is not realistic and credible as the project activity faces many barriers as will be described below.

Sub-step 1b. Consistency with mandatory laws and regulations:

All of the proposed alternatives are in compliance with all mandatory applicable legal and regulatory requirements.

According to Attachment A to Appendix B of the simplified modalities and procedures for CDM small-scale project activities evidence to why the proposed project is additional is offered under the following categories of barriers: (b) technological barrier and (c) prevailing practice.

Technological barrier:

[1] *Blackouts hit Sulawesi, Sumatra*. Jakarta Post. 07 September 2006.

There are a number of technological barriers for the project activity. Firstly, Cargill is knowledgeable about running gensets and boilers on diesel oil, but not on biomass residues. Within the project activity, there will be two major technology changes: 1) the use of a cogeneration system and 2) the use of biomass residues.

Power production from cogeneration in Indonesia represents only 5% of total power production in the country and of this, biomass based cogeneration facilities represent an even smaller fraction. Although there are existing cogeneration plants in Indonesia, these plants are all industrial cogeneration facilities located in large industries[2]. This lack of development of biomass cogeneration is due to a lack of experience, and presents a technological barrier for a biomass cogeneration project at a small manufacturing facility. In contrast to the easily available fossil fuel based systems, cogeneration facilities are not readily available. They must be custom made which results in additional costs and a long preparation period. There is also the increased risk from using a novel and unfamiliar technology.

The Cargill staff is currently trained to use the existing diesel oil system. As there is a significant lack of cogeneration development for small industries in the agricultural and commercial sectors in the region[3], the knowledge and expertise to operate a cogeneration facility is not inherent. Cargill personnel must be trained to operate and service the facility. Skills such as proper collection, weighing and disposal of the ash from the boiler must be learned by the staff. The staff will be trained by PT Weltest, the provider of the cogeneration facility.

Additionally, there is a need to install a water treatment plant to make sure that the cogen boiler receives the water at the desired quality. The service life of the boiler and steam turbine will largely depend on the water treatment program which will use: softeners to remove water hardness, demineralizers to remove salt and calcium minerals in the water, and chemicals to prevent scale formation and corrosion in boiler water tubes. As much as possible, condensates from the process will be recovered. Water treatment plants for fossil fueled facilities are not as large and complex as is necessary for a cogeneration plant; this translates to additional costs and technology needed for the cogeneration facility. If the water treatment plant does not remove all the undesirable contaminants present in the feed water, there is a risk of technical difficulties in the facility. These difficulties could cause premature damage on the boiler tubes thus resulting to prolonged downtime or slowdown of the copra crushing operations.

There is also a technology barrier associated with the transportation, storage, pre-treatment and handling of the biomass residues. There is a challenge associated with the freight and handling of the cocoshell fuel. Due to the bulkiness of coconut shells, the loads of the trucks cannot be maximized unless the coconut shells are crushed. The crushing is typically only done if the suppliers are willing. If the suppliers do not want to crush the shells, more trips to transport the biomass waste will be required. In order to avoid having to transport coconut shells long distances, research must be done to find stock piles from which the shells can be removed. It is typical that the coconut residues are located in areas that are not accessible by trucks. Farmers must first transport the residues by cow-pulled carts to areas that are accessible by trucks. Developing relationships with the biomass waste owners and infrastructure to reach the shells will require time and effort and is another technological barrier. Additionally, the facility staff is used to working with a homogeneous fuel – diesel oil. With biomass residue, the staff must constantly be aware that the fuel is very heterogeneous and of variable quality (e.g. varying moisture quality). The staff must learn to test moisture content and then test every batch of biomass residues that are purchased to ensure a moisture content of less than 19%

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[2] EC-ASEAN COGEN Programme Phase III, “Cogeneration Development in Asean.” 2004.

[3] EC-ASEAN COGEN Programme Phase III, “Cogeneration Development in Asean.” 2004.

Finally, there is the barrier associated with the need to guarantee of a long term supply of biomass. There is no guarantee of a long term supply; there is a continued risk of shortage of the supply of biomass residues due to uncontrollable circumstances such as natural disasters or pests. The Project activity will not be able to continue if there is not a sufficient amount of biomass residues available.

