



6.5 MW cogeneration project in Akbarpur, Punjab



Document Prepared by EKI Energy Services Limited

Project Title	<i>6.5 MW cogeneration project in Akbarpur, Punjab</i>
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Report ID	<i>VCS 1160¹</i>
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¹ <https://registry.verra.org/app/projectDetail/VCS/1160>



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1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

The project activity is being implemented in the Sangrur district in Punjab at the textile unit of M/s Gillanders Arbuthnot & Co. Ltd. (hereafter known as GACL). GACL is a part of the well-known G.D Kothari Group of companies. The company has businesses in the area of plantation, construction, textile and chemical to name a few.

The project activity involves installation of a cogeneration plant comprising of one rice husk fired AFBC boiler with steam generation capacity of 34 TPH at 66 kg/cm² (g) pressure and 495±5° C temperature and a 6.5 MW multistage extraction cum condensing steam turbine generator. The project activity has been commissioned on 30/03/2009 and is estimated to produce 41.769 GWh of net electrical output per annum.

In the pre-project scenario power had been sourced from the NEWNE electricity grid (now a part of unified Indian grid), which is mainly connected with GHG intensive fossil fuel based power plants and process steam is generated from a 3 TPH rice husk fired boiler. The project utilizes biomass (rice husk) which is carbon neutral fuel, to generate electricity and steam for captive consumption in a co-generation unit. The project activity therefore, reduces the emissions of GHG from the fossil fuel based power plants connected to the regional electricity grid and contributes in reducing global warming.

The design of the project equipments allows to use following fuels:

1. Rice husk (to the extent of 100%)
2. Sub bituminous coal in case of exigencies (to the extent of 100%)

Rice Husk is an agro waste generated from local rice mills and hence identified as Renewable Biomass.

The project was conceived considering usage of 100% rice husk as fuel and emission reduction is estimated considering the same.

Total emission reductions achieved in this monitoring period:

During the current monitoring period the project underwent continuous operation, except for scheduled maintenance or breakdown. Also during the current monitoring period i.e. from 20/06/2011 to 19/06/2017 the project has resulted into emission reductions of 193,456 tCO₂e.

1.2 Sectoral Scope and Project Type

The project activity falls under the following Sectoral scope and Project Type:

Sectoral Scope: 01 - Energy industries (renewable / non-renewable sources)

Project Type: I - Renewable Energy Projects

Methodology: AMS I.C. Thermal energy production with or without electricity; Version 18²

The project is not a grouped project activity.

1.3 Project Proponent

Organization name	Gillanders Arbuthnot & Co. Ltd.
Contact person	Mr. Manoj Sodhani
Title	President Textile
Address	8, N.S. Road, C-4, Gillander House, 4 th Floor, Kolkata – 700 001, West Bengal, India
Telephone	+91 33 -22302331, +91 33 30224470
Email	sodhani.manoj@gillandersarbuthnot.com

1.4 Other Entities Involved in the Project

Organization name	EKI Energy Services Limited
Role in the Project	Verra Account Holder
Contact person	Mr. Bhaskar Dutta
Title	Sr. Manager- Operations
Address	Office No 201, Plot No 48, Scheme 78, Part 2, Vijay Nagar, Indore- 452010, Madhya Pradesh, India
Telephone	+91-9109916710
Email	registry@enikingint.org

1.5 Project Start Date

The start date of the project is 30/03/2009 which coincides with the commissioning date of the project activity.

1.6 Project Crediting Period

The Crediting period details are provided below:

Crediting period start date: 30/03/2009

Crediting period end date: 29/03/2019

Duration of crediting period: 10 years 0 months (Fixed)

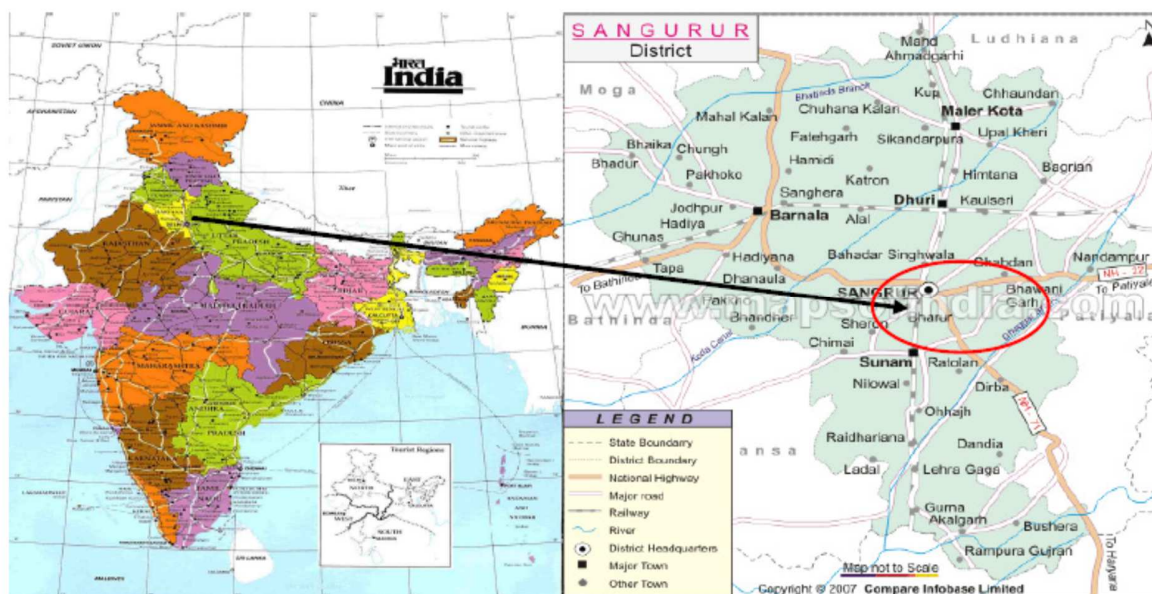
1.7 Project Location

The geographical coordinates of the project activity are:

² <https://cdm.unfccc.int/methodologies/DB/VJWCB0FBX89L3K73D4S1QPUP0UBXGC>

Latitude: 31.4991 ° N

Longitude: 75.3675 ° E



The project activity is located on national highway no. 71. Amritsar is the nearest airport from Akbarpur which is 110 km from the project site.

The physical address of the project is:

Gillanders Arbuthnot & Co. Ltd.

Village – Akbarpur PO Box – 1, Ahmedgarh

District – Sangrur,

Punjab – 148021

1.8 Title and Reference of Methodology

Type I – Renewable energy projects

Category C – AMS I.C. Thermal energy production with or without electricity Version 18

The following methodology/guidance/ tools are applied in the project activity:

- AMS-I.D. - Grid connected renewable electricity generation --- Version 16³
- Attachment C to Appendix B version 3 “General guidance on leakage in biomass project activities

³ <https://cdm.unfccc.int/methodologies/DB/W3TINZ7KKWCK7L8WTXFQQQFQQH4SBK>

- Tool to calculate the emission factor for an electricity system, Version 02, EB 50, Annex 14⁴.

1.9 Participation under other GHG Programs

The project is also registered in CDM with reference number 4886⁵, however it will be ensured that the project activity has not claimed emission reductions for the same monitoring period claimed in VCS.

Further it is to be noted here that a request for issuance under CDM is already submitted from the same project activity for the period from 01/01/2013 to 31/03/2018, however since the project is claiming VCU's for the period *20/06/2011 to 19/06/2017*, the project developer has given an undertaking as well that the emission reductions for this period will not be claimed under any other GHG mechanisms.

1.10 Other Forms of Credit

Emission Trading Programs and Other Binding Limits:

Net GHG emission reductions or removals generated by the Project will not be used for compliance with an emissions trading program or to meet binding limits on GHG emissions in any Emission Trading program or other binding limits.

Other Forms of Environmental Credit:

Not applicable, as the project is not registered in any other GHG mechanism other than VCS. Also, the project activity is not availing any REC benefits and the same can be confirmed from publically available link of REC generators.

Web-link: https://www.recregistryindia.nic.in/index.php/general/publics/registered_regens

1.11 Sustainable Development

Social well-being:

The project contributes to the general well-being of the region and is in line with the sustainable development policies of the host country:

The project activity generates employment for skilled and unskilled labours to operate the power plant. The project activity also enhances employment generation for the collection and transportation of biomass. This also offers the farmers an additional source of revenue.

Economic well-being:

The project has opened up business opportunities for direct and indirect businesses for technology provider, consultants, labor contractors, biomass suppliers, farmers and local villagers, thus promoting economic well-being in the region.

⁴ https://cdm.unfccc.int/methodologies/PAMethodologies/tools/am-tool-07-v1.1.pdf/history_view

⁵ <https://cdm.unfccc.int/Projects/DB/TUEV-RHEIN1307501311.32/view>

Environmental Well-being:

Use of biomass instead of high carbon intensive fossil fuel in the project activity contributes in reduction of GHG emissions. . The project also helps in reducing SOX and NOx emissions which are associated with fossil fuel consumption for power generation.

Technological well-being:

The project activity involves the installation of a cogeneration project in a textile mill. This will help in the promotion of such technology in the sector as well as enhance the skill sets of people involved in the operation and maintenance of the plant.

2 SAFEGUARDS

2.1 No Net Harm

The Central Pollution Control Board requested the project participant to perform an Environmental Impact Assessment, therefore the EIA study has been conducted for the project activity. The reference number is SEIAA/2008/24976⁶. The clearance is obtained on 27/06/2008 from State Level Environment Impact Assessment Authority, Punjab, India.

The EIA was conducted by M/s EST Consultants (P) Ltd. and environmental impacts are not considered significant. Following are the key areas on which impact of the project activity has been considered:

Impact on Air Environment:

The main pollutants discharged into the atmosphere from the thermal power plant shall be SPM, SO₂ and NO_x. Being a cleaner fuel, gaseous emission loads will be extremely low with rice husk. The SO₂ generation from the boiler will be traces and SPM (Suspended Particulate Matter) will remain within the stipulated standards as GACL will use electrostatic precipitators and sufficient stack height. The temperature encountered in the steam generator while burning biomass fuels, are low enough not to produce nitrogen oxides.

Impact on water environment:

In a thermal power plant, thermal pollution is apprehended from the water discharged from the cooling towers of steam boiler. In the project activity the cooling tower blow down for auxiliary circuit operates in a closed cycle with cooling tower for heat rejection which eliminate the chances of thermal pollution of any surface water body in the surrounding area.

