8MW Waste Heat Recovery Based Power Project by Sree Rengaraaj Power India Private Limited

Document Prepared By EPIC Sustainability Services Private Limited

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Summary:

EPIC Sustainability Services Private Limited (hereinafter referred to as EPIC) has been contracted by Abi Energy Consultancy Services Private Limited to undertake the second verification of the project activity titled "8MW Waste Heat Recovery Based Power Project by Sree Rengaraaj Power India Private Limited" (VCS project id: 773 (hereinafter referred to as project activity) for the monitoring period 28/12/2009 to 30/11/2015. The verification was based on the monitoring report version 2.2 dated 30/03/2023 and other supporting documents made available to the verification team.

The project achieves GHG emission reductions through waste heat based power generation at Sree Rengaraaj Ispat Industries Private Limited (Formerly Sree Rengaraaj power India Private Limited) which involves utilization of waste heat content of the by-product gases emanating out of the process by installing Waste heat recovery boilers to generate steam and subsequently power. The electricity generated by this project activity is used within the industrial facility for captive usage and the remaining surplus power is wheeled to its sister concern through TANGEDCO which is part of southern regional grid. Thus the project activity will result in reductions of greenhouse gas emissions that are real, measurable and give long-term benefits to the mitigation of climate change. The project is located in Perundurai, Erode District, Tamil Nadu, India. During the monitoring period, the project activity has displaced net electricity of 182,972.689 MWh and thus the total emission reduction comes to 1,56,573 tCO_2e. In the absence of the project, the equivalent amount of electricity would be generated from GHG intensive Southern Grid and in the process, the project avoids 1,56,573 tCO_2e. The project was commissioned on 21/12/2005.

The proposed VCS project activity has applied the baseline and monitoring methodologies (ACM0012 v3.1). In summary, it is the opinion of EPIC that the implemented VCS project activity meets the relevant VCS requirements and the actual GHG reductions from the project are real, monitored, permanent and additional.

The verification team identified, through the verification process, 5 CARs, 1 CL and a FAR. The PP has taken actions and submitted to EPIC the revised monitoring report and supporting evidence. In summary, it is the opinion of EPIC that the proposed VCS project activity has correctly applied the baseline and monitoring methodology (Methodology Applied: ACM0012 v3.1 for the project activity and meets the relevant VCS requirements. The estimated GHG reductions from the project would be real, measurable, permanent and additional. The verification team, through the verification process, confirmed that the emission reductions achieved by the project activity during the monitoring period are correctly calculated in the ER sheet and MR, Version 2.2, dated 30/03/2023 based on the approved monitoring methodology. Therefore, EPIC certifies the emission reductions amounting to 1,56,573 tCO_2e during the current monitoring period

1 INTRODUCTION

1.1 Objective

EPIC Sustainability Services Private Limited (hereinafter referred to as EPIC) has been contracted by Abi Energy Consultancy Services Private Limited to undertake the second verification of the project activity titled “8MW Waste Heat Recovery Based Power Project by Sree Rengaraaj Power India Private Limited” (VCS project id: 773 (hereinafter referred to as project activity) for the monitoring period 28/12/2009 to 30/11/2015.

- The purpose of the verification is to perform an independent, third party assessment of whether the project activity confirms to the qualification criteria set in the VCS standard/1/ v4.3 requirements to attain real, measurable, additional and permanent emission reduction. The verification statement / opinion is a written assurance that the project complies with all the applicable VCS requirements/1/ and has the ability to generate the emission reductions stated over the projects crediting period.

- To verify that the actual monitoring system and procedures are in full compliance with the system and procedures described in the MR/2/ v2.2 dated 30/03/2023 (hereinafter referred to as MR) as well as with the applicable methodology;

- To verify that the data reported were accurate, complete, consistent, transparent and free of material error or omission by checking the monitoring records and the emissions reduction calculation; and
- To verify and certify GHG emission reduction reported for the project for the period from 28/12/2009 to 30/11/2015 (hereinafter referred to as current monitoring period).

1.2 Scope and Criteria

The verification scope includes an independent and objective review of the Monitoring report/2/ (MR), the project’s baseline study, monitoring plan and other relevant documents. Specifically, the objectives of the verification work involve:

- To verify whether the project activity meets the requirements of VCS standard/1/ v4.3 including additionality, proof of title and compliance with local laws.
- To assess whether the baseline and monitoring plan are in conformance with the methodology applied from the VCS approved GHG program.
- To certify that the information presented are complete, consistent, transparent and free of material error.

The Project Description was reviewed against VCS standard[/1/] and the VCS program guidelines[/1/]and the applied CDM methodology[/11/]. EPIC has performed the verification based on a risk based approach focusing mainly on the significant risks to meet the qualification criteria and the ability to generate VCUs. The work carried out by EPIC is free from any conflict of interest.

The scope of the verification was the independent and objective review and ex-post determination of the monitored reductions in GHG emissions from the project activity. The verification of this CDM project was based on the initial MR and supporting documents made available to the verification team. These documents were reviewed against the requirements of the VCS standard[/1/] v4.3, VCS guidelines[/1/], the CDM Modalities and Procedures, related rules and guidance, and the Validation and Verification standard for project activities[/1/] v3.0. The verification is not meant to provide any consulting towards the client. However, stated request for clarifications and/or corrective actions may provide input for improvement of the project design.

