**MONITORING REPORT**
**Version: 01**
**Date 05/08/2010**

**Power capacity expansion project at Dwarikesh Puram**
**PROJECT NUMBER 1257**
**3rd Monitoring period (08/03/2009 - 19/04/2010)**

## SECTION A. GENERAL DESCRIPTION OF THE PROJECT ACTIVITY

### A.1. Brief description of the project activity:

As proposed, Dwarikesh Sugar Industries Limited (DSIL) has increased the power generation capacity at its existing sugar manufacturing facility at Dwarikesh Puram by installation of a new Bi-drum, natural circulation, balanced draft top supported water tube bagasse fired traveling grate, spreader stoker boiler suitable for steam output capacity of 120 tons per hour (tph) at 86 kg/cm2 pressure and steam temperature of 515 +/- 5$^{o}$C and a 24 MW double extraction cum condensing turbine for generating power along with all other accessories and equipments. The project activity got fully commissioned on 04th February 2008. The power generated is being supplied to the Northern Grid.

This is the third monitoring report associated with Dwarikesh Puram project activity. The period covered in this monitoring report is from 08th March 2009 to 19th April 2010 (Both days included). This monitoring report does not cover any period of time which was part of the previous monitoring report.

The crushing season of sugar mills depends on the availability of sugarcane which is a seasonal crop. Due to less availability of sugarcane in the current monitoring period the plant at Dwarikesh Puram was operational only for 144 days from 27th November 2009 to 19th April 2010. The CERs generated in the monitoring period are 28,746 $tCO_2e$.

The first monitoring report covered the period from 30th November 2007 to 2nd April 2008 (both days included).

The second monitoring report covered the period from 3nd April 2008 to 7th March 2009 (both days included).

### A.2. Project Participants

Dwarikesh Sugar Industries Limited (DSIL)

## A.3. Location of the project activity:

The project is located in the existing sugar manufacturing unit of DSIL – Dwarikesh Puram at Village Bahadurpar, Tehsil Dhampur, District Bijnore, Uttar Pradesh State in Northern India. The project site is well connected by road to NH 74 and the nearest railway station is at Dhampur. The coordinates of Dhampur are: Latitude: 290 19'N, Longitude: 780 31'E

## A.4. Technical description of the project

The technical specification of the equipments deployed in the project activity is as listed below:

**Boiler specifications**

| | |
|---|---|
| Description | Bi-drum, natural circulation, balanced draft, top supported water tube, bagasse fired, traveling grate, spreader stoker |
| Steam generating capacity (tons per hour) | 120 |
| Steam pressure (kg/cm2) | 86 |
| Steam temperature (0 C) | 515 ± 5 |
| No. | 1 |

**Turbine specifications**

| | |
|---|---|
| Description | Double extraction cum condensing turbine |
| Capacity (MW) | 24 |
| Steam pressure (kg/cm2) | 86 |
| Steam temperature (0 C) | 515 ± 5 |
| No. | 1 |

**Electrical Generator**

| | |
|---|---|
| Description | Four pole, 3 phase Air cooled, Brushless excitation with digital automatic voltage type regulation system |
| Speed (RPM) | 1500 |
| Frequency (Hz) | 50 |
| Power factor (lagging) | 0.8 |
| Voltage (kV) | 11 |
| No. | 1 |

The technology for the boilers and turbines is well established and the project activity does not involve any transfer of technology. The technology being used is environmentally safe and sound.

**Pre project scenario**

In the pre project scenario the sugar mill of DSIL in Dwarikesh Puram was meeting its in house steam and power requirements by a set of low pressure boilers and turbo generators respectively , the specifications for which are as given below:

**Boiler details**

| Description | 1 | 2 |
|---|---|---|
| Steam generating capacity (tonnes per hour) | 60 | 60 |
| Steam pressure (kg/cm2) | 45 | 45 |

**Turbine details**

| Description | 1 | 2 | 3 |
|---|---|---|---|
| Power (MW) | 3 | 3 | 3 |

**A.5. Title, reference and version of the baseline and monitoring methodology applied to the project activity:**

**Title**: Consolidated baseline methodology for electricity generation from biomass residues

**Reference** – Approved consolidated baseline methodology ACM0006, Version 05, Sectoral Scope: 01.

The approved methodology also draws upon the "Tool for the demonstration and assessment of additionality (version3)" and the following methodology for grid emission factor calculation:

Title: "Consolidated baseline methodology for grid-connected electricity generation from renewable sources"

Reference: UNFCCC Approved baseline methodology ACM0002 / Version 06, Sectoral Scope: 01, 19th May 2006

**A.6. Registration date of the project activity:**

30th November 2007

**A.7. Crediting period of the project activity and related information (start date and choice of crediting period):**

A fixed crediting period of 10 years has been chosen and the start date of crediting period is 30th November 2007 – 29th November 2017

**A.8. Name of responsible person(s)/entity(ies):**

Dwarikesh Sugar Industries Limited

## SECTION B. Implementation of the project activity

### B.1. Implementation status of the project activity

The project got fully operational on 4th Feb 2008. The power generated is being supplied to the Northern Grid. It is mentioned in the PDD that the plant will be operational for a period of 200 days in a particular year. However, the plant was operational for 144 days in the current monitoring period.

### B.2. Revision of the monitoring plan

Revision was sought in the monitoring plan and the same was approved by UNFCCC on 4th June 2009.

