BIOMASS BASED COGENERATION PROJECT AT NECTAR LIFE SCIENCES LTD.

By M/s Nectar Lifesciences Limited

Project Title	Biomass Based Cogeneration Project at Nectar Life Sciences Ltd.
Version	03
Date of Issue	02nd July 2011
Project ID	251
Monitoring Period	01st January 2010 to 31st December 2010
Prepared By	M/s Nectar Lifesciences Limited
Contact	Village: Saidpur, Tehsil: Derabassi, District: Mohali, Punjab. Telephone: +91-1762-308000/01. Email: sales@neclife.com . Website: www.neclife.com

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1 PROJECT DETAILS

1.1 Summary Description of Project

Nectar Lifesciences Ltd (NecLife) is a 200 million US$ integrated pharmaceutical organization, offering comprehensive range of Cephalosporin Active Pharmaceutical Ingredients and Finished Dosage Forms. NecLife is engaged in the development and manufacture of quality intermediates, bulk actives and are one of the largest manufacturers of cephalosporin range of products and delivering innovative and affordable products to domestic as well as international markets. NecLife has tactically positioned itself in the global pharmaceutical industry. It has developed sustainable production systems to manufacture highest quality pharmaceutical products meeting diverse requirements of its customer base in over 45 countries worldwide.

The project activity at Neclife involved installation of a new biomass based cogeneration system at the pharmaceutical unit of Nectar Lifesciences Limited (NecLife). The cogeneration system included a Triveni make 6 MW single extraction cum condensing turbine generator and a Thermax make 40 TPH capacity AFBC boiler with a pressure rating of 67 kg/cm2 and temperature 490°C. The extraction from the turbine is 20 TPH at 6 Kg/cm^2 and 256°C. After extraction from the turbine the steam is fed into the processes via Desuperheating System (DSH) where water from deareater is added into the steam which increases the quantity of steam up to 24 TPH and decreases the temperature of steam as per the process requirements.

The aim of the project activity was the installation of a biomass fired cogeneration plant to meet the demand of power in Units (1 & 2) and process steam for the manufacturing process of Unit 2 complex of the pharmaceutical plant. The project activity was proposed considering the thermal and electrical energy required for the proposed menthol plant, menthol crystal plant, menthol distillation plant, sterile plant and the expansion of solvent recovery plant. The project activity is catering to existing electricity requirement of unit 1 complex and steam and electricity requirement of unit 2 complex.

1.2 Sectoral Scope and Project Type

Sectoral Scope: 1. Energy Industries (Renewable/Non-Renewable Sources)

Type: I – Renewable Energy Projects

Category: C Thermal Energy production with or without electricity.

1.3 Project Proponent

Contact information of project proponent and credit owner is shown as below:

Organization:	Nectar Lifesciences Ltd.
Village:	Saidpur
Tehsil:	Dera Bassi

District:	Mohali
State/Region:	Punjab
Postfix/ZIP:	
Country:	India
Telephone:	+91-1762-308000/01
FAX:	+91-1762-281187
E-Mail:	sales@neclife.com
URL:	www.neclife.com
Represented by:	
Title:	Senior Vice President
Salutation:	Mr.
Last Name:	Singh
Middle Name:	P.
First Name:	H.
Department:	
Mobile:	+91-9447768858
Direct Fax:	
Direct tel:	
Personal E-Mail:	hpsingh@neclife.com

Project proponent is fully responsible for the development of the project and will credit all VCUs.

1.4 Other Entities Involved in the Project

No other entities are involved in the project.

1.5 Project Start Date

Start date of the project is 27th May 2007.

1.6 Project Crediting Period

Start Date of Crediting Period: 27th May 2007

End Date of Crediting Period: 26th May 2016

Choice of Crediting Period: Fixed (10 Years)

1.7 Project Location

Nectar Lifesciences Ltd.

Village: Saidpura

Tehsil: Derabassi

District: Mohali

The Project activity is located near NH-21 (Ambala- Mandi Highway) in Eastern Punjab. The major town near the project activity is Chandigarh which is only 25 km away from the site.

The following table gives an idea about geographical location of project activity.

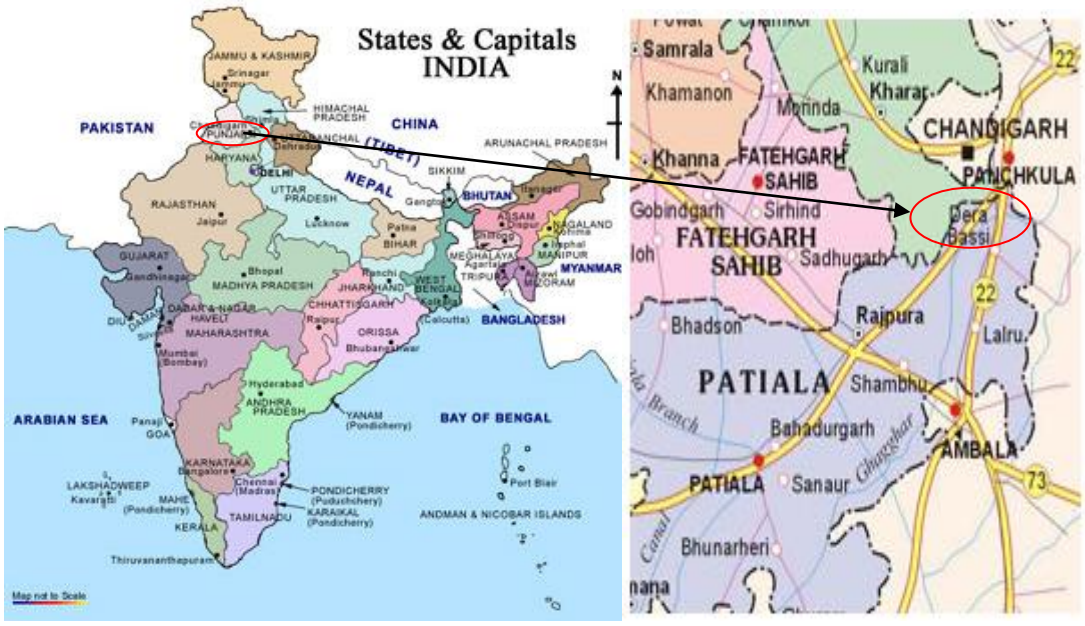
Table 1A: Longitude and Latitude (Unit I Complex)

Longitude	76°52'41" (East)	76.8780 (East)
Latitude	30°35'07" (North)	30°5852 (North)

Table 1B: Longitude and Latitude (Unit II Complex)

Longitude	76°52'51" (East)	76.8808 (East)
Latitude	30°35'10" (North)	30.5861 (North)

The following figure shows the location of the project activity:



Map showing the project site

The following are the ways of accessing to the project site:

Road : National Highway 21 (Ambala- Mandi Highway)

Rail : Chandigarh Railway Station

Airport : Chandigarh Airport

1.8 Title and Reference of Methodology

Title: Thermal energy production with or without electricity.