1.3 Level of Assurance

In line with VCS requirements and as per ISO 14064-3:2015, a reasonable level of assurance has been followed for the verification of the project. Based on the desired level of accuracy EPIC has established an internal quality control process and assures that the information given in the MR is materially correct and is a fair representation of the of the actual project details, and is prepared in accordance with the VCS requirements[/1/] and the applied CDM methodology[/11/] for information pertaining to GHG quantification, monitoring and reporting. The verification report is carried out as per this requirement and details are presented in the verification statement in section 4 below.

1.4 Summary Description of the Project

The purpose of the VCS project is to achieve GHG emission reductions through waste heat based power generation at Sree Rengaraaj Ispat Industries Private Limited (Formerly Sree Rengaraaj power India Private Limited) which involves utilization of waste heat content of the by-product gasses emanating out of the process by installing Waste heat recovery boilers to generate steam and subsequently power. The electricity generated by this project activity is used within the industrial facility for captive usage and the remaining surplus power is wheeled to its sister concern through southern regional grid. During the monitoring period, the project activity has displaced net electricity of 182,972.689 MWh[/4/] and thus the total emission reduction comes to 1,56,573 tCO_2e[/4/]. In the absence of the project, the equivalent amount of electricity would be generated from GHG intensive Southern Grid and in the process, the project avoids 1,56,573 tCO_2e[/4/]. The project was commissioned on 21/12/2005. As per the VCS 2007.1, the crediting should start after 28/03/2006. Thus the crediting period start date for the project activity is from 28/03/2006 to 27/03/2016 (both days included) as described in the monitoring report[/2/] and in the registered VCS PD[/15/]. The verification team has reviewed the wheeling agreement[/3/], electricity generation records[/8/], and commissioning certificates[/7/] and confirmed the same.

2 VERIFICATION PROCESS

2.1 Method and Criteria

The EPIC verification process consists of the following phases:

- a document review of the project description and preparation of verification protocol;
- on-site visit to the project activity and interviews with project developer, project consultant; and relevant stakeholders
- resolution of outstanding issues and the issuance of final verification report and opinion

In order to ensure transparency, a verification protocol was customised for the project according to the VCS guidelines/1/. The protocol describes the findings, criteria (requirements), means of verification, results from the validating and how the identified criteria, have been met in a transparent manner. The verification protocol serves the following purposes:

- it organizes, details and clarifies the requirements of a VCS project is expected to meet;
- it ensures a transparent verification process where the verifier will document how a particular requirement has been verified and the result of the verification.

The protocol consists of Appendix, where findings established during the verification were classified as non-fulfilment of verification protocol criteria or where risks to the fulfilment of project objectives were identified. Corrective Action Request (CAR) was issued, where:

- mistakes have been made that directly impact on the project results; or
- verification protocol requirements have not been met; or
- there was a risk that the project would not be accepted as a VCS project or that emission reductions will not be certified.

The verification team has also raised “Clarification” (CL), where additional information is needed to fully clarify an issue.

Resolution of Corrective Action and Clarification Requests			
Draft report clarifications and corrective action requests by verification team	Ref. to Section of the PD	Summary of project owner response	Verification team conclusion
If the conclusions from the draft Validation are either a CAR or CL, these should be listed in this section.	Reference to the Section of the PD where the relevant CAR or CL is raised.	The responses given by the project participants during the communications with the verification team should be summarized in this section.	This section should summarise the verification team’s responses and final conclusions.

The following team members from EPIC are involved in identifying the following:

Name	**Role**	**Components reviewed**
Mr. A Prabu Das	Lead Auditor	Completeness check, desk review, On-site audit, Interview with project representatives, issuance of

		findings, report preparation
Mr. Seshan Ranganathan	Technical expert	Technical inputs to the verification team
Mr R Vijayaraghavan and Mr Ravi Kumar Prabhu	Technical Reviewer Team	Technical Issues related to project

2.2 Document Review

The initial MR[/2/] version 1.0 submitted by the client and additional backgrounds documents related to the project design and baseline were reviewed as an initial step of the verification process. As a result of review and findings, PP had submitted the revised MR 02.2[/2/] dated 30/03/2023 (referred to as final MR).

A desk review was further done to assess the following parameters:

1. Project details as per VCS MR template
2. Compliance with relevance laws and regulation, operating licences
3. Management system
4. Monitoring procedure
5. Calibration procedure
6. Proof of title
7. Supporting documents mentioned in the PD or monitoring report
8. Local stakeholder consultation reports
9. EIA approval certificate
10. Wheeling agreement
11. Commissioning certificates
12. Declaration on 'no double counting' and 'no ODA'
13. Electricity generation data and monthly invoices
14. Calibration certificates
15. Production records-sponge iron
16. Monthly reports for Gross electricity generation
17. Monthly reports for auxiliary electricity consumption from CPP
18. Monthly reports for auxiliary electricity consumption from Southern Grid (TNEB).

2.3 Interviews

After the review of the Project description and documents, on-site audit was carried out on 07/04/2022 to verify the project implementation followed by interviews with the following personnel. A follow-up meeting was also conducted with the project representatives. The following persons were interviewed.

