Monitoring report form

(Version 04.0)

Complete this form in accordance with the Attachment "Instructions for filling out the monitoring report form" at the end of this form.

MONITORING REPORT	
Title of the project activity	LMEL 25 MW Waste Heat based Captive Power Plant.
Reference number of the project activity	9003
Version number of the monitoring report	0
Completion date of the monitoring report	06/08/2014
Registration date of the project activity	27/05/2013
Monitoring period number and duration of this monitoring period	Monitoring Period No. 1, 27/05/2013 to 30/06/2014
Project participant(s)	M/s Lloyds Metals & Engineers Limited. (Now M/s Lloyds Metals & Energy Limited)
Host Party(ies)	India (host) Ministry of Environment and Forest
Sectoral scope and selected methodology(ies), and where applicable, applied standardized baseline(s)	Approved Methodology : ACM 0012 Version 04.00 Sectoral scope : 01& 04, EB 60 "Consolidated baseline methodology for GHG emission reductions from waste energy recovery projects"
Estimated amount of GHG emission reductions or net anthropogenic GHG removals by sinks for this monitoring period in the registered PDD	106,421 tonnes of CO_2e
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period	72,794 tonnes of CO_2e
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved during the period up to 31 December 2012(if applicable)	Not Applicable
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved during the period from 1 January 2013 onwards (if applicable).	72,794 tonnes of CO_2e

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

a) Purpose of the project activity and the measures taken for GHG emission reductions or net anthropogenic GHG removals by sinks;

The purpose of the project activity is to achieve efficient use of waste heat from waste flue gases to generate electricity. The electricity so generated shall be used to meet the power requirement of Lloyds Metals and Engineers Limited (LMEL) sponge iron plant itself and balance will be supplied to Maharashtra State Electricity Distribution Company Limited (MSEDCL) grid to wheel the electricity to power trading company as per power purchase agreement signed for sell of up to 15MW of surplus power.

b) Brief description of the installed technology and equipment

1) The Waste Heat Recovery Boilers (WHRB):
A separate WHRB is provided for each kiln with specifications given below. There will be total 5 WHRBs as there are five kilns (4 numbers of 100 TPD and 1 number of 500 TPD).

PARAMETERS	WHRB Technical Data Values for each type of boiler	
Capacity tonnes/hr Max	12.7	58.4
Rated Capacity tonnes/hr	12	55
Steam pressure kg/cm2 a	70	70
Steam temperature deg c	490	490
Flue gas flow rate N m3/h	27000	120,000
Flue gas inlet temperature deg c	1000	1,000
Flue gas outlet temperature deg c	180	180
Boiler feed water temperature deg c	140	140
Sponge iron kiln number	4	1
No of boilers	4	1
Sponge iron kiln capacity TPD	100	500
Design Efficiency of boiler as per ERK data sheets	81.51%	82.8%
Manufacturer	Lloyds Steel Industries Ltd Engineering division	Lloyds Steel Industries Ltd Engineering division

2) Steam Turbine Generator: Project activity has set up one 30 MW steam turbine along with water cooled steam condenser and ejector system. Make of turbine: Qingdao Jieneng Power Station Engineering Co Limited, China which generate power at 11 KV.

3) Auxiliary Equipments: Auxiliary equipment to power plant comprise of one cooling tower with circulating water pumps, boiler feed water pumps and deaerator, all interconnecting piping with valves, control systems like DCS for all 5 WHRB boilers and one 90 TPH FBC boiler and power evacuation systems for connecting to grid at 220 KV level.

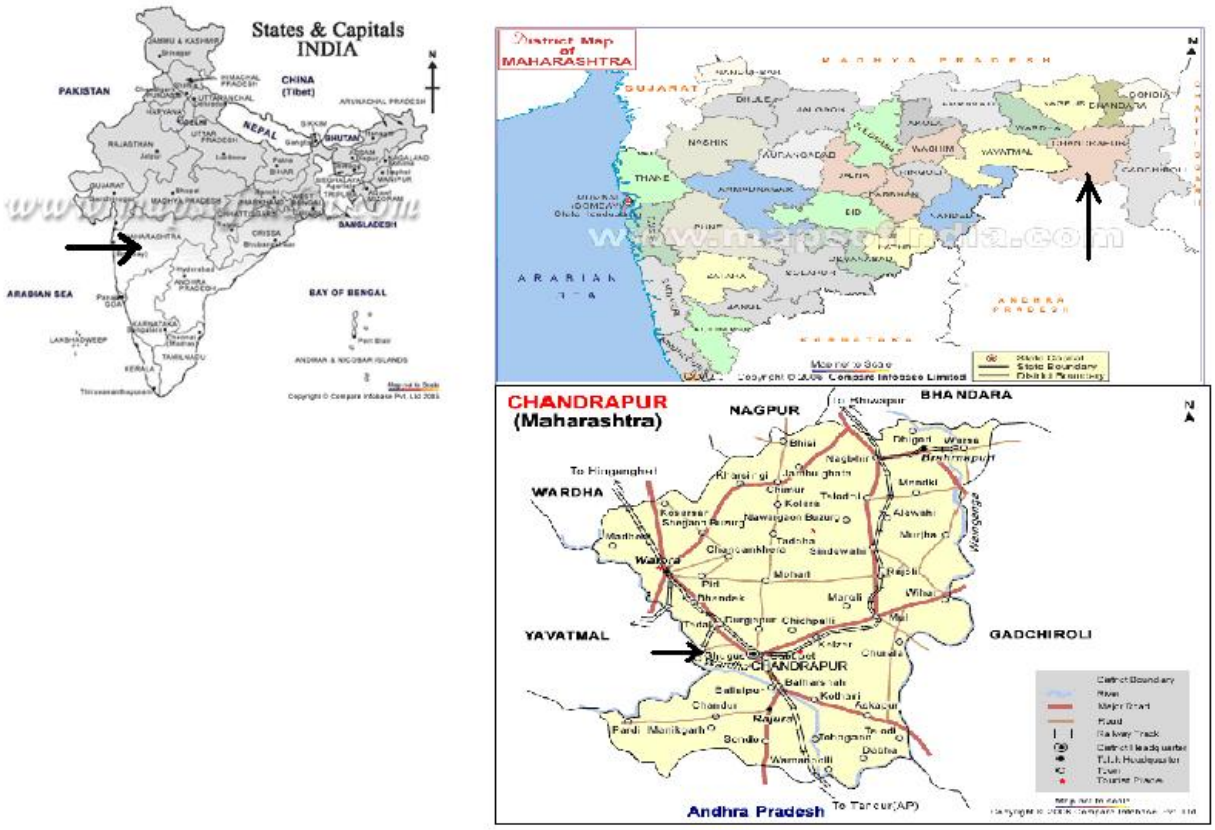
c) Relevant dates for the project activity

