

Revised Monitoring Plan

For

Project Title

**Substitution of clinker with fly ash in Portland Pozzolana Cement
(Blended Cement) at Lafarge India Pvt. Ltd. – Arasmeta Cement Plant**

Date: 10/06/2008

References

UNFCCC Reference No. 0746

Project Location

Arasmeta Cement Plant

Village - Parsada, Tehsil - Janjgir,
District - Janjgir-Champa, Bilaspur,
State - Chhattisgarh, Country - India

Project Participant

Lafarge India Private Limited

43 Ashutosh Chaudhuri Avenue, 101 B, 1st Floor Sunny Towers,
Kolkata, State - West Bengal, Country -India

D.2. 1. Option 1: Monitoring of the emissions in the project scenario and the baseline scenario

D.2.1.1. Data to be collected in order to monitor emissions from the project activity, and how this data will be archived:

ID number	Data variable	Source of data	Data unit	Measured (m), calculated(c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
1	In CaOy	In plant clinkerisation unit	%	M,C	Daily	100%	Electronic	Is a part of normal day to day operation of clinkerisation unit of the plant.
2	Out CaOy	In plant clinkerisation unit	%	M,C	Daily	100%	Electronic	Is a part of normal day t day operation of clinkerisation unit of the plant.
3	In MgOy	In plant clinkerisation unit	%	M,C	Daily	100%	Electronic	Is a part of normal day t day operation of clinkerisation unit of the plant.
4	Out MgOy	In plant clinkerisation unit	%	M,C	Daily	100%	Electronic	Is a part of normal day t day operation of clinkerisation unit of the plant.
5	Quantity of limestone used in the clinkerisation unit	In plant clinkerisation unit	Kilo tonnes	M	Annually	100%	Electronic	The plant records usages of limestone for clinker production on monthly basis. For annual records same can be crossed checked in annual financial accounts/ balance sheet/ opening and closing balance of raw material used and investment.
6	Quantity of clinker used for PPC production CLNKy	In plant grinding unit	Kilo tonnes	M	Annually	100%	Electronic	The plant records usages of clinker for PPC production on monthly basis. For annual records same can be crossed checked in annual financial records/ balance sheet/ opening and closing balance of clinker in published data of Cement Manufacturers Association of India

D.2.1.1. Data to be collected in order to monitor emissions from the project activity, and how this data will be archived:								
ID number	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/paper)	Comment
7	FFi,	<i>In plant clinkerisation unit</i>	<i>Tones</i>	<i>M</i>	<i>Annually</i>	<i>100%</i>	<i>Electronic</i>	<i>The plant records usages of coal for clinker production on monthly basis. For annual records same can be crossed checked in annual financial records/ balance sheet/ opening and closing balance of raw material consumption</i>
8	EFFi	<i>IPCC default values for the fuels type</i>	<i>tCO2/tonne of fuel used</i>	<i>C</i>	<i>Annually</i>	<i>100%</i>	<i>Electronic</i>	
9	PELEgrid_CLNK,y	<i>In plant clinkerisation unit</i>	<i>MWh</i>	<i>M</i>	<i>Monthly</i>	<i>100%</i>	<i>Electronic</i>	<i>The total electricity consumed by the unit for clinker production is recorded monthly and same can be cross checked with monthly electricity bills paid.</i>
10	EFgrid_y	<i>Central Electricity Authority under Ministry of Power Govt. of India</i>	<i>tCO2/MWh</i>	<i>C, E</i>	<i>Ex-ante estimated to 0.984 kg CO2e/ kWh and fixed for the whole crediting period.</i>	<i>100%</i>	<i>Electronic</i>	<i>Data on grid generation and power plant details has been sourced from State grid and central electricity authority of India and estimated ex-ante, based on the approved methodology ACM0002, using a combined margin approach.</i> <i>Ref. Page 8 of validation report submitted for registration of the project</i>
11	PELEsg_CLNK,y	<i>In plant data</i>	<i>MWh</i>	<i>M</i>	<i>Monthly</i>	<i>100%</i>	<i>Electronic</i>	<i>Unit uses DG sets to generate electricity during power cuts from grid.</i>
12	EFsg_y	<i>In plant data</i>	<i>tCO2/MWh</i>	<i>M,C,E</i>	<i>Annually</i>	<i>100%</i>	<i>Electronic</i>	<i>Unit would record the estimated emission factor of the in-house electricity generation based on calculated NCV and C% of HSD used.</i>
13	ADDy Quantity of	<i>In plant data</i>	<i>Kilo tonnes</i>	<i>M</i>	<i>Monthly</i>	<i>100%</i>	<i>Electronic</i>	<i>The plant records usages of fly ash</i>

