Appendix A[1] to the simplified modalities and procedures for small-scale CDM project activities

CLEAN DEVELOPMENT MECHANISM
SIMPLIFIED PROJECT DESIGN DOCUMENT
FOR SMALL SCALE PROJECT ACTIVITIES (SSC-PDD)
Version 01 (21 January, 2003)

CONTENTS

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[1] This appendix has been developed in accordance with the simplified modalities and procedures for small-scale CDM project activities (contained in annex II to decision 21/CP.8, see document FCCC/CP/2002/7/Add.3) and it constitutes appendix A to that document. For the full text of the annex II to decision 21/CP.8 please see http://unfccc.int/cdm/ssc.htm).

A. General description of project activity

A.1 Title of the project activity:

Paramonga CDM Bagasse Boiler Project

A.2 Description of the project activity:

Agro Industrial Paramonga S.A. - AIPSA, the project proponent, is the largest sugar company in Peru, producing approximately 110 thousand metric tonnes of sugar annually, which represents an 11% share of the total national sugar production. AIPSA's output is produced on 10.453 hectares of sugar cane; 6.717 of their own and 3.736 leased from different land owners. AIPSA is situated approximately 200 kilometres north of Lima. Its climatic conditions allow AIPSA to produce continuously through out the 12 months of the year.

AIPSA was one of the first sugar companies established in Peru. When the company was set up in the late 1800s, it was conceived with two principal production activities: sugar and paper. For an efficient use of the bagasse, the company was initially designed so that the bagasse generated by the milling of cane from the sugar production activity was transferred directly to the paper plant to produce pulp. The energy and steam requirements for the joint production activities were supplied by boilers that operated mainly with Residual Fuel Oil and complemented on a minor scale with pith (a residual of the pulp process) and leftover bagasse.

In 1974 the company was nationalized and divided into two independent companies by the government of Peru. The power plant was physically and legally divided into two side-by-side components. Supreme Decree 016 of 1974 assigned the power plant with all the boilers to the paper company (Sociedad Paramonga Ltda, now known as QUIMPAC) under the commitment that they would supply all the electric energy and steam required by the sugar company (Cooperativa Agraria Azucarera Paramonga LTDA, now known as AIPSA).

In 1990, a long-term agreement was signed by the two firms to give the sugar company the right to use QUIMPAC's main boiler and a secondary boiler to generate the electrical energy and steam for its production processes. The agreement gives Paramonga Sugar the right to use part of QUIMPAC's power plant, including the largest petroleum boiler, for 30 years. The two companies also signed agreements for the exchange of Bagasse for residual pith and Residual Fuel Oil[2].

In 1998, the sugar company was privatized, creating today's AIPSA sugar company. The paper company was also privatised and its name today is QUIMPAC. Currently, the two companies continue to supply each other with bagasse (AIPSA to QUIMPAC), and with Residual Fuel Oil and pith (QUIMPAC to AIPSA), based on the resource exchange agreements.

Today AIPSA's steam requirements are produced by the boilers using Residual Fuel Oil, complemented by residual pith and bagasse as fuel inputs. The standing 30 year agreement between AIPSA and QUIMPAC to use the main boiler for the long term, the favourable economics of continuing to use the existing arrangement, and recent investments by AIPSA to refurbish the petroleum boilers for long term use, establish the baseline scenario – continued use of the existing production system.

In 2000, AIPSA was contacted by CONAM, the national environmental authority of Peru, and was invited to participate as a case study in the National Strategy Study (NSS) for Implementation of the

[2] All references to "Oil" in this document refer to Bunker Fuels No. 6 and No. 500, produced by Petro Peru

CDM. AIPSA agreed to evaluate the economics of converting to a new bagasse boiler and displacing the use of Residual Fuel Oil, under the scenario of receiving income from certificates of emission reduction (CERs) to cofinance the new investment. The project was included in the NSS, and AIPSA worked closely with CONAM to learn about the potential benefits of applying the CDM[3].

The main objective of the CDM project activity is to generate the financial resources necessary to change the energy generation system of Agro Industria Peruana S.A. – AIPSA, from the actual Residual Fuel Oil based energy generation system, to a new sugar cane bagasse energy system. The project will replace the existing boilers with a new bagasse one, displacing the use of Residual Fuel Oil with renewable energy and zero net greenhouse gas emissions.

The following table summarize the baseline scenario and the project scenario:

Table 1. Baseline and CDM Project Scenarios		
Characteristics	**Baseline Scenario**	**Project Scenario**
Operating boilers	Foster Wheeler (120 ton/hr; 31,6 KGF/CM^2, 371 ^{0}C) Edge Moore (17,5 ton/hr; 31,6 KGF/CM^2; 371 ^{0}C)	CBS/MEIC (120 ton/hr; 42 KGF/CM^2 ; 430^{0}C)
Fuel input	Residual Petroleum Pith Bagasse	Pith Bagasse

The project will contribute to sustainable development because it will displace a fossil fuel system with a biomass based renewable energy system, generating benefits not only by reducing greenhouse gases, but by also reducing other local air pollutants and environmental impacts associated with the burning of Residual Fuel Oil which have deteriorated the local environment.

The accreditation period for the project was set beginning May 1, 2006, through April 30,2016. The tables and estimations presented in this PDD begin with 2006, and should be interpreted specifically as beginning in May 2006 and ending 12 months later. That is, the CDM operational year will run from May to April of each consecutive year.

A.3 Project participants:

Host Country - PERU
Agro Industrial Paramonga S.A.A. (AIPSA)
Mr. Jaime Wong - Director

(Official Contact Information for the CDM project)

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A.4 Technical description of the project activity:

A.4.1 Location of the project activity:

[3] World Bank-CONAM, National Strategy Study for Implementation of the CDM in Peru, 2003.

A.4.1.1	Host country Party(ies):	PERU
A.4.1.2	Region/State/Province etc.:	LIMA Department Barranca Province
A.4.1.3	City/Town/Community etc:	District of Paramonga
A.4.1.4	Detailed description of the physical location, including information allowing the unique identification of this project activity *(max one page)*:	

The CDM project activity will take place in the main processing facilities of AIPSA, specifically in the power building. AIPSA production facilities are located in the District of Paramonga at the following address: Avenida del Ferrocarril 212. The District of Paramonga is located approximately 205 Kilometres north the city of Lima. The main access road is the North Panamerican Highway, the most important thoroughfare of Perú, which runs along the Pacific Coast and joins the northern and southern regions of the country.

The following are the geographical coordinates of the location of the project activity:
Latitud: 10º40'20''
Longitud: 77º49'00''
Altitude: 11,65 above sea level.

Maps 1 and 2 presented in the Appendix VI show the detailed location of the proposed project activity.

A.4.2 Type and category(ies) and technology of project activity

Type I: Renewable Energy
Category C: Thermal energy for a user

According with the *Appendix B to the simplified M&P for small-scale CDM project activities*, Paramonga CDM Bagasse Project can be classified as a **Type I – Renewable Energy Project and a Category Type C – Thermal energy for a user**.

The project is considered a renewable energy project because the new boiler will use bagasse and pith as the only fuels. According to the indicative list drawn up by the CDM Executive Board, "biomass combustion" as well as "power and heat production from waste" project activities are considered within the renewable energy project type.

The new boiler will produce steam for use in the sugar production process that would otherwise be generated by residual fuel oil, technically Bunker Fuels No. 6 and No. 500, produced by Petro Peru. Category C "Thermal energy for a user" comprises renewable energy technologies that supply users with thermal energy that displaces fossil fuel. It also includes biomass based co-generation systems that produce heat and electricity for use on site. Therefore, this category is appropriate for the proposed project activity.

Finally, the proposed CDM project activity conforms with the requirements for a small-scale project because it will utilize a bagasse boiler with an installed capacity of 13,6 MWth, according to the following specifications of the manufacturer of the equipment and capacity conversion calculations:

New Bagasse Boiler Specifications:

Name of Manufacturer:	CBS/MEIC
Type of Equipment:	Aqua tubular Boiler
Reference:	CBS/MEIC
Output Capacity/System rating for primary boiler:	Steam production capacity 120 Ton/h
Temperature:	430^0C
Pressure:	42 KGF/CM^2 ; 430^0C

Annex I, *Propuesta Técnica Comercial*, presents the complete manufacturer's specifications for the boiler.

Table 2: Project Activity Equipment Capacity

		Value	Units
A.	Manufacturer Boiler Steam Capacity (Maximum Continuous Rating - MCR)	120	Ton Steam/hr at 42 Kgf/CM^2, 430^oC
	Conversion factors		
B.	1 Ton Steam/hr at 42 Kgf/CM^2, 430^oC	3,87E+05	BTU/hr
C.	1 BTU/hr =	2,93E-07	MWth
	Equivalent Capacity (A*B*C)	13,60	MWth

The capacity of the bagasse boiler is 13,6 MW. This is less than the maximum allowed capacity of 45 MWth assigned to the corresponding project type in CDM regulations. As such, the project qualifies as a small scale CDM project in the stated project type.

A.4.3 Brief statement on how anthropogenic emissions of greenhouse gases (GHGs) by sources are to be reduced by the proposed CDM project activity:

The project will substitute two boilers, which consume primarily Residual Fuel Oil, complemented by residual pith and bagasse, with one new boiler that uses only bagasse and pith. In this way, a fossil fuel will be displaced by renewable fuels; therefore the net GHG emissions associated with the fossil fuel burning will be eliminated.

