CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-PDD)
Version 03 - in effect as of: 28 July 2006

CONTENTS

Annexes

SECTION A. General description of project activity

A.1. Title of the project activity:

Timbues cogeneration project
Version: 2.3
Date: 13/07/2010

A.2. Description of the project activity:

Noble Argentina SA (hereafter referred as "Noble") is a commodity trader based in Argentina that offers a range of agricultural commodity products, as well as logistics and technical services. The company has been operating for slightly more than 5 years and within that period has grown to become the 10th ranked exporter of soybean, corn and wheat from Argentina.

Noble completed the construction of a new soybean crushing facility in its existing port terminal in Timbues, Santa Fe Province, Argentina, that is capable of processing up to 8,000 tonnes of soybeans per day and includes soya crushing, soybean dehulling, storage and handling facilities. It expands the capabilities of the company's existing grain river port terminal beyond origination, port services and exporting of grain, to include crushing and exporting product.

1. Purpose of project activity

a) The scenario prior to the start of the project activity
The soya bean crushing plant is a Greenfield project hence no steam or electrical power was consumed at the site prior to the implementation of the project activity.

b) Purpose of the project
The project activity aims to minimize the use of fossil fuel by installing a Greenfield renewable cogeneration plant (electricity and steam) fired by biomass residues (wood waste and wood residues as off-cuts) coming from wood and wood related industries (the 'project activity'). The biomass residues would, if not used by the project activity, be burned on the field or left on site to decay, but not used for energy production. The project is to be implemented in two phases. In phase 1, a first biomass boiler complemented by a fossil fuel boiler will deliver steam to the turbine. In Phase 2, a second identical biomass boiler unit will be installed to ensure up to 100% of renewable energy production at the site. The fossil fuel boiler will remain as a backup during maintenance or emergency downtime of the biomass boilers or to guarantee stable steam throughput.

c) The baseline scenario
In the absence of the project activity, the electricity would be supplied by the national grid. In the project activity, the grid will be used as backup therefore the full power capacity can be delivered by the grid.
The steam would be generated by two conventional natural gas fired steam boilers.

2. Contribution to Reduction of GHGs

The project activity will contribute to the mitigation of climate change by offsetting the carbon intensive power generation from the grid and by avoiding the use of fossil fuel for steam generation. It leads to the reduction of Greenhouse Gas (GHG) emissions, which in the absence of the proposed project activity would have been released from the combustion of fossil fuel.

3. Contribution of the project activity to sustainable development

A. Economical aspect

Job creation: The operation of a biomass system is technically more challenging than a conventional system and will result in the creation of an estimated 14 durable, long-term employment for its operation (1 Chief, 1 supervisor, 8 Utilities operators, 4 for water plant) and 20 part-time permanent jobs for the collection, processing and transport of the biomass. During construction about 100 temporary jobs will also be created (construction workers, electricians and other workers).

Contribution to the conservation of natural resources: The gradual shift from carbon-intensive gas/fuel oil towards biomass demonstrates the social responsibility of Project Participant in using cleaner technology in-line with the sustainable development policies of Argentina. This brings direct benefits to achieving sustainable development (continuous Improvement in the Quality of the Environment)

Technology transfer: The energy generation from biomass is new in the soya bean industry in Argentina and the project is a first of its kind. As such, Noble searched for the Best Available Technology and selected a European technology. The technology will be imported from Belgium while proper training will be provided by the supplier in order to ensure a smooth operation of the facility.

B. Social criteria

The project will provide employment for a lower stratum of society and provide them with a steady long term income. The top management of Noble is very much concerned with the social impacts of its activities, especially on the local population. Noble aims to continue to support the local community with its new project.

C. Environmental aspect

An environmental study was conducted[1] which revealed that there are no negative impacts associated with the implementation of the project. On the contrary, the study revealed that the project activity would alleviate air pollution and reduce GHG emission associated with the burning of fossil fuel as follows:

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1 See EIA of crushing plant

Positive impacts associated with the project include:

- Reduction of air contamination associated with the burning of fossil fuel
- Generation of clean (renewable and carbon neutral) energy
- Reduction of fossil fuel use
- Use of ashes as non-chemical soil conditioner

A.3. Project participants:

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity (ies) project participants (*) (as applicable)	Kindly indicate if the Party wishes to be considered as project participant (Yes/No)
Argentina (host)	Private entity: Noble Argentina S.A.	No
United Kingdom	Private entity: Noble Carbon Credits Limited	No

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

Argentina

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

Department of Santa Fe

A.4.1.3. City/Town/Community etc.:

Timbúes

A.4.1.4. Details of physical location, including information allowing the unique identification of this project activity (maximum one page):

The project activity is located within an industrial zone in Timbúes. The details of the project activity location are given below.

Location	Brigadier Estanislao López 8514, Timbúes, Santa Fe, Argentina
Latitude	32ª 36' 24,64" S
Longitude	60ª 46' 21,68" W

Location map of the project site is given below.

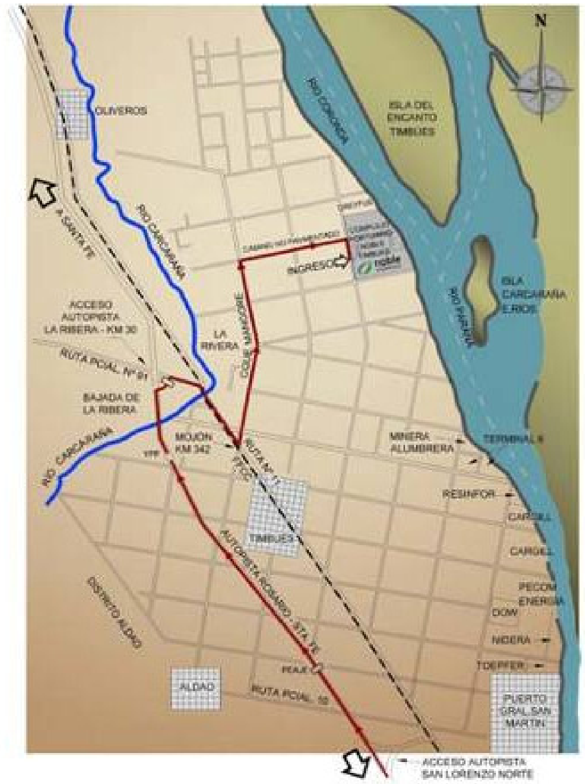

Figure 1: map of Argentina

Figure 2: map of Rosario

Figure 3: aerial view of the Noble port terminal

A.4.2. Category(ies) of project activity:

The project activity falls under the Sectoral Scope 01: Energy industries (renewable -/non-renewable sources)

A.4.3. Technology to be employed by the project activity:

Environmentally friendly technology

Cogeneration systems offer considerable environmental benefits when compared with purchased electricity and onsite-generated heat. By capturing and utilizing heat that would otherwise be wasted from the production of electricity, cogeneration systems require less fuel than equivalent separate heat and power systems to produce the same amount of energy. Because less fuel is combusted, greenhouse gas emissions, such as CO_2, as well as criteria air pollutants like NO_x and SO_2, are reduced.

The use of biomass fuels in cogeneration, rather than natural gas or coal, further reduces CO_2 emissions from heat and power production. In addition to displacing the emissions of purchased fossil fuels that would otherwise be needed to separately generate thermal energy (rather than using captured waste heat), biomass residues are considered a net zero emitter of CO_2 when used as a fuel for electricity and heat generation.

Because CO_2 is captured from the atmosphere by plants and trees during their growth, when it is released again during combustion it is reentering the carbon cycle, not being newly created. If plant materials are then re-grown over a given period of time, the re-growth of new biomass takes up as much CO_2 as was released from the original biomass through combustion. This process results in a cycle in which biomass fuels are considered to emit a total of zero net CO_2 emissions and are classified as green power when used to generate electricity.

The use of biomass residues in modern boilers also reduces the environmental hazards associated with the combustion of fossil fuels that emits pollutants such as carbon dioxide, nitrous oxides, sulfur oxides, carbon monoxide, particulates, organic compounds, trace metals, etc. Biomass is a low sulfur fuel - contributing much less than fossil fuels to the acid rain phenomenon[2]. The technology selected by the project participant is designed and manufactured by a reputable European supplier specialized in biomass boiler and having their proprietary technologies. The biomass boiler is to be manufactured by Vyncke, a Belgium based company operating since 1912. The company offers extensive experience in combustion technology, boiler construction and automated management and control systems for Waste to Energy systems; from design, engineering, manufacturing, installation and commissioning to training and after-sales service[3].

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[2] BIOMASS COGENERATION IN ASEAN, GHG MITIGATION POTENTIAL AND THE BARRIERS

Dr. Ludovic Lacrosse, Arul Joe Mathias, EC-ASEAN COGEN Programme, Asian Institute of Technology, Bangkok, UNIDO Expert Group Meeting on Industrial Energy Efficiency, Cogeneration and Climate Change, 2-3 December 1999, Vienna, http://www.unido.org/fileadmin/import/userfiles/ploutakm/asean.pdf

[3] Vyncke Energietechniek: www.vyncke.be

Contribution to technology and know-how transfer

The technology selected for the project activity is not available in the Host Country and will be imported from European countries (Annex 1) which will contribute to the transfer of environmentally safe and sound technology to Argentina.

The following aspects are contributing to the transfer of technology and know-how:

- The technology is imported from Europe (Belgium)
- Collaboration with local companies for the construction of the balance of plant and erection of the equipment
- Training of local staff during commissioning (operation and maintenance)
- Building of local know-how about the technology: the operators will be trained to such technology

Purpose of project activity

The project activity consists of two high pressure steam boilers fired by biomass and one backup fossil fuel boiler to supply steam to the turbine.

a) Scenario prior to the start of the project activity:
The project activity is part of a Greenfield soya crushing plant hence no equipments were installed prior to the start of the project activity.

b) The project is utilising a steam turbine type of cogeneration, fed by steam boilers.
The main components of the project are detailed in the diagram here below and consist of:
   1. Biomass boilers (2 units)
   2. Backup fossil fuel boiler (1 unit)
   3. Steam turbine and alternator (1 unit)

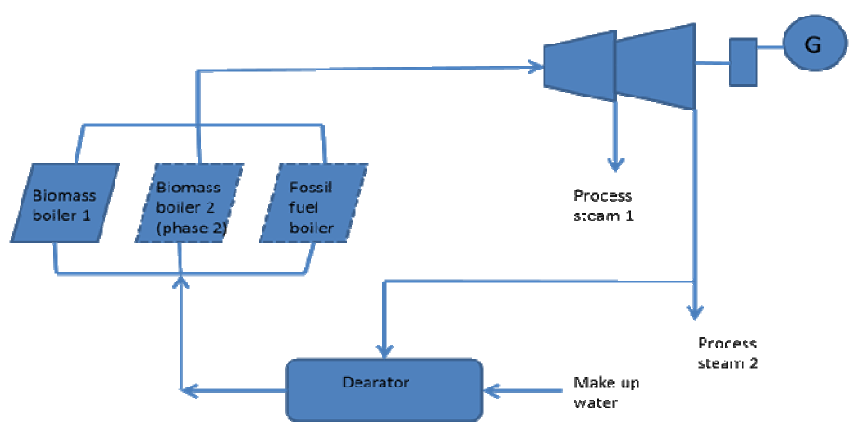

Figure 4: Main components of the Project Activity

The plant is designed to produce 10.7 MWe and up to 123 tph of low pressure steam at MCR[4] to cover the energy needs of the soya bean crushing plant. The electricity and steam will be used onsite (captive energy plant).

Outputs of project activity	*Value*	*Unit*	*Reference*
Availability	7,920 (330 days * 24 hours)	hours	Plant design[5]
Process Steam 1 (12 bara)	10,327	kW	Heat Balance Diagram[6]
Process Steam 2 (7.5 bara)	81,747	kW	Heat Balance Diagram
Electricity	10,700	kW	Heat Balance Diagram

Operating mode of boilers	*Biomass boiler 1*	*Biomass boiler 2*	*Backup fossil fuel boiler*
Phase 1	In service	Not built	In service
Phase 2	In service	In service	Backup

1. Biomass boiler specifications (2 units)	*Description*
Biomass combustion systems	Duplex Water-cooled step grate type. DWS-48-CLC with extended drying zone FWT-22-CLC
Operating pressure	43 bar(g)
Design capacity (steam)	60 ton/h
Feed water temperature	109 °C
Boiler efficiency (average LHV basis)	75%
Supplier	Vyncke Energietechniek N.V.(Belgium).

Design fuel specifications at the boiler inlet	*Minimal*	*Maximal*[7]	*Nominal*
LHV (kcal/kg)	2,100	3,000	2,400
Moisture content, wt.%	30	45	40
Ash content, wt.%	-	5	-

The fuel to be used is readily available biomass residues (wood waste and wood residues as woodchips) coming from agriculture, forestry and related industries.