D.2.1.1. Data to be collected in order to monitor emissions from the project activity, and how this data will be archived:								
ID number	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/paper)	Comment
	<i>additives</i>							<i>for PPC production on monthly basis. For annual records same can be crossed checked in annual financial records balance sheet/ opening and closing balance of fly ash</i>
14	PEcalcin,y	<i>In plant data</i>	<i>tCO2/tonne of clinker</i>	<i>C</i>	<i>Annually</i>	<i>100%</i>	<i>Electronic</i>	
15	PEfossil_fuel,y	<i>In plant data</i>	<i>tCO2/tonne of clinker</i>	<i>C</i>	<i>Annually</i>	<i>100%</i>	<i>Electronic</i>	
16	PEele_grid_CLNK,y	<i>In plant data</i>	<i>tCO2/tonne of clinker</i>	<i>C</i>	<i>Annually</i>	<i>100%</i>	<i>Electronic</i>	
17	PEele_sg_CLNK,y	<i>In plant data</i>	<i>tCO2/tonne of clinker</i>	<i>C</i>	<i>Annually</i>	<i>100%</i>	<i>Electronic</i>	
18	PEele_sg_CLNK,y	<i>In plant data</i>	<i>tCO2/tonne of clinker</i>	<i>C</i>	<i>Annually</i>	<i>100%</i>	<i>Electronic</i>	
19	PEele_grid_BC,y	<i>In plant data</i>	<i>tCO2/tonne of blended cement</i>	<i>C</i>	<i>Annually</i>	<i>100%</i>	<i>Electronic</i>	
20	PEele_sg_BC,y	<i>In plant data</i>	<i>tCO2/tonne of blended cement</i>	<i>C</i>	<i>Annually</i>	<i>100%</i>	<i>Electronic</i>	
21	Pblend,y	<i>In plant data</i>	<i>Tonne of clinker/tonne of blended cement</i>	<i>C</i>	<i>Annually</i>	<i>100%</i>	<i>Electronic</i>	

D.2.1.2. Description of formulae used to estimate project emissions (for each gas, source, formulae/algorithm, emissions units of CO2 equ.)

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$$PEBC,y = [PEclinker,y * PBlend,y] + PEele_ADD_BC,y \quad (1)$$

where:

PEBC,y = CO2 emissions per tonne of BC in the project activity plant in year y (tCO2/tonne BC)

PEclinker,y = CO2 emissions per tonne of clinker in the project activity plant in year y (t CO2/tonne clinker) and defined below

PBlend,y = Share of clinker per tonne of BC in year y (tonne of clinker/tonne of BC)

PEele_AD,D_BC,y = Electricity emissions for BC grinding and preparation of additives in year y (tCO2/tonne of BC)

CO2 per tonne of clinker in the project activity plant in year y is calculated as below:

$$PE_{clinker,y} = PE_{calcin,y} + PE_{fossil_fuel,y} + PE_{ele_grid_CLNK,y} + PE_{ele_sg_CLNK,y} \quad (1.1)$$

where:

$PE_{clinker,y}$ = Emissions of CO₂ per tonne of clinker in the project activity plant in year y (tCO₂/tonne clinker)