Name & Designation	Company	Details of Interview
S Shyam sundar	Sree Rengaraaj Ispat Industries Private Limited	Completeness check, desk review, Interview with project representatives & stakeholders, issuance of findings, report preparation. Baseline, monitoring plan, Proof of title, Technical Details, electricity generation,
K Vijayarajan	Abi Energy	

	Consultancy Services Pvt Ltd	Monitoring system, calibration frequency, Infrastructure, Wheeling Agreement, Overall Project management.
K Prabakaran	Abi Energy Consultancy Services Pvt Ltd	
T Balamurugan	Operations team, Sree Rengaraaj Ispat Industries Private Limited	Technical Details, Monitoring system, calibration frequency, Power Purchase Agreement, Land Ownership details, Overall Project management.
T Rajaganapathi	Maintenance team, Sree Rengaraaj Ispat Industries Private Limited	Technical Details, Monitoring system
R Dhanasekaran	Local stakeholder	On-going communication as part of local stakeholder engagement
P Sathyamoorthy	Local stakeholder	
A Palanivel	Local stakeholder	

2.4 Site Inspections

During the On-site visit, the actual on-site practices adopted and followed for the operation of the project were compared with the description given in the monitoring report[/2/] and the PD[/15/]. The technical details, sponge iron manufacturing process, electricity generation, calibration and level of accuracy were examined. The archived data of the energy generated was also reviewed.

A remote assessment was conducted as a part of verification activity and involved:

1) an assessment of the implementation and operation of the project activity as per the MR

2) a review of information flows for generating, aggregating and reporting of the monitoring parameters

3) interviews with relevant personnel to confirm that the operational and data collection procedures are implemented in accordance with the MR

4) a cross-check between information provided in the MR and data from other sources

5) a review of baseline and additionality of the project

6) a check of the monitoring equipment including calibration performance, and observations of monitoring practices against the requirements of the MR and the applied methodology

7) a review of calculations and assumptions made in determining the GHG data and ERs, and

8) an identification of QA/QC procedures in place to prevent, or identify and correct, any errors or omissions in the reported monitoring parameters.

2.5 Resolution of Findings

The objective of this phase of the verification was to resolve the corrective action requests and clarifications and any other outstanding issues which needed to be clarified prior to EPIC positive conclusion on the monitoring report and the project design. During the verification process 1 CL and 5 CARs were raised. One FAR from Validation applicable for this monitoring period was raised in this verification.

Clarification requests (CL) is raised if the project reporting lacks transparency and further information is needed to determine if a material discrepancy is present. Corrective action requests (CAR) is raised if the verification has identified a material discrepancy or non- conformance that the project proponent must address. All the CARs and CRs were resolved during this phase. In order to ensure the transparency of the verification process, the concerns raised and responses that were given are summarized in Appendix 1 of this report. All the corrective actions have been incorporated into the monitoring report.

2.5.1 Forward Action Requests

One FAR is raised in this verification.

2.6 Eligibility for Validation Activities

The scope of work includes verification only. EPIC is accredited for all the VCS sectors for validation as well as verification. There is no gap validation or validation of methodology deviations and project description deviations involved under the scope of EPIC work.

3 VALIDATION FINDINGS

3.1 Participation under Other GHG Programs

The verification team has confirmed that the project has not participated or been rejected under any other GHG programs since validation or previous verification. The project has not received or sought any other form of environmental credit, or has become eligible to do so since validation or previous verification. The GHG emission reductions generated by the project were not included in an 'emissions trading program' or any other mechanism that includes GHG allowance trading. The project has applied only under VCS for registration, and the same has been cross verified by the verification team by reviewing other GHG programs like GS, CDM, GCC etc. The PP has submitted declaration[16] to confirm that the project will not be counted towards any obligation established by state or local mandates and other national or international level GHG emission trading schemes.

3.2 Methodology Deviations

There is no methodology deviation involved during the monitoring period.

3.3 Project Description Deviations

Following deviations which are classified as project description deviation that occurred during the current Monitoring period are discussed as below:-

Deviation no: 01

As per the registered PD, Sree Rengaraaj Power India Private Limited is one of the PP, later the management of Sree Rengaraaj Power India Private limited decided to merge with its sister concern (Sree Rengaraaj Ispat Industries Private Limited (SRIIPL) in April 2011) and this change was effected in April 2011. The PP has submitted the Honourable High Court of Madras, merger order dated 28/04/2011 which confirmed the merger of “Sree Rengaraaj Power India Pvt Ltd.” with “Sree Rengaraj Ispat Industries Pvt Ltd.”, and consequently the company is now known as “Sree Rengaraj Ispat Industries Pvt Ltd”, for all commercial purposes as per companies Act. The merger order dated 28/04/2011 from Honourable High Court of Madras and Memorandum of Association of "Sree Rengaraj Ispat Industries Pvt Ltd", from registrar of companies were reviewed for the conformance.

Deviation no: 02

The calibration of all the energy meters were delayed during the current MR period, and this is reported as deviation. The delayed calibration reports/5/ of the gross energy meter(EGgross) and auxiliary energy(EGAux-fromCPP) meter indicate that the meters were functioning within the permissible limits, so the PP applied the maximum permissible error for the entire month for which the delay period falls. The accuracy class of the EGgross and EGAux-fromCPP meters are 1.0 and 0.5 respectively. Since the parameter EGgross refers to electricity export the error applied is (1-(1/100)) and for the parameter EGAux-fromCPP refers to electricity import so the error applied is (1+(0.5/100)). For the delayed calibration the export/import power has been corrected based on the guidance provided in VVS-PA, ver 3.0/1/. See sec 4.5 of this report for full resolution of this issue.

3.4 Grouped Project

This is not a grouped project.