### B.3. Request for deviation applied to this monitoring period

No request for deviation has be applied for this monitoring period

### B.4. Notification or request of approval of changes

No notification or request of approval of change has been made.

## SECTION C. Description of the monitoring system

**Measures to ensure the Results / uncertainty analysis**

The project-monitoring plan consists of metering the electricity generated by the project activity, total electricity generated by all the units at site, quantity of bagasse fired in project activity, calorific value of bagasse, net quantity of heat generated by project plant and average net energy efficiency of heat generation in the boilers operated next to the project plant.

Energy meters are being used for monitoring the energy generated by all the units. All energy meters used are electronic tri-vector meters of accuracy class 0.5 %. The energy meters are maintained in accordance with electricity standards in India. Each meter is inspected and sealed ensuring no interference by anyone. All the energy meters are tested for accuracy annually by an independent agency, which is accredited with National Accreditation Board for Testing & Calibration Laboratories (NABL), Department of Science & Technology, Government of India. If during the yearly test check, any meter is found to be beyond permissible limits of error, it would be calibrated immediately. Net Calorific Value of bagasse is established every six months based on the test conducted by an independent agency taking at least three samples for each measurement.

Total quantity of bagasse fired in the project plant is measured as per the procedure documented in the PDD and the related equipments such as the weigh bridge and rotary feeder are calibrated annually by an independent agency.

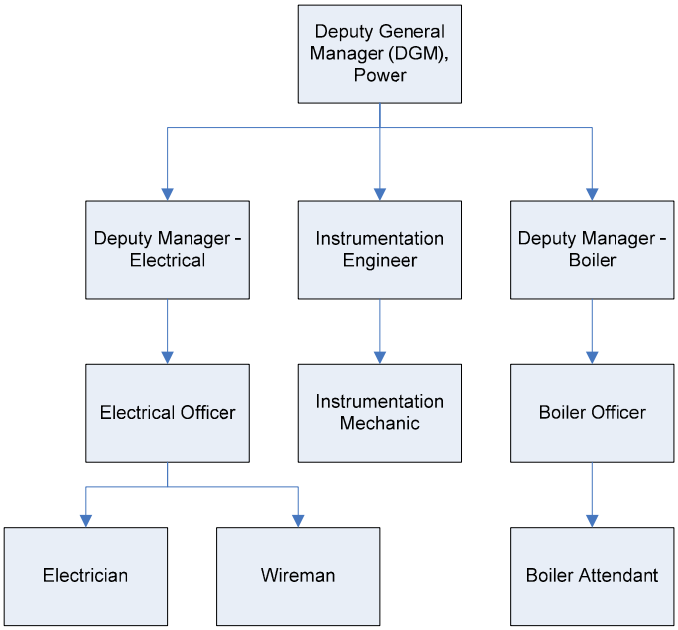
Any observations (like inconsistencies in reported parameters) and/or discrepancies in the operation of the power plant observed by any of the team member are informed to the concerned personnel for necessary action. These measures are undertaken in order to detect and minimize the uncertainty levels in data monitoring. Furthermore, as a safety measure, the total power generating system is equipped with an 'Automatic Alarming System' which gives a prior indication of any fluctuations in the operating parameters of the power plant thereby enabling the operators to take necessary preventive measures.

**Roles and responsibilities**

In accordance with the monitoring plan of the PDD, The following operational and management structure has been implemented for the project activity:


- The shift in-charge is assigned with the responsibility of monitoring and recording of parameters as per the monitoring plan.
- On a monthly basis, the monitoring records are checked and discussed with project manager.
- In case of any irregularity observed, necessary action is taken immediately.
- On monthly basis, the reports are prepared and forwarded to the management.

The following organisation structure is present to operate the project activity:



**SECTION D. Data and parameters**

## MONITORED DATA

### PARAMETERS RELATED TO POWER GENERATION

| Month | Total quantity of electricity generated in the project plant (24 MW) | Auxiliary electricity consumption by the project plant (24 MW) | Total quantity of electricity generated in all the power units at the project site | Total quantity of auxiliary electricity consumption in all the power units at the project site | Net quantity of electricity generated in the project plant | Net quantity of electricity generated in all power units at the project site |
|---|---|---|---|---|---|---|
| 27/11/2009 to 30/11/2009 | 1659.1 | 149.88 | 2160.64 | 231.19 | 1509.22 | 1929.45 |
| 01/12/2009 to 31/12/2009 | 17685.1 | 1446 | 22032.72 | 2089.05 | 16239.1 | 19943.67 |
| 01/01/2010 to 31/01/2010 | 9938.1 | 1039.19 | 12481.66 | 1513.19 | 8898.91 | 10968.47 |
| 01/02/2010 to 28/02/2010 | 14647.30 | 1295.90 | 18403.36 | 1848.23 | 13351.4 | 16555.13 |
| 01/03/2010 to 21/03/2010 | 16766.1 | 1476.21 | 20949.45 | 2077.67 | 15289.89 | 18871.78 |
| 01/04/2010 to 19/04/2010 | 10187.90 | 913.53 | 10686.9 | 998.63 | 9274.37 | 9688.27 |
| **TOTAL** | **70883.6** | **6320.71** | **86714.73** | **8757.96** | **64562.89** | **77956.77** |

