



**Monitoring report form for CDM project activity  
(Version 06.0)**

*Complete this form in accordance with the instructions attached at the end of this form.*

**MONITORING REPORT**

<b>Title of the project activity</b>	The TIMARPUR-OKHLA Waste Management Company Pvt Ltd's (TOWMCL) integrated waste to energy project in Delhi	
<b>UNFCCC reference number of the project activity</b>	1254	
<b>Version number of the PDD applicable to this monitoring report</b>	14	
<b>Version number of this monitoring report</b>	01	
<b>Completion date of this monitoring report</b>	12/02/2018	
<b>Monitoring period number</b>	4	
<b>Duration of this monitoring period</b>	10/03/2016 – 09/03/2017	
<b>Monitoring report number for this monitoring report</b>	01	
<b>Project participants</b>	TIMARPUR-OKHLA Waste Management Company Pvt. Ltd (TOWMCL)	
<b>Host Party</b>	India	
<b>Sectoral scopes</b>	Sectoral scope 13 and 1	
<b>Applied methodologies and standardized baselines</b>	Applied methodology: AM0025 (version 06) "Avoided emissions from organic waste through alternative waste treatment process"  Standardized baseline: Not applicable	
<b>Amount of GHG emission reductions or net anthropogenic GHG removals achieved by the project activity in this monitoring period</b>	Amount achieved before 1 January 2013	Amount achieved from 1 January 2013
	0	70,933
<b>Amount of GHG emission reductions or net anthropogenic GHG removals estimated ex ante for this monitoring period in the PDD</b>	345,833	

## SECTION A. Description of project activity

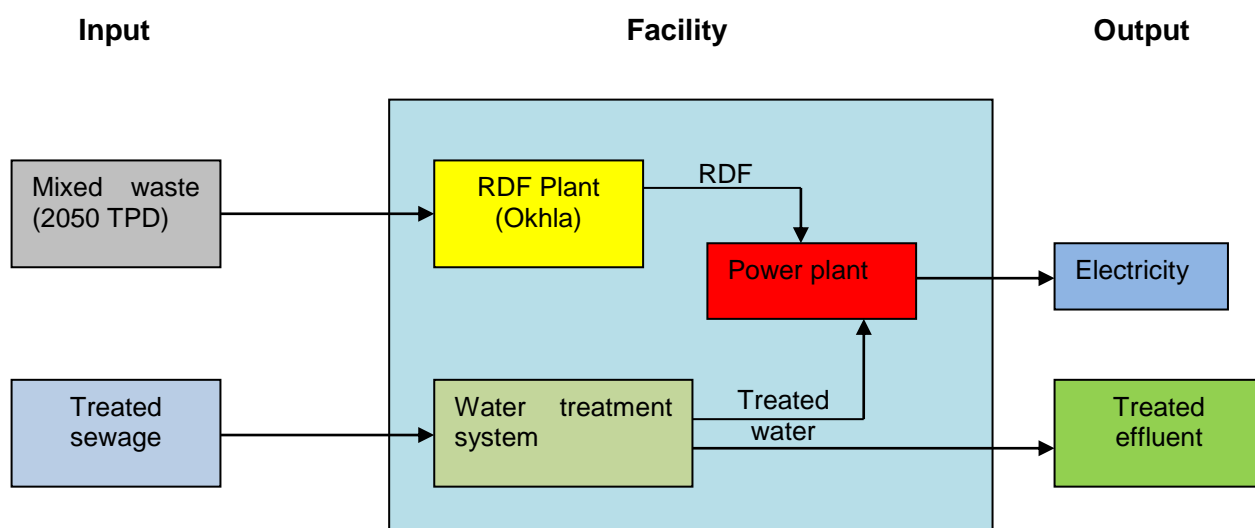
### A.1. General description of project activity

The purpose of the project activity is to address a critical environmental problem faced in solid waste management by both Municipal Corporation of Delhi (MCD) and New Delhi Municipal Council (NDMC). This will contribute in significant reduction of greenhouse gas emissions, which otherwise would have taken place in form of methane emission from solid waste being dumped in the open landfill (dump) sites. In addition, the project activity will also address to some extent the acute energy crisis faced by northern India by producing 20.9 MW of clean electricity that will be supplied to the state electricity grid. By displacing carbon intensive grid energy with a renewable, carbon neutral energy source, the project activity further reduces carbon dioxide emissions over the project life. Replicable technology, environmental, and sustainable development benefits also result from the project activity. These include: introducing efficient municipal waste management technology; reducing power shortages in the state of Delhi India; and, fostering sustainable economic growth through promoting energy self-sufficiency and proper waste management in Delhi, India.

The project was earlier envisaged to be developed at two different location, i.e. Timarpur and Okhla. About 650 Tonne Per Day (TPD) of Municipal Solid Waste (MSW) was envisaged to be processed at the Timarpur site while 1300 TPD of MSW was envisaged to be processed at Okhla site for the preparation of Refuse Derived Fuel (RDF). Additionally, 100 TPD of green waste (waste collected from garden like dry leaves, cut grass, etc) was to be utilized at Okhla site for generation of Compost and biogas through composting and biomethanation plants respectively. The PP had also envisaged to generate electricity to the tune of 16 MW by utilizing the RDF produced from the project activity. However the project design has been changed over the period of time and PP sought the post registration change (Data before approval of the request for post-registration changes on 24 Jun 2014), the revised project design is discussed below:

The project activity involves processing of 2050 TPD of MSW and installation of 20.9 MW waste to energy plant at the Okhla site. At a PLF of 90% the gross energy generation is expected to be 151.30 GWh/year considering an operation period of 335 days. Auxiliary consumption is envisaged to be 18% of the total power produced.

#### ***Design implemented***



The project activity includes one bleed cum condensing TG set of 20.9MW capacity and three boilers with individual capacity of 26 TPH, amounting to a total of 78 TPH, and a fourth boiler with 26 TPH capacities shall be installed in second phase. One deaerator (capacity of 72 m<sup>3</sup>/hr), one boiler feed water pump (capacity of 40 m<sup>3</sup>/hr), an Air cooled condenser (capacity of 9.5 TPH) and a cooling tower (capacity 600 m<sup>3</sup>/hr) is installed in the project activity. 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. The specification of major equipment deployed for the project activity is as follows:

Boiler – Technical Specification	
Description	
No of boilers	4
Steam generating capacity of each boiler (tons per hour)	26
Steam pressure at super-heated outlet (kg/cm <sup>2</sup> )	41
Steam temperature at super-heated outlet (° C)	400 ± 5
Feed water temperature at economizer inlet (° C)	130

Turbine – Technical Specification	
Turbine make	Siemens Limited
Serial No.	3,20,11,287
Speed	6800 RPM
Capacity of Turbine (MW)	20.9
Steam pressure at the inlet (kg/cm <sup>2</sup> )	38
Steam temperature at the inlet (° C)	395
Turbo-Generator – Technical Specification	
Turbo-Generator make	TD Power Systems Pvt. Ltd.
Turbo-Generator Serial No.	2K10121323-01
Capacity of Turbo generator (MW)	21

The project activity has been implemented as per the design and was operational during the monitoring period. The Project activity has been successfully commissioned on 27/01/2012 (Date of grid synchronization of first Boiler) by TOWMCL at Okhla, Delhi, and is operational since the day of commissioning. The project activity is in operation since the grid synchronization of the first Boiler i.e. 27/01/2012; the schedule of project implementation is as follows:

Project Implementation Details
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Major Equipment	Make	Number	Important Dates
Turbine	Siemens	32011287	Final Test: 25/01/2012
Generator	Greaves Cotton Ltd.	3325121103073	Final stability test: 26/01/2012
Boiler-1	HBG	Registration No. D2243	Grid Synchronization: 27/01/2012 Handover to project proponent: 10/03/2012
Boiler-2	HBG	Registration No. D2244	Grid Synchronization: 15/02/2012 Handover to project proponent: 10/03/2012
Boiler-3	HBG	Registration No. D2245	Grid Synchronization: 18/05/2012 Handover to project proponent: 25/05/2012
Boiler-4	Under planning phase yet to be commissioned		

### Water System:

The main source of raw water available for the power plant is treated sewage water from adjacent sewage treatment plant (STP) of Delhi Jal Board (DJB). The STP water from DJB is being treated at project activity site by STP plant of 42m<sup>3</sup>/hr capacity, the STP water first clarified in a clarifier and clarified water is stored in a storage tank (equalization tank). From this the cooling tower make up will be provided after softening. Clarified water is further treated in a series of filters and fed to the RO plant (10m<sup>3</sup>/hr). Plant service water shall also be obtained after treatment of treated sewage to the desired norms. The rejects (water) of RO plant, turbine and evaporator condenser water is collected in tank and after PH normalization used for miscellaneous activity like gardening, cleaning etc. within the plant premises.

The leachate generated from the plant is being treated at leachate treatment plant of capacity 100KLD; multiple (triple) effect evaporators are treating the leachate and slurry is being burnt out in the boilers after sludge drying.

This is the third monitoring period for the project activity. Details of the previous and present monitoring period (duration and emission reduction achieved) are as follows:

Monitoring Period details	
First Monitoring Period	From 30/03/2011 to 31/08/2012
CER issued	12,478
Second Monitoring Period	From 01/09/2012 to 09/03/2015

CERs	246,180
Third Monitoring Period	From 10/03/2015 to 09/03/2016
CERs	-
Fourth Monitoring Period	From 10/03/2016 to 09/03/2017
CERs	70,933

## A.2. Location of project activity

(a) Host Party: India

(b) Region/state/province etc: Delhi

(c) City/town/community, etc: Okhla

(d) Physical/geographical location: The project activity is located in the waste management complex at Okhla in New Delhi, India. The nearest international airport is Indira Gandhi International airport. The location detail of the project activity is given below:

Location	Latitude	Longitude
Okhla (New Delhi)	28° 33'	77° 17'

## A.3. Parties and project participants

Parties involved	Project participants	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
India (Host country)	M/s TIMARPUR-OKHLA Waste Management Company Pvt Ltd	No

## A.4. Reference to applied methodologies and standardized baselines

Applied Methodology: Approved baseline methodology AM0025 (version 06)<sup>1</sup>; “Avoided emissions from organic waste through alternative waste treatment processes”

### Reference:

- “Consolidated baseline methodology for grid-connected electricity generation from renewable sources” (ACM0002),
- Small-scale methodologies 1.D “Renewable electricity generation for a grid”

**Methodology tool:** “Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site<sup>2</sup>” (Annex 14, EB-26)

<sup>1</sup> [http://cdm.unfccc.int/filestorage/C/D/M/CDMWf\\_AM\\_APK6RSOHXNSZ6B307M6IYIHV8IEK/AM0025ver06\\_for\\_the\\_web.pdf?t=b3F8bzA3bDFkfDDKVUFRUxrhNE13tzKhG8ix](http://cdm.unfccc.int/filestorage/C/D/M/CDMWf_AM_APK6RSOHXNSZ6B307M6IYIHV8IEK/AM0025ver06_for_the_web.pdf?t=b3F8bzA3bDFkfDDKVUFRUxrhNE13tzKhG8ix)

<sup>2</sup> [https://cdm.unfccc.int/EB/026/eb26\\_repan14.pdf](https://cdm.unfccc.int/EB/026/eb26_repan14.pdf)

**A.5. Crediting period type and duration**

A fixed crediting period of 10 years has been chosen for the project activity; the start date of crediting period is 30/03/2011 and duration of crediting period is from 30/03/2011 to 29/03/2021.

**SECTION B. Implementation of project activity****B.1. Description of implemented project activity**

The project activity has been implemented as described in the above section. The project activity by TOWMCL will process 2050 TPD of municipal solid waste generated in the region of Delhi (MCD and NDMC area) to produce RDF. The RDF further utilized to produce electricity, which will be fed into the state electricity grid. The details of the implemented technology and technical specification of the major equipment has been discussed in the previous section.

The first boiler of the project activity has been commissioned on 10/03/2012 and is operational since then; followed by commissioning of the two more boilers. However, fourth boiler is in planning stage.