4 VERIFICATION FINDINGS

4.1 Project Implementation Status

The project activity involves generation of electricity from waste heat produced during sponge iron conversion process which would have otherwise been imported from southern regional grid. The project

activity involves supply, erection, commissioning and operation of 8 MW waste heat recovery boiler and turbines. Sree Rengaraj Ispat Industries Pvt Ltd (SRIIPL)[1] is operating a Sponge Iron Plant at SIPCOT Industrial growth centre, Perundurai Taluka, Erode district, Tamil Nadu. The sponge iron is produced by the conversion of sponge iron ore in the rotary kiln which is operated at a very high temperature. The flue gas generated due to the conversion process which has high heat content is recovered in waste heat recovery boiler of capacity 36 TPH operating at 64 kg/cm2 and 485 deg C and is used for producing electricity in a 8MW turbine. The generated electricity is used for the sponge iron industrial process in the SRIIPL and also wheeled through southern grid for its sister concerns.

Technical Specifications of the Main equipments in this project activity

Waste Heat Recovery Boiler:	
Type	Natural Circulation, Water Tube Boiler
Steam Output	36 Tonnes per Hour
Steam Pressure (abs)	64 Kg/ cm^2
Steam Temperature	485^{o}c
Make	Cethar Vessels Limited

Turbine:	
Capacity	8 MW
Inlet Steam Pressure (abs)	64 Kg/ cm^2
Inlet Steam flow	33.90 Tonnes per Hour
Inlet Steam Temperature	480^{o}c
RPM	7555
Make	ABB Limited

Alternator:	

[1] Sree Rengaraaj Power India Private Limited (SRPIL) got merged with Sree Rengaraj Ispat Industries Pvt Ltd (SRIIPL) on April 2011, the verification team has reviewed Memorandum of Association (MoA) /10/ and Madra High court order/10/ for the confirmance.

Make	BHEL
Capacity	8 MW
Generator Voltage	11KV
Frequency	50 Hz
Full Load Current	525 Amps
Phase	3
RPM	1500
Connection	Star

All the physical components and project boundary are in conformity with the description in registered VCS PD and validation report. The capacity of project equipment's has been confirmed through the technical specifications/6/, commissioning certificate/7/. The verification team has reviewed the technical specifications/6/, Single line diagram/6/, Electricity Generation reports, auxiliary consumption and electricity import reports/8/ from grid/10/, calibration certificates/5/ for meters and confirmed that the project is implemented and operated as described in the registered VCS PD/15/.

The crediting period start date for the project activity is from 28/03/2006 to 27/03/2016 (both days included) is as per the registered PD/15/. The verification team has reviewed the wheeling agreement/3/, electricity generation records/6/, and commissioning certificates/7/ and confirmed the same.

For the current monitoring period, the project activity was implemented and operated as per the registered PD and the validation report. The verification team confirms that there is no change from the registered VCS PD of the physical features of the project (including project equipment and its operation) which may impact the emission reductions of the project activity. The verification team through the review of commissioning certificates, plant operational records such as log books, electricity generation – export/import records, calibration records etc confirms that during the current MR period, the plant was implemented and operational as per the registered PD and the monitoring was as per the monitoring plan except for the instances where calibration delay was observed which is assessed and reported as deviation no: 02 (refer sections 3.3 and 4.5 of this report). Other than this, there were no such events that had any impact on the GHG ER calculations. This is the second monitoring period, and the emission reductions achieved through the avoidance of release of CO2 to the atmosphere commenced prior to this verification[2].

The detailed monitoring plan of the project is detailed in section 4.4 of the report.

[2] The GHG emission reduction achieved during the first monitoring period is reported as 104,586 tCO2

During the on-site inspection and through interviews of the plant personnel, monitoring procedures of all the parameters were identified which demonstrate that: operational and management system of the project is in place; monitoring, data collection and its archiving mechanism; monitoring data crosscheck including QA/QC procedures and confirmation that all operational staff were trained before taking up positions were reviewed. The verification team thus confirmed that the monitoring of the project activity has been implemented in accordance with the monitoring plan in the registered VCS PD, and the monitoring plan enables data monitoring and calculation of emission reductions.

The registered VCS PD clearly describes the monitoring and responsibility of monitoring. During the onsite interviews, monitoring, data collection and reporting procedures were confirmed with the relevant staff and through document review of relevant records.

The verification team confirms that the monitoring plan is in accordance with approved methodology ACM0012, version 3.1. There is no deviation from methodology for the current MR period. All data are collected and archived in accordance with the applied methodology and included in the monitoring plan.

The verification team confirms that there were no material discrepancies observed between the the actual monitoring system, and the monitoring plan set out in the project description and the applied methodology.

All the ex-ante parameters which are used in the calculation of emission reductions are consistent with the registered VCS PD. It is confirmed that ex-ante parameters mentioned in section 4.1 of the MR are in line with the parameters mentioned in section 5.1 of the registered VCS PD. All the ex-post parameters have been monitored as per the monitoring plan and presented in section 4.2 of the MR.

In conclusion, all the implementation of the project including the monitoring plan are in line with the project description in registered VCS PD (except for the calibration delay which is assessed as deviation (refer sections 3.3 and 4.5 of this report)).

As per Sec 1.11 of the MR, the project identified SDG 13 "*Tonnes of greenhouse gas emissions avoided or removed*", for the current MR period the Project has prevented the release of 1,56,573 tonnes of carbon into the atmosphere during the monitoring period, which is also assessed in Sec 4.4 and 4.5 of this report.

