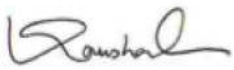
Project Verification Report

2021

COVER PAGE Project Verification Report Form (VR)	
BASIC INFORMATION	
Name of approved UCR Project Verifier / Reference No.	KBS Certification Services Limited (https://www.ucarbonregistry.io/CouRegistry/VerifierList)
Type of Accreditation	☒ CDM or other GHG Accreditation ☐ ISO 14065 Accreditation Name of the entity that provided the accreditation: UNFCCC Date of validity: 29/11/2019 to 28/11/2024 Web link of the active accreditation certificate and approval: https://cdm.unfccc.int/DOE/list/DOE.html?entityCode=E-0051
Approved UCR Scopes and GHG Sectoral scopes for Project Verification	Sectoral Scope 07: Transport
Validity of UCR approval of Verifier	15/01/2022 onwards
Completion date of this VR	09/12/2023
Title of the project activity	Installation of Low Green House Gases (GHG)

	emitting rolling stock cars in metro system
Project reference no. (as provided by UCR Program)	0370
Name of Entity requesting verification service (can be Project Owners themselves or any Entity having authorization of Project Owners, example aggregator.)	Delhi Metro Rail Corporation (DMRC)
Contact details of the representative of the Entity, requesting verification service (Focal Point assigned for all communications)	Name: Sh. S A Verma Designation: Executive Director Organisation: Delhi Metro Rail Corporation Telephone: 011-22754719 E-Mail ID: saverma_rs@yahoo.com
Country where project is located	India
Applied methodologies (approved methodologies by UCR Standard used)	AMS III.C. “Emission reduction by low greenhouse gas emitting vehicles” Version: 10
GHG Sectoral scopes linked to the applied methodologies	07 Transport
Project Verification Criteria: Mandatory requirements to be assessed	☒ UCR Standard ☒ Applicable Approved Methodology ☒ Applicable Legal requirements /rules of host country ☒ Eligibility of the Project Type ☒ Start date of the Project activity ☒ Meet applicability conditions in the applied

	methodology ☒ Credible Baseline ☒ Do No Harm Test ☒ Emission Reduction calculations ☒ Monitoring Report ☒ No GHG Double Counting ☐ Others (please mention below)
Project Verification Criteria: Optional requirements to be assessed	☒ Environmental Safeguards Standard and do-no-harm criteria ☒ Social Safeguards Standard do-no-harm criteria
Project Verifier's Confirmation: The *UCR Project Verifier* has verified the UCR project activity and therefore confirms the following:	The UCR Project Verifier KBS Certification Services Ltd., certifies the following with respect to the UCR Project Activity Installation of Low Green House Gases (GHG) emitting rolling stock cars in metro system. ☒ The Project Owner has correctly described the Project Activity in the Project Concept Note (dated 04/12/2023) including the applicability of the approved methodology AMS III C Version 10.0 and meets the methodology applicability conditions and has achieved the estimated GHG emission reductions, complies with the monitoring methodology and has calculated emission reductions estimates correctly and conservatively. ☒ The Project Activity is

	likely to generate GHG emission reductions amounting to the estimated 2,376,993 TCO_{2e}, as indicated in the PCN, which are additional to the reductions that are likely to occur in absence of the Project Activity and complies with all applicable UCR rules, including ISO 14064-2 and ISO 14064-3. ☒ The Project Activity is not likely to cause any net-harm to the environment and/or society ☒ The Project Activity complies with all the applicable UCR rules[1] and therefore recommends UCR Program to register the Project activity with above mentioned labels.
Project Verification Report, reference number and date of approval	GHG.23.VAL.017
Name of the authorised personnel of UCR Project Verifier and his/her signature with date	 Mr. Kaushal Goyal Managing Director

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PROJECT VERIFICATION REPORT

Executive summary

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KBS Certification Services Limited has been commissioned by “Delhi Metro Rail Corporation (DMRC)” to perform independent verification of its registered UCR project, “Installation of Low Green House Gases (GHG) emitting rolling stock cars in metro system”, UCR Ref. No: 0370 for the reported GHG emission reductions for the given monitoring period 01/01/2013 – 31/12/2022 (both dates included). The UCR project must undergo independent third-party verification and certification of emission reductions as the basis for issuance of Carbon Offset Units (COUs).

Verification Objectives and Scope:
The objectives of this verification exercise are, by review of objective evidence, to establish that:

- The project activity has been implemented and operated as per the approved PCN and that all physical features (technology, project equipment, and monitoring and equipment) of the project are in place;
- Monitoring report and other supporting documents are complete;
- The actual monitoring systems & procedures and monitoring report conforms with the requirements of the registered monitoring plan and the approved monitoring methodology;
- The data is recorded and stored as per the monitoring methodology and registered monitoring plan.

