




**Verification and certification report form for
CDM project activities
(Version 03.0)**

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

BASIC INFORMATION

Title and UNFCCC reference number of the project activity	Installation of Low Green House Gases (GHG) emitting rolling stock cars in metro system UNFCCC ID: 1351
Scale of the project activity	<input type="checkbox"/> Large-scale <input checked="" type="checkbox"/> Small-scale
Version number of the verification and certification report	1.0 TN P-No. :
Completion date of the verification and certification report	10/12/2019
Monitoring period number and duration of this monitoring period	MP: 7 01/01/2013 to 28/12/2017 (Both days included)
Version number of the monitoring report to which this report applies	5.0
Crediting period of the project activity corresponding to this monitoring period	Fixed Crediting Period
Project participants	Delhi Metro Rail Corporation (DMRC)
Host Party	India
Applied methodologies and standardized baselines	AMS III.C. "Emission reduction by low greenhouse gas emitting vehicles" Version: 10 No Standardized Baseline is applied
Mandatory sectoral scopes	Scope: 7 / Technical Area: 7.1
Conditional sectoral scopes, if applicable	N/A
Estimated amount of GHG emission reductions or GHG removals for this monitoring duration in the registered PDD	242,713 tCO ₂ e
Certified amount of GHG emission reductions or GHG removals for this monitoring period	226,516 tCO ₂ e
Name and UNFCCC reference number of the DOE	TÜV NORD CERT GmbH; E-0022
Name, position and signature of the approver of the verification and certification report	 Final Approval Stefan Winter

SECTION A. Executive summary

Delhi Metro Rail Corporation (DMRC) has commissioned the TÜV NORD JI/CDM Certification Program to carry out the 7th periodic verification of the project:

“Installation of Low Green House Gases (GHG) emitting rolling stock cars in metro system”

with regard to the relevant requirements for CDM project activities.

This verification covers the period from 01/01/2013 to 28/12/2017 (including both days).

The project activity comprises of operation of low GHG emitting rolling stocks which have regenerative braking system. Thus, the project activity replaces conventional electro-dynamic rheostatic braking technology, with regenerative braking technology. The regenerated electrical energy by the project activity reduces the consumption of equivalent grid electrical energy required by the powering trains, and conserves equivalent electrical energy which leads to reduced GHG emissions.

Details of the project location are given in table A-1 below:

Table A-1: Project Location

No.	Project Location
Host Country	India
Region:	Delhi
Project location address:	Delhi Metro Rail Corporation (DMRC) Bhishma Pitamah Marg Pragati Vihar IIIrd NBCC Place New Delhi Delhi – 110003
Latitude:	28.61° N
Longitude:	77.23°E

During the onsite verification, it is confirmed that the actual implementation of the project is in line with the project technical description in the revised PDD^{/PDD/}. The project complies with all relevant statutory requirements.

The project activity involves operation of low GHG emitting rolling stocks which have regenerative braking system. Thus, the project activity replaces conventional electro-dynamic rheostatic braking technology, with regenerative braking technology. The regenerated electrical energy by the project activity reduces the consumption of equivalent grid electrical energy required by the powering trains, and conserves equivalent electrical energy which leads to reduced GHG emissions.

The project activity aims to reduce GHG emissions reducing approximately 47,053 tCO_{2e} per year over the fixed crediting period of 10 years, (ref. Approved PDD Version 05)^{/PDD/}

As a result of this verification, the verifier confirms that:

- all operations of the project are implemented and installed as planned and described in the validated project design document.
- the monitoring plan is in accordance with the applied small scale CDM methodology, i.e., AMS III.C. Version 10
- the installed equipment essential for measuring parameters required for calculating emission reductions are calibrated appropriately.
- the monitoring system is in place and functional. The project has generated GHG emission reductions.

As the result of the 7th periodic verification, the verifier confirms that the GHG emission reductions are calculated without material misstatements in a conservative and appropriate manner.

SECTION B. Verification team, technical reviewer and approver

B.1. Verification team member

No.	Role	Type of resource	Last name	First name	Affiliation (e.g. name of central or other office of DOE or outsourced entity)	Involvement in			
						Desk/document review	On-site inspection	Interviews	Verification findings
1.	TL	EI	Thanekar	Swapnil	-	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
2.	Technical Expert	EI	Katyarmal	Rajiv	-	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

B.2. Technical reviewer and approver of the verification and certification report

No.	Role	Type of resource	Last name	First name	Affiliation (e.g. name of central or other office of DOE or outsourced entity)
1.	Technical reviewer	IR	Krupp	Eric	TN Cert GmbH
2.	Technical reviewer /Approver	IR	Winter	Stefan	TN Cert GmbH

SECTION C. Application of materiality

C.1. Consideration of materiality in planning the verification

In order to ensure a complete, transparent and timely execution of the verification task the team leader has planned the complete sequence of events necessary to arrive at a substantiated final verification opinion.

Various tools have been established in order to ensure an effective verification planning.

Materiality Threshold

The verification is based on the materiality threshold identified in table below:

Applied Materiality Threshold

	Threshold	Related to
<input type="checkbox"/>	0.5 %	Emission reductions or removals for registered CDM project activities achieving a total emission reduction or removal equal to or more than 500,000 tonnes of carbon dioxide equivalent per year ¹ ;
<input type="checkbox"/>	1 %	Emission reductions or removals for registered CDM project activities achieving a total emission reduction or removal of between 300,000 and 500,000 tonnes of carbon dioxide equivalent per year;

¹ A year refers to a period of 12 consecutive months.

	Threshold	Related to
<input type="checkbox"/>	2 %	Emission reductions or removals for registered large-scale CDM project activities achieving a total emission reduction or removal of 300,000 tonnes of carbon dioxide equivalent per year or less;
<input checked="" type="checkbox"/>	5 %	Emission reductions or removals for registered small-scale CDM project activities other than registered CDM project activities covered under next category below;
<input type="checkbox"/>	10 %	Emission reductions or removals for the type of registered CDM project activities referred to in decision 3/CMP.6, paragraph 38 (referred to as microscale project activities).

Strategic Analysis

At the beginning of the verification, the verification team leader has assessed the nature, scale and complexity of the verification tasks by carrying out a strategic analysis of all activities relevant to the project activity. The team leader has collected and reviewed the information relevant to assess that the designated verification team is sufficiently competent to carry out the verification and to ensure that it is able to conduct the necessary risk analysis.

Risk analysis and detailed audit testing planning

For the identification and assessment of potential reporting risks and to determine the necessary detailed audit testing procedures for residual risk areas the following table is used.

No.	Risk that could lead to material errors, omissions or misstatements	Assessment of the risk		Response to the risk in the verification plan and/or sampling plan
		Risk level	Justification	
1.	Human error in the quantification of emissions	Low	Human error is likely to occur if personnel are unfamiliar with, or not well trained regarding, emissions processes or data recording	Depending on the monitoring period being verified, conduct increased verifying during the months when there is a greater likelihood of errors and issues with data quality control due to project participants' leave schedules
2.	Undue reliance on a poorly designed information system, which may have few effective quality controls	Low	Use of spreadsheets without adequate controls related to data changes/updates, version tracking, traceability, security	Depending on how data is generated, processed, and reported, place greater emphasis on verifying data captured and processed manually and/or in spreadsheets versus those that are generated from an automated system
3.	Omissions and misstatements in data transfer from hand written notes into digital Excel ER spreadsheet	Medium	Ineffective quality control of data transfer due to unclear QA/QC procedure	Check QM procedure/manual. PP may demonstrate how to transfer data and how this is crosschecked. Conduct interview with related personnel whether procedure is actually conducted but not adequately described.

On the basis of the risk analysis the verification has been planned. A detailed audit/verification plan has been prepared and submitted to the project participant(s) in due time before the site visit.

C.2. Consideration of materiality in conducting the verification

Based on the verification planning the verification has been carried out. The concept of materiality has been considered. A breakdown of the chosen approaches is included in the following table.

Parameter	Approach*	Errors* detected	Findings reference	Corrected	Remaining verification risk
EG _{i, Wr}	CDC	<input checked="" type="checkbox"/>	CL1, CL 2, CAR 1, CAR 3	<input checked="" type="checkbox"/>	Not material
EG _{i, R}	CDC	<input checked="" type="checkbox"/>	CL1, CL 2, CAR 1, CAR 3	<input checked="" type="checkbox"/>	Not material
S _i	CDC	<input checked="" type="checkbox"/>	CL 2	<input checked="" type="checkbox"/>	Not material
N	CDC	<input checked="" type="checkbox"/>	CL 2	<input checked="" type="checkbox"/>	Not material
Aggregate					Materiality threshold not exceeded

*) incl. omissions and misstatements

+) Verification Approaches:

CDC: Complete data check of data including all data aggregation steps

NDC: Non-complete data check – omissions not material

SPL: Sampling approach (all data available)

ASP: Acceptance Sampling

COM: Data check at higher data aggregation levels and sampling at original data levels

The verification was basically carried out as per the verification plan. However, based on the actual situation on-site and the errors, omissions and misstatements identified during the verification minor deviations from the original plan occurred. However, due to the insignificance no major revision of the overall plan was required. Esp. there was no need for significant modification of the sampling approaches or for additional / less locations to be visited during the on-site.

SECTION D. Means of verification

D.1. Desk/document review

During the desk review all documents initially provided by the client and publicly available documents relevant for the verification were reviewed. The main documents are listed below:

- the last revision of the PDD including the monitoring plan^{/PDD/},
- the last revision of the validation report^{/VAL/},
- the monitoring report, including the claimed emission reductions for the project^{/MR/},
- the documentation of previous verifications^{/VER/},
- the emission reduction calculation spreadsheet^{/XLS/}.

Other supporting documents, such as publicly available information on the UNFCCC website and background information were also reviewed.

D.2. On-site inspection

Duration of on-site inspection: 18/03/2019				
No.	Activity performed on-site	Site location	Date	Team member
1.	Opening meeting	DMRC, Najafgarh Depot	18/03/2019	Swapnil Thanekar, Rajiv Katyarmal.
2.	On-site inspection Interview with PP Representative and Operation Staff	DMRC, Najafgarh Depot	18/03/2019	
3.	Documents check	DMRC, Najafgarh Depot	18/03/2019	
4.	Finding Summary	DMRC, Najafgarh Depot	18/03/2019	
5.	Close Meeting	DMRC, Najafgarh Depot	18/03/2019	

D.3. Interviews

No.	Interviewee			Date	Subject	Team member
	Last name	First name	Affiliation			
1.	Sant Adhar	Verma	Delhi Metro Rail Corporation (DMRC) / GM/ Environment	18/03/2019	<ul style="list-style-type: none"> - General aspects of the project - Changes since validation - Monitoring and measurement - Quality management system - Involved personnel and responsibilities - Training and practice of the operational personnel - Implementation of the monitoring plan - Monitoring data management - Data uncertainty and residual risks - Procedural aspects of the verification - Maintenance - Environmental aspects - Sustainability indicators - Data management - Traceability and integrity of data - ER calculations 	Swapnil Thanekar, Rajiv Katyarmal.
2.	Vikash	Singhal	Delhi Metro Rail Corporation (DMRC) / DGM/ Environment	18/03/2019		
3.	Singh	Varun	Delhi Metro Rail Corporation (DMRC) / AM/ Environment	18/03/2019		
4.	Kumar	Gaurav	Delhi Metro Rail Corporation (DMRC) / ASE	18/03/2019		
5.	Joshi	Sanjay	Delhi Metro Rail Corporation (DMRC) / ASE	18/03/2019		
6.	Lal	Nand	Delhi Metro Rail Corporation (DMRC) / JE	18/03/2019		
7.	Dhiman	Anil	Delhi Metro Rail Corporation (DMRC) / Senior Tech	18/03/2019		
8.	Reddy	Pradeep	Delhi Metro Rail Corporation (DMRC) / JE	18/03/2019		
9.	Sethi	Ankit	Delhi Metro Rail Corporation (DMRC) / ASE/ Environment	18/03/2019		
10.	Kumar	Deepak	Delhi Metro Rail Corporation (DMRC) / ASE	18/03/2019		

D.4. Sampling approach

D.4.1 Sampling during monitoring

<input checked="" type="checkbox"/>	No sampling approach has been used by the PP to determine the monitored parameters
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<input type="checkbox"/>	A sampling approach has been taken for the following monitored parameter(s):				
	Parameter	Sampling approach ¹⁾	Sampling Type ²⁾	Population	Sample Size

¹⁾ Sampling Approaches:

- SiRS: Simple Random Sampling
- StRS: Stratified Random Sampling
- SS: Systematic Sampling
- CS: Cluster Sampling
- MSS: Multi-stage Sampling

²⁾ Sampling Types:

- PS: Parameter Sampling

D.4.2 Sampling approaches during verification

<input checked="" type="checkbox"/>	No sampling approach has been used ¹⁾ by the VT to verify the monitored parameters				
<input type="checkbox"/>	A sampling approach has been applied by the VT for the following monitored parameter(s):				
	Parameter	Sampling approach ¹⁾	Sampling Type ²⁾	Population	Sample Size

¹⁾ Sampling Approaches:

- SiRS: Simple Random Sampling
- StRS: Stratified Random Sampling
- SS: Systematic Sampling
- CS: Cluster Sampling
- MSS: Multi-stage Sampling

²⁾ Sampling Types:

- AS: Acceptance Sampling
- PS: Parameter Sampling
- COM: Full data check at higher data aggregation levels and sampling at original data levels

D.5. Clarification requests (CLs), corrective action requests (CARs) and forward action requests (FARs) raised

Areas of verification findings	No. of CL	No. of CAR	No. of FAR
Compliance of the monitoring report with the monitoring report form	-	1	-
Compliance of the project implementation and operation with the registered PDD	1	1	-
Post-registration changes	-	-	-
Compliance of the registered monitoring plan with the methodologies including applicable tools and standardized baselines	-	-	-
Compliance of monitoring activities with the registered monitoring plan	-	-	-
Compliance with the calibration frequency requirements for measuring instruments	-	1	-
Assessment of data and calculation of emission reductions or net removals	1	2	-
Assessment of reported sustainable development co-benefits	-	-	-
Global stakeholder consultation	-	-	-
Others (please specify)	-	-	-
Total	2	5	-

SECTION E. Verification findings

E.1. Compliance of the monitoring report with the monitoring report form

Means of verification	<p>A draft monitoring report was submitted to the verification team by the project participants. The DOE has made this report publicly available prior to the start of the verification activities. No comments were received.</p> <p>By means of the UNFCCC website it has been checked whether the latest applicable MR template CDM-MR-FORM has been used.</p> <p>Further it has been checked whether the latest instructions for filling out the MR template have been followed. Every section has been checked against the respective guidance.</p> <p>The following sources of information have been used in this context:</p> <ul style="list-style-type: none"> • /MR/ • /MRF/ • /unfccc/ 	
Findings	<input checked="" type="checkbox"/>	The latest reporting template CDM-MR-FORM as listed on the UNFCCC website has been used for the Monitoring Report to be uploaded.
	<input type="checkbox"/>	The latest instructions for filling out the MR have been followed. No adverse finding has been identified in the course of this verification.
	<input checked="" type="checkbox"/>	The respective requirements have widely been complied with; however; the following issues needed to be addressed in this context: CAR 05, CL 1 and CL 2
Conclusion	<input type="checkbox"/>	No CARs/CLs have been raised in this context. No correction was required in the context. The project is in line with the respective requirements.
	<input checked="" type="checkbox"/>	The raised CARs/CLs have been addressed appropriately. The PP has carried out the requested corrections. All respective findings could be closed out. For details please refer to Appendix 4.
	<p>During the verification, no mistakes and needs for clarification were identified for using the CDM-MR-FORM. It can be confirmed that the Monitoring report is complete and transparent and in accordance with the latest approved PDD, other relevant requirements as well as with the applicable monitoring report form (Version 07.0). Refer closure of CAR 05, CL 1 and CL 2.</p>	

E.2. Remaining forward action requests from validation and/or previous verifications

During the validation the validating DOE might have raised issues that could not be closed or resolved during the validation stage. For this purpose FARs might have been raised. Likewise FARs might have been raised in the course of previous verifications.

