4.5 MW GROUPED SMALL HYDROPOWER PROJECTS FOR GRID SYSTEM BY BHORUKA POWER CORPORATION LIMITED IN KARNATAKA STATE, INDIA (2ND VERIFICATION REPORT)

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Project Title	4.5 MW Grouped Small Hydropower Projects for Grid system by Bhoruka Power Corporation Limited in Karnataka State, India
Version	Version 02
Report ID	01 997 9105076103

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Client	Bhoruka Power Corporation Limited
Pages	32

Date of Issue	27-September-2013
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Summary:

M/s Bhoruka Power Corporation Limited has commissioned the TÜV Rheinland (China) Ltd to carry out the verification of the Project "4.5 MW Grouped Small Hydropower Projects for Grid system by Bhoruka Power Corporation Limited in Karnataka State, India", India with regard to the requirements of VCS Version 3.3 Standard.

The project activity involves installing and operating 2 hydro projects of each capacity 1 MW and 2x1.75 MW amounting to 4.5 MW installed capacity which is supplying power to KPTCL Grid which is a part of Southern Grid of India.

Reporting period: From 01/01/2010 to 31/12/2012 (both days included)

Verification methodology and process

The verification has been performed as described in the VCS validation and verification manual, version 03.0 and constitutes the following steps:

- Desk review of the MR
- On-site assessment (15/07/2013 & 16/07/2013)
- Resolution of outstanding issues

- Issuance of Verification Report

In the course of the verification 6 Corrective Action Requests (CARs), 2 Clarification Requests (CLs) were raised and closed successfully. Furthermore No FAR is raised which need to be checked during next verification period.

The verification is based on the draft monitoring report, the monitoring plan as set out in the validated PD/VCS-PD/, the validation report, emission reduction calculation spreadsheet and supporting documents made available to the TÜV Rheinland (China) Ltd by the project participant. The TÜV Rheinland (China) Ltd has employed a risk-based approach in the verification, focusing on the identification of significant risks and reliability of project monitoring and generation of emission reductions.

As the result of the 2nd periodic verification, the verifier confirms that the GHG emission reductions are calculated without material misstatements in a conservative and appropriate manner. TÜV Rheinland (China) Ltd herewith confirms that the project has achieved emission reductions in the above mentioned reporting period as follows:

Total Emission reductions 26,723 t CO_2 equivalents

GHG Emission Reductions or Removals	2010	2011	2012	Total in the monitoring period
Net GHG emission reductions or removals* (tCO_2e)	8723	11269	6731	**26,723**

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1 INTRODUCTION

1.1 Objective

The purpose of this verification, by independent checking of objective evidence, is as follows:

- to verify that the project is implemented as described in the project design document;
- to assess the implementation of the monitoring plan (MP) content in the VCS-PD;
- to assess the project's compliance with other relevant rules, including the host country (India) legislation;
- to confirm that the monitoring system is implemented and fully functional to generate voluntary emission reductions (VERs / VCUs) without any double counting; and
- to establish that the data reported are accurate, complete, consistent, transparent and free of material error or omission by checking the monitoring records and the emissions reduction calculation.

1.2 Scope and Criteria

The verification of this project is based on the validated VCS PD, the monitoring report[/P1/], emission reduction calculation spread sheet[/P2/], supporting documents made available to the verifier and information collected through performing interviews and during the on-site assessment. Furthermore publicly available information was considered as far as available and required.

The TRC has employed a risk-based approach in the verification, focusing on the identification of significant risks and reliability of project monitoring and generation of emission reductions.

1.3 Level of assurance

The verification has been planned and organized to achieve a

☒ Reasonable level of assurance

☐ Limited level of assurance

1.4 Summary Description of the Project

This VCS project is a grouped project of two small scale, run-of-river hydropower plants, at two different locations (districts) of the State of Karnataka, India; the project have different start dates

and are bundled together as the title for the credit is vested with a common entity, M/S Bhoruka Power Corporation Limited (BCPL), and grouping of the two projects brings down the transaction costs. The individual installed capacities of the two projects are 1 x 1 MW at Shahpur and 2 x 1.75 MW at Mandagere and the power generated at both sites is evacuated into the Karnataka Power Transport Corporation Limited (KPTCL) grid which is a part of the Southern Regional Grid.

The key parameters of the project are given below:

Parameter	Unit	Value	
		Shahpur D-9	Mandagere
Rated discharge	m^3/sec	6	30.86
Head	m	21	8
Turbine type		Horizontal Francis	Horizontal Kaplan
Generator type		Squirrel cage	Synchronous
Number of generating units		1	2
Installed capacity per each unit	MW	1	1.75
Generation Voltage	kV	3.3	3.3
Sub-station	kV	Gugi	Kikkeri
Voltage	kV	33/11	66/11

The technical specification of the WTGs are verified through the technical specification of the turbine & generator and also confirmed during site visit.

2 VALIDATION PROCESS, FINDINGS AND CONCLUSION

2.1 Validation Process

The project is already validated under VCS. The project ID number of the project is VCS PD265. Further for above points, please refer to VCS Final Validation report of "4.5 MW Grouped Small Hydropower Projects for Grid system by Bhoruka Power Corporation Limited in Karnataka State, India" dated 14/11/2009 by TÜV NORD CERT GmbH available in the VCS registry.

2.2 Validation Findings

2.2.1 Gap Validation

Not applicable as the project is already validated.

2.2.2 Methodology Deviations

Not applicable as the project is already validated.

2.2.3 Project Description Deviations

Not applicable as the project is already validated.

2.2.4 New Project Activity Instances

Not applicable as the project is already validated.

2.3 Validation Conclusion

Not applicable as the project is already validated.