The greenhouse gas emissions from fuel consumption of the existing petroleum boilers that would have been used in the absence of the CDM activity for generating thermal energy to the AIPSA sugar processing plant would have been net 923,107 tonnes of CO_{2eq} during the crediting period. As shown in section B3 (table 12), these emissions constitute the baseline scenario. Conversion to the biomass boiler will substitute the emissions from Residual Fuel Oil consumption with renewable energy from sugar cane production that continually captures and recycles the emitted CO2, though the growing process. After the CDM project is adjusted for leakage (table 15) and residual non-CO2 emissions (table 12A), the net mitigation of $CO2_e$ by this project will be 852,999 tons, or 85,299 tons CO2 per year on average.

A.4.4 Public funding of the project activity:

No public funding is considered for the project activity.

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

The proposed project activity is not a debundled component because there is NEITHER a registered small-scale CDM project activity NOR an application to register another small-scale CDM project activity:

- with the same project participants;
- in the same project category and technology/measure; and
- registered within the previous 2 years; and
- whose project boundary is within 1 km of the project boundary of the proposed small-scale activity at the closest point.

B. Baseline methodology

B.1 Title and reference of the project category applicable to the project activity:

Type (I): Renewable Energy Project.

Category I.C: Thermal energy for the user.

Baseline Methodology Description: "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, times an emission coefficient for the fossil fuel displaced".

Methodology is included in the Appendix B of the simplified modalities and procedures for small-scale CDM project activities.

B.2 Project category applicable to the project activity:

The simplified baseline for the small-scale project type and category applicable to the Paramonga CDM Project is "the fuel consumption of the technologies that would have been used in the absence of the project activity times an emission coefficient for the fossil fuel displaced". This simplified baseline is suitable for the Paramonga Project because it encompasses the two main characteristics of the project: all the net emissions within the project boundary are currently and would be produced by the combustion of fossil fuels in the absence of the CDM activity; and, it allows analyzing which is the technology that would have been used in the absence of the bagasse boiler.

The other simplified baselines included in the project category are not applicable to the Paramonga Project because they are designed either for the case when the project displaces a non-renewable source of biomass, or when the project generates renewable electricity for a grid. Neither of those situations is applicable to the Paramonga Project: all biomass used in the project boundary comes from the sugar cane planting activity that is constantly cycled and renewed; and the project will not generate electricity for a grid: it will produce steam for and electricity for the user's sugar production process.

B.3 Description of how the anthropogenic GHG emissions by sources are reduced below those that would have occurred in the absence of the proposed CDM project activity *(i.e. explanation of how and why this project is additional and therefore not identical with the baseline scenario)*

In this section we will show that the Paramonga Bagasse Boiler Project would not have occurred anyway, due to an investment barrier, existing contractual arrangements, and financial conditions that favourably support the continued use of Residual Fuel Oil in the existing boilers for the long term.

It is important to highlight that AIPSA and QUIMPAC have contractually set up a 30-year agreement for AIPSA to use the main boiler at no cost. In addition, they have regularly signed resource exchange agreements that favour the continuation of the existing fossil fuel energy system[4]. Further, AIPSA recently invested in refurbishing the Edge Moore boiler, with an aim to supplying its energy requirements for the long term at the least cost[5]. At the present time AIPSA has only two alternatives in the absence of the CDM:

1. Continue with the actual situation, generating energy and steam with the existing boilers, using the existing agreement to supply QUIMPAC with bagasse in exchange for Residual Fuel Oil and pith for their energy requirements, or:
2. Install a new bagasse boiler not as a CDM project.

Both alternatives have the same output and objectives: to generate the energy requirements for the sugar production process. Both alternatives are in compliance with prevailing laws and regulations.

INVESTMENT BARRIER:
For demonstrating that alternative 2 would not have occurred anyway, due to an investment barrier, we have to undertake a financial analysis of both alternatives. The financial analysis is based on a documented cash flow analysis of all the costs and revenues related to each alternative.

Alternative 1
For alternative 1, the costs include all those related to maintenance and fuel of the three boilers, and revenues include the selling of bagasse to QUIMPAC and others. Depreciation costs are not included in the analysis because they do not imply cash demands. Table A.1 in the appendix shows the historical costs associated with alternative 1 incurred by AIPSA during the period 1999 – 2004.

As mentioned in the description of the project activity, AIPSA signed a resource exchange agreement with QUIMPAC that transfers bagasse from AIPSA to QUIMPAC for its paper pulp process, and transfers two types of fuel from QUIMPAC to AIPSA: pith (polvillo) and Residual Fuel Oil. This agreement also gives AIPSA the right to use QUIMPAC's boilers at no cost to generate energy and steam. The amount of bagasse received by QUIMPAC depends on its production requirements. The amount of Pith returned by QUIMPAC to AIPSA is constant relative to the amount of bagasse transferred because it is a byproduct of the pulp process (approximately 34% of the quantity of the bagasse received). The resource exchange agreement signed by AIPSA and QUIMPAC defines the terms of the exchanges of the three different fuels: bagasse, pith and Residual Fuel Oil, based on their caloric potential. Three agreements have been signed during the period 1990 to 2004. The terms of exchange of the current agreement are 46 Gallons of Residual Fuel Oil per ton of bagasse, and 30 Gallons of Residual Fuel Oil per ton of pith.

For accounting purposes, both companies register the resource exchanges as purchases and sales of fuels, valued by the price of oil. But in terms of cash flow, AIPSA has no cost because the revenue received from the sale of bagasse to QUIMPAC equals the cost of purchase of Pith and Residual Fuel Oil. Also, AIPSA has the right to use QUIMPAC's boilers at no cost. Likewise, the bagasse burned by AIPSA has no cash flow cost because the bagasse used is a byproduct of its sugar production process.

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[4] Actas de Entendimiento QUIMPAC-AIPSA: Intercambio Bagazo-Medula-Petróleo No. 6, Abril 30, 1999, Enero 2002, others.

[5] AIPSA also has used a small (10 ton vapour per hour) Distral boiler during 2003-2004 but was taken out of service in 2004 due to inefficiencies.

In conclusion, the existing conditions are quite favorable and the intentions of both firms in the absence of the CDM were to continue. The costs associated with the alternative 1 – *continue with the current situation* - are limited to the projected costs of maintenance of the existing generation units during the crediting period. The following table shows the costs as well as the net present value of alternative 1:

TABLE 3. CASH FLOW ANALYSIS FOR ALTERNATIVE 1: CONTINUE WITH EXISTING SITUATION

(Figures in USD)

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Sale of bagasse to QUIMPAC		6.990.724	6.169.569	6.978.613	6.779.985	7.000.414	7.000.414	7.000.414	7.000.414	7.000.414	7.000.414
Sale of bagasse to others		406.578	358.820	405.874	394.321	407.142	407.142	407.142	407.142	407.142	407.142
Operation and Maintenance Costs											
Fuel costs											
Pith		1.534.678	1.354.410	1.532.020	1.488.415	1.536.806	1.536.806	1.536.806	1.536.806	1.536.806	1.536.806
Residual Fuel Oil		5.456.046	4.815.159	5.446.593	5.291.571	5.463.608	5.463.608	5.463.608	5.463.608	5.463.608	5.463.608
Maintenance costs											
Foster Wheeler		410.603	410.603	410.603	410.603	410.603	410.603	410.603	410.603	410.603	410.603
Edge Moore		55.028	55.028	55.028	55.028	55.028	55.028	55.028	55.028	55.028	55.028
Total Costs		7.456.355	6.635.199	7.444.244	7.245.616	7.466.044	7.466.044	7.466.044	7.466.044	7.466.044	7.466.044
Net Cash Flow		(59.053)	(106.811)	(59.757)	(71.309)	(58.489)	(58.489)	(58.489)	(58.489)	(58.489)	(58.489)
NPV (10%)	($388.739)										

Parameters and Assumptions	
Discount rate	10%
Price of purchasing Petroleum from QUIMPAC (USD/Gal)	0,67
Price of sale of Bagasse to QUIMPAC ($USD/ton)	30,92
Price of purchasing Pith from QUIMPAC ($USD/ton)	20,17
Price of sale of bagasse to others	30,60
Price of purchase of steam from QUIMPAC ($USD/Ton V)	23,37

Alternative 2
For alternative 2 – implementing a new bagasse boiler without CDM revenues, the cash flow analysis includes the investment costs and the maintenance costs, and the revenues from the net sale of bagasse to QUIMPAC.

The investment cost, US$ 5,369,000., includes all costs associated with the purchase of the equipment, transport, and installation, as well as the costs incurred in conditioning the power plant for the operation of the new boiler. A breakdown of the total investment cost is presented in appendix 2, *Detailed Investment Costs Associated with Alternative 2.*

The maintenance cost of the new boiler (USD$ 377,499 per year) was estimated adjusting the projected cost of the Foster Wheeler Boiler, which is similar in type of operations. The adjustments include relevant personnel reductions, stoppage costs, and reduced maintenance. See appendix 3 for detail of operating costs.

With this alternative, AIPSA would have additional revenue from selling of the residual bagasse to QUIMPAC. For calculating the revenue, it was assumed that the total residual amount resulting from the bagasse produced and not burned in the new boiler would be purchased by QUIMPAC. QUIMPAC will still return Pith and instead of supplying residual oil, will pay the equivalent value according with the terms of resource exchange.