In the course of this verification the latest version of the PDD^{/PDD/} and the validation report^{/VAL/}, where applicable, have been checked in order to identify any remaining forward action requests. For the current monitoring period the following applies:

(i) Open issues from validation:

<input checked="" type="checkbox"/>	There were no open issues which have been addressed in the latest version of the validation report.
<input type="checkbox"/>	All open issues from the validation have been appropriately addressed in the context of previous verifications.
<input type="checkbox"/>	All issues related to the validation have been appropriately addressed in the course of the current monitoring period (for details please refer to appendix 4)
<input type="checkbox"/>	The following issues related to the validation have not yet been appropriately addressed (for details please refer to appendix 4):
	- N/A

(ii) Open issues from previous verifications:

<input type="checkbox"/>	N/A – as this is the first monitoring period for this CDM project activity.
<input checked="" type="checkbox"/>	There were no open issues which have been addressed in the previous verification report

<input type="checkbox"/>	All issues related to the previous verification have been appropriately addressed in the course of the current monitoring period (for details please refer to appendix 4)
<input type="checkbox"/>	The following issues related to the previous verification have not yet been appropriately addressed (for details please refer to appendix 4):
-	N/A

E.3. Compliance of the project implementation and operation with the registered project design document

Means of verification	<p>By means of an in-depth review of the PDD in its latest form – as downloaded from the UNFCCC project site - and the checks carried out during the on-site visit an assessment has been carried out whether the project has been implemented and operated in line with the latest approved version of the PDD and whether all physical features of the project are in place. The following has been checked: implemented technology, project equipment as well as monitoring and metering equipment.</p> <p>Further is has been checked if relevant technical equipment of the project activity has been exchanged or modified during the monitoring period and consistent notations of key equipment (rolling stock, cars, regenerative braking system etc.) in PDD, MR and calculation spreadsheet are applied.</p> <p>Interviews with operational personnel have been carried out, QMS records, maintenance records, instrument specifications were checked in this context.</p> <p>Special focus has further been laid to determine whether a potential phase wise implementation has occurred within the crediting period or any delays with respect to the starting dates have occurred.</p> <p>Further it has been checked whether any observed deviations from the registered project design have been correctly addressed as PRCs.</p> <p>The following sources of information have been used in this context:</p> <ul style="list-style-type: none"> • /PDD/ • /MR/ • /VVS/ • /XLS/ • /QC/ • /unfccc/ 																
Findings	<table border="1"> <tr> <td><input checked="" type="checkbox"/></td> <td>The project has been implemented as described in the latest version of the PDD as well as in section B.1 of the monitoring report. No deviations thereof have been identified in the course of this verification.</td> </tr> <tr> <td><input type="checkbox"/></td> <td>The following deviations from the registered / approved project design and or the project description in the MR have been identified in the course of this verification (for further details please refer to section E.4): - N/A</td> </tr> <tr> <td><input checked="" type="checkbox"/></td> <td>In this context the following CARs, CLs have been raised: CAR 02, CL 1 and CL 2</td> </tr> <tr> <td colspan="2"><i>In case of phased implementation:</i></td> </tr> <tr> <td><input type="checkbox"/></td> <td>N/A</td> </tr> <tr> <td><input checked="" type="checkbox"/></td> <td>The phased implementation has correctly and in sufficient detail been described in the latest version of the PDD.</td> </tr> <tr> <td><input checked="" type="checkbox"/></td> <td>The description in section B.1 of the MR differs in content or the level of detail from the latest version of the PDD. However, the description in the MR is correct and reflects the situation during the site inspection.</td> </tr> <tr> <td><input type="checkbox"/></td> <td>The project description in the PDD/MR is not deemed sufficient. The detailed implementation timeline is as follows: -</td> </tr> </table>	<input checked="" type="checkbox"/>	The project has been implemented as described in the latest version of the PDD as well as in section B.1 of the monitoring report. No deviations thereof have been identified in the course of this verification.	<input type="checkbox"/>	The following deviations from the registered / approved project design and or the project description in the MR have been identified in the course of this verification (for further details please refer to section E.4): - N/A	<input checked="" type="checkbox"/>	In this context the following CARs, CLs have been raised: CAR 02, CL 1 and CL 2	<i>In case of phased implementation:</i>		<input type="checkbox"/>	N/A	<input checked="" type="checkbox"/>	The phased implementation has correctly and in sufficient detail been described in the latest version of the PDD.	<input checked="" type="checkbox"/>	The description in section B.1 of the MR differs in content or the level of detail from the latest version of the PDD. However, the description in the MR is correct and reflects the situation during the site inspection.	<input type="checkbox"/>	The project description in the PDD/MR is not deemed sufficient. The detailed implementation timeline is as follows: -
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	<p>During the verification a site visit was carried out on 18/03/2019. On the basis of an onsite visit, interview and the reviewed project documentation it can be confirmed that w.r.t. the realized technology, the project equipment, as well as the monitoring and metering equipment, the project has been implemented and operated in line with the latest version of the PDD (Version 5). The Delhi Metro Rail System is implemented in all phases, Phase I, Phase II and Phase III consisting line 1, line 2, line 3 and 4. Please refer section B.1 of MR and closure of CL 01 and CL 02.</p>
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E.4. Post-registration changes

E.4.1. Temporary deviations from the registered monitoring plan, applied methodologies, standardized baselines or other methodological regulatory documents²

It has been checked whether Temporary deviations from the registered monitoring plan (TDfrMP) or Temporary deviations from monitoring methodology or standardized baseline (TDfMM) have been applied during this monitoring period. The result is summarized in the table below.

<input type="checkbox"/>	No Temporary deviations from the registered monitoring plan (TDfrMP) or Temporary deviations from monitoring methodology or standardized baseline (TDfMM) have been submitted to the UNFCCC prior to the current monitoring period.									
<input checked="" type="checkbox"/>	The following TDfrMP or TDfMM have been approved or are under approval by the UNFCCC									
	1	<table border="1"> <tr> <td>Title</td> <td>Installation of Low Green House Gases (GHG) emitting rolling stock cars in metro system (Applicable from 2007-12-29 to 2008-01-31)</td> </tr> <tr> <td>Status</td> <td><input type="checkbox"/> under approval; <input checked="" type="checkbox"/> approved (approval No.: I-DEV0130)</td> </tr> <tr> <td>Appr.date</td> <td>2008-05-19</td> </tr> <tr> <td>Ref. No.</td> <td>Change of data transfer method of the monitoring parameters from electronic download to manual recording in daily check sheets. (I-DEV0130)</td> </tr> </table>	Title	Installation of Low Green House Gases (GHG) emitting rolling stock cars in metro system (Applicable from 2007-12-29 to 2008-01-31)	Status	<input type="checkbox"/> under approval; <input checked="" type="checkbox"/> approved (approval No.: I-DEV0130)	Appr.date	2008-05-19	Ref. No.	Change of data transfer method of the monitoring parameters from electronic download to manual recording in daily check sheets. (I-DEV0130)
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Appr.date	2010-05-25									
Ref.No.	Change of data transfer method of the monitoring parameters from electronic download to manual recording for a period of 46 days. (I-DEV0312)									
<input checked="" type="checkbox"/>	During the verification of the current MP no need for a TDfrMP or TDfMM has been identified. The monitoring plan is in accordance with the approved methodology applied by the PA									
<input type="checkbox"/>	An approval of the following TDfrMP or TDfMM is to be requested from the EB for the current MP as appendix 1 of the project standard does not apply. Please refer to the related PRC report submitted along with this issuance request for further details w.r.t. the assessment of the PRC.									
	1	Issue:								
	2	Issue:								
<input type="checkbox"/>	The following TDfrMP or TDfMM for which appendix 1 of the PS is applicable have been applied:									
	1	Issue:								
	2	Issue:								

E.4.2. Corrections

² Other standards, methodologies, methodological tools and guidelines (to be) applied in accordance with the applied(selected) methodologies are collectively referred to as the other (applied) methodological regulatory documents).

It has been checked whether any corrections to project information or parameters fixed at validation have been approved during this monitoring period or submitted with this monitoring report. The result is summarized in the table below.

<input checked="" type="checkbox"/>	During the verification of the current MP no need for corrections has been identified.	
<input checked="" type="checkbox"/>	The following corrections have been applied:	
1	Issue:	PDD had to be updated and transferred to latest template. Accordingly, the PDD version number, date and ERs changed on first page. The changes needed as the Corridor length extended in all the lines (Red Line, Yellow Line and Blue Line) in the Phase II implementations of the project, due to this CERs increases.
2	Issue:	In section B.3 of PDD, the words Phase II & Phase III are added
3	Issue:	The PDD section B.6.3 & B.6.4 have been updated due to the reason that the applied and identified design change has influence to the emission reductions. Therefore, related sections for ex-ante calculation of emission reductions in updated PDD (submitted along with the 5 th and 6 th Monitoring report) have been adjusted accordingly.
4	Issue	Further the monitoring plan (section B.7.3 of revised PDD) has been updated w.r.t. emergency procedure for monitoring of data in case the data monitoring system fails
The PDD has been revised accordingly: (New) version No.: 05 Revision date: 2013-10-20		
It is confirmed that the updated / corrected information is an accurate reflection of the actual project information and that the corrected parameters are in accordance with the applied methodology and the monitoring plan.		
<input checked="" type="checkbox"/> A related post registration change has been submitted prior to the issuance request. The approval has been received on 20 Dec 2013 and 21 Dec 2013 via approval number PRC-1351-001 and PRC-1351-002. The PP simultaneously applied for both the periodic verifications (5 th and 6 th periodic verification) so the same PRC Assessment Report was submitted for both the issuance requests and hence not reported separately.		
<input type="checkbox"/> A related post registration change is submitted along with this issuance request. Please refer to the related PRC report submitted along with this issuance request for further details w.r.t. the assessment of the PRC.		

E.4.3. Changes to the start date of the crediting period

<input checked="" type="checkbox"/>	N/A - as this is not the first verification within the crediting period
<input type="checkbox"/>	The PPs do not intend to change the start date of the crediting period.
<input type="checkbox"/>	As the change in the start date was below the related time period as indicated in PS § 277 and § 278 no prior approval was required but only a notification. This notification has been submitted by the PP without involvement of the DOE. The change and new start date has been checked from the related UNFCCC project webpage.
<input type="checkbox"/>	The PPs intend to change the start date of the crediting period. As the intended change in start date beyond the related time period as indicated in PS § 279 prior approval by the Board is required. For detailed assessment of the change please refer to related PRC validation report. As per assessment in this report the DOE confirms that the change to the start date of the crediting period are in line with the related requirements of the VVS and PS.
<input type="checkbox"/>	The approval to change the start date of the crediting period has been received on DD/MM/YYYY via approval number PRC-XXXX-00Z

E.4.4. Inclusion of a monitoring plan

<input checked="" type="checkbox"/>	N/A - as this monitoring plan was part of the registered PDD
<input type="checkbox"/>	In line with PS § 281 or § 282 the PP has forwarded a monitoring plan to the DOE for validation. No prior approval of the monitoring plan was required as the PP in line with PS § 282 wished to submit the monitoring plan together with the request for issuance for the first monitoring period. Please refer to the related PRC report submitted along with this issuance request for further details w.r.t. the assessment of the PRC.
<input type="checkbox"/>	In line with § 282 the PP submitted a monitoring plan prior to the submission of the request for issuance for validation to the DOE. A DOE has assessed the monitoring plan in line with related VVS requirements and submitted a related PRC report for prior approval. The approval has been received on DD/MM/YYYY via approval number PRC-XXXX-00Z.

E.4.5. Permanent changes from registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines or other methodological regulatory documents

It has been checked whether any permanent changes from the registered monitoring plan (PCfrMP) or applied methodologies (PCfMM) including standardized baselines (PCfSB) have been approved prior or during this monitoring period or submitted with this monitoring report. The result is summarized in the table below.

<input checked="" type="checkbox"/>	No PCfrMP, PCfMM or PCfSB have been submitted to the UNFCCC prior to the current monitoring period	
<input type="checkbox"/>	The following PCfrMP, PCfMM or PCfSB have been approved or are under approval by the UNFCCC	
	1	Title
		Status <input type="checkbox"/> under approval; <input type="checkbox"/> approved
		Appr.date
		Ref. No.
	2	Title
		Status <input type="checkbox"/> under approval; <input type="checkbox"/> approved
		Appr.date
		Ref.No.
<input checked="" type="checkbox"/>	During the verification of the current MP no need for a PCfrMP, PCfMM or PCfSB has been identified. The monitoring plan is in accordance with the approved methodology applied by the PA	
<input type="checkbox"/>	An approval of the following PCfrMP, PCfMM or PCfSB is to be requested from the EB for the current MP as appendix 1 of the project standard does not apply.	
	1	Issue:
	2	Issue:
<input type="checkbox"/>	The following PCfrMP, PCfMM or PCfSB for which appendix 1 of the PS is applicable have been applied:	
	1	Issue:
	2	Issue:

E.4.6. Changes to the project design

It has been checked whether any changes to the project design (CoPD) have been approved prior or during this monitoring period or submitted with this monitoring report. The result is summarized in the table below.