Coconut palm trees are susceptible to diseases such as: root wilt, lethal yellowing, cadang cadang, Ganoderma wilt and stem bleeding[4]. The project activity's back up supply of biomass residue is palm oil kernels. However, palm oil trees are also susceptible to diseases such as Ganoderma which causes basal rot. This is one of the most important diseases for oil palm, particularly in Southeast Asia. Disease management is constrained by limited understanding of the Ganoderma strains involved and of mechanisms of disease establishment and spread[5]. Currently, none of these diseases are abundant in Sulawesi and so, there is an excess of residues. However, if one of these diseases was to infect the palm population in the project activity region, a shortage of residues may occur.

Furthermore, there is neither additional plantation land available in North Sulawesi nor is there a replanting programme. The means that it is not possible for the copra supply and, hence, coconut shell availability to increase. This was determined through a survey conducted by Cargill's crop production surveyor.

Barrier due to prevailing practice:
Fossil fuel based energy systems are relatively low-tech and represent the most common practice for off-grid heat and power applications throughout the developing world; 80% of Indonesia's power comes from thermal/ fossil fuel sources[6]. The skills for facility maintenance of fossil fuel based off-grid heat and power applications are easily obtainable from the existing local population and there is little performance risk from the technology. In contrast to the number of fossil-fuel fired projects, there have been few small industrial cogeneration facilities in Indonesia; there are currently no other cogeneration facilities in North Sulawesi. The cogeneration industry is therefore relatively small and there is limited domestic capacity for facility service and maintenance requirements. Fossil fuel based generators and boilers are readily available on the market.

As demonstrated, the majority of manufacturing facilities, especially small scale facilities, are powered through the combustion of fossil fuels in boilers and in their engine driven generators. This continuation of the prevailing practice presents no particular obstacles. The Project activity is introducing not only a new technology, but also an atypical fuel. The installation of a private power facility utilizing biomass is a step away from the prevailing practice as the large majority of Indonesia's power plants are fossil fuel powered[7] and owned by PLN, the state electricity company. Also worth noting is that the installation of a power facility by a private entity is not common practice in Indonesia.

Conclusion:

The impacts of considering the project as a CDM projects are the followings:
Technological Barriers

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[4] Nair, M. K.; Rajesh, M. K. (2001) Coconut Production and Productivity. Indian Coconut Journal 32(2) 2-12.

[5] *Ganoderma Diseases of Perennial Crops*. British Society for Plant Pathology.

[6] Energy Information Administration, Indonesia Country Analysis Brief. 2005.

[7] Global Energy Network Institute. 2003.
Hhttp://geni.org/globalenergy/library/national_energy_grid/indonesia/index.shtmlH.

- Cargill is not accustomed to using a biomass residue cogeneration facility. The staff is used to working with boiler and gensets combusting diesel to generate heat and power. Training of the staff to work with the new equipment and fuel must be conducted.
- Staff must be trained to work with the water treatment plant to ensure optimal operation of the cogeneration facility. Currently, there is no water treatment plant; this is a new piece of equipment that must be operated and maintained by Cargill staff.
- Biomass residues are much more complex to transport, handle and measure moisture content, and store. This provides a technology barrier in comparison with the baseline fuel of diesel oil which is easily transported and handled.
- There is a risk of shortage of biomass residues in the region. Although there is currently an excess of coconut residues, with a back up of palm kernel residues, there is a constant risk of diseases such as Ganoderma which may greatly affect the palm population in the region.

Prevailing Practice:

- Prevailing practice is fossil fuel facilities. The use of biomass residues is not common practice in Indonesia.
- Small industrial cogeneration facilities are not common practice in Indonesia.
- There are no other cogeneration facilities in North Sulawesi.

The above section clearly demonstrates that this project faces investment and technological barriers and is not prevailing practice. The cogeneration facility requires a large capital investment and there is a lack of technical knowledge about the cogeneration facility and the use of coco shells at the facility. Finally, the Project activity is not prevailing practice in the area. The use of the Clean Development Mechanism will help to overcome these barriers in order to create a clean, sustainable energy project.

B.4. Description of how the definition of the project boundary related to the baseline methodology selected is applied to the small-scale project activity:

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As referred to in Appendix B for small-scale project activities:

- The project boundary for AMS-I.C. is the physical, geographical site of the renewable energy generation.