The residual bagasse is calculated by first estimating the total amount of bagasse produced by AIPSA according to its production projections. These projections also give the amount of steam required for the sugar process. With the steam[6] needed, we calculate the bagasse requirements of the new boiler to generate that steam based on its operating fuel efficiency. Finally, the residual bagasse is the difference between the total bagasse produced and the bagasse burned to produce the necessary steam.

Table 3.1 Calculation of residual bagasse sold to QUIMPAC in the project alternative 2 scenario.

	E.	F	G	H	I	J	K	
	Bagasse Produced*	Bagasse Burned	Residual Bagasse Sold to QUIMPAC	Pith Returned	Steam from Pith	Steam from Baggase	Total Steam Generated	Steam Requirements*
		(E*C)	(E-G)	(G*D)	(H*B)	(F*A)	(J+I)	(Ton)
2006	304.979	270.038	34.941	11.762	22.347	621.086	643.434	643.434
2007	269.155	238.318	30.837	10.380	19.722	548.131	567.854	567.854
2008	304.450	269.570	34.881	11.741	22.309	620.010	642.319	642.319
2009	295.785	261.897	33.888	11.407	21.674	602.363	624.037	624.037
2010	305.402	270.412	34.990	11.778	22.378	621.947	644.326	644.326
2011	305.402	270.412	34.990	11.778	22.378	621.947	644.326	644.326
2012	305.402	270.412	34.990	11.778	22.378	621.947	644.326	644.326
2013	305.402	270.412	34.990	11.778	22.378	621.947	644.326	644.326
2014	305.402	270.412	34.990	11.778	22.378	621.947	644.326	644.326
2105	305.402	270.412	34.990	11.778	22.378	621.947	644.326	644.326

* See table 8

Parameters and Assumptions		
A.	Fuel Operation Efficiency (Ton Steam/Ton Bagasse)	2,3
B.	Fuel Operation Efficiency (Ton Steam/Ton Pith)	1,9
C.	% Autoconsumo	89%
D.	% Return ton Pith per ton Bagasse	34%

The purchase value of the Bagasse is based in the average price of residual oil for the period Jan-Sept of 2004, is presented in annex table A2. Taking into account the above costs and revenues, the following table shows the cash flow analysis for the Alternative 2:

[6] The final value of the bagasse burned takes into account the steam generated by the Pith received.

TABLE 4. CASH FLOW ANALYSIS FOR ALTERNATIVE 2: IMPLEMENT BAGASSE BOILER WITHOUT CDM

(Figures in USD)

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Revenues											
Sales of Bagasse to QUIMPAC		1.080.479	953.562	1.078.607	1.047.908	1.081.977	1.081.977	1.081.977	1.081.977	1.081.977	1.081.977
Costs											
Initial investment	5.369.000										
Operation and Maintenance Costs											
Fuel costs											
Pith		237.198	209.336	236.787	230.048	237.527	237.527	237.527	237.527	237.527	237.527
Maintenance costs											
CBS/MEIC		377.499	377.499	377.499	377.499	377.499	377.499	377.499	377.499	377.499	377.499
Total Costs	-	614.697	586.835	614.286	607.547	615.026	615.026	615.026	615.026	615.026	615.026
Net Cash Flow	(5.369.000)	465.782	366.727	464.321	440.361	466.951	466.951	466.951	466.951	466.951	466.951
NPV (10%)	($2.589.235)										
IRR	-3%										

Parameters and Assumptions	
Discount rate	10%
Price of purchasing Petroleum from QUIMPAC (USD/Gal)	0,67
Price of sale of Bagasse to QUIMPAC ($USD/ton)	30,92
Price of purchasing Pith from QUIMPAC ($USD/ton)	20,17
Price of sale of bagasse to others	30,60
Price of purchase of steam from QUIMPAC ($USD/Ton V)	23,37

As we can see comparing the results of Table 3 and Table 4, Alternative 1 has a Net Present Value of USD$ -388.739, which is a significantly higher value (less loss) than Alternative 2, which has a NPV of USD$ -2.589.235. The more attractive option is alternative 1: to continue with the actual situation.

Although several of the Sugar Companies in Peru generate with bagasse, a common practice analysis is not applicable to the project because of the specific characteristics of AIPSA and the context they operate in, specifically the historic interdependence with QUIMPAC, the existing long term contracts for free use of the boiler, agreements for exchange of bagasse for residual fuel oil and pith, a context which provided favourable economic conditions for long term continuation of the use of fossil fuels.

It is also important to note that standing economic relationship with QUIMPAC and the resource exchange arrangements impose a barrier to undertaking the CDM activity. In the absence of the CDM, AIPSA would have preferred not to undertake the dissolution of the commitments with QUIMPAC.

Financial Impact of applying CDM to Alternative 2

The approval and registration of the project as a CDM activity will generate additional revenues from the sale of the CERs and favorably change the cash flow, NPV and rate of return of implementing the new bagasse boiler.

Section E2 presents the details for calculating the emissions reductions of the project activity. The price of CERs is estimated at $6 USD/Ton CO_2 corresponding to initial offers to project participants and recent reported CER transactions. The transaction costs include project preparation costs, validation, registration and certification. The costs are valued based on proposals of services made to project participants.

The following table shows the net additional revenue of the project derived from its registration as a CDM project activity:

TABLE 5. CASH FLOW ANALYSIS OF CDM COMPONENT

(Figures in USD)

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Emissions Reductions (Ton CO2 Equiv)											
Emissions Reductions (Ton CO2 Equiv)		86,520	76,357	86,370	83,912	86,640	86,640	86,640	86,640	86,640	86,640
Adaptation Fee (2%)		1,730	1,527	1,727	1,678	1,733	1,733	1,733	1,733	1,733	1,733
Administration Fee (2%)		1,730	1,527	1,727	1,678	1,733	1,733	1,733	1,733	1,733	1,733
Available CERs		83,059	73,303	82,915	80,555	83,174	83,174	83,174	83,174	83,174	83,174
Revenues											
Revenues from the Sale of CERs*		498,356	439,817	497,492	483,333	499,046	499,046	499,046	499,046	499,046	499,046
Cost											
Preparation and Formulation	58,000										
Validation	12,000										
Registration	15,000										
Certification		6000	6000	6000	6000	6000	6000	6000	6000	6000	6000
Net Cash Flow	(85,000)	492,356	433,817	491,492	477,333	493,046	493,046	493,046	493,046	493,046	493,046
NPV (10%)	**$2,898,601**										
IRR	570%										
*Sale price of CERs (USD$/ton CO2)	6										

As shown in the Table 5, the registration of the CDM project activity will increase the NPV of alternative 2 by USD$ 2,898,601. The income from CDM changes alternative 2 from a net loss to a positive economic decision.

TABLE 6. IMPACT OF CDM ON FINANCIAL INDICATORS OF PROJECT ALTERNATIVES		
	NPV(10%)	**IRR**
Alternative 1	($388.739)	
Alternative 2 without CDM	($2.589.235)	-3%
CDM revenues	$ 2.898.601	
Alternative 2 with CDM	**$309.366**	11%

In conclusion, the registration of the CDM project activity will alleviate the financial barriers for implementing the new bagasse boiler, demonstrating that the project activity is additional.

B.4 Description of the project boundary for the project activity:

According to the project type and category (I.C), the project boundary is the physical, geographical site of the renewable energy technologies generating the thermal energy (para. 17. Annex 6, Appendix B and amendments)

The physical, geographical site where the new bagasse boiler will operate is in the power plant of AIPSA. At the moment, AIPSA has two boilers (Foster Wheeler, Edge Moore) that generate steam for the production process, both of them located in the power plant.

The Edge Moore and Foster Wheeler boilers deliver steam at 450 PSI to the steam distributor. The steam distributors supply the steam for the mill and the turbine generators, which supply both electricity and steam at 125, 15 and 45 PSI to the production process.

The current boilers are fed with water from a “de-aerator”. The Edge Moore Boiler uses only bagasse for fuel, and the Foster Wheeler use residual oil, bagasse and pith.

Diagram 1 shows the flows of energy and steam of the power plant under current conditions, and table 7 presents the technical characteristics of the existing boilers.