4.2 Safeguards

4.2.1 No Net Harm

The project activity is the generation of electricity from heat energy contained in the waste gas which otherwise would have been released to the atmosphere. The project does not involve any negative environmental and socio-economic impact. The project is located in the Government approved SIPCOT Industrial Growth centre, a dedicated location for industrial activity wherein other manufacturing industries

also operate. The project has received EIA approval[7] and project is found to be in compliance with the laws and regulations of host country.

PP confirmed that no such events had occurred during the current monitoring period, which could be responsible for negative environmental and socio- economic impact. The verification team has reviewed the pollution control board certificate applicable for the monitoring period. Therefore, there is no net harm due to the project activity.

4.2.2 Local Stakeholder Consultation

The project activity generates power by utilising heat energy of waste gas and thereby resulting in zero GHG emission. Hence, the project activity has no negative impact on the environment. Further, as explained in the section 4.2.1 above, the project is operating in an industrial estate dedicated for industrial activity adhering to the Government regulations. The PP has established ongoing communication channels with the local stakeholders. During site visit, the verification team has reviewed the pollution and environmental related approvals and interacted with the nearby industries and the local stakeholders for any negative feedback and conclude that no such instance apply to the project for this monitoring period.

4.3 AFOLU-Specific Safeguards

Not applicable.

4.4 Accuracy of GHG Emission Reduction and Removal Calculations

The value of the emission reductions depends on the net electricity generated by the project activity. The baseline emissions are based on the net electricity supplied by the project. The project emissions are zero as there is no use of any fossil fuel. Leakage is considered as zero as per the methodology. Therefore the baseline emission equals the emission reductions.

Ex-ante parameters:

The following data and parameters fixed ex ante and usage of the values for the current MR period were checked by the verification team to be in line with registered VCS-PD[15].

- EF_{OM}
- EF_{BM}
- EF_{y}

Ex-Post parameters:

As per registered VCS-PD, the following data and parameters are to be monitored.

- EG_{Gross} (Total quantity of electricity generated by the project activity)
- $EG_{Aux\text{-}fromCPP}$ (Auxiliary consumption of electricity by the project activity from its own generation)
- $EG_{Aux\text{-}fromGrid}$ (Import of power from TNEB grid)
- EG_{Aux} (Auxiliary consumption of electricity from the Project activity and the Grid. Calculated from $EG_{Aux - from\ CPP}$ **and** $EG_{Aux - from\ Grid.}$)
- EG_{y} (Net quantity of electricity generated by the project activity. Calculated from EG_{gross} and EG_{Aux})

- D (No of operating days per year)
- $Q_{BL,Product}$ (Production associated with the relevant waste energy generation)
- $q_{wcm,Product}$ (Specific waste energy production per unit of product)

The verification team confirms that, the data monitoring, QA/QC procedures followed for the monitoring period is appropriate inline with the VCS-PD/15/ and the applied methodology/11/.

Emission reduction by this project is

$ER_Y = BE_Y - PE_Y$

PE_Y = Emissions from the project activity during the year *y* in tons of tCO_2e

The project activity did not involve usage of any fossil fuels to supplement waste heat, this was verified with plant records and interaction with plant personnel involved in operation of the plant.

Emission reduction

$ER_Y = BE_Y$

The baseline emissions for the year *y is* be determined as follows:

$BE_y = BE_{En\,y} + BE_{flst\,y}$

BEy = The total baseline emissions during the year *y* in tons of tCO_2e

$BE_{En,y}$ = The baseline emissions from energy generated by project activity during the year *y* in tons of tCO_2e

$BE_{flst,y}$ = Baseline emissions from steam generation, if any, using fossil fuel that would have been used for flaring the waste gas in absence of the project activity (tCO_2e per year), calculated as per equation 1c of the applied methodology.

This is relevant for those project activities where in the baseline steam is used to flare the waste gas, for this project activity $BE_{flst,y} = 0$, as per registered PD/15/ and this is appropriate for the project activity.

Therefore, $BE_y = BE_{En\,y}$

As per the applied methodology,

$BE_{Eny} = BE_{Elec\,y} + BE_{Ther\,y}$

$BE_{Elec,y}$ = Baseline emissions from electricity during the year *y* in tons of tCO_2e

$BE_{Ther,y}$ = Baseline emissions from thermal energy (due to heat generation by element process) during the year *y* in tons of tCO_2e

Since the project does not involve thermal energy generation and involve only electricity generation

BE_{Eny} = $BE_{Elec\ y}$

Baseline emissions from electricity ($BE_{electricity,y}$) Type-1 activities:

Case 1: Waste energy is used to generate electricity

$BE_{Elec\ y}$ = $f\ cap * f\ wcm * \sum_j \sum_i (EG_{i,j,y} * EF_{i,j,y})$

$BE_{elec,y}$ = Baseline emissions due to displacement of electricity during the year *y* in tons of CO_2e

$EG_{i,j,y}$ = The quantity of electricity supplied to the recipient *j* by generator, that in absence of the project activity would have been sourced from i th source (i can be either grid or identified source) during the year *y* in MWh,

f_{wcm} = Fraction of total electricity generated by the project activity using waste energy.