4 Maximum Continuous Throughput (MCR)

5 See Enclosure 1: page 30

6 See Enclosure 3: 10.7 MW Biomass Plant, Heat Balance Diagram: design guarantee point

7 For wood waste fuels with > 45 % moisture content, the boiler output capacity will reduce.

2. *Fossil fuel boiler specifications (one unit)*	
Gas/fuel oil combustion system	A-Type Water tube steam generator.
Operating pressure	43 bar(g)
Design capacity	60 ton/h
Feed water temperature	119 °C
Boiler efficiency [8]	92 % LHV
Supplier	Nebraska Boiler (USA).

3. *Steam turbine specifications*	
Type	Backpressure turbine
Model	MB420, multi stage steam turbine with medium inlet steam conditions.
Installed capacity	10.948 MW
Guaranteed bleed steam capacity	12 Tph at 10.7 bar(g) and 262.1C temperature
Guaranteed exhaust steam capacity	110.577 tph at 6 bar(g) and 209.2C temperature.
Supplier	Jebsen & Jessen / NG Metalurgica Ltda

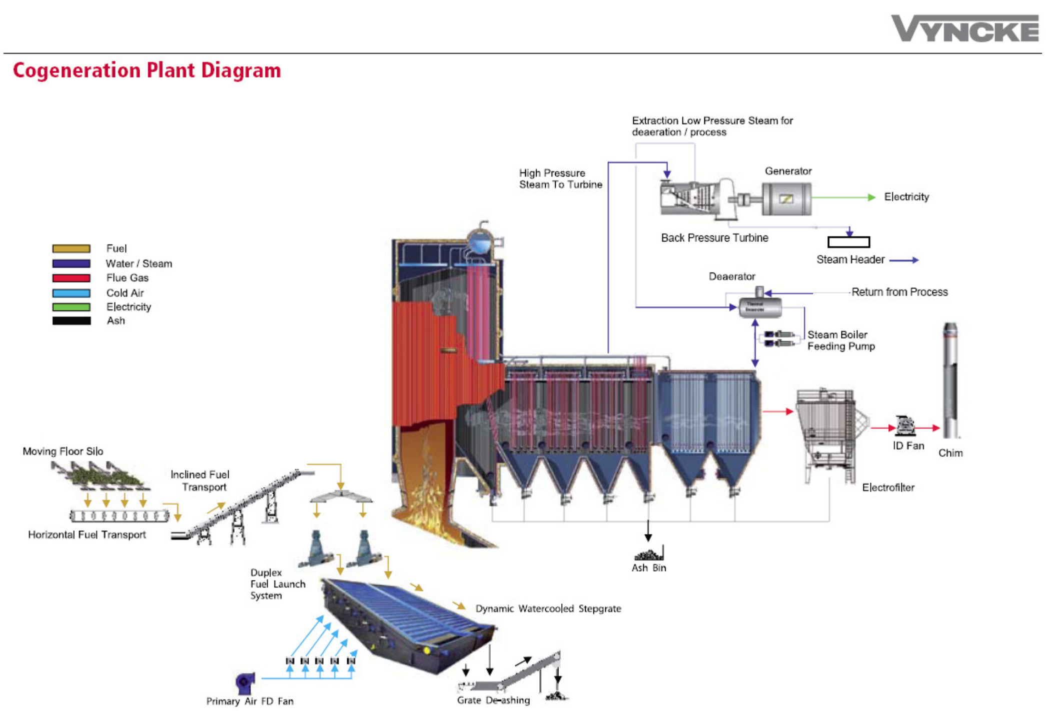

Figure 5: overview of biomass boiler

8 EB48, annex 12, option F (default value)=92%

c) The baseline scenario: please refer to section B.4

A.4.4. Estimated amount of emission reductions over the chosen crediting period:

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Years	Estimation of annual emission reductions in tonnes of CO_2e
2010 (year 1)	43,316
2011 (year 2)	43,316
2012 (year 3)	123,502
2013 (year 4)	123,502
2014 (year 5)	123,502
2015 (year 6)	123,502
2016 (year 7)	123,502
2017 (year 8)	123,502
2018 (year 9)	123,502
2019 (year10)	123,502
Total estimated reductions (tonnes of CO_2e)	1,074,648
Total number of crediting years	10
Annual average of the estimated reductions over the crediting period	107,464

A.4.5. Public funding of the project activity:

The project will not receive public funding from Parties included in Annex 1 of the Convention.

SECTION B. Application of a baseline and monitoring methodology

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

Methodology

“Consolidated methodology electricity generation from biomass residues” Reference: ACM0006 (Version 09, EB48)

“Consolidated baseline methodology for grid-connected electricity generation from renewable sources” (ACM0002, version 10); is used for the determination of the Combined Margin

Tools

1) “Combined tool to identify the baseline scenario and demonstrate additionality Reference: EB 28, Annex 14 (Version 02.2)
2) “Tool to calculate baseline, project and/or leakage emissions from electricity consumption”: EB39, Annex 7 (Version 01)
3) “Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion” Reference: EB 41, Annex 11 (Version 02)
4) “Tool to calculate the emission factor for an electricity system”: Version 01.1, EB35, Annex 12

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

The project activity is a Greenfield project hence the selected approach from paragraph 48 of the CDM modalities and procedures is "Emissions from a technology that represents an economically attractive course of action, taking into account barriers to investment".

Methodology ACM0006 page 3, stipulates that "*This methodology is applicable to biomass residue fired electricity generation project activities, including cogeneration plants*" and that the project activity may include "***The installation of a new biomass residue fired power plant at a site where currently no power generation occurs (Greenfield power projects***)" to which the project activity fully complies.

Further requirements are also fulfilled by the proposed project activity[9]:

Requirement for the methodology	Fulfilled by the proposed activity
No other biomass types than biomass residues, as defined above, are used in the project plant and these biomass residues are the predominant fuel used in the project plant (some fossil fuels may be co-fired);	The project will use only biomass residues coming from wood and wood related industries[10]. No fossil fuel will be co-fired in the biomass boilers. Steam generated from a separate gas/fuel oil boiler will be diverted to the steam turbine of the project activity (backup boiler).
For projects that use biomass residues from a production process (e.g. production of sugar or wood panel boards), the implementation of the project shall not result in an increase of the processing capacity of raw input (e.g. sugar, rice, logs, etc.) or in other substantial changes (e.g. product change) in this process	The biomass used is coming from wood waste and wood residues that are generated by industrial activities and that would normally be discarded, or dumped and left to decay, or eventually burned in an uncontrolled manner. Therefore, there will be no change in the processing capacity of the raw input.
The biomass residues used by the project facility should not be stored for more than one year;	The biomass residues will be stored onsite for a few days only (5,000 MT storage).
No significant energy quantities, except from transportation or mechanical treatment of the biomass residues, are required to prepare the biomass residues for fuel combustion, i.e. projects that process the biomass residues prior to combustion (e.g. esterification of waste oils)	Transportation and shredding are the only two energy consumers required for the preparation of the fuel prior combustion.

9 ACM0006 / Version 09 Sectoral Scope: 01 EB 48 (page 3)

10 The supply of biomass residues will be in compliance with the National Law 26 331 relating to the protection of native forest.

Conclusion

The proposed Project Activity meets all applicability requirements of the selected approved methodology and therefore the methodology is applicable to the project.

B.3. Description of the sources and gases included in the project boundary:

In the determination of the baseline and project emissions, the following emission sources are included:

	Source	Gas	Incl./Excl.	Justification
Baseline	Electricity generation (Grid)	CO_2	Included	Main emission source.
		CH_4	Excluded	Excluded for simplification. This is conservative.
		N_2O	Excluded	Excluded for simplification. This is conservative.
	Heat generation (Fossil fuel steam boiler)	CO_2	Included	Main emission source.
		CH_4	Excluded	Excluded.
		N_2O	Excluded	Excluded for simplification. This is conservative.
	Uncontrolled burning or decay of surplus biomass residues	CO_2	Excluded	It is assumed that CO_2 emissions from surplus biomass residues do not lead to changes of carbon pools in the LULUCF sector
		CH_4	Excluded[11]	Methane avoidance is not considered in the project activity as this source is not included in the project boundary.
		N_2O	Excluded	Excluded for simplification. This is conservative. Note also that emissions from natural decay of biomass are not included in GHG inventories as anthropogenic sources.
Project activity	On-site fossil fuel and electricity consumption due to the project activity (stationary or mobile)	CO_2	Included	May be an important source of emissions
		CH_4	Excluded	Excluded for simplification. This emission source is assumed to be very small.
		N_2O	Excluded	Excluded for simplification. This emission source is assumed to be very small.
	Off-site transportation of biomass residues	CO_2	Included	May be an important emission source
		CH_4	Excluded	Excluded for simplification. This emission source is assumed to be very small.
		N_2O	Excluded	Excluded for simplification. This emission source is assumed to be very small.
	Combustion of biomass residues	CO_2	Excluded	It is assumed that CO2 emissions from surplus biomass do not lead to changes of carbon pools in the LULUCF

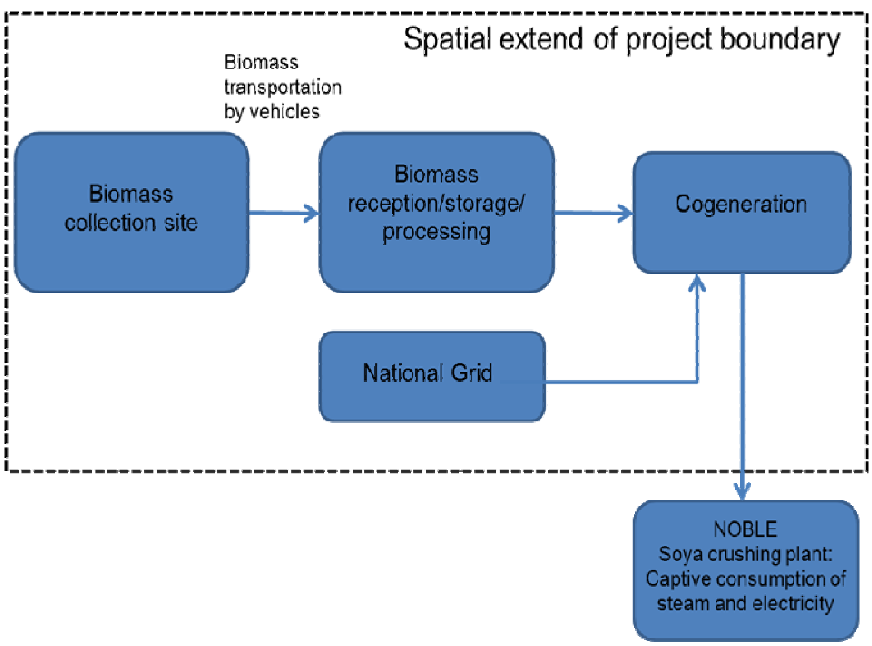
[11] As permitted by the methodology, the project participant has decided to exclude CH_4 emissions from the project boundary for both baseline and project emissions

	for electricity and / or heat generation			sector.
		CH_4	Excluded	Not included in the baseline scenario
		N_2O	Excluded	Excluded for simplification. This emission source is assumed to be very small.
	Storage of biomass residues	CO_2	Excluded	It is assumed that CO2 emissions from surplus biomass residues do not lead to changes of carbon pools in the LULUCF sector.
		CH_4	Excluded	Excluded for simplification. Since biomass residues are stored for not longer than one year, this emission source is assumed to be small.
		N_2O	Excluded	Excluded for simplification. This emission source is assumed to be very small.

Project boundaries

The spatial extend of the project boundary encompasses:

- Biomass cogeneration plant includes the biomass reception/storage/processing area, 2 biomass boilers, 1 fossil fuel boiler and the turbo-alternator.
- Vehicles used for the biomass transportation to the site
- Site(s) where the biomass residues would have been left to decay or dumped
- National grid



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

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The **ACM0006 / Version 09** methodology (page 4) states that *Project participants shall identify the most plausible baseline scenario and demonstrate additionality using the latest approved version of the "Combined tool to identify the baseline scenario and demonstrate additionality" version 02.2, agreed by the CDM Executive Board.*

As per EB meeting report 41 Annex 12, the steps 1 & 2 of the combined tool described above shall be presented here, the subsequent steps of the tool will be presented in Section B.5.

STEP 1. Identification of alternative scenarios

In applying ***Step 1a*** of the tool, realistic and credible alternatives should be separately determined regarding:

- How **power** would be generated in the absence of the CDM project activity;
- What would happen to the **biomass residues** in the absence of the project activity;
- How the **steam** would be generated in the absence of the project activity.