Diagram 1: Flows of Energy and Steam of the Power Plant

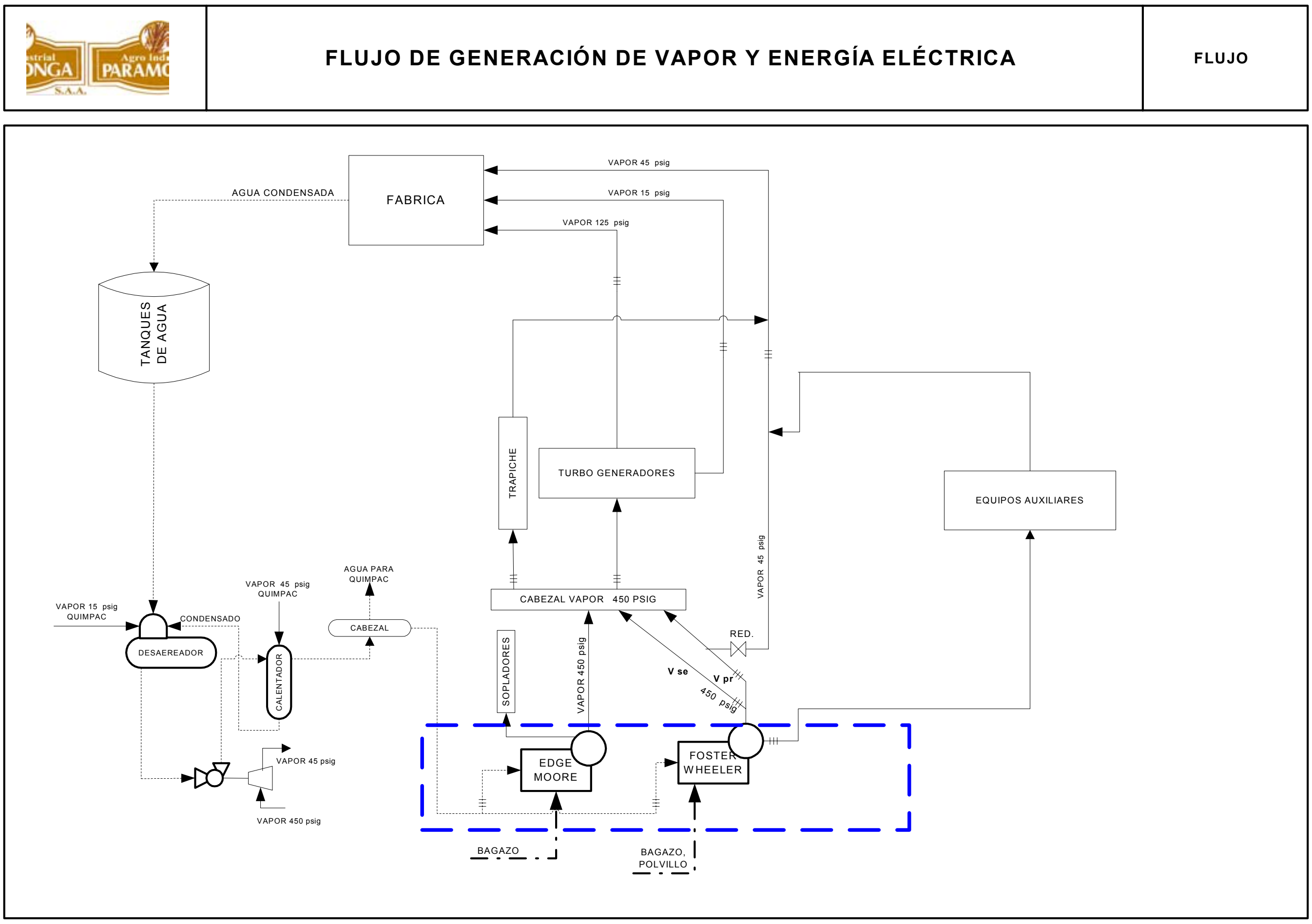


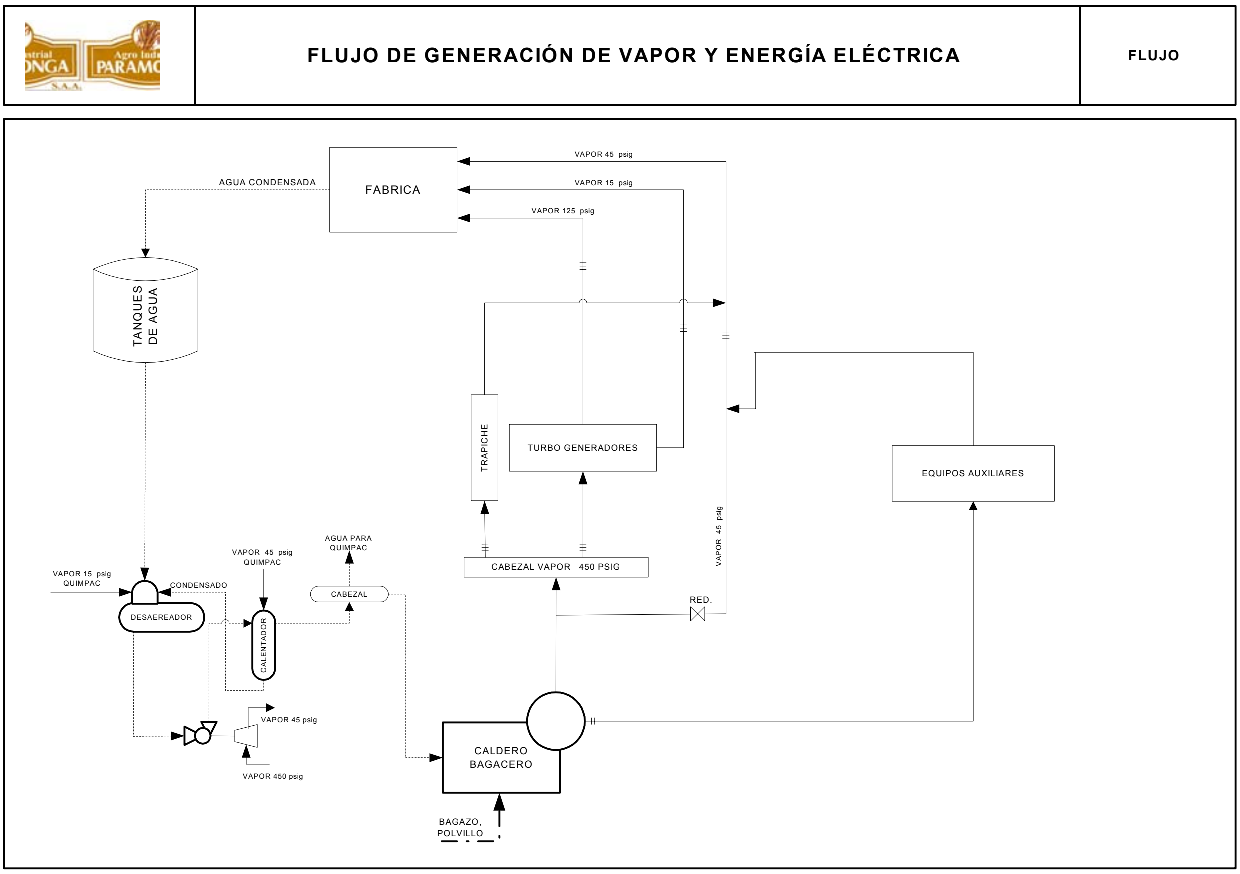
Table 7: Characteristics of Existing Boilers		
Technical Characteristics	**Foster Wheeler**	**Edge Moore**
Manufacturer	Foster Wheeler	Edge Moore
Reference	FW – 22.6	
Capacity (MCR) (Ton steam/hr)	120 *	17,5
Operating pressure (Kgf/CM^2)	31,6	31,6
Temperature (^{o}C)	371	371
Type of fuel	Residual Fuel Oil, Bagasse and Pith	Bagasse
Initial date of operation in AIPSA	Dec 1990	Jan – 2004

* Operates only with Residual Fuel Oil.

The project activity's main objective is to replace the existing boilers with a single new bagasse one. The new boiler will supply all the steam required by the production process through the steam distributor. The project boundary of the project activity is defined as the area of the Power Plant Building of AIPSA which includes the actual boilers as well as the area where the new boiler will be located.

Diagram 2 shows the project boundary of the CDM project activity.

Diagram 2: Project boundary of the CDM project activity



B.5 Details of the baseline and its development:

B.5.1 *Specify the baseline for the proposed project activity using a methodology specified in the applicable project category for small-scale CDM project activities contained in appendix B of the simplified M&P for small-scale CDM project activities:*

According to Appendix B of the simplified modalities and procedures for small scale projects activities, the baseline for the project category I.C. is the fuel consumption of the technologies that would have been used in the absence of the project activity, times an emission coefficient for the fossil fuel displaced.

As described in section B.3, the technologies that would have been used in the absence of the CDM project activity are the actual boilers. The baseline is calculated as the amount of Residual Fuel Oil that

the Foster Wheeler boiler would have consumed in order to generate the estimated energy required, multiplied by the IPCC emission coefficient of the fuel.

For calculating the baseline we will follow the following steps:

Step 1: Calculate the energy requirements of AIPSA in terms of amount of steam per year.
Step 2: Calculate the amount of the three fuels that AIPSA will use to generate the energy requirement of the process, particularly the amount of Residual Fuel Oil that would have been burned.
Step 3: Identify the IPCC emissions factors of the fossil fuel – Residual Fuel Oil displaced.
Step 4: Calculate amount of emissions of GHG of the baseline.

Step 1 – Calculation of the energy requirements of AIPSA in term of amount of steam per year.

AIPSA has a production schedule for the next 4 years based on the total days per year and effective hours of milling of sugar cane. The process has a constant capacity of amount of sugar cane processed per hour. The parameter of effective hours of milling per year multiplied by the production capacity in terms of Tons of Sugar Cane processed per hour, will be used to calculate the projected total amount of sugar cane processed per year. AIPSA cannot expand production during the CDM accreditation period because there are no additional lands available in the region to plant more cane.