The scope of the verification is the independent and objective review and ex-post determination of the monitored reductions in GHG emission by the project activity. The verification is based on the review of the monitoring report, supporting information and

a) The latest PCN/01/;
b) Monitoring report for the monitoring period under verification including COU calculations sheets and all supporting documents;
c) The applied monitoring methodology/05/;
d) Relevant decisions, clarifications, and guidance from UCR/04/;
e) All information and references relevant to the project activities resulting in emission reductions

KBS has based on the recommendations in the latest version of UCR Verification Standard// for project activity, employed a rule-based approach in the verification, focusing on the identification of significant reporting risks and the reliability of project monitoring.

Description of the Project:
The project activity operates low GHG emitting rolling stocks having regenerative braking system in Delhi Metro Rail Corporation (DMRC). The project activity replaces the conventional electro-dynamic rheostatic braking technology, with regenerative braking technology fitted rolling stocks. The regenerated electrical energy reduces the consumption of equivalent grid electrical energy required by the powering trains, thereby conserving electrical energy and subsequently leading to GHG emission reduction.

The project was found implemented and operated in line with the information provided in the approved PCN/01/. The project activity is undergoing its verification and the monitoring period of

the registered project activity is from 01/01/2013 – 31/12/2022including both dates). The total emission reductions claimed under the monitoring period as verified are 23,76,993 tCO2e.

Verification process:
The verification comprises a review of the monitoring report for the monitoring period from 01/01/2013 – 31/12/2022 (both days included) including monitoring parameters and monitoring plan, emission reduction calculation spread-sheet, monitoring methodology, and all related evidence provided by the project participant.

Methodology:
KBS follows a rule-based verification approach, wherein, as a first step, the contract review is undertaken as per the latest version of the UCR Standard/04/. A desk review of the project documentation is undertaken, which is followed by a site assessment by the members of the verification team in accordance with the latest version of UCR Verification standard/04/. The verification protocol provides transparent means to record the observations and compliances by the verification team members and the nonconformities, if any. The verification protocol is an internal document and is available on request.

Conclusion:
From the verification assessment, subject to successful closure of findings, KBS confirms that the project activity has been implemented and operated as per the approved PCN/01/ and that all physical features (technology, project equipment, and monitoring and metering equipment) of the project are in place. All the monitoring systems & procedures and monitoring reports confirm the requirements of the approved monitoring plan and the approved monitoring methodology. Based on the information reviewed and evaluated, we confirm that the implementation of the project has resulted in 23,76,993 tCO2e emission reductions during the period from 01/01/2013 – 31/12/2022 (Including both days).

Project Verification team, technical reviewer and approver

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Project Verification team

No.	Role	Last name	First name	Affiliation (e.g. name of central or other office of UCR Project Verifier or outsourced entity)	Involvement in		
					Doc review	On-Site inspection	Interviews
1.	Team Leader	Kandari	Sanjay	Central Office	✓	✓	✓
2.	Technical Expert (TA 7.1)	Sanghal	Atul	External resource	✓		
3.	Trainee	Madan	Rishabh	Central Office	✓	✓	✓

Technical reviewer and approver of the Project Verification report

No.	Role	Type of resource	Last name	First name	Affiliation (e.g. name of central or other office of UCR Project Verifier or outsourced entity)
1.	Technical reviewer	ER	Prabhu	Ravi Kumar	Central office
2.	Expert to Technical reviewer (TA 7.1)	ER	Srivastava	Harshit	Central Office
3.	Manager Technical & Certification	IR	Francis	Margaret	Central Office
4.	Approver	IR	Goyal	Kaushal	Central Office

Means of Project Verification

Desk/document review

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A desk review is undertaken, involving but not limited to,

- A review of the data and information presented to verify their completeness, and to assess the nature, scale and complexity of the verification activity.
- A review of the monitoring methodology, the quality of monitoring equipment used, and the quality assurance and quality control procedures;
- An evaluation of data management and the QA/QC system in the context of their influence on the generation and reporting of emission reductions, to achieve the desired confidence in the project owner's GHG information.
- A complete list of documents evidence reviewed or referred in this report are included.