<input type="checkbox"/>	No CoPD has been submitted to the UNFCCC prior to the current monitoring period	
<input checked="" type="checkbox"/>	The following CoPD have been approved or are under approval by the UNFCCC	
1	Title	Installation of Low Green House Gases (GHG) emitting rolling stock cars in metro system
	Status	<input type="checkbox"/> under approval; <input checked="" type="checkbox"/> approved
	Appr.date	21/12/2013
	Ref. No.	PRC-1351-002
2	Title	
	Status	<input type="checkbox"/> under approval; <input type="checkbox"/> approved
	Appr.date	
	Ref.No.	
<input checked="" type="checkbox"/>	During the verification of the current MP no need for a CoPD has been identified. The monitoring plan is in accordance with the approved methodology applied by the PA	
<input type="checkbox"/>	An approval of the following CoPD.is to be requested from the EB for the current MP as appendix 1 of the project standard does not apply.	
1	Issue:	
2	Issue:	
<input type="checkbox"/>	The following CoPD for which appendix 1 of the PS is applicable have been applied:	
1	Issue:	
2	Issue:	

E.4.7. Changes specific to afforestation and reforestation project activities

<input checked="" type="checkbox"/>	N/A - as this project is not a afforestation and reforestation project activity
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E.5. Compliance of the registered monitoring plan with applied methodologies, applied standardized baselines, and other applied methodological regulatory documents

Means of verification	<p>By means of comparison of the MR with</p> <ul style="list-style-type: none"> (i) the applied CDM methodology (ii) all applicable CDM Meth tools and (iii) if applicable, a standardized baseline <p>the verification team has checked whether the MP is in compliance with the MP related requirements of the applied methodology/tools/SB.</p> <p>All required equipment and procedures are available and implemented in an appropriate manner.</p> <p>All necessary monitoring instruments are installed. The measuring devices are well known and state-of-the-art. All required instruments including stand by and operating procedures for the same have been implemented in an appropriate manner.</p> <p>The following sources of information have been used in this context:</p> <ul style="list-style-type: none"> • /MR/
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	<ul style="list-style-type: none"> • /AMS III.C/ • /TEF/ • /EBS/ • /CAL/ • /MRR/ • /TA/ • /unfccc/ 							
Findings	<input checked="" type="checkbox"/> The MP is completely in accordance with the approved methodology applied by the CDM project (last registered/approved version of the PDD)							
	The breakdown of MP accordance of the referenced tools is as follows:							
	<table border="1"> <tr> <td rowspan="3">1</td> <td>Title (of the tool)</td> <td>Tool to calculate the emission factor for an electricity system</td> </tr> <tr> <td>Version</td> <td>04.0</td> </tr> <tr> <td>MP compliance</td> <td> <input type="checkbox"/> full compliance <input type="checkbox"/> findings have been raised <input checked="" type="checkbox"/> N/A (for MP) </td> </tr> </table>	1	Title (of the tool)	Tool to calculate the emission factor for an electricity system	Version	04.0	MP compliance	<input type="checkbox"/> full compliance <input type="checkbox"/> findings have been raised <input checked="" type="checkbox"/> N/A (for MP)
	1		Title (of the tool)	Tool to calculate the emission factor for an electricity system				
			Version	04.0				
		MP compliance	<input type="checkbox"/> full compliance <input type="checkbox"/> findings have been raised <input checked="" type="checkbox"/> N/A (for MP)					
	<table border="1"> <tr> <td rowspan="3">2</td> <td>Title (of the tool)</td> <td>Tool for the demonstration and assessment of additionality</td> </tr> <tr> <td>Version</td> <td>07.0.0</td> </tr> <tr> <td>MP compliance</td> <td> <input type="checkbox"/> full compliance <input type="checkbox"/> findings have been raised <input checked="" type="checkbox"/> N/A </td> </tr> </table>	2	Title (of the tool)	Tool for the demonstration and assessment of additionality	Version	07.0.0	MP compliance	<input type="checkbox"/> full compliance <input type="checkbox"/> findings have been raised <input checked="" type="checkbox"/> N/A
	2		Title (of the tool)	Tool for the demonstration and assessment of additionality				
			Version	07.0.0				
		MP compliance	<input type="checkbox"/> full compliance <input type="checkbox"/> findings have been raised <input checked="" type="checkbox"/> N/A					
<table border="1"> <tr> <td rowspan="3">3</td> <td>Title (of the tool)</td> <td>Tool for Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period</td> </tr> <tr> <td>Version</td> <td>03.0.1</td> </tr> <tr> <td>MP compliance</td> <td> <input type="checkbox"/> full compliance <input type="checkbox"/> findings have been raised <input checked="" type="checkbox"/> N/A </td> </tr> </table>	3	Title (of the tool)	Tool for Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period	Version	03.0.1	MP compliance	<input type="checkbox"/> full compliance <input type="checkbox"/> findings have been raised <input checked="" type="checkbox"/> N/A	
3		Title (of the tool)	Tool for Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period					
		Version	03.0.1					
	MP compliance	<input type="checkbox"/> full compliance <input type="checkbox"/> findings have been raised <input checked="" type="checkbox"/> N/A						
<input type="checkbox"/> The breakdown of MP accordance of the applicable SB is as follows:								
<table border="1"> <tr> <td rowspan="3">1</td> <td>Title (of the SB)</td> <td></td> </tr> <tr> <td>Version</td> <td></td> </tr> <tr> <td>MP compliance</td> <td></td> </tr> </table>	1	Title (of the SB)		Version		MP compliance		
1		Title (of the SB)						
		Version						
	MP compliance							
<input type="checkbox"/> In this context the following CARs, CLs, FARs have been raised:								
- N/A								
Conclusion	<input checked="" type="checkbox"/> No CARs/CLs/FARs have been raised in this context. No correction was required. The project is in line with the respective requirements.							
	<input type="checkbox"/> The raised CARs/CLs/FARs have been addressed appropriately. The PP has carried out the requested corrections. All respective findings could be closed out. For details please refer to Appendix 4.							
	The monitoring plan complies with the applied methodology and the monitoring system and all applied procedures are completely in compliance to the latest approved monitoring plan and the methodology AMS III.C. Version 10.							

E.6. Compliance of monitoring activities with the registered monitoring plan

E.6.1. Data and parameters fixed ex ante or at renewal of crediting period

Means of verification	By means of comparison of the MR and the ER calculation with the latest version of the registered PDD the verification team has checked whether all parameters fixed ex-ante or at renewal of the crediting period have been applied correctly.						
	There is only one ex-ante parameter determined emission factor EF_y . The emission factor used in the monitoring report has been verified against the PDD and found them to be consistent.						
	<table border="1"> <thead> <tr> <th>Parameter</th> <th>Value</th> <th>Unit</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>	Parameter	Value	Unit			
Parameter	Value	Unit					

	EF _y	800	tCO ₂ e/GWh
	<p>The following sources of information have been used in this context:</p> <ul style="list-style-type: none"> • /MR/ • /XLS/ • /PDD/ • /PS/ • /VVS/ • /unfccc/ 		
Findings	<input checked="" type="checkbox"/>	The MR and the ER calculation have considered the parameters fixed ex-ante or at the renewal of the crediting period correctly, no deviations have been observed.	
	<input type="checkbox"/>	The following deviations from the parameters fixed ex-ante or at renewal of crediting period have been identified in the course of this verification: - N/A	
	<input type="checkbox"/>	In this context the following CARs, CLs, FARs have been raised: - N/A	
Conclusion	<input checked="" type="checkbox"/>	No CARs/CLs/FARs have been raised in this context. No correction was required. The project is in line with the respective requirements.	
	<input type="checkbox"/>	The raised CARs/CLs/FARs have been addressed appropriately. The PP has carried out the requested corrections. All respective findings could be closed out. For details please refer to Appendix 4.	
	The parameters fixed ex ante have been indicated in the latest approved PDD. And the MR is checked and found in line with the PDD.		

E.6.2. Data and parameters monitored

Means of verification	<p>During the verification all relevant monitoring parameters (as listed in chapter B.7.1 of the PDD) have been verified with regard to the</p> <ul style="list-style-type: none"> (i) appropriateness of the applied measurement / determination method, (ii) the correctness of the values applied for ER calculation, (iii) the accuracy, and applied QA/QC measures. <p>The results as well as the verification procedure are described parameter-wise in the project specific verification checklist (Appendix 5).</p>		
Findings	CAR 1, CL1 and CL 2		
Conclusion	<input type="checkbox"/>	No CARs/CLs/FARs have been raised in this context. No correction was required. The project is in line with the respective requirements.	
	<input checked="" type="checkbox"/>	The raised CARs/CLs/FARs have been addressed appropriately. The PP has carried out the requested corrections. All respective findings could be closed out. For details please refer to Appendix 4.	
	During the verification all relevant monitoring parameters (as listed in chapter B.7.1 of the registered PDD) have been verified with regard to the appropriateness of the applied measurement / determination method, the correctness of the values applied for ER calculation, the accuracy, and applied QA/QC measures. The results as well as the verification procedure are described parameter-wise in the project specific verification checklist (Appendix 5). It can be confirmed that all monitoring parameters have been measured / determined without material misstatements and in line with all applicable standards and relevant requirements. Please also refer closure of finding under Appendix 4.		

E.6.3. Implementation of sampling plan

Means of verification	<p>The verification team has checked whether the PPs have applied a sampling approach to determine the monitored values. Further it has been checked whether the PPs have correctly applied the implemented sampling plan including</p> <ul style="list-style-type: none"> (i) description of the implemented sampling design (ii) collected data (iii) analysis of collected data (iv) demonstration on whether the required confidence/precision has been met. <p>The following sources of information have been used in this context:</p>		
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		<ul style="list-style-type: none"> • /MR/ • /XLS/ • /PDD/ 	
Findings	<input checked="" type="checkbox"/>	The PPs have not applied sampling approaches for the parameters monitored.	
	<input type="checkbox"/>	The PPs have applied sampling approaches for the following parameters monitored.	
		1	Parameter:
			Name:
			Description on how the sampling efforts and survey comply with the validated sampling plan:
2	Parameter:		
	Name:		
	Description on how the sampling efforts and survey comply with the validated sampling plan:		
<input type="checkbox"/>	In this context the following CARs, CLs, FARs have been raised:		
	-		
Conclusion	<input checked="" type="checkbox"/>	No CARs/CLs/FARs have been raised in this context. No correction was required. The project is in line with the respective requirements.	
	<input type="checkbox"/>	The raised CARs/CLs/FARs have been addressed appropriately. The PP has carried out the requested corrections. All respective findings could be closed out. For details please refer to Appendix 4.	
		No sampling was required to determine the monitored parameters. The PDD does not contain any sampling plan.	

E.7. Compliance with the calibration frequency requirements for measuring instruments

Means of verification		<p>During the verification the relevant monitoring equipment has been checked whether the calibration requirements have been met; especially if the calibration frequency is in line with the requirements of the validated PDD and/or the applicable calibration standards.</p> <p>The results as well as the verification procedure are described equipment-wise in the project specific verification checklist (Appendix 6).</p> <p>The following sources of information have been used in this context:</p> <ul style="list-style-type: none"> • /MR/ • /XLS/
Findings	<input checked="" type="checkbox"/>	Based on the details listed in Appendix 6 the verification team can confirm that all installed monitoring equipment has been duly calibrated for this entire monitoring period.
	<input type="checkbox"/>	<p>Based on the assessment and information as per Appendix 6 delay(s) in calibration have been identified. The PP has applied the maximum permissible error of the instrument to the measured values taken during the period between the scheduled date of calibration and the actual date of calibration.</p> <p>From the related calibration certificates and emission reduction calculation the verification team confirms that the maximum permissible error has been applied in a conservative manner so that the adjusted measured values due to the delayed calibration result in fewer claimed emission reductions.</p> <p>For details please refer to Appendix 6</p>
	<input checked="" type="checkbox"/>	In this context the following CARs, CLs, FARs have been raised:
		CAR 3
Conclusion	<input type="checkbox"/>	No CARs/CLs/FARs have been raised in this context. No correction was required. The project is in line with the respective requirements.
	<input checked="" type="checkbox"/>	The raised CARs/CLs/FARs have been addressed appropriately. The PP has carried out the requested corrections. All respective findings could be closed out. For details please refer to Appendix 4.
		The electrical energy consumed by the operational rolling stocks for motoring and auxiliary electricity is monitored by TIMS. The TIMS has an incremental counter for recording of energy data (motoring, breaking and auxiliary for each unit of the train).

	<p>This data is stored in the CPU of the each unit specific TIMS and are also displayed on the VDU located at unit specific DT. The energy data is downloaded from TIMS using maintenance terminals.</p> <p>The Verification Team checked the measurement procedure during onsite verification audit and subsequent interviews with the personnel. The verification team is convinced that the TIMS has been used throughout the monitoring period since its implementation. The technology for regenerative braking system including TIMS is provided by Mitsubishi Electric Corporation, Japan. TIMS is totally software based system with high level of accuracy and hence does not require calibration. No equipment has been exchanged so far. No downtime of measuring equipment has occurred during the monitoring period. The measurement method is found to be in line with the registered monitoring plan of the PDD and the applied methodology i.e. AMS III.C./Version 10.</p> <p>The Verification Team acknowledges that, DMRC has still undertaken sample calibrations of CT/ PT^{CAL} as measure which is additional to registered monitoring plan.</p>
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E.8. Assessment of data and calculation of emission reductions or net removals

E.8.1. Calculation of baseline GHG emissions or baseline net GHG removals by sinks