Start date	15/03/2007
Mechanical completion :	October 2010
Commissioning:	December 2010
Regular production :	January 2011

d) Total GHG emission reductions
Total GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period: 72,794 tonnes of CO_2e

A.2. Location of project activity

The project activity is located within the industrial facility of Lloyds Metals and Engineers Limited is located at Plot No A 1-2. MIDC Area, village Ghugus about 25 KM from Chandrapur town and situated at Longitude 79^0 07' 15" E Latitude 19^0 56' 15" N. Nearest Railway station is Tadali.



A.3. Parties and project participant(s)

Party involved ((host) indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
India (host) Ministry of Environment and Forest	M/sLloyds Metals & Engineers Limited. (Private entity) Name changed to M/sLloyds Metals & Energy Limited	No
Not applicable	Not applicable	
Not applicable	Not applicable	

A.4. Reference of applied methodology and standardized baseline

Title of approved methodology: "Consolidated baseline methodology for GHG emission reductions from waste energy recovery projects"

Methodology No &Version: ACM 0012, Version 04.0.0, Sectoral Scope: 1&4 EB 60

Tools ACM 0012 draws upon

(1) "Tool for the demonstration and assessment of additionality (Version 06.0.0) EB 65
(2) "Tool to calculate the emission factor for an electricity system Version 2.2.1, EB 63
(3)"Tool to determine the baseline efficiency of thermal or electric Energy generation systems" Version 1 EB 4
(4) "Tool to determine the remaining lifetime of equipment" Version1 EB 50
(5) "Tool to calculate project or leakage of CO_2 emissions from fossil Fuel combustion" Version 2 EB 41

A.5. Crediting period of project activity

Start date of this monitoring period: 27/05/2013
Length of crediting period for this monitoring period : 1 year and 35 days

A.6. Contact information of responsible persons/ entities

Responsible person for completing the CDM-MR-FORM. Lloyds Steel Industries Ltd engineering division is not a project proponent.

Mr R.M.Alegavi
Sr Vice President (Technology)
Lloyds Steel Industries
Engineering division of Uttam Value Steels Limited
16TH floor, Trade World,Kamala City
Lower Parel
Mumbai 400013
Tel No 91-22-30418111, 30418221 Fax No 91-22-30418260
rmalegavi@lloyds.in, rmalegavi@hotmail.com

SECTION B. Implementation of project activity

B.1. Description of implemented registered project activity

1) Implementation status.

Mechanical completion of power plant : October 2010
Commissioning activities : December 2010
Regular production of rated electricity January 2011

Schematic for project boundary and parameters are provided as below.

The project activity is 25 MW waste heat recovery based power generation from waste flue gases which were initially treated in water scrubber in absence of project activity. The technical specification of Power Plant equipments installed in project facility is as follows.