On-site inspection

Date of on site inspection: 01/12/2023			
No.	**Activity performed On-Site**	**Site location**	**Date**
1.	The project verification team conducted interviews with the project owner to confirm the information and to resolve issues identified in the document review.	New Delhi	01/12/2023
2.	An assessment of the implementation and operation of the project activity as per the PCN and UCR requirements		
3.	To validate that the project design, as documented is sound and reasonable, and meets the identified criteria UCR Standard Requirements and associated guidance		
4.	To assess conformance with the certification criteria as laid out in the UCR Standards;		
5.	To evaluate the conformance with the certification scope, including the GHG project and baseline scenarios; GHG sources, sinks, and reservoirs; and the physical infrastructure, activities, technologies and processes of the GHG project to the requirements of the GCC;		
6.	To evaluate the calculation of GHG emissions, including the correctness and transparency of formulae and factors used; assumptions related to estimating GHG emission reductions; and uncertainties; and		

7.	To determine whether the project could reasonably be expected to achieve the estimated GHG reduction/removals.		
8.	A review of information flows for generating, aggregating and reporting of the ex-ante monitoring parameters.		
9.	Interviews with relevant personnel to confirm that the operational and data collection procedures can be implemented in accordance with the Monitoring Plan		
10.	A cross-check between information provided in the submitted documents and data from other sources		
11.	A review of calculations and assumptions made in determining the GHG data and estimated ERs, and		
12.	An identification of QA/QC procedures in place to prevent, or identify and correct, any errors or omissions in the reported monitoring parameters		

Interviews

No.	Interview			Date	Subject
	Last name	First name	Affiliation		
1.	Soni	Santosh Kr.	Manager – Rolling Stock (DMRC)	01/12/2023	Project Boundary, Emission reduction calculations, Monitoring plan (feasibility of monitoring arrangements described in PCN), QA/QC procedures, responsibility of implementation of monitoring plan, data recording & storage procedures, Implementation plan
2.	Rawat	Gaurav Singh	Assistant Manager – Rolling Stock (DMRC)		
3.	Sethi	Ankit	AM – Environment (DMRC)		
4.	Kalra	Deepak	SE – Rolling Stock (DMRC)		
5.	Juyal	Rishank	SSE – Rolling stock (DMRC)		

Sampling approach

N/A

Clarification request (CLs), corrective action request (CARs) and forward action request (FARs) raised

Areas of Project Verification findings	No. of CL	No. of CAR	No. of FAR
Green House Gas (GHG)			
Identification and Eligibility of project type	-	-	-
General description of project activity	-	-	-
Application and selection of methodologies and standardized baselines	-	-	-
- Application of methodologies and standardized baselines	-	-	-
- Deviation from methodology and/or methodological tool	-	-	-
- Clarification on applicability of methodology, tool and/or standardized baseline	-	-	-
- Project boundary, sources and GHGs	-	-	-
- Baseline scenario	-	-	-
- Estimation of emission reductions or net anthropogenic removals	01	02	-

- Monitoring Report	-	-	-
Start date, crediting period and duration	-	-	-
Environmental impacts	-	-	-
Project Owner- Identification and communication	-	-	-
Others (please specify)	-	-	-
Total	01	02	-

Project Verification findings

Identification and eligibility of project type

Means of Project Verification	The project has been approved for verification under the UCR program with the project reference number 0370 (https://www.ucarbonregistry.io/Registry/Details?id=ameli6mzb5delLmivK0Siw%3D%3D). The project operates low GHG emitting rolling stocks cars having regenerative braking system in Delhi Metro Rail Corporation (DMRC). The project has taken reference with the approved CDM methodology AMS III C version 10.0/05/ and complies with the used methodology. The monitoring report complies with the approved PCN and the UCR Verification standard version 2.0/04/.
Findings	No findings were raised
Conclusion	The verification team confirms that the project is in line with the UCR standard version 6.0, UCR verification standard version 2.0 and UCR program manual.

General description of project activity

Means of Project Verification	The project activity operates low GHG emitting rolling stocks that have regenerative braking system in Delhi Metro Rail Corporation (DMRC). The project replaces the conventional electro-dynamic rheostatic barking technology. The regenerative electrical energy reduces the consumption of equivalent grid electrical energy required by powering trains, leading to GHG emission reduction. The regenerative braking system works on the principle of converting kinetic energy of the rolling stock while decelerating, into electrical energy using 3 phase induction motor and variable voltage variable frequency (VVVF) technology. In the regenerative mode, the traction motors work as generators and the Converter- Inverter (CI) converts the electrical energy regenerated to Direct Current (DC). The DC is subsequently converted to single-phase line frequency AC voltage, which is stepped up by transformer to the level of 25 kV. The single-phase line frequency AC voltage is then fed back to the Over Head Equipment (OHE). The regenerated electrical energy supplied back to the OHE is used by other accelerating Rolling stock in the same service line. The regenerated electrical energy reduces the consumption of equivalent amount of grid electrical energy which would otherwise have been consumed by the accelerating trains, thereby conserving electrical energy and reducing GHG emissions. DMRC has included all its 328 Rolling Stocks (except 70 Rolling Stocks as verification and issuance of CERs of 70 Rolling Stocks under UNFCCC/GS has been already completed – PC 1351 & GS 4597) for the period 01st January, 2013 – 28th December, 2017 and all 328 Rolling Stocks (including 70 Rolling Stocks mentioned above) for the remaining period of the crediting period.