<p>Means of verification</p>	<p>The formula used for the determination of baseline emissions is consistent with the registered PDD</p> $BE = EG_{wr} * EF$ <p>Where,</p> $EG_{wr} = \left[\sum_{i=1}^N \left(\frac{EG_{i,wr}}{S_i} \right) \cdot S_i \right]$ <p>EF CO2 emission factor of the northern grid (t CO2 e / GWh) EG_{wr} total electrical energy consumed by rolling stocks without regenerative braking (GWh) EG_{i,wr} total energy consumed by the rolling stock 'i' without regenerative braking (GWh) S_i total distance covered by the rolling stock 'i' (km) N total number of operational rolling stocks</p> <p>For the Monitoring Period 2013 EG_{wr} = 143,630,805 kWh EF = 800 tCO₂/ GWh BE = 143,630,805 x 800/1000000 BE = 114,904 tCO₂</p> <p>For the Monitoring Period 2014 EG_{wr} = 140,966,359 kWh EF = 800 tCO₂/ GWh BE = 140,966,359 x 800/1000000 BE = 112,773 tCO₂</p> <p>For the Monitoring Period 2015 EG_{wr} = 144,344,633 kWh EF = 800 tCO₂/ GWh BE = 144,344,633 x 800/1000000 BE = 115,475 tCO₂</p> <p>For the Monitoring Period 2016 EG_{wr} = 158,082,864 kWh EF = 800 tCO₂/ GWh BE = 158,082,864 x 800/1000000 BE = 126,466 tCO₂</p>
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	<p>For the Monitoring Period 2017 (01/01/2017 to 28/12/2017) $EG_{wr} = 154,137,179 \text{ kWh}$ $EF = 800 \text{ tCO}_2/\text{GWh}$ $BE = 154,137,179 \times 800/1000000$ BE = 123,310 tCO₂</p> <p>During the verification the calculation of baseline GHG emissions has been checked. In detail the following has been verified:</p> <ul style="list-style-type: none"> • <i>Transparency:</i> It has been checked whether the calculation of baseline emissions is fully traceable and, where used, the Excel calculation provides all calculation formulae. • <i>Parameter consistency:</i> It has been checked whether all internal and external parameters and data used for the calculation are applied consistently in the monitoring report and the calculation spreadsheet. • <i>Correctness:</i> It has been checked whether the applied formulae and methods for calculating baseline emissions are in accordance with the monitoring plan and the approved methodology. • <i>Completeness:</i> It has been checked whether all calculations are complete and without omissions. <p>The following sources of information have been used in this context:</p> <ul style="list-style-type: none"> • /MR/ • /PDD/ • /XLS/ 						
Findings	<table border="1"> <tr> <td data-bbox="451 869 523 1205" style="text-align: center; vertical-align: middle;"><input checked="" type="checkbox"/></td> <td data-bbox="523 869 1442 1205"> <p>The calculation of the baseline emissions was found to be fully compliant with the above stated principles. The calculations of baseline GHG emissions or baseline net GHG removals have been carried out in accordance with the formulae and methods described in the registered monitoring plan, the applied methodology and, where applicable, the applied standardized baseline. Any assumptions used in emission or removal calculations have been justified. Appropriate emission factors, IPCC default values, GWPs and other reference values have been correctly applied. No errors, miscalculations, omissions, misstatements or incomplete information has been identified.</p> </td> </tr> <tr> <td data-bbox="451 1205 523 1272" style="text-align: center; vertical-align: middle;"><input type="checkbox"/></td> <td data-bbox="523 1205 1442 1272"> <p>The verification team has identified mistakes in the baseline emissions calculation or the underlying calculation approaches.</p> </td> </tr> <tr> <td data-bbox="451 1272 523 1339" style="text-align: center; vertical-align: middle;"><input checked="" type="checkbox"/></td> <td data-bbox="523 1272 1442 1339"> <p>In this context the following CARs, CLs, FARs have been raised: CL 1, CL 2, CAR 1, CAR 2, CAR 4</p> </td> </tr> </table>	<input checked="" type="checkbox"/>	<p>The calculation of the baseline emissions was found to be fully compliant with the above stated principles. The calculations of baseline GHG emissions or baseline net GHG removals have been carried out in accordance with the formulae and methods described in the registered monitoring plan, the applied methodology and, where applicable, the applied standardized baseline. Any assumptions used in emission or removal calculations have been justified. Appropriate emission factors, IPCC default values, GWPs and other reference values have been correctly applied. No errors, miscalculations, omissions, misstatements or incomplete information has been identified.</p>	<input type="checkbox"/>	<p>The verification team has identified mistakes in the baseline emissions calculation or the underlying calculation approaches.</p>	<input checked="" type="checkbox"/>	<p>In this context the following CARs, CLs, FARs have been raised: CL 1, CL 2, CAR 1, CAR 2, CAR 4</p>
<input checked="" type="checkbox"/>	<p>The calculation of the baseline emissions was found to be fully compliant with the above stated principles. The calculations of baseline GHG emissions or baseline net GHG removals have been carried out in accordance with the formulae and methods described in the registered monitoring plan, the applied methodology and, where applicable, the applied standardized baseline. Any assumptions used in emission or removal calculations have been justified. Appropriate emission factors, IPCC default values, GWPs and other reference values have been correctly applied. No errors, miscalculations, omissions, misstatements or incomplete information has been identified.</p>						
<input type="checkbox"/>	<p>The verification team has identified mistakes in the baseline emissions calculation or the underlying calculation approaches.</p>						
<input checked="" type="checkbox"/>	<p>In this context the following CARs, CLs, FARs have been raised: CL 1, CL 2, CAR 1, CAR 2, CAR 4</p>						
Conclusion	<table border="1"> <tr> <td data-bbox="451 1339 523 1406" style="text-align: center; vertical-align: middle;"><input type="checkbox"/></td> <td data-bbox="523 1339 1442 1406"> <p>No CARs/CLs/FARs have been raised in this context. No correction was required. The project is in line with the respective requirements.</p> </td> </tr> <tr> <td data-bbox="451 1406 523 1496" style="text-align: center; vertical-align: middle;"><input checked="" type="checkbox"/></td> <td data-bbox="523 1406 1442 1496"> <p>The raised CARs/CLs/FARs have been addressed appropriately. The PP has carried out the requested corrections. All respective findings could be closed out. For details please refer to Appendix 4.</p> </td> </tr> <tr> <td colspan="2" data-bbox="443 1496 1442 1525" style="text-align: center;"> <p>All the calculations are now transparent, consistent, correct and complete.</p> </td> </tr> </table>	<input type="checkbox"/>	<p>No CARs/CLs/FARs have been raised in this context. No correction was required. The project is in line with the respective requirements.</p>	<input checked="" type="checkbox"/>	<p>The raised CARs/CLs/FARs have been addressed appropriately. The PP has carried out the requested corrections. All respective findings could be closed out. For details please refer to Appendix 4.</p>	<p>All the calculations are now transparent, consistent, correct and complete.</p>	
<input type="checkbox"/>	<p>No CARs/CLs/FARs have been raised in this context. No correction was required. The project is in line with the respective requirements.</p>						
<input checked="" type="checkbox"/>	<p>The raised CARs/CLs/FARs have been addressed appropriately. The PP has carried out the requested corrections. All respective findings could be closed out. For details please refer to Appendix 4.</p>						
<p>All the calculations are now transparent, consistent, correct and complete.</p>							

E.8.2. Calculation of project GHG emissions or actual net anthropogenic GHG removals by sinks

Means of verification	<p>In accordance with AMS III.C. Version 10, registered PDD and validation report, the project emission is zero.</p> $PE = \left[\sum_{i=1} \{ (EG_{i,wr} / S_i) - (EG_{i,R} / S_i) \} * S_i \right] * EF$ <p>Where,</p> $EG_R = \left[\sum_{i=1}^N \left(\frac{EG_{i,R}}{S_i} \right) \cdot S_i \right]$ <p>EF CO₂ emission factor of the northern grid (t CO₂e / GWh) EG_R total electrical energy regenerated with regenerative braking (GWh) EG_{i,R} total energy regenerated by the rolling stock 'i' with regenerative braking (GWh)</p>
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	<p>N total number of operational rolling stocks</p> <p>For the Monitoring Period 2013 $EG_{i,wr} = 143,630,805 \text{ kWh}$ $EG_{i,R} = 55,592,828 \text{ kWh}$ $EF = 800 \text{ tCO}_2/\text{GWh}$ $PE = (EG_{i,wr} - EG_{i,R}) \times EF$ $PE = (143,630,805 - 55,592,828) \times 800/1000000$ PE = 70,430 tCO₂</p> <p>For the Monitoring Period 2014 $EG_{i,wr} = 140,966,359 \text{ kWh}$ $EG_{i,R} = 53,527,700 \text{ kWh}$ $EF = 800 \text{ tCO}_2/\text{GWh}$ $PE = (EG_{i,wr} - EG_{i,R}) \times EF$ $PE = (140,966,235 - 53,527,700) \times 800/1000000$ PE = 69,951 tCO₂</p> <p>For the Monitoring Period 2015 $EG_{i,wr} = 144,344,633 \text{ kWh}$ $EG_{i,R} = 55,039,283 \text{ kWh}$ $EF = 800 \text{ tCO}_2/\text{GWh}$ $PE = (EG_{i,wr} - EG_{i,R}) \times EF$ $PE = (144,344,633 - 55,039,283) \times 800/1000000$ PE = 71,444 tCO₂</p> <p>For the Monitoring Period 2016 $EG_{i,wr} = 158,082,864 \text{ kWh}$ $EG_{i,R} = 60,439,253 \text{ kWh}$ $EF = 800 \text{ tCO}_2/\text{GWh}$ $PE = (EG_{i,wr} - EG_{i,R}) \times EF$ $PE = (158,082,864 - 60,439,253) \times 800/1000000$ PE = 78,115 tCO₂</p> <p>For the Monitoring Period 2017 (01/01/2017 to 28/12/2017) $EG_{i,wr} = 154,137,179 \text{ kWh}$ $EG_{i,R} = 58,547,761 \text{ kWh}$ $EF = 800 \text{ tCO}_2/\text{GWh}$ $PE = (EG_{i,wr} - EG_{i,R}) \times EF$ $PE = (154,137,179 - 58,547,761) \times 800/1000000$ PE = 76,472 tCO₂</p> <p>During the verification the calculation of project GHG emissions has been checked. In detail the following has been verified:</p> <ul style="list-style-type: none"> • Transparency: It has been checked whether the calculation of project emissions is fully traceable and, where used, the Excel calculation provides all calculation formulae. • Parameter consistency: It has been checked whether all internal and external parameters and data used for the calculation are applied consistently in the monitoring report and the calculation spreadsheet. • Correctness: It has been checked whether the applied formulae and methods for calculating project emissions are in accordance with the monitoring plan and the approved methodology. • Completeness: It has been checked whether all calculations are complete and without omissions. <p>The following sources of information have been used in this context:</p> <ul style="list-style-type: none"> • /MR/ • /VAL/ • /PDD/ • /XLS/
<p>Findings</p>	<p><input checked="" type="checkbox"/> The calculation of the project emissions was found to be fully compliant with the above stated principles.</p>

		<p>The calculations of project GHG emissions or actual net GHG removals have been carried out in accordance with the formulae and methods described in the registered monitoring plan, the applied methodology and, where applicable, the applied standardized baseline. Any assumptions used in emission or removal calculations have been justified. Appropriate emission factors, IPCC default values, GWPs and other reference values have been correctly applied.</p> <p>No errors, miscalculations, omissions, misstatements or incomplete information have been identified.</p>
	<input type="checkbox"/>	The verification team has identified mistakes in the project emissions calculation or the underlying calculation approaches.
	<input checked="" type="checkbox"/>	In this context the following CARs, CLs, FARs have been raised: CL 1, CL 2, CAR 1, CAR 2, CAR 4
Conclusion	<input type="checkbox"/>	No CARs/CLs/FARs have been raised in this context. No correction was required. The project is in line with the respective requirements.
	<input checked="" type="checkbox"/>	The raised CARs/CLs/FARs have been addressed appropriately. The PP has carried out the requested corrections. All respective findings could be closed out. For details please refer to Appendix 4.
	All the calculations are now transparent, consistent, correct and complete.	

E.8.3. Calculation of leakage GHG emissions

Means of verification		<p>In accordance with AMS III.C. Version 10, registered PDD and validation report, leakage of the project activity is not considered.</p> <p>During the verification it has been checked whether leakage emissions have to be considered and, in cases where leakage emissions have to be calculated, the respective calculation of leakage GHG emissions has been checked. In such cases the same verification principles have been considered as for the baseline and project emissions calculation. Please refer to E.8.1 and E.8.2 of this report.</p> <p>The following sources of information have been used in this context:</p> <ul style="list-style-type: none"> • /MR/ • /PDD/ • /AMS III.C/ • /XLS/
Findings	<input checked="" type="checkbox"/>	No leakage emissions were to be considered (LE = 0).
	<input type="checkbox"/>	<p>The calculation of the leakage emissions was found to be fully compliant with the above stated principles (see E.8.1 and E.8.2 of this report).</p> <p>The calculations of leakage GHG emissions have been carried out in accordance with the formulae and methods described in the registered monitoring plan, the applied methodology and, where applicable, the applied standardized baseline. Any assumptions used in leakage emissions calculations have been justified. Where applicable, appropriate emission factors, IPCC default values, GWPs and other reference values have been correctly applied.</p> <p>No errors, miscalculations, omissions, misstatements or incomplete information have been identified.</p>
	<input type="checkbox"/>	The verification team has identified mistakes in the project emissions calculation or the underlying calculation approaches.
	<input type="checkbox"/>	In this context the following CARs, CLs, FARs have been raised: - N/A
Conclusion	<input checked="" type="checkbox"/>	No CARs/CLs/FARs have been raised in this context. No correction was required. The project is in line with the respective requirements.
	<input type="checkbox"/>	The raised CARs/CLs/FARs have been addressed appropriately. The PP has carried out the requested corrections. All respective findings could be closed out. For details please refer to Appendix 4.
	It can be confirmed that no leakage emissions were to be considered.	

E.8.4. Summary calculation of GHG emission reductions or net anthropogenic GHG removals by sinks

<p>Means of verification</p>	<p>The verification team has checked if the MR includes a summary table of the emission reductions calculation specifying separately</p> <ul style="list-style-type: none"> - Total baseline emissions, - Total project emissions, - Total leakage, - Total emission reductions. <p>It has been assessed whether the values are correct or need to be revised as a consequence of issues identified above.</p> <p>Summary of emission reductions during the monitoring period:</p> $ER = BE - (PE + LE)$ <p>Where:</p> <table style="margin-left: 20px;"> <tr> <td>ER</td> <td>Emission reductions (tCO₂e)</td> </tr> <tr> <td>BE</td> <td>Baseline Emissions (tCO₂e)</td> </tr> <tr> <td>PE</td> <td>Project Emissions (tCO₂e)</td> </tr> <tr> <td>LE</td> <td>Leakage Emissions (tCO₂e)</td> </tr> </table> <p>Emission Reduction for 2013 $ER = BE - (PE + LE)$ Calculation:- $ER = 114,904 - (70,430 + 0)$ Emission Reduction (2013) = 44,474 t CO₂</p> <p>Emission Reduction for 2014 $ER = BE - (PE + LE)$ Calculation:- $ER = 112,773 - (69,951 + 0)$ Emission Reduction (2014) = 42,822 t CO₂</p> <p>Emission Reduction for 2015 $ER = BE - (PE + LE)$ Calculation:- $ER = 115,475 - (71,444 + 0)$ Emission Reduction (2015) = 44,031 t CO₂</p> <p>Emission Reduction for 2016 $ER = BE - (PE + LE)$ Calculation:- $ER = 126,466 - (78,115 + 0)$ Emission reduction (2016) = 48,351 tCO₂</p> <p>Emission Reduction for 2017(01/01/2017 to 28/12/2017) $ER = BE - (PE + LE)$ Calculation:- $ER = 123,310 - (76,472 + 0)$ Emission Reduction (2017) = 46,838 t CO₂</p>		ER	Emission reductions (tCO ₂ e)	BE	Baseline Emissions (tCO ₂ e)	PE	Project Emissions (tCO ₂ e)	LE	Leakage Emissions (tCO ₂ e)
ER	Emission reductions (tCO ₂ e)									
BE	Baseline Emissions (tCO ₂ e)									
PE	Project Emissions (tCO ₂ e)									
LE	Leakage Emissions (tCO ₂ e)									
<p>Findings</p>	<p><input checked="" type="checkbox"/></p> <p><input checked="" type="checkbox"/></p> <p><input checked="" type="checkbox"/></p> <p><input type="checkbox"/></p>	<p>Section E.4 of the MR includes in a summary table of the emission reductions calculation.</p> <p>The summary table specified the total baseline, project and leakage emissions as well as the total emission reductions separately.</p> <p>The values as specified in the ER summary table are correct; no issues have been identified during the verification which requires changes in the ER calculation.</p> <p>During the verification issues with impact on the ER calculation have been identified.</p> <p>In this context the following CARs, CLs, FARs have been raised:</p>								

	<input checked="" type="checkbox"/>	CL 1, CL 2, CAR 1, CAR 2, CAR 4
Conclusion	<input type="checkbox"/>	No CARs/CLs/FARs have been raised in this context. No correction was required. The project is in line with the respective requirements.
	<input checked="" type="checkbox"/>	The raised CARs/CLs/FARs have been addressed appropriately. The PP has carried out the requested corrections. All respective findings could be closed out. For details please refer to Appendix 4.
	All the calculations are now transparent, consistent, correct and complete.	