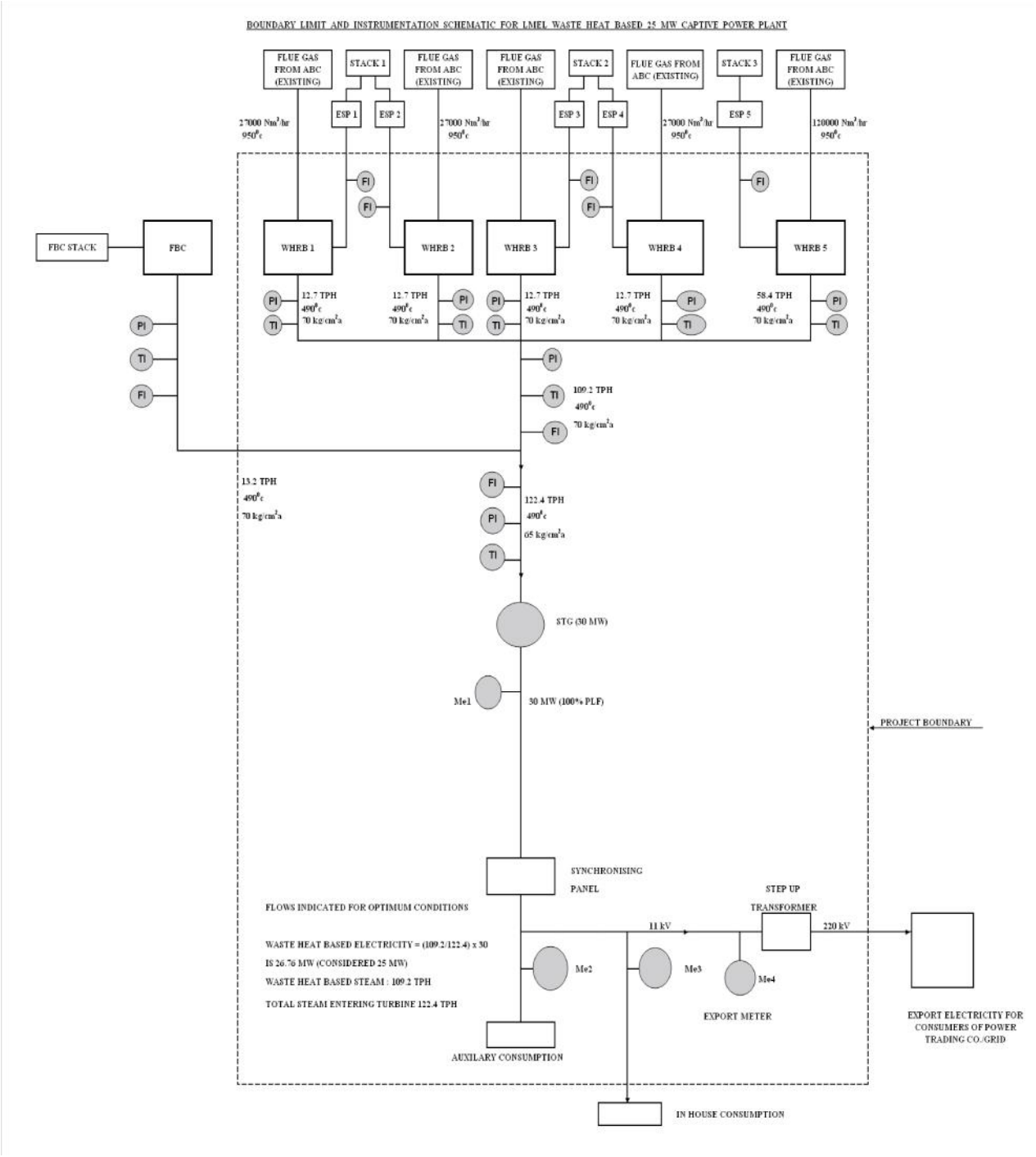
1) The Waste Heat Recovery Boilers (WHRB):
A separate WHRB is provided for each kiln with specifications given below. There will be total 5 WHRBs as there are five kilns (4 numbers of 100 TPD and 1 number of 500 TPD).

PARAMETERS	WHRB Technical Data Values for each type of boiler	
Capacity tonnes/hr Max	12.7	58.4
Rated Capacity tonnes/hr	12	55
Steam pressure kg/cm2 a	70	70
Steam temperature deg c	490	490

Flue gas flow rate N m3/h	27000	120,000
Flue gas inlet temperature deg c	1000	1,000
Flue gas outlet temperature deg c	180	180
Boiler feed water temperature deg c	140	140
Sponge iron kiln number	4	1
No of boilers	4	1
Sponge iron kiln capacity TPD	100	500
Design Efficiency of boiler as per ERK data sheets	81.51%	82.8%
Manufacturer	Lloyds Steel Industries Ltd Engineering division	Lloyds Steel Industries Ltd Engineering division

2) Steam Turbine Generator: Project activity has set up one 30 MW steam turbine along with water cooled steam condenser and ejector system. Make of turbine: Qingdao Jieneng Power Station Engineering Co Limited, China which generate power at 11 KV.

3) Auxiliary Equipments: Auxiliary equipment to power plant comprise of one cooling tower with circulating water pumps, boiler feed water pumps and deaerator, all interconnecting piping with valves, control systems like DCS for all 5 WHRB boilers and one 90 TPH FBC boiler and power evacuation systems for connecting to grid at 220 KV level.



B.2. Post registration changes

B.2.1. Temporary deviations from registered monitoring plan, applied methodology or applied standardized baseline

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No application for temporary deviation from registered monitoring plan and applied methodology has been done during this monitoring period.

B.2.2. Corrections

No application for corrections to project information, parameters fixed at validation has been done during the monitoring period.

B.2.3. Permanent changes from registered monitoring plan, applied methodology or applied standardized baseline

No application for permanent changes from registered monitoring plan and applied methodology has been done during this monitoring period

B.2.4. Changes to project design of registered project activity

No application for changes to the design of project activity has been done during this monitoring period

B.2.5. Changes to start date of crediting period

No application for changes in start date of the crediting period has been done during this monitoring period

B.2.6. Types of changes specific to afforestation or reforestation project activity

Not applicable as the project activity is not afforestation or reforestation project activity.

SECTION C. Description of monitoring system

(A) Purpose

To define the procedures and responsibilities for GHG Performance, monitoring, measurement and reporting of data and dealing with uncertainties and covers the responsibilities regarding plant operation and maintenance.

(B) Scope

This procedure is applicable to waste heat based WHRB power project of LMEL.

(C) Responsibilities for measurements.

We define below the responsibilities of the professionals involved in running the project activity.