Step 1a Define alternative scenarios to the proposed CDM project activity

For **power** generation, the realistic and credible alternatives may include, *inter alia*:

Alternative	Description	Comment
P1	The proposed project activity not undertaken as a CDM project activity.	This alternative is theoretically possible but not realistic.
P2	The continuation of power generation in an existing biomass residue fired power plant at the project site, in the same configuration, without retrofitting and fired with the same type of biomass residues as (co-)fired in the project activity.	This alternative is not realistic. This is a Greenfield project and therefore there is no existing power plant at the site.
P3	The generation of power in an existing captive power plant, using only fossil fuels.	This alternative is not realistic. This is a Greenfield project and therefore there is no existing power plant at the site nor is there any available cogeneration plant supplying energy nearby the project activity site.
P4	The generation of power in the grid.	Credible alternative. Grid is available at the project site. It was the scenario planned at the time of approval of the soya crushing plant.
P5	The installation of a **new** biomass residue fired power plant, fired with the same type and with the same annual amount of biomass residues as	This alternative is not realistic. There is no biomass cogeneration in the region of the project activity. As well it

	the project activity, but with a lower efficiency of electricity generation (e.g. an efficiency that is common practice in the relevant industry sector) than the project plant and therefore with a lower power output than in the project case.	is not a common practice to use biomass in the soya industry
P6	The installation of a **new** biomass residue fired power plant that is fired with the same type but with a higher annual amount of biomass residues as the project activity and that has a lower efficiency of electricity generation (e.g. an efficiency that is common practice in the relevant industry sector) than the project activity. Therefore, the power output is the same as in the project case.	This alternative is not realistic. There is no biomass cogeneration in the region of the project activity. As well it is not a common practice to use biomass in the soya industry
P7	The **retrofitting** of an existing biomass residue fired power, fired with the same type and with the same annual amount of biomass residues as the project activity, but with a lower efficiency of electricity generation (e.g. an efficiency that is common practice in the relevant industry sector) than the project plant and therefore with a lower power output than in the project case.	This alternative is not realistic. This is a Greenfield project and therefore there is no existing power plant at the site.
P8	The **retrofitting** of an existing biomass residue fired power that is fired with the same type but with a higher annual amount of biomass residues as the project activity and that has a lower efficiency of electricity generation (e.g. an efficiency that is common practice in the relevant industry sector) than the project activity.	This alternative is not realistic. This is a Greenfield project and therefore there is no existing power plant at the site.
P9	The installation of a **new** fossil fuel fired captive power plant at the project site.	This alternative is not realistic. The plant requires both steam and electricity. It is therefore non-economical to setup a separate heat and power plant compared to a combined heat and power.
P10	The installation of a new single- (using only biomass residues) or co-fired (using a mix of biomass residues and fossil fuels) cogeneration plant with the same rated power capacity as the project activity power plant, but that is fired with a different type and/or quantity of fuels (biomass residues and/or fossil fuels). The annual amount of biomass residue used in the baseline scenario is lower than that used in the project activity;	This alternative is not realistic. There is no biomass cogeneration in the region of the project activity. There is no biomass cogeneration in the region of the project activity. As well it is not a common practice to use biomass in the soya industry.
P11	The generation of power in an existing fossil fuel fired cogeneration plant co-fired with	This alternative is not realistic: This is a Greenfield project and

	biomass residues, at the project site	therefore there is no existing power plant at the site.

If the proposed project activity is the **cogeneration** of power and heat, project participants shall define the most plausible baseline scenario for the generation of heat. For **heat** generation, realistic and credible alternative(s) may include, *inter alia*:

Alternative	Description	Comment
H1	The proposed project activity not undertaken as a CDM project activity	This alternative is theoretically possible but not realistic.
H2	The proposed project activity (installation of a cogeneration power plant), fired with the same type of biomass residues but with a different efficiency of heat generation (e.g. an efficiency that is common practice in the relevant industry sector)	This alternative is not realistic. The proposed project activity is a first of kind in the soya industry in Argentina. As well it is not a common practice to use biomass in the soya industry
H3	The generation of heat in an existing captive cogeneration plant, using only fossil fuels	This alternative is not realistic. This is a Greenfield project and therefore there is no existing power plant at the site.
H4	The generation of heat in boilers using the same type of biomass residues	This alternative is not realistic. The proposed project activity is a first of kind in the soya industry in Argentina. There are no biomass boilers in the region of the project activity. As well the plant requires both steam and electricity. It is therefore non-economical to setup a separate heat plant compared to a combined heat and power.
H5	The continuation of heat generation in an existing biomass residue fired cogeneration plant at the project site, in the same configuration, without retrofitting and fired with the same type of biomass residues as in the project activity	This alternative is not realistic. This is a Greenfield project and therefore there is no existing power plant at the site.
H6	The generation of heat in boilers using fossil fuels	Credible alternative. This the current common practice in the soya industry and was the scenario planned at the time of approval of the soya crushing plant.
H7	The use of heat from external sources, such as district heat	This alternative is not realistic. The project activity site is located in a remote area where there is no district heat available.
H8	Other heat generation technologies (e.g. heat pumps or solar energy)	This alternative is not realistic. Steam is produced in a reliable manner with boilers only

H9	The installation of a **new** single- (using only biomass residues) or co-fired (using a mix of biomass residues and fossil fuels) cogeneration plant with the same rated power capacity as the project activity power plant, but that is fired with a different type and/or quantity of fuels (biomass residues and/or fossil fuels). The annual amount of biomass residue used in the baseline scenario is lower than that used in the project activity	This alternative is not realistic. The proposed project activity is a first of kind in the soya industry in Argentina. This is a Greenfield project.
H10	The generation of power in an existing fossil fuel fired cogeneration plant co-fired with biomass residues, at the project site.	This alternative is not realistic. This is a Greenfield project and therefore there is no existing power plant at the site.

The type of biomass utilized in the project activity falls under 'biomass residues' from agriculture, forestry and related industry. In particular the boiler(s) are designed to burn wood chips originated from forestry residues left on the fields (off-cuts) or from pruning activities (from surrounding municipalities). These residues/of-cuts are shredded on the collection site and transported to the project activity.
Noble will procure all its biomass externally. Indeed the soya crushing plant is not generating any residues suitable for combustion (hulls residues are typically sold as animal feed or landfilled).

Hence for the use of **biomass residues**, the realistic and credible alternative(s) may include, *inter alia*:

Baseline scenario	**Description**	**Project Activity**
B1	The biomass residues are dumped or left to decay under mainly aerobic conditions. This applies, for example, to dumping and decay of biomass residues on fields.	Credible Alternative There is a large amount of biomass residues unutilized and left to decay on the field.
B2	The biomass residues are dumped or left to decay under clearly anaerobic conditions. This applies, for example, to deep landfills with more than 5 meters. This does not apply to biomass residues that are stock-piled or left to decay on fields.	This alternative is not realistic. The residues are stockpiled or left to decay on the fields
B3	The biomass residues are burnt in an uncontrolled manner without utilizing it for energy purposes.	Credible Alternative There is a large amount of biomass residues unutilized and left to decay on the field.
B4	The biomass residues are used for heat and/or electricity generation at the project site	This alternative is not realistic. This is a Greenfield project and therefore there is no existing heat and/or electricity plant using biomass at the site.
B5	The biomass residues are used for power generation, including cogeneration, in other existing or new grid-connected power plants	This alternative is not realistic. There is no biomass power plant in the region
B6	The biomass residues are used for heat	This alternative is not realistic.

	generation in other existing or new boilers at other sites	There is no biomass boilers in the region
B7	The biomass residues are used for other energy purposes, such as the generation of biofuels	This alternative is not realistic. Wood chips is not appropriate for biofuel production
B8	The biomass residues are used for non-energy purposes, e.g. as fertilizer or as feedstock in processes (e.g. in the pulp and paper industry)	This alternative is not realistic. There are no other applications for the biomass residues which are left on the field or landfilled

Outcome of Step 1a: list of plausible alternative scenarios to the project activity:

Based on the above, two alternatives for the baseline scenario are identified:

#	Scenario	Description
Alternative 1	Scenario 2 which is a combination of: P4 + H6 + (B1 or B3)	"The power generated by the project plant would in the absence of the project activity be purchased from the grid. The biomass residues would in the absence of the project activity be dumped or left to decay or burnt in an uncontrolled manner without utilizing it for energy purposes. The steam would in the absence of the project activity be generated in boilers fired with fossil fuels"
Alternative 2	P1+ H1 + (B1 or B3)	"The project activity not undertaken as CDM"

Step 1b Consistency with mandatory applicable laws and regulations

The use of natural gas fuel for the generation of steam is consistent with the mandatory laws and regulations of Argentina[12] while emissions are in accordance with the Argentina national and provincial standards. Hence, the use of gas is a common practice in Argentina[13] and more specifically in the soya industry.

Hence both alternatives are realistic and in compliance with local laws and regulations.

STEP 2. Barrier analysis

This Step will identify barriers and assess which alternatives are prevented by barriers.

Step 2a. Identify barriers that would prevent the implementation of alternative scenarios.

[12] LEY GENERAL DEL AMBIENTE, Government of Argentina

[13] Argentina is the largest natural gas producer in South America (source: www.eia.doe.gov)

Lack of prevailing practice:

Alternative 1:

For the purpose of establishing first of its kind, we define:

1) Project technology = power supplied from the grid + fossil fuel fired steam boilers;
2) Applicable geographical region = province of Santa Fe

Supply of power from the grid and fossil fuel fired steam boilers are the common practice in the soya industry therefore there is no barrier that prevent the implementation of this alternative

➔ No barrier

Alternative 2:

For the purpose of establishing first of its kind, we define:

1) Project technology = steam turbine[14] cogeneration fired with biomass residues;
2) Applicable geographical region = province of Santa Fe

The outcome of the common practice analysis illustrated by table B.5.4 , demonstrates clearly that:

1) No biomass cogeneration is currently in commercial operation in the soya industry
2) Biomass cogeneration has not been proposed in another CDM project activity in the Santa Fe province and published in the CDM-PDD by a DOE for public comments

Step 2b. Eliminate alternative scenarios which are prevented by the identified barriers

	Lack of prevailing practice	Alternative prevented by barrier?
Alternative 1	No	No
Alternative 2	Significant	No

Outcome of step 2b: alternative scenario to the project activity that is not prevented by any barriers:

#	Scenario	Description
Alternative 1	Scenario 2 which is a combination of: P4 + H6 + (B1 or B3)	"The power generated by the project plant would in the absence of the project activity be purchased from the grid. The biomass residues would in the absence of the project activity be dumped or left to decay or burnt in an uncontrolled manner without utilizing it for energy purposes. The steam would in the absence of the project activity be generated in boilers fired with fossil fuels"
Alternative 2	P1+ H1 + (B1 or B3)	"The project activity not undertaken as CDM"

[14] Medium pressure (42.9 bara), medium size (10MWe), non-condensing steam turbine

Despite the significant barrier arising from 'lack of prevailing practice', the PP decided to apply as well step 3 to identify the baseline and demonstrate the additionality.

STEP 3: Investment Analysis

This step serves to determine which of the alternative scenarios in the short list remaining after step 2 is the most economically or financially attractive. For this purpose, an investment comparison analysis is conducted for the remaining alternative scenarios after step 2.

The investment analysis reveals that the project activity is not economically or financially attractive without the revenue from the sale of certified emission reductions (CERs).

The combined tool requires the PP to identify the financial/economic indicator, such as IRR, most suitable for the project type and decision context. Accordingly, PP has identified Project IRR as the financial indicator. Project IRR is one of the most frequently used financial indicators by banks and investors alike to evaluate the financial attractiveness of a project activity.

The project IRR needs to be compared with a benchmark[15] to prove the financial unattractiveness of the project. The Combined Tool stipulates that the benchmark/discount rates shall be derived from *inter alia* "Government/official approved benchmark where such benchmarks are used for investment decisions" Besides, the 'Guidance on the Assessment of Investment Analysis' issued by EB in its 41st meeting requires that "*In the cases of projects which could be developed by an entity other than the project participant the benchmark should be based on publicly available data sources which can be clearly validated by the DOE*". Hence, when the Combined Tool and Guidance are read together, the selected benchmark should satisfy three conditions: it should be Government/official approved; it should be used for investment decisions; and it should be publicly available data source so that DOE can validate.

Guidance on the Assessment of Investment Analysis states that, "In cases where a benchmark approach is used the applied benchmark shall be appropriate to the type of IRR calculated. Local commercial lending rates or weighted average costs of capital (WACC) are appropriate benchmarks for a project IRR".

Accordingly, PP has selected the local commercial lending rate as the benchmark. The commercial lending rate in Argentina as of December 2007 was 12%[16]. This rate has been chosen as the benchmark.