The requirements of steam will be calculated by applying an efficiency parameter of demand for steam of the production process. This efficiency parameter has been established as a result of optimisation of the process, set by company workplans. For each year of the 10-year projection of base line emissions we will use year 2005's estimated demand for steam per ton of cane milled. However, actual steam use will be monitored annually and used to adjust the base line emissions for purposes of calculating real annual GHG reductions.

The following table shows projected estimated of the energy requirements of the baseline scenario in terms of amount of steam per year.

TABLE 8: ESTIMATED STEAM REQUIREMENTS OF THE BASELINE SCENARIO

Year	Projected # Days Milled	Sugar Cane Produced Ton	Bagasse Produced Ton	Steam Requirements Ton
2006	288,6	1.088.888	304.979	643.434
2007	254,7	960.983	269.155	567.854
2008	288,1	1.087.001	304.450	642.319
2009	279,9	1.056.063	295.785	624.037
2010	289	1.090.397	305.402	644.326
2011	289	1.090.397	305.402	644.326
2012	289	1.090.397	305.402	644.326
2013	289	1.090.397	305.402	644.326
2014	289	1.090.397	305.402	644.326
2015	289	1.090.397	305.402	644.326

Projection Parameters

Working Hours	22
Ton Caña/Hora	171,5
% bagazo/caña	0,28
% ton steam/ton sugar cane	0,59

Step 2 – Calculation of the amount of fuels required to generate the steam demanded

As mentioned in the description of the project activity, AIPSA has a fuel exchange agreement with QUIMPAC. This agreement is the basis for the calculation of the amount of fuel that AIPSA would have used in order to generate the steam calculated in step 1.

The amount of bagasse received by QUIMPAC depends on its paper production requirements. Historically QUIMPAC has received 74% of the total bagasse produced by AIPSA. The amount of Pith returned by QUIMPAC to AIPSA, 34%, is constant relative to the amount of bagasse received because it is a byproduct of the pulp process. The resource exchange agreements signed by both AIPSA and QUIMPAC define the terms of exchange of the three different fuels: bagasse, pith and residual fuel oil, based on their caloric power. Three agreements have been signed during the period 1990 to 2004. The terms of exchange of the last agreement are 46 Gallons of Residual Oil per ton of bagasse, and 30 Gallons of Residual Oil per ton of pith. The net exchange rate of gallons of Oil per ton of bagasse delivered to QUIMPAC, taking into account the Pith returned to AIPSA, is 35.9 gallons per ton.

Each fuel has an efficiency of generation of steam that depends on the existing boilers. The following table shows the overall efficiency for the two boilers, based in historic performance:

Table 9: Existing Fuel Efficiencies

Fuel	Fuel Operation Efficiency
Residual Fuel Oil	0,048 Ton Steam/Gallon Oil
Pith	1,6 Ton Steam/ton Pith
Bagasse	2,1 Ton Steam/Ton Bagasse

In order to estimate the amounts of each fuel, first we calculate the total bagasse produced by AIPSA based on the projected sugar cane milled. Then we calculate the amount of bagasse sold to QUIMPAC by multiplying the produced bagasse by the historic average of QUIMPAC's receipt of bagasse. With the quantity received by QUIMPAC we calculate the amount of pith and residual fuel oil that QUIMPAC would deliver to AIPSA according to the exchange terms of the current agreement. With these two quantities of input fuels and their energy efficiency, we calculate the amount of additional bagasse delivered to QUIMPAC and/or steam purchased from QUIMPAC, for meeting the steam requirements for processing the projected sugar cane milled. This is the actual decision framework used to determine the real allocation of fuels by AIPSA.

The following table shows the calculation of the amount of fuels:

TABLE 10: FUELS CONSUMPTIONS ON THE BASELINE SCENARIO

	I.	J.	K.	L.	M.	N.	O.	P.	Q.	R.
	Bagasse Produced*	Tons Bagasse Sold to QUIMPAC	Tons Pith Returned	Oil purchase Gallons	Tons Steam from Oil	Tons Steam from Pith	Needs of Steam from Bagasse (Tons)	Residual Bagasse Burn	Bagasse sold to others	Steam Requirements*
		(I*D)	(J*E)	(J*H)	(L*C)	(I*B)	(R-M-N)	(I-J) or (O/A)	0 or (I-J-P)	
2006	304.979	226.071	76.099	8.116.298	387.660	118.128	137.646	65.621	13.287	643.434
2007	269.155	199.516	67.160	7.162.928	342.124	104.252	121.478	57.913	11.726	567.854
2008	304.450	225.679	75.967	8.102.236	386.988	117.923	137.408	65.507	13.264	642.319
2009	295.785	219.256	73.804	7.871.628	375.973	114.567	133.497	63.643	12.887	624.037
2010	305.402	226.384	76.204	8.127.547	388.197	118.291	137.837	65.712	13.306	644.326
2011	305.402	226.384	76.204	8.127.547	388.197	118.291	137.837	65.712	13.306	644.326
2012	305.402	226.384	76.204	8.127.547	388.197	118.291	137.837	65.712	13.306	644.326
2013	305.402	226.384	76.204	8.127.547	388.197	118.291	137.837	65.712	13.306	644.326
2014	305.402	226.384	76.204	8.127.547	388.197	118.291	137.837	65.712	13.306	644.326
2015	305.402	226.384	76.204	8.127.547	388.197	118.291	137.837	65.712	13.306	644.326

* See Table 8 - Projection of sugar cane, bagasse and steam

Parameters and Assumptions

A.	Fuel Operation Efficiency (Ton Steam/Ton Bagasse)	2,1
B.	Fuel Operation Efficiency (Ton Steam/Ton Pith)	1,6
C.	Fuel Operation Efficiency (Ton Steam/Gallon Oil)	0,048
D.	Bagasse Requirements of Quimpac	74%
E.	% Return ton Pith per ton Bagasse	34%
	Interchange Agreed Terms	
F.	Gallons Oil/Ton bagasse	46
G.	Gallon Oil/Ton pith	30
H.	Neto interchange Gal oil/Ton bagase and pith returned (F-(G*E)	35,90

Step 3: Identify the IPCC emissions factors of the fossil fuel – residual fuel oil displaced by the project activity.

The following table presents the IPCC emissions factors of GHG corresponding to the Residual Fuel Oil:

Table 11: IPCC Emission Factors for Residual Fuel Oil	
CO_2	
Carbon Emission Factor for Residual Fuel Oil (TC/teraJoule)	21,1*
Net Calorific Value - TeraJoules per Kilotonne	40,19**
Fraction of Carbon Oxidized %	99%***
*Carbon Emission Factor for Residual Fuel Oil - Table 1,1 Revised 1996 IPCC Guidelines for National Inventories **Net Calorific Values for other fuels (Residual Fuel Oil) - Table 1,3 Revised 1996 IPCC Guidelines for National Inventories ***Fraction of Carbon Oxidation (Oil and Oil Products) - Table 1,6 Revised 1996 IPCC Guidelines for National Inventories	
Non CO2	
Gas	Coefficient
CH4 Emission Factor (Kg / TJ)	3*
N2O Emission Factor (Kg / TJ)	0,3**
*CH4 Default Emissions Factor Table 1-16 (Industrial Boiler Performance Emission Factors) Revised 1996 IPCC Guidelines for National Inventories. **N20 Default Emissions Factor Table 1-16 (Industrial Boiler Performance Emission Factors) Revised 1996 IPCC Guidelines for National Inventories	

Step 4: Calculate amount of emissions of GHG of the baseline.
To calculate the emissions of GHG of the baseline, we calculate the amount of energy from the fossil fuel by multiplying the quantity of Residual Fuel Oil by the net calorific value. Next, we multiply the amount of energy by the carbon emission factor and by the fraction of carbon oxidised, resulting the net amount of emission in tons of Carbon emitted. Finally we convert the Ton of Carbon to Ton of CO2 by multiplying by the ratio 44/12. Table 12 presents the annual GHG baseline emissions: for the 10 year period, the total GHG are 923,107, for an annual average of 92,310.

TABLE 12: BASELINE PROJECTED GHG EMISSIONS

	J.	**K.**	**L.**	**M.**	**N.**	**O.**	**P.**
Year	**Oil Burned* (Gal)**	**Oil Burned (Kton)**	**Amount of Energy (Tjoules)**	**Emission (Ton CO2)**	**Emission CH4 Ton CO2 eq**	**Emission N2O Ton CO2 eq**	**Total Emissions Ton CO2 eq**
		(J*F)	**(K*A)**	**(K*B*E*I)**	**(L*C*G)/1000**	**(L*D*H)/1000**	**(M+N+O)**
2006	8.116.298	30	1.220	93.441	77	113	93.631
2007	7.162.928	27	1.077	82.465	68	100	82.633
2008	8.102.236	30	1.218	93.279	77	113	93.469
2009	7.871.628	29	1.183	90.624	75	110	90.809
2010	8.127.547	30	1.222	93.570	77	114	93.761
2011	8.127.547	30	1.222	93.570	77	114	93.761
2012	8.127.547	30	1.222	93.570	77	114	93.761
2013	8.127.547	30	1.222	93.570	77	114	93.761
2014	8.127.547	30	1.222	93.570	77	114	93.761
2015	8.127.547	30	1.222	93.570	77	114	93.761
Total	80.018.373	299	12.028	921.231	758	1.119	923.107

* See table 10 for calculation of the amount of oil burned

Projection Parameters and Assumptions

A.	Net Calorific Value (TJ/Kton)	40,19
B.	Carbon Emission Factor (TC/TJ)	21,1
C.	Carbon Emission Factor (Kg CH4/TJ)	3
D.	Carbon Emission Factor (Kg N2O/TJ)	0,3
E.	Fraction of Carbon Oxidized %	99%
F.	Conversion Gallon Petroleum to Kton	3,74E-06
G	GWP (CH4)	21
H.	GWP (N2O)	310
I.	Ton C to Ton CO2 eq	3,67

B.5.2 Date of completing the final draft of this baseline section *(DD/MM/YYYY)*:

15/11/2004

B.5.3 Name of person/entity determining the baseline:

The entity that determined the baseline is not a project participant. The following is his contact information:

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(Please provide contact information and indicate if the person/entity is also a project participant listed in annex 1 of this document.)