Sr. No	Year wise Details of Trains	Car Configuration			Total No. of Cars	No. of Cars (Cumulative)[2]	Total No. of Trains	No. of Trains (Cumulative)[3]	Cumulative CARs Considered for UCR
		4	6	8					
1.	2013	0	82	70	152	1198	0	208	918[4]
2.	2014	0	32	4	36	1234	0	208	954
3.	2015	0	76	0	76	1310	7	215	1030
4.	2016	20	66	8	94	1404	12	227	1124
5.	2017	0	84	172	256	1660	22	249	1380
6.	2018	0	396	78	474	2134	75	324	2134[5]
7.	2019	0	24	0	24	2158	4	328	2158
8.	2020	0	0	20	20	2178	0	328	2178
9.	2021	0	0	20	20	2198	0	328	2198
10.	2022	0	0	8	8	2206	0	328	2206

During the onsite visit to the DMRC depot, the verification team has

[2] As on 31/12/2012, the total no. of cars is 1,046

[3] As on 31/12/2012, the total no. of trains is 208

[4] The 70 Rolling Stocks having 4 cars each i.e., a total of 280 Cars considered for the CDM/GS Project activity and verified for the period 01/01/2013 to 28/12/2017 are excluded

[5] The 70 Rolling Stocks having 4 cars each i.e., a total of 280 Cars considered for the CDM/GS Project activity and verified for the period 01/01/2013 to 28/12/2017 are included in the project as the remaining lifetime of the rolling stocks is available for the rest of crediting period.

	verified the technology used in the project activity and it complies with the approved PCN/01/.
Findings	No findings were raised.
Conclusion	The verification team confirms that the project description contains all the relevant information required and is in line with the UCR standard version 6.0, UCR verification standard version 2.0 and UCR program manual and approved PCN.

Application and selection of methodologies and standardized baselines

(.a.i) Application of methodology and standardized baselines

<table>
<tr><td>Means of Project Verification</td><td>The project applies CDM methodology AMS III C, version 10.0: ‘Emission reductions by low-greenhouse gas emitting vehicles’ /5 and no standardized baseline is used.

The applicability of the methodology is assessed below:
<table>
<tr><td>Applicability criteria as per methodology</td><td></td></tr>
<tr><td>Comprises low-greenhouse gas emitting vehicles</td><td>The project contains the low-GHG emitting rolling stocks. During the onsite visit and desk review, verification team confirms that the project complies with the applicability.</td></tr>
<tr><td>Measures are limited to those that result in emission reductions of less than or equal to 60 kt CO2 equivalent annually</td><td>The project emission reductions are in total greater than 60kt CO2e annually. However the project falls under energy efficiency and shall be categorized in type II as energy saving in per rolling stock is less than 20 GWh/annum. Therefore overall ERs can breach the threshold. Project owner has confirmed that the UCR has allowed this deviation and the verification team has checked the deviation mail/06/ and confirms that the project complies with the applicability.</td></tr>
</table>
Verification team has checked the approved PCN/01/ and found that the applicability is found in line with the methodology/05/.</td></tr>
<tr><td>Findings</td><td>No findings were raised.</td></tr>
<tr><td>Conclusion</td><td>The verification team confirms that the applicability of the project is in line with the applied methodology and UCR standard version 6.0, UCR verification standard version 2.0 and UCR program manual and approved PCN.</td></tr>
</table>

(.a.ii) Clarification on applicability of methodology, tool and/or standardized baseline

Means of Project Verification	The latest available version of the methodology is version 16, however, the project owner sought a deviation to UCR to apply the version 10 of methodology as some rolling stocks of project were part of CDM and the crediting period has been expired. Verification team has checked the deviation mail/06/ from the project owner to the UCR and hence it is acceptable.
Findings	No findings were raised.
Conclusion	The verification team confirms that the clarification for the applicability is

	according to the UCR requirements.

(.a.iii) Project boundary, sources and GHGs

Means of Project Verification	As per the guidelines mentioned in Type III.C of Appendix-B of the simplified modalities and procedures for small-scale CDM project activities, the project boundary includes low-greenhouse gas emitting vehicles that are a part of the project activity. The rolling stocks in all operational nine lines are taken into consideration of project boundary. The project boundary therefore, consists of all trains running within the operational lines of Delhi Metro. Each of the rolling stock has a unique identification number. The verification team has assessed the project boundary with the approved PCN and found to be in line with the methodology.
Findings	No findings were raised.
Conclusion	The verification team confirms that the project boundary contains all the relevant information required and is in line with the UCR requirements and approved PCN.