Shift Engineer (Operations): Responsible for proper operation of the mechanical equipment and reporting hourly and eight hourly data and measurements of steam generated from WHRB, steam fed to turbines, parameters of steam and waste gas flow meters. The report is then sent to the Plant Manager for his review.

Shift Engineer (Electrical): Responsible for proper operation of electrical equipment and taking meter reading /measurement for electricity generation and export. The report is then sent to the Plant Manager for his review on a daily basis.

Shift Engineer (Maintenance): Responsible for proper maintenance management. The report is then sent to the Manager (plant) for his review on a daily basis.

Manager (Plant): Responsible for operation, maintenance and management of plant and calibration of monitoring equipments. He will be reviewing the monitored parameters/measurements shift-wise and presenting a daily executive summary report, duly signed by himself, to the General Manager (Plant)/Vice President.

General Manager /Vice President: Responsible and in charge of complete operation, maintenance and management of all plant and CDM related matters

He will be in charge of all CDM related matters and CDM officer will be directly reporting to him

CDM officer: He will be reporting to General Manager and will be responsible for preparing required documentation and reviewing the accuracy of various reports with counter checks along with project developer. He will be responsible for internal audit and archiving of data every month regarding CDM project matter.

Monitoring System

The following parameters will be monitored :

- Gross generation of electricity by the power plant
- Auxiliary consumption.
- Steam availability from WHRB boilers/other boiler
- Steam flow entering to STG.
- Temperature and pressure of steam entering STG.
- Net electricity generation from waste heat recovery.
- Energy content of WHRB steam and other steam
- Waste gas quantity
- Exported electricity
- In house electricity consumption

Plant operation and maintenance: Plant manager will be responsible for total plant operation and maintenance of all project equipment and monitoring equipment

Metering system

The metering system for the waste heat based power plant shall consist of

- In house metering system of LMEL (for metering the generation of power, auxiliary consumption, In-house consumption and LMEL meters to monitor the export of power to third party)
- Export electricity meters of MSEDCL grid.
- Flow meters for monitoring steam flow from WHRBS/other boilers
- Flow meter for steam inlet to turbine.
- Flow meters on waste gas duct.
- Steam Temperature gauge for WHRB boiler/other boiler outlets and at inlet of TG
- Steam Pressure gauge for WHRB boiler/other boiler and at inlet of TG

Calibration

All the metering devices shall be calibrated at regular intervals so that the accuracy of measurement is ensured.

SECTION D. Data and parameters

D.1. Data and parameters fixed ex ante or at renewal of crediting period

(Copy this table for each piece of data and parameter.)

Data / Parameter:	$EF_{Elec\ i,j,y}$
Unit:	tCO_2/MWh
Description:	The CO_2 Emission factor for the grid displaced due to project activity, during year y.
Source of data:	CEA CO_2 baseline database version 4.0, Oct 2008.
Value(s) applied):	0.8032

Purpose of data:	For calculating baseline emissions.
Additional comment:	Calculated value for $EF_{Elec\ y}$ =0.8032 tCO_2/MWh is fixed Ex-ante for entire credit period.

Data / Parameter:	$Q_{WCM,BL}$
Unit:	Nm^3/ year
Description:	Average quantity of WECM i.e. waste gas released in atmosphere in three years prior to start of the project activity.
Source of data:	Actual production data of LMEL facility
Value(s) applied):	$1.068*10^9$
Purpose of data:	For calculation of baseline cap f_{cap} used in calculating baseline emissions.
Additional comment:	

Data / Parameter:	$d_{wcm,BL}$
Unit:	Kg/Nm^3
Description:	Density of WECM i.e. waste flue gases
Source of data:	Process data sheets for waste heat recovery boilers at LMEL by process design licensor M/s ERK Eckrokessel GmbH.
Value(s) applied):	1.335 kg/Nm^3 for WECM from 100TPD kiln and 1.3649 kg/Nm^3 for WECM from 500 TPD kiln.
Purpose of data:	For calculating mass flow rate of waste gas used in calculating baseline emissions.
Additional comment:	

D.2. Data and parameters monitored

(Copy this table for each piece of data and parameter.)

Data / Parameter:	$Q_{WCM,y}$
Unit:	Nm3/year
Description:	Quantity of waste gas used to generate electricity during the year y
Measured/ Calculated / Default:	calculated
Source of data:	Individual WHR boiler log book records for each kiln mentioning the waste gas generation quantity in Nm^3.
Value(s) of monitored parameter:	1,255,085,833 Nm3 for monitoring period.

Monitoring equipment:	The monitoring point is after the boiler's ESP as no meter is suitable for metering the high temperatures waste flue gases at temperatures of 950 deg c before boiler inlet. Therefore the metering is done after the WHR boiler exit at 140 deg centigrade. The flow meter is calibrated according to temperature and pressure of WECM. Type of meter: Ultrasonic Make: GE Sensing Frequency of data measurement : On continuous basis Recording frequency : On hourly basis in logbook Responsible Person for recording data: Shift Engineer- operations Accuracy : +/- 2% as provided by GE Specifications
Measuring/ Reading/ Recording frequency:	The difference between end reading and start reading of the day is taken to arrive at the day's flow of flue gas. The total quantity per year is calculated using daily record.
Calculation method (if applicable):	Mass of waste gas is calculated by multiplying the Nm^3 quantity of gas with density at NTP conditions. Density of waste gas at NTP conditions is provided in section D.2 under parameter "$d_{wcm,BL}$" above
QA/QC procedures:	Meters are calibrated once every year to maintain the required accuracy in data measurement.
Purpose of data:	For calculation of baseline cap f_{cap} used in calculating baseline emissions
Additional comment:	Data will be archived for 12 years