C. Duration of the project activity and crediting period

C.1 Duration of the project activity:

C.1.1 Starting date of the project activity:

The starting date of the project activity is set for May 1, 2005, which is the estimated date for initiation of the construction and installation of the new boiler, pending positive validation. The process of construction and installation will take approximately 12 months; therefore the estimated date for the boiler to start operation has been set for May 1 2006. These estimates are based on the proposal of the boiler manufacturer and the AIPSA project development schedule.

C.1.2 Expected operational lifetime of the project activity: *(in years and months, e.g. two years and four months would be shown as: 2y-4m.)*

Expected operational lifetime of the new boiler is 30 years. This operational lifetime of the project activity is based in the lifetime of the new bagasse boiler, according to the manufacturer's specifications.

C.2 Choice of the crediting period and related information: *(Please underline the selected option (C.2.1 or C.2.2) and provide the necessary information for that option.)*

C.2.1 Renewable crediting period *(at most seven (7) years per crediting period)*

C.2.1.1 Starting date of the first crediting period *(DD/MM/YYYY)*:

C.2.1.2 Length of the first crediting period *(in years and months, e.g. two years and four months would be shown as: 2y-4m.)*:

C.2.2 Fixed crediting period *(at most ten (10) years)*:

C.2.2.1 Starting date *(DD/MM/YYYY)*: 01/05/2006

C.2.2.2 Length (max 10 years): *(in years and months, e.g. two years and four months would be shown as: 2y-4m.)* **10 YEARS**

The crediting period length is based on the utilization (usufruct) contract of the Foster Wheeler Boiler between AIPSA and QUIMPAC. The contract has a validity period of 30 years, and it was signed on January 1990. The expiration date of the contract is January 2020. A crediting period of 10 years is the most adequate choice because it is within the contract period in which the main decision variable does not change.

D. Monitoring methodology and plan

D.1 Name and reference of approved methodology applied to the project activity:

Type (I): Renewable energy project activities with a maximum output capacity equivalent to up to 15 megawatts.
Category C: Thermal energy for a user.

Name: "Metering the energy produced by a sample of the systems where the simplified baseline is based on the energy produced multiplied by an emission coefficient."

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

(Justify the choice of the monitoring methodology applicable to the project category as provided for in appendix B.)

The methodology is applicable to the project activity because the real emissions reduction achieved by the project will depend on the real energy produced by the boiler, which otherwise will be produced using residual fuel oil in the Foster Wheeler boiler.

Description of the Monitoring Plan

Through the implementation of the CDM project activity, a new bagasse boiler will produce steam that will displace the fossil fuel that the existing boilers would have burned. In order to estimate emissions reductions from the project activity, the amount of steam required by the production process has to be known. The steam requirements are measured routinely by the project operator as part of the control of the production process. As the steam requirements of AIPSA may vary depending *inter alia* on the days of milling in the year, it is necessary to use an indicator that is flexible enough to allow for fluctuations in baseline steam requirements in

different years. It is proposed to base the estimation on the ratio of amount of residual fuel oil burned to the amount of steam required by the process in the baseline scenario, calculated in Table 10: 12,61 gallons of fuel oil per ton of steam. The steam requirements of the process are subject to monitoring during the crediting period. The baseline emissions are then calculated by multiplying the monitored amount of steam consumed by the process by the ratio and by the same emissions factors of table 12.

The monitoring plan also includes the amount of bagasse sold to QUIMPAC for leakage calculation, and amount of Bagasse and pith burned in the bagasse boiler, for non-CO2 emissions calculation. (See section E.1.2)

Finally, although AIPSA's plan is to produce steam exclusively with renewable energy, the monitoring plan includes measuring the amount of residual oil that could be burned in extraordinary circumstances in the Foster Wheeler boiler during the accreditation period. No control is needed for the new boiler because it will not be conditioned to be fed by residual oil.

D.3 Data to be monitored:

ID	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
M1	Numeric	Thermal energy required by the process	Tons of Steam	M	Continuous	100%	Electronic and paper	2 years after the end of crediting period	The variable will be measured based on the metering system of the control room, and the steam distribution system.
M2	Numeric	Output thermal energy of the bagasse boiler	Tons of Steam	M	Continuous	100%	Electronic and paper	2 years after the end of crediting period	The variable will be measured based on the metering system included en the Bagasse Boiler.
M3	Numeric	Amount of residual oil used by Foster Wheeler Boiler	Gal	M	Continuous	100%	Electronic and paper	2 years after the end of crediting period	This variable will be used to discount the from the emissions reductions if the Foster Wheeler operates.
M4	Numeric	Amount of bagasse sold to QUIMPAC	Tons	E	Periodic (daily)	100%	Paper	2 years after the end of the crediting period	This variable will be estimated based in the accounting data
M5	Numeric	Amount of Bagasse burned in bagasse boiler	Tons	M	Continuous	100%	Electronic and paper	2 years after the end of crediting period	This data will be used to calculate non-co2 emissions due to project activity.
M6	Numeric	Amount of Pith burned in bagasse boiler	Tons	M	Continuous	100%	Electronic and paper	2 years after the end of crediting period	This data will be used to calculate non-co2 emissions due to project activity.

D.4 Name of person/entity determining the monitoring methodology:

The entity that determined the baseline is not a project participant. The following is its contact information:

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E. Calculation of GHG emission reductions by sources

E.1 Formulae used:

E.1.1 Selected formulae as provided in appendix B:

No specific formulae to calculate the GHG emission reductions by source are required for the Paramonga project type and Category.

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 each gas, source, formulae/algorithm, emissions in units of CO_2 equivalent)*

Since the proposed new boiler uses environmentally sustainable grown bagasse as its main fuel, the project activity results in zero net CO_2 on-site emissions. The CO_2 emissions of the combustion process will be consumed by sugar cane plant species, representing a cyclic process of carbon sequestration.

Although non-CO_2 emissions, methane and nitrous oxide, are produced in very small quantities in efficient biomass boilers, as a conservative approach, they will be discounted in the project scenario using IPCC emissions factors. To estimate emissions of non-CO2 GHG gases due to the project activity, it is necessary to calculate the incremental quantity of biomass that the project will burn in the bagasse boiler. The biomass, composed of bagasse and pith, will be aggregated using net calorific values. The incremental quantity will be calculated with the difference between the net calorific values in the baseline and in the project scenario, and applying IPCC emissions factors and global warming potential factors.

The formulae used to estimate Non CO_2 emissions due to project activity is:

$$PNE_t = \sum_{j=1}^{m} \left[\left(Bp_t \times NCV_{bj} \right) + \left(Pp_t \times NCV_{bj} \right) - \left(Bb_t \times NCV_{bj} \right) - \left(Pb_t \times NCV_{bj} \right) \right] \times R_j \times GWP_j$$

Where

PNE_t= Total Non CO2 Emissions in due to project activity in year t.
Bp_t= Amount of bagasse burned and monitored in the project activity in year t.
Bb_t= Estimated amount of bagasse burned in the baseline in year t.
Pp_t= Amount of Pith burned and monitored in the project activity in year t.
Bp_t= Estimated amount of pith burned in the baseline in year t.
NCV_{bj}= Net Calorific Value of Bagasse (TJ/kTons)
NCV_{pi}= Net Calorific Value of Pith (TJ/kTons)
R_j= Emissions factor of j Non-CO_2 gas (Kg/TJ)
GWP_j=Global Warming Potential of j greenhouse gas.
m= total significant Non-CO_2 emissions of biomass.

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 *(for each gas, source, formulae/algorithm, emissions in units of CO_2 equivalent)*

Under the rules for small scale project formulation, leakage should be estimated if the renewable energy technology is equipment transferred from a prior economic activity, or if the existing equipment is transferred to another activity. This does not occur in the Parmonga project. The renewable energy technology is new and will not be transferred from another project. Similarly, the equipment that will be displaced will not be transferred to another project activity: it will continue to reside in the AIPSA plant.

However, the adoption of the CDM project activity will clearly impose economic activities on other agents located outside the project boundaries that will increase net GHG emissions. When AIPSA begins to consume its own bagasse, QUIMPAC will need to acquire its bagasse supplies from other sugar cane producers. The producers are located at great distances, so the transportation of the bagasse will generate new GHG emissions during the accreditation period that should be accounted for in the project.