(This fraction is 1 as the electricity generation is purely from use of waste energy)

f_{cap} = Energy that would have been produced in project year *y* using waste energy

generated in base year expressed as a fraction of total energy produced using waste source in year *y*. The ratio is 1 if the waste energy generated in project year *y* is same or less than that generated in base year.

for the MR period, as per the Technical assessment on capping of baseline emissions prepared by third party entity ARK Engineering and Power Consultants Pvt Ltd/14/, the fcap is determined as 1.

$BE_{Elec\ y}$ = $EG_{i,j,y} * EF_{i,j,y}$

= 182972.689* 0.85573754

= 156,573 ton of CO_2e (Rounded Down Value)

As per the registered monitoring plan and the applied methodology, Project Emission and Leakage Emission is 'Zero'.

Emission Reduction due to the project activity = **156,573 ton of CO_2e**/4/

The total net electricity generated by the project activity during the monitoring period is 182,972.689 MWh/4/. The emission reductions were calculated correctly on the basis of the approved CDM baseline and monitoring methodology ACM0012 Version 3.1/11/, formulae given in the monitoring report/4/ and validated PD/15/. Project proponent provided the spreadsheets used for calculating the emission reductions including the algorithms used in the calculations. The calculations of above parameters were checked in the spreadsheets/4/ and found to be correct. This information is taken from statements/8/ issued by state electricity board and log sheets maintained by the monitoring personnel. The verification team crosschecked the emission reduction calculations/4/ by review of state electricity

board statements/8/ and daily/monthly log sheets/8/ which were found to be correct and accurate. There are no possible transpositions errors between data sets since the monitoring of all the parameters required for calculation of net electricity generated are through calibrated electronic meters with high accuracy. Also all the recorded data are verified by the team of project proponent as described monitoring plan of validated PD/15/. The default data used in the monitoring calculations is the combined margin grid emission factor. The values of the grid emission factor 0.85573754 CO_2e/MWh is calculated based on the data from the publicly available database of the Central Electricity Authority (CEA) in line with the tool provided in the methodology and the same is considered to be appropriate by the verification team. It is concluded by the verification team that, the project activity is in compliance with the applied monitoring methodology ACM0012.

4.5 Quality of Evidence to Determine GHG Emission Reductions and Removals

Calibration procedures and test reports/5/ of the all online energy meters covering the reported monitoring period were verified for their frequency and traceability to industry standards. Calibration of gross energy meter and auxiliary energy meter are carried out by Tespro Systems/5/ and calibration of import Meter is carried by state electricity board officials. The energy meters have been calibrated once in a year which is in line with the registered PD/15/. The calibration certificates/5/ for entire vintage were verified by the verification team. However, the verification team found that calibration has been delayed for all the energy meters. For the delayed calibration the export/import power has been corrected based on the guidance provided in VVS-PA, ver 3.0/1/. The delayed calibration reports/5/ of the gross energy meter(EGgross) and auxiliary energy(EGAux-fromCPP) meter indicate that the meters were functioning within the permissible limits, so the PP applied the maximum permissible error for the entire month for which the delay period falls for eg delay is observed for the following periods April 2012, April 2013 and April 2015. Since the parameter EGgross refers to electricity export the error applied is (1-(1/100)) and for the parameter EGAux-fromCPP refers to electricity import so the error applied is (1+(0.5/100)). The calibration of import meter (EGAux-fromCPP) is under the scope of state electricity board which was calibrated only in 2009, 2011 and 2014. Since the delayed calibration reports/5/ of import meter (EGAux-fromCPP) indicate that the meters were functioning within the permissible limits, so the PP applied the max permissible error (1+(0.5/100) for the entire delay period i.e April 2010 to Aug 2011, August 2012 to Dec 2014. The application of error is inline with Appendix. Calibration of VVS-PA, ver 3.0/1/.

Meters	Gross energy meter (EGgross)	Auxiliary energy (EGAux-fromCPP) meter	EGAux-fromCPP meter
Serial No:	050332069	63174/134-5104	03122801
Accuracy class	1.0	0.5	0.5
Calibration frequency as per	Annual	Annual	Annual

VCS-PD			
Calibration followed for this MR period	22/11/2009	22/11/2009	20/04/2009
	02/04/2010	02/04/2010	Not done
	01/04/2011	01/04/2011	12/08/2011
	03/04/2012	03/04/2012	Not done
	03/04/2013	03/04/2013	Not done
	02/04/2014	02/04/2014	05/12/2014*
	02/04/2015*	02/04/2015*	
	*Calibration valid upto MR end period of 30/11/2015		

4.6 Non-Permanence Risk Analysis

Not applicable for non AFOLU project.

5 VERIFICATION CONCLUSION

EPIC performed verification of the VCS project "8MW Waste Heat Recovery Based Power Project by Sree Rengaraaj Power India Private Limited". The verification was carried out to independently assess whether the project confirms to the qualification criteria and requirements of the Voluntary Carbon Standard (VCS)/1/, including the baseline and monitoring methodology applied. The VCS program provides the standard and framework for independent verification based on ISO 14064-2:2015 and ISO14064-3:2015 standards.

The verification was performed using a risk based approach, the review of the project description and the subsequent follow-up interviews provided EPIC with sufficient evidence to determine the fulfilment of the stated criteria.

The GHG emission calculations are documented in a complete and transparent manner. The formulae and methodologies for accounting GHG emissions are appropriate and emission factors are deemed to be of sufficient accuracy. The emission reductions forecast has been checked and it is deemed likely that the stated amount is achievable on the basis that the underlying assumptions do not change.

