BIOMASS BASED COGENERATION PROJECT AT NECTAR LIFE SCIENCES LTD.

Project Title	Biomass Based Cogeneration Project at Nectar Life Sciences Ltd.
Version	02
Report ID	5th Monitoring Period
Date of Issue	01-12-2016
Project ID	251
Monitoring Period	01-01-2013 to 30-06-2016
Prepared By	M/s EnvironmentFirst Energy Services Pvt. Ltd.
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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Project Details

1. Summary Description of the Implementation Status of the Project

Nectar Lifesciences Ltd. (NLL) is a knowledge driven organization which constitutes a vital part of fast growing Indian Pharmaceutical Industry. In a short span of existence, NLL has emerged as 365 ranked organization amongst the top 500 Indian Corporates & is currently among top 25 fore runners of the Indian Pharmaceutical industry with a top 5 ranking in the Indian Bulk Drug Industry from a standalone Active Pharmaceutical Ingredients (API Manufacture) perspective. NLL has transformed itself to being the most integrated player in the Global Cephalosprins Industry within Anti Infective Therapeutic segment. NLL is catapulting itself into Cephalosporin Formulations in a defining way by entering lucrative regulated markets like US, European Union & Japan to name a few with 11 State of Art manufacturing facilities spread across the States of Punjab, Himachal Pradesh Jammu & Kashmir with compliance to global standards of cGMP, Environment Health Safety (EHS) as well as pool of thousands of highly skilled, knowledgeable, competent qualified work force at all levels.

The project activity involves installation of a new biomass based cogeneration system at the pharmaceutical unit of Nectar Lifesciences Limited (NecLife). The cogeneration system includes 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. However the extraction is from the turbine is 20 TPH but for more for extraction like 25 TPH the electricity generation capacity would decrease accordingly.

The aim of the project activity was the installation of a biomass fired cogeneration plant to meet the present and future demand of power in Units (1 & 2) and process steam for the manufacturing process of Unit 2 of the pharmaceutical plant. The project activity was proposed considering the Thermal and Electrical energy required for the proposed new Menthol Plant, Menthol Crystal Plant, Menthol Distillation Plant, sterile plant and the expansion of solvent recovery plant. The project activity caters to existing electricity requirement of unit one and steam and electricity requirement of unit two (existing and expansion).

The current monitoring period of the project activity is from 01-01-2013 to 30-06-2016 and during this monitoring period the project activity has reduced net GHG emission of amount 1,66,484 tCO_2e.

Current 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. Extracted steam from turbine is supplied to Unit -2 and unit -10 via De-superheating Station (DSH). DSH reduces the temperature of steam and increases the quantity of the steam therefore extracted steam goes higher up to 24 TPH for process heat. Flow meters are there between DSH and Unit – 2 and Unit – 10. The pressure of the steam supplied to the unit – 2 and unit – 10 is same however temperature is slightly different.

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.

Further, the project does not belong to AFOLOU category and also is not a grouped project activity.

3. Project Proponent

Organization name	M/s. Nectar Lifesciences Ltd.
Contact person	Mr. H.P. Singh
Title	Director
Address	Unit II, Village: Saidpur, Mohali Disctrict, Punjab
Telephone	+91-1762-308000/01
Email	hpsingh@neclife.com

4. Other Entities Involved in the Project

Provide contact information and roles/responsibilities for any other project participant(s). Copy and paste the table as needed.

Organization name	EnvironmentFirst Energy Services Pvt. Ltd.
Role in the project	Baseline Development and MR preparation.
Contact person	Harish Sharma
Title	Director
Address	405 A, Prakrati Corporate, Y N Road, Indore (Madhya Pradesh) 452001
Telephone	0731 6007860, 2970493
Email	info@environmentfirst.in

5. Project Start Date

Start date of the project is 27-05-2007.

6. Project Crediting Period

Start Date of Crediting Period: 27-05-2007

End Date of Crediting Period: 26-05-2017

The crediting period is for a period of 10 years which can be renewed at the maximum for two times.

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 1: Longitude and Latitude (Unit I)

Longitude	76°52’41” (east)
Latitude	30°35’7” (north)

Table 2: Longitude and Latitude (Unit II)

Longitude	76°52’51” (east)
Latitude	30°35’10” (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

8. Title and Reference of Methodology

The monitoring of VERs generated by the project follows the same principles that have been adopted for the monitoring of emission reductions under the Clean Development Mechanism. (hereafter referred to as AMS-IC): Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories

Type I: Renewable Energy Projects

Sub Category C: Thermal energy production with or without electricity.