* All figures are in MWh

**Parameters related to bagasse and Steam**

| Month | Quantity of wet bagasse combusted in project plant (tonnes) | Moisture Content (%) | Quantity of dry bagasse combusted in project boiler (tonnes) |
|---|---|---|---|
| 27/11/2009 to 30/11/2009 | 3446.20 | 49.91 | 1726.20 |
| 01/12/2009 to 31/12/2009 | 34190.88 | 49.81 | 17160.40 |
| 01/01/2010 to 31/01/2010 | 19200.85 | 49.56 | 9684.91 |
| 01/02/2010 to 28/02/2010 | 28600.98 | 49.33 | 14492.12 |
| 01/03/2010 to 21/03/2010 | 32519.50 | 49.56 | 16402.84 |
| 01/04/2010 to 19/04/2010 | 18351.01 | 49.60 | 9248.91 |
| **Total** | **136309.43** | | **69067.99** |

***The moisture content is to be monitored on a monthly basis as per the monitoring plan but since on site it was measured on a daily basis, the lowest value of moisture content in a month has been used in the calculations taking a conservative approach.**

**ENERGY CONTENT OF FUEL (BAGASSE)**

**NET CALORIFIC VALUE[1] (GJ/TONNE, ON DRY BASIS) OF BAGASSE**

| UNITS | Cal/gm* | Cal/gm** | Average | GJ/ton | MWh/ton |
|---|---|---|---|---|---|
| Sample 1 | 3730 | 3850 | = 3733+3810 = **3771.5** | 15.791 | 4.39 |
| Sample 2 | 3710 | 3780 | | | |
| Sample 3 | 3760 | 3800 | | | |
| **Average** | **3733** | **3810** | | | |

* Test conducted on 26th Feb, 2010
** Test conducted on 2nd Jan 2010

**D.1. Data and parameters determined at registration and not monitored during the monitoring period, including default values and factors**

| **Data / Parameter:** | $EF_{historic}$ |
|---|---|
| Data unit: | GWh |
| Description: | Average of net quantity of electricity generated during the most recent years in all power plants at the project site, generated from firing the same type(s) of biomass residues as in the project plant |
| Source of data used: | Plant records |
| Value(s) : | 22.2 |
| Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations) | Baseline |
| Additional comment: | The data for generation has been historically measured by energy meters situated on the site along with the power plant auxiliaries. The net generation has been determined by subtracting auxiliary consumption from total generation. Historically this data has been collected daily and has been held at the plant. |

| **Data / Parameter:** | $EF_{grid,y}$ |
|---|---|
| Data unit: | tCO2/MWh |
| Description: | CO2 emission factor for grid electricity during the year y |
| Source of data used: | Baseline Carbon Dioxide Emission Database Version 2.0 (www.cea.nic.in) |
| Value(s) : | 0.80 |

Formatted: French (France)

| | |
|---|---|
| Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations) | Baseline |
| Additional comment: | The combined margin emission factor of the grid has been calculated as per the guidance provided in approved methodology ACM0002.<br>Operating margin, OM = 0.99 tCO2/MWh<br>Build margin, BM = 0.60 tCO2/MWh |

| **Data / Parameter:** | $\varepsilon_{el, reference plant, y}$ |
|---|---|
| Data unit: | - |
| Description: | Average net energy efficiency of power generation in the reference power plant that would use the biomass residues fired in the project plant in the absence of the project activity |
| Source of data used: | Calculated from consumption of biomass and power generation in the reference plant (45 kg/cm2). |
| Value(s) : | 0.0945 |
| Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations) | Baseline |
| Additional comment: | Based on the total quantity of biomass consumed and the power generated. The reference plant has been taken as the project participants own plant at Dwarikesh Nagar which has low configuration boilers. The common practice in Indian Sugar Industry is operation of low pressure boilers upto 35 kg/cm2. Dwarikesh is operating a 45 kg/cm2 pressure cogeneration system at the sugar mill, which has been taken as the baseline scenario. This approach is deemed conservative.<br>Check consistency with manufacturer's information or the efficiency of comparable plants. |

## D.2. Data and parameters monitored

| **Data / Parameter:** | **$EG_{project\ plant,\ y}$** |
|---|---|
| Data unit: | MWh/yr |
| Description: | Net quantity of electricity generated in the project plant during the year y |
| Measured /Calculated /Default: | Calculated |
| Source of data: | The corresponding values are calculated and totalized and recorded hourly in log books. |
| Value(s) of monitored parameter: | **64562.89**<br>(For monitoring period) |
| Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations) | For calculation of Baseline emissions |
| Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity) | 1. Gross Generation – 24 MW.-(M1) |

| **Description** | |
|---|---|
| **S. No.** | ELI 10810 |
| **Make** | Secure Meters Ltd. |
| **Model** | SWIFT ELITE |
| **Type** | HT4,1A |
| **Voltage** | 3X63.5 Vp-n (3 Phase 4 Wire) |
| **Current** | 1 A |
| **Voltage Ratio** | 11000/rt3/110/rt3 |
| **Current Ratio** | 2000/1A |
| **Class** | 0.5s |
| **Date of Calibration** | 22/09/2009 |