Reference: AMS-IC, Version 15

http://cdm.unfccc.int/methodologies/DB/6EL4AG49US2S1DNH55Y4S7GDQFA2JF

2 IMPLEMENTATION STATUS

2.1 Implementation Status of the Project Activity

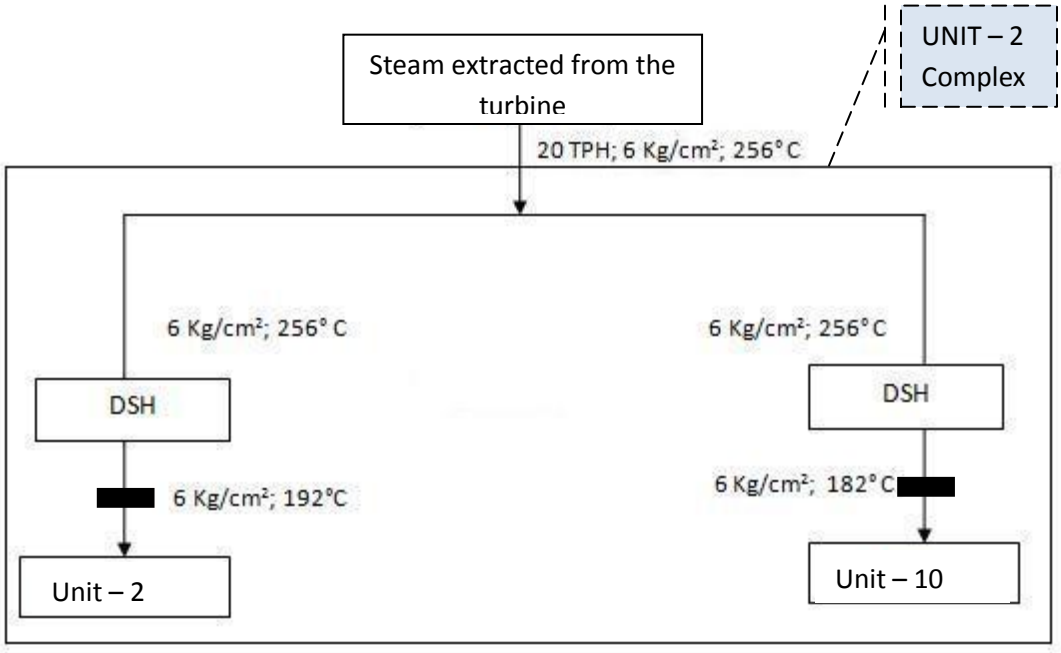
The project activity is in operation since 27/05/2007. The project is operating in successful manner.

As project activity is cogeneration activity it includes both steam generation and electricity generation.

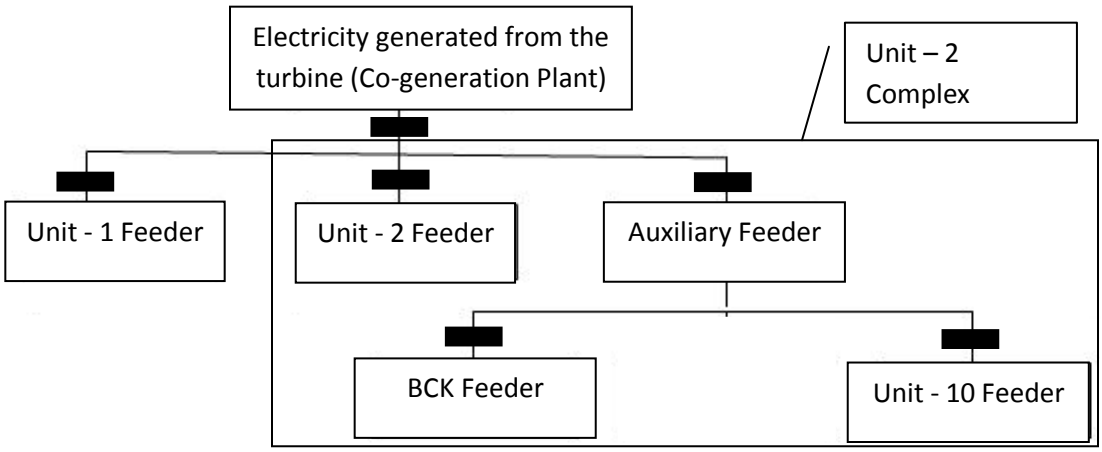
Steam

Steam is extracted from the turbine and supplied to Unit – 2 (SRP Plant, API Plant) and Unit – 10 (Menthol Distillation) via Desuperheating Systems (DSH). DSH reduces the temperature of superheated steam by injecting water into high velocity steam.

DSH reduces the temperature and increases the quantity of the steam therefore process steam goes higher up to 24 TPH for process heat. There are two DSH, one is between turbine and Unit- 2 and another is between turbine and Unit – 10. The pressure of the steam supplied to Unit- 2 and Unit – 10 is same, however temperature is slightly different. Following flow diagram of the extracted steam makes it clearer:



The metering system for the electricity generated from the co-generation plant is shown below:



(In the above diagrams " ■ " sign represents the position of the respective transmitter / meter)

As shown in the flowchart, Unit – 1 Feeder[1] , Unit – 2 Feeder and Auxiliary Feeder are connected to Total Generation Feeder and further BCK Feeder and unit -10 Feeder are connected to Auxiliary Feeder .

Unit - 1 Feeder and Unit - 2 Feeder as shown in the above diagram are situated far away from the Co-generation plant compare to BCK Feeder and Unit - 10 Feeder. Therefore electricity transmitted from the turbine to Unit - 1 Feeder and Unit - 2 Feeder is through HT Lines and electricity transmitted from the turbine to BCK Feeder and Unit - 10 Feeder via Auxiliary Feeder is through LT Lines. The Auxiliary Feeder shown in the above diagram is the term used to describe a common feeder (for LT Lines) from which BCK Feeder and unit -10 Feeder are further attached. The electricity from Auxiliary Feeder is being dispatched to BCK Feeder, unit 10 Feeder and for meeting the Net Auxiliary requirement of Co-generation plant.

The reading of the Auxiliary Feeder meter does not represents the electricity consumed by the Co-generation plant. Electricity consumed by the Co-generation plant is hereafter termed as Net Auxiliary Consumption and calculated as:

$$\text{Net Auxiliary} = \text{Auxiliary} - (\text{BCK} + \text{Unit - 10})$$

At the time of registration it was assumed that plant would operate for an average of 330 days but on actual for the year 2010 the plant was operated for 350 days. Detailed information is given in section 4 of this report.

[1] Energy Meters are installed at all the all the Feeders.

2.2 Deviations from the Monitoring Plan

There are no deviations from the monitoring plan in the project description.

2.3 Grouped Project

The project is not a grouped project.

3 DATA AND PARAMETERS

3.1 Data and Parameters Available at Validation

Data Unit / Parameter:	η
Data unit:	No Unit
Description:	The total efficiency (including both thermal and electrical) of the cogeneration plant using fossil fuel that would have been used in the absence of the project activity.
Source of data:	Being conservative taken 100% as per methodology AMS IC.
Value applied:	100%
Purpose of the data:	This data was used for the calculation of baseline emissions.
Any comment:	-

Data Unit / Parameter:	EF_{coal}
Data unit:	tCO_2e/TJ
Description:	Emission factor of coal
Source of data:	IPCC default values
Value applied:	96.1
Purpose of the data:	This data was used for the calculation of baseline emissions.
Any comment:	-

Data Unit / Parameter:	EF_D
Data unit:	tCO_2/TJ
Description:	Emission Factor of Diesel
Source of data:	IPCC default value
Value applied:	74.1
Purpose of the data:	This data was used for the calculation of Project emission and Leakage emission.
Any comment:	-

Data Unit / Parameter:	NCV_{Diesel}

Data unit:	TJ/Tonne
Description:	Net Calorific Value of Diesel
Source of data:	IPCC default value
Value applied:	0.043
Purpose of the data:	This data was used for the calculation of Project emission and Leakage emission.
Any comment:	-

Data Unit / Parameter:	TL
Data unit:	Tonnes
Description:	Load of biomass on each truck.
Source of data:	It was estimated as the capacity of truck which carries biomass.
Value applied:	8
Purpose of the data:	This data was used for the calculation of Leakage emission.
Any comment:	-

Data Unit / Parameter:	M
Data unit:	KM/Lit
Description:	Average mileage of each truck
Source of data:	A normalized and conservative fixed value was used.
Value applied:	4
Purpose of the data:	This data was used for the calculation of Leakage emission.
Any comment:	-