AMS I C, Version – 15 in effect from 31 July 2009

For more information regarding the baseline methodology and monitoring methodology, please refer to AMS IC, Version-15:

http://cdm.unfccc.int/methodologies/DB/JSEM51TG3UVKADPA25IPUHXJ85HE8A

9. Other Programs

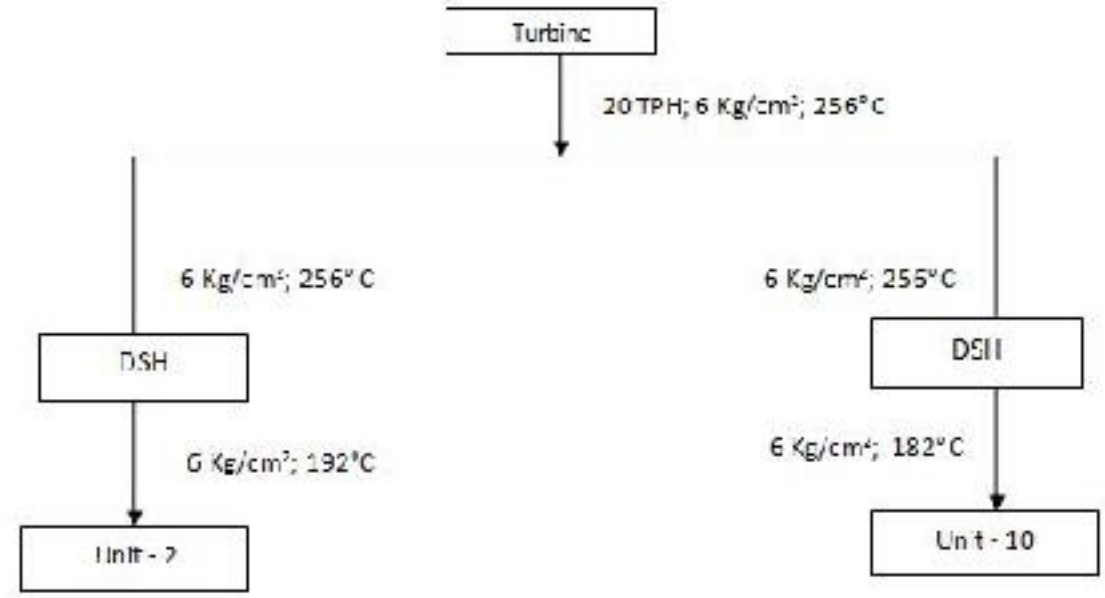
- Emission Trading Programs and Other Binding Limits: The given project activity isn't a part of any Emission Trading Program or any other mechanism that includes GHG allowance trading
- Other Forms of Environmental Credit: The given project activity hasn't sought or received another form of GHG-related environmental credit, including those of renewable energy certificates, during this monitoring period.
- Participation under Other GHG Programs: The given project activity is not registered under any other GHG programs.

2. IMPLEMENTATION STATUS

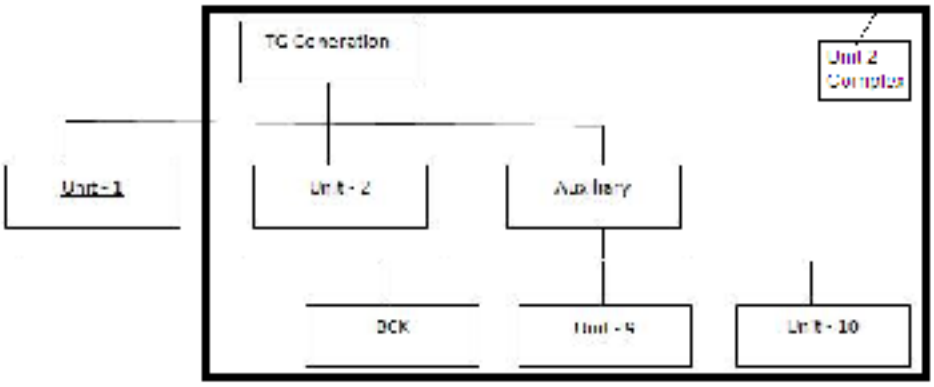
2.1. Implementation Status of the Project Activity

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.