<table>
<tr><td></td><td>2. Cogen Convertor Transformer (Auxiliary Consumption-24 MW)-(M3)<br><br><table><tr><td>Description</td><td></td></tr><tr><td>S. No.</td><td>ELI09053</td></tr><tr><td>Make</td><td>Secure Meters Ltd.</td></tr><tr><td>Model</td><td>SWIFT ELITE</td></tr><tr><td>Type</td><td>HT4, 1A</td></tr><tr><td>Voltage</td><td>3 X 63.5 V p-n (3 Phase 4 wire)</td></tr><tr><td>Current</td><td>1A</td></tr><tr><td>Voltage Ratio</td><td>11000/rt3/110/rt3</td></tr><tr><td>Current Ratio</td><td>200/1A</td></tr><tr><td>Class</td><td>0.5s</td></tr><tr><td>Date of Calibration</td><td>21/09/2009</td></tr></table><br>3. Cogen Distribution Transformer Auxiliary Consumption-24 MW)-(M4)<br><br><table><tr><td>Description</td><td></td></tr><tr><td>S. No.</td><td>ELI10812</td></tr><tr><td>Make</td><td>Secure Meters Ltd.</td></tr><tr><td>Model</td><td>SWIFT ELITE</td></tr><tr><td>Type</td><td>HT4, 1A</td></tr><tr><td>Voltage</td><td>63.5 V</td></tr><tr><td>Current</td><td>1A</td></tr><tr><td>Voltage Ratio</td><td>11000/rt3/110/rt3</td></tr><tr><td>Current Ratio</td><td>200/1A</td></tr><tr><td>Class</td><td>0.5s</td></tr><tr><td>Date of Calibration</td><td>21/09/2009</td></tr></table></td></tr>
<tr><td>Measuring/ Reading/ Recording frequency:</td><td>Hourly recordings of data for gross generation and auxiliary consumption is taken from the energy meters and logged in the daily log book</td></tr>
<tr><td>Calculation method (if applicable):</td><td>Net quantity of electricity in the project plant generated is calculated by subtracting auxiliary consumption from gross generation of the</td></tr>
</table>

| | |
|---|---|
| | project plant. Separate energy meters are used for continuous measurement of gross electricity generation and auxiliary consumption. |
| QA/QC procedures applied: | The consistency of net electricity generation is cross checked with receipt of sales and the quantity of biomass fired. |

| **Data / Parameter:** | **$EG_{total, y}$** |
|---|---|
| Data unit: | MWh/yr |
| Description: | Net quantity of electricity generated in all power units at the project site, generated from firing the same type(s) of biomass residues as in the project plant, including the new power unit installed as part of the project activity and any previously existing units, during the year *y* |
| Measured /Calculated /Default: | Calculated |
| Source of data: | Recorded hourly |
| Value(s) of monitored parameter: | **77956.77**<br>(For monitoring period) |
| Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations) | For calculation of Baseline emissions |
| Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity) | 1. Gross Generation Turbine No.01-03 MW-(M12)<br><br>**Description** \| <br>**S. No.** \| ELI11869<br>**Make** \| Secure Meters Ltd.<br>**Model** \| SWIFT ELITE<br>**Type** \| LT, 5A<br>**Voltage** \| 240 V<br>**Current** \| 5 A<br>**Current Ratio** \| 5200/5A<br>**Class** \| 0.5s<br>**Date of Calibration** \| 21/09/2009<br><br>2. Gross Generation Turbine No.02-03 MW-(M13) |

| Description | |
|---|---|
| S. No. | ELI10857 |
| Make | Secure Meters Ltd. |
| Model | SWIFT ELITE |
| Type | LT, 5A |
| Voltage | 240 V |
| Current | 5 A |
| Current Ratio | 5200/5 |
| Class | 0.5s |
| Date of Calibration | 21/09/2009 |

3. Gross Generation Turbine No.03-03 MW-(M14)

| Description | |
|---|---|
| S. No. | ELI10856 |
| Make | Secure Meters Ltd |
| Model | SWIFT ELITE |
| Type | LT,5A |
| Voltage | 240 V |
| Current | 5 A |
| Current Ratio | 5200/5A |
| Class | 0.5s |
| Date of Calibration | 21/09/2009 |

04. Bolier No. 01 MCC – Auxiliary of 09 MW-(M10)

| Description | |
|---|---|
| S. No. | ELI11872 |
| Make | Secure Meters Ltd |
| Model | SWIFT ELITE |
| Type | LT, 5 A |
| Voltage | 240 V |

| | |
|---|---|
| **Current** | 5 A |
| **Current Ratio** | 1600/5 |
| **Class** | 0.5s |
| **Date of Calibration** | 21/09/2009 |

05. Bolier No. 02 MCC – Auxiliary of 09 MW-(M11)

| **Description** | |
|---|---|
| **S. No.** | ELI10858 |
| **Make** | Secure Meters Ltd. |
| **Model** | SWIFT ELITE |
| **Type** | LT, 5A |
| **Voltage** | 240 V |
| **Current** | 5 A |
| **Current Ratio** | 1600/5 A |
| **Class** | 0.5s |
| **Date of Calibration** | 21/09/2009 |

06. MCC for Feed Pump 1&2 – Auxiliary of 09 MW-(M8)

| **Description** | |
|---|---|
| **S. No.** | ELI11868 |
| **Make** | Secure Meters Ltd. |
| **Model** | SWIFT ELITE |
| **Type** | LT, 5A |
| **Voltage** | 240 V |
| **Current** | 5 A |
| **Current Ratio** | 2500/5A |
| **Class** | 0.5s |
| **Date of Calibration** | 21/09/2009 |

7. MCC for Feed Pump No.03- Auxiliary of 09 MW-(M09)

| | |
|---|---|
| | |

| Description | |
|---|---|
| S. No. | ELI11870 |
| Make | Secure Meters Ltd. |
| Model | SWIFT ELITE |
| Type | LT, 5 A |
| Voltage | 240 V |
| Current | 5 A |
| Current Ratio | 1600/ 5A |
| Class | 0.5s |
| Date of Calibration | 21/09/2009 |