(.a.iv) Baseline scenario

Means of Project Verification	The baseline is the use of electro dynamic rheostatic braking system with no electrical energy regeneration in the rolling stock. Thus in the baseline scenario, the total electrical energy consumed by rolling stock is consumed from the grid only. Therefore, the baseline emissions are equal to the total electrical energy which is consumed by rolling stock in all the service lines during the project activity without the regenerative braking. **Step 1: Total Electrical energy consumed by the rolling stocks[6] without regenerative braking:** $$EG_{Wr} = \left[\sum_{i=1}^{N} \left(\frac{EG_{i,Wr}}{S_i} \right) * S_i \right]$$ (for *i* =1to N, *i* is the number of the rolling stock) Where, EG_{Wr} = total electrical energy consumed by rolling stocks without regenerative braking (GWh / year) $EG_{i, Wr}$ = total energy consumed by the rolling stock '*i*' without regenerative braking (GWh / year) S_i = total distance covered by the rolling stock '*i*' (Km /year) N = total number of operational rolling stocks
Findings	No findings were raised.
Conclusion	The verification team confirms that the baseline of the project is in line with the approved methodology, UCR requirements and approved PCN.

(.a.v) Estimation of emission reductions or net anthropogenic removal

Means of Project Verification	In accordance with the applied methodology, the project owner has calculated emission reductions in the following manner: $ER_y = BE_y – PE_y – LE_y$

[6] The Total electrical energy consumed by the rolling stock includes the electrical energy consumed by the rolling stock for motoring and meeting the Auxiliary electricity requirements.

Baseline emission calculation:
The baseline emissions (in tCO_2/ year) from rolling stock cars regenerating electrical energy during a year, is calculated as:

$BE_y = EG_{Wr} * EF_y$

Where,

EF_y = Emission factor of Indian grid

The emission factor of the grid for the ex-post approach is used as the UCR approved grid emission factor as 0.90 tCO2e /MWh as per the communication received during the project's approval from UCR.

For the period 01 Jan 2013 - 31 Dec 2013:

EG_{Wr} = 374,750,526.5 kWh
= 374,750 MWh
EF_y = 0.90 tCO2e/MWh

BE_y = 374,750 * 0.90
= 337,275 tCO2e

The communication mail/07/ has been checked by the verification team and has accepted the emission factor.

Project emissions calculation:
In the project activity, while decelerating, the rolling stocks regenerate electrical energy that is fed to supply line which is consumed by other accelerating rolling stock in the same service line. The equivalent electrical energy regenerated by rolling stock in the project activity would have otherwise been consumed from the grid in the baseline scenario with no regeneration by rolling stock. Therefore, the project emissions are the emissions equivalent to actual energy consumed by rolling stock which is the difference between total electrical energy which is consumed and the electrical energy regenerated by rolling stock in all the service lines.

Total electrical Energy regenerated by rolling stock:

$$PE_y = [\{\sum_{i=1}^{N} \{\left(\frac{EG_{i,Wr}}{S_i}\right) - \left(\frac{EG_{i,R}}{S_i}\right)\} * S_i\}] * EF_y$$

Where,

EF_y = Emission factor of Indian grid

The emission factor of the grid for the ex-post approach is used as the UCR approved grid emission factor as 0.90 tCO2e /MWh as per the communication received during the project's approval from UCR.

For the period 01 Jan 2013 - 31 Dec 2013:

EG_R = 153,240,961.7 kWh
= 153,240 MWh
EG_{Wr} = 374,750,526.5 kWh
= 374,750 MWh
EF_y = 0.90 tCO2e/MWh

PE_y = (374,750 - 153,240) * 0.90

	= 221,510 * 0.90 = 199,359 tCO2e **Leakage:** According to the methodology, the baseline emissions as mentioned in paragraph 7 are, “No leakage calculation is required”.
Findings	CL01, CAR 01 and CAR 02 were raised and closed successfully.
Conclusion	The verification team confirms that the calculations are in line with the methodology and done correctly.

(.a.vi) Monitoring Report

<table>
<tr><td>Means of Project Verification</td><td>The monitoring contains the following parameters as required:

<table>
<tr><th>S. No.</th><th>Parameter</th><th>Description</th></tr>
<tr><td>1.</td><td>N

Total number of operational rolling stocks in all the service lines in each year</td><td>The data is monitored by operation and maintenance department of DMRC.

Values applied: 328

A unique identification number of each rolling stock is identified and verified at the regular monitoring interval.