Extracted steam from turbine is supplied to Unit - 2 and unit - 10 via De-superheating Station (DSH). DSH reduces the temperature of steam and increases the quantity of the steam therefore extracted steam goes higher up to 24 TPH for process heat. Flow meters are there between DSH and Unit – 2 and Unit – 10. The pressure of the steam supplied to the unit – 2 and unit – 10 is same however temperature is slightly different. Following flow diagram of the extracted steam makes it clearer:



Flow of electricity is explained through following flowchart:



As shown in the flowchart, unit – 1 meter, unit – 2 meter and auxiliary meter are connected to total generation meter and further BCK meter, unit – 9 meter and unit -10

meter are connected to auxiliary meter. The electricity from auxiliary meter is being dispatched to BCK unit, unit 9, unit 10 and for meeting the auxiliary requirement of co-generation plant. Net auxiliary consumption of co-generation plant can be calculated by subtracting the electric units consumed by BCK unit, unit 9 and unit 10 from the units of auxiliary meter.

2.2. Deviations

2.2.1. Methodology Deviations

No deviations applied during this monitoring period. The current monitoring is done as per registered monitoring plan which is in compliance to the methodology applied in the project description.

2.2.2. Project Description Deviations

There are no deviations 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 / Parameter	Ƞ
Data unit	No Unit
Description	Efficiency of the plant using fossil fuel that would have been used in the absence of the project activity.
Source of data	Fixed and conservative value has been taken as per paragraph 18 (C) of the methodology
Value applied:	100%
Justification of choice of data or description of measurement methods and procedures applied	Fixed and conservative value has been taken as per paragraph 18 (C) of the methodology
Purpose of the data	Calculation of baseline emissions
Comments	NA

3.2.

Data / Parameter	EFcoal
Data unit	tCO_2e/TJ
Description	Emission Factor of coal

Source of data	IPCC default value as per Table 1.4 Chapter 1, Volume 2 Energy of IPCC 2006 Publication (http://www.ipccnggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf)
Value applied:	96.1
Justification of choice of data or description of measurement methods and procedures applied	Default value as published by IPCC has been applied
Purpose of the data	Calculation of project emissions
Comments	NA

Data / Parameter	EF_D
Data unit	tCO2e/TJ
Description	Emission Factor of Diesel
Source of data	IPCC default value as per Table 1.4 Chapter 1, Volume 2 Energy of IPCC 2006 Publication
Value applied:	74.1
Justification of choice of data or description of measurement methods and procedures applied	IPCC default value as per Table 1.4 Chapter 1, Volume 2 Energy of IPCC 2006 Publication (http://www.ipccnggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf)
Purpose of the data	Calculation of project emissions and leakage emission
Comments	NA

Data / Parameter	NCV_{Diesel}
Data unit	TJ/Tonne
Description	Net Calorific Value of Diesel

Source of data	IPCC default value as per Table 1.4 Chapter 1, Volume 2 Energy of IPCC 2006 Publication (http://www.ipccnggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf)
Value applied:	0.043
Justification of choice of data or description of measurement methods and procedures applied	Default value as published by IPCC has been applied
Purpose of the data	Calculation of project emissions and leakage emission
Comments	NA

Data / 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
Justification of choice of data or description of measurement methods and procedures applied	Based on industry estimates
Purpose of the data	Calculation of Leakage emissions
Comments	NA

Data / Parameter	D_T
Data unit	Km
Description	Distance travelled by each truck
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. The maximum round trip distance is 120 km. Being conservative fixed value of 150 is used.