E.8.5. Comparison of actual GHG emission reductions or net anthropogenic GHG removals by sinks with estimates in registered PDD

Means of verification	The verification team has checked if the MR includes a comparison of actual values of the monitoring period with the estimations in the registered PDD. It has further checked which of the below listed cases is applicable for the calculated ER of the current monitoring period.	
Findings	<input checked="" type="checkbox"/>	Case 1: The ex-ante estimated value was found to be proportionally higher than the ex-post determined value. No further action is deemed required.
	<input type="checkbox"/>	Case 2: The ex-ante estimated value fits very good to the actually monitored value. No further justification is deemed required.
	<input type="checkbox"/>	Case 3: The ex-ante estimated value was found to be proportionally lower than the ex-post determined value.
	<input checked="" type="checkbox"/>	In this context the following CARs, CLs, FARs have been raised: CL 1, CL 2, CAR 1, CAR 2, CAR 4
Conclusion	<input type="checkbox"/>	No CARs/CLs/FARs have been raised in this context. No correction was required. The project is in line with the respective requirements.
	<input checked="" type="checkbox"/>	The raised CARs/CLs/FARs have been addressed appropriately. The PP has carried out the requested corrections. All respective findings could be closed out. For details please refer to Appendix 4.
	The MR includes a comparison of the calculated actual emission reductions with the ex-ante calculated values in the registered PDD. The calculated ex-post value of 226,516 tCO ₂ was found to be lower than the ex-ante of 242,713 tCO ₂ as per revised PDD.	

E.8.6. Remarks on difference from estimated value in registered PDD

Means of verification	On the basis of the above comparison of actual values of the monitoring period with the estimations in the registered PDD (B.6.4) the verification team has checked whether (in case 3) an appropriate explanation is included in the MR.	
Findings	<input checked="" type="checkbox"/>	No further justification or explanation is deemed required as actual emissions of this MP do not exceed significantly the ex-ante calculated emission reductions (applicable for case 1 and 2).
	<input type="checkbox"/>	For case 3: The PP has provided a related justification in the MR. The reasons for the increase are as follows: -
	<input checked="" type="checkbox"/>	In this context the following CARs, CLs, FARs have been raised: - CL 1, CL 2, CAR 1, CAR 2, CAR 4
Conclusion	<input type="checkbox"/>	No CARs/CLs/FARs have been raised in this context. No correction was required. The project is in line with the respective requirements.
	<input checked="" type="checkbox"/>	The raised CARs/CLs/FARs have been addressed appropriately. The PP has carried out the requested corrections. All respective findings could be closed out. For details please refer to Appendix 4.
	-	

E.8.7. Actual GHG emission reductions or net anthropogenic GHG removals by sinks during the first commitment period and the period from 1 January 2013 onwards

Means of verification	The verification team has checked chapter E.7 of the MR and the emission reduction calculation sheet ^{/XLS/} .	
Findings	<input checked="" type="checkbox"/>	The MR in section E.7 includes a summary table of the ER breakdown a) ER up to 31/12/2012 and b) ER from 01/01/2013 onwards

	<input type="checkbox"/> The breakdown of the ERs during the first commitment period and from 01/01/2013 onwards is as follows: <ul style="list-style-type: none"> <input type="checkbox"/> The ER have completely been generated during the first commitment period <input checked="" type="checkbox"/> The ERs have completely been generated from 01/01/2013 onwards, <input type="checkbox"/> The ERs have partly been generated during the first commitment period and partly from 01/01/2013 onwards. <input checked="" type="checkbox"/> The breakdown of the ERs is correct, considering the applicable guidance.								
	<table border="1"> <thead> <tr> <th></th> <th>until 31/12/2012¹⁾</th> <th>from 01/01/2013¹⁾</th> <th>Sum</th> </tr> </thead> <tbody> <tr> <td>Emission reductions [tCO_{2e}]</td> <td>n.a.</td> <td>226,516 tCO_{2e}</td> <td>226,516 tCO_{2e}</td> </tr> </tbody> </table> <p>¹⁾ Both days included</p>		until 31/12/2012 ¹⁾	from 01/01/2013 ¹⁾	Sum	Emission reductions [tCO _{2e}]	n.a.	226,516 tCO _{2e}	226,516 tCO _{2e}
	until 31/12/2012 ¹⁾	from 01/01/2013 ¹⁾	Sum						
Emission reductions [tCO _{2e}]	n.a.	226,516 tCO _{2e}	226,516 tCO _{2e}						
Conclusion	<input checked="" type="checkbox"/> No CARs/CLs/FARs have been raised in this context. No correction was required. The project is in line with the respective requirements.								
	<input type="checkbox"/> The raised CARs/CLs/FARs have been addressed appropriately. The PP has carried out the requested corrections. All respective findings could be closed out. For details please refer to Appendix 4.								
	-								

E.9. Assessment of reported sustainable development co-benefits

Means of verification	<input checked="" type="checkbox"/> N/A – as the PP has not monitored the sustainable development co-benefits of the registered CDM project activity or not requested the DOE to verify them.
	<input type="checkbox"/> The project participants have monitored the sustainable development co-benefits of the registered CDM project activity, and requested the DOE to verify them. The following sources of information have been used in this context: <ul style="list-style-type: none"> • /MR/ • /CPA-DD/ • /unfccc/ • /IM01/
Findings	<input checked="" type="checkbox"/> N/A – as the PP has not monitored the sustainable development co-benefits of the registered CDM project activity or not requested the DOE to verify them.
	<input type="checkbox"/> Therefore, the DOE has assessed and confirms that: (a) The monitoring has been carried out in accordance with the document for monitoring sustainable development co-benefits, if such document was developed and published on the UNFCCC CDM website in accordance with the “CDM project standard for project activities”; (b) The reported monitoring results correspond to the sustainable development co-benefits of the project activity as observed by the DOE.
	<input type="checkbox"/> In this context the following CARs, CLs, FARs have been raised: - N/A
Conclusion	<input checked="" type="checkbox"/> No CARs/CLs/FARs have been raised in this context. No correction was required. The project is in line with the respective requirements.
	<input type="checkbox"/> The raised CARs/CLs/FARs have been addressed appropriately. The PP has carried out the requested corrections. All respective findings could be closed out. For details please refer to Appendix 4.
	<input checked="" type="checkbox"/> N/A – as the PP has not monitored the sustainable development co-benefits of the registered CDM project activity or not requested the DOE to verify them.

E.10. Global stakeholder consultation

Means of verification	In accordance with the PCP the DOE has submitted the initial version of the monitoring report provided by the PP for this monitoring period to be published on the UNFCCC webpage. The monitoring report has been published from 11/02/2019. The following sources of information have been used in this context:
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	<ul style="list-style-type: none"> • /MR/ • /unfccc/ 											
Findings	<input checked="" type="checkbox"/> No comments have been received on the published monitoring report for this monitoring period.											
	<input type="checkbox"/> Comments have been received and the DOE has concluded that comments are related to issues outside the CDM rules and requirements. Please refer to the list provided under Conclusion of this Section below for related information.											
	<input type="checkbox"/> Comments have been received. The DOE has <ul style="list-style-type: none"> - requested further information from the submitters of the comments - informed the project participants of the comments received, and requested their feedback within a specified timeframe, - considered the input received and has assessed whether such comments are relevant to the CDM project activity, - acknowledged receipt of all submitted comments on the MR of the proposed CDM project activity, - assessed whether the comments are related to the CDM rules and requirements (if so related findings have been raised as per below), - used all possible means to determine the authenticity of the name and contact details of the individual or organization on whose behalf the comments have been submitted, - contacted the secretariat to make them publicly available (if only addressed to the DOE), - determined whether authentic and relevant comments in the global stakeholder consultation were taken into due account in the PDD of the proposed CDM project activity. 											
	<input type="checkbox"/> In this context the following CARs, CLs, FARs have been raised, i.e. as the DOE concludes that the comments are related to the CDM rules and requirements: <ul style="list-style-type: none"> - N/A 											
Conclusion	<input checked="" type="checkbox"/> No CARs/CLs/FARs have been raised in this context. No correction was required. The project is in line with the respective requirements.											
	<input type="checkbox"/> The raised CARs/CLs/FARs have been addressed appropriately. The PP has carried out the requested corrections. All respective findings could be closed out. For details please refer to Appendix 4.											
	As the DOE has concluded that comments are related to issues outside the CDM rules and requirements the comments and information gathered are listed as follows:											
	<table border="1"> <thead> <tr> <th>Nbr.</th> <th>Original comment received</th> <th>Feedback by the PP</th> <th>Statement by DOE</th> </tr> </thead> <tbody> <tr> <td>1</td> <td></td> <td></td> <td></td> </tr> <tr> <td>2</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	Nbr.	Original comment received	Feedback by the PP	Statement by DOE	1				2		
Nbr.	Original comment received	Feedback by the PP	Statement by DOE									
1												
2												

SECTION F. Internal quality control

Before the submission of the final verification report a technical review of the whole verification procedure was carried out. The technical reviewers are competent GHG auditors being appointed for the scope this project falls under. The technical reviewers are not considered to be part of the verification team and thus not involved in the decision making process up to the technical review.

As a result of the technical review process the verification opinion and the topic specific assessments as prepared by the verification team leader may have been confirmed or revised. Furthermore reporting improvements might have been achieved.

After the successful technical review an overall (esp. procedural) assessment of the complete verification has been carried out by a senior assessor located in the accredited premises of TÜV NORD.

After this step the submission for requesting for issuance is conducted.

SECTION G. Verification opinion

Delhi Metro Rail Corporation (DMRC) has commissioned the TÜV NORD JI/CDM Certification Program to carry out the 7th periodic verification of the project: "Installation of Low Green House Gases (GHG) emitting rolling stock cars in metro system", with regard to the relevant requirements for CDM project activities. The project reduces GHG emissions by operating low GHG emitting rolling stocks having regenerative braking system in Delhi Metro Rail Corporation (DMRC). It replaces the conventional electro-dynamic rheostatic braking technology, with regenerative braking technology fitted rolling stocks. This verification covers the period from 01/01/2013 to 28/12/2017.

As a result of this verification, the verifier confirms that:

- all operations of the project are implemented and installed as planned and described in the validated project design document,
- the monitoring plan is in accordance with the applied small scale CDM methodology, i.e., AMS III.C. Version 10,
- the installed equipment essential for measuring parameters required for calculating emission reductions are calibrated appropriately,
- the monitoring system is in place and functional. The project has generated GHG emission reductions,
- the GHG emission reductions are calculated without material misstatements in a conservative and appropriate manner.

TÜV NORD JI/CDM CP further confirms that the project has achieved emission reductions in the above mentioned reporting period as follows:

Emission reductions: **226,516 tCO₂e**

SECTION H. Certification statement

As a duly accredited DOE, TÜV NORD CERT confirms that the project

“Installation of Low Green House Gases (GHG) emitting rolling stock cars in metro system”

registered under

UNFCCC-No. : 1351

has achieved emission reductions in accordance with all applicable requirements for registered CDM project activities during the current monitoring period

MP-No.: 7th

from: 01/01/2013

to: 28/12/2017

(including both days) as follows:

Emission reductions: **226,516 tCO₂e**

Essen , 10/12/2019



Swapnil Thanekar
Team Leader

Appendix 1. Abbreviations

Abbreviations	Full texts
AC	Alternating Current
CA	Corrective Action / Clarification Action
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CER	Certified Emission Reduction
CL	Clarification Request
CO₂	Carbon dioxide
CO_{2eq}	Carbon dioxide equivalent
CPU	Central Processing Unit
CT	Current Transformer
DC	Direct Current
DMRC	Delhi Metro Rail Corporation
DT	Driving Trailer car
DverR/DVR	Draft Verification Report
ER	Emission Reduction
FAR	Forward Action Request
FSR	Feasibility Study Report
GHG	Greenhouse gas(es)
M	Motor Car
MP	Monitoring Plan
MR	Monitoring Report
NWPG	Northwest Power Grid
OHE	Over Head Equipment
PA	Project Activity
PDD	Project Design Document
PP	Project Participant
PRC	Post Registration Change
PT	Potential Transformer
QA/QC	Quality Assurance / Quality Control
TIMS	Train Integrated Management system
UNFCCC	United Nations Framework Convention on Climate Change
VDU	Visual Display Unit
VVS	Validation and Verification Standard
VVVF	Variable Voltage Variable Frequency
XLS	Emission Reduction Calculation Spread Sheet

Appendix 2. Competence of team members and technical reviewers



TUV NORD
Certification

Statement of Competence
Appointment and authorization according to the procedures of the TUV NORD JICDM Certification Program

Mr. Stefan Winter

SCHEME	STATUS	VALID UNTIL
CDM	Senior Assessor (Validation, Verification) Technical Reviewer	2017-07-27
VCS	Senior Assessor (Validation, Verification) Technical Reviewer	2017-07-27

Authorization status for technical areas within sectoral scopes:

CODE	TECHNICAL AREA
1.1	Thermal energy generation
1.2	Renewables
2.1	Energy distribution
3.1	Energy demand
4.1	Cement and lime production
4.2	Paper
5.2	Caprolactam, nitric and adipic acid
9.1	Aluminum and magnesium production
9.2	Iron, steel and Ferro-alloy production
13.1	Solid waste and wastewater
13.2	Manure

163 – Rev. 4, Date: 2015-01-05

163_VA060 F20_2016-01-05_rev4.doc

Statement of Competence
Appointment and authorization according to the procedures of the TUV NORD JICDM Certification Program

Mr. Swapnil Thanekar

SCHEME	STATUS	VALID UNTIL
CDM	Lead Assessor (Validation, Verification)	2020-02-02
VCS	Lead Assessor	2020-02-02

Authorization status for technical areas within sectoral scopes:

CODE	TECHNICAL AREA
1.2	Renewable Energies

047 – Rev 4, Date: 2017-07-04



Statement of Competence
Appointment and authorization according to the procedures of the TUV NORD JICDM Certification Program

Mr. Rajiv Katyarmal

Authorization status for technical areas within sectoral scopes:

CODE	TECHNICAL AREA
7.1	Transport

380 - Rev. 0, Date: 2019-02-20

Appendix 3. Documents reviewed or referenced

Table: Documents provided by the project participant(s)

No.	Author	Title	References to the document	Provider
1	DMRC	Delhi Metro Annual report	/AR/	DMRC