The verification team has checked the number in the ER sheet that has been cross checked during the onsite visit with the log book data maintained by DMRC.</td></tr>
<tr><td>2.</td><td>$EG_{i, Wr}$

Electrical energy consumed by the operational rolling stock ‘i’</td><td>The data is sourced by Train Integration and Management System (TIMS) which records the electricity consumed by each rolling stock. The TIMS does not requires any calibration as per the manufacturer specifications.

Values applied: 7010.557 GWh/year

The values has been checked by the verification team during the onsite visit and process to collect the data.</td></tr>
<tr><td>3.</td><td>$EG_{i, R}$

Electrical energy regenerated by the operational rolling stock ‘i’</td><td>The data is sourced by Train Integration and Management System (TIMS) which records the electricity regenerated by each rolling stock. The TIMS does not requires any calibration as per the manufacturer specifications.

Values applied: 2641.108 GWh/year

The values has been checked by the verification team during the onsite visit and process to collect the data</td></tr>
<tr><td>4.</td><td>S_i

Total distance covered by the rolling stock ‘i’</td><td>The data is sourced by Train Integration and Management System (TIMS) which records the distance covered by each rolling stock. The TIMS does not requires any calibration as per the manufacturer specifications.

Values applied: 302,322,384.1 Km

The values has been checked by the verification team during the onsite visit and process to collect the data</td></tr>
</table>

The monitoring report and parameters are found to be in line with the approved PCN and methodology applied.</td></tr>
<tr><td>Findings</td><td>No findings were raised.</td></tr>
</table>

Conclusion	The verification team confirms that the monitoring plan and monitoring report has been in line with the methodology and UCR requirements.

Start date, crediting period and duration

Means of Project Verification	The project has a fixed crediting period of 10 years. The start date of the project is 01/01/2013 and end date is 31/12/2022. The project has been previously verified and issuance of CERs has been done under UNFCCC/GS with CDM ref no. 1351/08/ and GS reference no. 4597, 70 rolling stocks has been excluded from the period 01/01/2013 – 28/12/2017. This has been verified by the verification team during the desk review process and during the onsite visit.
Findings	No findings were raised.
Conclusion	The verification team confirms that the project start date is in accordance with UCR requirements and approved PCN.

Positive Environmental impacts

Means of Project Verification	The project has multiple environment benefits as it replaces the partial grid electricity which avoids the equivalent emissions that have been generated. The project contributes to environmental improvement as it reduces the pollution levels in the city by using electricity instead of fossil fuels.
Findings	No findings were raised
Conclusion	The verification team confirms that the project has environmental benefits.

Project Owner- Identification and communication

Means of Project Verification	Delhi Metro Rail Corporation has been identified as the project owner and all the communication with the UCR has been done by DMRC. This is been verified through the mail communication with the UCR.
Findings	No findings were raised.
Conclusion	The verification team confirms that project owner is as per UCR requirements.

Positive Social Impact

Means of Project Verification	The project has multiple social benefits as it is safe and efficient mode of transportation to ensure social wellbeing of the region. Metro reduces the travel time and helps on eliminating traffic congestions. It reduces the exposure of commuters to various gaseous and particulate matter pollutants.
Findings	No findings were raised.
Conclusion	The verification team confirms that the project has social benefits.

Sustainable development aspects (if any)

Means of Project Verification	NA
Findings	NA
Conclusion	NA

Internal quality control

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The draft and final verification report prepared by team leader is reviewed by an independent technical reviewer (having competence of relevant technical area himself/herself or through an independent technical area expert) to confirm the internal procedures established by KBS are duly followed and the verification report/opinion is reached in an objective manner and complies with the applicable UCR requirements.

The independent technical reviewer may approve or reject the draft verification report. The findings may be identified even at this stage, which needs to be satisfactorily resolved, before the request for issuance is submitted to UCR. The final decision is taken by the Manager Technical and Certification. The technical reviewer and Manager (Technical & Certification) can be the same person.

The final decision is authorized by Managing Director, KBS once the report is approved by the Manager (Technical & Certification).

Project Verification opinion

KBS Certification Services Ltd. has been contracted by “Delhi Metro Rail Corporation (DMRC)” to undertake independent verification and certification for the greenhouse gas (GHG) emission reductions reported from the UCR Project activity “Installation of Low Green House Gases (GHG) emitting rolling stock cars in metro system” and UCR Reference Number 0370 for the monitoring period 01/01/2013 – 31/12/2022 (including both days) in the Monitoring Report Version 2.

The verification is based on the approved PCN and the monitoring report for this project. Our verification approach was based on the requirements as defined under the UCR Project Verification Standard.

The management of the DMRC is responsible for the preparation of the GHG emissions data and the reported GHG emissions reductions on the basis set out within the project Final Monitoring Report. The calculation and determination of GHG emission reductions from the project is the responsibility of the management of the DMRC. The development and maintenance of records and reporting procedures are in accordance with the Monitoring Report.