Value applied:	150
Justification of choice of data or description of measurement methods and procedures applied	The data was calculated at the time of validation and is fixed ex-ante. Normative and conservative fixed value is being used.
Purpose of the data	Calculation of Leakage emissions
Comments	NA

Data / Parameter	M
Data unit	Km/Lit
Description	Average mileage each truck
Source of data	Normative and conservative fixed value is being used
Value applied:	4
Justification of choice of data or description of measurement methods and procedures applied	Normative and conservative fixed value is being used
Purpose of the data	Calculation of Leakage emissions
Comments	NA

Data / Parameter	D
Data unit	Kg/Lit
Description	Density of Diesel
Source of data	Normative and conservative fixed value is being used
Value applied:	0.87
Justification of choice of data or description of measurement methods and procedures applied	Normative and conservative fixed value is being used
Purpose of the data	Calculation of Leakage emissions
Comments	NA

3.2. Data and Parameters Monitored

Data / Parameter	**EG_y**
Data unit	kWh
Description	Gross electricity generated from cogeneration plant
Source of data	Electricity Log Books and electronic database
Description of measurement methods and procedures to be applied	Gross electricity generation is measured by electronic meters at the plant and DCS will measure the data.
Frequency of monitoring/recording	Continuous Monitoring, Hourly Recording and Monthly compilation will be done
Value monitored:	Year 2013 = 3,01,71,400 Year 2014 = 3,30,51,800 Year 2015 = 3,97,69,200 Year 2016 = 2,14,24,000
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.
Purpose of the data	Calculation of baseline emissions
Calculation method	NA
Comments	NA

3.3.

Data / Parameter	**$EG_{Net\ Aux}$**
Data unit	kWh

Description	Net Auxiliary electricity consumed by cogeneration plant
Source of data	Calculated on actual basis as per the method described in "description of measurement method and procedures to be applied".
Description of measurement methods and procedures to be applied	Data type: Calculated Archiving policy: Paper & Electronic Responsibility: Manager (Power Plant)
Frequency of monitoring/recording	Daily
Value monitored:	Year 2013 = 1,06,80,753 Year 2014 = 76,93,300 Year 2015 = 82,34,477 Year 2016 = 43,65,440
Monitoring equipment	Value has been calculated on actual basis with the help of the various energy meters installed at the cogeneration plant as per the calculation method mentioned in the below row.
QA/QC procedures to be applied	Calibration: Related energy meters calibrated annually
Purpose of the data	Calculation of baseline emissions
Calculation method	Calculated on actual basis with the help of energy meters. Net auxiliary electricity is calculated by: $EC_{Aux.} – (EC_{BCK} + EC_{Unit\ 9} + EC_{Unit\ 10})$
Comments	NA

Data / Parameter	**EG_{Aux}**
Data unit	kWh
Description	Quantity of Electricity consumed by the BCK unit, Unit-10, and net auxiliary for the power plant.
Source of data	Electricity Log Book and Electronic database
Description of measurement methods and procedures to be applied	Data is being monitored by auxiliary energy meter
Frequency of monitoring/recording	Daily

Value monitored:	Year 2013 = 1,15,39,800 Year 2014 = 77,12,100 Year 2015 = 85,23,600 Year 2016 = 43,78,640
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	Calibration: Related energy meters calibrated annually
Purpose of the data	Calculation of baseline emissions
Calculation method	The data is directly recorded from auxiliary energy Meter
Comments	NA

Data / Parameter	EG_{BCK}
Data unit	kWh
Description	Quantity of Electricity consumed by the BCK unit
Source of data	Electricity Log Book and Electronic database
Description of measurement methods and procedures to be applied	Data is being monitored by BCK energy meter
Frequency of monitoring/recording	Daily
Value monitored:	Year 2013 = 0 Year 2014 = 0 Year 2015 = 0 Year 2016 = 3200
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	Calibration: Related energy meters calibrated annually
Purpose of the data	Calculation of baseline emissions
Calculation method	The data is directly recorded from BCK energy Meter
Comments	NA

Data / Parameter	**EG** Unit-10
Data unit	kWh
Description	Quantity of Electricity consumed by unit - 10
Source of data	Electricity Log Book and Electronic database
Description of measurement methods and procedures to be applied	Data is being monitored by unit -10 energy meter
Frequency of monitoring/recording	Daily
Value monitored:	Year 2013 = 859047 Year 2014 = 18800 Year 2015 = 289123 Year 2016 = 10000
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	Calibration: Related energy meters calibrated annually
Purpose of the data	Calculation of baseline emissions
Calculation method	The data is directly recorded from BCK energy Meter
Comments	NA