8. Bagasse Handling MCC-Auxiliary of 09 MW-(M07)

| Description | |
|---|---|
| S. No. | ELI11871 |
| Make | Secure Meters Ltd. |
| Model | SWIFT ELITE |
| Type | LT,5A |
| Voltage | 240 V |
| Current | 5 A |
| Current Ratio | 1600/5 |
| Class | 0.5s |
| Date of Calibration | 21/09/2009 |

| | |
|---|---|
| Measuring/ Reading/ Recording frequency: | Hourly |
| Calculation method (if applicable): | Net quantity of electricity in all the power units at the project site generated is calculated by subtracting aggregated auxiliary consumption from the aggregated gross generation of all the power units at the plant site. Separate energy meters are used for measurement of gross electricity generations and auxiliary consumptions of all units at the project site and thus subsequently aggregated respectively. |
| QA/QC procedures applied: | The consistency of net electricity generation should be cross-checked with receipts from electricity sales (if available) and the quantity of fuels fired (e.g. check whether the electricity generation divided by the quantity of fuels fired results in a reasonable efficiency that is comparable to previous |

| | |
|---|---|
| | years). |

| **Data / Parameter:** | **$EG_{Gross,project\ plant,y}$** |
|---|---|
| Data unit: | MWh/yr |
| Description: | Total quantity of electricity generated in the project plant during the year y |
| Measured /Calculated /Default: | Measured |
| Source of data: | Plant log books |
| Value(s) of monitored parameter: | **70883.6**<br>(For monitoring period) |
| Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations) | For calculation of Baseline emissions |
| Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity) | |
| Measuring/ Reading/ Recording frequency: | Hourly recording |
| Calculation method (if applicable): | Electronic tri-vector meters/power monitoring system of accuracy class0.5 has been installed to permit continuous monitoring and measurement. Hourly recordings of data are taken from energy meters and logged in the daily log books by the Switch Board attendant. The shift in-charge signs off in the logbook at the end of every shift and the daily power generation are signed by the power plant manager. |
| QA/QC procedures applied: | The consistency of gross electricity generation has been cross checked with receipt of sales and the quantity of biomass fired.<br>The meters are calibrated annually by an independent third party. The data will be archived on paper and electronically for 2 years beyond the crediting period. |

| **Data / Parameter:** | **$EG_{Aux,project\ plant,\ y}$** |
|---|---|
| Data unit: | MWh/yr |
| Description: | Auxiliary electricity consumption by the project plant. |
| Measured /Calculated /Default: | Measured |

| | |
|---|---|
| Source of data: | Metering records |
| Value(s) of monitored parameter: | **6320.71**<br>(For monitoring period) |
| Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations) | For calculation of Baseline emissions |
| Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity) | |
| Measuring/ Reading/ Recording frequency: | Hourly recording |
| Calculation method (if applicable): | Electronic tri-vector meters/power monitoring system of accuracy class 0.5 is installed to permit continuous monitoring and measurement. Hourly recordings of data are taken from energy meters and logged in the daily log books by the Switch Board attendant. The shift in-charge will sign off in the logbook at the end of every shift, and the daily auxiliary consumption is also signed by the power plant manager |
| QA/QC procedures applied: | The meter is being calibrated annually by an independent third party.<br>The meters are calibrated annually by an independent third party. The data will be archived on paper and electronically for 2 years beyond the crediting period. |

| **Data / Parameter:** | $EG_{Total\ Gross,\ y}$ |
|---|---|
| Data unit: | MWh/yr |
| Description: | Total quantity of electricity generated in all the power units , generated from firing the same type(s) of biomass residues as in the project plant, including the new power unit installed as part of the project activity and any previously existing units, during the year *y* |
| Measured /Calculated /Default: | Measured |
| Source of data: | Metering records |
| Value(s) of monitored parameter: | **86714.73**<br>(For monitoring period) |
| Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations) | For calculation of Baseline emissions |
| Monitoring equipment (type, accuracy class, serial number, calibration | |

| | |
|---|---|
| frequency, date of last calibration, validity) | |
| Measuring/ Reading/ Recording frequency: | Hourly basis |
| Calculation method (if applicable): | Electronic tri-vector meters/power monitoring systems of accuracy class 0.5 are installed to permit continuous monitoring and measurement for each individual power generating unit. The total is then calculated by adding the gross generation of all power generating units and recorded hourly. Hourly recordings of data will be taken from energy meters and logged in the daily log books by the Switch Board attendant. The shift in-charge signs off in the logbook at the end of every shift, and the daily power generation is signed by the power plant manager. |
| QA/QC procedures applied: | The consistency of gross electricity generation is cross checked with receipt of sales and the quantity of biomass fired.<br>The meters will be calibrated annually by an independent third party.<br>The data will be archived on paper and electronically for 2 years beyond the crediting period |

| **Data / Parameter:** | **$EG_{Total\ Aux\ y}$** |
|---|---|
| Data unit: | MWh/yr |
| Description: | Total quantity of auxiliary electricity consumption in all the power units at the project site, generated from firing the same type(s) of biomass residues as in the project plant, including the new power unit installed as part of the project activity and any previously existing units, during the year y |
| Measured /Calculated /Default: | Measured |
| Source of data: | Metering records |
| Value(s) of monitored parameter: | **8757.96**<br>(For monitoring period) |
| Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations) | For calculation of Baseline emissions |
| Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity) | |
| Measuring/ Reading/ Recording frequency: | Hourly basis |
| Calculation method (if | Electronic tri-vector meters/power monitoring systems of accuracy |