The monitoring plan is in line with the approved monitoring methodologies of ACM0012 v 3.1/11/. The plan adequately addresses all necessary information for monitoring and reporting of emissions reductions due to the project activity. Responsibilities and authorities for project management, monitoring and reporting, and the data quality control and quality assurance procedures have been described in the final MR.

The verification was carried out in accordance with the requirements of the Validation and Verification standard for project activities version 3.0/1/ and VCS Standard 4.3/1/. As a result of the verification, the verification team confirms that for the reporting period:

- all operations of the project were implemented as described in the registered PD/15/, (project ID 773) ,
- the monitoring plan is in accordance with the approved monitoring methodology applied by the project activity.
- the monitoring has been carried out in accordance with the MR version 2.2 dated 30/03/2023/2/.
- the monitoring aspects (i.e. additional monitoring parameters, monitoring frequency and calibration frequency) were in place and functional, with the installed equipment essential for generating emission reduction operating appropriately and the calibration of all the equipment had been carried out accordingly and appropriate adjustments had been made when there were delays in the calibration, and
- the GHG emission reductions achieved were calculated correctly on the basis of approved monitoring methodology.

We have verified that the information included in the final MR/2/ was correct and that the emission reductions achieved had been determined correctly. In our opinion, the GHG emission reductions for the monitoring period stated in the latest revised monitoring report for the project are fairly stated.

The verifier confirms that the GHG emission reductions were calculated without material misstatements for the whole monitoring period. Our opinion is based on the project's GHG emissions and resulting GHG emission reductions reported, and, to the valid and registered project baseline and monitoring documents. We confirm that verified GHG emission reductions and removals for the period from 28/12/2009 to 30/11/2015 is 1,56,573 tCO_2e

Verification period: From [28/12/2009] to [30/11/2015]

Verified GHG emission reductions and removals in the above verification period:

For non-AFOLU projects:

Year	Baseline emissions or removals (tCO_2e)	Project emissions or removals (tCO_2e)	Leakage emissions (tCO_2e)	Net GHG emission reductions or removals (tCO_2e)
Year 2009 (28th Dec to 31st Dec)	573	0	0	573
2010	25476	0	0	25476
2011	26856	0	0	26856
2012	30745	0	0	30745
2013	28570	0	0	28570
2014	23476	0	0	23476
Year 2015 (upto 30th	20877	0	0	20877

Nov)				
Total	156,573	0	0	156,573

The actual achieved emission reductions for the current monitoring period is156,573 tCO_2 against the ex-ante estimate of 260,513 tCO_2 which is lower by 39.89%. Since the project activity involves electricity generation from the heat recovery of the flue gases that is emanating from the sponge iron kiln, the quantum of electricity is directly dependent on the operation of the sponge iron kiln. The operation of sponge iron kiln is not stable and the load varies hence the quantity and quality of steam produced by the waste heat recovery boiler (WHRB) also varies impacting the power generation potential. The power generation is dependent on parameters such as temperature and volume of flue gases. For the current MR period, low emissions reductions are achieved due to fluctuations in steam generation in WHRB. The verification team reviewed the sponge iron plant records and that of WHRB records containing the flue gas and steam parameters, and considers this as reasonable and is found acceptable to the verification team.

APPENDIX 1: < RESOLUTION OF CARS AND CL'S >

Correction Action Request (CAR) or Clarification Request (CR) or Forward Action Request (FAR)	Response from project participant	Verification team conclusion
CL 01 It is stated that the PP Sree Rengaraaj Power India Pvt Ltd got merged with Sree Rengaraj Ispat Industries Pvt Ltd on 20/11/2011, but the wheeling agreement dated 29/10/2011 is signed by Sree Rengaraj Ispat Industries Pvt Ltd which is before the merger, PP to clarify the exact date of merger with evidence and accordingly update sec 1.3 of the MR.	The Honourable High Court of Madras issued the Merger Order on 28/04/2011. After the Merger Order the PP informed to all the Government Department for name change.	The PP has submitted the Honourable High Court of Madras, merger order dated 28/04/2011 which confirmed the merger of "Sree Rengaraaj Power India Pvt Ltd." with "Sree Rengaraj Ispat Industries Pvt Ltd.", and consequently the company is now known as "Sree Rengaraj Ispat Industries Pvt Ltd" for all commercial purposes as per companies Act. **CL 01 Closed**
CAR 01 The signed wheeling agreement dated 29/10/2011 between Sree Rengaraj Ispat Industries Pvt Ltd and TNEB indicate that the agreement is valid for one year and is extendable based on mutual agreement. In this regard, PP to explain the validity of the agreement applicable for the monitoring period.	The addendum Energy Wheeling Agreement dated 20/10/2012 and all the wheeling agreements for the entire MR period are submitted.	The energy wheeling agreement dt 20/10/2012 confirms that the validity of the agreement is renewed and is valid for one year. Every year, the signed agreement is renewed with a validity period of 1 year, the verification team has reviewed all the wheeling agreements applicable for the entire MR period, for confirmation. **CAR 01 closed**
CAR 02 The information indicated in Sec 1.2 of the MR with respect to sectoral scope and project category is wrong.	Sectoral scope and Project Category are corrected in the revised MR.	Revised MR correctly indicates the sectoral scope and project category.