Data Unit / Parameter:	D
Data unit:	KG/Lit
Description:	Density of Diesel
Source of data:	A normalized and conservative fixed value was used.
Value applied:	0.87
Purpose of the data:	This data was used for the calculation of Leakage emission.
Any comment:	-

3.2 Data and Parameters Monitored

Data Unit / Parameter:	EG_y
Data unit:	KWh
Description:	Gross electricity generated from co-generation plant.
Source of data:	Electricity log book.
Description of measurement methods and procedures to be applied:	Measured using an energy meter and reading is taken daily.
Frequency of monitoring/recording:	Daily
Value monitored:	01.01.2010 - 31.12.2010 = 39838100
Monitoring equipment:	Sr. No.: 06744912 Make: L&T Accuracy: +/- 0.5% Data type: Measured Recording Frequency: Daily Archiving policy: Paper & Electronic Responsibility: Manager (Power Plant) Calibration: Calibrated annually
QA/QC procedures to be applied:	The meter is calibrated annually by the accredited NABL approved independent third party. Latest calibration date: 21-04-2010 Next Calibration due on: 20-04-2011
Calculation method:	The data was directly recorded from gross energy meter.
Any comment:	-

Data Unit / Parameter:	$EC_{Net\ Aux}$
Data unit:	KWh
Description:	Net electricity consumed by the co-generation plant.
Source of data:	Calculated on actual basis as per the method described in “Calculation method”.
Description of measurement methods and procedures to be applied:	Value has been calculated on actual basis with the help of the various energy meters installed at

	the co-generation plant as per the formula mentioned below.
Frequency of monitoring/recording:	Daily
Value monitored:	01.01.2010 - 31.12.2010 = 7234222
Monitoring equipment:	Data type: Calculated Archiving policy: Paper & Electronic Responsibility: Manager (Power Plant)
QA/QC procedures to be applied:	Calculated data is based on the calibrated energy meters.
Calculation method:	The value has been calculated as per the following formula: $EC_{Net\ Aux} = EC_{Aux.} – (EC_{BCK} + EC_{Unit\ 10})$
Any comment:	-

Data Unit / Parameter:	EC_{Aux}
Data unit:	KWh
Description:	This meter is connected to Auxiliary Feeder which supplies electricity to BCK Unit, Unit - 10 and Net Auxiliary consumed by the Co-generation plant.
Source of data:	Electricity log book.
Description of measurement methods and procedures to be applied:	Measured using an energy meter and reading is taken daily.
Frequency of monitoring/recording:	Daily
Value monitored:	01.01.2010 - 31.12.2010 = 12557500
Monitoring equipment:	Sr. No.: UPB09919 Make: Secure Accuracy: +/- 0.5% Data type: Measured Archiving policy: Paper & Electronic Responsibility: Manager (Power Plant) Calibration: Calibrated annually
QA/QC procedures to be applied:	The meter is calibrated annually by the accredited NABL approved independent third

	party. Latest calibration date: 21-04-2010 Next Calibration due on: 20-04-2011
Calculation method:	The data was directly recorded from Auxiliary Feeder energy meter.
Any comment:	-

Data Unit / Parameter:	EC_{BCK}
Data unit:	KWh
Description:	Electricity supplied to the BCK unit.
Source of data:	Electricity log book.
Description of measurement methods and procedures to be applied:	Measured using an energy meter and reading is taken daily.
Frequency of monitoring/recording:	Daily
Value monitored:	01.01.2010 - 31.12.2010 = 1815860
Monitoring equipment:	Sr. No.: 07882301 Make: L&T Accuracy: +/- 1% Data type: Measured Archiving policy: Paper & Electronic Responsibility: Manager (Power Plant) Calibration: Calibrated annually
QA/QC procedures to be applied:	The meter is calibrated annually by the accredited NABL approved independent third party. Latest calibration date: 21-04-2010 Next Calibration due on: 20-04-2011
Calculation method:	The data was directly recorded from BCK energy meter.
Any comment:	-

Data Unit / Parameter:	$EC_{Unit-10}$
Data unit:	KWh
Description:	Electricity supplied to the Unit-10.
Source of data:	Electricity log book.

Description of measurement methods and procedures to be applied:	Measured using an energy meter and reading is taken daily.
Frequency of monitoring/recording:	Daily
Value monitored:	01.01.2010 - 31.12.2010 = 3507418
Monitoring equipment:	Sr. No.: 07884932 Make: L&T Accuracy: +/- 1% Data type: Measured Archiving policy: Paper & Electronic Responsibility: Manager (Power Plant) Calibration: Calibrated annually
QA/QC procedures to be applied:	The meter is calibrated annually by the accredited NABL approved independent third party. Latest calibration date: 21-04-2010 Next Calibration due on: 20-04-2011
Calculation method:	The data was directly recorded from Unit-10 energy meter.
Any comment:	-

Data Unit / Parameter:	EG_{Net}
Data unit:	KWh
Description:	Net electricity supplied from the cogeneration plant.
Source of data:	Electricity log book.
Description of measurement methods and procedures to be applied:	Data was calculated by difference of Gross Electricity generation and Net Auxiliary electricity consumption by the Co-generation plant.
Frequency of monitoring/recording:	Daily
Value monitored:	01.01.2010 - 31.12.2010 = 32603878
Monitoring equipment:	Data type: Calculated Archiving policy: Paper & Electronic Responsibility: Manager (Power Plant)
QA/QC procedures to be applied:	The meter for measuring EG_y and EG_{Aux} is calibrated annually by the accredited NABL

	approved independent third party. The consistency of metered net electricity generation should be crosschecked with factory receipts / records
Calculation method:	The data was calculated as following method: $EG_{Net} = EG_y – EC_{Net\ Aux}$
Any comment:	-

Data Unit / Parameter:	Q_{Unit-2}
Data unit:	Tonnes
Description:	Quantity of Steam supplied to unit-2.
Source of data:	Plant log book.
Description of measurement methods and procedures to be applied:	Measured using a totalizer and reading is taken from the DCS of the Co-generation plant.
Frequency of monitoring/recording:	Daily
Value monitored:	01.01.2010 - 31.12.2010 = 163654
Monitoring equipment:	Sr. No.: 91G216756 Make: Yokogawa Data type: Measured Archiving policy: Paper & Electronic Responsibility: Manager (Power Plant) Calibration: Calibrated annually
QA/QC procedures to be applied:	The meter is calibrated annually by the accredited NABL approved independent third party. Latest calibration date: 21-04-2010 Next Calibration due on: 20-04-2011
Calculation method:	The data was directly recorded from the DCS of the Co-generation plant.
Any comment:	-

Data Unit / Parameter:	$Q_{Unit-10}$
Data unit:	Tonnes
Description:	Quantity of Steam supplied to unit-10.
Source of data:	Plant log book.
Description of measurement methods and	Measured using a totalizer and reading is taken

procedures to be applied:	from the DCS of the Co-generation plant..
Frequency of monitoring/recording:	Daily
Value monitored:	01.01.2010 - 31.12.2010 = 46567
Monitoring equipment:	Sr. No.: 0700043 Make: ABB Data type: Measured Archiving policy: Paper & Electronic Responsibility: Manager (Power Plant) Calibration: Calibrated annually
QA/QC procedures to be applied:	The meter is calibrated annually by the accredited NABL approved independent third party. Latest calibration date: 21-04-2010 Next Calibration due on: 20-04-2011
Calculation method:	The data was directly recorded from the DCS of the Co-generation plant
Any comment:	-