| | |
|---|---|
| applicable): | class 0.5 are installed to permit continuous monitoring and measurement for auxiliary consumption at each individual power generating unit. The total then is calculated by adding the auxiliary consumption of all power generating units and recorded hourly. Hourly recordings of data is taken from energy meters and logged in the daily log books by the Switch Board attendant. The shift in-charge signs off in the logbook at the end of every shift and the daily auxiliary consumption are then signed by the power plant manager. |
| QA/QC procedures applied: | The meter is being calibrated annually by an independent third party. The data will be archived on paper and electronically for 2 years beyond the crediting period. |

| **Data / Parameter:** | **$BF_{k, y}$** |
|---|---|
| Data unit: | Tonnes |
| Description: | Quantity of bagasse combusted in the project plant during the year y |
| Measured /Calculated /Default: | Measured |
| Source of data: | On-site measurements |
| Value(s) of monitored parameter: | **69067.99**<br>(For monitoring period) |
| Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations) | For calculation of Baseline emissions |
| Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity) | 1. Bagasse Rotary Feeder No.5 Speed. |

| | |
|---|---|
| **Name** | Speed Transmitter |
| **Make** | P & F |
| **Sr. No.** | 10569 |
| **Model No.** | KFU8-FSSP-1D |
| **Range** | 0-3 RPM |
| **Previous Date of Calibration** | 01-10-2008 |
| **Date of Calibration** | 28-09-2009 |
| **Location** | Bagasse Rotary Feeder No.5 |

2. Bagasse Rotary Feeder No.4 Speed.

| | |
|---|---|
| **Name** | Speed Transmitter |

| | |
|---|---|
| **Make** | P & F |
| **Sr. No.** | 10568 |
| **Model No.** | KFU8-FSSP-1D |
| **Range** | 0-3 RPM |
| **Previous Date of Calibration** | 01-10-2008 |
| **Next Calibration Proposed on** | 28-09-2009 |
| **Location** | Bagasse Rotary Feeder No.4 |

3. Bagasse Rotary Feeder No3 Speed.

| | |
|---|---|
| **Name** | Speed Transmitter |
| **Make** | P & F |
| **Sr. No.** | 10567 |
| **Model No.** | KFU8-FSSP-1D |
| **Range** | 0-3 RPM |
| **Previous Date of Calibration** | 01-10-2008 |
| **Date of Calibration** | 28-09-2009 |
| **Location** | Bagasse Rotary Feeder No.3 |

4. Bagasse Rotary Feeder No. 2 Speed.

| | |
|---|---|
| **Name** | Speed Transmitter |
| **Make** | P & F |
| **Sr. No.** | 10566 |
| **Model No.** | KFU8-FSSP-1D |
| **Range** | 0-3 RPM |
| **Previous Date of Calibration** | 01-10-2008 |
| **Date of Calibration** | 28-09-2009 |
| **Location** | Bagasse Rotary Feeder No.2. |

5. Bagasse Rotary Feeder No.1 Speed.

| | |
|---|---|
| | |

| | |
|---|---|
| **Name** | Speed Transmitter |
| **Make** | P & F |
| **Sr. No.** | 10565 |
| **Model No.** | KFU8-FSSP-1D |
| **Range** | 0-3 RPM |
| **Previous Date of Calibration** | 01-10-2008 |
| **Date of Calibration** | 28-09-2009 |
| **Location** | Bagasse Rotary Feeder No1 |

6. Weigh Bridge Calibration details

| Serial No. | Capacity of Weigh bridge | Previous Date Of Calibration | Date of Calibration |
|---|---|---|---|
| 1 | 80000 kg | 02/10/08 | 01/10/2009 |
| 2 | 10000 kg | 10/10/08 | 04/11/2009 |
| 3 | 10000 kg | 05/10/08 | 05/11/2009 |
| 4 | 10000 kg | 10/10/08 | 05/11/2009 |
| 5 | 50000 kg | 10/10/08 | 04/11/2009 |
| 6 | 50000 kg | 10/10/08 | 04/11/2009 |

| | |
|---|---|
| Measuring/ Reading/ Recording frequency: | Daily basis |
| Calculation method (if applicable): | Weight or volume meters are used and adjustment for the moisture content is carried out in order to determine the quantity of dry biomass. The quantity shall be cross-checked with the quantity of electricity (and heat) generated and any fuel purchase receipts (if available).<br>The direct measurement of bagasse would be monitored by monitoring the speed of the rotary feeder. This monitoring instrument would be calibrated to give the amount of bagasse being combusted in the project activity. Also annual mass and energy balance would be carried out to cross check the biomass quantity used in the project activity. The mass balance would be on the basis of the measured quantity of sugarcane crushed, water added, mixed juice and excess bagasse and the energy balance would on the basis of steam quality and quantity generated. |

| | |
|---|---|
| QA/QC procedures applied: | Any direct measurement with mass or volume meters at the plant site would be cross checked with an annual energy balance that is based on purchased quantities and stock changes. |