$PE_{calcin,y}$ = Emissions per tonne of clinker due to calcinations of calcium carbonate and magnesium carbonate in year y (tCO₂/tonne clinker)

$PE_{fossil_fuel,y}$ = Emissions per tonne of clinker due to combustion of fossil fuels for clinker production in year y (t CO₂/tonne clinker)

$PE_{ele_grid_CLNK,y}$ = Grid electricity emissions for clinker production per tonne of clinker in year y (t CO₂/tonne clinker)

$PE_{ele_sg_CLNK,y}$ = Emissions from self-generated electricity per tonne of clinker production in year y (t CO₂/tonne clinker)

$$PE_{calcin,y} = 0.785 \cdot (Out_{CaO,y} - In_{CaO,y}) + 1.092 \cdot (Out_{MgO,y} - In_{MgO,y}) / [CLNK_y \cdot 1000] \quad (1.1.1)$$

$PE_{calcin,y}$ = Emissions from the calcinations of limestone (tCO₂/tonne clinker)

0.785 = Stoichiometric emission factor for CaO (tCO₂/t CaO)

1.092 = Stoichiometric emission factor for MgO (tCO₂/t MgO)

$In_{CaO,y}$ = CaO content (%) of the raw material * raw material quantity (tonnes)

$Out_{CaO,y}$ = CaO content (%) of the clinker * clinker produced (tonnes)

$In_{MgO,y}$ = MgO content (%) of the raw material * raw material quantity (tonnes)

$Out_{MgO,y}$ = MgO content (%) of the clinker * clinker produced (tonnes)

$$PE_{fossil_fuel,y} = \sum_i FFi_y \cdot EFF_i / CLNK_y \cdot 1000 \quad (1.1.2)$$

where:

FFi_y = Fossil fuel of type i consumed for clinker production in year y (tonnes of fuel i)

EFF_i = Emission factor for fossil fuel i (tCO₂/tonne of fuel)

$CLNK_y$ = Annual production of clinker in year y (kilotonnes of clinker)

$$PE_{ele_grid_CLNK,y} = [PELE_{grid_CLNK,y} \cdot EF_{grid,y}] / [CLNK_y \cdot 1000] \quad (1.1.3)$$

where:

$PELE_{grid_CLNK,y}$ = Grid electricity for clinker production in year y (MWh)

$EF_{grid,y}$ = Grid emission factor in year y (t CO₂/MWh)

$CLNK_y$ = Annual production of clinker in year y (kilotonnes of clinker)

$$PE_{elec_sg_CLNK,y} = [PELE_{sg_CLNK,y} \cdot EF_{sg,y}] / [CLNK_y \cdot 1000] \quad (1.1.4)$$

where:

$PELE_{sg_CLNK,y}$ = Self generation of electricity for clinker production in year y (MWh)

$EF_{sg,y}$ = Emission factor for self generated electricity in year y (t CO₂/MWh)

$CLNK_y$ = Annual production of clinker in year y (kilotonnes of clinker)

$$PE_{ele_ADD_BC,y} = PE_{ele_grid_BC,y} + PE_{ele_sg_BC,y} \quad (1.2)$$

where:

$PE_{ele_grid_BC}$ = Grid electricity emissions for BC grinding in year y (tCO₂/tonne of BC)

PEele_sg_BC = Emissions from self generated electricity for BC grinding in year y (tCO₂/tonne of BC)

$$\text{PEele_grid_BC,y} = [\text{PELEgrid_BC,y} * \text{EFgrid_BSL,y}] / [\text{BCy} * 1000] \quad (1.2.1)$$

PELEgrid_BC,y = Baseline grid electricity for grinding BC (MWh)

EFgrid_y = Grid emission factor in year y (t CO₂/MWh), estimated *ex-ante* based on the approved methodology ACM0002 using a combined margin approach. For Western regional grid of India, the grid emission factor has been estimated to 0.984 t CO₂e/ MWh.