The project activity was operational during the monitoring period i.e. 10/03/2016-09/03/2017; however, the turbine operation was shutdown at certain instances due to unforeseen instances (mainly due to grid failure and technical reasons). The outage taken by the turbine (shutdown summary) during the monitoring period is as follows:

Plant (Power Generation) Outage during 10/03/2016-09/03/2017			
S.No.	Period	Shutdown Time	Reason
		hrs:mm:ss	
1	17/3/2016	00:15:00	Grid Fail
2	17/3/2016	00:14:00	High Pressure
3	18/3/2016	00:12:00	ACC Breaker Problem
4	19/3/2016	00:25:00	ACC Breaker Problem
5	21/3/2016	00:13:00	Grid Fail
6	16-04-2016	00:16:00	Grid Fluctuation
7	16-04-2016	02:15:00	PCC-3 Breaker problem
8	16-04-2016	01:27:00	Hot well level low
9	19-04-2016	00:02:00	Grid Fluctuation
10	22-04-2016	00:03:00	Grid Fluctuation
11	23-04-2016	00:02:00	Grid Fluctuation
12	27-04-2016	00:10:00	Grid Fluctuation
13	04-05-2016	01:03:00	ACB Breaker problem
14	06-05-2016	00:55:00	Grid Fail
15	16-05-2016	00:18:00	Grid Fluctuation
16	22-05-2016	00:43:00	Grid Fail
17	22-05-2016	00:21:00	Grid Fail
18	22-05-2016	00:14:00	Grid Fail
19	25-05-2016	00:10:00	Grid Fail
20	01-06-2016	04:31:00	BSES Shut Down
21	03-06-2016	00:25:00	BSES Changeover
22	03-06-2016	00:44:00	BSES Changeover
23	04-06-2016	00:19:00	Grid Fail

24	05-06-2016	00:16:00	Grid Fluctuation
25	09-06-2016	00:06:00	Grid Fail + Turbine
26	09-06-2016	02:04:00	Grid Fluctuation
27	11-07-2016	00:16:00	Grid Fail
28	11-07-2016	00:42:00	Grid Fail
29	11-07-2016	00:03:00	Grid Fluctuation
30	11-07-2016	01:03:00	Grid Fail
31	17-07-2016	03:02:00	Grid Fail
32	19-07-2016	00:22:00	Grid Fluctuation
33	20-07-2016	00:24:00	Grid Fluctuation
34	29-07-2016	01:38:00	Grid Fluctuation
35	03-08-2016	01:18:00	Grid Fluctuation
36	24-08-2016	00:16:00	Grid Fluctuation
37	04-09-2016	00:23:00	Grid Fluctuation
38	06-09-2016	00:02:00	Grid Fluctuation
39	08-09-2016	00:04:00	Grid Fluctuation
40	08-09-2016	00:25:00	Grid Fluctuation
41	12-09-2016	00:03:00	Grid Fluctuation
42	01-10-2016	02:11:00	Grid Fail
43	03-10-2016	00:08:00	Grid Fluctuation
44	04-10-2016	00:03:00	Grid Fluctuation
45	04-10-2016	00:32:00	Grid Fluctuation
46	04-10-2016	00:25:00	Grid Fail
47	05-10-2016	05:14:00	Grid Fail
48	07-10-2016	00:35:00	Grid Fluctuation
49	08-10-2016	01:55:00	Grid Fail
50	08-10-2016	01:46:00	Grid Fluctuation
51	09-10-2016	00:39:00	Grid Fail
52	16-10-2016	00:23:00	Grid Fail
53	18-10-2016	00:19:00	Grid Fluctuation
54	22-10-2016	00:15:00	Grid Fluctuation
55	05-11-2016	00:22:00	Grid Fail
56	10-11-2016	00:03:00	Grid Fluctuation
57	10-11-2016	00:11:00	Grid Fail
58	10-11-2016	00:04:00	Grid Fluctuation
59	19-11-2016	00:18:00	Grid Fail
60	29-11-2016	00:07:00	Grid Fluctuation
61	29-11-2016	00:11:00	Grid Fail
62	29-11-2016	01:00:00	Grid Fail
63	30-11-2016	00:05:00	BSES Changeover
64	10-12-2016	00:13:00	BSES
65	10-12-2016	00:14:00	BSES
66	24-12-2016	02:06:00	Turbine tripped
67	24-12-2016	07:13:00	Turbine tripped
68	31-12-2016	00:40:00	Turbine tripped
69	04-01-2017	427:34:00	Turbine major shut down (4rth Jan to 22nd Jan)
70	05-01-2017	00:10:00	Grid Fluctuation

71	07-01-2017	00:05:00	Grid Fluctuation
72	07-01-2017	00:10:00	Grid Fluctuation
73	23-01-2017	00:21:00	Turbine tripped
74	25-01-2017	00:28:00	Turbine tripped
75	30-01-2017	01:23:00	Turbine tripped
76	10-02-2017	00:10:00	Turbine tripped
77	10-02-2017	00:38:00	Turbine unload
78	14-02-2017	00:42:00	-
79	14-02-2017	00:20:00	-
80	15-02-2017	00:12:00	-
81	17-02-2017	01:37:00	Turbine Tripped
82	20-02-2017	00:03:00	-
83	27-02-2017	00:29:00	-
84	03-03-2017	00:26:00	BSES
85	09-03-2017	00:06:00	Inst fault
		<b>104:04:00</b>	

## B.2. Post-registration changes

### B.2.1. Temporary deviations from the registered monitoring plan, applied methodologies or standardized baselines

NA

### B.2.2. Corrections

Revised PDD was submitted for prior approval along with the corrections made and the same was approved. The value of equation constants of first order decay (FOD) and fixed parameter (Methane correction factor) used for calculation of “The amount of methane that would, in the absence of the project activity, be generated from disposal of waste at the solid waste disposal site (BECH<sub>4</sub>,SWDS,y)”; as per the Methodological tool- “Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site” (Annex 14, EB-26) have been included in the PDD. Data / Parameters ( $p_{n,j,x}$ ) and ( $z_x$ ) have been included in the monitoring plan and editorial changes made under the Value(s) applied for the Parameter A<sub>i</sub>.

The value of equation constants of first order decay (FOD) and fixed parameter (Methane correction factor) used for calculation of “The amount of methane that would in the absence of the project activity be generated from disposal of waste at the solid waste disposal site (BECH<sub>4</sub>,SWDS,y)”; as per the Methodological tool- “Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site” (Annex 14, EB-26) were presented in the validated emission reduction calculation sheet however not reported in the registered PDD.

The parameter Methane correction factor (MCF) is being used to calculate “The amount of methane produced in the year y (BECH<sub>4</sub>,SWDS,y)” as per the applied methodological tool “Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site” (Annex 14 EB 26). The parameter is being validated by DoE during the registration process along with the baseline and project emission reduction calculation; however the same has not been reported in the registered PDD since it was included in the methodological tool. The project proponent would like to include the parameter in the registered PDD (revised PDD, Version 10 dated 01/08/2016). Project proponent would also like to clarify the value applied for the parameter MCF.

Methane correction factor (MCF): As per the applied methodology tool the parameter shall be sourced from IPCC 2006 Guidelines for National Greenhouse Gas Inventories. Further, in the baseline scenario solid waste being dumped in the open landfill (dump) sites i.e. an unmanaged solid waste disposal site (please also refer pre-project scenario of registered PDD). Hence the MCF value has been considered as 0.8 as per the applied methodological tool (for unmanaged



solid waste disposal sites – deep and/or with high water table. This comprises all SWDS not meeting the criteria of managed SWDS and which have depths of greater than or equal to 5 meters and/or high water table at near ground level. Latter situation corresponds to filling inland water, such as pond, river or wetland, by waste).

Further, the study conducted by Central Ground Water Board, Ministry of Water Resources (Govt. of India) on “Study of Groundwater Contamination through Landfill Site, NCT Delhi” (Annexure-1, Copy available on <http://www.cgwb.gov.in/INCGW/AL%20Ramanathan.pdf>) suggests that the groundwater level in Delhi city varies between 15 to 20 meter depth. The study also suggests that with reference to Okhla landfill, the A deep aquifer was reported by CGWB, water table was obtained at the depth of 60-80 m from ground surface.

Hence, the MCF0.8 for unmanaged solid waste disposal sites – deep and/or with high water Table is appropriate.

### B.2.3. Changes to the start date of the crediting period

The start date of the crediting period has been revised for the project activity; UNFCCC has approved the request of change of crediting period on 24/06/2014. Details of the previous and existing crediting period have been provided in the following table:

Details of Crediting Period (Existing/Previous)	
Existing Crediting Period (Changed)	30/03/2011 – 29/03/2021 (Fixed)
Previous Crediting Period (Changed from)	01/04/2009 – 31/03/2019 (Fixed)
Date of Approval	24/06/2014

### B.2.4. Inclusion of monitoring plan

The monitoring plan for the project activity has been defined in the registered PDD, hence not applicable.

### B.2.5. Permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other applied standards or tools

The project participant while implementing the project activity has not installed the bio methanation and composting process step as the project activity had adopted a better technology available which uses the heat generated in the boiler for pre heating the input waste thereby enhancing the efficiency of the boiler than that was envisaged at the time of registration of the project activity. Hence in the revised monitoring plan, monitoring of the parameters related to composting and bio methanation have not been considered and these are:

- $P_{li}$ - is the leakage of methane emissions from the anaerobic digester.
- $EF_{c,N_2O}$ -is the Emission factor for  $N_2O$  emissions from the composting process
- $EF_{N_2O}$ - Aggregate  $N_2O$  emission factor for waste incineration.
- $EF_{CH_4}$ - Aggregate  $CH_4$  emission factor for waste incineration.
- $M_{compost}$ - is the total quantity of compost produced in year
- $M_a$ - is the total quantity of methane produced by the digester in year.
- $Q_{biomass}$ - is the amount of RDF combusted in tonnes per year.
- $Km_y$ -is the distance travelled by each truck for transporting compost

In the registered PDD section B.6.2, the parameter related to emission factor of electricity grid is mentioned under both baseline emission parameters ( $CEF_{baseline}$ ) and project emission parameters ( $CEF_d$ ). Similarly,  $NCV_{fuel}$  are mentioned in the registered PDD section B.6.2 under both project emission parameters and leakage emission parameters. However, the parameters have the same values in the registered PDD under baseline/project/leakage emission parameters. In the revised PDD version 09 dated 30 January 2014 these repetitions have been avoided by retaining once under section B.6.2 of the revised PDD the parameter  $CEF_d$  that is emission factor of the grid electricity displaced by the project activity and  $NCV_{fuel}$  that is Net Calorific Value of diesel.

**RATE<sub>Compliancey</sub>**- In the revised PDD this parameter is included as a monitored parameter under section B.7.1

**EG<sub>PJ,FF,y</sub>**- Amount of electricity generated in an on-site fossil fuel fired power plant or consumed from grid in the project activity. This is measured with energy meter of accuracy class 0.2 and will be calibrated on annual basis. The recording will be done on daily basis. This parameter is now being monitored instead of  $MWh_e$  –electricity consumption mentioned in the registered PDD.

The following parameters are now proposed to be additionally monitored consequent upon the technology adopted.

- **DT<sub>y</sub>**- Average additional distance travelled by vehicle for ash and inert disposal compared to the baseline in year y is now proposed to be monitored to account for the project emission .
- Amount of RDF used outside the project boundary is proposed to be monitored based on the sale invoice. There will normally be no sale and the parameter is used for project emission calculations.
- **R<sub>n</sub>** -Weight of RDF sold offsite for which no sale invoices can be provided is also monitored .The quantity will be monitored based on weigh bridge report and is being monitored to account for project emission.
- **MC<sub>CH<sub>4</sub>,r,y</sub>** -Monitored content of methane in the stack gas from RDF combustion in year y. This will be monitored by third party on quarterly basis. This parameter is being monitored to account for project emission.
- **MC<sub>N<sub>2</sub>O,r,y</sub>**- Monitored content of nitrous oxide in the stack gas from RDF combustion in year y. This will be monitored by third party on quarterly basis. This parameter is being monitored to account for project emission.

Monitoring details were added/clarified in Table B.7.1 in for the following monitored parameters

- **R<sub>c</sub>**- Amount of RDF combusted in year, the parameter will be monitored on daily basis using load cells for the grab crane feeding waste to boiler,
- **VF<sub>consumption</sub>**- Vehicle fuel consumption in litres per kilometer for vehicle type which will be updated on an annual basis based on the latest publically available data and the conservative value will be adopted for the project and leakage emission calculations,
- **EG<sub>d</sub>**- Amount of electricity generated utilizing the RDF produced and exported to grid in the project activity during the year y which will be recorded on daily basis with the gross generation measured using meter of accuracy class 0.2. auxiliary consumption measured using meters of accuracy class 0.5,
- **A<sub>j, x</sub>**- Amount of organic waste type j prevented from disposal in the landfill in the year x (tonnes/year) which is based on the weighbridge receipt and charaterisation of waste done on quarterly basis by third party.

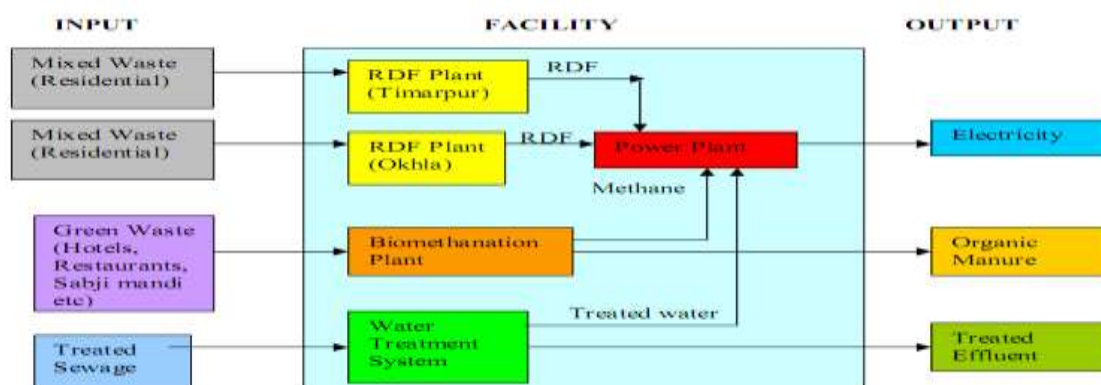
- $A_{ci,y}$ - Amount of residual waste type 'ci' from combustion of RDF which is based on the weighbridge receipt and characterization of waste done on quarterly basis by third party
- $NO_{vehicles}$ - Vehicles per carrying capacity per year .This parameter is measured on daily basis and will be cross checked with the amount of ash and inert material transported and the carrying capacity of the truck.

### B.2.6. Changes to project design

There are certain permanent changes in the project activity from the registered PDD as highlighted below:

- The project was earlier envisaged to be developed at two different location, i.e. Timarpur and Okhla. About 650 Tonne Per Day (TPD) of Municipal Solid Waste (MSW) was envisaged to be processed at the Timarpur site while 1300 TPD of MSW was envisaged to be processed at Okhla site for the preparation of Refuse Derived Fuel (RDF). Additionally, 100 TPD of green waste (waste collected from garden like dry leaves, cut grass, etc) was to be utilized at Okhla site for generation of Compost and biogas through composting and biomethanation plant respectively. The PP had also envisaged to generate electricity to the tune of 16 MW by utilizing the RDF produced from the project activity.