B.5. Details of the baseline and its development:

>>

The baseline calculation for the Project follows the procedures as outlined in Appendix B (version 07: 28 November 2005) of the simplified modalities and procedures for small-scale CDM project activities for categories:

- AMS-I.C. – "Thermal energy for the user": Methodology AMS-I.D. was used for the baseline scenario
  - AMS- I.D., version 10, 23 December 2006, was used to calculate the baseline for the electricity component of the project as instructed by the methodology. The baseline used is the annual kWh generated by the renewable unit times an emission coefficient for a modern diesel generating unit of >200 kW operating at optimum load as seen in Table I.D.1 in AMS-I.D.
  - Emission reductions from savings of fossil fuels are determined by dividing the quantity of generated heat that displaces heat generation in fossil fuel fired boilers by the net calorific value of the fuel and the efficiency of the boiler that would be used in the absence of the project activity, and by multiplying with the respective CO_2 emission factor.

The baseline study was prepared on 20/9/06 by:
EcoSecurities Group plc Tel: +1 212 356 0160 (contact: Courtney Blodgett, Courtney@ecosecurities.com). EcoSecurities Group plc is a project participant.

SECTION C. Duration of the project activity / Crediting period:

C.1. Duration of the small-scale project activity:

>>

C.1.1. Starting date of the small-scale project activity:

>>
01/01/08 (operation date)

C.1.2. Expected operational lifetime of the small-scale project activity:

>>
25 years

C.2. Choice of crediting period and related information:

>>
Renewable crediting period (7 years per crediting period, renewable for up to 21 years)

C.2.1. Renewable crediting period:

>>

C.2.1.1. Starting date of the first crediting period:

>>
01/01/08

C.2.1.2. Length of the first crediting period:

>>
7 years, 0 months

C.2.2. Fixed crediting period:

>>
Not applicable

C.2.2.1. Starting date:

>>

C.2.2.2. Length:

>>

SECTION D. Application of a monitoring methodology and plan:

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D.1. Name and reference of approved monitoring methodology applied to the small-scale project activity:

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According to Type I.C. "Thermal energy for the user" contained in Appendix B of the simplified M&P for CDM small-scale activities, version 8, monitoring shall consist of metering the thermal and electrical energy generated for co-generation projects.

The thermal energy generated by the Amurang Biomass Cogeneration Facility will displace thermal energy generated by fossil fuels in the absence of the project activity. In such cases, baseline emissions are calculated by multiplying the savings of fossil fuels with the emissions factor of these fuels. This project determines savings of fossil fuels by dividing the generated thermal energy by the net calorific value of the fuel displaced and the efficiency of the boiler that would be used in the absence of the project activity.

D.2. Justification of the choice of the methodology and why it is applicable to the small-scale project activity:

>>

The chosen methodology is to be used in conjunction with baseline methodology AMS-1.C., version 09, 23 December 2006. The proposed activity meets all the applicability requirements as described in Appendix B.

D.3 Data to be monitored:

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ID number	Data type	Data variable	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	For how long is archived data to be kept?	Comment
1.	Electricity generated	Q_{elec}	MWh/yr	m	Continuous	100%	Electronic	Crediting period + 2 years	
2.	Steam generated for heat component	S	t/hr	m	Daily	100%	Electronic	Crediting period + 2 years	
3.	Steam energy content	$Q_{steam,}$	kJ/kg	e	Daily	100%	Electronic	Crediting period + 2 years	This will be estimated using steam tables based on the temp and pressure of the steam
4.	Steam temperature	T	°C	m	Daily	100%	Electronic	Crediting period + 2 years	
5.	Steam pressure	P	bar	m	Daily	100%	Electronic	Crediting period + 2 years	
6.	Steam generation for heat operating hours	$O_{hr,1}$	hours	m	Daily	100%	Electronic	Crediting period + 2 years	Based on the daily operating hours the total flow per day will be calculated which in turn will be aggregated per year
7.	Auxiliary fossil fuel usage	$Q_{y,ff}$	t or m^3	m	Periodically	100%	Electronic	Crediting period + 2 years	
8.	Quantity of biomass residues combusted in the year “y”	$Q_{waste,y}$	t/yr	m/c	Monthly	100%	Electronic	Crediting period + 2 years	
9.	Unused biomass availability in the region	$Q_{waste,unused}$	t/yr	e	Annually	100%	Electronic	Crediting period + 2 years	A surplus of a quantity of 25% greater than the biomass that will be utilised is to be demonstrated using published literature, official reports, surveys etc.