Data / Parameter	**EG_{Net}**
Data unit	kWh
Description	Net Electricity Generated by Cogeneration Power Plant
Source of data	Electricity Log Book and Electronic database
Description of measurement methods and procedures to be applied	Data is calculated by subtracting net auxiliary electricity consumption from gross electricity generation.
Frequency of monitoring/recording	Daily
Value monitored:	Year 2013 = 1,94,90,647 Year 2014 = 2,53,58,500 Year 2015 = 3,15,34,723 Year 2016 = 1,70,58,560
Monitoring equipment	Data type: Calculated Archiving policy: Paper & Electronic Responsibility: Manager (Power Plant)
QA/QC procedures to be applied	The meters for reading EG_y and $EG_{Net\ Aux}$ are calibrated annually by the accredited NABL approved independent third party.
Purpose of the data	Calculation of baseline emissions
Calculation method	The data was calculated as following method: $EG_{Net} = EG_y – EC_{Net\ Aux}$
Comments	NA

Data / Parameter	**$EG_{PJ,thermal,y}$**
Data unit	TJ
Description	Thermal energy (from Steam) supply to process
Source of data	Data has been calculated on the bases of procedures given in below defined description
Description of measurement methods and procedures to be applied	Heat from steam is calculated with the help of parameters viz. quantity of steam, temperature of steam and pressure of steam. Steam flow is measured from steam flow meter of unit 2 and unit 10 separately. Flow of steam in tonnes/hr is converted to TJ by calculation.
Frequency of monitoring/recording	Monthly

Value monitored:	Year 2013 = 322.25 Year 2014 = 394.13 Year 2015 = 451.83 Year 2016 = 256.93
Monitoring equipment	Calculated Material
QA/QC procedures to be applied	NA
Purpose of the data	Calculation of baseline emissions
Calculation method	Heat from steam is calculated with the help of parameters viz. quantity of steam, temperature of steam and pressure of steam. Steam flow is measured from steam flow meter of unit 2 and unit 10 separately. Flow of steam in tonnes/hr is converted to TJ by calculation.
Comments	NA

Data / Parameter	Q_{Unit-2}
Data unit	Tonnes
Description	Quantity of steam which was supplied to unit-2
Source of data	Plant Log Book and Electronic database
Description of measurement methods and procedures to be applied	Data is recorded directly from steam flow meter
Frequency of monitoring/recording	Daily
Value monitored:	Year 2013 = 74,481 Year 2014 = 1,01,387 Year 2015 = 1,22,179 Year 2016 = 75,796
Monitoring equipment	Sr. No.: 91G216756 Make: Yokogawa Data type: Measured Accuracy: 0.3% 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.
Purpose of the data	Calculation of baseline emissions
Calculation method	NA
Comments	NA

Data / Parameter	$Q_{Unit-10}$
Data unit	Tonnes
Description	Quantity of steam which was supplied to unit-10
Source of data	Plant Log Book and Electronic database
Description of measurement methods and procedures to be applied	Data is recorded directly from steam flow meter
Frequency of monitoring/recording	Daily
Value monitored:	Year 2013 = 58,514 Year 2014 = 61,043 Year 2015 = 63,647 Year 2016 = 29,152
Monitoring equipment	Sr. No.: 0700043 Make: ABB Data type: Measured Accuracy: 0.26% 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.
Purpose of the data	Calculation of baseline emissions
Calculation method	NA
Comments	NA

Data / Parameter	T_{Unit-2}
Data unit	^0C
Description	Temperature of steam which was supplied to unit-2
Source of data	Plant Log Book and Electronic database
Description of measurement methods and procedures to be applied	Data is recorded directly from steam temperature sensor
Frequency of monitoring/recording	Hourly
Value monitored:	Year 2013 = 227.25 Year 2014 = 223.75 Year 2015 = 223.75 Year 2016 = 231.17
Monitoring equipment	Sr. No.: DSR 3219 Make: Actusays Data type: Measured Accuracy: 0.1% 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.
Purpose of the data	Calculation of baseline emissions
Calculation method	NA
Comments	NA

Data / Parameter	$T_{Unit-10}$
Data unit	^0C
Description	Temperature of steam which was supplied to unit-10
Source of data	Plant Log Book and Electronic database
Description of measurement methods and procedures to be applied	Data is recorded directly from steam temperature sensor
Frequency of monitoring/recording	Hourly