BCy = Annual production of BC in year y (kilotonnes of BC)

$$\text{PEelec_sg_BC,y} = [\text{PELEsg_BC,y} * \text{EFsg_y}] / [\text{BCy} * 1000] \quad (1.2.2)$$

PELEsg_BC,y = Self generated electricity for grinding BC in year y (MWh)

EFsg_y = Emission factor for self generated electricity in year y (t CO₂/MWh)

BCy = Annual production of BC in year y (kilotonnes of BC)

$$\text{EF}_{\text{sg,y}} = \sum_{i,j} \text{F}_{i,j,y} \times \text{COEF}_{i,j} / \sum_j \text{GEN}_{j,y} \quad (1.3)$$

where:

$\text{F}_{i,j,y}$ is the amount of fuel i (in a mass or volume unit) consumed by relevant power sources j in year(s) y, j refers to the power sources delivering electricity to the grid, not including low-operating cost and must-run power plants, and including imports to the grid,

$\text{COEF}_{i,j,y}$ is the CO₂ emission coefficient of fuel i (tCO₂ / mass or volume unit of the fuel), taking into account the carbon content of the fuels used by relevant power sources j and the percent oxidation of the fuel in year(s) y, and

$\text{GEN}_{j,y}$ is the electricity (MWh) delivered to the grid by source j.

The CO₂ emission coefficient COEF_i is obtained as

$$\text{COEF}_i = \text{NCV}_i \times \text{EFCO}_{2,i} \times \text{OXID}_i \quad (1.3.1)$$

where:

NCV_i is the net calorific value (energy content) per mass or volume unit of a fuel i,

OXID_i is the oxidation factor of the fuel

$\text{EFCO}_{2,i}$ is the CO₂ emission factor per unit of energy of the fuel i.

D.2.1.3. Relevant data necessary for determining the baseline of anthropogenic emissions by sources of GHGs within the project boundary and how such data will be collected and archived :								
ID number	Data variable	Source of data	Data unit	Measured (m), calculated (c) estimated(e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
1	In CaOBSL	In plant clinkerisation unit	%	M,C	Daily	100%	Electronic	
2	Out CaOBSL	In plant clinkerisation unit	%	M,C	Daily	100%	Electronic	
3	In MgOBSL	In plant clinkerisation unit	%	M,C	Daily	100%	Electronic	
4	Out MgOBSL	In plant clinkerisation unit	%	M,C	Daily	100%	Electronic	
5	Quantity of limestone used in the clinkerisation unit in baseline	In plant clinkerisation unit	Kilo tonnes	M	Annually	100%	Electronic	
6	Quantity of clinker used for PPC production CLNKBSL	In plant grinding unit	Kilo tonnes	M	Annually	100%	Electronic	
7	FFi,	In plant clinkerisation unit	Tones	M	Annually	100%	Electronic	
8	EFFi_BLS	IPCC default values for the fuels type	tCO2/tonne of fuel used	C	Annually	100%	Electronic	
9	PELEgrid_CLNK, BSL	In plant clinkerisation unit	MWh	M	Monthly	100%	Electronic	
10	EFgrid_BSL	Central Electricity Authority under Ministry of Power Govt. of India	tCO2/MWh	E	Ex-ante estimated to 0.984 kg CO2e/ kWh and fixed for the whole crediting	100%	Electronic	Data on grid generation and power plant details has been sourced from State grid and central electricity authority of India and estimated ex-ante,