To calculate the leakage caused by the project activity, we identified the possible sources from which Quimpac could purchase and supply their bagasse requirements. No single source is able to supply the complete bagasse needs of Quimpac. As a result, a weighted average of the distances from QUIMPAC to the set of bagasse sources was calculated, and is presented in the following table. Truck capacity and diesel fuel efficiency in transport were calculated taking into account the same transport systems that AIPSA uses to transport its own bagasse. This produces estimates of bagasse transport emissions that would be caused by the implementation of the CDM project activity, applying the following formulae:

$$T_t = \left[\frac{B_t}{k}\right] \times 2 \qquad (1)$$

T_t= Estimated total round truck trips needed to transport Bagasse to meet QUIMPAC deficit in year t.
B_t= Estimated Quimpac's bagasse deficit (Tons) in year t. Estimation is based in the difference between baseline bagasse sold to Quimpac (Table 10) and monitored project scenario bagasse sold.
k = truck capacity (Tons)
2 = For converting one way trips to round trips

$$F_t = \frac{T_t \times \dfrac{\sum_{i=1}^{n} d_i \times C_i}{\sum_{i=1}^{n} C_i}}{E} \qquad (2)$$

F_t = Amount of fuel (Kg) needed for transporting Quimpac's deficit in bagasse in year t.
T_t= Estimated total one way trips needed to transport Bagasse to meet QUIMPAC deficit in year t
d_i= Distance (Km) from QUIMPAC to bagasse supplier i.
C_i= Sugar Cane production (Tons/year) of bagasse supplier i.
E = Fuel efficiency (Km/Kg of fuel)
n = Total number of probable Quimpac's bagasse suppliers

$$L_t = \sum_{j=1}^{m} F_t \times R_j \times GWP_j \qquad (3)$$

L_t= Total leakage of GHG emissions in year t
F_t= Amount of fuel needed for transporting Quimpac's deficit in bagasse
R_j= Emissions factor of j greenhouse gas (Tons gas/kg of fuel)
GWP_j=Global Warming Potential of j greenhouse gas.
m= total significant GHG emissions of diesel fuel.

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

$PE_t = L_t + PNE_t$ (4)

PE_t= Project emissions in year t.
L_t= Total leakage of GHG emissions in year t
PNE_t = Project non-CO_2 emission in year t.

E.1.2.4 Describe the formulae used to estimate the anthropogenic emissions by sources of GHG's 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: *(for each gas, source, formulae/algorithm, emissions in units of CO_2 equivalent)*

For CO2 Emissions:

$$BE_{CO2_t} = Sd_t \times FR \times Cc \times EF_{CO2} \times Of \times (44/12) \quad (5)$$

$BE_{co2\,t}$ = Emissions of CO2 for baseline for year t.
Sd_t = Steam demanded (Tons Steam) by the process in year t. Data to be monitored.
FR = Residual Oil fuel consumption per ton of steam (ratio). A priori calculation table 12.
Cc = Calorific Content of residual fuel oil (TJ/Kton)
$EFco_2$ = CO_2 emission factor for residual fuel oil (Ton C/TJ).
O*f* = Oxidation fraction

Non CO2 Emission

$$BE_{GHG} = \sum_{i=1}^{m} Sd_t \times FR \times EF_i \times Cc \times GWP_i \quad (6)$$

BE_{GHG} = Emissions of Non CO2 GHG for baseline for year t (Ton $CO_{2\,eq}$).
Sd_t = Steam demanded (Tons Steam) by the process in year t. Data to be monitored.
FR = Residual Oil fuel consumption per ton of steam (ratio). A priori calculation table 12.
Cc = Calorific Content of residual fuel oil (TJ/Kton)
EF_i = i greenhouse gas emission factor for residual fuel oil (Ton gas i/TJ).

$BE_t = BE_{co2\,t} + BE_{ghg\,t}$ (7)

BE_t = Baseline total emissions in year t (Ton $CO_{2\,eq}$).
$BE_{co2\,t}$ = Emissions of CO2 for baseline for year t (Ton $CO_{2\,eq}$).
$BE_{GHG\,t}$ = Emissions of Non CO2 GHG for baseline for year t (Ton $CO_{2\,eq}$).

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:

$ER_t = BE_t - PE_t$ (8)

ER_t= Emissions reductions due to project activity in year t (Ton $CO_{2\,eq}$).
BE_t = Baseline total emissions in year t (Ton $CO_{2\,eq}$).
PE_t=Project emissions in year t (Ton $CO_{2\,eq}$).

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

TABLE 13: BASELINE MONITORED EMISSION OF GHG

	K.	L.	M.	N.	O.	P.	Q.	R.
			Oil	**Amount**	**Emission**	**Emission**	**Emission**	**Total**
	Total Steam	**Gallons of**	**Burned**	**of Energy**		**CH4**	**N2O**	**Emissions**
	Demanded**	**Fuel Oil**	**(Kton)**	**(Tjoules)**	**(Ton CO2)**	**Ton CO2 eq**	**Ton CO2 eq**	**Ton CO2 eq**
Year		(K*B)	(L*G)	(M*A)	(N*C*F*J)	(N*D*H)/1000	(N*E*I)/1000	(O+P+Q)
2006	643.434	8.116.298	30,4	1.220,0	93.440,8	76,9	113,5	93.631,1
2007	567.854	7.162.928	26,8	1.076,7	82.464,9	67,8	100,1	82.632,9
2008	642.319	8.102.236	30,3	1.217,9	93.278,9	76,7	113,3	93.468,9
2009	624.037	7.871.628	29,4	1.183,2	90.624,0	74,5	110,0	90.808,6
2010	644.326	8.127.547	30,4	1.221,7	93.570,3	77,0	113,6	93.760,9
2011	644.326	8.127.547	30,4	1.221,7	93.570,3	77,0	113,6	93.760,9
2012	644.326	8.127.547	30,4	1.221,7	93.570,3	77,0	113,6	93.760,9
2013	644.326	8.127.547	30,4	1.221,7	93.570,3	77,0	113,6	93.760,9
2014	644.326	8.127.547	30,4	1.221,7	93.570,3	77,0	113,6	93.760,9
2015	644.326	8.127.547	30,4	1.221,7	93.570,3	77,0	113,6	93.760,9
Total	6.343.596	80.018.373	299	12.028	921.231	758	1.119	923.107

** Variable to be monitored

Projection Parameters and Assumptions

A.	Net Calorific Value (TJ/Kton)	40,19
B.	Ratio of Gallons of Petroleum per Ton of Steam Demanded	12,61
C.	Carbon Emission Factor (TC/TJ)	21,1
D.	Carbon Emission Factor (Kg CH4/TJ)	3
E.	Carbon Emission Factor (Kg N2O/TJ)	0,3
F.	Fraction of Carbon Oxidized %	0,99
G.	Conversion Gallon Petroleum to Kton	3,74E-06
H.	GWP (CH4)	21
I.	GWP (N2O)	310
J.	Ton C to Ton CO2 eq	3,67

TABLE 12A: PROJECT SCENARIO NON-CO2 GHG EMISSIONS

	G.	H.	I.	J.	K.	L.	M.	N.	O.	P.
	BASELINE			Project Scenario						
Year	Bagasse Burned (Kton)	Pith Burned (Kton)	Energy from Biomass (Tjoules)	Bagasse Burned (Kton)	Pith Burned (Kton)	Energy form Biomass (Tjoules)	Additional Energy from Biomass (Tjoules)	Emission CH4 Ton CO2 eq	Emission N2O Ton CO2 eq	Total Emissions Ton CO2 eq
			(G*A)+(H*B)			(J*A)+(K*B)	L-I	M*C*E/1000	M*D*F/1000	N+O
2006	66	76	915	270	12	2,021	1,106	697	1372	2,069
2007	58	67	807	238	10	1,784	976	615	1211	1,826
2008	66	76	913	270	12	2,018	1,104	696	1369	2,065
2009	64	74	887	262	11	1,960	1,073	676	1330	2,006
2010	66	76	916	270	12	2,024	1,108	698	1374	2,072
2011	66	76	916	270	12	2,024	1,108	698	1374	2,072
2012	66	76	916	270	12	2,024	1,108	698	1374	2,072
2013	66	76	916	270	12	2,024	1,108	698	1374	2,072
2014	66	76	916	270	12	2,024	1,108	698	1374	2,072
2015	66	76	916	270	12	2,024	1,108	698	1374	2,072
Total	**647**	**750**	**9,020**	**2,662**	**116**	**19,927**	**10,906**	**6,871**	**13,524**	**20,395**

Projection Parameters and Assumptions

A. Net Calorific Value of Bagasse (TJ/Kton)	7.23
B. Net Calorific Value of Pith (TJ/Kton)	5.79
C. Ch4 Emission Factor (Kg CH4/TJ)	30
D. N2O Emission Factor (Kg N2O/TJ)	4
E. GWP (CH4)	21
F. GWP (N2O)	310

Sources:
Emissions Factors and GWP: Revised 1996 IPCC Guidelines for National Inventories
Bagasse Net Calorific Value: calculated based in E. Hugot (1986) “Manual para Ingenieros Azucareros”, CIA Editorial Continental, México, (1986) pg 623; using 52% of humidity of Bagasse.
Bagasse Net Calorific Value: 80% of Bagasse NCV, based in AIPSA experience.