Data Unit / Parameter:	T_{Unit-2}
Data unit:	°C
Description:	Temperature of the steam supplied to unit-2.
Source of data:	Plant log book.
Description of measurement methods and procedures to be applied:	Measured using a temperature gauge and reading is taken from the DCS of the Co-generation plant.
Frequency of monitoring/recording:	Hourly
Value monitored:	Average of 01.01.2010 - 31.12.2010 = 210.22
Monitoring equipment:	Sr. No.: DSR 3219 Make: Actuasys Data type: Measured Archiving policy: Paper & Electronic Responsibility: Manager (Power Plant) Calibration: Calibrated annually

QA/QC procedures to be applied:	The meter is calibrated annually by the accredited NABL approved independent third party. Latest calibration date: 21-04-2010 Next Calibration due on: 20-04-2011
Calculation method:	The data was directly recorded from the DCS of the Co-generation plant
Any comment:	-

Data Unit / Parameter:	$T_{Unit-10}$
Data unit:	°C
Description:	Temperature of the steam supplied to unit-10.
Source of data:	Plant log book.
Description of measurement methods and procedures to be applied:	Measured using a temperature gauge and reading is taken from the DCS of the Co-generation plant.
Frequency of monitoring/recording:	Hourly
Value monitored:	Average of 01.01.2010 - 31.12.2010 = 170.81
Monitoring equipment:	Sr. No.: TE 1100 Make; Actuasys Data type: Measured Archiving policy: Paper & Electronic Responsibility: Manager (Power Plant) Calibration: Calibrated annually
QA/QC procedures to be applied:	The meter is calibrated annually by the accredited NABL approved independent third party. Latest calibration date: 21-04-2010 Next Calibration due on: 20-04-2011
Calculation method:	The data was directly recorded from the DCS of the Co-generation plant
Any comment:	-

Data Unit / Parameter:	P
Data unit:	KG/cm^2
Description:	Pressure of the steam supplied to unit-2 and

	unit-10.
Source of data:	Plant log book.
Description of measurement methods and procedures to be applied:	Measured using a pressure gauge and reading is taken from the DCS of the Co-generation plant.
Frequency of monitoring/recording:	Daily
Value monitored:	Average of 01.01.2010 - 31.12.2010 = 5.81
Monitoring equipment:	Sr. No.: 91F935651 Make: Yokogawa Data type: Measured Archiving policy: Paper & Electronic Responsibility: Manager (Power Plant) Calibration: Calibrated annually
QA/QC procedures to be applied:	The meter is calibrated annually by the accredited NABL approved independent third party. Latest calibration date: 21-04-2010 Next Calibration due on: 20-04-2011
Calculation method:	The data was directly recorded from the DCS of the Co-generation plant
Any comment:	-

Data Unit / Parameter:	Q_y
Data unit:	Tonnes
Description:	Quantity of Rice Husk used.
Source of data:	Daily log sheets.
Description of measurement methods and procedures to be applied:	Quantity of rice husk used in the boiler was calculated by spring balance system which is in place for all the 3 conveyer belts.
Frequency of monitoring/recording:	Daily
Value monitored:	01.01.2010 - 31.01.2010 = 79203
Monitoring equipment:	Data type: Measured Frequency: Monthly Archiving policy: Electronic Responsibility: Manager (Power Plant)

QA/QC procedures to be applied:	The values shown here can be cross checked from factory records.
Calculation method:	
Any comment:	-

Data Unit / Parameter:	Q_y
Data unit:	Tonnes
Description:	Quantity of Paddy straw used.
Source of data:	Daily log sheets.
Description of measurement methods and procedures to be applied:	Quantity of Paddy straw used in the boiler was calculated by spring balance system which is in place for all the 3 conveyer belts.
Frequency of monitoring/recording:	Daily
Value monitored:	01.01.2010 - 31.01.2010 = 0
Monitoring equipment:	Data type: Measured Frequency: Monthly Archiving policy: Electronic Responsibility: Manager (Power Plant)
QA/QC procedures to be applied:	The values shown here can be cross checked from factory records.
Calculation method:	-
Any comment:	-

Data Unit / Parameter:	Q_y
Data unit:	Tonnes
Description:	Quantity of Mustard husk used.
Source of data:	Daily log sheets.
Description of measurement methods and procedures to be applied:	Quantity of Mustard husk used in the boiler was calculated by spring balance system which is in place for all the 3 conveyer belts.
Frequency of monitoring/recording:	Daily
Value monitored:	01.01.2010 - 31.01.2010 = 1976
Monitoring equipment:	Data type: Measured Frequency: Monthly Archiving policy: Electronic

	Responsibility: Manager (Power Plant)
QA/QC procedures to be applied:	The values shown here can be cross checked from factory records.
Calculation method:	-
Any comment:	-

Data Unit / Parameter:	Q_y
Data unit:	Tonnes
Description:	Quantity of Barely used.
Source of data:	Daily log sheets.
Description of measurement methods and procedures to be applied:	Quantity of Barely used in the boiler was calculated by spring balance system which is in place for all the 3 conveyer belts.
Frequency of monitoring/recording:	Daily
Value monitored:	01.01.2010 - 31.01.2010 = 0
Monitoring equipment:	Data type: Measured Frequency: Monthly Archiving policy: Electronic Responsibility: Manager (Power Plant)
QA/QC procedures to be applied:	The values shown here can be cross checked from factory records.
Calculation method:	-
Any comment:	-

Data Unit / Parameter:	Q_y
Data unit:	Tonnes
Description:	Quantity of Sugarcane trash used.
Source of data:	Daily log sheets.
Description of measurement methods and procedures to be applied:	Quantity of Sugarcane trash used in the boiler was calculated by spring balance system which is in place for all the 3 conveyer belts.
Frequency of monitoring/recording:	Daily
Value monitored:	01.01.2010 - 31.01.2010 = 0
Monitoring equipment:	Data type: Measured Frequency: Monthly

	Archiving policy: Electronic Responsibility: Manager (Power Plant)
QA/QC procedures to be applied:	The values shown here can be cross checked from factory records.
Calculation method:	-
Any comment:	-

Data Unit / Parameter:	Q_y
Data unit:	Tonnes
Description:	Quantity of Cotton sticks desi used.
Source of data:	Daily log sheets.
Description of measurement methods and procedures to be applied:	Quantity of Cotton stick desi used in the boiler was calculated by spring balance system which is in place for all the 3 conveyer belts.
Frequency of monitoring/recording:	Daily
Value monitored:	01.01.2010 - 31.01.2010 = 0
Monitoring equipment:	Data type: Measured Frequency: Monthly Archiving policy: Electronic Responsibility: Manager (Power Plant)
QA/QC procedures to be applied:	The values shown here can be cross checked from factory records.
Calculation method:	-
Any comment:	-

Data Unit / Parameter:	Q_y
Data unit:	Tonnes
Description:	Quantity of Bajra stalk used.
Source of data:	Daily log sheets.
Description of measurement methods and procedures to be applied:	Quantity of Bajra stalk used in the boiler was calculated by spring balance system which is in place for all the 3 conveyer belts.
Frequency of monitoring/recording:	Daily
Value monitored:	01.01.2010 - 31.01.2010 = 0
Monitoring equipment:	Data type: Measured

	Frequency: Monthly Archiving policy: Electronic Responsibility: Manager (Power Plant)
QA/QC procedures to be applied:	The values shown here can be cross checked from factory records.
Calculation method:	-
Any comment:	-

Data Unit / Parameter:	Q_y
Data unit:	Tonnes
Description:	Quantity of Sunflower stalk used.
Source of data:	Daily log sheets.
Description of measurement methods and procedures to be applied:	Quantity of Sunflower stalk used in the boiler was calculated by spring balance system which is in place for all the 3 conveyer belts.
Frequency of monitoring/recording:	Daily
Value monitored:	01.01.2010 - 31.01.2010 = 0
Monitoring equipment:	Data type: Measured Frequency: Monthly Archiving policy: Electronic Responsibility: Manager (Power Plant)
QA/QC procedures to be applied:	The values shown here can be cross checked from factory records.
Calculation method:	-
Any comment:	-