Data / Parameter:	$EG_{i,j,y}$
Unit:	MWh/yr
Description:	Quantity of electricity supplied to the recipient plants by generator which in the absence of project activity would have been sourced from grid during the year
Measured/ Calculated / Default:	The quantity of electricity supplied to the recipient facility is calculated from metered values of gross electricity generation minus auxiliary consumption of power plant. i.e. $EG_{gross} - EG_{Auxilary}$
Source of data:	1) Recipient plants records maintained in log book (i.e. LMEL and Power trading company receiving the surplus electricity from project activity) and 2) Generation plant i.e. LMEL measurement records as maintained in log book.
Value(s) of monitored parameter:	144,095.2 for monitoring period
Monitoring equipment:	Meter details: Me1 - Generator end, Type- E3-M Premier, Make-SEMS Me2 - Auxiliary consumption meter (4 numbers), Type-Alpha M++, Make: Elster Me4 - Export meter, Type – Alpha M++, Make: Elster Me3 - In house LMEL consumption meter, Type-Alpha M++, Make: Elster
Measuring/ Reading/ Recording frequency:	Log book of hourly reading is signed by plant manager daily. The difference between end reading and start reading of the day is taken to arrive at the day's energy generation and export data. The meters reading will be available on DCS continuously or DMRI data from Energy meter is uploaded to Elster's (ABB) Pearl Reporting Software and report is generated and same will be transferred to log book to be maintained by shift engineer, approved by shift in charge daily

Calculation method (if applicable):	Power plant has been provided with four meters for metering the auxiliary consumption and one meter for metering the gross energy generation. The location of meters is provided in project boundary diagram in section B.3 of PDD. 1) Gross generation "EG_{gross}" is metered by "Me1" 2) Auxiliary consumption "$EG_{Auxilary}$" is metered by "Me2" which is sum of readings of "Me2A", "Me2B", "Me2C", "Me2D" sub-meters. This calculation is cross checked by sum of export electricity metered by energy meter "Me4" and in house consumption electricity meter "Me3". Further Export meter "Me4" value can be cross checked with official MSEDCL meter used for billing. Frequency of data measurement : On continuous basis Recording frequency : On hourly basis in logbook Responsible Person for recording data: Shift Engineer- operations Accuracy : +/- 0.2%
QA/QC procedures:	Quality control of monitored data from energy meters will be ensured as the meters will undergo calibration once every year.
Purpose of data:	For calculating $EG_{j,y}$ used in calculation of base line emissions
Additional comment:	Data will be archived for 12 years

Data / Parameter:	$EG_{j,y}$
Unit:	MWh
Description:	Quantity of electricity supplied to recipient facilities (i.e. LMEL and Power Trading Company) by the project activity during the year y
Measured/ Calculated / Default:	Calculated.
Source of data:	Recipient plants records maintained in log book at LMEL facility (i.e. LMEL and Power trading company receiving the surplus electricity from project activity)
Value(s) of monitored parameter:	90,630.11 for monitoring period
Monitoring equipment:	Not applicable
Measuring/ Reading/ Recording frequency:	Log book of hourly reading is signed by plant manager daily. The difference between end reading and start reading of the day is taken to arrive at the day's to arrive at the day's energy. The records and monitoring procedure will be same as stated in "EGi,j,y" above.
Calculation method (if applicable):	Calculated by using the following formula $EG_{j,y} = f_{WCM} * EG_{i,j,y}$ where $f_{WCM} = ST_{whr,y} / ST_{whr,y} + ST_{other,y}$ $ST_{whr,y}$ = energy content of the steam generated by WHRB fed into turbine via common steam header $ST_{other,y}$ = energy content of the steam generated by other boiler FBCB fed into turbine via common steam header
QA/QC procedures:	Quality control of monitored data from energy meters will be ensured as the meters will undergo calibration once every year.
Purpose of data:	For calculating base line emissions
Additional comment:	Data will be archived for 12 years

Data / Parameter:	$EG_{export,y}$
Unit:	MWh
Description:	Quantity of electricity supplied to the recipient plants by generator which in the absence of project activity would have been sourced from grid during the year y
Measured/ Calculated / Default:	measured
Source of data:	Recipient plants records maintained in log book at LMEL facility (i.e. LMEL and Power trading company receiving the surplus electricity from project activity)
Value(s) of monitored parameter:	144,095.2 for monitoring period
Monitoring equipment:	Internal captive consumption of LMEL will be metered via meter "Me3". Surplus export of power is exported to power trading company and metered via meter "Me4". Export meter Me4 value can be cross checked with official MSEDCL meter used for billing installed in plant premises. Meter details: Me4 - Export meter, Type- Alpha M++, Make : Elster Accuracy of Meter : 0.2%
Measuring/ Reading/ Recording frequency:	Log book of hourly reading is signed by plant manager daily. The difference between end reading and start reading of the day is taken to arrive at the day's energy. The meters reading will be available on DCS continuously and same will be transferred to log book to be maintained by shift engineer, approved by shift in charge daily.
Calculation method (if applicable):	Not applicable
QA/QC procedures:	Quality control of monitored data from energy meters will be ensured as the meters will undergo calibration once every year.
Purpose of data:	To cross check $EG_{i,j,y\ y}$ used in calculation of base line emissions
Additional comment:	Data will be archived for 12 years