This benchmark satisfies all the three conditions listed above:

- The lending rate of commercial banks is based on the state rate and hence it is *official rate*;
- The benchmark is *used* by commercial banks *to take a financing decision* in as much as a project which cannot service the interest does not merit consideration by bank; and
- The benchmark is *publicly available* data source and *verifiable by DOE*.

The benchmark of 12% chosen, therefore, fulfils all the criteria laid down by the Combined Tool[17] and is considered conservative. The project developer has selected this rate as the benchmark as this covers the cost of the loan and also provides a return on equity (which is much riskier than term loan).

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[15] Because one of the baseline is electricity from the grid, a benchmark analysis is appropriate (EB51, annex 58, point 16 and see also AM_CLA_0125).

[16] Source: Monetary Report, December 2007 (p.7); see Enclosure 24

Financial indicator for the project activity has been computed based on the following broad parameters:

Table B.5.2: Parameters for financial analysis		Unit	Value
Biomass Boiler(s) & Turbine	Phase 1	US$	$16,079,700
	Phase 2	US$	$10,825,500
Financing pattern	Equity	%	30
	Debt	%	70
Interest (LIBOR, 6 months + 4.25%)		%	7.5%
Repayment Holiday		Year	1.5
Repayment period		Year	8
Design Soya bean throughout per year		MT/year	2,640,000
Power saved		MWh	79,200
Specific power requirement per MT of soya		kWh	30.00
Specific steam requirement per MT of soya		tonne	0.250
Cost of Gas per 1,000 M^3		US$	120.0
Cost of biomass per Mt (delivered at the gate)		US$	30.00
Electricity tariff		USD/MWh	116
O&M costs (non fuel) per MWh		USD/MWh	26.0
Depreciation	civil works	%	2
	plant and machinery	%	10
Tax		%	35

All the input values have been based on quotations/purchase orders, sanction letters, or standard publications available at the time of decision. References to the support documents are provided in the spread sheet (reference is provided beside each assumptions).

The income statement of the project and the project IRR has been computed based on the above input parameters. In computing the project IRR, profit after tax, depreciation, interest on term loan and salvage value have been taken as cash inflow and the entire project cost as cash outflow as suggested by the Guidance on the Assessment of Investment Analysis. The IRR has been computed for a period of 20 years with a salvage value added at the end of the project lifetime. Based on the above assumptions, the project IRR works out to be 2.61% against the benchmark return of 12%.

The IRR estimate is quite conservative in the sense that the escalation in O&M expenses has been taken constant as against the inflation rate of 8.8% in 2008. If provisions are made for this, IRR will come down.

The robustness of this conclusion was tested by subjecting critical parameters to reasonable variations. Guidance on the Assessment of Investment Analysis defines critical assumptions as those which constitute more than 20% of total project costs or total project revenue and reasonable variation has been defined as a range of +10% and - 10% [18]. Three factors were identified as critical: project cost, fuel cost and O&M cost (though O&M cost does not account for 20% of total project revenue).

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17 And also the *Guidance on the Assessment of Investment Analysis*, Point No.11 (page No.3)

18 EB51, Annex 58, points 17 & 18

The impact of a 'reasonable variation' in these three parameters on the project IRR have been worked out and the results are shown in tables B.5.3.

<u>Table B.5.3:</u> *Sensitivity analysis of IRR*

Factors	**-10%**	**0%**	**+10%**	**Benchmark**
Project activity cost	3.61%	2.61%	1.58%	12%
Fuel cost (NG)	-0.05%		4.62%	
O&M cost	3.75%		1.17%	
With CDM	12.14%			12%

It could be seen from the above that even under the most optimistic conditions, the project IRR will not cross the benchmark. The financial unattractiveness of the project is thus evident.
The project, therefore is not a business-as-usual scenario and hence additional. The CDM benefits will enable the project to improve its return and become viable, as evidenced from the fact that with CDM benefits, the project will earn a return of 12.09% .

The conclusion of the investment analysis does not change even under sensitivity analysis.

Hence the selected baseline is alternative 1.
The amount of steam and electricity required for the operation of the plant are based on the specific energy requirements per tonne of soya bean processed. Electricity is required at every stage of the process (soya preparation, crushing, dehulling, extraction, storage and handling facilities) while steam is mainly used by solvent extraction process and for the soya bean dryer during the harvesting season.

<u>Table B.4.1:</u> *Key parameters of selected baseline*		
Soya crushing plant		
Processing capacity at MCR	8,000	tonnes soybean/day
Availability	7,920	hours/year (330 days/year)
Specific energy requirements[19]		
Steam	0.250	tonne steam/tonne soybean
Electricity	30.00	kWh/tonne soybean
Source of energies		
Steam	Natural gas	Plant connected to the existing natural gas distribution network
Electricity	National grid	Plant connected to the national grid

[19] See Enclosure 1: Investment proposal document

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity (assessment and demonstration of additionality):

Prior consideration of CDM

Annex 46 of EB 41 states that all projects with a start date before 2 August 2008, for which the start date is prior to the date of publication of the PDD for global stakeholder consultation, should demonstrate that the CDM was seriously considered in the decision to implement the project activity. Such demonstration requires the following elements to be satisfied:

(a) The project participant must indicate awareness of the CDM prior to the project activity start date, and that the benefits of the CDM were a decisive factor in the decision to proceed with the project. Evidence to support this would include, *inter alia*, minutes and/or notes related to the consideration of the decision by the Board of Directors, or equivalent, of the project participant, to undertake the project as a CDM project activity.

(b) The project participant must indicate, by means of reliable evidence, that continuing and real actions were taken to secure CDM status for the project in parallel with its implementation. Evidence to support this should include, *inter alia*, contracts with consultants for CDM/PDD/methodology services, Emission Reduction Purchase Agreements or other documentation related to the sale of the potential CERs (including correspondence with multilateral financial institutions or carbon funds), among others

Noble decided in December 2007 to set up a Greenfield soya crushing plant. The energy needs were originally based on grid electricity and natural gas for steam generation with conventional boilers.

Driven by the recommendations of Noble Carbon[20] (a subsidiary of Noble Group specialised in the development of emission reductions projects) and Vyncke Energietechniek[21], the design of the energy centre has been switched to renewable energy by using a combined heat and power (CHP) plant. With the income generated from carbon credits, the project became financially attractive and was therefore approved by Noble if developed as a CDM project. The board resolution confirming the investment for the biomass CHP was passed on 27th February 2008. A copy of the resolution will be made available to the DOE during validation.

As soon as January 2008, Noble entered in discussions with various CDM consultants and selected Kyoto Energy with whom the contract was signed on 25th July 2008.

The contract for the biomass boiler was awarded to Vyncke Energietechniek N.V. on 16 April 2008, which is considered as the start date of the project activity. Construction works commenced in July 2008 while the delivery of equipment started in January 2009. The first phase of the project activity will be in commercial operation by early 2010.

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20 Noble Carbon is a major player in the market for emission reduction certificates or “carbon credits” and one of world's largest suppliers of registered CERs.

21 Vyncke Energietechniek: www.vyncke.be

From the foregoing, it should be evident that the project activity has conformed to both the conditions stipulated vide Annex 46 of EB 41 with respect to the demonstration of serious consideration of CDM benefits.

Table B5.1: Prior consideration of the CDM		*Reference document*
Proposal from biomass boiler supplier	16/01/2008	Enclosure 15
Initial discussion with Carbon Consultant	21/01/2008	Enclosure 12
Board resolution	27/02/2008	Enclosure 22
Purchasing agreement for biomass boiler	16/04/2008	Enclosure 23
Engagement of CDM consultant	25/07/2008	Enclosure 11
Stakeholder consultation	8/10/2008	Enclosure 13
Notification to the Host DNA	09/10/2008	Enclosure 10
Initial inquiries from DOEs for validation	17/02/2009	Enclosure 14
ERPA	27/11/2009	Enclosure 21
Expected commercial operation start date	July 2010	

STEP 4: Common practice analysis

The previous steps are complemented with an analysis of the extent to which the proposed project type has already diffused in the relevant sector and geographical area. This test is a credibility check to demonstrate additionality.

The soya industry in Argentina plays a major role in the local economy of Argentina and especially in the Santa Fe province where over 37 million tonnes of soya is produced annually (said amount varying according to weather conditions). Altogether in Santa Fe, 12 soya crushing plants hold the market. These players represent almost 80% of all crushing plants in Argentina. The remaining 20% are small crushers scattered around the country, and therefore, not on a comparative scale. Of the 80%, only two are using fossil fuel based cogeneration. Some plants, such as Vicentin are not only crushing soya beans but also sunflower, thus using its own sunflower seed as biomass along with fuel oil and natural gas. The Project Activity is not generating combustible biomass residues and hence needs to rely on external supply of biomass which is an obstacle for the development of such project.

As the below table shows, at the time of decision to proceed with the project activity (2008), the industry was mainly relying on grid power supply and fossil fuel boilers for steam as evidenced by the survey of the current practice detailed in the table here below (survey made by the project participant).

<u>Table B.5.4:</u> current practice of soya crushing plant in the province of Santa Fe (Argentina)

#	Company	Location (Santa Fe province)	Tonnes/day	Fossil fuel used	Grid + Boilers	Fossil fuel Cogen	Biomass Cogen
1	Bunge	San Geronimo	2,000	Fuel Oil + NG	Yes	No	No
2	Bunge	Puerto San martin	8,000	Fuel Oil + NG	Yes	No	No
3	Terminal 6	Puerto San martin	19,000	Fuel Oil + NG	Yes	No	No
4	Buyatti	Puerto San martin	3,000	Fuel Oil + NG	Yes	No	No
5	Nidera	Puerto San martin	2,200	Fuel Oil + NG	Yes	No	No
6	Cargill	Puerto San martin	9,000	Fuel Oil + NG	Yes	No	No
7	Cargill	VG Galvez	13,000	Fuel Oil + NG	Yes	No	No
8	Molinos	San Lorenzo	17,000	Fuel Oil + NG	No	Yes	No
9	Vicentin	San Lorenzo	16,000	Fuel Oil + NG	Yes	No	No
10	Vicentin	Ricardone	5,500	Fuel Oil + NG +Sunflower hulls	No	Yes	No
11	Dreyfus	General Lagos	12,000	Fuel Oil + NG	Yes	No	No
12	Dreyfus	Timbues	6,000	Fuel Oil + NG	Yes	No	No

Table B.5.4 demonstrates that there are no other biomass cogeneration plants in commercial operation in the soya industry in the province of Santa Fe.

In a large context, the use of biomass cogeneration as fuel in Argentina is a new concept and the project activity is a first of its kind as described above. Renewable energy producers are concentrating mainly on hydroelectric power from major plants. Argentina possesses multiple underutilized potentials for generating heat and electricity from hydro and wind power but also from solar, biomass and geothermal sources[22].

<u>Conclusion</u>

Since all conditions of the "Combined tool to identify the baseline scenario and demonstrate additionality" are satisfied, the proposed project activity is additional.

[22] Energy-policy Framework Conditions for Electricity Markets and Renewable Energies, 23 Country Analyses, Eschborn, September 2007, GTZ, Federal Ministry for Economic Cooperation and Development

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

This section describes the project emissions, baseline emissions, leakage and emissions reductions based on *scenario 2* of ACM0006 v09.