TABLE 14: WEIGHTED DISTANCE FOR QUIMPAC'S BAGASSE SUPPLY

Probable Sources	A. Distance to Paramonga (Km)	B. Milled Capacity* (Ton)	C Adjusted Distance A*B
Andahuasi	100	357.988	35.798.800
San Jacinto	250	399.863	99.965.750
Laredo	380	524.943	199.478.340
Cartavio	440	805.401	354.376.440
Total		2.088.195	689.619.330
Total Weighted Distance			**330**
* Total production in 2003, source APAB			

TABLE 15: LEAKAGE OF GHG EMISSIONS							
	J.	**K.**	**L.**	**M.**	**N.**	**O.**	**P.**
Year	**Quimpac Bagasse Req. (Ton)**	**Total round Trips** (# trips)	**Amount of Diesel Burned** (Kg)	**CO2 Emissions** (Ton CO eq)	**CH4 Emissions** (Ton COeq)	**N20 Emissions** (Ton CO eq)	**Total Emissions** (Ton CO eq)
		(J/30)*2	(K*D/B)*C	(L*E)/1E+06	(L*F*H)/1E+06		
2006	191.129	12.742	1.573.788	4.993	5,95	44	5.042
2007	168.679	11.245	1.388.926	4.406	5,25	39	4.450
2008	190.798	12.720	1.571.062	4.984	5,94	44	5.034
2009	185.368	12.358	1.526.346	4.842	5,77	43	4.890
2010	191.394	12.760	1.575.970	4.999	5,96	44	5.049
2011	191.394	12.760	1.575.970	4.999	5,96	44	5.049
2012	191.394	12.760	1.575.970	4.999	5,96	44	5.049
2013	191.394	12.760	1.575.970	4.999	5,96	44	5.049
2014	191.394	12.760	1.575.970	4.999	5,96	44	5.049
2015	191.394	12.760	1.575.970	4.999	5,96	44	5.049
Total	**1.884.340**	**125.623**	**15.515.940**	**49.221**	**59**	**433**	**49.713**

	Projection Parameters	
A.	Truck Capacity (Ton Bagasse)	30
B.	Diesel efficiency (Km/Gal)	10
C.	Conversion Kg/Gal	3,74
D.	Weighted Distance per travel	330
E.	CO2 Emission Factor (g/Kg fuel)	3172,31
F.	CH4 Emission Factor (g/Kg fuel)	0,18
G.	N2O Emission Factor (g/Kg fuel)	0,09
H.	GWP (CH4)	21
I.	GWP (N2O)	310

TABLE 16: TOTAL NET EMISSIONS REDUCTIONS

	A.	B.	C.	D.
Year	**Baseline* Emissions (Ton CO2 eq)**	**Project** Emissions (Ton CO2 eq)**	**Leakage*** Emissions (Ton CO2 eq)**	**Net Reductions Ton CO2 Eq**
				(A-B-C)
2006	93,631	2,069	5,042	86,520
2007	82,633	1,826	4,450	76,357
2008	93,469	2,065	5,034	86,370
2009	90,809	2,006	4,890	83,912
2010	93,761	2,072	5,049	86,640
2011	93,761	2,072	5,049	86,640
2012	93,761	2,072	5,049	86,640
2013	93,761	2,072	5,049	86,640
2014	93,761	2,072	5,049	86,640
2015	93,761	2,072	5,049	86,640
Total	**923,107**	**20,395**	**49,713**	**852,999**

* See table 13

** See table 12 A

***See table 15

F. Environmental impacts

F.1 If required by the host Party, documentation on the analysis of the environmental impacts of the project activity: *(if applicable, please provide a short summary and attach documentation)*

The implementation of the CDM project activity, the new bagasse boiler, will significantly improve the environment and general well being of the local community by displacing the current system. The existing energy production system imposes significant environmental problems that may have affected the local community negatively in terms of human health and visual pollution. Environmental problems directly related to the current system include:
(a) harmful emissions of various types of pollutants from the burning of residual fuel oil;
(b) the high levels of pith particles in the air.
These afflictions were referred to by stakeholders in the public consultation process (see following section).

The adoption of the new bagasse boiler will reduce or eliminate the emissions of nationally controlled air pollutants, metals, total organic compounds, trace elements, and greenhouse gasses commonly generated by the combustion of residual fuel oils in industrial burners. The new bagasse boiler includes a wet scrubber which will control emissions of particulates; according to EPA, these scrubbers reduce particulates between 50 and 60%.[7] CO will still be emitted by bagasse consumption; however, the new boiler complies with World Bank-IFC emission standards. NO_x should be reduced, and SO_2 emissions should be eliminated.

Pith particles from the existing system, which fill the air when prevailing winds blow them upwards from open air storage and handling systems, have been deposited over the years throughout the community, accumulating in homes and public places. The new system will reduce Pith usage and volatility by 75%.

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[7] Technical proposal from MEIC-CBSERV, the new boiler manufacturers. Pg 16.

This should significantly reduce the minor irritations to eyes and breathing commonly experienced by local residents.

Metals, total organic compounds and trace elements have not been measured, but have been documented by US EPA as standard emissions from the industrial combustion of residual fuel oil. If these are present in the current emissions in significant quantities, the impacts to human health may be highly significant; the CDM project activity should reduce or eliminate most of these, to the benefit of the community's health and welfare.

<table>
<tr><td colspan="2">TOCs, Metals and Trace Elements from Combustion of Residual Fuel Oil in Industrial Boilers</td></tr>
<tr><td colspan="2">Compilation of Air Pollutant Emission Factors, AP-42, Fifth Edition, Volume I,:
Stationary Point and Area Sources. US EPA, Washington DC, 2004
Section 1.3: Fuel Oil Combustion</td></tr>
<tr><td>Total Organic Compounds</td><td>Volatile organic compounds; semi volatile organic compounds; condensable organic compounds; formaldehyde.</td></tr>
<tr><td>Trace Elements</td><td>As, Be, Cd, Cr, Cu, Pb, Hg, Mn, Ni, Se, Zn</td></tr>
<tr><td>Trace metals</td><td>A wide range of metals are usually emitted. Actual emissions depend on the composition of the fuel, concentration levels of the metals, and combustion temperatures. See appendix IV, EPA table 1.3-11 for metals and emissions factors identified in 18 of 19 samples from residual oil combustion in industrial boilers.</td></tr>
</table>

In conclusion, the current pollution problems will be replaced by vapour and reduced particulate emissions from the controlled burning of bagasse in the new boiler, which includes a high efficiency wet scrubber. The new system should greatly reduce emissions of the entire range of contaminants documented by EPA from residual fuel oil. The CO2 will be recycled and sequestered during each growing season, resulting in zero net CO_2 emissions. The adoption of the CDM project activity should greatly improve the local environment, including human health and visual pollution. In addition, the project will contribute significantly to reducing global warming by displacing 852,999 tons of CO_2 during the 10 year accreditation period, and potentially much more, as the useful life of the new boiler could be many more years into the future.

Host party requirement:

INRENA is the government authority responsible for controlling air quality in Peru's sugar cane processing industry. Regulations require that the new boiler comply with existing regulation D.S. 074-2001-PCM, “National Standards for Environmental Air Quality”. The new system complies with World Bank-IFC standards and improves upon Peru's permitted limits for NO_2, SO_2, and CO. The wet scrubber should control particulate matter emissions far below permitted standards, which should also improve visual effects.

G. Stakeholders comments

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

To inform and consult local stakeholders about the CDM project activity, AIPSA conducted a community stakeholders forum on the 29th of October at the Paramonga sugar mill installations. Paramonga invited local radio and television stations to the event to ensure regional dissemination of the event and the main messages.

AIPSA prepared a list of potentially interested and affected stakeholders from all sectors of the community and invited them to the forum. The event was attended by the governor, the mayor, directors of the television and radio stations, representatives of the poor communities most affected by the existing pollution, numerous health services organizations, local police, and environmental officials from the mayor's office. The national environmental authority, CONAM, was invited but was unable to attend. 23 participants attended. Appendix V includes the letter of invitation, lists of entities invited and actual participants.

AIPSA officials presented the CDM project in detail, highlighted the technical and environmental attributes of the new bagasse boiler, and discussed how the air pollution problems from the existing system would be reduced or eliminated.

G.2 Summary of the comments received:

Participants were asked to fill out a short survey form that asked them to state in their own words their perceptions regarding environmental conditions around the Paramonga sugar mill. 20 of the 23 indicated that the worst environmental problems in the area are caused by the smokestack emissions from the residual fuel boilers. 100% supported the CDM project to replace the burning of residual fuel oils with the wet-scrubbed bagasse boiler.

In the question and answer session, all participants discussed the negative health and visual effects of the existing boilers and fuels, and most insisted that the new project be implemented as soon as possible.

Appendix V includes the results of the survey and the transcriptions of all the comments and questions received at the end of the event. AIPSA asked participants to send in any additional comments by mail if they wished; none had been received at the date of preparation of this document.

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

No negative comments regarding the implementation of the CDM project activity (the new bagasse boiler) were received. The recommendations from the community were all related to the rapid replacement of the old boiler and fuels with the new system. AIPSA is working as quickly as possible to implement the new system under the CDM.

Annex 1

CONTACT INFORMATION FOR PARTICIPANTS IN THE PROJECT ACTIVITY

Non Annex B Partner	
Organization:	Agro Industrial Paramonga S.A.A. (AIPSA)
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URL:	
Represented by	
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Mobile:	
Direct FAX:	
Direct tel:	
Personal E-Mail:	

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding will be used for the CDM project

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