2	-	Commissioning certificates of the total 70 number of Rolling stock car units in the three service lines 1, 2, 3 and 4.	/CC/	DMRC
3	TUV	The signed contract between TUV NORD and Project Proponent (DMRC) for carrying out verification of certified emission reduction	/CON/	DMRC
4	DMRC	Sample daily operation reports as proof of increase in ridership demand by the rolling stocks between the stations for the complete monitoring period	/DOR/	DMRC
5	DMRC	Details of Depots within project activity boundary	/DEPOT/	DMRC
6	SEB	Sample electricity bills as a proof of grid connection for the monitoring period	/GRD/	DMRC
7	DMRC	Monthly summary for monitoring of Energy consumption, energy regeneration and distance travelled for all train sets and all months in the monitoring period Daily check sheets for all train sets for energy consumption, energy regeneration and distance travelled for all days within the monitoring period	/LOG/	DMRC
8	DMRC	Records of minutes of the meeting of the internal review meeting	/MM/	DMRC
9	DMRC	<ul style="list-style-type: none"> • Monitoring Report for the period 2013-01-01 to 2017-12-28, dated 30/01/2019, Version 1. • Monitoring Report for the period 2013-01-01 to 2017-12-28, dated 29/04/2019, Version 2. • Monitoring Report RBS for 2013-01-01 to 2017-12-28 dated 14/06/2019_TC Version 3. • Monitoring Report RBS for 2013-01-01 to 2017-12-28 dated 26/06/2019 Version 4. • Monitoring Report RBS for 2013-01-01 to 2017-12-28 dated 23/07/2019 Version 5. 	dated /MR/	DMRC
10	DMRC	Procedure for electronic download and storage of data for carbon credit project (DMRC/134/08/Carbon Credits/270) dated 18 March 2008.	/PED/	DMRC
11	DMRC	<ul style="list-style-type: none"> - Quality procedure (PR/RS/PPIO/001) for planning, Maintenance and Monitoring of trains, dated 02/01/2006 - Quality procedure (DMRC/SPD/CDM/001, ("Procedure to address mismatch / discrepancies of energy monitoring for CDM project") dated 15/02/2008) to address mismatch/discrepancies of energy monitoring and data reporting for CDM Project. - CDM Manual dated 12/04/2008. - Record of internal audit of CDM data conducted on 20/04/2011, 19/04/2012 - Quality procedure for planning, maintenance and monitoring of trains dated 15/04/2008 	/QP/	DMRC
12	-	<ul style="list-style-type: none"> - Extract of the Energy Measurement scheme in C/I of rolling stock (HCNL5642-70), Mitsubishi Electric Corporation, 27 January 2001. - Extract of Rolling Stock-Training Manual of DMRC, for Technical details for the flow of C/I 	/TD/	DMRC

		propulsion system, power and energy management, dated 10/05/2005. - General Schematic for the C/I propulsion system, DMRC Maintenance - Training Manual, dated 23/07/2003 - Data download/upload by TIMS terminal, Train Integrated Management system (TIMS), DMRC Maintenance Training Manual, dated 23/07/2003 - Accuracy of the measurement as 0.01%		
13	-	- Details of the training provided to the personnel in DMRC in data collection, recording, archiving etc.	/TRN/	DMRC
14	DMRC	Excel (draft, intermediate and final versions inline with above listed MRs ^{MR/}) – Calculation sheets provided by the project participant for <ul style="list-style-type: none"> • Emission Reduction calculation MP-2013 • Emission Reduction calculation MP-2014 • Emission Reduction calculation MP-2015 • Emission Reduction calculation MP-2016 • Emission Reduction calculation MP-2017 	/XLS/	DMRC
15	-	Project Design Document for CDM project: “Installation of Low Green House Gases (GHG) emitting rolling stock cars in metro system” Version 05 dated 20/10/2013 approved on date 21/12/2013 http://cdm.unfccc.int/Projects/DB/RWTUV1190204766.13/view	/PDD/	DMRC
16	-	Installation of Low Green House Gases (GHG) emitting rolling stock cars in metro system version 02 dated 02/02/2017	/GSP/	DMRC
17	-	Calibration Record of CT/PT (sample basis)	/CAL/	DMRC
18	-	Validation Report for CDM project “Installation of Low Green House Gases (GHG) emitting rolling stock cars in metro system”, dated 2007-11-27 http://cdm.unfccc.int/Projects/DB/RWTUV1190204766.13/view Installation of low Green House Gases (GHG) emitting rolling stock cars in Metro (GS 4597), Gold Standard Validation Report, dated 08/09/2017	/VAL/	DMRC
19	-	Verification reports till sixth periodic verification available on the project page http://cdm.unfccc.int/Projects/DB/RWTUV1190204766.13/view	/VER/	DMRC
20	-	Validation Opinion related to changes in PDD version 05 http://cdm.unfccc.int/Projects/DB/RWTUV1190204766.13/view	/PRC/	UNFCCC

Table: Background investigation and assessment documents

No.	Author	Title	References to the document	Provider
1	DOE	TÜV NORD JI / CDM CP Manual (incl. CP procedures and forms)	/CPM/	TÜV NORD
2	UNFCCC	UNFCCC: Guidelines for completing CDM-PDD and CDM-NM	/GCP/	UNFCCC
3	IPCC	IPCC Good Practice Guidance & Uncertainty Management in National Greenhouse Gas Inventories, 2000	/IPCC-GP/	IPCC website
4	IPCC	1996 IPCC Guidelines for National Greenhouse Gas Inventories: work book	/IPPC/	IPCC website

		2006 IPCC Guidelines for National Greenhouse Gas Inventories: work book		
5	IPCC	Revised 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Reference Manual	/IPPC-RM/	IPCC website
6	UNFCCC	Kyoto Protocol (1997)	/KP/	UNFCCC
7	UNFCCC	Decision 3/CMP. 1 (Marrakesh – Accords)	/MA/	UNFCCC
8	UNFCCC	Guideline: completing the monitoring report form, Version 07.0	/TEMP/	UNFCCC
9	UNFCCC	CDM validation and verification standard for project activities (Ver02.0)	/VVS/	UNFCCC
10	UNFCCC	CDM Project Standard for project activities (Ver02.0)	/PS/	UNFCCC
11	UNFCCC	AMS-III.C. ver. 10 - Emission reductions by low-greenhouse gas emitting vehicles	/AMS III.C/	UNFCCC

Appendix 4. Clarification requests, corrective action requests and forward action requests

Table 2. Remaining FAR from validation and/or previous verifications

FAR ID	N/A	Section no.	-	Date: -
Description of FAR				
Project participant response				Date: -
Documentation provided by project participant				
<input type="checkbox"/>	Changes in the PDD	Section(s):	New version No.:	
<input type="checkbox"/>	Changes in MR	Section(s):	New version No.:	
<input type="checkbox"/>	Changes in XLS	Worksheet(s):	New version No.:	
<input type="checkbox"/>	Other:			
DOE assessment				Date: -

Table 3. CL from this verification

CL ID	01	Section no.	ER worksheet, On site Observations	Date: 2019-03-18
Description of CL				
The Assessment Team identified inconsistency between the car number stated in the ER worksheet and the rolling stock cars (one example)				
Nomenclature followed in the ER sheet		Nomenclature followed in the rolling car		
TS #17 – M301		TS #17 – M3A01		
Project participant response (1st round)				Date: 29/04/2019
Inconsistency between the CAR number has been rectified in the ER worksheets. In the ER worksheet, both the old car number and new car number has been mentioned. The same has been attached as Emission Reduction Calculation MP-2013, Emission Reduction Calculation MP-2014, Emission Reduction Calculation MP-2015, Emission Reduction Calculation MP-2016, Emission Reduction Calculation MP-2017.				
Documentation provided by project participant (1st round)				
<input type="checkbox"/>	Changes in the PDD	Section(s):	New version No.:	
<input checked="" type="checkbox"/>	Changes in MR	Section(s): Annexure-I	New version No.: 02	

<input checked="" type="checkbox"/> Changes in XLS	Worksheet(s):Emission Reduction Calculation MP-2013, Emission Reduction Calculation MP-2014, Emission Reduction Calculation MP-2015, Emission Reduction Calculation MP-2016, Emission Reduction Calculation MP-2017	New version No.: 02
<input type="checkbox"/> Other:		
DOE assessment (1st round)		Date:16/05/2019
The PP has submitted update ER worksheet with the latest numbering of the cars The Annexure-I of the MR is still referring the old numbers which are no more utilized. Findings have been kept OPEN.		
Project participant response (2ndround)		Date:14/06/2019
The train set number of 70 Rolling Stock which are part of project activity are mentioned in the PDD. Further, the monitoring report has been prepared in accordance with these train set number only.		
DOE assessment (2nd round)		Date:22/06/2019
Justification is accepted. The CL has been CLOSED.		
Conclusion <i>Tick the appropriate checkbox</i>	<input type="checkbox"/> Additional action should be taken (finding remains open) <input checked="" type="checkbox"/> The finding is closed	

CL ID	02	Section no.	A.1 of MR, Onsite observations	Date: 2019-03-18
Description of CL				
The PDD (Section A.1) and MR (Section A.1) states that the project activity involves 4 cars for each rolling stock however, the rolling stocks employ 8 or 6 cars for each rolling stock. In addition, it needs to be justified how the project is in line with the registered PDD (Version: 05, dated 2013-10-20).				
Project participant response (1st round)				Date: 29/04/2019
Section A.1 of the MR has been revised accordingly and details of conversion of cars from 4 to 6/8 has been attached as Appendix-1. The project proponent viz Delhi Metro Rail Corporation has increased four cars to six/eight cars in each rolling stock. The cars has been increased considering the increase in passenger ridership. Consequently, the number of cars in rolling stock has changed. For instance in the train set No.12. which is an 8 car rolling stock, the previous car number and new car number including additional cars are as follows:				
Train Set No.	Old Car Number	New Car Number	Remarks	
TS 12	M323	M3A12	Data monitored as required in Registered PDD	
	M324	M3B12		
	-	M3C12	Data not monitored.	
		M3D12		
It is further submitted that only those cars which are part of registered PDD has been considered in calculation of Emission Reduction. The same is also evident from the Emission Reduction sheets submitted along with Monitoring Report for year 2013-2017. Rest Rolling Stock cars which are not in registered PDD have not been considered in ER calculation. Hence, from above it can be concluded that the project is in line with the registered PDD.				
Documentation provided by project participant (1st round)				
<input type="checkbox"/> Changes in the PDD		Section(s):	New version No.:	
<input checked="" type="checkbox"/> Changes in MR		Section(s): A.1	New version No.: 02	
<input type="checkbox"/> Changes in XLS		Worksheet(s):	New version No.:	
<input type="checkbox"/> Other:				
DOE assessment (1st round)				Date: 16/05/2019

Authenticated Appendix-1 is requested.

Further, response in line with the para 242 of the Project Standard (PS) Version 02.0 is requested.

The impact on the below particulars are not addressed

- (a) The applicability and application of the applied methodologies, the applied standardized baselines and the other applied methodological regulatory documents with which the project activity has been registered;
- (b) The compliance of the monitoring plan with the applied methodologies, the applied standardized baselines and the other applied methodological regulatory documents;
- (c) The level of accuracy and completeness in the monitoring of the project activity compared with the requirements contained in the registered monitoring plan;
- (d) The additionality of the project activity;
- (e) The scale of the project activity.

Finding has been kept OPEN.

Project participant response (2ndround)

Date:14/06/2019

Authenticated copy of Appendix-1 is attached as “Appendix-1 Details for Conversion of Rolling Stock“

Point wise reply of particulars are mentioned below:

(a) As per the provisions of appendix B of simplified modalities and procedures for small scale CDM project activities, Type III C category:

1. “Comprises low-greenhouse gas emitting vehicles”.
2. “Measures are limited to those that result in emission reductions of less than or equal to 60 kt CO₂ equivalent annually”.
 - The project boundary covers the low-greenhouse gas emitting rolling stock in all the service lines that are part of the project activity.
 - The emission reductions from the project activity are 47,053 tCO₂e annually which is below the specified limit of 60,000 tCO₂e per year through-out the crediting period.

Hence, the project activity meets both the applicability criterion of the AMS III.C. methodology.

The baseline and emission reduction calculations for the project are based on paragraph 4, 5, 6 under Type III.C. of Appendix B of the simplified modalities and procedures for small-scale CDM project activities.

The project is applicable for four coaches of 70 Rolling Stock only. The conversion of four car to six/eight car are not part of project boundary and is therefore not considered under applicability and application of applied methodologies.

(b) The monitoring plan of the project activity is based on guidance provided in the paragraph 8 and 9 under Type III.C. of Appendix B of the simplified modalities and procedures for small scale CDM project activities.

The Baseline, Project and other parameters for the monitoring period has been monitored as per Section B.6 of PDD.

Hence, the monitoring plan remains unaffected due to the conversion of four car to six/eight cars in a rolling stock.

(c) Since the project activity is a small-scale CDM project of Type III.C category, the monitoring methodology and plan has been developed in line with the guidance provided in paragraph 8 under Type III.C of Appendix B.

The monitoring of the all electrical energy data required for estimation of baseline and project emissions for the project activity is carried out through state of the art electronic equipment like Train Integration Management system (TIMS). This is an electronic device of very high accuracy used for measurement and recording. The projects activity represents four cars of all 70 rolling stock trains of all the service lines for which electrical energy data is monitored through TIMS during the project activity.

All the parameters during the monitoring period have been monitored as per the Monitoring plan mentioned in Section B.7 of the PDD.

Hence, the completeness and accuracy of monitoring parameters remains unaffected due to the conversion of four car to six/eight cars in a rolling stock.

(d) Four car Rolling stock has been converted to six/eight cars Rolling stock. However, the additional coaches in each rolling stock are not the part of project activity and therefore have not been considered for monitoring. Therefore the conversion of 4 cars to 6/8 cars of 70 rolling stocks has not changed the additionality of the project and the additionality is in accordance with paragraph 28 of the simplified modalities and procedures for small-scale CDM project activities.

(e) The four car rolling stock has been converted to Six/Eight car rolling stock. However, as per the registered PDD, only four car of rolling stock are considered and Emission Reduction from the registered cars have been considered. This is also evident from the ER worksheets considered for calculation of CERs. Hence, the scale of the project activity remains unaffected by conversion of four to six/eight cars and project remains as a small scale project.

DOE assessment (2nd round)

Date:22/06/2019

The Verification visited the site and accordingly raised above CL based on the onsite observations. During the interviews, the PP updated that the ridership is continuously increasing and thus, it is a natural phenomenon to add CARS to match the ridership requirement. Each CAR is having independent monitoring system and the monitoring plan has provision to capture monitoring parameter dedicated to each CAR by the TIMS. Please also refer additional assessment as given below:

- During the site visit, the Verification Team observed that the monitoring process is exactly in line with the registered monitoring plan and the monitoring of the 70 CARS as stated in the PDD is undertaken and reported into the emission reduction worksheet. The verification team is thus convinced that the conversion from 4 CAR to 6 or 8 is not affecting the project design as still the provisions of monitoring are intact.
- The emission reduction accrued from the 70 CARS is well within the threshold of the small scale type III i.e. 60 kT CO₂. Thus, it is also accepted that the limit of small scale activity is not affected.
- Only the 70 CARS are getting monitored, and the details of the transfer of CAR from one yard to other is also appropriately updated under the section B.2 of MR (please also refer to closure of CAR 2 below)

The Verification team also applied plausibility check and derived the various specific parameter as tabulated below

Periodic Verification	No. of days	RSC	Energy consumed (kWh)	Regenerated Energy (kWh)	Total km	Specific Energy (kWh/km)	Specific Regeneration (kWh/km)	km/RSC/days
1	34	70	10,298,021	4,086,244	805,614	13	5.07	338.49
2	335	70	127120021	44,118,987	8,318,505	15	5.30	354.73
3	365	70	154,202,104	54,691,259	9,818,791	16	5.57	384.29
4	365	70	161,274,579	59,111,341	10,209,312	16	5.78	399.58
5	365	70	165,026,734	59,495,997	10,505,508	16	5.66	411.17
6	365	70	162,059,389	59,862,205	10,089,625	16	5.93	394.89
7	1823	70	741,161,840	283,146,825	48,355,770	15	5.85	378.93
Total ^T / Average ^A	-	70	1,521,142,688 ^T	564,512,858 ^T	98,103,125 ^T	15.51 ^A	5.75 ^A	380.30 ^A

Based on the above assessments it is confirmed by the Verification team that, the project activity is in line with the registered PDD.