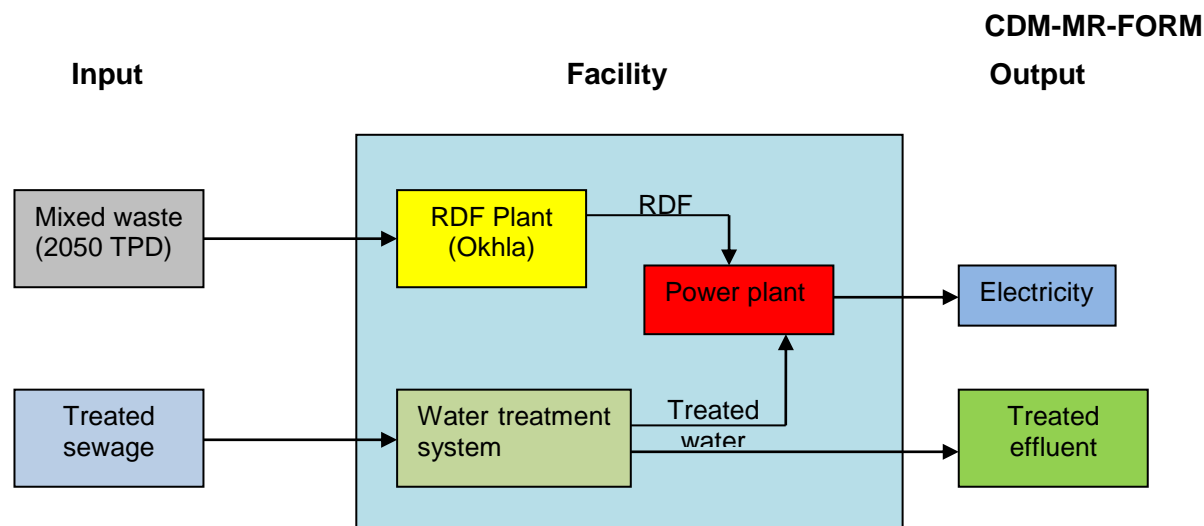
#### Earlier design



However, after accessing the success rate of existing technologies and availability of better technologies for such project activities the board took a decision to implement the project activity with a better technology (technical details are provided section A.4.3) and some design changes. The Timarpur site has been dropped from the project and the entire waste (1950 TPD) is now processed at the Okhla site. Further, the envisaged plants of biomethanation and composting are dropped as the green waste envisaged in the initial phase is not supplied to the project activity as a separate tender has been floated for the same. Instead, PP shall be now be sourcing an additional 100 TPD of MSW for the project activity. Also, since PP is implementing a better technology for waste processing and power generation, it was established that the RDF produced shall be capable of producing 20.9 MW of electricity instead of 16 MW as envisaged in the first place.

Therefore, the project activity would now involve processing of 2050 TPD of MSW to generate about 20.9 MW of power using a turbine at the Okhla site.

#### Design implemented



### SECTION C. Description of monitoring system

The monitoring plan for the project activity has been implemented as per the registered monitoring plan and discussed in the following section; further the project plant layout and schematic of monitoring equipment has been presented in the Appendix-2. The monitoring procedures of main parameters are discussed below:

**MSW Received (Amount of Fresh Waste) and No of vehicles:** The MSW is supplied by NDMC and MCS through the different size of vehicles (trucks) to the project activity site. There are 3 weighbridges have been installed at the gate to monitor the weight of incoming and outgoing vehicles (trucks) i.e. Gross weight and Tare weight of truck difference of the both is the amount of fresh waste received at the plant site. The characterization of MSW carried out on quarterly basis by the 3<sup>rd</sup> party.

**MSW Processed and combusted (Amount of RDF produced and Amount of RDF combusted):** Both the parameters are being monitored with the load cells at the MSW processing area and boiler feeder.

**Electrical Energy (Generated, Export, Import and Auxiliary consumption):** The electricity generated from the project activity is being monitored with the turbine generation meter installed at the power plant. The electricity export and import is being monitored with the export/import meter installed at the Jasola sub-station. Auxiliary Consumption at the plant is being monitored with the multiple energy meters installed at the plant.

**Stack Monitoring:** There are two stacks installed at project activity site for flue gases exhaust from Boilers. Both of the stacks are in operation; Boiler No-1 and Boiler No-2 are connected to stack-1 and Boiler No.3 has been connected to Stack-2. The location of the gas flow meters and all the monitoring equipment depicted in the Annex-II. Further, the concentration of N<sub>2</sub>O and CH<sub>4</sub> in the flue gas is being monitored on quarterly basis by 3<sup>rd</sup> party.

**Diesel consumption (on-site):** The onsite-diesel consumption is being monitored with the oil flow meter installed at diesel tank.

Details and specification of the monitoring instruments and equipment are provided in the following section of Monitoring Report.

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

As per the monitoring plan of the registered PDD; all the monitoring equipment shall be calibrated by an independent agency, which is accredited with National Accreditation Board for Testing &

Calibration Laboratories (NABL), Department of Science & Technology, and Government of India on an annual basis. If during the yearly test check, any meter is found to be beyond permissible limits of error, it would be calibrated immediately.

As per the Power Purchase Agreement (PPA), the energy exported to the state Grid is recorded from two independent meters viz., Main Meter and Check Meter and reading of main meter is used for billing. In the event of main meter not in operation / fails, the reading of the check meter shall be used for billing. Power Generation, Export & Auxiliary Consumption, fuel consumption are being recorded on regular interval, as defined in section D.7.2, and the same is being verified and approved by Manager (O&M).

### **Emergency Procedure**

Though, all the measures are taken to avoid erroneous recording of the monitoring parameters, there might be certain situations which may include failure of various metering devices. To minimize the risk of data discrepancy a set of spare for different meters are maintained at the plant site. Further, regular checking and maintenance of all metering devices is carried out by plant personals at TOWMCL to maintain highest level of accuracy.

### **Roles and responsibilities**

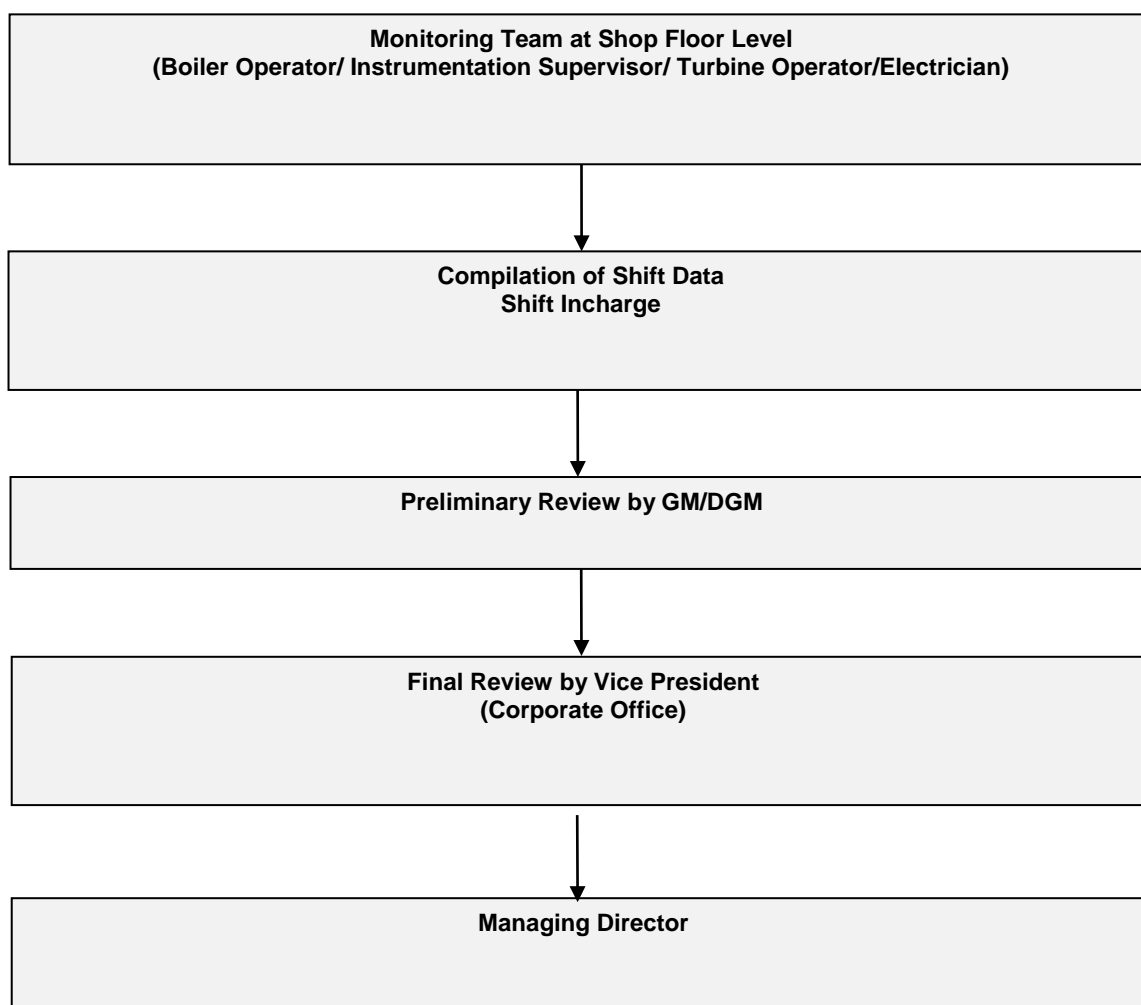
Different operators are responsible for monitoring of daily data of the waste received, RDF produced, RDF combusted, steam generated from boiler, steam fed to turbine, electricity generated, etc. The report is then sent to the Shift in-charge for the review. The plant layout with monitoring point and details of monitoring equipment has been presented in Appendix – 2.

Shift Electrician (Electrical) is responsible for taking meter readings for electricity generation daily.

Shift In-charge is responsible for compilation of data which is then sent to GM for preliminary review.

GM is responsible for reviewing the monitored parameters report on a daily basis and presenting a daily executive summary report to the Vice President Corporate office which is finally reported to Managing Director (MD), TOWMCL.

Organization structure responsible for monitoring and reporting of parameters involved in CDM project activity has been presented in the following flow chart.



## SECTION D. Data and parameters

### D.1. Data and parameters fixed ex ante

<b>Data/parameter:</b>	CEF <sub>d</sub>
Unit	tCO <sub>2</sub> /MWh
Description	Emission factor of the grid electricity displaced by the project activity
Source of data	Ex-ante as fixed in registered PDD
Value(s) applied)	0.75
Choice of data or measurement methods and procedures	Registered PDD
Purpose of data	Calculation of Baseline emissions
Additional comments	The same shall be applicable for the electricity exported to the grid

<b>Data/parameter:</b>	NCV <sub>fuel</sub>
Unit	MJ/ kg
Description	Net Calorific Value of diesel
Source of data	Ex-ante as fixed in registered PDD
Value(s) applied)	43.3

Choice of data or measurement methods and procedures	Registered PDD
Purpose of data	Estimation of baseline emissions
Additional comments	-

<b>Data/parameter:</b>	EF <sub>fuel</sub>
Unit	tCO <sub>2</sub> / TJ
Description	CO <sub>2</sub> emission factor of diesel
Source of data	Ex-ante as fixed in registered PDD
Value(s) applied)	74.1
Choice of data or measurement methods and procedures	Registered PDD
Purpose of data	Estimation of project emissions
Additional comments	-

<b>Data/parameter:</b>	CCW <sub>i</sub>																		
Unit	%																		
Description	Fraction of carbon content in waste type i																		
Source of data	Ex-ante as fixed in registered PDD																		
Value(s) applied)	<table border="1"> <thead> <tr> <th>Waste type</th><th>Fraction of carbon content</th></tr> </thead> <tbody> <tr> <td>Paper/cardboard</td><td>46</td></tr> <tr> <td>Textiles</td><td>50</td></tr> <tr> <td>Food Waste</td><td>38</td></tr> <tr> <td>Wood</td><td>50</td></tr> <tr> <td>Garden and park waste</td><td>49</td></tr> <tr> <td>Rubber and leather</td><td>67</td></tr> <tr> <td>Plastics</td><td>75</td></tr> <tr> <td>other, inert waste</td><td>03</td></tr> </tbody> </table>	Waste type	Fraction of carbon content	Paper/cardboard	46	Textiles	50	Food Waste	38	Wood	50	Garden and park waste	49	Rubber and leather	67	Plastics	75	other, inert waste	03
Waste type	Fraction of carbon content																		
Paper/cardboard	46																		
Textiles	50																		
Food Waste	38																		
Wood	50																		
Garden and park waste	49																		
Rubber and leather	67																		
Plastics	75																		
other, inert waste	03																		
Choice of data or measurement methods and procedures	Registered PDD																		
Purpose of data	Estimation of baseline emissions																		
Additional comments	-																		

<b>Data/parameter:</b>	FCF <sub>i</sub>
Unit	%
Description	Fraction of fossil carbon content in waste type i
Source of data	Ex-ante as fixed in registered PDD

Value(s) applied)	

<b>Data/parameter:</b>	$EF_i$
Unit	Fraction
Description	Combustion efficiency for waste type i
Source of data	Ex-ante as fixed in registered PDD
Value(s) applied)	1
Choice of data or measurement methods and procedures	Registered PDD
Purpose of data	Calculation of the baseline emissions
Additional comments	-

<b>Data/parameter:</b>	$D_{fuel}$
Unit	Kg/l
Description	Density of diesel
Source of data	Ex-ante as fixed in registered PDD
Value(s) applied)	0.84
Choice of data or measurement methods and procedures	Registered PDD



Purpose of data	Estimation of project emissions
Additional comments	Fixed ex-ante as given in PDD, used for calculation of baseline emissions.