It is our responsibility to express an independent GHG verification opinion on the GHG emissions and on the calculation of GHG emission reductions from the project for the monitoring period 01/01/2013 – 31/12/2022 (including both days) based on the reported emission reductions in the Final Monitoring Report Version 2.

Based on an understanding of the risks associated with reporting GHG emissions data and the controls in place to mitigate these, KBS planned and performed our work to obtain the information and explanations that we considered necessary to provide sufficient evidence for us to give reasonable assurance that this reported amount of GHG emission reductions for the period is fairly stated. KBS confirms the following;

Verified and certified emission reductions reporting period: 01/01/2013 – 31/12/2022 including both days)

	Amount	Unit
Baseline emissions (BEy)	63,09,497	tCO2e
Project emissions (PEy)	39,32,504	tCO2e
Leakage emissions (LEy)	0	tCO2e
Emission reductions (ERs)	**23,76,993**	**tCO2e**

Abbreviations

Abbreviations	Full texts
UCR	Universal Carbon Registry
COUs	Carbon Offset Units
CDM	Clean Development Mechanism
GHG	Green House Gases
PCN	Project Concept Note
UNFCCC	United Nation Framework for Climate Change Convection
CERs	Certified Emission Reductions
GS	Gold Standard
DMRC	Delhi Metro Rail Corporation
tCO2e	Tonnes of Carbon dioxide equivalent
TIMS	Train Integration and Management System

Competence of team members and technical reviewers

>>

Personnel Name	Sanjay Kandari					
Schemes	☒ CDM	☒ GCC	☒ GS	☒ VCS	☒ Other GHG Schemes (UCR)	
Qualified to work as						
Team Leader	☒	Technical Expert	☒			
Validator/Verifier	☒	Financial Expert	☒			
Technical Reviewer	☒	Local Expert	☒			
Area(s) of Technical Expertise						
Sectoral Scope		**Technical Area**				
SS 1: Energy industries (renewable/non-renewable sources)		TA 1.1: Thermal energy generation from fossil fuels and biomass including thermal electricity from solar -				
		TA 1.2: Energy generation from renewable energy sources				
SS 2: Energy distribution		TA 2.1. Energy distribution				
SS 3: Energy demand		TA 3.1. Energy Demand				
SS 13: Waste Handling and Disposal		TA 13.1 Waste Handling and Disposal				
		TA 13.2 Manure				
Approved by (Manager Competence & Training)		Manager C & T				
Approval date		05-12-2020				

Personnel Name	Atul Sanghal					
Schemes	☒ CDM	☒ GCC	☒ GS	☒ VCS	☒Other GHG Schemes (UCR)	
Qualified to work as						
Team Leader	☐	Technical Expert	☒			
Validator/Verifier	☐	Financial Expert	☐			

Technical Reviewer	☐	Local Expert	☐
Area(s) of Technical Expertise			
Sectoral Scope		**Technical Area**	
SS 7: Transport		TA: 7.1: Transport	
Approved by (Manager Competence & Training)		Shikha Sharma	
Approval date		27-10-2022	

Personnel Name:		**Rishabh Madan**	
Qualified to work as:			
Team Leader	☐	Technical Expert	☐
Validator/Verifier (trainee)	☒	Financial Expert	☐
Technical Reviewer	☐	Local Expert	☐
Area(s) of Technical Expertise			
Sectoral Scope		**Technical Area**	
-		-	
Approved by (Manager C & T)		Shikha Sharma	
Approval date:		11/01/2023	

Personnel Name	Ravi Kumar Prabhu				
Schemes	☒ CDM	☒ GCC	☒ GS	☒ VCS	☒Other GHG Schemes (UCR)
Qualified to work as					
Team Leader	☒	Technical Expert	☒		
Validator/Verifier	☐	Financial Expert	☐		
Technical Reviewer	☒	Local Expert (India)	☒		
Area(s) of Technical Expertise					
Sectoral Scope		**Technical Area**			
SS: 01: Energy industries (renewable/non-renewable sources)		TA 1.1: Thermal energy generation from fossil fuels and biomass including thermal electricity from solar			
		TA 1.2: Energy generation from renewable energy sources			
SS 5: Chemical industry		TA 5.1 Chemical industry			
SS 12: Solvents use		TA 12.1 Chemical industry			
SS 13: Waste handling and disposal		TA 13.1. Waste handling and disposal			
Approved by (Manager Competence & Training)		Shikha Sharma			
Approval date		06-08-2022			