| **Data / Parameter:** | **$NCV_k$** | | |
|---|---|---|---|
| Data unit: | GJ/ton | | |
| Description: | Net Calorific value of bagasse | | |
| Measured /Calculated /Default: | Calculated | | |
| Source of data: | Calculations and laboratory reports | | |
| Value(s) of monitored parameter: | Units | Cal/gm | Cal/gm |
| | Sample 1 | 3730 | 3850 |
| | Sample 2 | 3710 | 3780 |
| | Sample 3 | 3760 | 3800 |
| | Average | 3733 | 3810 |
| Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations) | For calculation of baseline emissions | | |
| Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity) | NCV test is carried out at reputed external laboratories | | |
| Measuring/ Reading/ Recording frequency: | Twice in a season | | |
| Calculation method (if applicable): | The net calorific value of bagasse is fairly constant.<br>Every six months external laboratory tests for NCV at reputed laboratories and according to relevant international standards is carried out taking at least three samples for each measurement<br>The NCV is determined based on dry biomass. | | |
| QA/QC procedures applied: | Consistency of measurements and local / national data would be checked with default values by the IPCC. If the values differ significantly from the IPCC default values, additional information or conducted measurements would be possibly collected. The accredited external laboratories would ensure that proper monitoring of the calorific value is being carried out. | | |

| **Data / Parameter:** | Moisture content of bagasse |
|---|---|
| Data unit: | % Water content |
| Description: | Moisture content of bagasse |
| Measured /Calculated | Measured |

<table>
<tr><td>/Default:</td><td></td></tr>
<tr><td>Source of data:</td><td>On-site laboratory measurements</td></tr>
<tr><td>Value(s) of monitored parameter:</td><td>
<table>
<tr><th>Sr. No</th><th>Month</th><th>Moisture content of Baggase</th></tr>
<tr><td>1</td><td>23 Nov 09 - 30 Nov 09</td><td>49.91</td></tr>
<tr><td>2</td><td>1 Dec 09-31 Dec 09</td><td>49.81</td></tr>
<tr><td>3</td><td>1 Jan 10- 31 Jan 10</td><td>49.56</td></tr>
<tr><td>4</td><td>1 Feb 10-28 Feb 10</td><td>49.33</td></tr>
<tr><td>5</td><td>1 Mar 10-31 Mar 10</td><td>49.56</td></tr>
<tr><td>6</td><td>1April 10-19APril 10</td><td>49.60</td></tr>
</table>
</td></tr>
<tr><td>Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)</td><td>For calculation of dry bagasse which is used for the calculation of Baseline emissions</td></tr>
<tr><td>Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)</td><td></td></tr>
<tr><td>Measuring/ Reading/ Recording frequency:</td><td></td></tr>
<tr><td>Calculation method (if applicable):</td><td></td></tr>
<tr><td>QA/QC procedures applied:</td><td>Procedure for monitoring is repeated with multiples samples till consecutive readings are obtained.</td></tr>
</table>

## SECTION E. Emission reductions calculation

### E.1. Baseline emissions calculation

***Estimation of emission reductions:***

$$ER_y = ER_{heat,y} + ER_{electricity,y} + BE_{biomass,y} - PE_y - L_y$$

Where:

$ER_y$ are the emissions reductions of the project activity during the year *y* in tons $CO_2$,

$ER_{electricity,y}$ are emission reductions due to displacement of electricity during year *y* in tons $CO_2$,

$ER_{heat,y}$ are the emission reductions due to displacement of heat during year *y* in tons $CO_2$,

$BE_{biomass,y}$ are the baseline emissions due to natural decay or burning of anthropogenic sources of biomass during the year *y* in tons of $CO_2$ equivalents,

$PE_y$ are the project emissions during the year *y* in tons of $CO_2$, and

$L_y$ are the leakage emissions during the year *y* in tons of $CO_2$.

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

$$ER_{electricity,y} = EG_y \times EF_{electricity}$$

$ER_{electricity, y}$ are emission reductions due to displacement of electricity during the year *y* in tons of $CO_2$,

$EG_y$ is the net quantity of increased electricity generation as a result of the project activity (incremental to baseline generation) during the year *y* in MWh,

$EF_{electricity}$ is the $CO_2$ emission factor for the electricity displaced due to the project activity in tons $CO_2$/MWh

The emission factor for the displacement of electricity corresponds to the grid emission factor ($EF_{electricity} = EF_{grid}$).

**Emission Factor of the Grid ($EF_{Grid}$)**

The emission factor of Northern grid ($EF_{electricity}$) as fixed ex-ante in the registered PDD is 0.80 $tCO_2$/MWh.

***Determination of electricity generation (EGy):***

$$EG_y = MIN\left\{\begin{array}{c} EG_{project\ plant,y} - \varepsilon_{el,other\ plant(s)} \cdot \frac{1}{3.6} \cdot \sum_k BF_{k,y} \cdot NCV_k \\ \\ EG_{total,y} - \frac{EG_{historic,3yr}}{3} \end{array}\right\}$$

where:

$EG_y$ Net quantity of increased electricity generation as a result of the project activity (incremental to baseline generation) during the year *y* (MWh)

$EG_{project\ plant,y}$ Net quantity of electricity generated in the project plant during the year *y* (MWh)

$\varepsilon_{el,other\ plant(s)}$ Average net energy efficiency of electricity generation in (the) other power plant(s) that would use the biomass residues fired in the project plant in the absence of the project activity ($MWh_{el}/MWh_{biomass}$)

$EG_{total,y}$ Net quantity of electricity generated in all power plants at the project site, generated from firing the same type(s) of biomass residues as in the project plant, including the new power plant installed as part of the project activity and any previously existing plants, during the year *y* (MWh/yr)

*EGhistoric,3yr* Net quantity of electricity generated during the most recent three years in all power plants at the project site, generated from firing the same type(s) of biomass residues as in the project plant14 (MWh)

*BFk,y* Quantity of biomass residue type *k* combusted in the project plant during the year *y* (tons of dry matter or liter)

*NCVk* Net calorific value of the biomass residue type *k* (GJ/ton of dry matter or GJ/litre)

With respect to Scenario 13, *εel,other plant(s)* corresponds to the average net efficiency of electricity generation in the "reference plant" (*εel,reference plant*) that would be installed in the absence of the CDM project activity.