<b>Data/parameter:</b>	$\phi$
Unit	-
Description	Model correction factor to account for model uncertainties
Source of data	Methodological tool "Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site"(Annex 14, EB26)
Value(s) applied)	0.9
Choice of data or measurement methods and procedures	Fixed parameter from applied methodological tool
Purpose of data	Calculation of Baseline emissions
Additional comments	Oonk et al. (1994) have validated several landfill gas models based on 17 realized landfill gas projects. The mean relative error of multi-phase models was assessed to be 18%. Given the uncertainties associated with the model and in order to estimate emission reductions in a conservative manner, a discount of 10% is applied to the model results. The same shall be applicable for the electricity exported to the grid

<b>Data/parameter:</b>	OX
Unit	-
Description	Oxidation factor (reflecting the amount of methane from SWDS that is oxidized in the soil or other material covering the waste)
Source of data	Methodological tool "Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site"(Annex 14, EB26)
Value(s) applied)	0
Choice of data or measurement methods and procedures	Fixed parameter from applied methodological tool
Purpose of data	Calculation of Baseline emissions
Additional comments	-

<b>Data/parameter:</b>	F
Unit	-
Description	Fraction of methane in the SWDS gas (volume fraction)
Source of data	Methodological tool "Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site"(Annex 14, EB26)
Value(s) applied)	0.5
Choice of data or measurement methods and procedures	Fixed parameter from applied methodological tool
Purpose of data	Calculation of Baseline emissions
Additional comments	This factor reflects the fact that some degradable organic carbon does not degrade, or degrades very slowly, under anaerobic conditions in the SWDS. A default value of 0.5 is recommended by IPCC.

<b>Data/parameter:</b>	DOCf
Unit	-

Description	Fraction of degradable organic carbon (DOC) that can decompose
Source of data	Methodological tool "Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site"(Annex 14, EB26)
Value(s) applied)	0.5
Choice of data or measurement methods and procedures	Fixed parameter from applied methodological tool
Purpose of data	Calculation of Baseline emissions
Additional comments	-

<b>Data/parameter:</b>	MCF
Unit	-
Description	Methane correction factor
Source of data	Methodological tool "Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site"(Annex 14, EB26)
Value(s) applied)	0.8
Choice of data or measurement methods and procedures	Fixed parameter from applied methodological tool
Purpose of data	Calculation of Baseline emissions
Additional comments	<p>The methane correction factor (MCF) accounts for the fact that unmanaged SWDS produce less methane from a given amount of waste than managed SWDS, because a larger fraction of waste decomposes aerobically in the top layers of unmanaged SWDS.</p> <p>MCF 0.8 for unmanaged solid waste disposal sites – deep and/or with high water table. This comprises all SWDS not meeting the criteria of managed SWDS and which have depths of greater than or equal to 5 meters and/or high water table at near ground level. Latter situation corresponds to filling inland water, such as pond, river or wetland, by waste.</p>

<b>Data/parameter:</b>	DOC <sub>j</sub>														
Unit	-														
Description	Fraction of degradable organic carbon (by weight) in the waste type j														
Source of data	Methodological tool "Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site"(Annex 14, EB26)														
Value(s) applied)	<p>Apply the following values for the different waste types j:</p> <table border="1"> <thead> <tr> <th>Waste type j</th><th>DOC<sub>j</sub> (% wet waste)</th></tr> </thead> <tbody> <tr> <td>Wood and wood products</td><td>43</td></tr> <tr> <td>Pulp, paper and cardboard (other than sludge)</td><td>40</td></tr> <tr> <td>Food, food waste, beverages and tobacco (other than sludge)</td><td>15</td></tr> <tr> <td>Textiles</td><td>24</td></tr> <tr> <td>Garden, yard and park waste</td><td>20</td></tr> <tr> <td>Glass, plastic, metal, other inert waste</td><td>0</td></tr> </tbody> </table>	Waste type j	DOC <sub>j</sub> (% wet waste)	Wood and wood products	43	Pulp, paper and cardboard (other than sludge)	40	Food, food waste, beverages and tobacco (other than sludge)	15	Textiles	24	Garden, yard and park waste	20	Glass, plastic, metal, other inert waste	0
Waste type j	DOC <sub>j</sub> (% wet waste)														
Wood and wood products	43														
Pulp, paper and cardboard (other than sludge)	40														
Food, food waste, beverages and tobacco (other than sludge)	15														
Textiles	24														
Garden, yard and park waste	20														
Glass, plastic, metal, other inert waste	0														
Choice of data or measurement methods and procedures	Fixed parameter from applied methodological tool														
Purpose of data	Calculation of Baseline emissions														
Additional comments	-														

<b>Data/parameter:</b>	K <sub>j</sub>												
Unit	-												
Description	Decay rate for the waste type j												
Source of data	Methodological tool "Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site"(Annex 14, EB26)												
Value(s) applied)	<p>Apply the following default values for the different waste types j: <b>Decay rate for the waste type j (Tropical (MAT&gt;20°C) and Dry (MAP&lt;1000mm))</b></p> <table border="1"> <thead> <tr> <th>Waste type j</th><th>K<sub>j</sub></th></tr> </thead> <tbody> <tr> <td>Wood and wood products</td><td>0.025</td></tr> <tr> <td>Pulp, paper and cardboard (other than sludge)</td><td>0.045</td></tr> <tr> <td>Food, food waste, beverages and tobacco (other than sludge)</td><td>0.085</td></tr> <tr> <td>Textiles</td><td>0.045</td></tr> <tr> <td>Garden, yard and park waste</td><td>0.065</td></tr> </tbody> </table>	Waste type j	K <sub>j</sub>	Wood and wood products	0.025	Pulp, paper and cardboard (other than sludge)	0.045	Food, food waste, beverages and tobacco (other than sludge)	0.085	Textiles	0.045	Garden, yard and park waste	0.065
Waste type j	K <sub>j</sub>												
Wood and wood products	0.025												
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Food, food waste, beverages and tobacco (other than sludge)	0.085												
Textiles	0.045												
Garden, yard and park waste	0.065												
Choice of data or measurement methods and procedures	Fixed parameter from applied methodological tool												
Purpose of data	Calculation of Baseline emissions												
Additional comments	-												

## D.2. Data and parameters monitored

Data/parameter:	EG <sub>PJ,FF,y</sub>				
Unit	MWh				
Description	Amount of electricity consumed from grid in the project activity				
Measured/calculated/default	Measured				
Source of data	Logbook readings of the electricity import				
Value(s) of monitored parameter	73				
Monitoring equipment					
	Monitoring Equipment	Make	Serial No	Metering Point	Accuracy/ Class
	Energy Meter	Elster	05252046	MP-06	0.2
	Date of Calibration	Calibration due on	Gap (if any)		
	12-11-2014	11-11-2015	NA		
	10-11-2015	09-11-2016	NA		
Measuring/reading/recording frequency:	Measuring Frequency- Daily basis Recording Frequency- Daily basis Reporting Frequency- Daily basis in ER spread sheet				
Calculation method (if applicable):	Not applicable; The parameter has been directly monitored with the energy meter.				

QA/QC procedures:	All Meters are calibrated by accredited external third party, as per standard procedures, on annual basis. The readings shall be cross checked with the bills received from the State load dispatch centre.
Purpose of data:	Calculation of the baseline emissions
Additional comments:	Data shall be archived till 2 years after the expiry of the crediting period.

<b>Data/parameter:</b>	CEF <sub>elec</sub>										
Unit	tCO <sub>2</sub> /MWh										
Description	Emission factor for the electricity consumed in the project activity (import)										
Measured/calculated/default	Calculated										
Source of data	Central Electricity Authority (CEA) – Ministry of Power (Govt. of India) CEA database version 12.0 <a href="http://cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver12.pdf">http://cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver12.pdf</a>										
Value(s) of monitored parameter	0.98										
Monitoring equipment	Not Applicable; the parameter has been obtained from the latest database published by the Central Electricity Authority (CEA) – Ministry of Power (Govt. of India).										
Measuring/reading/recording frequency:	Measuring Frequency- Annually Recording Frequency- Annually Reporting Frequency- Annually										
Calculation method (if applicable):	<p>The same has been calculated referring the “tool to calculate the emission factor for an electricity system”, version 02.2.1. The CEA database version 12.0 includes the Carbon emissions factor for electricity generation in the project activity (Combined Margin in tCO<sub>2</sub>/MWh for NEWNE Grid of India) for year 2011-2014 as follows:</p> <table border="1"> <tr> <td>2015-2016</td><td>0.94 tCO<sub>2</sub>/MWh</td></tr> <tr> <td>2014-2015</td><td>0.96 tCO<sub>2</sub>/MWh</td></tr> <tr> <td>2013-2014</td><td>0.98 tCO<sub>2</sub>/MWh</td></tr> <tr> <td>2012-2013</td><td>0.98 tCO<sub>2</sub>/MWh</td></tr> <tr> <td>2011-2012</td><td>0.95 tCO<sub>2</sub>/MWh</td></tr> </table> <p>Taking a conservative approach maximum value of the combined margin i.e. 0.98 tCO<sub>2</sub>/MWh has been used for emission deduction calculations.</p>	2015-2016	0.94 tCO <sub>2</sub> /MWh	2014-2015	0.96 tCO <sub>2</sub> /MWh	2013-2014	0.98 tCO <sub>2</sub> /MWh	2012-2013	0.98 tCO <sub>2</sub> /MWh	2011-2012	0.95 tCO <sub>2</sub> /MWh
2015-2016	0.94 tCO <sub>2</sub> /MWh										
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2012-2013	0.98 tCO <sub>2</sub> /MWh										
2011-2012	0.95 tCO <sub>2</sub> /MWh										
QA/QC procedures:	Not Applicable										
Purpose of data:	For estimation of project emissions										
Additional comments:	Data shall be archived till 2 years after the expiry of the crediting period.										

<b>Data/parameter:</b>	F <sub>cons</sub>
Unit	Litres
Description	Diesel consumption on-site during year ‘y’ of the crediting period
Measured/calculated/default	Measured
Source of data	Logbook data
Value(s) of monitored parameter	1802

Monitoring equipment	<b>Monitoring Equipment</b>	<b>Make</b>	<b>Serial No</b>	<b>Metering Point</b>	<b>Accuracy/Class</b>
	Oil Meter	Kent	110517	MP-05	0.5
	<b>Date of Calibration</b>	<b>Calibration due on</b>	<b>Gap (if any)</b>		
	05-01-2015	04-01-2016	NA		
	04-01-2016	03-01-2017	NA		
Measuring/reading/recording frequency:	Measuring Frequency- Daily basis Recording Frequency- Daily basis Reporting Frequency- Daily basis in ER spread sheet				
Calculation method (if applicable):	Not applicable; the parameter has been monitored with the Oil meter installed at the project activity site.				
QA/QC procedures:	All Meters are calibrated by accredited external third party, as per standard procedures, on annual basis. The quantity of diesel consumed shall be cross checked with inventory and purchase during the monitoring period. The same shall be equal to or less than the checked value.				
Purpose of data:	For estimation of project emissions				
Additional comments:	Data shall be archived till 2 years after the expiry of the crediting period.				

<b>Data/parameter:</b>	A <sub>i</sub>																		
Unit	Ton/year																		
Description	Amount of waste type 'i' fed into the RDF combustor																		
Measured/calculated/default	Measured values																		
Source of data	Logbook data for incoming waste and third party report for physical characterization of waste																		
Value(s) of monitored parameter	<p>Amount of waste type 'i' fed into the RDF combustor during 10/03/2016-09/03/2017 are as follows (Daily Data has been provided in Emission reduction calculation sheet):</p> <table border="1"> <thead> <tr> <th>Waste type</th> <th>Quantity (MT)</th> </tr> </thead> <tbody> <tr> <td>Paper/cardboard</td> <td>76,846</td> </tr> <tr> <td>Textiles</td> <td>151,845</td> </tr> <tr> <td>Food Waste</td> <td>290,185</td> </tr> <tr> <td>Wood</td> <td>39,457</td> </tr> <tr> <td>Garden and park waste</td> <td>130,462</td> </tr> <tr> <td>Rubber and Leather</td> <td></td> </tr> <tr> <td>Plastics</td> <td>147,877</td> </tr> <tr> <td>Other, inert waste</td> <td></td> </tr> </tbody> </table> <p>The values have been calculated using the third party characterization certificates.</p>	Waste type	Quantity (MT)	Paper/cardboard	76,846	Textiles	151,845	Food Waste	290,185	Wood	39,457	Garden and park waste	130,462	Rubber and Leather		Plastics	147,877	Other, inert waste	
Waste type	Quantity (MT)																		
Paper/cardboard	76,846																		
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Wood	39,457																		
Garden and park waste	130,462																		
Rubber and Leather																			
Plastics	147,877																		
Other, inert waste																			

Monitoring equipment	<b>Monitoring Equipment</b>	<b>Make</b>	<b>Serial No</b>	<b>Metering Point</b>	<b>Accuracy/Class</b>
	Weighbridge-1, 2 & 3	Endevour	85, 46, 47	MP-01, MP-02 and MP-12	Class III (eValue 5 kg)
	<b>Date of Calibration</b>		<b>Calibration due on</b>		<b>Gap (if any)</b>
	31-12-2014		31-12-2015		NA
	29-12-2015		29-12-2016		NA
Measuring/reading/recording frequency:	<b><u>Incoming MSW</u></b> Monitoring frequency: Daily basis Recording frequency: Daily basis				
Calculation method (if applicable):	Based on the physical characterization analysis, the quantity of different type of waste present in the MSW received shall be calculated. (The incoming MSW shall be measured on daily basis and consolidated on annual basis). Formulae: Quantity of annual waste * % of a type of waste (Paper, food, etc) as per third party report				
QA/QC procedures:	All weighbridge/load cells are calibrated by accredited external third party, as per standard procedures, on annual basis.				
Purpose of data:	Calculation of the baseline emissions				
Additional comments:	Data shall be archived till 2 years after the expiry of the crediting period.				