D.2.1.3. Relevant data necessary for determining the baseline of anthropogenic emissions by sources of GHGs within the project boundary and how such data will be collected and archived :								
ID number	Data variable	Source of data	Data unit	Measured (m), calculated (c) estimated(e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
					<i>period.</i>			<i>based on the approved methodology ACM0002, using a combined margin approach.</i> <i>Ref. Page 8 of validation report submitted for registration of the project</i>
11	PELEsg_CLNK, BSL	<i>In plant data</i>	<i>MWh</i>	<i>M</i>	<i>Monthly</i>	<i>100%</i>	<i>Electronic</i>	
12	EFsg_BSL	<i>In plant data</i>	<i>Tco2/MWh</i>	<i>M,C,E</i>	<i>Annually</i>	<i>100%</i>	<i>Electronic</i>	
13	ADDy Quantity of additives added in the baseline	<i>In plant data</i>	<i>Kilo tonnes</i>	<i>M</i>	<i>Monthly</i>	<i>100%</i>	<i>Electronic</i>	
14	BEcalcin, BSL	<i>In plant data</i>	<i>tCO2/tonne of clinker</i>	<i>C</i>	<i>Annually</i>	<i>100%</i>	<i>Electronic</i>	
15	BEfossil_fuel, BSL	<i>In plant data</i>	<i>tCO2/tonne of clinker</i>	<i>C</i>	<i>Annually</i>	<i>100%</i>	<i>Electronic</i>	
16	BEele_grid_CLNK, BSL	<i>In plant data</i>	<i>tCO2/tonne of clinker</i>	<i>C</i>	<i>Annually</i>	<i>100%</i>	<i>Electronic</i>	
17	BEele_sg_CLNK, BSL	<i>In plant data</i>	<i>tCO2/tonne of clinker</i>	<i>C</i>	<i>Annually</i>	<i>100%</i>	<i>Electronic</i>	
18	BEele_sg_CLNK, BSL	<i>In plant data</i>	<i>tCO2/tonne of clinker</i>	<i>C</i>	<i>Annually</i>	<i>100%</i>	<i>Electronic</i>	
19	BEele_grid_BC, BSL	<i>In plant data</i>	<i>tCO2/tonne of blended cement</i>	<i>C</i>	<i>Annually</i>	<i>100%</i>	<i>Electronic</i>	
20	BEele_sg_BC, BSL	<i>In plant data</i>	<i>tCO2/tonne of blended cement</i>	<i>C</i>	<i>Annually</i>	<i>100%</i>	<i>Electronic</i>	
21	Bblend,y	<i>In plant data</i>	<i>Tonne of clinker/tonne of blended cement</i>	<i>C</i>	<i>Annually</i>	<i>100%</i>	<i>Electronic</i>	

D.2.1.4. Description of formulae used to estimate baseline emissions (for each gas, source, formulae/algorithm, emissions units of CO2 equ.)

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$$\text{BEBC}_y = [\text{BEclinker} * \text{BBlend}_y] + \text{BEele_ADD_BC} \quad (2)$$

where:

BEBC_y = Baseline CO2 emissions per tonne of blended cement type (BC) (tCO2/tonne BC)

BEclinker = CO2 emissions per tonne of clinker in the baseline in the project activity plant (t CO2/tonne clinker) and defined below

BBlend_y = Baseline benchmark of share of clinker per tonne of BC updated for year y (tonne of clinker/tonne of BC)

BEele_ADD_BC = Baseline electricity emissions for BC grinding and preparation of additives (tCO2/tonne of BC)

CO₂ per tonne of clinker in the project activity plant in the baseline has been calculated as below:

$$\text{BEclinker} = \text{BEcalcin} + \text{BEfossil_fuel} + \text{BEele_grid_CLNK} + \text{BEele_sg_CLNK} \quad (2.1)$$

where:

BEclinker = Baseline emissions of CO2 per tonne of clinker in the project activity plant (t CO2/tonne clinker)

BEcalcin = Baseline emissions per tonne of clinker due to calcinations of calcium carbonate and magnesium carbonate (t CO2/tonne clinker)

BEfossil_fuel = Baseline emissions per tonne of clinker due to combustion of fossil fuels for clinker production (t CO2/tonne clinker)