3 VERIFICATION PROCESS

3.1 Method and Criteria

The verification of the project consisted of the following steps:

1. Completeness check of the Monitoring report;

2. Desk review of the monitoring plan, monitoring report, monitoring methodology, project description, applicable tools in particular attention to the frequency of measurements, quality of metering equipment's including calibration requirements, QA/QC procedures and other relevant documents;

3. On-site visit (including follow-up interviews with project stakeholders, when deemed necessary). The on-site assignment includes the following;

   - An assignment of implementation and operation of project activity with respect to validated VCS-PD or approved revised VCS-PD;

- Review of information flows for generating, aggregating and reporting the monitoring parameters;
- Interview with relevant personals to determine whether the operational and data collection procedures are implemented and in accordance with monitoring plan of the VCS-PD;
- Cross check of information and data provided in the monitoring report with plant logbooks, inventories, purchase records or similar data sources;
- Check of monitoring equipment's, calibration frequency and monitoring practice in-line with methodology and VCS-PD;
- Review of assumptions made in calculating the emission reduction;
- Implementation of QA/QC procedure in-line with the VCS-PD and methodology requirement.

4. Resolution of outstanding issues and the issuance of the final Verification report.

The following sections outline each step in more detail.

3.2 Document Review

The following table outlines the documentation reviewed during the verification:

<table>
<tr><th colspan="2">Ref no.</th><th>Reference Document</th></tr>
<tr><td rowspan="2">/P1/</td><td>/P1.1/</td><td>VCS monitoring report, version 01 dated 07/05/2013</td></tr>
<tr><td>/P1.2/</td><td>VCS monitoring report, version 01.01, dated 23/09/2013</td></tr>
<tr><td rowspan="2">/P2/</td><td>/P2.1/</td><td>ER calculation sheets (draft), version 01, w.r.t monitoring report version 01</td></tr>
<tr><td>/P2.2/</td><td>ER calculation sheet (Final), version 02, w.r.t monitoring report version 02</td></tr>
<tr><td colspan="2">/P3/</td><td>Monthly joint meter reading statement (B-Form) for the monitoring period for the period from 01-January-2010 to 31-December-2012</td></tr>
<tr><td colspan="2">/P4/</td><td>Invoice copies of the sale of power for the monitoring period for the period from 01-January-2010 to 31-December-2012</td></tr>
<tr><td colspan="2">/P5/</td><td>Test certificates of the energy meters involved in the monitoring of the project activity

<u>Shahapur-D9Project</u>
<table>
<tr><th>Description</th><th>Main meter</th><th>Check meter</th></tr>
<tr><td>Serial No.</td><td>08002008</td><td>08002025</td></tr>
<tr><td>Date of Calibration</td><td>8/03/2010, 05/01/2011, 24/05/.2011, 23/12/2011; 16/08/2012</td><td>8/03/2010, 05/01/2011, 24/05/2011, 23/12/2011; 16/08/2012</td></tr>
</table></td></tr>
</table>

	Mandagere Project **Description** / **Line-1** (Main meter, Check meter) / **Line-2** (Main meter, Check meter) Serial No. — 03157703 / 03157704 / 03157705 / 03157706 Date of Calibration — 01/01/2010, 08/09/2010, 09/03/2011, 11/11/2011, 24/09/2012 (all four columns)
/P6/	Power Purchase Agreement Mandagere facility & Power Purchase Agreement Shahpur D-9 Facility
/P7/	Internal quality assurance and quality control records and procedures of GE India
/P8/	Log book energy generation reading gross energy meter
/P9/	Commissioning certificate dated 22.09.2004 of 1 x 1.75 MW turbine at Mandagere from the Karnataka Power Transmission Corporation Ltd.(KPTCL). Commissioning certificate dated 19.03.2005 of 1 x 1.75 MW turbine at Mandagere from the Karnataka Power Transmission Corporation Ltd. Commissioning certificate dated 29.08.2003 of 1 x 1 MW turbine at Shahpura D-9 from the Karnataka Power Transmission Corporation Ltd.
/P10/	Log book maintained in the DG room providing details of DG running, duration, diesel consumed, and power generated
/P11/	Consent for emissions under the Air Act, 1981, dated 18.12.2009, valid till 31.12.2012 Consent for emissions under the Air Act, 1981, dated 13.12.2009, valid till 31.12.2012
/P12/	Register containing details of scheduled and forced outages of plant maintained by the plant personnel

Background investigation and other referred documents/websites:

Reference	Document
/B1/	Approved CDM Methodology AMS – I.D, Version 13: "Grid connected renewable electricity generation"
/B2/	1. 1996 IPCC Guidelines for National Greenhouse Gas Inventories: work book 2. 2006 IPCC Guidelines for National Greenhouse Gas Inventories: work book
/B3/	Greenhouse gases – Part 1: Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals Greenhouse gases – Part 2: Specification with guidance at the project level for quantification, monitoring and reporting of greenhouse gas emission reductions or

	removal enhancements Greenhouse gases – Part 3: Specification with guidance for the validation and verification of greenhouse gas assertions
/B4/	Greenhouse gases – Requirements for greenhouse gas validation and verification bodies for use in accreditation or other forms of recognition
/B5/	Voluntary Carbon Standard, version 03.3
/B6/	VCS PD Template, version 3.2
/B7/	VCS Validation and Verification Manual, version 03.0
/B8/	Registration and Issuance Process: VCS Version 3
/B9/	CDM Validation documents: Validated VCS PD, version 02, dated 10/09/2009 VCS Validation report (Rep. No 53601108 – 08/239), dated 14/11/2009
/B10/	GUIDELINES FOR ASSESSING COMPLIANCE WITH THE CALIBRATION FREQUENCY REQUIREMENTS EB 52, Annex 60
/B11/	CO2 Baseline Database for the Indian Power Sector Version Ver.03, 15 Dec 2007

3.3 Interviews

TÜV Rheinland verification team carried out an on-site visit dated (15/07/2013& 16/07/2013) and performed interviews with the project representatives and stakeholders.

Prior to the interview salient points to be discussed were planned. Date of interview, interviewee and points discussed are given in the following table.