D.4. Qualitative explanation of how quality control (QC) and quality assurance (QA) procedures are undertaken:

>>

QC and QA

Data	*Uncertainty level of data (High/Medium/Low)*	*Explain QA/QC procedures planned for these data, or why such procedures are not necessary.*
1-2, 4-8	Low	The data will be directly measured and monitored at the project site. All relevant records will be checked to ensure accuracy and consistency.
3	Low	Determined from external sources i.e. steam tables.
9	Medium	To be demonstrated using surveys, published literature, etc

D.5. Please describe briefly the operational and management structure that the project participant(s) will implement in order to monitor emission reductions and any leakage effects generated by the project activity:

>>

See the table below for the operational procedures and responsibilities for monitoring. All internal standard procedures will be followed.

E = Executive responsibility
R = Responsibility for overseeing and assuring quality
I = To be informed

Task	Amurang Facility Operators	Amurang Operations Manager	Equipment Supplier / External Company	EcoSecurities
Collect Data	E	R	N/A	N/A
Enter data into Spreadsheet	E	R	N/A	N/A
Make monthly & annual reports	E	R	N/A	I
Archive data & reports	E	R	N/A	N/A
Calibration/ maintenance; rectify faults	N/A	R	E	I

D.6. Name of person/entity determining the monitoring methodology:

>>

The monitoring methodology was prepared by:
EcoSecurities Group plc, CDM consultant, Tel: +1 212 356 0160 (contact: Courtney Blodgett, Courtney@ecosecurities.com). EcoSecurities Group plc is a project participant.

SECTION E.: Estimation of GHG emissions by sources:

E.1. Formulae used:

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E.1.1 Selected formulae as provided in appendix B:

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The baseline calculation for the Project follows the procedures as outlined in Appendix B (version 07: 28 November 2005) of the simplified modalities and procedures for small-scale CDM project activities for categories:

- AMS-I.C. – "Thermal energy for the user": Methodology AMS-I.D. was used for the baseline scenario
    - AMS- I.D. was used to calculate the baseline for the electricity component of the project. The baseline used is the annual kWh generated by the renewable unit times an emission coefficient for a modern diesel generating unit of >200 kW operating at optimum load as seen in AMS I.D., Table I.D.1.

E.1.2 Description of formulae when not provided in appendix B:

>>

E.1.2.1 Describe the formulae used to estimate anthropogenic emissions by sources of GHGs due to the project activity within the project boundary:

>>

For AMS-I.C., the IPCC Guidelines[8] state that biomass combustion is equal to its regrowth, therefore there are zero net emissions from the combustion of the biomass in the Project activity.
Auxiliary fossil fuels will be monitored. However, they are expected to be negligible[9] and therefore will not be considered.

CO_2 emissions from the auxiliary fuel consumed – if significant- will be estimated assuming the complete oxidation of carbon to CO_2 in the combustion.

$$PE_{y,comb} = Q_{,fuel} * E_{y,fuel}$$

where:

$Q_{,fuel}$:Quantity of auxiliary fuel used in the year "y" (tonnes)
$E_{y,fuel}$:CO_2 emission factor for the combustion of the auxiliary fuel (tonnes CO_2 per tonne fuel,

[8] Revised 2006 IPCC Guidelines for National Greenhouse Gas Inventories

[9] Estimated 50-100 litres/yr

according to IPCC Guidelines)

E.1.2.2 Describe the formulae used to estimate leakage due to the project activity, where required, for the applicable project category in appendix B of the simplified modalities and procedures for small-scale CDM project activities

>>

According to Appendix B, I.C., paragraph 8, leakage is to be considered only if the equipment is transferred from another activity or if the existing equipment is transferred to another activity. Since there is no transfer of equipment in this project, there are no sources of leakage expected from the project.

In accordance with Attachment C, Cargill conducted surveys on the supply of the coconut residues in the area. The surveys were completed in August 2006 and demonstrated that there is an annual surplus of over 50,000 tons, of coconut shells, and 250,000 mt of coconut husks. A survey about the annual excess availability of palm kernel shells was also conducted:

	2008	**2010**	**2012**	**2014**	**2015**
Available palm kernel shell (thousand t/yr)	136.95	177.33	244.75	320.47	357.23

As required in Attachment C, General guidance on leakage in biomass project activities, the quantity of biomass availability in the region is greater is at least 25% larger than the quantity of biomass that is utilised including the project activity. This will be monitored in accordance with the approved monitoring methodology of AMS I.C.