Data Unit / Parameter:	Q_y
Data unit:	Tonnes
Description:	Quantity of Moong straw used.
Source of data:	Daily log sheets.
Description of measurement methods and procedures to be applied:	Quantity of Moong straw used in the boiler was calculated by spring balance system which is in place for all the 3 conveyer belts.
Frequency of monitoring/recording:	Daily
Value monitored:	01.01.2010 - 31.01.2010 = 0

Monitoring equipment:	Data type: Measured Frequency: Monthly Archiving policy: Electronic Responsibility: Manager (Power Plant)
QA/QC procedures to be applied:	The values shown here can be cross checked from factory records.
Calculation method:	-
Any comment:	-

Data Unit / Parameter:	Q_y
Data unit:	Tonnes
Description:	Quantity of Arhar Stick used.
Source of data:	Daily log sheets.
Description of measurement methods and procedures to be applied:	Quantity of Arhar Stick used in the boiler was calculated by spring balance system which is in place for all the 3 conveyer belts.
Frequency of monitoring/recording:	Daily
Value monitored:	01.01.2010 - 31.01.2010 = 0
Monitoring equipment:	Data type: Measured Frequency: Monthly Archiving policy: Electronic Responsibility: Manager (Power Plant)
QA/QC procedures to be applied:	The values shown here can be cross checked from factory records.
Calculation method:	-
Any comment:	-

Data Unit / Parameter:	Q_y
Data unit:	Tonnes
Description:	Quantity of Arhar husk used.
Source of data:	Daily log sheets.
Description of measurement methods and procedures to be applied:	Quantity of Arhar husk used in the boiler was calculated by spring balance system which is in place for all the 3 conveyer belts.

Frequency of monitoring/recording:	Daily
Value monitored:	01.01.2010 - 31.12.2010 = 0
Monitoring equipment:	Data type: Measured Frequency: Monthly Archiving policy: Electronic Responsibility: Manager (Power Plant)
QA/QC procedures to be applied:	The values shown here can be cross checked from factory records.
Calculation method:	-
Any comment:	-

Data Unit / Parameter:	Q_y
Data unit:	Tonnes
Description:	Quantity of Saw chips used.
Source of data:	Daily log sheets.
Description of measurement methods and procedures to be applied:	Quantity of Saw chips used in the boiler was calculated by spring balance system which is in place for all the 3 conveyer belts.
Frequency of monitoring/recording:	Daily
Value monitored:	01.01.2010 - 31.12.2010 = 0
Monitoring equipment:	Data type: Measured Frequency: Monthly Archiving policy: Electronic Responsibility: Manager (Power Plant)
QA/QC procedures to be applied:	The values shown here can be cross checked from factory records.
Calculation method:	-
Any comment:	-

Data Unit / Parameter:	Q_y
Data unit:	Tonnes
Description:	Quantity of Saw dust used.
Source of data:	Daily log sheets.
Description of measurement methods and	Quantity of Saw dust used in the boiler was

procedures to be applied:	calculated by spring balance system which is in place for all the 3 conveyer belts.
Frequency of monitoring/recording:	Daily
Value monitored:	01.01.2010 - 31.01.2010 = 6839
Monitoring equipment:	Data type: Measured Frequency: Monthly Archiving policy: Electronic Responsibility: Manager (Power Plant)
QA/QC procedures to be applied:	The values shown here can be cross checked from factory records.
Calculation method:	-
Any comment:	-

Data Unit / Parameter:	Q_y
Data unit:	Tonnes
Description:	Quantity of Bushes (sarkanda) used.
Source of data:	Daily log sheets.
Description of measurement methods and procedures to be applied:	Quantity of Bushes (sarkanda) used in the boiler was calculated by spring balance system which is in place for all the 3 conveyer belts.
Frequency of monitoring/recording:	Daily
Value monitored:	01.01.2010 - 31.01.2010 = 0
Monitoring equipment:	Data type: Measured Frequency: Monthly Archiving policy: Electronic Responsibility: Manager (Power Plant)
QA/QC procedures to be applied:	The values shown here can be cross checked from factory records.
Calculation method:	-
Any comment:	-

Data Unit / Parameter:	$GCV_{Rice\ Husk}$
Data unit:	Kcal/Kg
Description:	Gross calorific value of the fuel (Biomass).

Source of data:	Plant Log Books.
Description of measurement methods and procedures to be applied:	GCV of the fuels has been calculated by Bomb Calorimeter present in the Lab at the project site.
Frequency of monitoring/recording:	Daily
Value monitored:	Average of 01.01.2010 - 31.12.2010 = 3414.92
Monitoring equipment:	Data type: Measured Archiving policy: Electronic Responsibility: Manager (Power Plant)
QA/QC procedures to be applied:	The Bomb calorimeter is calibrated annually by the accredited NABL approved independent third party. Latest calibration date: 31-01-2010 Next Calibration due on: 31-01-2011
Calculation method:	The value of GCV is calculated from Bomb calorimeter maintained at plant.
Any comment:	-

Data Unit / Parameter:	$GCV_{Saw\ Dust}$
Data unit:	Kcal/Kg
Description:	Gross calorific value of the fuel (Biomass).
Source of data:	Plant Log Books.
Description of measurement methods and procedures to be applied:	GCV of the fuels has been calculated by Bomb Calorimeter present in the Lab at the project site.
Frequency of monitoring/recording:	Daily
Value monitored:	Average of 01.01.2010 - 31.12.2010 = 3847.67
Monitoring equipment:	Data type: Measured Archiving policy: Electronic Responsibility: Manager (Power Plant)
QA/QC procedures to be applied:	The Bomb calorimeter is calibrated annually by the accredited NABL approved independent third party. Latest calibration date: 31-01-2010 Next Calibration due on: 31-01-2011
Calculation method:	The value of GCV is calculated from Bomb calorimeter and maintained at plant.
Any comment:	-

Data Unit / Parameter:	$GCV_{Mustard\ Husk}$
Data unit:	Kcal/Kg
Description:	Gross calorific value of the fuel (Biomass).
Source of data:	Plant Log Books.
Description of measurement methods and procedures to be applied:	GCV of the fuels has been calculated by Bomb Calorimeter present in the Lab at the project site.
Frequency of monitoring/recording:	Daily
Value monitored:	Average of 01.01.2010 - 31.12.2010 = 3722
Monitoring equipment:	Data type: Measured Archiving policy: Electronic Responsibility: Manager (Power Plant)
QA/QC procedures to be applied:	The Bomb calorimeter is calibrated annually by the accredited NABL approved independent third party. Latest calibration date: 31-01-2010 Next Calibration due on: 31-01-2011
Calculation method:	The value of GCV is calculated from Bomb calorimeter and maintained at plant.
Any comment:	-

Data Unit / Parameter:	$MOISTURE_{Rice\ Husk}$
Data unit:	%
Description:	It represents the moisture content in the rice husk which resultant to decrease in calorific value.
Source of data:	Plant Log Books.
Description of measurement methods and procedures to be applied:	Moisture of the fuel has been calculated using Dry Oven. A fixed quantity of fuel is weighted and then it is dried in the oven to remove the moisture. Dried fuel is weighted again and difference between the weight represents the moisture in the fuel.
Frequency of monitoring/recording:	Daily
Value monitored:	Average of 01.01.2010 - 31.12.2010 = 7.38
Monitoring equipment:	Data type: Measured Archiving policy: Electronic Responsibility: Manager (Power Plant)

QA/QC procedures to be applied:	The values can be cross checked from the plant records.
Calculation method:	Moisture % =($Weight_{Before\ Drying}$ - $Weight_{After\ Drying}$)/ $Weight_{Before\ Drying}$
Any comment:	-