Correction Action Request (CAR) or Clarification Request (CR) or Forward Action Request (FAR)	Response from project participant	Verification team conclusion
		CAR 02 closed
CAR 03 The parameters $EG_{Gross,}$ $\mathbf{EG_{Aux\text{-}fromCPP}}$ etc is not adjusted for calibration delay and also the calibration details applicable for the entire duration of the MR period is not indicated in the MR. PP to submit the calibration certificates for all the meters for the MR period.	The energy meters are not calibrated as per the frequency mentioned in the monitoring plan for this monitoring period. The maximum permissible error for the EG_{Gross} monitoring meter is 1%, and for $\mathbf{EG_{Aux\text{-}fromCPP}}$ meter is 0.5%. Hence monitored values are multiplied by (1-(1/100)) for EG_{Gross} meter, as it is export meter and for $\mathbf{EG_{Aux\text{-}fromCPP}}$ meter it is multiplied by (1+(0.5/100)) as it is import meter.	PP applied the maximum permissible error for the entire month for which the delay period falls for eg delay is observed for the following period April 2012, April 2013 and April 2015. Since the parameter EGgross refers to electricity export the error applied is (1-(1/100)) and for the parameter $EG_{Aux\text{-}fromCPP}$ refers to electricity import so the error applied is (1+(0.5/100)). The delayed calibration reports indicate that the meters were functioning within the permissible limits, so the application of max permissible as per the accuracy class is correct as per guidance in VVS-PA, ver 3.0 and accepted by the verification team. **CAR 03 Closed**
CAR 4 Following parameters D (No of operating days per year), QBL,Product, qwcm,product are not indicated as monitored parameters as per Validated PD	Parameters D (No of operating days per year), QBL,Product, qwcm,product are included in the revised MR.	The missing parameters are verified to be included in the revised MR. **CAR 04 Closed**
CAR 5 The name of the entity responsible for Technical assessment on capping of baseline emission indicated in section 5.1 of the MR is wrong	The name of the entity responsible for Technical assessment on capping of baseline emission indicated in section 5.1 of the MR is corrected in the revised MR	The name of the entity is corrected to ARK Engineering and Power Consultants Pvt Ltd which is as per the evidence submitted and thus accepted by the verification team. **CAR 05 Closed**
FAR 01 (from validation) The Methodology is requiring fcap in	The f_{cap} calculation has	The third party technical assessment study submitted

Correction Action Request (CAR) or Clarification Request (CR) or Forward Action Request (FAR)	Response from project participant	Verification team conclusion
order to cap the baseline emissions to an extent which has happened in the base year. Since the way of monitoring QWCM,y is not clear, and assuming that the plant will be operating without any change in load, so QWCM,y can be calculated in the same fashion like QWCM,BL. QWCM,y is mainly dependent on the operation hours/days the plant operates in year y hence the waste gas quantity and the operating days has to be demonstrated during the verification. PP to address the FAR for this verification.	been substantiated with third party Technical Assessment study report and same was submitted to the Verifier.	was verified and found that the f_{cap} is determined as 1 which is inline the validated PD. The FAR is thus closed for the current periodic verification and needs to be assessed during subsequent periodic verifications.

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REFERENCES

No	Author	Title	Provider
1	UNFCCC/ VCS	Validation and Verification Standard for project activities, v3.0 https://cdm.unfccc.int/sunsetcms/storage/contents/stored-file-20210921115831128/reg_stan06_v03.0.pdf Project Standard for project activities, v3.0 https://cdm.unfccc.int/sunsetcms/storage/contents/stored-file-20210921115752577/reg_stan04_v03.0.pdf VCS_Validation_Verification_Manual, ver 3.2 (https://verra.org/wp-content/uploads/2018/03/VCS_Validation_Verification_Manual_v3.2.pdf) VCS-Standard_v4.3.pdf Registration & Issuance Process v4.2 https://verra.org/wp-content/uploads/2022/07/VCS-Registration-and-Issuance-Process-v4.2.pdf	Publicly available
2	PP	Initial MR v1.0 Final MR 2.2 dated 30/03/2023 (Request for issuance)	PP
3	State electricity board (TANGEDCO) and PP	Wheeling agreement	PP
4	PP	ER spreadsheet (initial and final version)	PP
5	Third party (TESPRO system) and (Electronics Test & Development centre (ETDC), Govt of India	Calibration certificates for the export and import meters	PP
6	Equipment Manufacturer (Cethar Vessels for WHRB, ABB for Turbine)	Single line diagram, Technical specifications of WHR boiler, turbine	PP
7	State electricity	Commissioning certificate	PP

	board (TNEB)		
8	PP and State electricity board (TANGEDCO)	Electricity generation & import data and monthly invoices	PP
9	Registrar of companies	Memorandum of Association of Sree Rengaraaj Power India Private Limited (SRPIL) and Sree Rengaraj Ispat Industries Pvt Ltd (SRIIPL)	PP
10	Madras High Court order	Madras High Court order for the merger of SRPIL with SRIIPL	PP
11	UNFCCC	CDM Methodology ACM0012 v3.1	Publicly available
12	PP	Plant shutdown (both planned and forced shutdown details_	PP
13	Third party	EIA	PP
14	ARK Engineering and Power Consultants Pvt Ltd	Technical assessment on capping of baseline emissions	PP
15	PP	Registered VCS PD, version 02 dt 07/09/2009	PP
16	PP	Declaration on ‘no double counting’ and ‘no ODA’	PP