Value monitored:	Year 2013 = 177.75 Year 2014 = 180.83 Year 2015 = 181.50 Year 2016 = 181.17
Monitoring equipment	Sr. No.: TE 1100 Make: Actusays Data type: Measured Accuracy: 0.1% 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.
Purpose of the data	Calculation of baseline emissions
Calculation method	NA
Comments	NA

Data / Parameter	**P**
Data unit	Kgf/cm2
Description	Pressure of steam which was supplied to unit-2 and Unit-10
Source of data	Plant Log Book and Electronic database
Description of measurement methods and procedures to be applied	Data is recorded directly from pressure transmitter
Frequency of monitoring/recording	Continuous monitoring and Hourly recording
Value monitored:	Year 2013 = 5.81 Year 2014 = 5.88 Year 2015 = 5.86 Year 2016 = 5.92
Monitoring equipment	Sr. No.: 91F935651 Make: Yokogawa Accuracy: 0.26% 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.
Purpose of the data	Calculation of baseline emissions
Calculation method	NA
Comments	NA

Data / Parameter	Q_Y
Data unit	Tonnes
Description	Quantity of Rice Husk used during the year Y
Source of data	Electronic database
Description of measurement methods and procedures to be applied	Quantity of rice husk used in the boiler was calculated by estimation based on the number of times the hopper is filled in a day which is known as Bunker loading method.
Frequency of monitoring/recording	Daily
Value monitored:	Year 2013 = 37,716 Year 2014 = 47,205 Year 2015 = 57,760 Year 2016 = 32,420
Monitoring equipment	Data type: Estimated Frequency: Monthly Archiving policy: Electronic Responsibility: Manager (Power Plant)
QA/QC procedures to be applied	The values can be cross checked from factory records.
Purpose of the data	Calculation of baseline emissions
Calculation method	Bunker loading method
Comments	NA

Data / Parameter	Q_Y
Data unit	Tonnes

Description	Quantity of Saw Dust used during the year Y
Source of data	Electronic database
Description of measurement methods and procedures to be applied	Quantity of Saw Dust used in the boiler was calculated by estimation based on the number of times the hopper is filled in a day which is known as Bunker loading method.
Frequency of monitoring/recording	Daily
Value monitored:	Year 2013 = 8,142.3 Year 2014 = 5,142.2 Year 2015 = 6,910.8 Year 2016 = 394
Monitoring equipment	Data type: Estimated Frequency: Monthly Archiving policy: Electronic Responsibility: Manager (Power Plant)
QA/QC procedures to be applied	The values can be cross checked from factory records.
Purpose of the data	Calculation of baseline emissions
Calculation method	Bunker loading method
Comments	NA

Data / Parameter	$NCV_{Rice\ husk}$
Data unit	Kcal/Kg
Description	Net Calorific Value of Rice Husk
Source of data	Plant Records
Description of measurement methods and procedures to be applied	NCV of the fuels has been calculated using a Bomb Calorimeter and IR instrument present in the Lab at the project site.
Frequency of monitoring/recording	Batch wise
Value monitored:	3,150
Monitoring equipment	Sr. No.: T/A5 Make; TOSHNIWAL 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.

Purpose of the data	Calculation of baseline emissions
Calculation method	NA
Comments	NA

Data / Parameter	**$NCV_{Saw\ Dust}$**
Data unit	Kcal/Kg
Description	Net Calorific Value of Saw Dust
Source of data	Plant Records
Description of measurement methods and procedures to be applied	NCV of the fuels has been calculated using a Bomb Calorimeter and IR instrument present in the Lab at the project site.
Frequency of monitoring/recording	Batch wise
Value monitored:	3,390
Monitoring equipment	Sr. No.: T/A5 Make; TOSHNIWAL 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.
Purpose of the data	Calculation of baseline emissions
Calculation method	NA
Comments	NA

3.3. Monitoring Plan

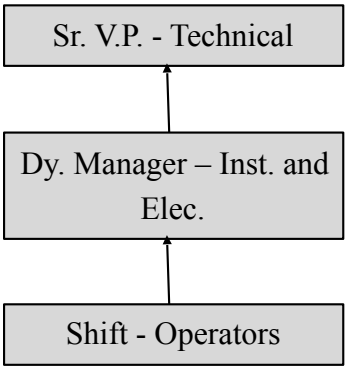
Nectar Life Sciences Ltd. is responsible for implementation of the monitoring plan. There are total 6 separate energy meters to measure the power produced and consumed at various units in the project activity. The electrical energy monitoring is required as the calculation of emission reduction is based 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 to ensure the accuracy of the measurement.