Data Unit / Parameter:	$MOISTURE_{Saw\ Dust}$
Data unit:	%
Description:	It represents the moisture content in the saw dust which resultant to decrease in calorific value.
Source of data:	Plant Log Books.
Description of measurement methods and procedures to be applied:	Moisture of the fuel has been calculated using Dry Oven. A fixed quantity of fuel is weighted and then it is dried in the oven to remove the moisture. Dried fuel is weighted again and difference between the weight represents the moisture in the fuel.
Frequency of monitoring/recording:	Daily
Value monitored:	Average of 01.01.2010 - 31.12.2010 = 13.02
Monitoring equipment:	Data type: Measured Archiving policy: Electronic Responsibility: Manager (Power Plant)
QA/QC procedures to be applied:	The values can be cross checked from the plant records.
Calculation method:	Moisture % =($Weight_{Before\ Drying}$ - $Weight_{After\ Drying}$)/ $Weight_{Before\ Drying}$
Any comment:	-

Data Unit / Parameter:	$MOISTURE_{Mustard\ Husk}$
Data unit:	%
Description:	It represents the moisture content in the mustard husk which resultant to decrease in calorific value.
Source of data:	Plant Log Books.
Description of measurement methods and procedures to be applied:	Moisture of the fuel has been calculated using Dry Oven. A fixed quantity of fuel is weighted and then it is dried in the oven to remove the moisture. Dried fuel is weighted again and

	difference between the weight represents the moisture in the fuel.
Frequency of monitoring/recording:	Daily
Value monitored:	Average of 01.01.2010 - 31.12.2010 = 8.39
Monitoring equipment:	Data type: Measured Archiving policy: Electronic Responsibility: Manager (Power Plant)
QA/QC procedures to be applied:	The values can be cross checked from the plant records.
Calculation method:	Moisture % =($Weight_{Before\ Drying}$ - $Weight_{After\ Drying}$)/ $Weight_{Before\ Drying}$
Any comment:	-

Data Unit / Parameter:	D_T
Data unit:	KM
Description:	Distance travelled by each truck carrying biomass.
Source of data:	Nectar Lifesciences Limited factory log book in which records of the suppliers detail and declaration from the supplier stating the distance between initial point and dumping station are being maintained.
Description of measurement methods and procedures to be applied:	The maximum round trip distance is 120 km. Being conservative fixed value of 150 km. is used.
Frequency of monitoring/recording:	Fixed conservative value is used.
Value monitored:	150
Monitoring equipment:	Fixed conservative value is used.
QA/QC procedures to be applied:	Declaration from all the husk providers is being submitted for this purpose.
Calculation method:	Fixed value is used.
Any comment:	-

Data Unit / Parameter:	Q_D
Data unit:	Lit / Annum
Description:	Quantity of diesel consumed in tractors used for levelizing the piles/heaps of biomass.
Source of data:	This value has been referred from the diesel

	purchase log book at Nectar Lifesciences Limited factory
Description of measurement methods and procedures to be applied:	The value has been taken from the data recorded at the project site.
Frequency of monitoring/recording:	Monthly
Value monitored:	01.01.2010 - 31.01.2010 = 33264
Monitoring equipment:	Data type: Measured Frequency: Monthly Archiving policy: Electronic Responsibility: Manager (Power Plant)
QA/QC procedures to be applied:	
Calculation method:	This value has been referred from the diesel purchase log book at Nectar Lifesciences Limited factory
Any comment:	-

3.3 Description of the Monitoring Plan

- **Monitoring Plan**

  Nectar Lifesciences Ltd. is responsible for implementation of the monitoring plan.

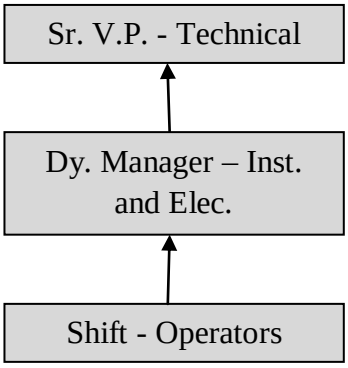
  There are total 6 separate energy meters to measure the power produced and consumed at various units in the project activity. The electrical energy monitoring is required as the calculation of emission reduction is based on the electricity displaced from grid. The net auxiliary energy consumed by power plant is calculated as described in section 3.2.

  The steam input is also required to be monitored, in order to calculate the emission reductions due to thermal energy displacement. The flow rate, pressure and temperature of steam supplied to processes of Unit – 2 and Unit – 10 are also monitored by steam flow meter, pressure gauge, totalizer, temperature gauge and RTD sensors. All instruments are calibrated annually. so that the accuracy of the measurement can be ensured.

  All monitoring parameters according to the monitoring plan are being recorded as specified in section 3.2 above. . Since the shift wise data logging is being carried out along with daily reporting, the uncertainty level of the monitored data used for calculating emission reduction is low.

- **Organizational Structure, responsibilities and competencies**

  Nectar Lifesciences Ltd. would ensure accuracy of the measurement system by adopting the following operational and management structure.



Sr. V.P. – Technical: is responsible for overall VCS project activity.

Dy. Manager – Inst. and Elec.: is responsible for maintenance all records pertaining to net electricity generation and net steam used for the process, calibration of meters and monitoring. Dy. Manager is qualified technical person with more than 5 years of experience in relevant field

Shift - Operators: are responsible for the eight hourly data recording of the relevant parameters mentioned in the monitoring plan.

- **Methods for generating, recording, storing, aggregating, collating and reporting data on monitored parameters.**

  Data generation for the monitored parameters is on actual readings shown by the various meters. The meters are calibrated annually with NABL accredited lab so that the accuracy of data can be assured.

  Recording of data is done on hourly basis for the steam flow and temperature and pressure in the log books and electricity is measured every eight hourly.

  Data is stored in plant log books.

  Aggregation and collation of data is done by engineers at the power plant on the daily basis in the excel sheet. Aggregation and collation of data is done in the excel sheet from the plant log books.

- **Procedure for handling internal auditing and non-conformities**

In order to ensure the accurate reporting of the monitored parameters and to avoid any kind of disparity in the reported data, the following quality assurance measures have been adopted.

Shift operator is assigned with the responsibility recording of parameters as per the monitoring plan. The shift engineer records / checks the observations in the plant log books on a daily basis and forwards the same in the soft form and hard form to the Dy. Manager. The Dy. Manager review the data received and compiles and generates a daily report and sends it to the Sr. V.P. (Technical) for his perusal.

Emergency Preparedness Plan

In order to avoid any kind of discrepancies in the monitoring procedures the following emergency preparedness plan has been adopted at the plant.

- The spare meter duly calibrated is available at the plant for replacement in case of failure of any of the installed meters.
- In orders to monitor the parameters with the acceptable accuracy, all the meters are calibrated annually.

The above mentioned emergency preparedness plan has been in place at the plant site since beginning of the monitoring period.

No failure of any meter was reported during the current monitoring period.

4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

The actual annual emission reductions are calculated considering 6 MW of electricity and 24 TPH of steam extraction.

For electricity and thermal energy (steam/heat) produced in a cogeneration unit, using fossil fuel, the following equation shall be used:

$$BE_{cogen,CO2,y} = [(EG_{PJ,thermal,y} + EG_{PJ,electrical,y} * 3.6) / \eta_{BL,cogen}] * EF_{FF,CO2}$$

Where:

$BE_{cogen,CO2,y}$	The baseline emissions from electricity and steam displaced by the project activity during the year y; tCO_2
$EG_{PJ,thermal,y}$	The net quantity of thermal energy supplied by the project activity during the year y; TJ
$EG_{PJ,electrical,y}$	The amount of electricity supplied by the project activity during the year y; GWh
3.6	Conversion factor; TJ/GWh
$\eta_{BL,cogen}$	The total efficiency (including both thermal and electrical) of the cogeneration plant using fossil fuel that would have been used in the absence of the project activity. Efficiency should be calculated as the total energy produced (electricity and steam/heat extracted) divided by thermal energy of the fuel used
$EF_{FF,CO2}$	The CO2 emission factor of the fossil fuel that would have been used in the baseline cogeneration plant; tCO2 / TJ obtained from reliable local or national data if available, otherwise IPCC default emission factors are used

Summary of data related to electricity generation and steam generation (Unit – 2 & Unit – 10 separately) is provided in Section - 5 at the end of this report. All the supporting related to data has been provided for cross verification.