CL has been CLOSED.

Conclusion <i>Tick the appropriate checkbox</i>	<input type="checkbox"/> Additional action should be taken (finding remains open) <input checked="" type="checkbox"/> The finding is closed
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Table 4. CAR from this verification

CAR ID	01	Section no.	ER worksheet	Date:	2019-03-18
Description of CAR					
The submitted ER worksheet has external web-links and redundant data, same needs to be rectified (example: tab "YBD-DEC14-1", "NFD-Aug16-1", "NFD-Jul16-1", "KPD-MAY-17-1", "KPD-June-17-1".					
<ul style="list-style-type: none"> • In addition inconsistency is identified for below cases: <ul style="list-style-type: none"> ○ Difference of 671 units is registered between the year 2015 for moths of October (1656301) end reading of C2 and November (1655630) start reading of C2 for Regeneration CAR reference MC#02 Refer tabs ("SLPD-NOV15-1" and "SLPD-OCT15-1"). ○ Difference of 500 units is registered between the year 2015 for moths of June (3420845) end reading of C2 and July (3420345) start reading of C2 for Motoring CAR reference TS03 Refer tabs ("SPD-JULY15-1" and "SPD-JUNE15-1"). ○ Data for the SLPD is not reported for the SLPD for period of January 2013 to March 2013. 					
The submitted ER worksheet will be reassessed.					
Project participant response (1st round)					
<ol style="list-style-type: none"> 1. The external web links and redundant data have been removed from the ER sheets. 2. The inconsistencies of data as mentioned in above ER sheets have been rectified. 					
Documentation provided by project participant (1st round)					Date: 29/04/2019
<input type="checkbox"/>	Changes in the PDD	Section(s):		New version No.:	
<input type="checkbox"/>	Changes in MR	Section(s):		New version No.:	
<input checked="" type="checkbox"/>	Changes in XLS	Worksheet(s): All		New version No.:02	
<input type="checkbox"/>	Other:				
DOE assessment (1st round)					Date: 16/05/2019

<ul style="list-style-type: none"> Redundant data is still apparent. Examples “NFD-SEP14-1”, “NFD-JAN15-1”, “KPD-JAN15-1”, “YBD-OCT15-1”. PP is requested to recheck of all the worksheets and the tabs to address the issue. Finding has been kept OPEN Inconsistency is addressed for tabs (“SLPD-NOV15-1” and “SLPD-OCT15-1”), the end reading of October and start reading of November for C2 is appropriately reported as (1656301) Inconsistency is addressed for tabs (“SPD-JULY15-1” and “SPD-JUNE15-1”), the end reading of June and start reading of July for C2 is appropriately reported as (3420845) Response to the finding is pending. Finding is KEPT OPEN. 	
Project participant response (2ndround)	Date: 14/06/2019
<p>Redundant data has been addressed in all ER worksheets.</p> <p>The same has been attached as Emission Reduction Calculation MP-2013, Emission Reduction Calculation MP-2014, Emission Reduction Calculation MP-2015, Emission Reduction Calculation MP-2016 and Emission Reduction Calculation MP-2017.</p>	
DOE assessment (2nd round)	Date: 22/06/2019
<p>Redundant Data is not eliminated from the submitted worksheets.</p> <p>Finding has been CLOSED.</p>	
Conclusion <i>Tick the appropriate checkbox</i>	<input type="checkbox"/> Additional action should be taken (finding remains open) <input checked="" type="checkbox"/> The finding is closed

CAR ID	02	Section no.	A.2, B.1	Date: 2019-03-18
Description of CAR				
<p>The map under section A.2 of MR is unclear.</p> <p>Section B.1 of MR is deficient with respect to clear status of the year-wise allocation of rolling stocks across the line 1, 2, 3 and 4. Data for SPD, NFD, KPD is shared for year 2013, whereas from 2014 SPD, NFD, KPD, YBD, SLPD. Changes in the allocation of the rolling stock is also not transparently discussed under MR section B.1.</p>				
Project participant response (1st round)				
<p>Map under section A.2 of MR has been changed.</p> <p>Year wise allocation of rolling stocks across the line 1, 2, 3 and 4 has been mentioned now in Section B.1. of MR. Also, changes in allocation of rolling stock has now been transparently addressed under Section B.1. of MR.</p>				
Documentation provided by project participant (1st round)				Date: 29/04/2019
<input type="checkbox"/>	Changes in the PDD	Section(s):	New version No.:	
<input checked="" type="checkbox"/>	Changes in MR	Section(s): B.1	New version No.: 02	
<input type="checkbox"/>	Changes in XLS	Worksheet(s):	New version No.:	
<input type="checkbox"/>	Other:			
DOE assessment (1st round)				Date: 16/05/2019
<ul style="list-style-type: none"> Clear map is now provided. Finding is CLOSED. Year wise allocation of rolling stock is provided transparently under section B.1 of MR. The ER sheets are compared with the information under MR and internally the reporting are found to be consistent. PP is further requested to submit authenticated allocation data for the changes in the allocation of rolling stocks. Finding is KEPT OPEN 				
Project participant response (2ndround)				Date: 14/06/2019
<p>Authenticated copy of allocation of rolling stocks is attached as “Appendix-2 Details of Rolling Stock on Service Lines”.</p>				
DOE assessment (2nd round)				Date: 22/06/2019
<p>Authenticated copy is now submitted. CAR has been CLOSED.</p>				
Conclusion <i>Tick the appropriate checkbox</i>	<input type="checkbox"/> Additional action should be taken (finding remains open) <input checked="" type="checkbox"/> The finding is closed			

CAR ID	03	Section no.	C	Date: 2019-03-18
Description of CAR				

The para "Calibration Procedure" states that DMRC undertakes "PP does the calibration of CT/PT from accredited lab, with a frequency of once in a three year". During onsite verification, the PP however argued that calibration is not applicable and supported argument with registered monitoring plan. Inconsistency statements needs to be addressed.

Project participant response (1st round)

The Project Proponent carries out calibration of CT/PT from accredited lab on sampling basis for few equipment. Since, this said calibration is not required under the registered monitoring plan, hence the calibration procedure has been modified in Section C of the Monitoring Report.
In addition, the calibration details of sample equipment are mentioned in Section D.2 of the monitoring report.

Documentation provided by project participant (1st round) **Date:** 29/04/2019

<input type="checkbox"/> Changes in the PDD	Section(s):	New version No.:
<input type="checkbox"/> Changes in MR	Section(s):	New version No.:
<input type="checkbox"/> Changes in XLS	Worksheet(s):	New version No.:
<input type="checkbox"/> Other:		

DOE assessment (1st round) **Date:** 16/05/2019

Accepted. TIMS is totally software based system with high level of accuracy and hence does not require calibration. The Verification Team confirms that the registered monitoring plan also does not mandate for calibration requirements. The CT/ PT are however calibrated on sample basis as additional measure to maintain accuracy. Finding has been CLOSED.

Conclusion <i>Tick the appropriate checkbox</i>	<input type="checkbox"/> Additional action should be taken (finding remains open) <input checked="" type="checkbox"/> The finding is closed
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CAR ID	04	Section no.	E.1	Date: 2019-03-18
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Description of CAR

The section of E.1 of MR lacks the sample calculation for all formulae used to calculate the baseline GHG emissions calculations by applying actual values.

Project participant response (1st round)

Calculation for baseline emission of each year has been mentioned in the Section E.1. of the Monitoring Report.

Documentation provided by project participant (1st round) **Date:** 29/04/2019

<input type="checkbox"/> Changes in the PDD	Section(s):	New version No.:
<input checked="" type="checkbox"/> Changes in MR	Section(s):E.1	New version No.:02
<input type="checkbox"/> Changes in XLS	Worksheet(s):	New version No.:
<input type="checkbox"/> Other:		

DOE assessment (1st round) **Date:** 16/05/2019

Sample calculation is appropriately included in line with the MR filling guidelines.
The Verification Team also verified the MR section E.1 and the ER worksheets and confirms that the values are consistently reported without material misstatement
Finding has been CLOSED.

Conclusion <i>Tick the appropriate checkbox</i>	<input type="checkbox"/> Additional action should be taken (finding remains open) <input checked="" type="checkbox"/> The finding is closed
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CAR ID	05	Section no.	All Section of MR	Date: 2019-06-22
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Description of CAR

Applied version of MR form expired. Appropriate action is requested.

Project participant response (1st round)

The version 04 of MR is submitted with updated format

Documentation provided by project participant (1st round) **Date:** 2019-06-27

<input type="checkbox"/> Changes in the PDD	Section(s):	New version No.:
<input checked="" type="checkbox"/> Changes in MR	Section(s): All	New version No.:04
<input type="checkbox"/> Changes in XLS	Worksheet(s):	New version No.:
<input type="checkbox"/> Other:		

DOE assessment (1st round) **Date:** 2019-06-28

The recent version of the MR is updated with the latest form version 07.0. There is no material changes in the information included in the latest version of MR. The MR filling guidelines were referred and submitted MR was checked. No discrepancies were identified.
 CAR has been CLOSED.

Conclusion <i>Tick the appropriate checkbox</i>	<input type="checkbox"/> Additional action should be taken (finding remains open) <input checked="" type="checkbox"/> The finding is closed
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Table 5. FAR from this verification

FAR ID	Xx	Section No.	Date: DD/MM/YYYY
Description of FAR			
Project participant response			Date: DD/MM/YYYY
Documentation provided by project participant			
DOE assessment			Date: DD/MM/YYYY

Appendix 5. Monitored Parameters

Table 1: Periodic Verification Checklist – Monitored Parameters

Checklist Item (incl. guidance for the verification team)	Reference	Verification Team Comments (Means and results of assessment)	Draft Concl.	Final Concl.
1. EG_{i, wr}		Description: Electrical energy consumed by the operational rolling stock 'I'		
<p>a) Measurement / Determination method (VVS, §§ 389-393) Describe how the monitoring parameter was measured / determined. Focus primarily on the original data level (ODL) but also describe the applied data aggregation trails (from ODL to data aggregation level zero (DAL0)). Check if relevant equipment has been exchanged and if in cases of failures / downtimes of standard equipment other measurement / determination methods have been used. Furthermore, verify the frequency of measurements as per the requirements. Assess whether the measurement / determination method is in line with the registered monitoring plan of the PDD and the applied methodology.</p>	/IM01/ /PDD/ /AMS III.C./ /MR/	<p>Description: The electrical energy consumed by the operational rolling stocks for motoring and auxiliary electricity is monitored by TIMS. The TIMS has an incremental counter for recording of each energy data (motoring, breaking and auxiliary for each unit of the train). These data are stored in the CPU of the each unit specific TIMS and are also displayed on the VDU located at unit specific DT. The energy data is downloaded from TIMS using maintenance terminals. The Verification Team also interviewed the DMRC engineers if the readings are noted for “Electrical energy consumed by the operational rolling stock ‘I’, “Electrical energy regenerated by the operational rolling stock ‘i’, “Total distance covered by the rolling stock ‘i’” and other important parameters (not part of monitoring plan) in rolling stock. It was confirmed that the readings are noted (visually inspected) on daily basis as a part of routine check to ensure that all components of Rolling stock are performing as per their respective requirements and hence, the generated data is under continuous data recording mode without fault. The Verification Team confirms (based on the interviews) that monitoring plan has been followed for daily noting and monthly downloading of TIMS data.</p> <p>However, CL 01, CL 02, CAR 01, CAR 02, CAR 04 are raised</p> <p>Verifier’s action: The verification checked the measurement procedure during onsite verification audit and subsequent interviews with the personnel. The verification team is convinced that the TIMS have been used throughout the monitoring period since its implementation. The technology for regenerative</p>	CL-01, CL-02, CAR 01, CAR 02, CAR 04	OK

Checklist Item (incl. guidance for the verification team)	Reference	Verification Team Comments (Means and results of assessment)	Draft Concl.	Final Concl.
		<p>braking system including TIMS is provided by Mitsubishi Electric Corporation, Japan. No equipment has been exchanged so far. No downtime of measuring equipment has occurred during the monitoring period. The measurement method is found to be in line with the registered monitoring plan of the PDD and the applied methodology i.e. AMS III.C./Version 10.</p> <p><i>Conclusion:</i> Findings are raised. Conformance to checklist requirement is subjected to closure of raised findings.</p>		
<p>b) Accuracy and QA/QC Procedure (VVS, §§ 394-400) <i>In case of measured (or estimated) values, check whether the accuracy of equipment used for monitoring is controlled and calibrated in accordance with the monitoring plan or if significant inaccuracies occur; in this case, make sure that the most conservative assumptions theoretically possible have been made for calculating ERs.</i> <i>Describe whether all applicable QA/QC procedures are met. Assess further if the calibration of the monitoring equipment has been carried out in line with the latest EB guidance. Include calibration dates and information in validity of the installed monitoring equipment in the table in Annex 2.</i></p>	<p>/CAL/ /MM/ /MR/</p>	<p><i>Description:</i> The TIMS data is recorded by CDM team member (From each service line depot) of the Rolling Stock Department and is forwarded to the CDM Coordinator of the project. A data review meeting is conducted once in 6 months which is chaired by CDM Chairman. In this meeting, data compiled by CDM coordinator is cross checked with service line data of all the rolling stock. Subsequently to check further the data authenticity and accuracy, data is verified, audited and signed by senior officials from DMRC. TIMS is totally software based system with high level of accuracy and hence does not require calibration. CAR 03 has been raised as inconsistent QA/ QC measures are reported in the MR.</p> <p><i>Verifier's action:</i> Monitoring records are consistently recorded as per approved frequency from TIMS which was cross verified during onsite visit and subsequent interview and found satisfactory by the verification team. The monitoring records generated by the TIMS in form of print outs were verified during the onsite assessment and found satisfactory by the verification team except errors during manual data transfer. In addition, data review meeting reports and calibration certificates were checked during the site visit by the verification team and found that quality assurance and quality control procedures have been applied in accordance with the monitoring plan (except errors during manual data transfer).</p> <p><i>Conclusion:</i> Accuracy of equipment used for monitoring is controlled in accordance with the monitoring plan. All applicable QA/QC procedures are met and the maintenance of the monitoring equipment have been carried out by competent personnel. Please refer CAR 03 for further correction.</p>	<p>CAR 03</p>	<p>OK</p>