Impact on Land Environment:

Arrangements are made for disposing of generated ash in low lying areas as land fill. Water sprinkler will be used for dust suppression.

Impact on due to noise:

The major stationary sources of noise generation in the plant are steam release valves, compressors and blowers. Proper arrangement has been made so that the ambient noise level remains within the permissible value.

⁶ http://nromoeef.gov.in/Environment_Reports/Reports/2014/5-94-2007.pdf

On the basis of the EIA studies and evaluation of impacts on the above areas, it is inferred that the project activity is environmentally safe to implement.

2.2 Local Stakeholder Consultation

The local stakeholder meeting was carried out for the project activity and the details of the same can be referred from the registered VCS PD. (section – 6.0)

Ref. web link - <https://registry.terra.org/app/projectDetail/VCS/1160>

The stakeholders identified for the project were: the usual occupants of villages around and the local communities, NGOs, governmental agencies, employees, contractors. Local population is considered to be a major stakeholder with respect to the project activity.

The PP also placed a grievance register onsite in order to ensure ongoing communication with relevant stakeholders where they can put down his/her complain and the same if found genuine will be addressed immediately. During the current monitoring period, no negative comments are received from the local stakeholders. Thus, no any mitigations has been applied.

2.3 AFOLU-Specific Safeguards

Not Applicable, as this is not an AFOLU project.

3 IMPLEMENTATION STATUS

3.1 Implementation Status of the Project Activity

The project activity involves installation of a cogeneration plant comprising of one biomass (rice husk) based AFBC boiler with steam generation capacity of 34 TPH at 66 Kg/cm² (g) pressure and 495 (+/-5) °C temperature and a 6.5 MW extraction cum condensing steam turbine generator.

The boiler is supplied by M/s. Thermax Limited which is one of the leading boiler manufacturers in India.

The technical details of the biomass based boiler are provided below:

Type of Boiler	Atmospheric Fluidized Bed Combustion ⁷
Make	M/s Thermax Limited
Number of boilers	1
Boiler capacity	34 TPH

⁷ https://www.thermaxglobal.com/wp-content/uploads/2020/03/AFBC_Brochure-2019.pdf

Type of fuel	Rice husk
Boiler steam outlet pressure	66 kg/cm ² (g)
Boiler steam outlet temp.	495 (+/-5) °C
Feed water temp.	105 °C
Efficiency (Rice Husk)	81 %

M/s Triveni Engineering & Industries Ltd. supplies the 6.5 MW turbine generator.

Type of Turbine	Multistage extraction cum condensing.
Number of turbine	1
Output capacity	6500 KW
Gear box output speed	1500 rpm
Inlet steam pressure	65 kg/cm ² (A)
Inlet steam temp	490°C

Apart from the above main equipments, other equipments as listed below are also part of the power plant.

- Cooling tower and circulating water system
- Fuel and ash handling systems
- RO Water system and Air Compressor Plant
- ESP to remove suspended particles from the flue gas
- Electrical and Instrumentation system

In terms of the safe and sound technology, the technology provider is experienced in this field. The boiler is being inspected by the boiler inspector ensuring that its operation is safe. Furthermore, consents to establish and operate from the Pollution Control Board is being confirmed that the factory adheres to environmental guidelines. Thus the technology implemented is environmentally safe and sound. There is no technology transfer taking place in the project activity.

The project activity is within the capacity limit for the small scale project activity as the project proponent does not plan to enhance the output of the project activity.

The plant is running smoothly since commissioning with scheduled maintenance. No events or situations happened during the reported monitoring period that can alter the applicability of the applied methodology or impact the GHG emission reductions or removals. The major

breakdown details that occurred during the monitoring period has been provided in the Annexure-1 of this report.

3.2 Deviations

3.2.1 Methodology Deviations

Not Applicable, as there are no methodological deviations.

3.2.2 Project Description Deviations

Not Applicable, as there are no project deviations.

3.3 Grouped Projects

Not Applicable, as this is not a grouped project activity.

4 DATA AND PARAMETERS

4.1 Data and Parameters Available at Validation

Data / Parameter	Biomass surplus availability
Data unit	%
Description	Surplus biomass (rice husk) availability in the region
Source of data	Based on report from DSCL energy services company ltd in Oct, 2008
Value applied	47.68
Justification of choice of data or description of measurement methods and procedures applied	The data is used from third party assessment report.
Purpose of Data	For the calculation of the Baseline Emission
Comments	DSCL Energy Services Company Ltd is CRISIL-BEE accredited agency http://www.bee-india.nic.in/schemes/documents/ecbc/accredited_ESCOs.pdf This value is determined ex-ante and is being fixed for the crediting period

Data / Parameter	SEC _{ff}
Data unit	TJ /MWh
Description	Specific energy consumption of the cogeneration unit when fired with subbituminous coal
Source of data	Calculated from boiler efficiency with sub-bituminous coal and total steam enthalpy at boiler outlet.
Value applied	Coal - 0.00424 (fixed <i>ex-ante</i>)
Justification of choice of data or description of measurement methods and procedures applied	The above value is calculated based on the 85% boiler efficiency (Tool to determine the baseline efficiency of thermal or electric energy generation systems, version 01) and the enthalpy of is taken from the steam tables for output steam at 66 ata pressure and 490 deg C temp. And feed water at 90 ata pressure and 105 deg C temp.
Purpose of Data	For the calculation of the Baseline Emission
Comments	This value is determined ex-ante and is being fixed for the crediting period.