Emission reductions

The emission reduction ER_y by the project activity during a given year y is the difference between the emission reductions through substitution of electricity generation with fossil fuels ($ER_{electricity,y}$), the emission reductions through substitution of heat generation with fossil fuels ($ER_{heat,y}$), project emissions (PE_y), emissions due to leakage (L_y) and, where this emission source is included in the project boundary and relevant, baseline emissions due to the natural decay or burning of anthropogenic sources of biomass residues ($BE_{biomass,y}$), as follows:

$ER_y = ER_{heat,y} + ER_{electricity,y} + BE_{biomass,y} - PE_y - L_y$		**Equation 1**[23]
Where	Description	Unit
ER_y	Emissions reductions of the project activity during the year y	tCO_2/year
$ER_{electricity,y}$	Emission reductions due to displacement of electricity during the year y	tCO_2/year
$ER_{heat,y}$	Emission reductions due to displacement of heat during the year y	tCO_2/year
$BE_{biomass,y}$	Baseline emissions due to natural decay or burning of anthropogenic sources of biomass residues during the year y	tCO_2/year
PE_y	Project emissions during the year y	tCO_2/year
L_y	Leakage emissions during the year y	tCO_2/year

Project emissions

Project emissions are calculated as follows:

$PE_y = PET_y + PEFF_y + PE_{EC,y} + GWP_{CH4} * (PE_{Biomass,CH4,y} - PE_{WW,CH4,y})$		**Equation 2**[24]
Where	Description	Unit
PET_y	CO_2 emissions during the year y due to transport of the biomass residues to the project plant	tCO_2/year
PEFFy	CO_2 emissions during the year y due to fossil fuels co-fired by the generation facility or other fossil fuel consumption at the project site that is attributable to the project activity	tCO_2/year
$PE_{EC,y}$	CO_2 emissions during the year y due to electricity consumption at the project site that is attributable to the project activity	tCO_2/year
GWP_{CH4}	Global Warming Potential for methane valid for the relevant commitment period	tCO_2/year
$PE_{Biomass,CH4,y}$	CH_4 emissions from the combustion of biomass residues during the year y	tCH_4/year

23 ACM0006 / Version 09 Sectoral Scope: 01 EB 48 (page 25)

24 ACM0006 / Version 09 Sectoral Scope: 01 EB 48 (page 27)

$PE_{WW,CH4,y}$	CH_4 emissions from the waste water generated from the treatment of biomass residues in the year *y* (tCH_4/yr)	tCO_2/year

a) Carbon dioxide emissions from combustion of fossil fuels for transportation of biomass residues to the project plant (*PETy*)

The project activity is to use biomass residues (wood waste and wood residues as woodchips) coming from wood and wood related industries. This biomass is transported to the site and not generated on-site. Therefore, the CO_2 emissions resulting from the transportation of the biomass residues to the project shall be calculated.
The biomass will be transported by a third party company therefore the approach based on the basis of distance, number of trips and vehicle type is selected by the project participant (Option 1)[25].

At the time of writing the PDD, the biomass suppliers have not yet been selected. Sources of biomass have been identified in the Santa Fe province and also in the surroundings provinces of Misiones, Corrientes and Entre Rios.

$PET_y = N_y * AVD_y * EF_{km},CO_{2,y}$		**Equation 3**
Where	Description	Unit
PET_y	CO_2 emissions during the year *y* due to transport of the biomass residues to the project plant	tCO_2/year
N_y	Number of truck trips during the year y	-
AVD_y	Average round trip distance (from and to) between the biomass residue fuel supply sites and the site of the project plant during the year y	km
$EF_{km,CO2y}$	Average CO_2 emission factor for the trucks measured during the year y	tCO_2/km

b) Carbon dioxide emissions from on-site consumption of fossil fuels (*$PEFF_y$*)

$PEFF_y$ is the quantity of CO_2 emitted from on-site consumption of fossil fuel and is calculated using the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion"[26]

<u>*Project plant fossil fuel consumption:*</u> *($FF_{project\ plant,\ i,y}$)*

There is no co-firing of fossil fuel in the biomass boiler however the main source of fossil fuel consumption at the project plant is associated with the steam that is generated in a separate fossil fuel boiler ($Q_{FF,y}$) and diverted to the turbine of the project activity (only during phase 1 of the project activity).

As per the general guidance[27] for all scenario of the methodology, the fuel combustion associated with such steam quantities should be included in $FF_{project\ plant,i,y}$ and should be calculated by dividing the quantity of diverted steam by the efficiency of the steam boiler.

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[25] ACM0006 / Version 09 Sectoral Scope: 01 EB 48 (page 24)

[26] Tool to calculate project or leakage CO2 emissions from fossil fuel combustion Version 02, EB 41 Report Annex 11, option B has been selected

[27] ACM0006 / Version 09 Sectoral Scope: 01 EB 48 : General guidance for all scenarios (page 40)

$FF_{project\ plant,y} = \sum_i \{Q_{FF,y} / (NCV_{i.y} * \varepsilon_{boiler,FF})\}$		**Equation 4**
Where	Description	Unit
$FF_{project\ plant,y}$	Quantity of fuel type *i* combusted in the project plant during the year *y*	m^3/year
$Q_{FF,y}$	Steam quantity generated by the fossil fuel boiler	GJ/year
$\varepsilon_{boiler,FF}$	Efficiency of the fossil fuel boiler	-
$NCV_{i.y}$	Weighted average net calorific value of the fuel type *i* in year *y*	GJ/m^3
i	Fuel type combusted	

<u>Project site fossil fuel consumption:</u> ($FF_{project\ site,\ i,y}$)

The fossil fuel consumption of the project activity $FF_{project\ site,\ i,y}$ is attributable to the on-site transport of biomass with mechanical shovels using diesel.

Hence;

$PEFF_y = \sum_i (FF_{project\ plant,i,y} * NCV_{i,y} * EF_{CO2,i}) + \sum_i (FF_{project\ site,i,y} * NCV_{i.y} * EF_{CO2,i})$		**Equation 5**
Where	Description	Unit
$PEFF_y$	CO_2 emissions from onsite fossil fuel combustion in the project activity during the year *y*	tCO_2/year
$FF_{project\ plant,\ i,y}$	Quantity of fuel type *i* combusted in the project plant during the year *y*	m^3/year
$FF_{project\ site,\ i,y}$	Quantity of fuel type *i* combusted at the project site for other purposes that are attributable to the project activity during the year *y*	m^3/year
$NCV_{i,y}$	Weighted average net calorific value of the fuel type i in the year y	GJ/m^3
$EF_{CO2,i}$	Is the weighted average CO2 emission factor of fuel type i in the year y	tCO_2/GJ
i	Fuel type combusted (diesel or natural gas)	

c) CO_2 emissions from electricity consumption (*$PE_{EC,y}$*)

Project emissions from on-site electricity consumption ($PE_{EC,y}$) is calculated using the latest approved version of the *"Tool to calculate baseline, project and/or leakage emissions from electricity consumption"*. Scenario A is applied: Electricity from the grid" (no captive power plant is installed at the site) [28].

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28 ACM0006 / Version 09 Sectoral Scope: 01 EB 48 (page 29), point c)

$PE_{EC,y} = EC_{PJ,y} * EF_{EL,y} * (1+~~TDL_y~~)$		
Where	Description	Unit
$PE_{EC,y}$	Project emissions from electricity consumption in year *y*	tCO_2/year
$EC_{PJ,y}$	Quantity of electricity consumed by the project electricity consumption source *j* in year *y*	MWh/year
$EF_{EL,y}$	Emission factor for electricity generation for source *j* in year *y*	tCO_2/MWh
TDL_y	Average technical transmission and distribution losses for providing electricity to source *l* [29] → *neglected*	-

Option A1 has been selected to calculate $EF_{EL,y}$. Hence the combined margin emission factor of the national grid is used based on the procedures in the latest approved version of the tool to calculate the emission factor for an electricity system. ($EF_{EL,j/k/l,y} = EF_{grid,CM,y}$).

$PE_{EC,y} = EC_{PJ,y} * EF_{grid,CM,y}$		**Equation 6**
Where	Description	Unit
$PE_{EC,y}$	Project emissions from electricity consumption in year *y*	tCO_2/year
$EC_{PJ,y}$	Quantity of electricity consumed by the project electricity consumption from grid in year *y* (MWh/yr)	MWh/year
$EF_{grid,CM,y}$	Combined margin emission factor for the national grid for year y *(ex-ante option)*	tCO_2/MWh

d) Methane emissions from combustion of biomass residues ($PE_{Biomass,CH4,y}$):

This source of emissions has been excluded from the project boundary (see section B.3).

→ $PE_{Biomass,CH4,y} = 0$

e) Methane emissions from waste water treatment ($PE_{WW,CH4}$)

No water is used in the treatment/preparation of biomass, hence:

→ $PE_{WW,CH4} = 0$

Hence:

$PE_y = PET_y + PEFF_y + PE_{EC,y}$	**Equation 7**

[29] As per ACM0006, general guidance (page 40), it is assumed that transmission and distribution losses in the electricity grid are not influenced significantly by the project activity. They are therefore neglected.

Emission reductions due to displacement of electricity ($ER_{electricity,y}$)

Emission reductions due to the displacement of electricity are calculated by multiplying the net quantity of increased electricity generated with biomass residues as a result of the project activity (*EGy*) with the CO_2 baseline emission factor for the electricity displaced due to the project ($EF_{electricity,y}$), as follows[30]:

Step 1: Determination of $EF_{electricity,y}$

The project activity displaces electricity from other grid connected sources (P4) and the power generation of the project activity is less than 15 MW. The emission factor for the displacement of electricity corresponds to the grid emission factor $EF_{electricity,y} = EF_{grid,y}$ and should be calculated as a combined margin (CM), following the guidance in the section "Baselines" in the "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" (ACM0002);

Step 2: Determination of EG_y

EG_y corresponds to the net quantity of electricity generation in the project plant: $EG_y=EG_{project\ plant,y}$

$ER_{electricity,y} = EG_{project\ plant,y} * EF_{grid,y}$		**Equation 8**
Where:	*Description*	*Unit*
$ER_{electricity,y}$	Emission reductions due to displacement of electricity during the year *y*	tCO_2/yr
$EG_{project\ plant,y}$	Net quantity of electricity generation as a result of the project activity during the year *y*	MWh
$EF_{grid,y}$	CO_2 emission factor for the electricity national grid of Argentina during the year *y (ex-ante option)*	tCO_2/MWh

Emission reductions due to displacement of heat (steam)

The emission reductions due to displacement of heat ($ER_{heat,y}$) shall be calculated as follows:

As the baseline scenario is the generation of heat in boilers using fossil fuels (H6), baseline emissions are calculated by multiplying the savings of fossil fuels with the appropriate CO_2 emission factor.

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 (Q_y) by the efficiency of the boiler that would be used in the absence of the project activity (ε_{boiler}) and by multiplying with the CO_2 emission factor of the fuel type that would be used in the absence of the project activity for heat generation ($EF_{CO2,BL,heat}$) as follows:

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30 ACM0006 / Version 09 Sectoral Scope: 01 EB 48 (page 31,equation 8)

$ER_{heat,y} = (Q_y / \varepsilon_{boiler}) * EF_{CO2,BL,heat}$		**Equation 9**
Where	*Description*	*Unit*
$ER_{heat,y}$ [31]	Baseline emissions due to displacement of heat during the year *y*	tCO2/year
$Q_{,y} = Q_{,project\ plant,\ y}$ [32]	All heat generated by the cogeneration project plant that would in the absence of the project activity be generated in fossil fuel fired boilers.	TJ/year
$EF_{CO2,BL,heat}$	CO2 emission factor of the fossil fuel type used for heat generation in the absence the project activity	tCO2/TJ
ε_{boiler}	Energy efficiency of the boiler that would be used in the absence of the project activity to generate heat	-

Baseline emissions due to natural decay or uncontrolled burning of anthropogenic sources of biomass residues

$BE_{Biomass,y} = 0$ as this source is not included in the project boundary (see section B3)

Leakage

In the absence of the project activity the biomass residues are dumped or left to decay or burnt in an uncontrolled manner without utilizing it for energy purposes. In this case, the project participant shall demonstrate that the use of the biomass residues does not result in increased fossil fuel consumption elsewhere. For this purpose, project participants shall assess as part of the monitoring the supply situation for the types of biomass residues used in the project plant. Three options are available as per methodology[33].

To do so at validation stage, option L_3 was selected.

L3: The project participant shall demonstrate that suppliers of the type of biomass residue in the region of the project activity are not able to sell all of their biomass residues. For this purpose, project participants shall demonstrate that the ultimate supplier of the biomass residue (who supplies the project) and a representative sample of suppliers of the same type of biomass residue in the region had a surplus of biomass residues (e.g. at the end of the period during which biomass residues are sold), which they could not sell and which is not utilized. Letters from 3 local suppliers are available to confirm that each of them have a surplus of biomass residues which is currently not utilised[34].

The geographical boundary of the region used to assess the leakage effect is located within a radius of 200 km from the project activity site and includes partly the provinces of Santa Fe, Entre Rios, Córdoba and Buenos Aires. This geographical boundary is fixed for the entire crediting period.

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31 ACM0006 / Version 09 Sectoral Scope: 01 EB 48 (page 31,equation 26)

32 ACM0006 / Version 09 Sectoral Scope: 01 EB 48 (page 31,equation 27)

33 ACM0006 / Version 09 Sectoral Scope: 01 EB 48 (page 52&53, options L1, L2 and L3)

34 See enclosures 16 to 18

➔ $\mathbf{L_y = 0}$ (for ex-ante calculation)

If the project participant cannot demonstrate that the use of biomass does not result in leakage, a leakage penalty will be apply as per methodology[35].