Data / Parameter:	$Q_{whr\ Steam}$
Unit:	tonnes/hr
Description:	Quantity of steam from WHRB used for electricity generation.
Measured/ Calculated / Default:	.calculated
Source of data:	LMEL Plant WHR boilers log book records for 5 WHR boilers on 4x100 TPD and 1x500 TPD kilns
Value(s) of monitored parameter:	479,064.3 for monitoring period

Monitoring equipment:	Quantity of steam generation from all WHR boilers will be individually monitored by electronic steam flow meters. Instrument type: Smart Transmitter with out put 4-20 MA analogue signal going to DCS. Make: Yokogwa Frequency of data measurement : On continuous basis Recording frequency : On hourly basis in logbook Responsible Person for recording data: Shift Engineer- operations Accuracy : +/- 0.2% as provided by supplier
Measuring/ Reading/ Recording frequency:	Log book of hourly reading is signed by plant manager daily. The difference between end reading and start reading of the day is taken as the day's generation of steam. The log book total can be cross checked with totalised data provided in the instrument.
Calculation method (if applicable):	If metered value is m^3/h then steam density from steam tables will used to calculate kgs/h. Sum of each meter reading is done to arrive at value.
QA/QC procedures:	Records will be maintained for 12 years as required. If metered value is m^3/h then steam density from steam tables will used to calculate kgs/h.
Purpose of data:	To calculate f_{WCM}" used in calculating baseline emissions.
Additional comment:	Data will be archived for 12 years

Data / Parameter:	$Q_{Other\ Steam(FBC\ Steam)}$
Unit:	Tonnes/hr
Description:	Quantity of steam from other boilers used for electricity generation.
Measured/ Calculated / Default:	Measured.
Source of data:	LMEL Plant 90 TPH FBC boilers log book records.
Value(s) of monitored parameter:	241,091.2 for monitoring period
Monitoring equipment:	Quantity of steam generation from FBC boiler will be monitored by electronic steam flow meters. Instrument type: Smart Transmitter with out put 4-20 MA analogue signal going to DCS. Make: Yokogwa Frequency of data measurement : On continuous basis Recording frequency : On hourly basis in logbook Responsible Person for recording data: Shift Engineer- operations Accuracy : +/- 0.2% as provided by supplier
Measuring/ Reading/ Recording frequency:	Log book of hourly reading is signed by plant manager daily. The difference between end reading and start reading of the day is taken as the day's generation of steam. The log book total can be cross checked with totalised data provided in the instrument.
Calculation method (if applicable):	Not applicable
QA/QC procedures:	Calibration of meter is carried out once a year. QA/QC of monitoring equipment will be maintained.
Purpose of data:	To calculate f_{WCM}" used in calculating baseline emissions.
Additional comment:	Data will be archived for 12 years

Data / Parameter:	$ST_{whr,y}$
Unit:	TJ
Description:	Energy content of Steam generated by WHRBs fed to turbine via common steam header
Measured/ Calculated / Default:	Calculated.
Source of data:	$Q_{whr\ Steam}$ *from log books* as described above Steam and feed water enthalpy will be taken from steam tables from the link http://www.spiraxsarco.com/resources/steam-tables/superheated-steam.asp .
Value(s) of monitored parameter:	1373.00 for monitoring period
Monitoring equipment:	Not Applicable.
Measuring/ Reading/ Recording frequency:	Daily/hourly
Calculation method (if applicable):	Enthalpy of steam fed to turbine from the WHR boilers is calculated by taking the difference of enthalpy of steam and enthalpy of feed water. Enthalpy of steam from WHR boiler will be taken at average steam pressure and temperature and of the day. Also feed water enthalpy at average feed water temperature of the day and will be taken from steam tables from the link http://www.spiraxsarco.com/resources/steam-tables/superheated-steam.asp $ST_{whr,y} = Q_{whr\ Steam}$ (Enthalpy of steam from WHR boiler will be taken ataverage steam pressure and temperature and of the day- feed water enthalpy at average feed water temperature of the day)
QA/QC procedures:	Not applicable.
Purpose of data:	To calculate f_{WCM}" used in calculating baseline emissions.
Additional comment:	Data will be archived for 12 years

Data / Parameter:	$ST_{other,y}$
Unit:	TJ
Description:	Energy content of Steam generated by FBC fed to turbine via common steam header
Measured/ Calculated / Default:	Calculated.
Source of data:	$Q_{Other\ Steam(FBC\ Steam)}$ *from log books* as described above Steam and feed water enthalpy will be taken from steam tables from the link http://www.spiraxsarco.com/resources/steam-tables/superheated-steam.asp .
Value(s) of monitored parameter:	691.0 for monitoring period
Monitoring equipment:	Not Applicable.
Measuring/ Reading/ Recording frequency:	Daily/hourly

Calculation method (if applicable):	Enthalpy of steam fed to turbine from the WHR boilers is calculated by taking the difference of enthalpy of steam and enthalpy of feed water. Enthalpy of steam from WHR boiler will be taken at average steam pressure and temperature and of the day. Also feed water enthalpy at average feed water temperature of the day and will be taken from steam tables from the link http://www.spiraxsarco.com/resources/steam-tables/superheated-steam.asp $ST_{whr,y} = Q_{whr\ Steam}$ (Enthalpy of steam from WHR boiler will be taken ataverage steam pressure and temperature and of the day- feed water enthalpy at average feed water temperature of the day)
QA/QC procedures:	Not applicable.
Purpose of data:	To calculate f_{WCM}" used in calculating baseline emissions.
Additional comment:	Data will be archived for 12 years