	Date	Name	Organization	Topic
	ShahpurD-9 facility			
/i/	15/07/2013	Mr. Maikanna K.	Dy.Manager (Mechanical)	Project implementation, operation, training, Calibration, Monitoring and data archiving, Data trail (information flow) till the reported values. CER calculation, Outage, Consents and statutory clearances.
/ii/	15/07/2013	Mr. Anand Badiger	Asst.Manager (Electrical)	
/iii/	15/07/2013	Mr. Sangameshwara GB	Engineer-CDM	Project implementation, operation, training, Calibration, Monitoring and data archiving, CER calculation.
	Mandagere facility			
/vi/	16/07/2013	Mr.Kanteppa B.K	Dy.Manager (Mechanical)	Project implementation, operation, training, Calibration, Monitoring and data archiving, Data trail (information flow) till the reported values. CER calculation, Outage, Consents and statutory clearances.
/vii/	16/07/2013	Mr. Raju M.B.	Dy.Manager (Civil)	
/viii/	16/07/2013	Mallikarjun	Engineer (Mech)	
/ix/	16/07/2013	Mr.Sangameshwara G B	Engineer-CDM, BPCL	Project implementation, operation, training, Calibration, Monitoring and data archiving, CER calculation.

Verification Team along with onsite observation, objective evidence collections, data generation and recording analysis also considered the views obtained in these interviews while arriving at Verification Opinion.

3.4 Site Inspections

The verification team has carried out an inspection on site on 15/07/2013and 16/07/2013 in order to verify that the project is implemented in accordance with the applicable criteria. Furthermore the on-site assessment was conducted and monitoring data were checked with respect to accuracy to ensure the calculation of emission reductions. The main tasks covered during the site visit include,

- The on-site assessment included an investigation of whether all relevant equipment is installed and works as anticipated.
- The operating staff was interviewed and observed in order to check the risks of inappropriate operation and data collection procedures.
- Information processes for generating, aggregating and reporting the selected monitored parameters were reviewed.
- The duly calibration of all metering equipment was checked.
- The monitoring processes, routines and documentations were audited to check their proper application.
- The monitoring data were checked completely.
- The data aggregation trails were checked via spot sample down to the level of the meter recordings.

Responsibilities related to monitoring are executed as defined in the monitoring plan/P2/ & /B9/ and were assessed.

3.5 Resolution of Any Material Discrepancy

The objective of this phase of the verification is to resolve any outstanding issues (issues that require further elaboration, research or expansion) which have to be clarified prior to final DOE's conclusions on the project implementation, monitoring practices and achieved emission reductions. In order to ensure transparency a verification protocol is completed for the project activity. The protocol shows in transparent manner criteria (requirements), means of verification and resulting statements on verification actual project activity against identified criteria.

The verification protocol serves the following purposes:

- It organises in a table form, details and clarifies the requirements, which VCS project is expected to meet VCS requirements;
- It ensures a transparent verification process where the DOE will document how a particular requirement has been verified and the result of the verification.
- It ensures that the issues are accurately identified, formulated, discussed and concluded in the validation report.
- It ensures the determination of achieving credible emission reductions from the project activity.

Findings during the verification can be interpreted as a non-compliance with VCS criteria or a risk to the compliance. Corrective action requests (CARs) are raised, in case:

(a) Non-conformities with the monitoring plan or methodology are found in monitoring and reporting and has not been sufficiently documented by the project participants, or if the evidence provided to prove conformity is insufficient;
(b) Modifications to the implementation, operation and monitoring of the registered project activity has not been sufficiently documented by the project participants;

(c) Mistakes have been made in applying assumptions, data or calculations of emission reductions which will impair the estimate of emission reductions;
(d) Issues identified in a FAR during validation/previous verification(s) that are not been resolved by the project participant(s) to be verified during current verification.

Requests for clarification (CLs) are raised, if information is insufficient or not clear enough to determine whether the applicable VCS requirements have been met.

A forward action request (FAR) is raised during verification to highlight issues related to project implementation/monitoring that require review during the subsequent verification of the project activity. FARs shall not relate to the VCS requirements for issuance.

The CARs/CLs/FARs are provided in the annex – I

4 VERIFICATION FINDINGS

4.1 Project Implementation Status

During the validation site visit, it was confirmed that the project has been implemented as per design and as described in the VCS PD. The hydropower project at Shahpur was commissioned on 29 August 2003 and the project activity at Mandagere was commissioned on 16 September 2004.

The validation site visit was conducted on 15 and 16 July 2013 and it was confirmed that the name plate capacity of the installed turbine, generator, transformer and such other generating and peripheral equipment were in accordance with the description provided in the PD. The monitoring methodology was in line with the chosen methodology and the equipment and instruments installed for monitoring of the project activity were sufficient to monitor the project activity in line with the requirement as described in the PD.

Complete details of the same are as below:

The generator and turbine details that were under operation during site visit have been recorded as follows:

Project	Equipment details
Shahpur D-9	**Generating Equipment:** Horizontal Francis type turbine, Jyothi Limited, 1 no.; Squirrel cage Induction generator, Jyothi limited, rated output 1000 kW, 1 no. Single evacuation line **Monitoring Equipment** Main meter: L&T make, Tri-vector type, Multiplication factor, 7.5 Sl no. 08002008 Check Meter:

	L&T make, Tri-vector type, Multiplication factor:7.5 Sl no. 08002025 No meter change during the monitoring period.
Mandagere	**Generating Equipment:** Horizontal Kaplan, Alstom India Limited,2 nos. Synchronous generator, Crompton Greaves, rated output 1750 kW, 2 nos. Double evacuation line **Monitoring Equipment** Line 1 Main Meter: Tri-vector meter, L&T Make Sl no. 03157703 Check Meter Tri-vector meter, L&T Make Sl no. 03157704 Line 2 Main Meter: Tri-vector meter, L&T Make Sl no. 03157705 Check Meter Tri-vector meter, L&T Make Sl no. 03157706

During the site visit it was confirmed by the team members that none of the generating or peripheral equipment for generation and transformation were altered or changed since inception and the name plate details of the generator and turbine were compared with the details obtained during validation site visit to confirm the same. The monitoring equipment is also not changed during the monitoring period.