$ER_y = ER_{heat,y} + ER_{electricity,y} + \sout{BE_{biomass,y}} - PE_y - Ly$	**Equation 10**

B.6.2. Data and parameters that are available at validation:

Data / Parameter:	GWP_{CH4}
Data unit:	tCO2e/tCH4
Description:	Global warming potential for CH4
Source of data used:	IPCC
Value applied:	21
Justification of the choice of data or description of measurement methods and procedures actually applied :	Shall be updated accordingly to any future COP/MOP decisions
Any comment:	-

Data / Parameter:	$EF_{grid,CM,y} = EF_{grid,y}$
Data unit:	tCO_2/MWh
Description:	Combined margin emission factor for the grid in year 2008
Source of data to be used:	Secretaria de Energia, http://energia3.mecon.gov.ar/contenidos/verpagina.php?idpagina=2311 Ex-ante option (0.5/0.5 weights)
Value applied:	0.442
Description of measurement methods and procedures to be applied:	As per "Tool to calculate the emission factor for an electricity system"
QA/QC procedures to be applied:	-
Any comment:	-

[35] ACM0006 / Version 09 Sectoral Scope: 01 EB 48 (page 53, formula 47)

B.6.3. Ex-ante calculation of emission reductions:

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Emission reductions (illustrated for year 1)

$ER_y = ER_{heat,y} + ER_{electricity,y} + BE_{biomass,y} - PE_y - L_y$			**Equation 1**
Where	Description	Value	Unit
ER_y	Emissions reductions of the project activity during the year *y*	43,316	tCO_2/yr
$ER_{electricity,y}$	Emission reductions due to displacement of electricity during the year *y*	35,006	tCO_2/yr
$ER_{heat,y}$	Emission reductions due to displacement of heat during the year *y*	95,170	tCO_2/yr
$BE_{biomass,y}$	Baseline emissions due to natural decay or burning of anthropogenic sources of biomass residues during the year *y*	0	tCO_2/yr
PE_y	Project emissions during the year *y*	86,860	tCO_2/yr
L_y	Leakage emissions during the year *y*	0	tCO_2/yr

Emission reductions due to displacement of heat (steam)

$ER_{heat,y} = (Q_y / \epsilon_{boiler}) * EF_{CO2,BL,heat}$			**Equation 9**
Where	*Description*	*Value*	*Unit*
$ER_{heat,y}$	Baseline emissions due to displacement of heat during the year *y*	95,170	tCO2/yr
$Q_{,y} = Q_{,project\ plant,\ y}$	All heat generated by the cogeneration project plant that would in the absence of the project activity be generated in fossil fuel fired boilers.	1,561	TJ/year
$EF_{CO2,BL,heat}$	CO2 emission factor of the fossil fuel type used for heat generation in the absence the project activity	56.1	tCO2/TJ
ε_{boiler}	Energy efficiency of the boiler that would be used in the absence of the project activity to generate heat	92.0%	-

Emission reductions due to displacement of electricity ($ER_{electricity,y}$)

$ER_{electricity,y} = EG_{project\ plant,y} \cdot * EF_{grid,y}$			**Equation 8**
Where:	*Description*	*Value*	*Unit*
$ER_{electricity,y}$	Emission reductions due to displacement of electricity during the year *y*	35,006	tCO_2/year
$EG_{project\ plant,y}$	Net quantity of electricity generation as a result of the project activity during the year *y*	79,200	MWh/year
$EF_{grid,y}$	CO_2 emission factor for the electricity national grid of Argentina during the year *y*	0.442	tCO_2/MWh

Project emissions

$PE_y = PET_y + PEFF_y + PE_{EC,y} + GWP_{CH4}$ * ~~($PE_{Biomass,CH4,y}$ – $PE_{WW,CH4,y}$)~~			**Equation 2**
Where	Description	Value	Unit
PE_y	Project emissions during the year *y*	86,860	tCO_2/year
PET_y	CO_2 emissions during the year *y* due to transport of the biomass residues to the project plant	3,082.4	tCO_2/year
PEFFy	CO_2 emissions during the year y due to fossil fuels co-fired by the generation facility or other fossil fuel consumption at the project site that is attributable to the project activity	83,773	tCO_2/year
$PE_{EC,y}$	CO_2 emissions during the year *y* due to electricity consumption at the project site that is attributable to the project activity	4.1	tCO_2/year
GWP_{CH4}	Global Warming Potential for methane valid for the relevant commitment period	21	tCO_2/year
$PE_{Biomass,CH4,y}$	CH_4 emissions from the combustion of biomass residues during the year *y*	0	tCH_4/year
$PE_{WW,CH4,y}$	CH_4 emissions from the waste water generated from the treatment of biomass residues in the year *y* (tCH_4/yr)	0	tCO_2/year

Carbon dioxide emissions from combustion of fossil fuels for transportation of biomass residues to the project plant (*PETy*)

$PET_y = N_y * AVD_y * EF_{km},CO_{2,y}$			**Equation 3**
Where		Value	Unit
PET_y	CO_2 emissions during the year *y* due to transport of the biomass residues to the project plant	3,082.4	tCO_2/year
N_y	Number of truck trips during the year y	7,264.3	-
AVD_y	Average round trip distance (from and to) between the biomass residue fuel supply sites and the site of the project plant during the year y	400	km
$EF_{km,CO2,y}$	Average CO_2 emission factor for the trucks measured during the year y	1.061[36]	$kgCO_2$/km

Carbon dioxide emissions from on-site consumption of fossil fuels (*$PEFF_y$*)

$PEFF_y = \sum_i (FF_{project\ plant,i,y} * NCV_{i,y} * EF_{CO2,i}) + \sum_i (FF_{project\ site,i,y} * NCV_{i.y} * EF_{CO2,i})$			**Equation 5**
Where	Description	Value	Unit
$PEFF_y$	CO_2 emissions from onsite fossil fuel combustion in the project activity during the year *y*	83,773	tCO_2/year

36 Calculated by using an estimated average diesel consumption of 0.4 l/km for a 25 MT truck

$FF_{project\ plant,\ i,y}$	Quantity of fuel type *natural gas* combusted in the project plant during the year *y*	38,206,464	m^3/year
$FF_{project\ site,\ i,y}$	Quantity of fuel type diesel combusted at the project site for other purposes that are attributable to the project activity during the year *y*	95.04	m^3/year
$NCV_{NG,y}$	Weighted average net calorific value of the fuel type natural gas in the year y	0.0390	GJ/m^3
$NCV_{diesel,y}$	Weighted average net calorific value of fuel type diesel in the year y	35.8	GJ/m^3
$EF_{CO2,NG}$	Is the weighted average CO2 emission factor of fuel type natural gas in the year y	0.056	tCO_2/GJ
$EF_{CO2,diesel}$	Is the weighted average CO2 emission factor of fuel type diesel in the year y	0.074	tCO_2/GJ

Calculation of $FF_{project\ plant,y}$

$FF_{project\ plant,y} = \sum_i \{Q_{FF,y} / (NCV_{i,y} * \varepsilon_{boiler,FF})\}$			**Equation 4**
Where	Description	Value	Unit
$FF_{project\ plant,y}$	Quantity of fuel type *natural gas* combusted in the project plant during the year *y*	38,206,464	(m^3/year)
$Q_{FF,y}$	Steam quantity generated by the fossil fuel boiler	1,489,000	(GJ/year)
$\varepsilon_{boiler,FF}$	Efficiency of the fossil fuel boiler	92.0%	-
$NCV_{i,y}$	Weighted average net calorific value of the fuel type *i* in year *y*	0.0390	GJ/m^3

Fuel combustion associated with the diverted steam quantities generated from the fossil fuel boiler during phase 1 is calculated from the net steam energy divided by the boiler efficiency:

Assumptions	Value	Unit	Comments
Steam quantity (outlet of boilers)	96,078/2[37]	kW	Heat & Mass diagram (enclosure 4)
Steam characteristics (superheated) - pressure - temperature - enthalpy	 42.9 405 3,220.2	 bar_a C kJ/kg	 Heat & Mass diagram Heat & Mass diagram Heat & Mass diagram
Boiler efficiency (Nebraska A-type)	92.0%	%	EB48, Annex 12, default value
$FF_{project\ plant,\ i,y}$	1,489	TJ/year	Calculated

[37] During phase 1, max. 50% of the energy is supplied by the fossil fuel boiler. The steam quantity is corrected to take into consideration the feed water and blow-down enthalpies

<u>Calculation of $FF_{project\ site,\ i,y}$</u>

It consists of diesel consumed by mechanical equipment for on-site transport of biomass.

	Consumers description	Fuel type	Value	Unit
$FF_{project\ site,\ i,y}$	Shovel to move woodchips from ware house to the biomass boiler hoper (12 liter/hour x 7,920)	Diesel	95.04	m^3/year

CO_2 emissions from electricity consumption ($PE_{EC,y}$)

$PE_{EC,y} = EC_{PJ,y} * EF_{grid,CM,y}$			**Equation 6**
Where	Description	Value	Unit
$PE_{EC,y}$	Project emissions from electricity consumption in year *y*	4.1	tCO_2/year
$EC_{PJ,y}$	Quantity of electricity consumed by the project electricity consumption from grid in year *y* (MWh/yr)	9.6	MWh/year
$EF_{grid,CM,y}$	Combined margin emission factor for the national grid for year y	0.442	tCO_2/MWh

B.6.4 Summary of the ex-ante estimation of emission reductions:

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YEAR	Estimation of project activity emissions (tCO_{2e})	Estimation of baseline emissions (tCO_{2e})	Estimation of leakage (tCO_{2e})	Estimation of overall emission reductions (tCO_{2e})
1	86,860	130,176	0	43,316
2	86,860	130,176	0	43,316
3	6,674	130,176	0	123,502
4	6,674	130,176	0	123,502
5	6,674	130,176	0	123,502
6	6,674	130,176	0	123,502
7	6,674	130,176	0	123,502
8	6,674	130,176	0	123,502
9	6,674	130,176	0	123,502
10	6,674	130,176	0	123,502
Total	**227,112**	**1,301,760**	**0**	**1,074,648**

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

B.7.1 Data and parameters monitored:

Data / Parameter:	$BF_{k,y} = BF_{T,k,y}$ (ID1)
Data unit:	tons of dry matter
Description:	Quantity of biomass residue type *k* combusted in the project plant during the year y
Source of data to be used:	On-site measurements
Description of measurement methods and procedures to be applied:	The amount of biomass combusted is estimated from the amount of biomass delivered to the project site. Each truck entering the project activity will be weighted at the gate by the use of a weighbridge. The moisture will be recorded in order to calculate the dry weight.
Monitoring frequency	Continuously, prepare annually an energy balance.
QA/QC procedures to be applied:	• The quantity shall be crosschecked with the quantity of electricity and heat generated and the fuel purchase receipts (if available). • An energy balance for the verification period will be undertaken, considering the stocks of biomass at the beginning and end of each verification period and the biomass purchase receipts. • The monthly stock of biomass will be recorded by using the best available methods (trapezoidal method for volume determination). • Data is recorded manually in a data log file • Uncertainly level of data: low • Calibration as per manufacturer's recommendation or at least once a year
Any comment:	

Data / Parameter:	Moisture content of the biomass residues (ID2)
Data unit:	% Water content
Description:	Moisture content of each biomass residue type *k*
Source of data to be used:	On-site measurements
Description of measurement methods and procedures to be applied:	By using a moisture analyser
Monitoring frequency	The moisture content of the biomass type *k* from each truck transported to the project site will be tested (internal laboratory) on a continuous basis i.e. measurements taken from each truck delivered. The mean values will be calculated at least annually
QA/QC procedures to be applied:	• Moisture content is recorded manually in a data log file • Uncertainly level of data: low • Maintenance and calibration as per manufacturer's specifications or at least every year
Any comment:	

Data / Parameter:	AVD_y (ID3)
Data unit:	km
Description:	Average round trip distance (from and to) between the supply sites and the project site
Source of data to be used:	Records by the project participant of the origin the biomass.
Description of measurement methods and procedures to be applied:	For each supply site, the distance between the source of the biomass and the plant will be estimated by using GIS mapping software or a GPS. The mean value of km travelled by trucks that supply the biomass plant will be calculated based on the amount of trips for each site and the corresponding distance.
Monitoring frequency	Continuously, each truck origin will be recorded
QA/QC procedures to be applied:	• Check consistency of distance records provided by the truckers by comparing recorded distances with other information from other sources. • The origin of the biomass and the corresponding round trip distance for each truck will be recorded manually in a data log file • Uncertainly level of data: low
Any comment:	

Data / Parameter:	N_y (ID4)
Data unit:	-
Description:	Number of truck trips for the transportation of biomass.
Source of data to be used:	On-site measurements
Description of measurement methods and procedures to be applied:	Recording of each truck delivering biomass to the plant
Monitoring frequency	Continuous (Each truck)
QA/QC procedures to be applied:	• The consistency of the number of truck trips with the quantity of biomass combusted will be checked (e.g. by relation with previous years). • Uncertainly level of data: low
Any comment:	