Data / Parameter	SEC _{biomass}
Data unit	TJ /MWh
Description	Specific energy consumption of boiler when fired with biomass (rice husk)
Source of data	Calculated from manufacturer supplied boiler efficiency with rice husk and total steam enthalpy at boiler outlet.
Value applied	Rice husk - 0.00444 (fixed <i>ex-ante</i>)
Justification of choice of data or description of measurement methods and procedures applied	The above value is calculated based on the boiler efficiency (supplier specification) and the enthalpy of is taken from the steam tables for output steam at 66 ata pressure and 490 deg C temp. And feed water at 90 ata pressure and 105 deg C temp.
Purpose of Data	For the calculation of the Baseline Emission
Comments	This value is determined ex-ante and is being fixed for the crediting period

4.2 Data and Parameters Monitored

Data / Parameter	EG_{gross,y}						
Data unit	MWh						
Description	Gross electricity generated by the project activity in the year y						
Source of data	Plant log book/DCS record						
Description of measurement methods and procedures to be applied	The data is being recorded on an hourly basis by electrical technician. There are three shifts in a day and the data for the three shifts is then being summarized daily and is being consolidated on monthly basis.						
Frequency of monitoring/recording	Monthly						
Value monitored	257,681						
Monitoring equipment	Energy Meter with 0.5 s accuracy installed within the project boundary. <table border="1"> <tr> <td>Meter Type</td><td>TrivectorMeter, E3M051,3 Phase 4 Wire</td></tr> <tr> <td>Manufacturer</td><td>Secure Meters Ltd</td></tr> <tr> <td>Serial Number</td><td>KAU06136</td></tr> </table> For detailed schedule of calibration please refer Annexure- I	Meter Type	TrivectorMeter, E3M051,3 Phase 4 Wire	Manufacturer	Secure Meters Ltd	Serial Number	KAU06136
Meter Type	TrivectorMeter, E3M051,3 Phase 4 Wire						
Manufacturer	Secure Meters Ltd						
Serial Number	KAU06136						
QA/QC procedures to be applied	Energy Meter duly calibrated by an independent accredited third party. Calibration frequency: Once in three years Responsible Entity: Management of GACL Archiving Policy: Paper & Electronic.						
Purpose of the data	Calculation of Baseline emissions						
Calculation method	Not applicable						
Comments	The data is being kept for a minimum of two years after the end of crediting period or the last issuance of VERs whichever occurs later. The data is being maintained in both soft copy and hard copy format.						

Data / Parameter	EG_{aux,y}
Data unit	MWh
Description	Auxiliary electricity consumption during the year y
Source of data	Plant records (Log book)

Description of measurement methods and procedures to be applied	The data is being recorded on an hourly basis by electrical technician. There is being three shifts in a day and the data for the three shifts is then being summarized daily and is being consolidated on monthly basis.						
Frequency of monitoring/recording	Monthly						
Value monitored	27,100						
Monitoring equipment	Energy Meter with 0.5 s accuracy installed within the project boundary <table border="1"> <tr> <td>Meter Type</td><td>EM6400</td></tr> <tr> <td>Manufacturer</td><td>Conzerv</td></tr> <tr> <td>Serial Number</td><td>186772/3764-4109</td></tr> </table> For detailed schedule of calibration please refer Annexure- II	Meter Type	EM6400	Manufacturer	Conzerv	Serial Number	186772/3764-4109
Meter Type	EM6400						
Manufacturer	Conzerv						
Serial Number	186772/3764-4109						
QA/QC procedures to be applied	Energy Meter duly calibrated by an independent accredited third party. Calibration frequency: Once in three years Responsible Entity: Management of GACL Archiving Policy: Paper & Electronic.						
Purpose of the data	Calculation of Baseline emissions						
Calculation method	Not Applicable						
Comments	The data is being kept for a minimum of two years after the end of crediting period or the last issuance of CERs whichever occurs later. The data is being maintained in both soft copy and hard copy format.						

Data / Parameter	EG_{BL,y}
Data unit	MWh
Description	The amount of net electricity supplied by the project activity during the year y
Source of data	Plant records
Description of measurement methods and procedures to be applied	Not applicable
Frequency of monitoring/recording	Calculated monthly basis and consolidated annually.
Value monitored	230,580
Monitoring equipment	Not Applicable

QA/QC procedures to be applied	Not applicable.
Purpose of the data	Calculation of Baseline emissions
Calculation method	Calculated as $EG_{gross,y} - EG_{aux,y}$
Comments	The data is being kept for a minimum of two years after the end of crediting period or the last issuance of CERs whichever occurs later. The data is being maintained in both soft copy and hard copy format.