From the site visit observation and by the verification supporting documents, the validation team confirms that the project continued to operate as described in the registered PD. All details of outages, both planned and forced, were effectively captured in the plant logbook and the details were included in the MR. This was verified and found to tally well with the data available.

The validation team also reviewed the validated VCS-PD and the respective validation report and previous verification reports and found that there is not remaining issues pending with the validation or previous verifications of the project.

From the assessment the DOE confirms the following:

- The project is implemented as described in the validated VCS-PD and no design change took place which will affect the project eligibility.
- The monitoring plan is implemented as described in the validated VCS-PD and hence we can conclude the monitoring is complete & precise.
- No material discrepancies found between the actual project operational status and the validated VCS-PD.
- No remaining issues from previous validation or verification.

4.2 Accuracy of GHG Emission Reduction or Removal Calculations

During the site visit, the details of energy meter such as make, accuracy class, date of commissioning, and meter number, were noted down. The details mentioned in respect of energy meters in the monitoring plan were found to be the same as per the data collected during the site visit. Also the calibration certificates are verified and found to be in line with the meter number, date of calibration, meter make, accuracy class, and date of commissioning mentioned in the monitoring plan provided in the registered PD.

All relevant evidences were fully checked by the verification team during the on-site visit. All evidences are clearly identifiable and assessed to be correct. It could be evidenced that the monitoring system ensures for continuous operation.

The information provided by the PP during the verification stage such as joint meter readings (B-Forms) was thoroughly verified and it is cross checked with the invoice copies. Also the log records of the diesel consumptions are also verified and found to be in consistent with the data used for the emission reduction calculation.

Emission reductions due to the project activity are equivalent to the emissions avoided in the baseline by displacing the grid electricity.

No leakage emissions are considered from the grouped project activity since no energy generating equipment is transferred from another activity and / or / to the project activity.

Thus, ERy = BEy – PEy, where,

ERy = Emission reductions,

BEy = Baseline emissions, and

PEy = Project emissions.

As per the selected methodology for the project activity, AMS – I.D, the baseline for the project activity is the kWh produced by the project activity multiplied by an emission coefficient calculated as the Combined Margin (CM) being a combination of the Operating Margin (OM) and Build Margin (BM)/B11/ of southern grid of India. The OM and BM are calculated in a transparent and conservative manner as described in the “Tool to calculate the emission factor of an electricity system”

As per the registered PD, the baseline emission factor has been fixed at 0.8545tCO_2e/MWh on ex-ante basis based on data published by the Central Electricity Authority.

The monitoring methodology as per the registered PD has defined the method of calculating net kWh produced and exported to the grid by the project activity by monitoring the gross power exported and the quantity imported from the grid.

The Joint Meter Readings record the export and import readings in the two bundled hydropower projects; the difference between the export and import readings gives the net power exported.

Hence, BEy = (net power exported in MWh) x (0.8545) tCO_2e

Project emissions are considered to offset the emissions by the diesel fuel used to run the diesel fired power generating station in times of emergency. This is calculated as per the method stipulated by the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion". The quantity of diesel consumed for running the DG set is monitored and recorded in the DG Log Book and the project emissions are calculated as,

PEy = F d,y × Density × NCVDiesel × $EFCO_2$ × OXID / 10^6, where,

PE diesel, y = Project Emissions due to usage of diesel during the year y (tCO_2)

Fd,y = Quantity of diesel used during the year (Ltrs)

Density = density of diesel 0.82 kg/Ltr. as per Society of Indian Automobile Manufacturers (SIAM)

NCVDiesel = The calorific value of diesel (43 TJ/Gg as per IPCC 2006 default value)

$EFCO_2$ = The CO_2 emission factor of Diesel (74.1 tCO_2/TJ as Per IPCC 2006 default Value)

OXID = The oxidation factor of the Diesel (1 as per IPCC 2006 default value)

The aforesaid procedure to calculate the emission reductions effected by the project activity has been correctly followed in the MR and the MS Excel spread sheet submitted.

The Joint Meter Readings in FORM – B for each month has been verified and the corresponding entries in the revised MS spread sheet have been checked and confirmed that the entries are correct. The Grid Emission factor fixed ex-ante in the registered PD has been correctly entered.

Further, while calculating the yearly the emission reductions have been "Rounded down". This is rightly in the cause of conservativeness.

The net power exported (gross export minus the import from the grid) to the grid in every month of the crediting period is entered in the MS Excel Sheet spread sheet as also the diesel consumption. Based on these two the baseline emissions (product of net power exported with grid emission factor) and project emissions (as per formula).Difference between the two gives the net emission reduction

For calculating the project emissions, default values are used for density, calorific value and oxidation factor for diesel. As stipulated in the methodology, the density is country specific and is sourced from the Society of Indian Automobile Manufacturers„; for the other parameters, since no country specific value is available, IPCC default values are used.

The monitoring methodology adopted by the PP is in line with the approved monitoring plan as per the registered VCS PD. The QA/QC procedures described in the monitoring methodology have been complied with.

The instruments installed for monitoring have been properly calibrated as per standard procedures and the relevant records of calibrations have been submitted for verification. The records have been verified and are found to meet with the procedure mentioned in the registered PD.

The verification team has verified the accuracy of all the data used for calculation of emission reductions as also the values entered in the spread sheet. The formula used for calculating the emission reductions, both baseline and project, are used to produce conservative values. The formula used in the spread sheet is transparent, approved, as per approved PD and can be verified.

Thus, the verification team confirms that the methodology has been followed as prescribed, the value of data for the monitored parameters are based on robust and well delineated procedures, the transfer of the monitored data has been done without any error, the formula used are transparent and designed to produce conservative results; the emission reductions calculated are accurate, real, conservative and truly represent the quantity of GHG emission reductions achieved.