Data / Parameter:	$EF_{km,CO2,y}$ (ID5)
Data unit:	tCO_2/km
Description:	Average CO_2 emission factor for the trucks during the year *y*
Source of data to be used:	Conduct sample measurements of the fuel type, fuel consumption and distance traveled for all truck types. Calculate CO2 emissions from fuel consumption by multiplying with appropriate net calorific values and CO2 emission factors. For net calorific values and CO2 emission factors, use reliable national default values or, if not available, (country-specific) IPCC default values. Alternatively, choose emission factors applicable for the truck types used from the literature in a conservative manner (i.e. the higher end within a plausible range)
Description of measurement	-

methods and procedures to be applied:	
Monitoring frequency	At least once annually
QA/QC procedures to be applied:	• Cross-check measurement results with emission factors referred to in the literature. • Uncertainly level of data: low
Any comment:	

Data / Parameter:	$EF_{CO2,FF,NG}$ (ID 6)
Data unit:	tCO_2/GJ
Description:	CO_2 emission factor for fossil fuel type *natural gas*
Source of data to be used:	IPCC 2006 default emission factors
Description of measurement methods and procedures to be applied:	-
Monitoring frequency	Review the appropriateness of the data annually
QA/QC procedures to be applied:	-
Any comment:	Reliable local or national data not available

Data / Parameter:	$EF_{CO2,FF,diesel}$ (ID 7)
Data unit:	tCO_2/GJ
Description:	CO_2 emission factor for fossil fuel type *diesel*
Source of data to be used:	IPCC 2006 default emission factors
Description of measurement methods and procedures to be applied:	-
Monitoring frequency	Review the appropriateness of the data annually
QA/QC procedures to be applied:	-
Any comment:	Reliable local or national data not available

Data / Parameter:	$FF_{project\ plant,i,y}$ (ID 8)
Data unit:	m^3/year or liter/year
Description:	Quantity of fossil fuel type *i* combusted in the project plant during the year *y*
Source of data to be used:	On-site measurements
Description of measurement methods and procedures to be applied:	Use weight or volume meters
Monitoring frequency	Continuous
QA/QC procedures to be applied:	• Cross-check the measurements with an annual energy balance that is based on purchased quantities and stock changes. • Uncertainly level of data: low • Maintenance and calibration as per manufacturer's specifications or at least every year
Any comment:	

Data / Parameter:	$FF_{project\ site,i,y}$ (ID 9)
Data unit:	m^3/year or liter/year
Description:	Quantity of fossil fuel type *i* combusted at the project site for other purposes that are attributable to the project activity during the year *y*
Source of data to be used:	On-site measurements
Monitoring frequency	Continuous
Description of measurement methods and procedures to be applied:	Use weight or volume meters A diesel storage tank will be installed. A meter will record the consumption of diesel during refuelling of equipment.
QA/QC procedures to be applied:	Cross-check the measurements with the purchasing invoices of the fossil fuel and stock changes. • Continuously (aggregate) recording of the fossil fuel combusted • Data will be recorded manually in a data log file (monthly basis) • Uncertainly level of data: low • Maintenance and calibration as per manufacturer's specifications or at least every year
Any comment:	

Data / Parameter:	$Q_{FF,y}$ (ID 10)
Data unit:	GJ
Description:	Quantity of steam diverted from other fossil fuel boilers to the project plant.
Source of data to be used:	On-site measurements
Description of measurement methods and procedures to be applied:	Net heat generation is determined as the difference of the enthalpy of the steam generated by the project cogeneration plant minus the enthalpy of the feed-water and any condensate return The respective enthalpies should be determined based on the mass (or volume) flows, the temperatures and, in case of superheated steam, the pressure. Steam tables or appropriate thermodynamic equations will be used to calculate the enthalpy as a function of temperature and pressure. The fraction of heat generated from firing biomass residues should be determined by dividing the quantity of biomass residues fired by the total quantity of all fuels fired, both expressed in energy quantities
Monitoring frequency	Continuously
QA/QC procedures to be applied:	• The consistency of metered net heat generation should be cross-checked with receipts from sales (if available) and the quantity of biomass fired (e.g. check whether the net heat generation divided by the quantity of biomass fired results in a reasonable thermal efficiency that is comparable to previous years) • Uncertainly level of data: low • Maintenance and calibration as per manufacturer's specifications or at least once per year
Any comment:	The fossil fuel boiler will be used mainly during phase 1 (back up in phase 2)

Data / Parameter:	$e_{boiler,FF}$ (ID 11)
Data unit:	-
Description:	Average net efficiency of steam generation in the plant from where steam is diverted to the project plant (fossil fuel boiler)
Source of data to be used:	The higher value among (a) the measured efficiency and (b) manufacturer's information on the efficiency
Monitoring frequency	Quarterly
Description of measurement methods and procedures to be applied:	The efficiency will be calculated by dividing the steam generation by the sum of the fuels used, both expressed in energy units.
QA/QC procedures to be applied:	• Check consistency with manufacturer's information or the efficiency of comparable plants. • Data will be recorded manually in a data log file • Uncertainly level of data: low
Any comment:	$e_{boiler,FF} = e_{boiler}$ (average net efficiency of heat generation in the boiler that would generate heat in the absence of the project activity)

Data / Parameter:	$EG_{project\ plant,y}$ (ID 12)
Data unit:	MWh/yr
Description:	Net quantity of electricity generated in the project plant during the year y
Source of data to be used:	On-site measurements
Monitoring frequency	Continuously
Description of measurement methods and procedures to be applied:	Energy meter providing a cumulative reading of the kWh
QA/QC procedures to be applied:	• The consistency of metered net electricity generation will be cross-checked with the quantity of fuels fired (biomass and/or fossil fuel)[38] (e.g. check whether the electricity generation divided by the quantity of fuels fired results in a reasonable efficiency that is comparable to previous years). • Data are recorded manually and stored electronically in a data log file (DLF). • Data are aggregated monthly in a data log file (DLF). • Uncertainly level of data: low
Any comment:	During Phase 1, one unit of biomass boiler and one unit of fossil fuel boiler are running. During Phase 2, only two biomass boilers are running and fossil fuel boiler as standby unit.

Data / Parameter:	$Q_{project\ plant,y}$ (ID 13)
Data unit:	GJ
Description:	Net quantity of heat generated from firing biomass in the project plant
Source of data to be used:	On-site measurements: they are two steam outputs (process steam 1 and process steam 2)

[38] No sale of electricity hence no receipts from sale are available

Description of measurement methods and procedures to be applied:	Net heat generation is determined as the difference of the enthalpy of the steam generated by the project cogeneration plant minus the enthalpy of the feed-water and any condensate return. The respective enthalpies should be determined based on the mass (or volume) flows, the temperatures and, in case of superheated steam, the pressure. Steam tables or appropriate thermodynamic equations will be used to calculate the enthalpy as a function of temperature and pressure. The fraction of heat generated from firing biomass residues should be determined by dividing the quantity of biomass residues fired by the total quantity of all fuels fired, both expressed in energy quantities
Monitoring frequency	Continuously
QA/QC procedures to be applied:	• The consistency of metered net heat generation should be cross-checked with the quantity of fuels fired (e.g. check whether the net heat generation divided by the quantity of fuels fired results in a reasonable thermal efficiency that is comparable to previous years)[39] • Uncertainly level of data: low • Maintenance and calibration as per manufacturer's specifications or at least once per year
Any comment:	For scenario 2: $Q_y = Q_{project\ plant,y}$

Data / Parameter:	NCV_i (ID14)
Data unit:	GJ /m^3
Description:	Net calorific value of the fossil fuel type *i*
Source of data:	Either conduct measurements or use accurate and reliable local or national data if available. If such data is not available, use IPCC default net calorific values (country-specific, if available) if they are deemed to reasonably represent local circumstances. Choose the values in a conservative manner and justify the choice
Monitoring frequency	In case of measurements: At least every six months, taking at least three samples for each measurement. In case of other data sources: Review the appropriateness of the data annually
Measurement procedures (if any)	Measurements should be carried out at reputed laboratories and according to relevant international standards
QA/QC procedures to be applied:	Check consistency of measurements and local / national data with default values by the IPCC. If the values differ significantly from IPCC default values, possibly collect additional information or conduct measurements
Any comment:	The appropriate method will be selected based on the availability of information and the type of fuel (natural gas and diesel)

Data / Parameter:	NCV_k (ID 15)
Data unit:	GJ/ton of dry matter
Description:	Net calorific value of biomass residue type *k*
Source of data to be used:	Measurement: determination of the gross calorific value of solid biomass

[39] No sale of steam hence no receipts from sale are available

	fuel based on the bomb calorimeter, and calculation of net calorific value.
Monitoring frequency	At least every six months, taking at least three samples for each measurement.
Measurement procedures (if any)	Measurements to be carried out at accredited laboratory and according to relevant international standards. Measure the NCV based on dry biomass.
QA/QC procedures to be applied:	• Check the consistency of the measurements by comparing the measurement results with measurements from previous years, relevant data sources and default values by the IPCC. If the measurement results differ significantly from previous measurements or other relevant data sources, conduct additional measurements. Ensure that the NCV is determined on the basis of dry biomass. • Data are recorded manually in a data log file • Uncertainly level of data: low
Any comment:	NCV_k is calculated based on the GCV_k, adjusted based on moisture and the hydrogen content of the sample biomass *k*.

Data / Parameter:	(ID 16)
Data unit:	Tons
Description:	Availability of a surplus of biomass residue type *k* (which cannot be sold or utilized) at the ultimate supplier to the project and a representative sample of other suppliers in the defined geographical region
Source of data to be used:	Surveys or statistics
Monitoring frequency	Annually
Description of measurement methods and procedures to be applied:	-
QA/QC procedures to be applied:	-
Any comment:	-

Data / Parameter:	$EC_{PJ,y}$ (ID 17)
Data unit:	MWh
Description:	On-site grid electricity consumption attributable to the project activity during the year *y*
Source of data to be used:	On-site measurements
Monitoring frequency	Continuously, aggregated at least annually
Description of measurement methods and procedures to be applied:	Energy meter providing a cumulative reading of the kWh.
QA/QC procedures to be applied:	• Shall be cross-checked with electricity purchase receipts (if available). • Uncertainly level of data: low
Any comment:	

B.7.2. Description of the monitoring plan:

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A final monitoring plan will be prepared prior the start crediting date based on the as-built project activity. It will address the following aspects:

1. **The CDM monitoring team** will be composed by the following staff:

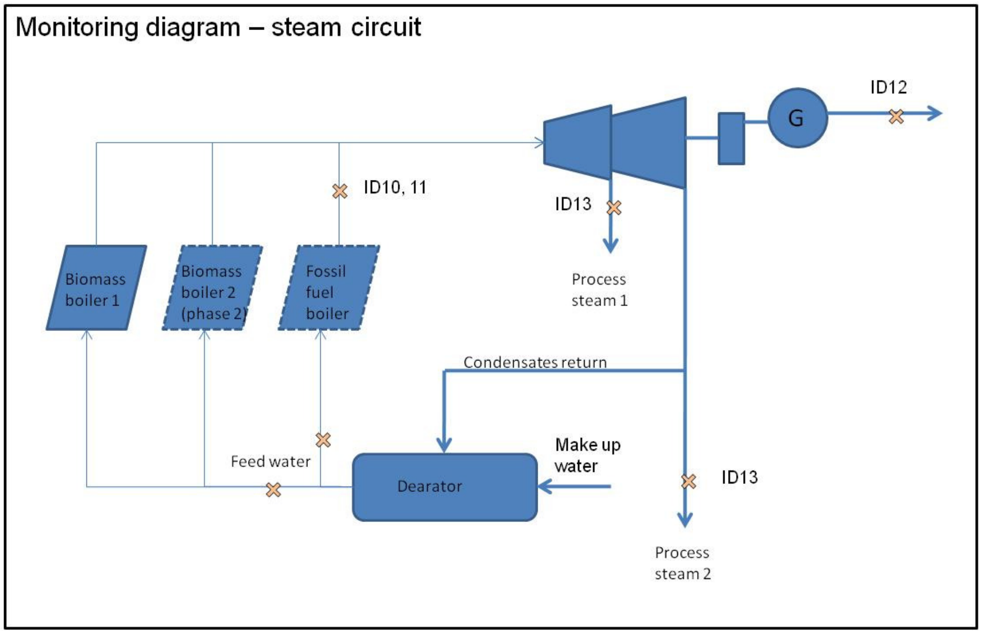
Position	Qualifications
Operator	Technician
Supervisor	Technician
Chief	Engineer
CDM consultant	-