**Calculation of EGy for the current monitoring period**

$EG_{project\ plant,y}$ = 64562.89 MWh
$\varepsilon_{el,other\ plant(s)}$ = 9.450% [2]
$EG_{total,y}$ = 77956.77 MWh
$EG_{historic,}$ = 22200MWh
$BF_{k,y}$ = 69067.99 Tonnes

Formatted: French (France)

[2] As fixed in the registered PDD

$NCV_k$ = 15.79 GJ/tonne

$EG_y$ is minimum among the following options

1. $EG_{total,y} - EG_{historic}$ = 55756.77MWh

2. $EG_{project\ plant,y} - \varepsilon_{el,\ other\ plant\ (s)} \cdot \frac{1}{3.6} \cdot \sum_k BF_{k,y} \cdot NCV_k$ = 35932.77 MWh

Therefore $EG_y$ = 35932.77 MWh

$ER_{electricity,y}$ = $EG_y$ X $EF_{electricity}$
= 35601.21 MWh X 0.8 $tCO_2$ /MWh
= 28746 $tCO_2$

**Emission reductions or increases due to displacement of heat ($ER_{heat,y}$)**
As demonstrated in the PDD, $ER_{heat,y} = 0$.

**Baseline emissions due to natural decay or uncontrolled burning of anthropogenic sources of biomass**
As per ACM0006 (version 05), for scenario 13, baseline emissions due to uncontrolled burning or decay of the biomass residues are zero i.e $BE_{Biomass} = 0$

## E.2. Project emissions calculation

***Project emissions ($PE_y$)***
According to the methodology, Project emissions include CO2 emissions from transportation of biomass to the project site (*PETy*), CO2 emissions from on-site consumption of fossil fuels due to the project activity (*PEFFy*) and $CH_4$ emissions from the storage of biomass.

In the project scenario, since the project activity uses bagasse as the fuel, the project leads to no GHG on-site emissions. The GHG emission of the combustion process, mainly $CO_2$, is sequestered during the growth of sugarcane.

[a] Project Emissions associated with fossil fuel combustion
As there is no fossil fuel combustion associated with the project activity, hence there are no project emissions associated to fossil fuel combustion due to project activity implementation.

[b] Project Emissions associated with transport of bagasse fuel

The bagasse to be used as the feedstock for project activity is supplied by the sugar mill itself; no transportation of bagasse is involved. Hence there are no emissions due to transportation of bagasse.

[c] Project Emissions associated with the storage of bagasse fuel
The net increase of methane emissions associated with the storage of bagasse fuel is regarded as negligible if the bagasse is not stored for more than one year. The bagasse utilized for the project activity is stored in open piles for not more than one year. Therefore there would be no project emissions associated with the storage of bagasse fuel.

Thus $PE_y = 0$.

## E.3. Leakage calculation

***Leakage ($L_y$)***
In case of scenario 4, according to ACM0006 (Version 05), the diversion of biomass residues to the project activity is already considered in the calculation of baseline reductions. Thus, the leakage effects do not need to be addressed i.e. $L_y = 0$.

## E.4. Emission reductions calculation / table

**Emission reductions**

| $ER_{heat,y}$ | $ER_{electricity,y}$ | $BE_{biomass,y}$ | $PE_y$ | $L_y$ | $ER_y$ |
|---|---|---|---|---|---|
| 0 | 28746 | 0 | 0 | 0 | **28746** |

Thus net emission reductions by the project activity during the current monitoring period are:
$ER_y = 28746\ tCO_2e$

## E.5. Comparison of actual emission reductions with estimates in the CDM-PDD

| | |
|---|---|
| Emission reductions as estimated in the Validation report of Revised Monitoring plan | 41207 $tCO_2$ |
| Number of operational days as per the PDD | 200 out of 365 days |
| Number of operational days in the present monitoring period | 144 |
| Estimated emission reduction for the present monitoring period | = (41207*144)/200 = 29669 |

| Item | Values applied in ex-ante calculation of the registered CDM-PDD | Actual values reached during the monitoring period |
|---|---|---|
| **Emission reductions ($tCO_2e$)** | 29669 $TCO_2$ | 28746 $TCO_2$ |

## E.6. Remarks on difference from estimated value in the PDD

The estimated ER's for the present Monitoring period i.e. 08/03/2009 to 19/04/2010 based on the PDD assumptions are as given below:

With regard to comparison of CER claimed in the monitoring period and that estimated for the present monitoring period the explanation has been cited as under

The crushing season of sugar mills depends on the availability of sugarcane which is a seasonal crop. Due to less availability of sugarcane in the year of the monitoring period under consideration the plant at Dwarikesh Puram

The ER for the present monitoring period consist of only 144 days in contrast to the quantum claimed in the PDD, which is representative of 200 operational days.