4.3 Quality of Evidence to Determine GHG Emission Reductions or Removals

The quantum of electricity generated is monitored continuously and recorded on a monthly basis by the authorised representatives of the agency scheduled to buy the power from the project activity. The monthly record is countersigned by the representative of the PP and provides details of power exported, power imported and the net power export.

The energy meter is calibrated at least once in three months as per the procedure described in the Power Purchase Agreement and the meters are rendered pilfer proof. The energy meters are not calibrated with in the 3 months frequency during the monitoring period. Hence for the calibration non-validity period the PP has applied the error (0.2% or error resulted in the immediate next calibration whichever is higher). This is seems to be appropriate and in line with the CDM guidance/B10/. In both the sites the energy meters installed remain unchanged during the monitoring period.

The parameters required for calculating the baseline emissions are the Grid Emission Factor and the power exported to the carbon intensive grid. The Grid Emission Factor is calculated as per the prescribed methodology enunciated in the applicable tool and is based on the data published by the Central Electricity Authority.

Monitoring Parameter:

During the verification, all relevant monitoring parameters (as listed in Section 3.2 and 3.3 of the VCS PD/B02/) 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.

After appropriate corrections were carried out by the project participant it can be confirmed that all monitoring parameters have been measured / determined without material misstatements and are in line with all applicable standards and relevant requirements.

The audit team verified following documents and respective parameters:

- Monthly B-Form for each month for net electricity supplied to the grid
- SCADA data for the monitoring period
- Ex-ante emission factor as per the validated VCS PD
- Calibration records
- Daily log records and adjustment statement provided by M/s Bhoruka Power Corporation Limited

All the figures as per the monitoring plan were cross-checked by the verification team against basic monitored data and the calculations were found to be correct.

The key monitoring parameter with influence on the calculation of the emission reductions is the net power exported to the KPTCL grid. The power is measured with an accuracy and duly calibrated class 0.2 energy meters.

All records needed for monitoring are archived in line with the requirements of the registered monitoring plan. No significant, lack of evidence and missing data were detected during on-site verification/P09/.

It could be evidenced that the monitoring system ensures for continuous (except some routine breakdowns or outage such as non –availability of grid for evacuation of generated power) operation and there is no non-availability of data for the calculation of emission reduction during the current verification period.

Monitoring Parameter Requirement	Assessment/ Observation by the DOE
Data / Parameter: (as in monitoring plan of PDD):	EGgross, y - Total electricity generated by the project in the year y.
Measuring frequency:	Continuously measured and aggregated monthly
Reporting frequency:	Continuously measured and Monthly report prepared by Bhoruka Power Corporation Limited
Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	Yes
Type of monitoring equipment:	Energy meter with serial number 3201100158 for Shahpur – D9 and Mandagere Project (Sl No: 7175067 for Unit 1 & Sl No: 7175068 for Unit 2)
Is accuracy of the monitoring equipment as	The accuracy of energy meter was mentioned in the

stated in the VCS PD? If the VCSPD does not specify the accuracy of the monitoring equipment, does the monitoring equipment represent good monitoring practice?	registered VCS PD. The accuracy class of 0.2 installed for the monitoring of electricity represents the good monitoring practice and is in line with the requirements of internal QA/QC.
Calibration frequency /interval:	As per industrial standards
Is the calibration interval in line with the monitoring plan of the VCS PD? If the VCS PD does not specify the frequency of calibration, does the selected frequency represent good monitoring practice?	Yes it is in line with VCS PD requirements and represents good monitoring practice.
Company performing the calibration:	Third party calibration agency appointed by BPCL
Did calibration confirm proper functioning of monitoring equipment? (Yes / No):	Yes
Is(are) calibration(s) valid for the whole reporting period?	Yes, there was no delay in calibration identified during the second monitoring period.
If applicable, has the reported data been cross-checked with other available data?	Not applicable.
How were the values in the monitoring report verified?	The parameter is used for internal QA/QC and not used for emission reduction calculation.
Does the data management (from monitoring equipment to emission reduction calculation) ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?	Yes, all the applicable QA/QC procedures are carried out as described in monitoring plan of the registered VCS PD.
In case only partial data are available because activity levels or non-activity parameters have not been monitored in accordance with the registered monitoring plan, has the most conservative assumption theoretically possible been applied or has a request for deviation been approved?	NA

Monitoring Parameter Requirement	Assessment/ Observation by the DOE
Data / Parameter: (as in monitoring plan of PDD):	EGexport, y - Quantity of Electricity exported to the grid by the grouped project during the year y.
Measuring frequency:	Continuously measured and aggregated monthly
Reporting frequency:	Continuously measured and Monthly report jointly prepared by Bhoruka Power Corporation Limited

	and KPTCL
Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	Yes
Type of monitoring equipment:	Energy meter with serial number 08002008 Main meter and 08002025 check meter for Shahpur – D9 and Mandagere Project (SI No: 03157703 Main meter and 03157704 check meter for Unit 1 & SI No: 03157705 Main meter and 03157706 check meter for Unit 2)
Is accuracy of the monitoring equipment as stated in the VCS PD? If the VCSPD does not specify the accuracy of the monitoring equipment, does the monitoring equipment represent good monitoring practice?	The accuracy of energy meter was mentioned in the registered VCS PD. The accuracy class of 0.2 installed for the monitoring of electricity represents the good monitoring practice and is in line with the requirements of PPA.
Calibration frequency /interval:	As per PPA
Is the calibration interval in line with the monitoring plan of the VCS PD? If the VCS PD does not specify the frequency of calibration, does the selected frequency represent good monitoring practice?	Yes it is in line with VCS PD requirements and represents good monitoring practice.
Company performing the calibration:	KPTCL
Did calibration confirm proper functioning of monitoring equipment? (Yes / No):	Yes
Is(are) calibration(s) valid for the whole reporting period?	No, there was delay in calibration identified during the second monitoring period.
If applicable, has the reported data been cross-checked with other available data?	The value are cross verified with the invoices raised by Bhoruka Power Corporation Limited
How were the values in the monitoring report verified?	The value are cross verified with the invoices raised by Bhoruka Power Corporation Limited
Does the data management (from monitoring equipment to emission reduction calculation) ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?	Yes, all the applicable QA/QC procedures are carried out as described in monitoring plan of the registered VCS PD.