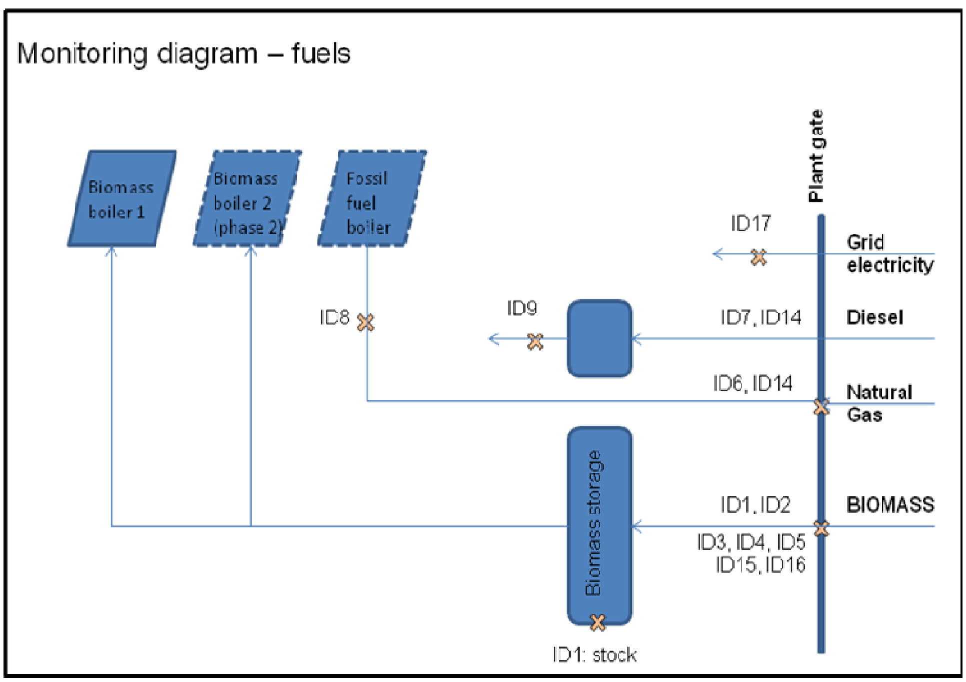
2. **The allocation of responsibility** to ensure compliance with the monitoring requirement of the methodology is given here below:

	Tasks description	Operator	Supervisor	Chief	CDM Consultant
Monitoring activity					
1	Recording of monitored data	✓			
Quality Assurance & Quality Control					
2	Verification of data monitored (consistency and completeness)			✓	
3	Ensuring adequate training of staff			✓	
4	Ensuring adequate maintenance		✓		
	Ensuring calibration of monitoring instruments		✓		
5	Data archiving: ensuring adequate storage of data monitored (integrity and backup): 2 years after the end of the crediting period			✓	
6.	Identification of non-conformance and corrective/preventive actions and monitoring plan improvement		✓		
7	Emergency procedures		✓		
8	External audit				✓
Calculation of GHG emission reductions and reporting					
9	Processing of data and calculation of emission reductions				✓
10	Monitoring report: management review of monitoring report (internal audit)			✓	

3. Monitoring diagram

Each monitored parameter is identified in the diagram here below:





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

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The final draft of this baseline was completed on 12/10/2009 by Mr Michel Buron (michel.buron@kyotoenergy.net). Kyoto Energy Pte Ltd (www.kyotoenergy.net) provides carbon advisory services and is not a project participant listed in Annex 1

SECTION C. Duration of the project activity / crediting period

C.1. Duration of the project activity:

C.1.1. Starting date of the project activity:

16/04/2008

C.1.2. Expected operational lifetime of the project activity:

20 years

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

This project activity will make use of a fixed crediting period.

C.2.1. Renewable crediting period:

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

Not applicable

C.2.1.2. Length of the first crediting period:

Not applicable

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

01/09/2010 or the date of registration, whichever is later.

C.2.2.2. Length:

10 years and 0 months.

SECTION D. Environmental impacts

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D.1. Documentation on the analysis of the environmental impacts, including transboundary impacts:

As such the project activity does not require an Environmental Impact Assessment but it was conducted for the entire crushing facility, including the project activity as well. It verifies any potential impact of the project as requested under the environmental laws of the Government of the Province of Santa Fe, Argentina[40].

The positive effects of the project activity on key environmental parameters are briefly described below.

- The project will reduce CO_2 emissions by displacing non-renewable fossil fuels (natural gas), with the use of biomass residues that were previously burned or left to decay.
- The project includes adequate air pollution control equipment to ensure that emissions meet Argentina standards, as per the Santa Fe RESOLUCION Nº201[41]
- The use of biomass will further help to reduce air emissions from contaminants present in fossil fuel such as sulfur and heavy metals
- The avoidance of methane formation by anaerobic decay or by burning of the biomass
- The ashes produced by the combustion process contain a high proportion of potassium and can be used as natural fertilizer. These are to be disposed as soil conditioner reducing the quantity of chemical fertilizer to be utilized.

Finally the EIA identifies the expected negative impacts of the crushing facility which are mainly arising from particulate emissions. The project activity contributes partly to these: in particular due to the emissions from the boilers and the transportation by trucks of biomass.
However the EIA concludes that these impacts are moderate in nature and none of greater importance[42].

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[40] Ley del Ambiente, Government of Argentina, Articulo 11, and **LA LEGISLATURA DE LA PROVINCIA DE SANTA FE SANCIONA CON FUERZA DE L E Y : MEDIO AMBIENTE Y DESARROLLO SUSTENTABLE Capitulo VIII.Articulo 18.**

[41] See enclosure 19

[42] See EIA section 3.2.6

D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

Not applicable. Environmental impacts are moderate in nature and none of greater importance.

SECTION E. Stakeholders' comments

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

The stakeholder consultation consisted of a public meeting addressing the stakeholders mentioned above. Stakeholders were invited to the consultation meeting through personal invitations delivered by hand (see annex 1 for example of invitation). The Stakeholder Consultation Meeting was held on Wednesday 08 October 2008.

Policy makers, Union leaders, local people directly impacted by the project, municipal and government organizations, immediate neighbours, local companies, members of the municipal counsel, including teachers from local schools,. Altogether, 21 participants from various public and private organizations, from Noble Argentina, from Noble Carbon and from KYOTOenergy participated in the consultation meeting.

The meeting was held in Spanish. Two PowerPoint presentations were given. A first presentation was given by Noble Argentina explaining the company's activities and to introduce the project activity's objectives and justification. The second presentation was given by KYOTOenergy to explain in non-technical terms what is the Kyoto protocol, what are the principles of a CDM project, and how the Noble Argentina project fits in the CDM project profile. Following the presentations, there was a question and answers period to allow participants to discuss and ask questions on any and all presentations, and to ensure their understanding of the project. Finally all participants, except for those from Noble Argentina and KYOTOenergy, were given the opportunity to answer an optional questionnaire, in Spanish as to review their understanding of the project. The questionnaire was distributed to each participant willing to fill out the questionnaire.

Meeting procedure

- Opening of meeting
- Presentation of Noble Argentina activities
- Explanation in non-technical terms of CDM projects and on the purpose of the consultation
- Discussions, clarifications
- Answering of questionnaire
- Lunch and refreshments

E.2. Summary of the comments received:

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QUESTION
Have any government officials been notified about this project and about this Public Consultation?
Will this project increase the frequency of transport?
What will happen with the ashes from the boiler?
Where is the biomass residues bought?
What is the total surface of the project?
Why did Noble choose biomass as an alternate source of energy?
Did Noble plan any teaching, training and other capacity building programmes for the new system?
Is there a problem if the size of the wood chips you will use is not exactly uniform? Will there be any rejects?

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

None of the comments received during the stakeholder consultation meeting required any action that had not already taken place prior to the consultation meeting in anticipation with the concern of the stakeholders. Therefore, none of the comments have an impact on the project.

QUESTION	How due account was taken?
Have any government officials been notified about this project and about this Public Consultation?	Yes in fact two representatives of the Provincial Environment government are attending the meeting.
Will this project increase the frequency of transport?	The project is located in an industrial zone and therefore, no trucks will go through the municipality to bring the biomass. In fact, the routes to be used are the same as those used for the transport of crushed soya.
What will happen with the ashes from the boiler?	The ashes are to be used as fertilizer. A lot of it will be used on Noble's own land. The rest will be used on other land that is in need of natural fertilizer or as soil conditioner.
Where is the biomass residues bought?	There are several potential suppliers of biomass residues. For the moment, no contracts have been signed with any supplier.
What is the total surface of the project?	The project for Noble is not only the biomass boiler but the whole crushing plant which extends over 200 hectares. The biomass boiler project is therefore a very small part of the whole surface, which are the boiler area and the biomass storage area.
Why did Noble choose biomass as an alternate source of energy?	The alternative would be natural gas, diesel or coal which is very polluting. Coal is very expensive in Argentina and would lead to high emissions. Biomass seemed to be a logical choice. And although the costs for the boiler is higher than that of a fossil fuel boiler (3 to 4 times higher), with the carbon credits it seemed like a feasible and sustainable option.

Did Noble plan any teaching, training and other capacity building programmes for the new system?	Yes, Noble will give special training to the employees responsible for operating and maintaining the biomass boiler, and for all the logistics surrounding the new technology
Is there a problem if the size of the wood chips you will use is not exactly uniform? Will there be any rejects?	There is no problem on the size of the woodchips. There is an acceptable range and therefore, all the wood waste and wood residues as woodchips will be used. There will be no rejects from the biomass wood.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

The project activity is not receiving any funding from parties included in Annex 1 of the Kyoto Protocol

Annex 3

BASELINE INFORMATION

Annex 4

MONITORING INFORMATION

Monitoring refers to the collection and archiving of all relevant data necessary for determining the baseline, measuring anthropogenic emissions by sources of greenhouse gases (GHG) within the project boundary of a CDM project activity and leakage. It includes developing suitable data collection methods and data interpretation techniques for monitoring and verification of GHG emissions with specific focus on specific energy production parameters.

Data Monitoring

The monitoring methodology involves amongst other the monitoring of the following:

- Steam quantity (GJ): calculated from the flow, pressure and temperature of steam (some flow meters have inbuilt temperature and pressure compensation which means that it is not required to measure separately p and T). The corresponding steam enthalpies are determined by using the steam table or appropriate thermodynamic equations. Adjustment will be made to take into consideration the enthalpies of the feed-water and condensates return.
- Electricity consumption/generation (MWh): by using energy meters
- Weight (tonne): by the use of electronic weight scale or volume measurement multiplied by density
- Moisture content: is the water content: (or “moisture content on wet basis”) proportion of water mass compared to wet material mass.

$$w = Water.Content = \frac{m_{water}}{m_{dry.fuel} + m_{water}} \qquad \in [0\% , 100\%]$$

The purpose of the monitoring procedure will be to direct and support monitoring of project performance project indicators to determine project outcomes, greenhouse gas (GHG) emission reductions. The project employs latest state of art monitoring and control equipment that measure, control and record key parameters continuously.

On-line monitoring system

Whenever feasible key parameters required to determine GHG emissions and emission reductions will be monitored from a central control point which will record meter readings continuously at a pre-determined interval (e.g. every ten minutes or shorter interval) or at each events (e.g. number of trucks entering the facility).

Ensuring adequate maintenance and calibration of monitoring instruments

- Specific maintenance, repair or replacement of monitoring equipment will be recorded and will describe the time and action undertaken.
- The calibration will occur at intervals determined on the basis of instrument manufacturers' recommendations, stability, purpose, usage and history of repeatability. Recalibration should be performed whenever an event occurs that places the accuracy of the instrument in doubt.
- Calibration of the flow meter will take place at least once per year to ensure that the monitoring equipment are properly installed and functioning properly.
- Energy meters are delivered with a certificate of conformity and are not calibrated after installation. They will be calibrated yearly after the first year of service.
- Last calibration certificates and next calibration date will be provided during periodic verification
- Defect, repair or change of monitoring equipment will be recorded.

Data archiving

The monitored data will be kept for a minimum of 2 years after the end of the crediting years by using paper documents and electronic files.

Identification of non-conformities

A verification of inconsistencies of the data recorded will be performed periodically. Any discrepancies (completeness, calculation errors, transcription errors, instrument calibration issues) will be analyzed and actions taken to correct the problem.

Ensuring adequate training of staff

- All new staff will undergo ‘on job training’ covering the monitoring requirements
- The monitoring plan will be made available to each staff involved in the monitoring in the local language. A copy is located in the control room at the site.
- During the training, staff is required to sign training attendance list.

- All training record shall be documented inclusive of training attendance, training memo and training material if any.
- Type of training required will be indicated from Training Need Analysis conducted yearly. The record of training and awareness should be kept for at least 2 years after the crediting period.
- Regular meetings will be organized to ensure that the personnel is aware of the relevance and importance of its activities and how it is contributing to the achievement of the quality monitoring plan.

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