Data / Parameter	FC_{rice husk,,y}						
Data unit	Tonne						
Description	Quantity of biomass type i consumed (on dry basis) in the project activity during the year y						
Source of data	Procurement data as maintained in the plant, data is being monitored on a monthly frequency.						
Description of measurement methods and procedures to be applied	Measurement Method: Stock in/stock out method The amount of rice husk consumed during the year y is consolidated from the difference of opening stock ,total biomass produced from weigh bridge(as when purchased basis) as the balance stock recorded on monthly basis.						
Frequency of monitoring/recording	The data is being recorded on monthly basis						
Value monitored	273,279.6						
Monitoring equipment	In house Weigh Bridge for measuring the procurement quantity with accuracy of $\pm 5kg$. <table border="1"> <tr> <td>Meter</td><td>Wipro</td></tr> <tr> <td>Type</td><td>Digital</td></tr> <tr> <td>Serial Number</td><td>270424</td></tr> </table> For detailed schedule of calibration please refer Annexure- I	Meter	Wipro	Type	Digital	Serial Number	270424
Meter	Wipro						
Type	Digital						
Serial Number	270424						
QA/QC procedures to be applied	Data is being verified by the rice husk purchase records and invoices.						
Purpose of the data	Calculation of Baseline emissions						
Calculation method	The amount of rice husk consumed during the year y is being consolidated from the formula as below- Quantity of husk used=Opening Stock-Closing Stock +Quantity of husk purchased.						
Comments	The data is being kept for a minimum of two years after the end of crediting period or the last issuance of VEs whichever occurs later. The data is being maintained in both soft copy and hard copy format.						

Data / Parameter	FC_{coal,y}						
Data unit	Tonne						
Description	Quantity of sub-bituminous coal consumed in the project activity during the year y						
Source of data	Procurement data						
Description of measurement methods and procedures to be applied	Not applicable as no coal has been used during present monitoring period						
Frequency of monitoring/recording	Monthly						
Value monitored	0						
Monitoring equipment	In house Weigh Bridge for measuring the procurement quantity with accuracy of ± 5kg. <table border="1"> <tr> <td>Meter</td><td>Wipro</td></tr> <tr> <td>Type</td><td>Digital</td></tr> <tr> <td>Serial Number</td><td>270424</td></tr> </table> For detailed schedule of calibration please refer Annexure- I	Meter	Wipro	Type	Digital	Serial Number	270424
Meter	Wipro						
Type	Digital						
Serial Number	270424						
QA/QC procedures to be applied	The sub-bituminous coal purchase records and invoices are verifying data.						
Purpose of the data	Calculation of Project emissions						
Calculation method	The amount of sub-bituminous coal consumed during the year y is being consolidated from the difference of the opening stock, total coal procured from weigh bridge records (as when purchased basis) and the balance stock recorded on monthly basis.						
Comments	The data is being kept for a minimum of two years after the end of crediting Period or the last issuance of VERs whichever occurs later. The data is being maintained in both soft copy and hard copy format.						

Data / Parameter	NCV_{coal,y}
Data unit	TJ/tonne
Description	Net calorific value of sub-bituminous coal consumed in the project activity during the year y
Source of data	Supplier data or in absence of which National/local or IPCC default values at the upper limit of the uncertainty at a 95%

	confidence interval as provided in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories is being considered.
Description of measurement methods and procedures to be applied	Default
Frequency of monitoring/recording	Not applicable as no coal has been used during present monitoring period
Value monitored	0
Monitoring equipment	Not applicable
QA/QC procedures to be applied	Values is being verified whether they are within the uncertainty range of the IPCC default values as provided in Table 1.2, Vol. 2 of the 2006 IPCC Guidelines. If the values fall below this range collect additional information from the testing laboratory to justify the outcome or conduct additional measurements. The laboratories have ISO17025 accreditation or comply with similar quality standards in case supplier or local data is being used.
Purpose of the data	Calculation of Project emissions
Calculation method	Not applicable
Comments	The data is being kept for a minimum of two years after the end of crediting period or the last issuance of VERs whichever occurs later. The data is being maintained in both soft copy and hard copy format.

Data / Parameter	EF_{CO2,coal,y}
Data unit	tCO ₂ /TJ
Description	Emission factor of sub-bituminous coal consumed in the project activity during the year y
Source of data	In absence local and supplier data IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories has been considered.
Description of measurement methods and procedures to be applied	Not applicable as no coal has been used during present monitoring period

Frequency of monitoring/recording	Not applicable
Value monitored	100
Monitoring equipment	Not applicable
QA/QC procedures to be applied	As IPCC Guidelines is publicly available third party data, no QA/QC check is required.
Purpose of the data	Calculation of Project emissions
Calculation method	Not applicable
Comments	The data is being kept for a minimum of two years after the end of crediting period or the last issuance of VERs whichever occurs later. The data is being maintained in both soft copy and hard copy format.

Data / Parameter	NCV _{rice husk,y}																	
Data unit	TJ/tonne																	
Description	Net calorific value of biomass by type i (on dry basis) consumed in the project activity during the year y																	
Source of data	Annual laboratory test report from NABL accredited laboratory.																	
Description of measurement methods and procedures to be applied	Default																	
Frequency of monitoring/recording	Not applicable																	
Value monitored	0.01231552 (weighted average value for the complete monitoring period) Further below is the yearly average of NCV obtained during the current monitoring period <table><tr><th>Year</th><th>NCV</th></tr><tr><td>2011</td><td>0.01228422</td></tr><tr><td>2012</td><td>0.01239719</td></tr><tr><td>2013</td><td>0.01218799</td></tr><tr><td>2014</td><td>0.01218799</td></tr><tr><td>2015</td><td>0.01177796</td></tr><tr><td>2016</td><td>0.01239719</td></tr><tr><td>2017</td><td>0.01228422</td></tr></table>		Year	NCV	2011	0.01228422	2012	0.01239719	2013	0.01218799	2014	0.01218799	2015	0.01177796	2016	0.01239719	2017	0.01228422
Year	NCV																	
2011	0.01228422																	
2012	0.01239719																	
2013	0.01218799																	
2014	0.01218799																	
2015	0.01177796																	
2016	0.01239719																	
2017	0.01228422																	
Monitoring equipment	Not applicable																	
QA/QC procedures to be applied	Consistency of the measurements is being checked by comparing the measurement results with measurements from previous years. If the measurement results differ significantly from previous measurements or other relevant data sources, additional measurements is being conducted.																	