Checklist Item (incl. guidance for the verification team)	Reference	Verification Team Comments (Means and results of assessment)	Draft Concl.	Final Concl.
<p>c) Correctness (VVS, §§ 389-393) Determine whether the value given in the monitoring report is correct or determined in a conservative manner. In case of conservative approaches used in lieu of the monitoring as per registered MP detailed assessment of the conservativeness of the approach used should be given. In case of mistakes / deviations pl. provide details and descriptions of the CARs raised.</p>	/XLS/ /MR/	<p><input type="checkbox"/> Correct <input checked="" type="checkbox"/> Not correct (initial assessment) <i>Description:</i> The values given in the MR and Corresponding Excel Sheet cannot be considered as correct and sufficiently justified. Mistakes were detected and CL 01, CL 02, CAR 01, CAR 02, CAR 03, CAR 04 was raised. <i>Verifier's action:</i> Values provided in the monitoring report were cross checked with the provided monitoring data excel sheet by the PP. <i>Conclusion:</i> The values given in the monitoring report are not correct and sufficiently justified.</p>	GL-01, GL-02, CAR 01, CAR 02, CAR 03, CAR 04	OK
<p>2. EGi, R</p>		<p><i>Description: Electrical energy regenerated by the operational rolling stock 'i'</i></p>		
<p>a) Measurement / Determination method (VVS, §§ 389-393) Describe how the monitoring parameter was measured / determined. Focus primarily on the original data level (ODL) but also describe the applied data aggregation trails (from ODL to data aggregation level zero (DAL0)). Check if relevant equipment has been exchanged and if in cases of failures / downtimes of standard equipment other measurement / determination methods have been used. Furthermore, verify the frequency of measurements as per the requirements. Assess whether the measurement / determination method is in line with the registered monitoring plan of the PDD and the applied methodology.</p>	/IM01/ /PDD/ /AMS III.C./ /MR01/ /TIMS record/TI MS data/ /XLS/	<p><i>Description:</i> The electrical energy regenerated by the operational rolling stocks is monitored by TIMS. The TIMS has an incremental counter for recording of each energy data (motoring, breaking and auxiliary for each unit of the train). These data are stored in the CPU of the each unit specific TIMS and are also displayed on the VDU located at unit specific DT. The energy data is downloaded from TIMS using maintenance terminals. The energy data is downloaded from TIMS using maintenance terminals. The Verification Team also interviewed the DMRC engineers if the readings are noted for "Electrical energy consumed by the operational rolling stock 'i'", "Electrical energy regenerated by the operational rolling stock 'i'", "Total distance covered by the rolling stock 'i'" and other important parameters (not part of monitoring plan) in rolling stock. It was confirmed that the readings are noted (visually inspected) on daily basis as a part of routine check to ensure that all components of Rolling stock are performing as per their respective requirements and hence, the generated data is under continuous data recording mode without fault. The Verification Team confirms (based on the interviews) that monitoring plan has been followed for daily noting and monthly downloading of TIMS data. However, CL 01, CL 02, CAR 01, CAR 02, CAR 04 are raised</p>	GL-01, GL-02, CAR 01, CAR 02, CAR 04	OK

Checklist Item (incl. guidance for the verification team)	Reference	Verification Team Comments (Means and results of assessment)	Draft Concl.	Final Concl.
		<p><i>Verifier's action:</i> Verification team checked the measurement procedure during onsite verification audit and subsequent interviews with the personnel. The verification team is satisfied that the TIMS have been used throughout the monitoring period since its implementation.</p> <p>The technology for regenerative braking system including TIMS is provided by Mitsubishi Electric Corporation, Japan.</p> <p><i>Conclusion:</i> No equipment has been exchanged so far. No downtime of measuring equipment has occurred during the monitoring period. The measurement method is found to be in line with the registered monitoring plan of the PDD and the applied methodology i.e. AMS III.C./Version 10. However, please refer raised findings.</p>		
<p>b) Accuracy and QA/QC Procedure (VVS, §§ 394-400)</p> <p><i>In case of measured (or estimated) values, check whether the accuracy of equipment used for monitoring is controlled and calibrated in accordance with the monitoring plan or if significant inaccuracies occur; in this case, make sure that the most conservative assumptions theoretically possible have been made for calculating ERs.</i></p> <p><i>Describe whether all applicable QA/QC procedures are met. Assess further if the calibration of the monitoring equipment has been carried out in line with the latest EB guidance. Include calibration dates and information in validity of the installed monitoring equipment in the table in Annex 2.</i></p>	/CAL/ /MM/	<p><i>Description:</i> The TIMS data is recorded by CDM team member (From each service line depot) of the Rolling Stock Department and is forwarded to the CDM Coordinator of the project. A data review meeting is conducted once in 6 months which is chaired by CDM Chairman. In this meeting, data compiled by CDM coordinator is cross checked with service line data of all the rolling stock. Subsequently to check further the data authenticity and accuracy, data is verified, audited and signed by senior officials from DMRC. TIMS is totally software based system with high level of accuracy and hence does not require calibration. CAR 3 has been raised for inconsistent reporting of the QA/ QC measures</p> <p><i>Verifier's action:</i> Monitoring records are consistently recorded as per approved frequency from TIMS which was cross verified during onsite visit and subsequent interview and found satisfactory by the verification team except errors during manual data transfer. The monitoring records generated by the TIMS in form of print outs were verified during the onsite assessment and satisfactory by the verification team (except errors during manual data transfer).</p> <p><i>Conclusion:</i> Accuracy of equipment used for monitoring is controlled and in accordance with the monitoring plan. All applicable QA/QC procedures are met. Please refer CAR 03 for further correction.</p>	CAR 03	OK

Checklist Item (incl. guidance for the verification team)	Reference	Verification Team Comments (Means and results of assessment)	Draft Concl.	Final Concl.
<p>c) Correctness (VVS, §§ 389-393) Determine whether the value given in the monitoring report is correct or determined in a conservative manner. In case of conservative approaches used in lieu of the monitoring as per registered MP detailed assessment of the conservativeness of the approach used should be given. In case of mistakes / deviations pl. provide details and descriptions of the CARs raised.</p>	/XLS/ /MR/	<p><input type="checkbox"/> Correct <input checked="" type="checkbox"/> Not correct (initial assessment) <i>Description:</i> values given in the submitted MR and Corresponding Excel Sheet are not deemed as correct and sufficiently justified. Mistakes were detected and CL 01, CL 02, CAR 01, CAR 02, CAR 03, CAR 04 was raised. <i>Verifier's action:</i> Values provided in the monitoring report were cross checked with the provided monitoring data excel sheet by the PP. <i>Conclusion:</i> The values given in the monitoring report are not correct and sufficiently justified.</p>	CL 01, CL 02, CAR 01, CAR 02, CAR 03, CAR 04	OK
3. Si		<i>Description: Total distance covered by the rolling stock 'i'</i>		
<p>a) Measurement / Determination method (VVS, §§ 389-393) Describe how the monitoring parameter was measured / determined. Focus primarily on the original data level (ODL) but also describe the applied data aggregation trails (from ODL to data aggregation level zero (DAL0)). Check if relevant equipment has been exchanged and if in cases of failures / downtimes of standard equipment other measurement / determination methods have been used. Furthermore, verify the frequency of measurements as per the requirements. Assess whether the measurement / determination method is in line with the registered monitoring plan of the PDD and the applied methodology.</p>	/IM01/ /PDD/ /AMS III.C./ /MR01/	<p><i>Description:</i> The distance travelled by each rolling stock is monitored by TIMS. The data regarding the total distance covered by each rolling stock is downloaded from TIMS using a maintenance terminal as per the procedure for electronic download and storage of data for carbon credit project. The measurement / determination method is in line with the registered monitoring plan of the PDD and the applied methodology. The energy data is downloaded from TIMS using maintenance terminals. The Verification Team also interviewed the DMRC engineers if the readings are noted for "Electrical energy consumed by the operational rolling stock 'i'", "Electrical energy regenerated by the operational rolling stock 'i'", "Total distance covered by the rolling stock 'i'" and other important parameters (not part of monitoring plan) in rolling stock. It was confirmed that the readings are noted (visually inspected) on daily basis as a part of routine check to ensure that all components of Rolling stock are performing as per their respective requirements and hence, the generated data is under continuous data recording mode without fault. The Verification Team confirms (based on the interviews) that monitoring plan has been followed for daily noting and monthly downloading of TIMS data. However, CL 01, CL 02, CAR 01, CAR 02, CAR 04 are raised</p>	CL 01, CL 02, CAR 01, CAR 02, CAR 04	OK

Checklist Item (incl. guidance for the verification team)	Reference	Verification Team Comments (Means and results of assessment)	Draft Concl.	Final Concl.
		<p><i>Verifier's action:</i> By means of onsite assessment and cross checking of MR against registered PDD.</p> <p><i>Conclusion:</i> The measurement / determination method is in line with the registered monitoring plan of the PDD and the applied methodology.</p> <p>Pending closure of CL 01, CL 02, CAR 01, CAR 02, CAR 04 are raised.</p>		
<p>b) Accuracy and QA/QC Procedure (VVS, §§ 394-400) <i>In case of measured (or estimated) values, check whether the accuracy of equipment used for monitoring is controlled and calibrated in accordance with the monitoring plan or if significant inaccuracies occur; in this case, make sure that the most conservative assumptions theoretically possible have been made for calculating ERs.</i> <i>Describe whether all applicable QA/QC procedures are met. Assess further if the calibration of the monitoring equipment has been carried out in line with the latest EB guidance. Include calibration dates and information in validity of the installed monitoring equipment in the table in Annex 2.</i></p>	/CAL/ /MM/	<p><i>Description:</i> The data is monitored by the operation and maintenance department of DMRC. Maintenance is being carried out by the trained and skilled personnel of DMRC. Inaccuracies have been identified for QA/ QC measures of this parameter, CAR 03 is raised.</p> <p><i>Verifier's action:</i> Monitoring records are consistently recorded as per approved frequency from TIMS which was cross verified during onsite visit and subsequent interview and found satisfactory by the verification team (except errors during manual data transfer).</p> <p><i>Conclusion:</i> Accuracy of equipment used for monitoring is controlled in accordance with the monitoring plan. All applicable QA/QC procedures are met and maintenance of the monitoring equipment have been carried out by competent personnel.</p>	CAR 03	OK
<p>c) Correctness (VVS, §§ 389-393) <i>Determine whether the value given in the monitoring report is correct or determined in a conservative manner.</i> <i>In case of conservative approaches used in lieu of the monitoring as per registered MP detailed assessment of the conservativeness of the approach used should be given.</i> <i>In case of mistakes / deviations pl. provide details and descriptions of the CARs raised.</i></p>	/XLS01/	<p><input type="checkbox"/> Correct <input checked="" type="checkbox"/> Not correct (initial assessment)</p> <p><i>Description:</i> values given in the web hosted MR and Corresponding Excel Sheet is not correct and sufficiently justified.</p> <p>Mistakes were detected in calculation.</p> <p><i>Verifier's action:</i> Values provided in the monitoring report were cross checked with the provided monitoring data excel sheet by the PP.</p> <p><i>Conclusion:</i> The values given in the monitoring report is not correct and sufficiently justified, CL 01, CL 02, CAR 01, CAR 02, CAR 03, CAR 04 are raised.</p>	CL 01, CL 02, CAR 01, CAR 02, CAR 03, CAR 04	OK
4. N		<i>Description:</i> Total number of operational Rolling stocks in the three service lines		

Checklist Item (incl. guidance for the verification team)	Reference	Verification Team Comments (Means and results of assessment)	Draft Concl.	Final Concl.
<p>a) Measurement / Determination method (VVS, §§ 389-393) Describe how the monitoring parameter was measured / determined. Focus primarily on the original data level (ODL) but also describe the applied data aggregation trails (from ODL to data aggregation level zero (DAL0)). Check if relevant equipment has been exchanged and if in cases of failures / downtimes of standard equipment other measurement / determination methods have been used. Furthermore, verify the frequency of measurements as per the requirements. Assess whether the measurement / determination method is in line with the registered monitoring plan of the PDD and the applied methodology.</p>	/IM01/ /PDD/ /AMS III.C/ /MR/	<p><i>Description:</i> The measurement / determination method is in line with the registered monitoring plan of the PDD and the applied methodology.</p> <p><i>Verifier's action:</i> The number of all operational rolling stocks is monitored by DMRC in the framework of the normal operation of the metro lines. Unique Identification number of each Rolling stock is identified and verified at the regular monitoring interval by the operation and maintenance department of DMRC. There is no measuring equipment involved in the monitoring of this parameter. Monitoring procedure found to be in line with the registered monitoring plan of the PDD and the applied methodology.</p> <p><i>Conclusion:</i> The measurement / determination method is in line with the registered monitoring plan of the PDD and the applied methodology.</p>	OK	OK
<p>b) Accuracy and QA/QC Procedure (VVS, §§ 394-400) In case of measured (or estimated) values, check whether the accuracy of equipment used for monitoring is controlled and calibrated in accordance with the monitoring plan or if significant inaccuracies occur; in this case, make sure that the most conservative assumptions theoretically possible have been made for calculating ERs. Describe whether all applicable QA/QC procedures are met. Assess further if the calibration of the monitoring equipment has been carried out in line with the latest EB guidance. Include calibration dates and information in validity of the installed monitoring equipment in the table in Annex 2.</p>	/CAL/ /MM/ /TRN/ /QP/	<p><i>Description:</i> No any inaccuracies have been identified for this parameter. The data is monitored by the operation and maintenance department of DMRC. Maintenance is being carried out by the trained and skilled personnel of DMRC.</p> <p><i>Verifier's action:</i> There is no measuring equipment involved in the monitoring of this parameter. Monitoring procedure found to be in line with the registered monitoring plan of the PDD and the applied methodology.</p> <p><i>Conclusion:</i> All applicable QA/QC procedures are met</p>	OK	OK
<p>c) Correctness (VVS, §§ 389-393) Determine whether the value given in the monitoring report is correct or determined in a conservative manner. In case of conservative approaches used in lieu of the monitoring as per registered MP detailed assessment of the conservativeness of the approach used should be given.</p>	/XLS/	<p><input checked="" type="checkbox"/> Correct <input type="checkbox"/> Not correct (initial assessment)</p> <p><i>Description:</i> values given in the web hosted MR and Corresponding Excel Sheet is correct and sufficiently justified. No mistakes were detected in calculation.</p> <p><i>Verifier's action:</i> Values provided in the monitoring report were cross checked with the provided monitoring data excel sheet by the PP.</p>	OK	OK

Checklist Item (incl. guidance for the verification team)	Reference	Verification Team Comments (Means and results of assessment)	Draft Concl.	Final Concl.
<i>In case of mistakes / deviations pl. provide details and descriptions of the CARs raised.</i>		<i>Conclusion:</i> The values given in the monitoring report is correct and sufficiently justified.		

Appendix 6. Calibration dates and validity of installed monitoring equipment

TIMS is totally software based system with high level of accuracy and hence does not require calibration. Please refer assessment under Appendix above.

Document information

<i>Version</i>	<i>Date</i>	<i>Description</i>
03.0	31 May 2019	Revision to: <ul style="list-style-type: none"> • Ensure consistency with version 02.0 of the “CDM validation and verification standard for project activities” (CDM-EB93-A05-STAN); • Make structural and editorial improvements.
02.1	11 January 2018	Editorial revision to correct the numbering of appendices in the instructions.
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