E.1.2.3 The sum of E.1.2.1 and E.1.2.2 represents the small-scale project activity emissions:

>>

There is no leakage in this project or project emissions from the Project activity.

E.1.2.4 Describe the formulae used to estimate the anthropogenic emissions by sources of GHGs in the baseline using the baseline methodology for the applicable project category in appendix B of the simplified modalities and procedures for small-scale CDM project activities:

>>

Baseline emissions from steam generation

For steam generation, I.C. paragraph 5 states:

"For renewable energy technologies that displace technologies using fossil fuels, the simplified baseline is the fuel consumption of the technologies that would have been used in the absence of the project activity multiplied by an emissions coefficient for the fossil fuel displaced. IPCC default values for emission coefficients may be used."

Baseline emissions are calculated by multiplying the savings of fossil fuels with the emission factor of these fuels. Ex-post estimates of savings of fossil fuels are determined by dividing the net generated heat in the project activity by the net calorific value of the fuel and the efficiency of the boiler that would be used in the absence of the project activity.

Baseline emissions for steam production, $ES_{baseline}$, are given by:

$$ES_{baseline}\ (tCO_2/yr) = SFF\ (t\ fuel/year) * \langle ES \rangle_{baseline}\ (tCO_2/t\ fuel)$$

Where SFF stands for saved fossil fuel; and

<*ES*>$_{baseline}$ is a calculated emission coefficient for diesel (tCO_2/ tonne fuel).

Savings of fossil (SFF) fuels is given by:

$$SFF\ (tonne/year) = Q_{energy}\ (GJ/year) \div (\varepsilon_{boiler} * NCVi\ (GJ/\ tonne)\ )$$

Where Q_{energy} is the quantity of thermal energy generated in the biomass-based boiler; and

ε_{boiler} is the energy efficiency of the boiler being replaced and

NCVi is the net calorific value of the diesel fuel displaced due to the project activity in GJ/t fuel. (NCV for diesel is 43.0 GJ/tfuel[10])

The quantity of thermal energy (Q_{energy}) is determined as follows:

$$Q_{energy}\ (GJ/year) = Q_{steam}\ (GJ/tonne) \times \sum[(S\ (tonnes/hour) \times O_{hr}\ (hours/day)]_y$$

Q_{steam} = Energy content of steam (GJ/tonne)
S = Steam generated (tonnes/hour) (to be aggregated per year)
O_h = Daily operating hours, (to be aggregated per year)

Q_{steam} is a function of the steam temperature (T) and pressure (P). As temperature and pressure of the steam are known, the energy content was calculated by referring to a standard steam table[11].

The baseline calculation is presented below.
Savings of fossil (SFF) fuels is given by[12]:

$$SFF\ (tonne/year) = Q_y\ (GJ/year) \times (43.00\ GJ/tfuel)$$

Actual steam generated will be used to estimate the baseline emissions on an ex-post basis.

<u>Baseline emissions from electricity generation</u>

$$BE_{elec} = Q_{elec} \times EF_{diesel\ unit}$$

Where:

---

[10] tCO_2/t fuel was calculated as follows with 2006 IPCC data for diesel fuel: 20.20 (kgC/GJ) * 44/12 (t CO_2/t C) * 43.00 (GJ/t fuel)

[11] Excel Engineering steam table. www.x-eng.com. 2006.

[12]. In determining emissions reductions during the crediting period, the baseline will be calculated annually *from the total amount of measured steam produced in the project per year.*

BE_{elec}= Baseline emissions from electricity generation
Q_{elec}= Generation of electricity (kWh)
$EF_{diesel\ unit}$= Emission coefficient for a modern diesel generating unit of the relevant capacity operating at optimal load as given in AMS.I.D[13].