Data / Parameter:	$t_{whrsteam}$ / $t_{othersteam}$
Unit:	Deg C
Description:	Steam temperature at inlet to Steam turbine generator.
Measured/ Calculated / Default:	.measured
Source of data:	LMEL Plant Records
Value(s) of monitored parameter:	480.28 for monitoring period
Monitoring equipment:	Direct measurement. Instrument type: Smart Transmtter with out put 4-20 MA analogue signal going to DCS. Make: Yokogwa Frequency of data measurement : On continuous basis Recording frequency : On hourly basis in logbook Responsible Person for recording data: Shift Engineer- operations Accuracy : +/- 0.2% as provided by supplier
Measuring/ Reading/ Recording frequency:	Daily/hourly
Calculation method (if applicable):	Not applicable
QA/QC procedures:	Calibration of transmitter is carried out once a year. QA/QC of monitoring equipment will be maintained.
Purpose of data:	To calculate $ST_{whr,y}$ $ST_{whr,y}$ used to calculate f_{WCM}" used in calculating baseline emissions
Additional comment:	Data used for referring steam table for calculating steam enthalpy. Records will be maintained for 12 years as per CDM requirement.

Data / Parameter:	$P_{whr\ steam}$/ $P_{other\ steam}$
Unit:	Kg/cm^2 abs
Description:	Steam pressure at inlet to STG

Measured/ Calculated / Default:	Measured
Source of data:	LMEL Plant Records.
Value(s) of monitored parameter:	62.10 for monitoring period
Monitoring equipment:	Direct measurement. Instrument type: Smart Transmtter with out put 4-20 MA analogue signal going to DCS. Make: Yokogwa Frequency of data measurement : On continuous basis Recording frequency : On hourly basis in logbook Responsible Person for recording data: Shift Engineer- operations Accuracy : +/- 0.2% as provided by supplier .
Measuring/ Reading/ Recording frequency:	Daily/hourly
Calculation method (if applicable):	Not applicable
QA/QC procedures:	Calibration of transmitter is carried out once a year. QA/QC of monitoring equipment will be maintained
Purpose of data:	To calculate $ST_{whr,y}$ $ST_{whr,y}$ used to calculate f_{WCM}" used in calculating baseline emissions
Additional comment:	Data used for referring steam table for calculating steam enthalpy. Records will be maintained for 12 years as per CDM requirement.

Data / Parameter:	T_{BFW}
Unit:	Deg C
Description:	Steam temperature at inlet to Steam turbine generator.
Measured/ Calculated / Default:	.measured
Source of data:	LMEL Plant Records
Value(s) of monitored parameter:	119.89 for monitoring period
Monitoring equipment:	Direct measurement. Instrument type: Smart Transmtter with out put 4-20 MA analogue signal going to DCS. Make: Yokogwa Frequency of data measurement : On continuous basis Recording frequency : On hourly basis in logbook Responsible Person for recording data: Shift Engineer- operations Accuracy : +/- 0.2% as provided by supplier
Measuring/ Reading/ Recording frequency:	Daily/hourly
Calculation method (if applicable):	Not applicable
QA/QC procedures:	Calibration of transmitter is carried out once a year. QA/QC of monitoring equipment will be maintained.
Purpose of data:	To calculate $ST_{whr,y}$ $ST_{whr,y}$ used to calculate f_{WCM}" used in calculating baseline emissions
Additional comment:	Data used for referring steam table for calculating steam enthalpy. Records will be maintained for 12 years as per CDM requirement.

D.3. Implementation of sampling plan

Not applicable as sampling approach is not followed.

SECTION E. Calculation of emission reductions or GHG removals by sinks

E.1. Calculation of baseline emissions or baseline net GHG removals by sinks

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Ex-ante Calculation of Baseline Emissions:

To calculate the baseline emissions equation no. 3 as stated in section B.6.1 above is followed. The baseline emissions are due to electricity displaced by the project activity in NEWNE grid. The baseline emissions for the year y i.e. "$BE_{Elec,y}$" are determined as follows.

$$BE_{Elec,y} = f_{cap} * f_{wcm} * \sum_{j} \sum_{i} (EG_{i,j,y} * EF_{Elec,i,j,y})$$

Calculation of each of the component of above formulae is provided below.

Calculation of Baseline cap " f_{cap}" using equation 38 of ACM 0012 Version 4

$$f_{cap} = \frac{Q_{WCM,BL}}{Q_{WCM,y}}$$

$Q_{WCM,BL}$ = Quantity of waste gas generated prior to start of the project activity,Nm3
$Q_{WCM,y}$ = Quantity of waste used for energy generation during the year,Nm3

Calculation of fraction of total electricity generated by the project activity using waste energy " f_{wcm}":

Calculation of fraction "f_{WCM}" as per equation 39 of ACM0012 version 4 to calculate electricity supplied by waste heat is as below.

$$f_{WCM} = \frac{ST_{whr,y}}{ST_{whr,y} + ST_{other,y}}$$

(Equation no. 39 as per methodology)

Where,

$ST_{whr,y}$ = energy content of the steam generated by WHRB fed into turbine via common steam header

$ST_{other,y}$ = energy content of the steam generated by other boilers fed into turbine via common steam header

Following table provide the calculation of **"*fwcm*"**. All the steam enthalpy data is taken from following web link having the standard steam table.

http://www.spiraxsarco.com/resources/steam-tables/superheated-steam.asp

Enthalpy of feed water is taken from following web link.
http://www.spiraxsarco.com/resources/steam-tables/sub-saturated-water.asp

Emission Reductions

Emission reductions for the project activity are calculated by using the equations no. 42 of the methodology which is as stated below

$$ER_y = BE_y - PE_y$$

Where

ER_y = Total emission reductions tonnes/year

BEy= BE $_{Elec,y}$ i.e. Baseline emissions for the project activity during the year y

PE $_y$ =0

As sample calculation we give below for the values calculated for the monitoring period.