Personnel Name	Harshit Srivastava				
Schemes	☒ CDM	☒ GCC	☒ GS	☒ VCS	☒Other GHG Schemes (UCR)
Qualified to work as					
Team Leader	☐	Technical Expert	☒		
Validator/Verifier	☐	Financial Expert	☐		
Technical Reviewer	☐	Local Expert	☐		
Area(s) of Technical Expertise					
Sectoral Scope		**Technical Area**			
SS 7: Transport		TA: 7.1: Transport			
Approved by (Manager Competence & Training)		Shikha Sharma			
Approval date		18-07-2022			

Document reviewed or referenced

No.	Author	Title	References to the document	Provider
1	Project Owner	Final Project Concept Note version 2.0	Final PCN version 2.0 dt. 04/12/2023	PO
2	Project Owner	Monitoring report version 2.0	Final MR version 2.0 dt. 04/12/2023	PO
3	Project Owner	ER spreadsheet	ER sheet	PO
4	UCR	UCR Program Standard Ver 6.0 UCR Verification Standard Ver2.0 UCR Program manual	https://www.ucarbonregistry.io/Document?projectCategoryId=1	UCR
5	UNFCCC	CDM methodology AMS III C. Emission reduction by low greenhouse gas emitting vehicles version 10.0	https://cdm.unfccc.int/methodologies/DB/HLOH5R7J6M96A23TFECTQ1BVIE24CK	UNFCCC
6	PO	Email communication with UCR regarding deviation from CDM Standard	-	PO
7	PO	Email communication with UCR regarding use of emission factor	-	PO
8	UNFCCC	Project reference number 1351: Installation of low GHG emitting rolling stocks	https://cdm.unfccc.int/Projects/DB/RWTUV1190204766.13/view	UNFCCC
9	Gold Standard	Project reference number 4597: Installation of low GHG emitting rolling stocks	https://registry.goldstandard.org/projects/details/820	Gold Standard

Clarification request, corrective action request and forward action request

Table 1. CLs from this Project Verification

CL ID	01	**Section no.**	UCR Communications	**Date:** 02/12/2023
Description of CL				
PP shall provide the updated PCN and corresponding ER spreadsheet after correcting the emission factor as per the communication between PP and UCR registry during the project's approval.				
Project Owner's response				**Date:** 04/12/2023
PCN and ER Spreadsheet updated as per the communication received from UCR.				

Documentation provided by Project Owner	
PCN v2.0 dated 04/12/2023 and Updated ER Spreadsheet.	
UCR Project Verifier assessment	**Date:** 06/12/2023
The verification team has assessed the updated PCN and ER sheet. The emission factor has been updated according to the UCR standard. Hence the CL is closed.	

Table 2. CARs from this Project Verification

CAR ID	01	**Section no.**	C.5	**Date:** 02/12/2023
Description of CAR				
The comparison of actual versus ex-ante COUs shall be part of the monitoring report to ensure that the project is operated as per the planned operation.				
Project Owner's response				**Date:** 04/12/2023
Comparison table of actual versus ex-ante COUs has been mentioned in Section C.5 of the monitoring report.				
Documentation provided by Project Owner				
Monitoring Report v2.0 dated 04/12/2023.				
UCR Project Verifier assessment				**Date:** 06/12/2023
The verification team has assessed the updated Monitoring report. The comparison has been provided by the PO. Hence CAR 01 is closed.				

CAR ID	02	**Section no.**	C.5	**Date:** 02/12/2023
Description of CAR				
The monitoring report shall be filled in accordance with the guideline of filling it, the guideline is not met for the section C.5 of the template. The guideline states: *"Provide sample calculations for all formulae used to calculate baseline GHG emissions or baseline net GHG removals, applying actual values. Attach spreadsheets to the monitoring report to present full calculations for this monitoring period."*				
Project Owner's response				**Date:** 04/12/2023
Sample calculation for baseline and project emissions for the period 01st Jan, 2013 – 31st Dec, 2013 has been mentioned in the Section C.5 of the monitoring report. Also, ER sheet is attached along with the monitoring report mentioning year wise values of baseline emissions, project emissions and emission reductions				
Documentation provided by Project Owner				
Monitoring Report v2.0 dated 04/12/2023 and ER Spreadsheet.				
UCR Project Verifier assessment				**Date:** 06/12/2023
The verification team has assessed the updated Monitoring report and ER sheet. The sample comparison has been provided by PO. Hence CAR 02 is closed.				

~~Table 3. FARs from this Project Verification~~

~~**FAR ID**~~	~~xx~~	~~**Section no.**~~		~~**Date:** DD/MM/YYYY~~
~~**Description of FAR**~~				
~~**Project Owner's response**~~				~~**Date:** DD/MM/YYYY~~
~~**Documentation provided by Project Owner**~~				
~~**UCR Project Verifier assessment**~~				~~**Date:** DD/MM/YYYY~~