BEele_grid_CLNK = Baseline grid electricity emissions for clinker production per tonne of clinker (t CO2/tonne clinker)

BEele_sg_CLNK = Baseline emissions from self generated electricity for clinker production per tonne of clinker (t CO2/tonne clinker)

$$\text{BEcalcin} = [0.785 * (\text{OutCaO} - \text{InCaO}) + 1.092 * (\text{OutMgO} - \text{InMgO})] / [\text{CLNKBSL} * 1000] \quad (2.1.1)$$

Where:

BEcalcin = Emissions from the calcinations of limestone (tCO2/tonne clinker)

0.785 = Stoichiometric emission factor for CaO (tCO2/t CaO)

1.092 = Stoichiometric emission factor for MgO (tCO2/t MgO)

InCaO = CaO content (%) of the raw material * raw material quantity (tonnes)

OutCaO = CaO content (%) of the clinker * clinker produced (tonnes)

InMgO = MgO content (%) of the raw material * raw material quantity (tonnes)

OutMgO = MgO content (%) of the clinker * clinker produced (tonnes)

CLNKBSL = Annual production of clinker in the base year (kilotonnes of clinker)

$$\text{BEfossil_fuel} = [\sum \text{FFi_BSL} * \text{EFFi}] / [\text{CLNKBSL} * 1000] \quad (2.1.2)$$

FFi_BSL = Fossil fuel of type i consumed for clinker production in the baseline (tonnes of fuel i)

EFFi = Emission factor for fossil fuel i (t CO2/tonne of fuel)

CLNKBSL = Annual production of clinker in the base year (kilotonnes of clinker)

$$\mathbf{BEele_grid_CLNK} = [\mathbf{BELEgrid_CLNK} * \mathbf{EFgrid_BSL}] / \mathbf{CLNKBSL} * \mathbf{1000} \quad (2.1.3)$$

BELEgrid_CLNK = Baseline grid electricity for clinker production (MWh)

EFgrid_BSL = Baseline grid emission factor (tCO₂/MWh), estimated *ex-ante* based on the approved methodology ACM0002 using a combined margin approach. For Western regional grid of India, the grid emission factor has been estimated to 0.984 t CO₂e/ MWh.

CLNKBSL = Annual production of clinker in the base year (kilotonnes of clinker)

$$\mathbf{BEelec_sg_CLNK} = [\mathbf{BELEsg_CLNK} * \mathbf{EFsg_BSL}] / [\mathbf{CLNKBSL} * \mathbf{1000}] \quad (2.1.4)$$

BELEsg_CLNK = Baseline self generation of electricity for clinker production (MWh)

EFsg_BSL = Baseline electricity self generation emission factor (t CO₂/MWh)

CLNKBSL = Annual production of clinker in the base year (kilotonnes of clinker)

$$\mathbf{BEele_ADD_BC} = \mathbf{BEele_grid_BC} + \mathbf{BEele_sg_BC} \quad (2.2)$$

where:

BEele_grid_BC = Baseline grid electricity emissions for BC grinding (tCO₂/tonne of BC)

BEele_sg_BC = Baseline self generated electricity emissions for BC grinding (tCO₂/tonne of BC)

$$\mathbf{BEele_grid_BC} = [\mathbf{BELEgrid_BC} * \mathbf{EFgrid_BSL}] / [\mathbf{BCBSL} * \mathbf{1000}] \quad (2.2.1)$$

BELEgrid_BC = Baseline grid electricity for grinding BC (MWh)

EFgrid_BSL = Baseline grid emission factor (t CO₂/MWh)

BCBSL = Annual production of BC in the base year (kilotonnes of BC)

$$\mathbf{BEelec_sg_BC} = [\mathbf{BELEsg_BC} * \mathbf{EFsg_BSL}] / [\mathbf{BCBSL} * \mathbf{1000}] \quad (2.2.2)$$

BELEsg_BC = Baseline self generation electricity for grinding BC (MWh)