S.No	Parameter	Value
1	Average steam pressure	62.1 kg/cm2
2	Average steam temperature	480.28 C
3	Average Boiler feed water temperature	119.89 C
4	Enthalphy of steam at average pressure and temperature	0.003374 TJ/tonne
5	Enthalphy of BF water at average pressure and temperature	0.000508 TJ/tonne
6	Enthalphy provided in boiler = 0.003362- 0.000564	0.002866 TJ/tonne
7	WHRB steam generated in the month *Q $_{whr\ Steam}$*	*479,064.3 Tonnes*
8	FBC steam generated in the month *Q $_{other\ Steam}$*	*241,091.2Tonnes*
9	Enegy content in WHRB steam *ST $_{whr,y}$*	*479,064.3 x*0.002866 = 1373 TJ
10	Energy content in FBC steam *ST $_{other,y}$*	*241,091.2X*0.002866 =691 TJ
11	Calculation of fraction $f_{WCM} = \frac{ST_{whr,y}}{ST_{whr,y} + ST_{other,y}}$	1373/(1373+691) = 0.66522
12	Quantity of electricity supplied to recipient plants *EG $_{i,j,y}$*	*144,095.2 MWh*
13	Quantity of electricity supplied to recipient plants by project activity *$EG_{j,y} = f_{wcm}$ x EG $_{i,j,y}$*	0.66522x*144,095.2* *= 6263.31 Mwh*
14	*Quantity of waste gas used for electricity generation Q $_{WCM,y}$*	*125,508,5833 Nm3*
15	*Quantity of waste gas used for electricity generation Q $_{WCM,BL}$*	*118,666,6667 Nm3*
16	Calculation of baseline cap $f_{cap} = \frac{Q_{WCM,BL}}{Q_{WCM,y}}$	*118,666,6667/125,508,5833* *= 0.945486*
17	Ex ante CO_2 Emission factor for the grid displaced d project activity, during year y. *$EF_{Elec\ i,j,y}$*	*0.8032*
18	Calculation of baseline emissions for the month of July2013 $BE_{Elec,y} = f_{cap} * f_{wcm} * \sum_j \sum_i (EG_{i,j,y} * EF_{Elec,i,j,y})$	0.945486x0.66522x*144,095.2x* 0.8032 = 72,794.1034 tCO_2e
19	*Project emissions PE $_y$*	0
20	Leakage	0
21	*Emission reductions ER_y = BE_y - PE $_y$*	72794.1034 -0-0 =72,794.1034 tCO_2e

E.2. Calculation of project emissions or actual net GHG removals by sinks

In project activity there is no consumption of auxiliary fuel to supplement waste gas/ heat. Also project activity does not involve the gas cleaning before being used for generation of energy hence there is no electricity consumption required as well as no other supplementary electricity consumption is involved in project activity. Therefore in line with requirement of methodology project emissions are not applicable for the project in activity

Therefore, ***PEy=0***

E.3. Calculation of leakage

Leakage is not applicable as per ACM0012 version 4 of methodology

E.4. Summary of calculation of emission reductions or net anthropogenic GHG removals by sinks

Item	Baseline emissions or baseline net GHG removals by sinks (t CO_2e)	Project emissions or actual net GHG removals by sinks (t CO_2e)	Leakage (t CO_2e)	Emission reductions or net anthropogenic GHG removals by sinks (t CO_2e)
Total	72,794	0	0	72,794

E.5. Comparison of actual emission reductions or net anthropogenic GHG removals by sinks with estimates in registered PDD

Item	Values estimated in ex-ante calculation of registered PDD	Actual values achieved during this monitoring period
Emission reductions or GHG removals by sinks (t CO_2e)	106,421	72,794

E.6. Remarks on difference from estimated value in registered PDD

The actual emission reductions are 72,794 tCO_2e against estimated reductions at the time of registration of 106,421 tCO_2e which is less by 31.6%. This is due to operational reasons as the waste energy available has lot of variations in flow and temperature and also due to shut downs of kilns.

E.7. Actual emission reductions or net anthropogenic GHG removals by sinks during the first commitment period and the period from 1 January 2013 onwards

GHG removals by sinks during the first commitment period and the period from 1 January 2013 onwards

Item	Actual values achieved up to 31 December 2012	Actual values achieved from 1 January 2013 onwards
Emission reductions or GHG removals by sinks (t CO_2e)	Not applicable	72,794

Appendix 1. Contact information of project participants and responsible persons/ entities

Project participant and/or responsible person/ entity	☐ Project participant **X** Responsible person/ entity for completing the CDM-MR-FORM
Organization name	Lloyds Steel Industries Division of Uttam Value Steels Limited
Street/P.O. Box	Senapati Bapat Marg
Building	Trade World "C" Wing
City	Mumbai
State/Region	Maharashtra
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Contact person	
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Middle name	Mallikarjun
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