Purpose of the data	Calculation of Project emissions
Calculation method	Not applicable
Comments	The data is being kept for a minimum of two years after the end of crediting period or the last issuance of CERs whichever occurs later. The data is being maintained in both soft copy and hard copy format.

Data / Parameter	M_{rice husk,y}																
Data unit	% water																
Description	Moisture content of the biomass residues by type i in year y.																
Source of data	On site lab test report.																
Description of measurement methods and procedures to be applied	Default																
Frequency of monitoring/recording	Monthly recording																
Value monitored	8% (weighted average value for the complete monitoring period) Further below is the yearly average of moisture content obtained during the current monitoring period <table border="1"> <thead> <tr> <th>Year</th><th>Moisture %</th></tr> </thead> <tbody> <tr><td>2011</td><td>7%</td></tr> <tr><td>2012</td><td>8%</td></tr> <tr><td>2013</td><td>7%</td></tr> <tr><td>2014</td><td>8%</td></tr> <tr><td>2015</td><td>8%</td></tr> <tr><td>2016</td><td>8%</td></tr> <tr><td>2017</td><td>7%</td></tr> </tbody> </table>	Year	Moisture %	2011	7%	2012	8%	2013	7%	2014	8%	2015	8%	2016	8%	2017	7%
Year	Moisture %																
2011	7%																
2012	8%																
2013	7%																
2014	8%																
2015	8%																
2016	8%																
2017	7%																
Monitoring equipment	In house lab test.																
QA/QC procedures to be applied	As a QA/QC procedure, annual sampling is being done by third party accredited lab and highest value is being considered to calculate the dry quantity of biomass.																
Purpose of the data	Calculation of Project emissions																
Calculation method	Not applicable																
Comments	The data is being kept for a minimum of two years after the end of crediting period or the last issuance of CERs whichever occurs later. The data is being maintained in both soft copy and hard copy format.																

4.3 Monitoring Plan

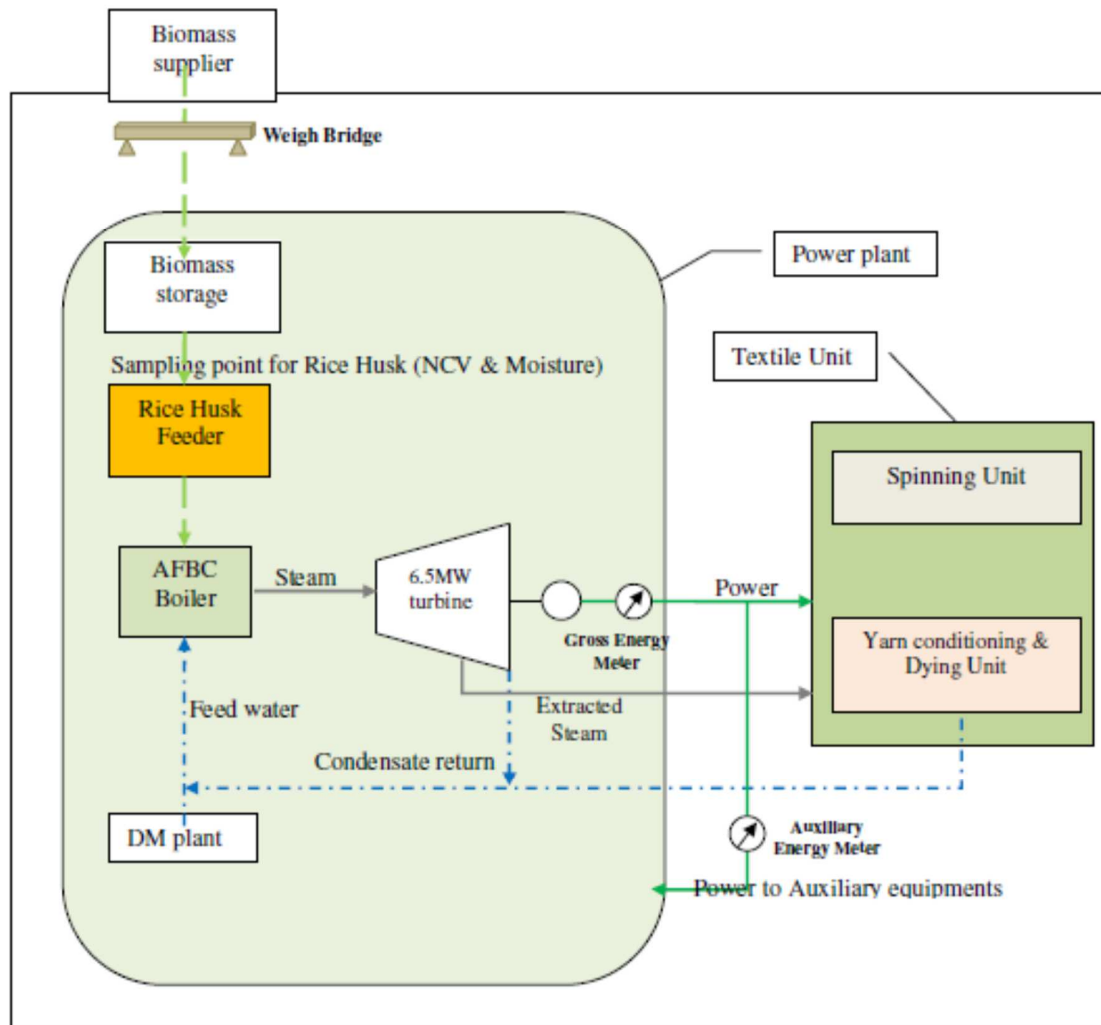
The monitoring plan revolves around the monitoring electrical energy generation. The gross electricity generation and auxiliary electricity consumption is being monitored using energy meters installed in the power plant.