EFsg_BSL = Baseline electricity self generation emission factor (t CO₂/MWh)

BCBSL = Annual production of BC in the base year (kilotonnes of BC)

$$\mathbf{EF_{sg,BLS}} = \sum_{i,j} \mathbf{F_{i,j,y}} \times \mathbf{COEF_{i,j}} / \sum_j \mathbf{GEN_{j,y}} \quad (2.3)$$

where:

F_{i,j,y} is the amount of fuel i (in a mass or volume unit) consumed by relevant power sources j in year(s) y, j refers to the power sources delivering electricity to the grid, not including low-operating cost and must-run power plants, and including imports⁴ to the grid,

COEF_{i,j,y} is the CO₂ emission coefficient of fuel i (tCO₂ / mass or volume unit of the fuel), taking into account the carbon content of the fuels used by relevant power sources j and the percent oxidation of the fuel in year(s) y, and

GEN_{j,y} is the electricity (MWh) delivered to the grid by source j.

The CO₂ emission coefficient COEF_i is obtained as

$$\mathbf{COEF_i} = \mathbf{NCV_i} \times \mathbf{EFCO_{2,i}} \times \mathbf{OXID_i} \quad (2.3.1)$$

where:

NCV_i is the net calorific value (energy content) per mass or volume unit of a fuel i,

OXID_i is the oxidation factor of the fuel

$EF_{CO_2,i}$ is the CO₂ emission factor per unit of energy of the fuel *i*.

D. 2.2. Option 2: Direct monitoring of emission reductions from the project activity (values should be consistent with those in section E).

D.2.2.1. Data to be collected in order to monitor emissions from the project activity, and how this data will be archived:

ID number	Data variable	Source of data	Data unit	Measured(m), calculated(c), estimated(e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/paper)	Comment

D.2.2.2. Description of formulae used to calculate project emissions (for each gas, source, formulae/algorithm, emissions units of CO₂ equ.):

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D.2.3. Treatment of leakage in the monitoring plan

D.2.3.1. If applicable, please describe the data and information that will be collected in order to monitor leakage effects of the project activity

ID number	Data variable	Source of data	Data unit	Measured (m), calculated(c) estimated(e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/paper)	Comment
1	Qadd ELEconveyor_ADD	In plant data	MWh	M	Monthly	100%	Electronic	
2	EFgrid	Central Electricity Authority under Ministry of Power Govt. of India	tcO ₂ /MWh	E	Ex-ante estimated to 0.984 kg CO ₂ e/ kWh and fixed for the whole crediting period.	100%	Electronic	Data on grid generation and power plant details has been sourced from State grid and central electricity authority of India and estimated ex-ante, based on the approved methodology ACM0002, using a combined margin approach. Ref. Page 8 of validation report submitted for registration of the

								<i>project</i>
3	Qadd	<i>In plant data</i>	<i>Tonne of additive/vehicle</i>	<i>M</i>	<i>Per trip</i>	<i>100%</i>	<i>Electronic</i>	
4	áy	<i>In plant data</i>	<i>Tonne of additive</i>	<i>M/C</i>	<i>Annually</i>	<i>100%</i>	<i>Electronic</i>	

D.2.3.2. Description of formulae used to estimate leakage (for each gas, source, formulae/algorithm, emissions units of CO2 equ.)

$$L_{add_trans} = (ELE_{conveyor_ADD} * EF_{grid}) * 1/Q_{add} * 1/1000 \quad (3)$$

where:

ELEconveyor_ADD = Electricity consumption for conveyor system for additives (MWh)

EFgrid = Grid electricity emission factor (tonnes of CO2/MWh), estimated *ex-ante* based on the approved methodology ACM0002 using a combined margin approach. For Western regional grid of India, the grid emission factor has been estimated to 0.984 t CO2e/ MWh.

Qadd = Quantity of additive carried in one trip per vehicle (tonnes of additive)