<b>Data/parameter:</b>	SG <sub>r,y</sub>		
Unit	m <sup>3</sup> /hr		
Description	Total volume of stack gas from RDF combustion in year y		
Measured/calculated/default	Measured		
Source of data	Online monitoring records		
Value(s) of monitored parameter	Parameter is being monitored in NM3/hr:		
	<b>Boiler-1</b>	<b>Boiler-2</b>	<b>Boiler-3</b>
	26839556.08	23279515.38	22956154.16

Monitoring equipment	<b>Monitoring Equipment</b>	<b>Make</b>	<b>Serial No</b>	<b>Metering Point</b>	<b>Accuracy/Ci ass</b>
	Gas Flow Meter-1, 2 & 3	Yokoga wa	01HTA20CF 901	MP-07	±0.51% of FSR
			02HTA20CF 901		
			03HTA20CF 901		
	<b>Date of Calibration</b>		<b>Calibration due on</b>		<b>Gap (if any)</b>
	17-01-2015		17-01-2016		NA
	17-01-2016		17-01-2017		NA
Measuring/reading/recordin g frequency:	Measuring Frequency- Daily basis Recording Frequency- Daily basis The data is monitored in NM3 at 160 °C and 1000mbar. The values are then converted applying the formulae as: “X” Nm3/hr *(T+273)/ (0+273)*(1013/1013+P) Where, T= temp P=Pressure				
Calculation method (if applicable):	Not applicable, the parameter has been monitored with the gas flow meters.				
QA/QC procedures:	Maintenance of the equipment is being carried out on regular basis. Also, the calibration of the equipment has been undertaken on annual basis.				
Purpose of data:	For estimation of project emissions				
Additional comments:	Data shall be archived till 2 years after the expiry of the crediting period.				

<b>Data/parameter:</b>	MC <sub>N2O,r,y</sub>			
Unit	tN <sub>2</sub> O/m <sup>3</sup>			
Description	Monitored content of nitrous oxide in the stack gas from RDF combustion in year y			
Measured/calculated/default	Monitored			
Source of data	Third party certificates			
Value(s) of monitored parameter	<b>Period</b>	<b>Stack-1</b>	<b>Stack-2</b>	<b>Avg.</b>
		<b>ppm</b>	<b>ppm</b>	<b>ppm</b>
	01/03/2015-31/05/2015	1.68	1.79	1.74
	01/06/2015-30/09/2015	1.74	1.32	1.53
	01/10/2015-31/12/2015	1.74	1.32	1.53
	01/01/2015-31/03/2016	1.38	1.47	1.43
Monitoring equipment	Third party monitoring is carried out and hence no monitoring equipment are maintained at the site.			
Measuring/reading/recording frequency:	Measuring Frequency- Quarterly basis Recording Frequency- Quarterly basis			
Calculation method (if applicable):	Not applicable, the parameter has been monitored with the gas flow meters by third party on quarterly basis from each of the stack (Stack 1 and Stack 2), as presented above. However, the average value has been used for emission reduction calculation.			

QA/QC procedures:	The data obtained is compared with previous values and the same is found to be in the same range. Also, calibration records of the equipment used by third parties shall be checked.
Purpose of data:	For estimation of project emissions
Additional comments:	Data will be archived till 2 years after the end of crediting period

<b>Data/parameter:</b>	VF <sub>consumption</sub>
Unit	Litre/km
Description	Vehicle fuel consumption in liters per kilometer for vehicle type i
Measured/calculated/default	Credible publically available data source has been referred
Source of data	Literature available by World Bank: ( <a href="http://siteresources.worldbank.org/INTSARREGTOPTRANSPORT/PublicationsandReports/20747263/Final_version03NOV2005.pdf">http://siteresources.worldbank.org/INTSARREGTOPTRANSPORT/PublicationsandReports/20747263/Final_version03NOV2005.pdf</a> )
Value(s) of monitored parameter	0.25
Monitoring equipment	Not Applicable
Measuring/reading/recording frequency:	Monitoring frequency: Annually Recording frequency: Annually
Calculation method (if applicable):	Not Applicable, the parameter has been obtained from the reliable source i.e. the world bank report on "ROAD TRANSPORT SERVICE EFFICIENCY STUDY for India".
QA/QC procedures:	Latest publically available data has been considered for calculation.
Purpose of data:	Calculation of the project and leakage emissions
Additional comments:	Data shall be archived till 2 years after the expiry of the crediting period.

Data/parameter:	MC <sub>CH4,r,y</sub>																				
Unit	tCH <sub>4</sub> /m <sup>3</sup>																				
Description	Monitored content of methane in the stack gas from RDF combustion in year y																				
Measured/calculated/default	Monitored																				
Source of data	Third party certificates																				
Value(s) of monitored parameter	<table><tr><th>Period</th><th>Stack-1</th><th>Stack-2</th></tr><tr><td></td><th>ppm</th><th>ppm</th></tr><tr><td>01/03/2015-31/05/2015</td><td>0.00</td><td>0.00</td></tr><tr><td>01/06/2015-30/09/2015</td><td>0.00</td><td>0.00</td></tr><tr><td>01/10/2015-31/12/2015</td><td>0.00</td><td>0.00</td></tr><tr><td>01/01/2015-31/03/2016</td><td>0.00</td><td>0.00</td></tr></table>			Period	Stack-1	Stack-2		ppm	ppm	01/03/2015-31/05/2015	0.00	0.00	01/06/2015-30/09/2015	0.00	0.00	01/10/2015-31/12/2015	0.00	0.00	01/01/2015-31/03/2016	0.00	0.00
Period	Stack-1	Stack-2																			
	ppm	ppm																			
01/03/2015-31/05/2015	0.00	0.00																			
01/06/2015-30/09/2015	0.00	0.00																			
01/10/2015-31/12/2015	0.00	0.00																			
01/01/2015-31/03/2016	0.00	0.00																			
Monitoring equipment	Third party monitoring is carried out and hence no monitoring equipment are maintained at the site.																				
Measuring/reading/recording frequency:	Measuring Frequency- Quarterly basis Recording Frequency- Quarterly basis																				
Calculation method (if applicable):	Not Applicable, the parameter has been obtained from 3 <sup>rd</sup> party test result.																				
QA/QC procedures:	The data obtained is compared with previous values and the same is found to be in the same range																				
Purpose of data:	For estimation of project emissions																				
Additional comments:	Data will be archived till 2 years after the end of crediting period																				



<b>Data/parameter:</b>	MB <sub>y</sub>
Unit	tCO <sub>2e</sub>
Description	Methane produced in the landfill in the absence of the project activity in year 'y'.
Measured/calculated/default	Calculated
Source of data	Calculated values as per the tool "Emission from solid waste disposal site", version 06.0.1
Value(s) of monitored parameter	155069.97 tCO <sub>2e</sub>
Monitoring equipment	-
Measuring/reading/recording frequency:	Recording Frequency- Annual basis Reporting Frequency- Annual basis in ER spread sheet
Calculation method (if applicable):	Calculated as per the tool "Emission from solid waste disposal site"
QA/QC procedures:	-
Purpose of data:	For estimation of baseline emissions
Additional comments:	Data shall be archived till 2 years after the expiry of the crediting period. In case the annual values are not available, the monthly values will be used for the estimation reductions as per the Ver 7.0 of the methodological tool: Emission from solid waste disposal sites.

<b>Data/parameter:</b>	EG <sub>d</sub>
Unit	MWh
Description	Amount of electricity generated utilizing the RDF produced and exported to grid in the project activity during the year y
Measured/calculated/default	Measured
Source of data	Metering Records
Value(s) of monitored parameter	113049.69

Monitoring equipment	<b>Gross generation meters:</b>				
	<b>Monitoring Equipment</b>	<b>Make</b>	<b>Serial No</b>	<b>Metering Point</b>	<b>Accuracy/Class</b>
	Energy Meter	Siemens Ltd.	GJU61733	MP-10	0.2
	<b>Date of Calibration</b>		<b>Calibration due on</b>		<b>Gap (if any)</b>
	10-01-2015		10-01-2016		NA
	10-01-2016		09-01-2017		NA
	<b>Import/Export meter:</b>				
	<b>Monitoring Equipment</b>	<b>Make</b>	<b>Serial No</b>	<b>Metering Point</b>	<b>Accuracy/Class</b>
	Energy Meter	Elster	0525246	MP-06	0.2
	<b>Date of Calibration</b>		<b>Calibration due on</b>		<b>Gap (if any)</b>
	12-11-2014		11-11-2015		NA
	10-11-2015		09-11-2016		NA
	<b>Auxiliary consumption meters:</b>				
	<b>Monitoring Equipment</b>	<b>Make</b>	<b>Serial No</b>	<b>Metering Point</b>	<b>Accuracy/Class</b>
	Energy Meter	Conzerv	203987/8967-2810 205056/9635-3310 205503/10130-3410	MP-11	0.5
<b>Date of Calibration</b>		<b>Calibration due on</b>		<b>Gap (if any)</b>	
10-01-2015		09-01-2016		NA	
10-01-2016		09-01-2017		NA	
Measuring/reading/recording frequency:	Measuring Frequency- Continuous Recording Frequency- Daily basis Reporting Frequency- Daily basis in ER spread sheet				
Calculation method (if applicable):	Not applicable, the parameter has been monitored from the energy meter.				
QA/QC procedures:	The electricity exported to the state grid may be cross checked from the invoices raised by the state load dispatch centre. It may be equal or lesser than the electricity injected in the grid based on accounting done for actual scenario.				
Purpose of data:	For estimation of baseline emissions				
Additional comments:	Data shall be archived till 2 years after the expiry of the crediting period.				

<b>Data/parameter:</b>	RATE <sup>Compliance<sub>y</sub></sup>
Unit	%
Description	Rate of Compliance
Measured/calculated/default	Latest publically available information

Source of data	Rate of Compliance has been taken from the latest status report on Municipal Solid Waste Management published by Central Pollution Control Board (CPCB), Ministry of Environment & Forests – Govt. of India. ( <a href="http://www.cpcb.nic.in/divisionsofheadoffice/pcp/MSW_Report.pdf">http://www.cpcb.nic.in/divisionsofheadoffice/pcp/MSW_Report.pdf</a> )
Value(s) of monitored parameter	12.45%
Monitoring equipment	Not Applicable
Measuring/reading/recording frequency:	Monitoring Frequency- Annually Recording Frequency- Annually
Calculation method (if applicable):	Not Applicable; the parameter has been obtained from the latest available information available from Government organization i.e. CPCB.
QA/QC procedures:	The source of the information is an authentic government source
Purpose of data:	Estimation of baseline emissions
Additional comments:	For the ex-post emission reduction calculation, the most recent RATE <sub>Compliance<sub>y</sub></sub> as published by Central Pollution Control Board (CPCB) has been considered for calculating baseline emission for methane emission from dumping of solid waste in unmanaged landfill in the baseline scenario. The project will stop receiving any credit once the compliance reaches 50% limit. If the rate exceeds 50%, no CERs can be claimed

<b>Data/parameter:</b>	NO <sub>vehicles</sub>
Unit	Number
Description	Vehicles per carrying capacity per year
Measured/calculated/default	Monitored
Source of data	Logbook records
Value(s) of monitored parameter	14616
Monitoring equipment	Not Applicable
Measuring/reading/recording frequency:	Measuring Frequency- Daily basis Recording Frequency- Daily basis Reporting Frequency- Daily basis in ER spread sheet
Calculation method (if applicable):	Not Applicable, the parameter has been monitored directly and recorded.
QA/QC procedures:	The number of vehicles shall be cross checked with the amount of ash and inert material transported and the carrying capacity of the truck. Measure of full truck load consignment and consignment not sent on full truck load shall be assessed separately.-
Purpose of data:	Calculation of the project emissions
Additional comments:	Data shall be archived till 2 years after the expiry of the crediting period.

<b>Data/parameter:</b>	DT <sub>y</sub>
Unit	Km
Description	Average additional distance travelled by vehicle for ash and inert disposal compared to the baseline in year y
Measured/calculated/default	Monitored
Source of data	Logbook records
Value(s) of monitored parameter	20
Monitoring equipment	Not Applicable
Measuring/reading/recording frequency:	Monitoring Frequency- Annually Recording Frequency- Annually Reporting Frequency- Annually

Calculation method (if applicable):	Not Applicable, the distance between the landfill site and project activity plant is about 7.5km (trip distance will be 15km); hence the trip distance of 20 km has been considered conservative.
QA/QC procedures:	Not Applicable
Purpose of data:	Calculation of the leakage emissions
Additional comments:	Data shall be archived till 2 years after the expiry of the crediting period.