The monitoring is being done on a continuous basis and records (logbooks) would be maintained on an hourly basis. The power plant manager then collates these records at the end of every day. The biomass and coal (if any) consumed in the project activity is being monitored in stock in stock out basis. Moisture is being measured in-house on monthly basis and NCV would be tested annually by NABL accredited external lab.

All the energy meters are being calibrated at least once in three year and Weigh Bridge is being calibrated at least once in a year to ensure their proper functioning. In case of any measuring equipment failure, same is being replaced as soon as possible to avoid any loss of run data of the project plant.

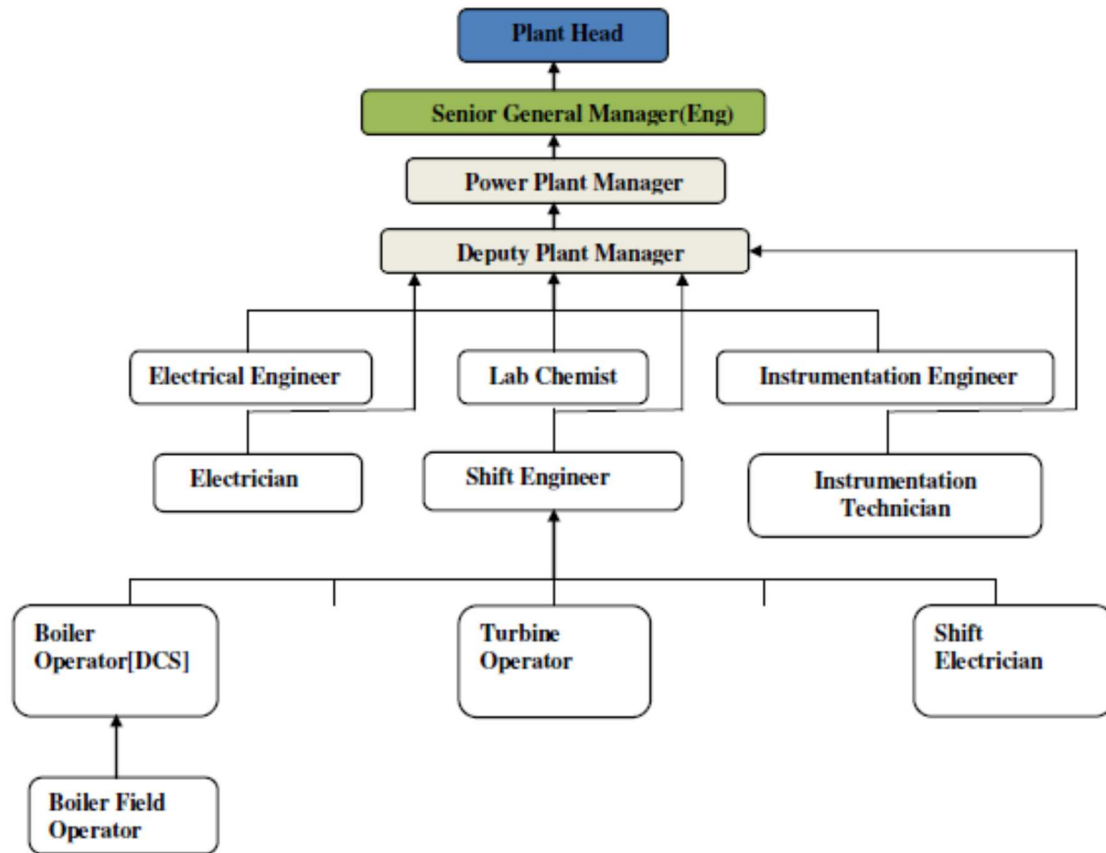
The monitored data is being kept in the plant for a minimum of two years after the end of crediting period or the last issuance of VERs whichever occurs later. The data is being be maintained in both soft copy and hard copy format. There is being internal audits to check the consistency of data and to take necessary corrective actions in case any data discrepancy. Training is being provided to the respective responsible persons for proper monitoring and data archiving.