In case only partial data are available because activity levels or non-activity parameters have not been monitored in accordance with the registered monitoring plan, has the most conservative assumption theoretically possible been applied or has a request for deviation been approved?	NA

Monitoring Parameter Requirement	Assessment/ Observation by the DOE
Data / Parameter: (as in monitoring plan of PDD):	EGimport, y - Grid electricity import to the project activity during the year y.
Measuring frequency:	Continuously measured and aggregated monthly
Reporting frequency:	Continuously measured and Monthly report jointly prepared by Bhoruka Power Corporation Limited and KPTCL
Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	Yes
Type of monitoring equipment:	Energy meter with serial number 08002008 Main meter and 08002025 check meter for Shahpur – D9 and Mandagere Project (SI No: 03157703 Main meter and 03157704 check meter for Unit 1 & SI No: 03157705 Main meter and 03157706 check meter for Unit 2)
Is accuracy of the monitoring equipment as stated in the VCS PD? If the VCSPD does not specify the accuracy of the monitoring equipment, does the monitoring equipment represent good monitoring practice?	The accuracy of energy meter was mentioned in the registered VCS PD. The accuracy class of 0.2 installed for the monitoring of electricity represents the good monitoring practice and is in line with the requirements of PPA.
Calibration frequency /interval:	As per PPA
Is the calibration interval in line with the monitoring plan of the VCS PD? If the VCS PD does not specify the frequency of calibration, does the selected frequency represent good monitoring practice?	Yes it is in line with VCS PD requirements and represents good monitoring practice.
Company performing the calibration:	KPTCL
Did calibration confirm proper functioning of monitoring equipment? (Yes / No):	Yes
Is(are) calibration(s) valid for the whole	No, there was delay in calibration identified during

reporting period?	the second monitoring period.
If applicable, has the reported data been cross-checked with other available data?	The value are cross verified with the invoices raised by Bhoruka Power Corporation Limited
How were the values in the monitoring report verified?	The value are cross verified with the invoices raised by Bhoruka Power Corporation Limited
Does the data management (from monitoring equipment to emission reduction calculation) ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?	Yes, all the applicable QA/QC procedures are carried out as described in monitoring plan of the registered VCS PD.
In case only partial data are available because activity levels or non-activity parameters have not been monitored in accordance with the registered monitoring plan, has the most conservative assumption theoretically possible been applied or has a request for deviation been approved?	NA

Monitoring Parameter Requirement	Assessment/ Observation by the DOE
Data / Parameter: (as in monitoring plan of PDD):	EGy - Net Electricity supplied to the grid by the grouped project during the year y.
Measuring frequency:	Continuously measured and aggregated monthly
Reporting frequency:	Continuously measured and Monthly report jointly prepared by Bhoruka Power Corporation Limited and KPTCL
Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	Yes
Type of monitoring equipment:	Energy meter with serial number 08002008 Main meter and 08002025 check meter for Shahpur – D9 and Mandagere Project (SI No: 03157703 Main meter and 03157704 check meter for Unit 1 & SI No: 03157705 Main meter and 03157706 check meter for Unit 2)
Is accuracy of the monitoring equipment as stated in the VCS PD? If the VCSPD does not specify the accuracy of the monitoring equipment, does the monitoring equipment represent good monitoring practice?	The accuracy of energy meter was mentioned in the registered VCS PD. The accuracy class of 0.2 installed for the monitoring of electricity represents the good monitoring practice and is in line with the requirements of PPA.

Calibration frequency /interval:	As per PPA
Is the calibration interval in line with the monitoring plan of the VCS PD? If the VCS PD does not specify the frequency of calibration, does the selected frequency represent good monitoring practice?	Yes it is in line with VCS PD requirements and represents good monitoring practice.
Company performing the calibration:	KPTCL
Did calibration confirm proper functioning of monitoring equipment? (Yes / No):	Yes
Is(are) calibration(s) valid for the whole reporting period?	No, there was delay in calibration identified during the second monitoring period.
If applicable, has the reported data been cross-checked with other available data?	The value are cross verified with the invoices raised by Bhoruka Power Corporation Limited
How were the values in the monitoring report verified?	The value are cross verified with the invoices raised by Bhoruka Power Corporation Limited
Does the data management (from monitoring equipment to emission reduction calculation) ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?	Yes, all the applicable QA/QC procedures are carried out as described in monitoring plan of the registered VCS PD.
In case only partial data are available because activity levels or non-activity parameters have not been monitored in accordance with the registered monitoring plan, has the most conservative assumption theoretically possible been applied or has a request for deviation been approved?	NA

Monitoring Parameter Requirement	Assessment/ Observation by the DOE
Data / Parameter: (as in monitoring plan of PDD):	Fd,y - Quantity of diesel used in DG set during the year,y
Measuring frequency:	Daily recorded and aggregated monthly
Reporting frequency:	Monthly
Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	Yes
Type of monitoring equipment:	Level gauge/Ruler

Is accuracy of the monitoring equipment as stated in the VCS PD? If the VCSPD does not specify the accuracy of the monitoring equipment, does the monitoring equipment represent good monitoring practice?	NA
Calibration frequency /interval:	NA
Is the calibration interval in line with the monitoring plan of the VCS PD? If the VCS PD does not specify the frequency of calibration, does the selected frequency represent good monitoring practice?	Yes it is in line with VCS PD requirements and represents good monitoring practice.
Company performing the calibration:	NA
Did calibration confirm proper functioning of monitoring equipment? (Yes / No):	NA
Is(are) calibration(s) valid for the whole reporting period?	NA
If applicable, has the reported data been cross-checked with other available data?	The value are cross verified with the fuel purchase receipts
How were the values in the monitoring report verified?	The value are cross verified with the fuel purchase receipts
Does the data management (from monitoring equipment to emission reduction calculation) ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?	Yes, all the applicable QA/QC procedures are carried out as described in monitoring plan of the registered VCS PD.
In case only partial data are available because activity levels or non-activity parameters have not been monitored in accordance with the registered monitoring plan, has the most conservative assumption theoretically possible been applied or has a request for deviation been approved?	NA

Accuracy of equipment:

The DOE has verified the calibration records of the measuring instrument namely main meter and check meter. The accuracy of measurement (0.2) of the monitoring equipment was verified during the site visit. This is according to the requirements monitoring plan and PPA. All these measuring instruments have

been calibrated once in a quarter as per PPA requirements during the second verification period with some delay in calibration.