E.1.2.5 Difference between E.1.2.4 and E.1.2.3 represents the emission reductions due to the project activity during a given period:

>>

For the small scale methodology I.C, the project emission reductions are:

$$ER_y = BE_y - (PE_{total} + Leakage)$$

Where:

ER_y: Emission reduction in the year "y" (tonnes of CO_2 equivalent)
BE_y: $ES_{baseline} + BE_{elec}$
PE_{total}: $PE_{transp} + PE_{,power}$
Leakage: Not applicable

ER_y = 30,263 tCO_2/yr – 0 tCO_2/yr

ER_y = 30,263 tCO_2e/yr

E.2 Table providing values obtained when applying formulae above:

>>

Electricity and heat generation component for the AMS-I.C small scale methodology:

Years	Estimation of baseline emissions (tonnes of CO_2 e)	Estimation of project activity emissions (tonnes of CO_2e)	Estimation of leakage (tonnes of CO_2 e)	Estimation of emission reductions (tonnes of CO_2 e)
2008	30,263	0	0	30,263
2009	30,263	0	0	30,263
2010	30,263	0	0	30,263
2011	30,263	0	0	30,263
2012	30,263	0	0	30,263
2013	30,263	0	0	30,263
2014	30,263	0	0	30,263
Total (tonnes of CO_2)	211,841	0	0	211,841

Emission reductions estimations taken both methodologies into account:

Years	Annual estimation of emission reductions over the chosen crediting period
2008	30,263
2009	30,263

[13] Diesel generating unit is >200 kW so 0.8 is used

2010	30,263
2011	30,263
2012	30,263
2013	30,263
2014	30,263
Total estimated reductions (tonnes of CO_2)	211,841
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tonnes of CO_2)	30,263

SECTION F.: Environmental impacts:

F.1. If required by the host Party, documentation on the analysis of the environmental impacts of the project activity:

>>
Indonesia does not require Environmental Impact Assessments (EIA) for biomass power plant project generating less than 10 MW. As Amurang does not generate 10 MW, an EIA is not required. However, the environmental management and monitoring plan of the copra crushing facility was adjusted to include the biomass cogeneration facility. The adjustment was approved by Kepala Dinas Pertambangan, Energi, the Amurang District Environmental Agency.

SECTION G. Stakeholders' comments:

G.1. Brief description of how comments by local stakeholders have been invited and compiled:

>>
On 17 July 2006, the stakeholder consultation for the Project was held in the PT Cargill Indonesia office in the village of Kawangkoan Bawah. Attendees were invited through mail invitations and by telephone. Invitees included:

- the chiefs of four local villages,
- copra suppliers,
- representatives from the religious community,
- the head of the district, the local police chief,
- the head of the development committee and of the environment and energy department,
- representatives from the environmental impact analysis agency and from the environmental department at the local university.

Almost all of the invited stakeholders attended the consultation. At the consultation, presentations were given about the Clean Development Mechanism, Cargill and the Project activity. This was followed by a question and answer period; questions and comments given can be seen in section G.2.

G.2. Summary of the comments received:

>>
During the consultation, presentations were given about Cargill, the Clean Development Mechanism and about the Project. Questions were asked regarding:

- The use of the power (internal use only)

- Amount of biomass to be used (35,000 t/yr)
- Environmental impact in comparison with other power plant types (low environmental impact)
- Black smoke that could be produced (biomass will be burned at a high enough temperature – 800 degrees Celsius - to not produce the smog)
- The EIA does not give many details about the cogeneration facility (an amendment to the EIA was completed).

G.3. Report on how due account was taken of any comments received:

>>

The comment regarding the lack of information in the EIA was addressed. EIAs are not required for biomass projects of less than 10 MW but an amendment to the environmental management and monitoring plan of the copra crushing facility was completed and approved. It was not necessary to take due account of any of the other comments received.

Annex 1

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

Not applicable

ANNEX 3
BASELINE INFORMATION

	Factor	Value	Unit	Source
Heat generation	Steam generation	7.0	t/hr	Project developer
	Steam energy content	2,776.20	Kj/kg	Steam tables
	Efficiency of boiler being replaced	87	%	Manufacturer
	CEF of diesel	20.2	kgC/GJ	2006 IPCC
	Energy content of diesel	43.0	GJ/t	2006 IPCC
	Fraction oxidised	100	%	2006 IPCC
	Molecular weight C to CO_2	44/12		2006 IPCC
Electricity generation	Net capacity	2.5	MW	Project developer
	Operating days	345	Days/yr	Project developer
	Operating hours	24	Hrs/day	Project developer
	Electricity generation	20,700	MWh/yr	Calculated
	Diesel genset EF	0.8	tCO2/MWh	AMS. I.D.