Single Line Diagram showing the monitoring points



	Biomass
	Water/condensate
	Steam
	Power
	Energy Meter

The overall responsibility of the monitoring and reporting of the data is being with the Plant Head. The organization chart pertaining to the data monitoring for the project activity is given below.



5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

The net electricity supplied in this monitoring period is 230,580 MWh

Hence, Baseline Emission is

$$BE_y = EG_{BL,y} * EF_{CO_2,grid,y}$$

$$BE_y = 230,580 \text{ MWh} * 0.839 \text{ tCO}_2/\text{MWh}$$

$$= 193,456 \text{ tCO}_2\text{e/year (rounddown value)}$$

5.2 Project Emissions

The project emission can be calculated based on net calorific value and CO₂ emission factor of the fuel type i, as follows:

$$PE_y = FC_{i,y} * NCV_{i,y} * EF_{CO_2,i,y}$$

Presently GACL has no intention to fire fossil fuel (coal) and neither have the fuel preparation (coal crusher) equipment in place.

So, Project emission, $PE_y = 0$

5.3 Leakage

As per paragraph 45 of AMS-I.C., version 18, "If the energy generating equipment currently being utilised is transferred from boundary to the project activity, leakage is to be considered." For this project activity there is no transfer of equipment and therefore leakage due to equipment transfer has been taken to be zero.

It has been established ex-ante through biomass availability survey conducted by DSCL energy services company ltd in Oct, 2008, that within a distance of max. 50 km radius around the project site, the biomass available in the region is around 47.68% surplus than the quantity of biomass that is utilised including the project activity. Hence leakage calculation due to competitive use of rice-husk has not been considered.

Further, it has been confirmed from the rice husk transporters that the rice-husk is being transported from a distance of maximum 90 kms which is much lower than the distance of 200 kms suggested by the methodology for calculating emissions from transportation of biomass. Hence emissions due to biomass transportation has not been considered.

Thus, there are no leakage emissions from the project activity.

Therefore,

$$LE_y = 0$$

Therefore Emission Reduction is,

$$ER_y = BE_y - PE_y - LE_y$$

$$= 193,456 - 0 - 0 = 193,456 \text{ tCO}_2\text{e}$$

5.4 Net GHG Emission Reductions and Removals

Year	Baseline emissions or removals (tCO ₂ e)	Project emissions or removals (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Net GHG emission reductions or removals (tCO ₂ e)
20/06/2011 to 31/12/2011	10,179	0	0	10,179
01/01/2012 to 31/12/2012	32,217	0	0	32,217

01/01/2013 to 31/12/2013	33,624	0	0	33,624
01/01/2014 to 31/12/2014	35,126	0	0	35,126
01/01/2015 to 31/12/2015	35,900	0	0	35,900
01/01/2016 to 31/12/2016	31,122	0	0	31,122
01/01/2017 to 19/06/2017	15,288	0	0	15,288
Total	193,456	0	0	193,456

The actual GHG avoided during the current monitoring plan is 193,456 tCO₂e. Considering the annual average emission reductions as per the registered PDD which is 35,044 tCO₂e per year, the number of days covered during the current monitoring period comes out to be 2124 days (after excluding major shutdowns), based upon which the estimated emission reductions attributed to this monitoring period comes out to be 212,667 tCO₂e. The actual VER is 9% lower than the estimated VER. This variation is majorly due to the shut-down of the plant for various maintenance work which is described in Annexure 1.

Annexure 1: Breakdown of the project Activity in the Current Monitoring Period

S.No.	Date	Remarks
1	20/06/2011 to 26/08/2011	Maintenance Shutdown
2	07/10/2011	Shutdown for maintenance
3	26/10/2011	Shutdown for maintenance
4	08/03/2012	Shutdown for maintenance
5	22/01/2013 to 03/02/2013	Shutdown for maintenance
6	23/07/2013 to 24/07/2013	Shutdown for inspection
7	20/02/2014 to 02/03/2014	Annual Shutdown
8	16/03/2014 to 17/03/2014	Shutdown for maintenance
9	11/09/2014	Shutdown for maintenance
10	16/08/2015	Shutdown for inspection

11	30/10/2016	Shutdown for inspection
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Annexure 2: Calibration Details

S.N o.	Meter Details	SI Number	Date of Calibration	Due date of calibration	Date of Calibration	Due date of calibration	Date of Calibration	Due date of Calibration
1	Gross Energy Meter	KAU06136	23/11/2010	22/11/2013	23/11/2013	22/11/2016	23/10/2014	22/10/2017
2	Auxiliary Energy Meter	186772/3764-4109	24/11/2010	23/11/2013	24/11/2013	23/11/2016	23/10/2014	22/10/2017
3	Weighbridge ⁸	270424	16/03/2012	15/03/2013	16/03/2013	15/03/2014	16/03/2014	15/03/2015
			16/03/2015	15/03/2016	16/03/2016	15/03/2017	16/03/2017	15/03/2018
4	Weigh Scale	84750059	16/03/2012	15/03/2013	16/03/2013	15/03/2014	16/03/2014	15/03/2015
			16/03/2015	15/03/2016	16/03/2016	15/03/2017	16/03/2017	15/03/2018

⁸ It is to be noted here that calibration of weigh bridge and weigh scale are actually delayed before 03/2012, however the above parameter has no impact upon the ER calculation.