The monitoring equipment's have been installed in the project activity according to registered monitoring plan. The table below summarizes relevant specifications of monitoring equipment's:

Shahpur-D9:

Monitoring Equipment:	Main Meter	Check Meter
Capacity	1.0 MW	
Function:	Net Electricity supplied to the grid by the grouped project during the year y	Net Electricity supplied to the grid by the grouped project during the year y
Ownership:	KPTCL	KPTCL
Location:	Substation	Substation
Transaction point:	Substation	Substation
Monitored parameter:	EGy	EGy
Meter Make:	L&T	L&T
Serial number:	08002008	08002025
Accuracy:	0.2	0.2
Current Calibration Date	8.03.2010, 05.01.2011, 24.05.2011, 23.12.2011, 16.08.2012	8.03.2010, 05.01.2011, 24.05.2011, 23.12.2011, 16.08.2012
Frequency of calibration:	Quarterly	Quarterly

Mandegere:

Monitoring Equipment:	Main Meter	Check Meter	Main Meter	Check Meter
Capacity	2 x 1.75 MW			
Function:	Net Electricity supplied to the grid by the grouped project during the year y	Net Electricity supplied to the grid by the grouped project during the year y	Net Electricity supplied to the grid by the grouped project during the year y	Net Electricity supplied to the grid by the grouped project during the year y
Ownership:	KPTCL	KPTCL	KPTCL	KPTCL
Location:	Substation	Substation	Substation	Substation

Transaction point:	Substation	Substation	Substation	Substation
Monitored parameter:	EGy	EGy	EGy	EGy
Meter Make:	L&T	L&T	L&T	L&T
Serial number:	03157703	03157704	03157705	03157706
Accuracy:	0.2	0.2	0.2	0.2
Current Calibration Date	01.01.2010, 08.09.2010, 09.03.2011, 11.11.2011, 24.09.2012	01.01.2010, 08.09.2010, 09.03.2011, 11.11.2011, 24.09.2012	01.01.2010, 08.09.2010, 09.03.2011, 11.11.2011, 24.09.2012	01.01.2010, 08.09.2010, 09.03.2011, 11.11.2011, 24.09.2012
Frequency of calibration:	Quarterly	Quarterly	Quarterly	Quarterly

The project emissions are calculated from the quantity of diesel used for the DG sets, its density, calorific value (CV) and oxidation factor, while the quantity of diesel used is recorded in the log book, the density is sourced from locally available data, and the CV and oxidation factor are sourced from the IPCC default values published.

Hence, the quality of the evidence provided for emission reduction calculation/P2.2/ is adequate.

4.4 Management and Operational System

The allocation of responsibilities is documented in a written form and is followed as described in the PD and MR. This has been verified. Routines for the archiving of data are defined and documented. Calculations laid down in the monitoring report are in line with VCS PD.

The monitoring personnel at site are well trained and follow reproducible routines as was evident during the site visit. Members of monitoring team were interviewed. Procedure for training and maintenance of critical equipment's were discussed during site visit. Day to day operation is supervised by the technically qualified site engineers who have adequate knowledge. They have the responsibility to supervise various technical staff for around the clock who engage in operation and maintenance of project activity.

Training is provided to the concerned personnel as required. They thus become competent to carry out the relevant tasks with sufficient accuracy. All necessary monitored and measured raw data were checked during on-site verification.

Supervisory personnel in charge of each shift are responsible for recording the total electricity generation, electricity export, electricity import, plant shut down times, diesel consumption, down time, hydrology report, etc.

Such daily data is aggregated and monthly reports are generated. These are submitted to the Head- O & M for verification and emission reduction calculations.

Plant Manager are responsible for the review of the monitored parameters, for correctness, and corrective measures to be initiated in case of minor errors in the monitored data and preparation of a daily summary on project operation and electricity generation to the Head- O & M on daily basis.

The responsibility of storage and archiving of information in good condition also lies with the Head- O & M. He also generates half-yearly internal audit reports as per the monitoring plan and whenever necessary, it will be submitted to the Managing Director for final review.

The reports of the internal audit conducted during the monitoring period have been verified; there ports record opportunities for improvement (OFI).

For non-conformance issues, root cause analysis has been completed; suitable correction and corrective actions have been implemented. All management and operational systems are in place. The roles and responsibilities of the monitoring personnel are clearly mentioned in the MR and also verified during the site visit and found same as described in the PD.

All internal data are subjected to QA/QC measures. All monitored data are archived in Physical and Electronic form. Details on monitoring constraint was verified during the site visit and found that proper procedures were adopted for data handling. The data will be stored for 2 years after the end of crediting period or till the last issuance of VERs for this project activity whichever occurs later.

All meters undergo calibration regularly and the reports were verified and found to be in accordance with the wheeling agreement and monitoring plan mentioned in the VCS PD. The MR mentions in detail the calibration procedures adopted and meter details including calibration dates and their delays. A conservative approach has been taken to calculate the ER. The monitoring report therefore satisfies the calibration procedure and the calibration frequency.