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 estimated 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 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; tCO2
$EG_{PJ,electrical,y}$	The amount of electricity supplied by the project activity during the year y; tCO2
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 Appendix – 1 attached at the end of this report. All the supporting related to data has been provided for cross verification.

Calculation for the month of January 2013 is shown below:

BEcogen,CO2 = [(EGPJ,thermal + EGPJ,electrical *3.6)/ηBL,cogen] *EFFF,CO2

BEcogen, CO2 = [(47 + 2.83 * 3.6) /100%] *96.1

= 5,526 tCO2e

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	Net Electricity Generated (GWh)	Equivalent Thermal Energy (TJ)	Baseline Emission due to Electricity (tCO2e)	Thermal Energy due to Steam (TJ)	Baseline Emission due to Steam (tCO2e)	Total Baseline Emissions (tCO2e)
2013						

Jan-13	2.83	10	979	47	4547	**5526**
Feb-13	1.94	7	671	24	2310	**2981**
Mar-13	1.39	5	480	21	2031	**2510**
Apr-13	0.95	3	329	23	2244	**2573**
May-13	0.90	3	311	25	2389	**2700**
Jun-13	0.78	3	269	26	2458	**2727**
Jul-13	1.09	4	377	30	2875	**3252**
Aug-13	2.24	8	775	26	2476	**3251**
Sep-13	2.29	8	794	30	2914	**3708**
Oct-13	2.35	8	814	26	2542	**3356**
Nov-13	0.98	4	340	14	1341	**1680**
Dec-13	1.74	6	603	30	2843	**3446**
Total	19.49	70.17	6742.98	322.25	30967.95	**37711**
2014						
Jan-14	0.43	2	149	7	625	**774**
Feb-14	1.37	5	474	26	2544	**3019**
Mar-14	2.08	7	721	30	2858	**3579**
Apr-14	2.27	8	785	33	3189	**3974**
May-14	2.22	8	767	37	3577	**4344**
Jun-14	2.49	9	860	35	3410	**4270**
Jul-14	2.34	8	810	37	3585	**4395**
Aug-14	2.76	10	955	43	4090	**5045**
Sep-14	2.66	10	920	41	3897	**4817**
Oct-14	2.14	8	739	29	2756	**3495**
Nov-14	2.00	7	693	37	3513	**4205**
Dec-14	2.60	9	899	40	3832	**4732**
Total	25.36	91.29	8773.03	394.13	37876.07	**46649**
2015						
Jan-15	2.72	10	939	40	3855	**4795**
Feb-15	2.31	8	800	36	3453	**4253**
Mar-15	2.57	9	888	40	3843	**4731**
Apr-15	1.62	6	561	24	2349	**2911**

May-15	2.97	11	1026	45	4307	**5333**
Jun-15	2.85	10	984	44	4190	**5174**
Jul-15	2.88	10	996	46	4457	**5453**
Aug-15	2.55	9	882	38	3670	**4552**
Sep-15	2.63	9	908	12	1134	**2043**
Oct-15	2.66	10	920	41	3962	**4883**
Nov-15	2.94	11	1016	41	3950	**4966**
Dec-15	2.86	10	988	44	4250	**5238**
Total	31.53	113.53	10909.75	451.83	43420.50	**54330**
2016						
Jan-16	2.88	10	998	44	4233	**5230**
Feb-16	2.86	10	988	42	4062	**5050**
Mar-16	2.85	10	987	45	4324	**5311**
Apr-16	2.91	10	1007	42	4082	**5089**
May-16	2.94	11	1017	43	4089	**5106**
Jun-16	2.62	9	905	41	3900	**4805**
Total	17.06	61.41	5901.58	256.93	24690.94	**30593**

4.2. Project Emissions

Quantify 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. = (QD * D / 1000) * NCVDiesel * EF_D

Where:

P.E. Project emission from the project activity; tCO2e

QD	Quantity of diesel consumed in tractors used for levelizing the piles/heaps of biomass; Litres
D	Density of diesel; Kg/Litre
NCVDiesel	Net Calorific Value of diesel; TJ/Tonnes
EFD	Emission factor of diesel; tCO2e/TJ

Values of the above variables are taken from the monitoring plan described in section 3.2

For the month of January 2013, project emissions from the project activity are calculated as:

P.E. = (2550 * 0.87/1000) * 0.04303 * 74.1

= 7.07 tCO2e

The project emissions on the account of tractor used for levelizing the piles of biomass is tabulated below.