<b>Data/parameter:</b>	Amount of RDF used outside the project boundary
Unit	Tons
Description	Project proponent shall monitor the amount of RDF sold for use outside of the project boundary
Measured/calculated/default	Monitored
Source of data	Sale invoices, if any
Value(s) of monitored parameter	0 (The PP is using the produced RDF to generate electricity at the project site. Therefore, the RDF is not envisaged to be sold outside the project boundary as per the project design)
Monitoring equipment	Not Applicable
Measuring/reading/recording frequency:	Measuring Frequency- Weekly basis Recording Frequency- Weekly basis
Calculation method (if applicable):	Not Applicable
QA/QC procedures:	The records of RDF production, RDF consumption and available inventory shall be checked to ascertain that there is no RDF sold outside the project boundary. During the monitoring period RDF has not been sold outside. Also, weighbridge shall be calibrated on annual basis.
Purpose of data:	Calculation of the project emissions
Additional comments:	Data will be archived till 2 years after the end of crediting period

<b>Data/parameter:</b>	$A_{j,x}$												
Unit	tonnes/year												
Description	Amount of organic waste type j prevented from disposal in the landfill in the year x (tonnes/year)												
Measured/calculated/default	calculated using measured values												
Source of data	Records of incoming waste and physical characterization certificate from third party												
Value(s) of monitored parameter	<table border="1"> <thead> <tr> <th>Waste type</th><th>Quantity (MT)</th></tr> </thead> <tbody> <tr> <td>Paper/cardboard</td><td>76,846</td></tr> <tr> <td>Textiles</td><td>151,845</td></tr> <tr> <td>Food Waste</td><td>290,185</td></tr> <tr> <td>Wood</td><td>39,457</td></tr> <tr> <td>Garden and park waste</td><td>130,462</td></tr> </tbody> </table>	Waste type	Quantity (MT)	Paper/cardboard	76,846	Textiles	151,845	Food Waste	290,185	Wood	39,457	Garden and park waste	130,462
Waste type	Quantity (MT)												
Paper/cardboard	76,846												
Textiles	151,845												
Food Waste	290,185												
Wood	39,457												
Garden and park waste	130,462												
Monitoring equipment	Not Applicable												
Measuring/reading/recording frequency:	Measuring Frequency- Daily basis Recording Frequency- Daily basis, consolidated on annual basis												

Calculation method (if applicable):	The total amount of the waste received in the plant shall be segregated according to the physical characterization, carried out by the third party on a quarterly basis. The sampling plan of the registered monitoring plan has been followed.
QA/QC procedures:	The composition of waste shall be determined quarterly by a third party and weighbridge shall be calibrated on annual basis. The third party follows sampling plan of the registered monitoring plan to collect the waste sample.
Purpose of data:	For estimation of baseline emissions
Additional comments:	Data will be archived till 2 years after the end of crediting period

<b>Data/parameter:</b>	$A_{ci,y}$
Unit	Tones/year
Description	Amount of residual waste type 'ci' from combustion of RDF
Measured/calculated/default	Measured
Source of data	weighbridge records and the physical characterization of the ash
Value(s) of monitored parameter	0 (The amount of residual waste coming out of RDF combustion is only inert material which could not be separated in the pre-processing stage)
Monitoring equipment	Not Applicable
Measuring/reading/recording frequency:	Measuring Frequency- Daily basis Recording Frequency- Daily basis Reporting Frequency- Daily basis in ER spread sheet
Calculation method (if applicable):	Not Applicable
QA/QC procedures:	The weighbridge shall be calibrated on annual basis
Purpose of data:	For estimation of leakage emissions
Additional comments:	Data will be archived till 2 years after the end of crediting period

<b>Data/parameter:</b>	$R_n$
Unit	Ton
Description	Weight of RDF sold offsite for which no sale invoices can be provided
Measured/calculated/default	Monitored
Source of data	Weighbridge records
Value(s) of monitored parameter	0 (The PP is using the produced RDF to generate electricity at the project site. Therefore, the RDF is not envisaged to be sold outside the project boundary as per the project design)
Monitoring equipment	The RDF sold offsite shall be monitored by the weighbridge. However, during the monitoring period PP has not sold RDF outside. The weighbridge details may be referred from data provided in previous parameters
Measuring/reading/recording frequency:	Measuring Frequency- Daily basis Recording Frequency- Daily basis
Calculation method (if applicable):	Not applicable
QA/QC procedures:	The weighbridge are calibrated on annual basis by a third party
Purpose of data:	Not Applicable
Additional comments:	Data shall be archived till 2 years after the expiry of the crediting period.

<b>Data/parameter:</b>	$R_t$
Unit	Ton
Description	Total weight of RDF produced
Measured/calculated/default	Measured

Source of data	Logbooks prepared using Load cell data																									
Value(s) of monitored parameter	593,848																									
Monitoring equipment	<table border="1"> <thead> <tr> <th>Monitoring Equipment</th><th>Make</th><th>Serial No</th><th>Metering Point</th><th>Accuracy/Class</th></tr> </thead> <tbody> <tr> <td>Load Cell</td><td>Cell Sensor</td><td>1024, 1025, 1026, 1027, 1028, 1029, 1030, 1031</td><td>MP-03 and MP-04</td><td>1</td></tr> <tr> <td colspan="2">Date of Calibration</td><td colspan="2">Calibration due on</td><td>Gap (if any)</td></tr> <tr> <td colspan="2">14-03-2014</td><td colspan="2">14-03-2015</td><td>NA</td></tr> <tr> <td colspan="2">14-03-2015</td><td colspan="2">14-03-2016</td><td>NA</td></tr> </tbody> </table>	Monitoring Equipment	Make	Serial No	Metering Point	Accuracy/Class	Load Cell	Cell Sensor	1024, 1025, 1026, 1027, 1028, 1029, 1030, 1031	MP-03 and MP-04	1	Date of Calibration		Calibration due on		Gap (if any)	14-03-2014		14-03-2015		NA	14-03-2015		14-03-2016		NA
Monitoring Equipment	Make	Serial No	Metering Point	Accuracy/Class																						
Load Cell	Cell Sensor	1024, 1025, 1026, 1027, 1028, 1029, 1030, 1031	MP-03 and MP-04	1																						
Date of Calibration		Calibration due on		Gap (if any)																						
14-03-2014		14-03-2015		NA																						
14-03-2015		14-03-2016		NA																						
Measuring/reading/recording frequency:	Measuring Frequency- Daily basis Recording Frequency- Daily basis, consolidated on monthly basis Reporting Frequency- Monthly basis in ER spread sheet																									
Calculation method (if applicable):	Not applicable, the parameter is being monitored with the load cells.																									
QA/QC procedures:	The load cells of the grab crane are calibrated by accredited external third party, as per standard procedures, on annual basis.																									
Purpose of data:	-																									
Additional comments:	Data shall be archived till 2 years after the expiry of the crediting period.																									

<b>Data / Parameter</b>	<b>p<sub>n,j,x</sub></b>																		
Unit	%																		
Description	Weight fraction of the waste type in the sample collected during the year																		
Source of data	Sample measurements																		
Value(s) applied	<table border="1"> <thead> <tr> <th>Type of waste</th><th>Average</th></tr> </thead> <tbody> <tr> <td>Food waste</td><td>36.17%</td></tr> <tr> <td>Garden waste</td><td>16.64%</td></tr> <tr> <td>Wood pieces</td><td>3.40%</td></tr> <tr> <td>Paper/Cardboard</td><td>9.23%</td></tr> <tr> <td>Textile/cotton/Jute</td><td>16.63%</td></tr> <tr> <td>Rubber/Leather/Tyre</td><td>0.36%</td></tr> <tr> <td>Polythene/plastic</td><td>2.67%</td></tr> <tr> <td>Inert and other</td><td>12.84%</td></tr> </tbody> </table>	Type of waste	Average	Food waste	36.17%	Garden waste	16.64%	Wood pieces	3.40%	Paper/Cardboard	9.23%	Textile/cotton/Jute	16.63%	Rubber/Leather/Tyre	0.36%	Polythene/plastic	2.67%	Inert and other	12.84%
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Polythene/plastic	2.67%																		
Inert and other	12.84%																		
Measurement methods and procedures	Measuring Frequency- Once in a quarter Recording Frequency- Once in a quarterly basis, consolidated on annual basis																		
Monitoring frequency	A minimum of one sample shall be undertaken every three months with the mean value valid for year y																		
QA/QC procedures	The characterization of Municipal Solid Waste (MSW) are conducted by the accredited 3 <sup>rd</sup> party agency/laboratory at least once in a																		

	quarter.
Purpose of data	To calculate the amount of particular waste from the total waste received at site
Additional comment	Data will be archived till 2 years after the end of crediting period. This parameter is introduced as per the requirement of the tool: Emission from solid waste disposal sites version 7

<b>Data / Parameter</b>	Z
Unit	-
Description	Number of samples collected during the year y
Source of data	Third party reports
Value(s) applied	4
Measurement methods and procedures	Measuring Frequency- Once in a quarter Recording Frequency- Once in a quarter
Monitoring frequency	A minimum of once samples shall be undertaken every three months
QA/QC procedures	The sampling will be conducted by the accredited 3rd party agency/laboratory at least three times in a quarter In case there is a wide variation in the samples we will apply the correction estimates as per the tool "Sampling and surveys for CDM project activities and programmes of activities"
Purpose of data	To calculate the amount of particular waste from the total waste received at site
Additional comment	Data will be archived till 2 years after the end of crediting period. This parameter is introduced as per the requirement of the tool: Emission from solid waste disposal sites version 7.

### D.3. Implementation of sampling plan

#### ***Sampling Plan: Waste collection for characterization***

Waste characterization assessment for the Municipal Solid Waste (MSW) received from MCD/NDMC is conducted by a NABL accredited laboratory in line with the applicable IS standards laid down for the municipal solid waste.

Sampling procedure for collecting a representative sample at Okhla plant is as follows:

MSW is received through roughly 250 trucks/day. MSW in each vehicle is weighed at the weighbridge station and weight is noted. Subsequently, about 10 kgs of MSW is collected from the truck from different locations and depths within the truck quantity. This procedure is carried out for collecting samples from all the trucks for the day. The collected samples are heaped up under a roof so that moisture loss does not occur.

The MSW heap is thoroughly turned repeatedly (for about 5-6 times) for mixing the contents. The MSW is then spread on concrete floor and one final sample of about 10 kg is collected. This sample is then segregated into 15 parts according to the requirements of the physical characterization. The sample thus collected is taken for analysis for the following physio-chemical parameters.

<b>Physio-Chemical Parameters:</b>
1. Net content (Material)

2. Density of material
3. Temperature
4. Moisture content
5. pH
6. Moisture content
7. Components
  - Food waste (Kitchen Waste, Lemon Chilka, Vegetables, Dry Sugar Canes, Coconut shell/hair)
  - Garden waste (Straw/Hey, Flowers, Green leaves/Green Matter, Dry leaves/Dry Matter)
  - Wooden Pieces (Wooden Pieces, Broom, Cardboard (wooden))
  - Paper/Cardboard
  - Textile/cotton
  - Rubber/Leather/Tyre
  - Polythene/plastics
  - Metals
  - Glass
  - Sand/soil/earth
  - Stones/brick/concrete
  - Ceramic and other
  - Human Hair
  - Batteries
  - PVC
  - Hazardous waste (if any)
  - Thermocol
  - Inert and other

Test protocols adopted for waste analysis are in accordance with standards prescribed by IS/ USEPS/ AISTM.

The characterization of Municipal Solid Waste (MSW) has been conducted by the accredited 3<sup>rd</sup> party agency/laboratory on quarterly basis. The MSW characterization results have been provided in the Appendix 1.

## **SECTION E. Calculation of emission reductions or net anthropogenic removals**

### **E.1. Calculation of baseline emissions or baseline net removals**

#### **Baseline Emissions (BE<sub>y</sub>):**

Baseline emissions are calculated as follows:

$$BE_y = (MB_y - MD_{reg,y}) * GWP_{CH_4} + EG_y * CEF_{Baseline,elec,y} + EG_{d,y} * CEF_d + HG_y * CEF_{baseline,therm,y}$$

**Where:**

BE <sub>y</sub>	Baseline emissions in year y (tCO <sub>2e</sub> )
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MB <sub>y</sub>	Methane produced in the landfill in the absence of the project activity in year y (tCH <sub>4</sub> )
MD <sub>reg,y</sub>	Methane that would be destroyed in the absence of the project activity in year y (tCH <sub>4</sub> ) (As per the registered PDD this value has been considered as 0)
GWP <sub>CH4</sub>	Global warming potential of Methane (tCO <sub>2e</sub> /tCH <sub>4</sub> )
EG <sub>y</sub>	Amount of electricity in the year y that would be consumed at the project site in the absence of the project activity and which is not consumed anymore due to the implementation of the project activity, (MWh). (As per the registered PDD this value has been considered as 0; Since, the project activity is a green field project EG <sub>y</sub> is zero.)
CEF <sub>baseline,elec,y</sub>	Carbon emissions factor for electricity consumed at the project site in the absence of the project activity (tCO <sub>2</sub> /MWh) (As per the registered PDD this parameter has not been used for Baseline emission calculations)
EG <sub>d,y</sub>	Amount of electricity generated utilizing the biogas/syngas collected or RDF produced, and exported to the grid in the project activity during the year y (MWh)
CEFd	Carbon emissions factor for the displaced electricity source in the project scenario (tCO <sub>2</sub> /MWh)
HG <sub>y</sub>	Quantity of thermal energy that would be consumed in year y at the project site in the absence of the project activity and which is not consumed anymore due to the implementation of the project activity (MWh). (As per the registered PDD this value has been considered as 0; Since, the project activity is a green field project HG <sub>y</sub> is zero.)
CEF <sub>baseline,therm,y</sub>	CO <sub>2</sub> emissions intensity for thermal energy generation (tCO <sub>2e</sub> /MJ) (As per the registered PDD this parameter has not been used for Baseline emission calculations)

Formulae	MB <sub>y</sub> =BE <sub>CH4,SWDS,y</sub>	EG <sub>d,y</sub>	CEFd	EG <sub>y</sub>	HG <sub>y</sub>	CEF <sub>baseline,elec,y</sub>	EG <sub>d,y</sub> * CEF <sub>d</sub>	BE <sub>y</sub>
	tCO <sub>2</sub>	MWh	tCO <sub>2</sub> /MWh	MWh	MWh	tCO <sub>2</sub> /MWh	tCO <sub>2e</sub>	tCO <sub>2e</sub>
10/03/2016 to 09/03/2017	155069.97	113048.69	0.75	0	0	0	84786.52	239856.49

### **Adjusted baseline emissions (BE<sub>y,a</sub>):**

The adjusted baseline emissions (BE<sub>y,a</sub>) are calculated as follows:

$$BE_{y,a} = BE_y * (1 - RATE_{y,compliance})$$

Where:	
BE <sub>y</sub>	Baseline emissions in year y (tCO <sub>2e</sub> )
BE <sub>y,a</sub>	Adjusted baseline emissions in year y (tCO <sub>2e</sub> )
MB <sub>y</sub>	Is the state-level compliance rate of the MSW Management Rules in that year y. The compliance rate shall be lower than 50%; if it exceeds 50% the project activity shall receive no further credit.