5 VERIFICATION CONCLUSION

TUV Rheinland (China) Ltd., the DOE, has performed the verification of the validated VCS project activity "4.5 MW Grouped Small Hydropower Projects for Grid system by Bhoruka Power Corporation Limited in Karnataka State, India". The project activity is designed to generate emission reductions by replacing grid electricity with renewable wind electricity

The project participants are responsible for the collection of data in accordance with the monitoring plan and the reporting of GHG emissions reductions from the project. It is DOE's responsibility to express an independent verification statement on the reported GHG emission reductions from the project. The DOE does not express any opinion on the selected baseline scenario or on the validated VCS-PD. The verification is carried out in-line with the VCS validation verification manual requirements.

The verification was performed to identify the compliance of the project activity with implementation and monitoring requirements, and to verify the actual amount of achieved emission reductions, through obtaining evidence and information on-site that included i) checking whether the provisions of the monitoring methodology and the monitoring plan were consistently and appropriately applied, ii) the collection of evidence supporting the reported data and iii) emission reductions that are claimed is free from material errors, omissions or misstatements.

The verification is based on:

— Validated VCS-PD version 02 dated 10/09/2009 and its monitoring plan;

— Approved CDM monitoring methodology AMS I.D "Grid Connected Renewable Electricity Generation, version-13,

— VCS Validation report, dated 14/11/2009;

— Monitoring reports versions 01 and 01.01, dated 07/05/2013 and 23/09/2013 respectively.

This statement covers verification period of 731 days between 01/01/2010 and 31/12/2012 (both days included).

The DOE has raised 2 clarification and 6 corrective action requests, all of which have been successfully resolved by PPs.

The DOE considers necessary to give reasonable assurance that reported GHG emission reductions were calculated correctly on the basis of the approved baseline and monitoring methodology and the monitoring plan contained in the registered PDD are fairly stated.

The DOE hereby certifies that the project activity, achieved emission reductions by sources of GHG is as mentioned below and all monitoring requirements have been fulfilled.

GHG Emission Reductions or Removals	2010	2011	2012	Total in the monitoring period
Baseline Emissions (tCO_2e)	8725.8	11271.5	6732.8	26730.1
Project Emissions (tCO_2e)	1.9	1.2	1.1	4.2

Leakage (tCO_2e)	0	0	0	0
Net GHG emission reductions or removals* (tCO_2e)	8723	11269	6731	**26,723**

*round down values

The DOE states that the Claimed emission reductions are free from material errors, omissions and misstatements with a reasonable level of assurance.

11/10/2013	01/10/2013	27/09/2013
Date	Date	Date
Mr.Henri Phan DOE Manager TUV Rheinland (China) Ltd.	Ms.Indumathi C Technical Reviewer TUV Rheinland (India) Pvt. Ltd.	Mr.R. Murali Team Leader TUV Rheinland (India) Pvt. Ltd

Annex-1*:* Abbreviations

BM	Build Margin
BPCL	Bhoruka Power Corporation Ltd.
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CEA	Central Electricity Authority
CL	Clarification request
CM	Combined Margin
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
DOE	Designated operational entity
FAR	Forward Action Request
GHG	Greenhouse gas(es)
GWP	Global Warming Potential
KPTCL	Karnataka Power Transport Corporation Limited
MoEF	Ministry of Environment & Forest
N2O	Nitrous oxide
OM	Operating Margin
PDD	Project Design Document
PLF	Plant Load Factor
PPA	Power Purchase Agreement
tCO_2e	Tonnes of CO_2 equivalents
TRC	TÜV Rheinland (China) Ltd.
VCS	Verified Carbon Standard

Annex-2 : List of Requests for Corrective Action (CAR) and Clarification(CL) Request

List of Requests for Corrective Action (CAR) and Clarification				
No.	Type of request	Observation	Summary of project owner response	Verification team conclusion
1.	/CAR-01/	Ref: Version 01 of the MR, • Page no 1 of the MR, the monitoring period is chosen from 2010-01-01 to 2012-12-01. Please clarify whether both days are inclusive. • The methodology name mentioned shall be corrected. • Entire document shall be checked for spelling.	Necessary changes have been made in the MR	1. The monitoring period consist the days 01/01//2010 and 31/12/2012. Same is updated in the MR 2. The methodology name is corrected now 3. The spell check has been done and made necessary correction. CAR-01 is closed
2.	/CAR-02/	Ref: Version 01 of the MR, Under section 1.1 and 2.3, the capacity of the project mentioned is not correct.	Section 1.1 & 2.3 has been corrected.	The capacity of the project is now corrected in the MR. CAR-02 is closed
3.	/CAR-03/	There is no metering diagram or line diagram showing all the metering points in the MR. Details related to training of monitoring personals are not included in the monitoring report. Please include the same.	Metering diagram for D9 & Manadagere project has been incorporated	The line diagram depicting the project equipment and metering points are now included in the MR. CAR-03 is closed
4.	/CAR-04/	Vintage wise total outages/shutdown shall be presented in the MR.	Vintage wise outage details are mentioned in the revised MR	The vintage wise total outage details are now presented in the MR and cross verified with the daily log records maintained for shutdown hours and outages.

				CAR-04 is closed
5.	/CAR-05/	Calibration frequency is not mentioned in the MR.	Calibration frequency is now incorporated in the revised MR	The calibration frequency is now mentioned in the MR. CAR-05 is closed
6.	/CAR-06/	In most of the section in MR and ER sheet, the verification period date is mentioned wrong.	Verification period date has been corrected in the revised MR and ER sheet	The verification period date is now corrected in all related documents. CAR-06 is closed
7.	/CL-01/	Project emission calculations are not presented in the MR	Project emission calculations are now incorporated in the revised MR	The project emission calculations are now presented in the MR which are checked to be correct. CL-01 is closed
8.	/CL-02/	Emission reduction values shall be compared for increase or decrease in comparison with registered VCS PD for transparency.	Emission reduction values comparison with registered VCS PD is now incorporated in the revised MR	The comparison of achieved emission reduction value and estimated emission reduction as per VCS-PD is now mentioned in the MR. There is no increase from the estimated emission reduction in actual. CL-02 is closed.