Month	Diesel Consumption (Litres)	Project Emission (tCO2e)
Jan-13	2550	7.07
Feb-13	2600	7.21
Mar-13	2600	7.21
Apr-13	2400	6.66
May-13	2500	6.94
Jun-13	2500	6.94
Jul-13	2500	6.94
Aug-13	2600	7.21
Sep-13	2300	6.38
Oct-13	2400	6.66
Nov-13	2500	6.94
Dec-13	2700	7.49
Jan-14	2900	8.04
Feb-14	2750	7.63
Mar-14	2800	7.77

Apr-14	2550	7.07
May-14	2650	7.35
Jun-14	2700	7.49
Jul-14	2800	7.77
Aug-14	2700	7.49
Sep-14	2650	7.35
Oct-14	2600	7.21
Nov-14	2600	7.21
Dec-14	2700	7.49
Jan-15	2900	8.04
Feb-15	2500	6.94
Mar-15	2700	7.49
Apr-15	2700	7.49
May-15	2600	7.21
Jun-15	2800	7.77
Jul-15	2800	7.77
Aug-15	2700	7.49
Sep-15	2700	7.49
Oct-15	2700	7.49
Nov-15	2700	7.49
Dec-15	2600	7.21
Jan-16	2700	7.49
Feb-16	2800	7.77
Mar-16	2700	7.49
Apr-16	2800	7.77
May-16	2700	7.49
Jun-16	2800	7.77

4.3. Leakage

The leakage for the project activity has been calculated on the account of biomass transported. For the month of January 2013, the leakage calculation has been shown as below:

Total biomass transported in the project boundary:

Fuel	Kg	Tons
Bazra Fodder		0
Waste-Cotton		0
Moongi Husk		0
Musterd Husk		0
Cotton Stick		0
Sarkanda		0
Sawdust		32
Sunflower		0
Rice Husk		6331
Total	**0**	6363

Leakage Estimation for the month of Jan 2013		
Total Biomass Requirements	6363	Tonnes
Truck capacity	8	Tonnes
Max. return distance between project site and collection centres	150	Km
Total Number of trips	796	
Consumption of diesel per trip (to and fro)(@4km/lit)	37.5	Lit
Total Diesel consumption	29850	Lit
Density of diesel	0.87	kg/lit
Mass of diesel used	25.9695	Tonnes
Calorific value of diesel	0.04303	TJ/Tonnes
Emission factor for diesel	74.1	tCO2e/TJ
Emissions due to transportation of biomass	82.81	t CO2 /month

Leakage emissions have been tabulated below:

	2013 (tCO2e)	2014 (tCO2e)	2015 (tCO2e)	2016 (tCO2e)
January	82.81	12.07	68.45	72.72
February	44.11	47.54	64.60	70.12
March	25.38	51.91	65.23	50.49
April	43.38	55.45	45.88	70.43
May	43.90	63.77	75.32	70.43
June	45.15	60.24	74.38	67.62
July	57.01	58.99	87.18	0.00
August	51.60	72.20	70.12	0.00
September	39.32	70.12	67.83	0.00
October	50.77	58.67	73.45	0.00
November	29.55	63.04	74.28	0.00
December	51.60	67.41	74.80	0.00
Total	**412.28**	**681.41**	**841.52**	**401.81**

4.4. Net GHG Emission Reductions and Removals

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

ERy = BEy − PEy – Ly

ERy = 5,526 – 7 - 83 = 5,436 tCO2e

Above calculation shows the ER for the month of January 2013

ER = 5,436

Emission Reductions have been tabulated below:

Year	Baseline emissions or removals (tCO_2e)	Project emissions or removals (tCO_2e)	Leakage emissions (tCO_2e)	Net GHG emission reductions or removals (tCO_2e)
Year A	37,711	84	565	37,062
Year B	46,649	90	681	45,878
Year C	54,330	90	842	53,399
Year D	30,593	46	402	30,145
Total	1,69,283	310	2,489	1,66,484