Total Baseline Emissions	Rate of Compliance	Compliance adjusted baseline emission from avoidance of methane emission
$BE_y$	$RATE_{Compliance,y}$	$BE_{y,a} = BE_y \cdot (1 - RATE_{Compliance,y})$
t CO <sub>2</sub> e	%	t CO <sub>2</sub> e
239856.49	12.45 %	209994.36

### **Methane generation from the landfill in the absence of the project activity (MB<sub>y</sub>):**

$$MB_y = BE_{CH_4,SWDS,y}$$

Where  $BE_{CH_4,SWDS,y}$  is calculated in accordance of the methodological tool “Emissions from solid waste disposal sites (Annex-14, EB 26)” as follows:

$$BE_{CH_4,SWDS,y} = \phi_y \cdot (1 - f_y) \cdot GWP_{CH_4} \cdot (1 - OX) \cdot \frac{16}{12} \cdot F \cdot DOC_{fy} \cdot MCF_y \cdot \sum_{x=1}^y \sum_j W_{j,x} \cdot DOC_j \cdot e^{-k_j \cdot (y-x)} \cdot (1 - e^{-k_j})$$

$$BE_{CH_4,SWDS,y} = BE_{CH_4,foodwaste,y} + BE_{CH_4,gardewaste,y} + BE_{CH_4,paper\ waste,y} + BE_{CH_4,textilewaste,y} + BE_{CH_4,wooden\ waste,y}$$

Where:	
$BE_{CH_4,SWDS,y}$	Methane generation from the landfill in the absence of the project activity at year y (Methane emissions avoided during the year y from preventing waste disposal at the solid waste disposal site (SWDS) during the period from the start of the project activity to the end of the year y)(tCO <sub>2</sub> e)
$A_{j,x}$	Amount of organic waste type j prevented from disposal in the landfill in the year x (tonnes/year)
$\phi$	Model correction factor to account for model uncertainties (0.9)
f	Fraction of methane captured at the SWDS and flared, combusted or used in another manner
$GWP_{CH_4}$	Global Warming Potential (GWP) of methane, valid for the relevant commitment period
OX	Oxidation factor (reflecting the amount of methane from SWDS that is oxidised in the soil or other material covering the waste)
F	Fraction of methane in the SWDS gas (volume fraction) (0.5)
$DOC_f$	Fraction of degradable organic carbon (DOC) that can decompose
MCF	Methane correction factor
$W_{j,x}$	Amount of organic waste type j prevented from disposal in the SWDS in the year x (tons)
$DOC_j$	Fraction of degradable organic carbon (by weight) in the waste type j
$k_j$	Decay rate for the waste type j
j	Waste type category (index)
x	Year during the crediting period: x runs from the first year of the first crediting period (x = 1) to the year y for which avoided emissions are calculated (x = y)
y	Year for which methane emissions are calculated

$BE_{CH_4,SWDS,y}$	$BE_{CH_4,foodwaste,y}$	$BE_{CH_4,gardewaste,y}$	$BE_{CH_4,paper\ waste,y}$	$BE_{CH_4,wooden\ waste,y}$	$BE_{CH_4,textilewaste,y}$
--------------------	-------------------------	--------------------------	----------------------------	-----------------------------	----------------------------

t CO <sub>2</sub> e	tCO <sub>2</sub> e	tCO <sub>2</sub> e	tCO <sub>2</sub> e	tCO <sub>2</sub> e	tCO <sub>2</sub> e
155069.97	54221.79	29828.01	18172.16	7661.72	13855.42

## E.2. Calculation of project emissions or actual net removals

### Project Emission (PE<sub>y</sub>):

The project emissions are calculated as follows:

$$PE_y = PE_{elec,y} + PE_{fuel,onsite,y} + PE_{a,y} + PE_{r,y}$$

Where:	
PE <sub>y</sub>	Project emissions in year y (tCO <sub>2</sub> e)
PE <sub>elec,y</sub>	Emissions from electricity consumption on-site due to the project activity in year y (tCO <sub>2</sub> e)
PE <sub>fuel,onsite,y</sub>	Emissions on-site due to fuel consumption on-site in year y (tCO <sub>2</sub> e).
PE <sub>a,y</sub>	Emissions from the anaerobic digestion process in year y (tCO <sub>2</sub> e)
PE <sub>r,y</sub>	Emissions from the combustion of RDF in year y (tCO <sub>2</sub> e)

PE <sub>y</sub>	PE <sub>elec,y</sub>	PE <sub>fuel,onsite,y</sub>	PE <sub>a,y</sub>	PE <sub>r,y</sub>
t CO <sub>2</sub> e	tCO <sub>2</sub> e	tCO <sub>2</sub> e	tCO <sub>2</sub> e	tCO <sub>2</sub> e
138864.57	8156.03	28.87	0	130679.67

### Project emissions from electricity use (PE<sub>elec,y</sub>):

The project activity involves electricity consumption and emissions are calculated as follows:

$$PE_{elec,y} = MWH_{e,y} * CEF_{elec}$$

Where:	
MWH <sub>e,y</sub>	Amount of electricity generated in an on-site fossil fuel fired power plant or consumed from the grid in the project activity, measured using an electricity meter (MWh) <i>MWH<sub>e,y</sub> is same as EG<sub>PJ,FF,y</sub> as per the methodology</i>
CEF <sub>elec</sub>	Carbon emissions factor for electricity generation in the project activity (tCO <sub>2</sub> /MWh)

PE <sub>elec,y</sub>	MWH <sub>e,y</sub>	CEF <sub>elec</sub>
tCO <sub>2</sub> e	MWh	tCO <sub>2</sub> e/MWh
8156.03	8322.48	0.98

### Emission from fuel use on-site (PE<sub>fuel,onsite,y</sub>):

Emissions are calculated from the quantity of fuel used and the specific CO<sub>2</sub>-emission factor of the fuel, as follows:

$$PE_{fuel,onsite,y} = F_{cons,y} * NCV_{fuel} * EF_{fuel}$$

Where:
--------

$F_{\text{cons},y}$	Fuel consumption on site in year y (l or kg)
$NCV_{\text{fuel}}$	Net caloric value of the fuel (MJ/l or MJ/kg)
$EF_{\text{fuel}}$	CO <sub>2</sub> emissions factor of the fuel (tCO <sub>2</sub> /MJ)

$PE_{\text{fuel,onsite},y}$	$F_{\text{cons},y}$	$NCV_{\text{fuel}}$	$EF_{\text{fuel}}$
tCO <sub>2e</sub>	Litres	MJ/kg	tCO <sub>2e</sub> /TJ
28.87	10712.50	43.3	74.1

**Emission from anaerobic digestion ( $PE_{a,y}$ ):**

Since, there is no anaerobic digestion taking place in the project activity, emissions under this parameter have been considered as Zero.

**Emissions from combustion of RDF ( $PE_{r,y}$ ):**

The project emission from RDF combustion is calculated as follows:

$$PE_{r,y} = PE_{r,f,y} + PE_{r,s,y}$$

Where:	
$PE_{r,f,y}$	Fossil-based waste CO <sub>2</sub> emissions from RDF-combustion in year y (tCO <sub>2e</sub> )
$PE_{r,s,y}$	Emissions from the final stacks from RDF-combustion in year y (tCO <sub>2e</sub> )

$PE_{r,y}$	$PE_{r,s,y}$	$PE_{r,f,y}$
tCO <sub>2e</sub>	tCO <sub>2e</sub>	tCO <sub>2e</sub>
130679.67	1623.12	129056.55

**Emissions from fossil based waste ( $PE_{r,f,y}$ )**

$$PE_{r,f,y} = \sum A_i * CCW_i * FCF_i * EF_i * (44/12)$$

Where:	
$A_i$	Amount of waste type i fed (t/yr)
$CCW_i$	Fraction of carbon content in waste type i (fraction)
$FCF_i$	Fraction of fossil carbon in waste type i (fraction)
$EF_i$	Combustion efficiency for waste type i (fraction)
44/12	Conversion factor (tCO <sub>2</sub> /tC)

	Paper/ Cardboard	Textiles	Food Waste	Wood	Garden and park waste	Rubber and leather	Plastics	Other, inert waste
$PE_{r,f,y}$	$PE_{r,f,y,i=A_i} * CCW_i * FCF_i * EF_i$	$PE_{r,f,y,i=A_i} * CCW_i * FCF_i * EF_i$	$PE_{r,f,y,i=A_i} * CCW_i * FCF_i * EF_i$	$PE_{r,f,y,i=A_i} * CCW_i * FCF_i * EF_i$	$PE_{r,f,y,i=A_i} * CCW_i * FCF_i * EF_i$	$PE_{r,f,y,i=A_i} * CCW_i * FCF_i * EF_i$	$PE_{r,f,y,i=A_i} * CCW_i * FCF_i * EF_i$	$PE_{r,f,y,i=A_i} * CCW_i * FCF_i * EF_i$

	(44/12)	(44/12)	(44/12)	(44/12)	(44/12)	(44/12)	(44/12)	(44/12)
t CO <sub>2</sub> e	t CO <sub>2</sub> e	t CO <sub>2</sub> e	t CO <sub>2</sub> e	t CO <sub>2</sub> e	t CO <sub>2</sub> e	t CO <sub>2</sub> e	t CO <sub>2</sub> e	t CO <sub>2</sub> e
129056.55	1296.14	55676.43	0	0	0	2548.60	56082.83	13452.56

### Emissions from RDF combustor ( $PE_{r,s,y}$ ):

For the calculation of the project emissions from stack gases of the RDF combustor Option 1 of the registered PDD has been chosen by the PP. The stack emission from project activity is as follows:

#### Option 1:

$$PE_{r,s,y} = SG_{r,y} * MC_{N_2O,r,y} * GWP_{N_2O} + SG_{r,y} * MC_{CH_4,r,y} * GWP_{CH_4}$$

Where:	
$SG_{r,y}$	Total volume of stack gas from the RDF combustion (m <sup>3</sup> /yr)
$MC_{N_2O,r,y}$	Monitored content of nitrous oxide in the stack gas from RDF combustion in year y (t <sub>N<sub>2</sub>O</sub> /m <sup>3</sup> )
$GWP_{N_2O}$	Global Warming Potential of nitrous oxide (tCO <sub>2</sub> e/t <sub>N<sub>2</sub>O</sub> )
$MC_{CH_4,r,y}$	Monitored content of methane in the stack gas from RDF combustion in year y (t <sub>CH<sub>4</sub></sub> /m <sup>3</sup> )
$GWP_{CH_4}$	Global Warming Potential of methane (tCO <sub>2</sub> e/t <sub>CH<sub>4</sub></sub> )

$PE_{r,s,y}$	$SG_{r,y}$	$MC_{N_2O,r,y}$	$GWP_{N_2O}$	$MC_{CH_4,r,y}$	$GWP_{CH_4}$
tCO <sub>2</sub> e	SM <sup>3</sup>	Avg.	t CO <sub>2</sub> e/tN <sub>2</sub> O	t N <sub>2</sub> O/m <sup>3</sup>	t CO <sub>2</sub> e/t
1623.12	73075225.62	1.55	298	0	25

### E.3. Calculation of leakage emissions

#### Leakage ( $L_y$ ):

The leakage emissions from the project activity are calculated as follows:

$$L_y = L_{t,y} + L_{r,y}$$

Where:	
$L_{t,y}$	Leakage emissions from increased transport in year y (tCO <sub>2</sub> e)
$L_{r,y}$	Leakage emissions from the residual waste from the anaerobic digester, the processing/combustion of RDF in year y (tCO <sub>2</sub> e) (Since there is no residual waste from the processing activity in project activity, the value of this parameter is zero)

$L_y$	$L_{t,y}$	$L_{r,y}$
tCO <sub>2</sub> e	tCO <sub>2</sub> e	tCO <sub>2</sub> e
196.96	196.96	0

#### Leakage emission from increased transport:

There is no increase in the distance travelled for disposal of the collected waste from the collection points. This is because of the reason that the waste processing unit is being established at the landfill sites only where the waste was being dumped earlier also. However, there is transport of ash to the disposal site developed at a distance of 10 km from the project site. Project emissions for the same are accounted as leakage emissions for the project activity as follows:

$$L_{t,y} = \sum NO_{\text{vehicles},i,y} * km_{i,y} * VF_{\text{cons},i} * CV_{\text{fuel}} * D_{\text{fuel}} * EF_{\text{fuel}}$$