Calculation for the month of January – 2010 is shown below:

$BE_{cogen, CO2, Jan-2010}$ = [(41.08 TJ + 2.43 * 3.6) /100%] *96.1

= 4788 tCO_2e

Being conservative, efficiency of the plant has been considered 100%.

Similarly the baseline emissions from the project activity have been calculated for subsequent months.

Month	$EG_{PJ,thermal}$	$EG_{PJ,electrical}$	Conversion Factor	$\eta_{BL,cogen}$	$EF_{Coal,CO2}$	$BE_{cogen,CO2,2010}$
	TJ	*GWh*	TJ/GWh	*100%*	t_{CO2}/ *TJ*	t_{CO2}
	a	B	c	d	e	{(a+b*c)/d}*e
Jan-10	41.08	2.43	3.6	100%	96.1	**4788**
Feb-10	38.37	2.17	3.6	100%	96.1	**4438**
Mar-10	41.16	2.10	3.6	100%	96.1	**4682**
Apr-10	31.25	2.24	3.6	100%	96.1	**3777**
May-10	37.27	2.88	3.6	100%	96.1	**4579**
Jun-10	34.25	2.69	3.6	100%	96.1	**4223**
Jul-10	39.86	2.93	3.6	100%	96.1	**4844**
Aug-10	44.52	2.99	3.6	100%	96.1	**5313**
Sep-10	43.87	3.07	3.6	100%	96.1	**5277**
Oct-10	46.63	3.15	3.6	100%	96.1	**5571**
Nov-10	46.75	3.22	3.6	100%	96.1	**5607**
Dec-10	43.87	2.74	3.6	100%	96.1	**5163**
Total	488.88	32.60				**58261**

Baseline emissions for project activity calculated ex ante in registered PD dated 20th Oct. 2010 is 54878 tCO_2, but for the year 2010 the baseline emissions increased up to 58261 tCO_2 which is 6.16 % higher.

The no. of baseline emissions increased due to increase in the no. of working days. At the time of registration it was assumed that plant would operate on an average 330 days but on actual for the year 2010 the plant was operated for 350 days (Shut down details are given below). However due to this, additionality of the project does not hamper because additionality was done on levelized cost of generation. The additionality sheet with the 350 working days has been provided to DOE for verification.

Shut-down details

MONTH	Date	Hrs
JANUARY	**-**	**-**
FEBRAURY	**-**	**-**
MARCH	**14**	**6**
	15	**14**
	16	**24**
APRIL	**27**	**24**
	28	**24**

MAY	**-**	**-**
JUNE	**28**	**8**
	29	**24**
	30	**20**
JULY	**19**	**8**
	20	**24**
	21	**15**
AUGUST	**30**	**24**
	31	**8**
SEPTEMBER	**1**	**16**
	27	**24**
	28	**16**
OCTOBER	**19**	**9**
	20	**24**
NOVEMBER	**-**	**-**
DECEMBER	**30**	**24**
	31	**24**
Total Shut Down Hours		**360**
Total Shut Down Days		**15 (360/24)**
Total Working Days		**350 (365-15)**

4.2 Project Emissions

The project emission in the project activity is accounted from the quantity of diesel used in the tractors for levelizing the piles/heaps of biomass. Data for diesel consumption is taken from the plant records.

As described in section 4.3 of the PD, the algorithm used in the calculation of project emission is explained below and the complete calculation is being submitted to the DOE.

Algorithm for the calculation of Project Emission:

$P.E. = (Q_D * D / 1000) * NCV_{Diesel} * EF_D$

Where:

P.E.	Project emission from the project activity; tCO_2e
Q_D	Quantity of diesel consumed in tractors used for levelizing the piles/heaps of biomass; Liters
D	Density of diesel; Kg/Liter
NCV_{Diesel}	Net Calorific Value of diesel; TJ/Tonnes
EF_D	Emission factor of diesel; tCO_2e/TJ

Values of the above variables are taken from the monitoring plan.

For the month of January 2010, project emissions from the project activity are calculated as:

P.E. = (2604 * 0.87/1000) * 0.04303 * 74.1

= 7.22 tCO_2e

The project emission on the account of tractor used for levelizing the piles of biomass for subsequent months is tabulated below:

Month	Q_D	$Density_{Diesel}$	Conversion	NCV_{Diesel}	EF_{Diesel}	PE_{2010}	PE_{2010}
	Litres	Kg/Litre	Tonnes/Kg	TJ/Tonnes	t_{CO2} / TJ	t_{CO2}	t_{CO2}
	a	B	c	d	e	(a*b/c)*d*e	Roundup
Jan-10	2604	0.87	1000	0.04303	74.1	7.22	8.00
Feb-10	2710	0.87	1000	0.04303	74.1	7.52	8.00
Mar-10	2760	0.87	1000	0.04303	74.1	7.66	8.00
Apr-10	2820	0.87	1000	0.04303	74.1	7.82	8.00
May-10	2870	0.87	1000	0.04303	74.1	7.96	8.00
Jun-10	2700	0.87	1000	0.04303	74.1	7.49	8.00
Jul-10	2785	0.87	1000	0.04303	74.1	7.73	8.00
Aug-10	2795	0.87	1000	0.04303	74.1	7.75	8.00
Sep-10	2710	0.87	1000	0.04303	74.1	7.52	8.00
Oct-10	2880	0.87	1000	0.04303	74.1	7.99	8.00
Nov-10	2810	0.87	1000	0.04303	74.1	7.79	8.00
Dec-10	2820	0.87	1000	0.04303	74.1	7.82	8.00
Total	33264					92.27	96

4.3 Leakage

The leakage for the project activity has been calculated on the account of biomass transported. For the month of January 2010, the leakage calculation has been shown as below:

Total biomass transported in the project boundary:

Fuel	Kg	Tons
Bazra Fodder	0	0
Arhar Husk	0	0
Moongi Husk	0	0
Musterd Husk	60420	60.42
Cotton Stick	0	0
Sarkanda	0	0
Sawdust	595866	595.866
Sunflower	0	0
Rice Husk	6615812	6615.812

Total	**7272098**	**7272.098**

Leakage Estimation			
Total Biomass Requirements	7272.098	Tonnes per month	a = Taken from Plant records
Truck capacity	8	Tonnes	b = Fixed Ex-Ante Values
Max. return distance between project site and collection centres	150	Km	c = Conservative Value Choosen
Total Number of trips	910		d = a/b
Consumption of diesel per trip (to and fro)(@4km/lit)	37.5	Lit	e = Fixed Ex Ante Value
Total Diesel consumption	34125	Lit	f = d*e
Density of diesel	0.87	kg/lit	g = Fixed Ex Ante Value
Mass of diesel used	29.68875	Tonnes	h = f*g/1000
Calorific value of diesel	0.04303	TJ/Tonnes	I = Fixed Ex Ante Value
Emission factor for diesel	74.1	tCO2e/TJ	j = Fixed Ex Ante value
Emissions due to transportation of biomass	94.67	t CO2 /month	k = h*i*j

Leakage emissions for the subsequent months have been tabulated below:

January	94.67	t CO2 /month
February	85.31	t CO2 /month
March	85.10	t CO2 /month
April	84.99	t CO2 /month
May	99.04	t CO2 /month
June	94.88	t CO2 /month
July	102.16	t CO2 /month
August	107.47	t CO2 /month
September	104.66	t CO2 /month
October	111.84	t CO2 /month
November	108.61	t CO2 /month
December	103.51	t CO2 /month
Total	**1182**	**t CO2 /month**

4.4 Summary of GHG Emission Reductions and Removals

The net GHG emission reductions from the project activity are calculated as:

ER_{2010} (tCO2e) = BE_{2010} (tCO_2e) – PE_{2010} (tCO_2e) – L_{2010} (tCO_2e)

For the month of January, the calculation has been shown as below:

$ER_{Jan\text{-}2010}$ = 4943 – 8 – 95

= 4840 tCO_2e

Emission Reductions for the subsequent months have been tabulated below:

Month	BE_{2010}	PE_{2010}	L_{2010}	ER_{2010}
	tCO_2e	tCO_2e	tCO_2e	tCO_2e
	a	b	c	d= a-b-c
January	4788	8	95	4685
February	4438	8	85	4344
March	4682	8	85	4589
April	3777	8	85	3684
May	4579	8	99	4472
June	4223	8	95	4121
July	4844	8	102	4734
August	5313	8	107	5197
September	5277	8	105	5165
October	5571	8	112	5451
November	5607	8	109	5490
December	5163	8	104	5051
Total	**58261**	**96**	**1182**	**56983**

Total emission reductions during the period 01st January 2010 to 31st December 2010 are calculated as **56983 tCO_2e**.

5 ADDITIONAL INFORMATION

During the monitoring period the plant was operated for 350 days while in the registered PD it was written that plant would operate for 330 days. In the registered PD the values were taken as the estimated values based on the industry practice. Generally plant operates for 24*7 except the operation and maintaince period, breakdown and shut down. Therefore at the time of registration it was considered that plant would operate a minimum for 330 working days in a year for the 20 years projection, However ex-post working days for the monitoring period is 350 days due to less breakdown and shutdown as the plant was operated very well during the time period.

Due to change in working days from 330 to 350 the additionality of the project has not been affected. After considering 350 working days, the levelized cost of energy generation from biomass has been found to be higher than coal. Kindly go through the below table:

Parameters	Units	Registered PD Ver 05	Monitoring Period (01.01.2010 – 31.12.2010)
Operating days in a Year	Days	330	350 (due to less breakdown and shutdown)
Baseline Emissions	tCO_2e	54878	58204
Levelized Cost of Generation For Coal Based boiler of cogeneration plant	Rs./GJ	196.97	196.79
Levelized Cost of Generation For Biomass Based boiler of cogeneration plant	Rs./GJ	224.02	223.01

The levelized cost for with 350 working days has been submitted.

Data of power generation:

Power									
Month	EG_{Gross}	EC_{Unit-1}	EC_{Unit-2}	EC_{Aux}	EC_{BCK}	$EC_{Unit-10}$	$EC_{Net\ Aux}$	EG_{Net}	EG_{Net}
	KWh	KWh	KWh	KWh	KWh	KWh	KWh	KWh	GWh
	a	b	c	d	e	f	g=d-e-f	h=a-g	i=h/10^6
Jan-10	3132800	648200	1219600	1265000	185773	376520	702707	2430093	2.43
Feb-10	2700800	404500	1359400	936900	77929	326176	532795	2168005	2.17
Mar-10	2666400	394600	1423600	848200	66372	213930	567898	2098502	2.10
Apr-10	2780300	422900	1536200	821200	60154	217474	543572	2236728	2.24
May-10	3530100	608300	1949600	972200	136688	188063	647449	2882651	2.88
Jun-10	3269800	546200	1829600	894000	213945	105021	575034	2694766	2.69
Jul-10	3561700	545700	1929600	1086400	215975	237203	633222	2928478	2.93

Aug-10	3653300	652700	1865900	1134700	164424	308166	662110	2991190	2.99
Sep-10	3738200	588900	2075900	1073400	76795	325357	671248	3066952	3.07
Oct-10	3815900	549800	2013800	1252300	201760	383215	667325	3148575	3.15
Nov-10	3658100	607700	1977500	1072900	211316	424707	436877	3221223	3.22
Dec-10	3330700	575500	1554900	1200300	204729	401586	593985	2736715	2.74
Total	39838100	6545000	20735600	12557500	1815860	3507418	7234222	32603878	32.60

Data of Steam – Unit 2:

Month	Q_{Unit-2}	P	$T_{unit\ 2}$	Enthalpy of Steam	Enthalpy of Steam	Feed Water Enthalpy	Net Enthalpy of Steam	Thermal Energy Generation - Unit - 2
	Tonnes	Kg/cm²	°C	kJ/kg	kCal/kg	kCal/kg	kCal/kg	TJ
	a	b	c	d	e=d/4.1868	f	g=e-f	h=(a*1000)*(g*4.1868)/10^9
Jan-10	12605	5.81	194.54	2833.74	676.83	125.00	551.83	29.12
Feb-10	11173	5.90	218.55	2886.19	689.35	125.00	564.35	26.40
Mar-10	11476	5.91	190.51	2824.11	674.53	125.00	549.53	26.40
Apr-10	11420	5.93	207.85	2862.64	683.73	125.00	558.73	26.71
May-10	14178	5.91	200.44	2846.35	679.84	125.00	554.84	32.94
Jun-10	13307	5.90	208.32	2863.82	684.01	125.00	559.01	31.14
Jul-10	14302	5.82	212.47	2873.31	686.28	125.00	561.28	33.61
Aug-10	15181	5.79	221.23	2892.50	690.86	125.00	565.86	35.97
Sep-10	15009	5.76	217.88	2885.37	689.16	125.00	564.16	35.45
Oct-10	15711	5.67	216.16	2882.04	688.36	125.00	563.36	37.06
Nov-10	15276	5.69	216.72	2883.17	688.63	125.00	563.63	36.05
Dec-10	14016	5.61	217.95	2886.20	689.36	125.00	564.36	33.12
Total	**163654.0**							**383.97**

Data of Steam – Unit 10:

Month	Q_{Unit-2}	P	$T_{unit\ 2}$	Enthalpy of Steam	Enthalpy of Steam	Feed Water Enthalpy	Net Enthalpy of Steam	Thermal Energy Generation - Unit - 10
	Tonnes	Kg/cm²	°C	kJ/kg	kCal/kg	kCal/kg	kCal/kg	TJ
	i	j	k	l	m=l/4.1868	n	o=m-n	p=(i*1000)*(o*4.1868)/10^9
Jan-10	5303	5.81	169.97	2777.54	663.40	125.00	538.40	11.95
Feb-10	5303	5.90	171.83	2781.18	664.27	125.00	539.27	11.97
Mar-10	6564	5.91	167.98	2772.01	662.08	125.00	537.08	14.76

Apr-10	2000	5.93	175.51	2789.59	666.28	125.00	541.28	4.53
May-10	1904	5.91	179.87	2799.83	668.73	125.00	543.73	4.33
Jun-10	1371	5.90	173.90	2786.03	665.43	125.00	540.43	3.10
Jul-10	2759	5.82	175.50	2790.31	666.45	125.00	541.45	6.25
Aug-10	3763	5.79	177.59	2795.35	667.66	125.00	542.66	8.55
Sep-10	3746	5.76	167.46	2771.88	662.05	125.00	537.05	8.42
Oct-10	4278	5.67	162.99	2761.93	659.68	125.00	534.68	9.58
Nov-10	4776	5.69	163.55	2763.12	659.96	125.00	534.96	10.70
Dec-10	4800	5.61	163.59	2763.83	660.13	125.00	535.13	10.75
Total	**46567.00**							**104.91**