Where:	
$NO_{\text{vehicles},i,y}$	Number of vehicles for transport with similar loading capacity
$km_{i,y}$	Average additional distance travelled by vehicle type i
$VF_{\text{cons},i}$	Vehicle fuel consumption in litres per kilometre for vehicle type i (l/km)
$CV_{\text{fuel}}$	Calorific value of the fuel (MJ/Kg or other unit)
$D_{\text{fuel}}$	Fuel density (kg/l)
$EF_{\text{fuel}}$	Emission factor of the fuel (tCO <sub>2</sub> /MJ)

$L_y$	$NO_{\text{vehicles},i,y}$	$km_{i,y}$	$VF_{\text{cons},i}$	$CV_{\text{fuel}}$	$D_{\text{fuel}}$	$EF_{\text{fuel}}$
tCO <sub>2</sub> e	No	Km	l/km	MJ/kg	Kg/l	tCO <sub>2</sub> /TJ
196.96	14616	20	0.25	43.3	0.84	74.1

#### E.4. Calculation of emission reductions or net anthropogenic removals

	Baseline GHG emissions or baseline net GHG removals (t CO <sub>2</sub> e)	Project GHG emissions or actual net GHG removals (t CO <sub>2</sub> e)	Leakage GHG emissions (t CO <sub>2</sub> e)	GHG emission reductions or net anthropogenic GHG removals (t CO <sub>2</sub> e)		
				Before 01/01/2013	From 01/01/2013	Total amount
Total	209994.36	138864.57	196.96	0	70,933	70,933

#### E.5. Comparison of emission reductions or net anthropogenic removals achieved with estimates in the registered PDD

Amount achieved during this monitoring period (t CO <sub>2</sub> e)	Amount estimated ex ante (t CO <sub>2</sub> e)
70,933	345,833

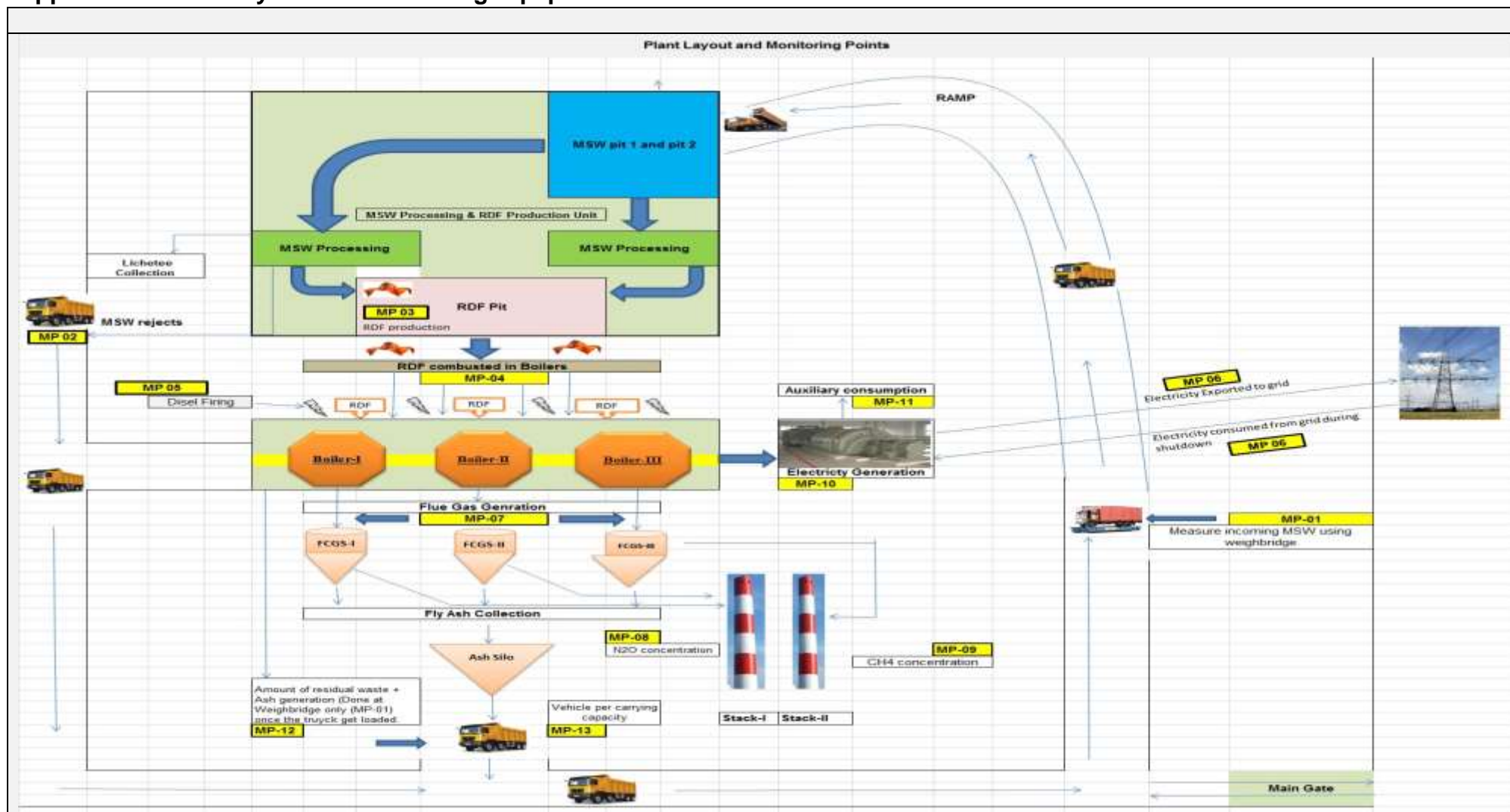
#### E.6. Remarks on increase in achieved emission reductions

The baseline emission from the methane production in absence of project activity is dependent on the physical characterization of the waste collected in year y and also on the parameters like “fraction of degradable organic content” and “decay rate for the waste”.

The composition of waste is dynamic the emission reduction may vary from the registered PDD and from one year to another. Also, the values for parameters “fraction of degradable organic content” and “decay rate for the waste” has been significantly decreased in the latest version of applicable tool – “Emissions from solid waste disposal sites”, version 06.0.1.

The actual emission reductions achieved during the monitoring period (70,933 tCO<sub>2</sub>e) are 79.49% less than the estimated value of emission reduction (345,833 tCO<sub>2</sub>e) for the equivalent period (i.e. 10/03/2016-09/03/2017).

## Appendix 1. Plant Layout and Monitoring Equipment



## Appendix 2. Monitoring Equipment

Calibration Details of Monitoring Equipment								
Parameter (s)	Monitoring Equipment	Make	Serial No	Metering Point	Accuracy/Class	Date of Calibration	Calibration due on	Gap (if any)
Amount of electricity consumed from grid in the project activity (EGPJ,FF,y)	Energy Meter	Elster	O5252046	MP-06	0.2	12-11-2014	11-11-2015	NA
						10-11-2015	09-11-2016	NA
Diesel consumption on-site during year 'y' of the crediting period (F con)	Oil Meter	Kent	110517	MP-05	0.5	05-01-2015	04-01-2016	NA
						04-01-2016	03-01-2017	
(1) Amount of RDF combusted in year y (Rc) (2) Total weight of RDF produced (Rt)	Load Cell	Cell Sensor	1024	MP-03 and MP-04	1	14-03-2015	14-03-2016	NA
						14-03-2014	14-03-2015	
	Load Cell	Cell Sensor	1025		1	14-03-2015	14-03-2016	NA
						14-03-2014	14-03-2015	
	Load Cell	Cell Sensor	1026		1	14-03-2015	14-03-2016	NA
						14-03-2014	14-03-2015	
	Load Cell	Cell Sensor	1027		1	14-03-2015	14-03-2016	NA
						14-03-2014	14-03-2015	
	Load Cell	Cell Sensor	1028		1	14-03-2015	14-03-2016	NA
						14-03-2014	14-03-2015	
	Load Cell	Cell Sensor	1029		1	14-03-2015	14-03-2016	NA
						14-03-2014	14-03-2015	
	Load Cell	Cell Sensor	1030		1	14-03-2015	14-03-2016	NA
						14-03-2014	14-03-2015	
Load Cell	Cell	1031	1	14-03-2015	14-03-2016	NA		



		Sensor				14-03-2014	14-03-2015	
Amount of waste and residue	Weighbridge-1	Endevour	85	MP-01, MP-02 and MP-12	Class III (e value 5 kg)	31-12-2014	31-12-2015	NA
						29-12-2015	29-12-2016	NA
	Weighbridge-2	Endevour	46		Class III (e value 5 kg)	31-12-2014	31-12-2015	NA
						29-12-2015	29-12-2016	NA
	Weighbridge-3	Endevour	47		Class III (e value 5 kg)	31-12-2014	31-12-2015	NA
						29-12-2015	29-12-2016	NA
Total volume of stack gas from RDF combustion in year y (SGr,y)	Gas Flow Meter	Yokogawa	01HTA20CF901	MP-07	±0.51% of FSR	17-01-2015	17-01-2016	NA
						17-01-2016	17-01-2017	NA
	Gas Flow Meter	Yokogawa	02HTA20CF901		±0.51% of FSR	17-01-2015	17-01-2016	NA
						17-01-2016	17-01-2017	NA
	Gas Flow Meter	Yokogawa	03HTA20CF901		±0.51% of FSR	17-01-2015	17-01-2016	NA
						17-01-2016	17-01-2017	NA
Amount of electricity generated utilizing the RDF produced and exported to grid in the project activity during the year y	Energy Meter (Gross Generation)	Siemens Ltd.	GJU61733	MP-10	0.2	10-01-2015	10-01-2016	NA
						10-01-2016	09-01-2017	NA
	Energy Meter (Import/Export)	Elster	O5252046	MP-06	0.2	12-11-2014	11-11-2015	NA
						10-11-2015	09-11-2016	NA
	Energy Meter (Auxiliary Consumption)	Conzerv	203987/8967-2810	MP-11	0.5	10-01-2015	10-01-2016	NA
						10-01-2016	09-01-2017	NA
	Energy Meter (Auxiliary Consumption)	Conzerv	205056/9635-3310		0.5	10-01-2015	10-01-2016	NA
						10-01-2016	09-01-2017	NA
	Energy Meter (Auxiliary Consumption)	Conzerv	205503/10130-3410		0.5	10-01-2015	09-01-2016	NA
						10-01-2016	09-01-2017	NA

### Appendix 3. Summary of calculation of emission reductions or net GHG removals by sinks during monitoring period

S.No.	Period	Baseline emissions or baseline net GHG removals by sinks (t CO <sub>2</sub> e)	Project emissions or actual net GHG removals by sinks (t CO <sub>2</sub> e)	Leakage (t CO <sub>2</sub> e)	GHG emission reductions or net GHG removals by sinks (t CO <sub>2</sub> e) achieved in the monitoring period
Formulae		BE <sub>y</sub>	PE <sub>y</sub>	L <sub>y</sub>	ER <sub>y</sub> = BE <sub>y</sub> - PE <sub>y</sub> - L <sub>y</sub>
10/03/2015-09/03/2016					
10/03/2015-09/03/2016		209994.36	138864.57	196.96	70,933

Comparison of actual emission reductions or net GHG removals by sinks with estimates in registered PDD				
S.No.	Period	Values estimated in ex ante calculation of registered PDD (t CO <sub>2</sub> e)	Actual values achieved during this monitoring period (t CO <sub>2</sub> e)	% Difference
Formulae		A	B	(A-B)/A * 100%
1	10/03/2016-09/03/2017 5 <sup>th</sup> Year	345,833	70,933	79%

## Document information

<i>Version</i>	<i>Date</i>	<i>Description</i>
06.0	7 June 2017	Revision to: <ul style="list-style-type: none"> <li>• Ensure consistency with version 01.0 of the “CDM project standard for project activities” (CDM-EB93-A04-STAN);</li> <li>• Make editorial improvements.</li> </ul>
05.1	4 May 2015	Editorial revision to correct version numbering.
05.0	1 April 2015	Revisions to: <ul style="list-style-type: none"> <li>• Include provisions related to delayed submission of a monitoring plan;</li> <li>• Provisions related to the Host Party;</li> <li>• Remove reference to programme of activities;</li> <li>• Overall editorial improvement.</li> </ul>
04.0	25 June 2014	Revisions to: <ul style="list-style-type: none"> <li>• Include the Attachment: Instructions for filling out the monitoring report form (these instructions supersede the "Guideline: Completing the monitoring report form" (Version 04.0));</li> <li>• Include provisions related to standardized baselines;</li> <li>• Add contact information on a responsible person(s)/ entity(ies) for completing the CDM-MR-FORM in A.6 and Appendix 1;</li> <li>• Change the reference number from <i>F-CDM-MR</i> to <i>CDM-MR-FORM</i>;</li> <li>• Editorial improvement.</li> </ul>
03.2	5 November 2013	Editorial revision to correct table in page 1.
03.1	2 January 2013	Editorial revision to correct table in section E.5.
03.0	3 December 2012	Revision required to introduce a provision on reporting actual emission reductions or net GHG removals by sinks for the period up to 31 December 2012 and the period from 1 January 2013 onwards (EB 70, Annex 11).
02.0	13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20).
01.0	28 May 2010	EB 54, Annex 34. Initial adoption.
Decision Class: Regulatory Document Type: Form Business Function: Issuance Keywords: monitoring report		