Industrie Service

Choose certainty.
Add value.

Verification Report

Vaturu and Wainikasou small-scale hydro project in Fiji Islands

Initial and First Periodic Verification

of the registered CDM project

“Vaturu and Wainikasou Hydro Projects”

Report No. 927374
Revision 4

August 23, 2007

TÜV SÜD Industrie Service GmbH
Carbon Management Service
Westendstr. 199 - 80686 Munich - GERMANY

Industrie Service

Report No.	Date of first issue	Revision	Date of this revision	Certificate No.
927374	February 08, 2007	4	August 23, 2007	-

Subject:	Initial and first Periodic Verification of a CDM Project
Executing Operational Unit:	TÜV SÜD Industrie Service GmbH Carbon Management Service Westendstr. 199 - 80686 Munich, GERMANY
Client:	Sustainable Energy Limited – SEL 2 Marlow Street, Suva, Fiji Islands
Contract approved by:	Werner Betzenbichler
Report Title:	Initial and First Periodic Verification of the registered CDM "Vaturu and Wainikasou Hydro Projects" in Fiji Islands
Number of pages	22 (excluding cover page and annexes)

Summary:

The certification body "Climate and Energy" of TÜV SÜD Industrie Service GmbH has been ordered by Sustainable Energy Limited (SEL) to carry out the initial and the first periodic verification of the registered CDM project "Vaturu and Wainikasou Hydro Projects" in Fiji Islands".

The verifier confirms that the project is implemented as planned and described in validated project design documents. Installed equipment being essential for generating emission reduction runs reliably and is calibrated appropriately. The monitoring system is in place and the project does generate GHG emission reductions.

The verifier can confirm that the GHG emission reduction for the whole monitoring period is calculated without material misstatements. Our opinion relates to the project's GHG emissions and resulting GHG emissions reductions reported and related to the valid and registered project baseline and monitoring, and its associated documents. Based on the information we have seen and evaluated we confirm the following statement:

Reporting period: from June 01, 2005 to October 31, 2006.

Verified emission in the above reporting period:

Baseline Emissions:	18,176 t CO2
Project Emissions :	0 t CO2
Emission Reductions:	18,176 t CO2

The verification team also determined some few areas of risks for the project in the context of the management / operation system and of quality assurance. Issues indicated as "Forward Action Request" should be submitted as indispensable information to the verification team of the next periodic verification.

Work carried out by:	Klaus Nürnberger (project manager) Bratin Roy (GHG auditor)	**Internal Quality Control by:** Werner Betzenbichler

Abbreviations

Abbreviations that have been used in the report here:

CAR	Corrective Action Request
CDM	Clean Development Mechanism
CO2	Carbon Dioxide
DNA	Designated National Authority
EB	CDM-Executive Board at UNFCCC Secreteriat
ERU	Emission Reduction Unit
FAR	Forward Action Request
GHG	Greenhouse Gas
IETA	International Emission Trading Association
IVC	Initial Verification Checklist
JI	Joint Implementation
KP	Kyoto Protocol
MP	Monitoring Plan
MVP	Monitoring and Verification Protocol
PDD	Project Design Document
PPA	Power Purchase Agreement
PVC	Periodical Verification Checklist
SEL	Sustainable Energy Limited
TÜV SÜD	TÜV SÜD Industrie Service GmbH
UNFCCC	UN Framework Convention on Climate Change
VVM	Validation and Verification Manual

Table of Contents

1 INTRODUCTION

Sustainable Energy Limited (SEL) has commissioned an independent verification by TÜV SÜD Industrie Service GmbH (TÜV SÜD) of its registered CDM project "Vaturu and Wainikasou small-scale hydro project in Fiji Islands". The order includes the initial, first and second periodic verification of the project.

Verification is the periodic independent review and ex post determination by the Designated Operational Entity / Independent Entity of the monitored reductions in GHG emissions during the defined verification period.

This report summarizes the findings of the initial and first periodic verification. It is based on the Initial Verification Report Template Version 3.0, December 2003 and on the Periodic Verification Report Template Version 3.0, December 2003, both part of the Validation and Verification Manual (VVM) published by International Emission Trading Association (IETA).

Initial and first periodic verification has been performed as one integrated activity. It consisted of a desk review of the project documents including PDD, monitoring plan, validation report, Monitoring Manual, draft monitoring report (June 2005 – October 2006) and further documentations.

The results of the determination were documented by TÜV SÜD in the validation report: "Vaturu and Wainikasou small-scale hydro project in Fiji Islands", report no. 566495, Revision 02, dated 11. August 2005. This final validation report indicates no remaining issues.

The verification team consists of the following personnel:

Klaus Nürnberger	TÜV SÜD Industrie Service, Munich, Germany	Project Manager, Team Leader
Bratin Roy	TÜV SÜD South Asia, Pune, India	GHG Auditor

1.1 Objective

The objective of verification can be divided in Initial Verification and Periodic Verification:

- Initial Verification:

The objective of an initial verification is to verify that the project is implemented as planned, to confirm that the monitoring system is in place and fully functional, and to assure that the project will generate verifiable emission reductions. A separate initial verification prior to the project entering into regular operations is not a mandatory requirement.

- Periodic Verification:

The objective of the periodic verification is to verify that actual monitoring systems and procedures are in compliance with the monitoring systems and procedures described in the monitoring plan; further more the periodic verification evaluates the GHG emission reduction data and express a conclusion with a high, but not absolute, level of assurance about whether the reported

GHG emission reduction data is free of material misstatements; and verifies that the reported GHG emission data is sufficiently supported by evidence, i.e. monitoring records. If no prior initial verification has been carried out, the objective of the first periodic verification also includes the objectives of the initial verification.

The verification shall consider both quantitative and qualitative information on emission reductions.

Quantitative data comprises the monitoring reports submitted to the verifier by the project entity. Qualitative data comprises information on internal management controls, calculation procedures, and procedures for transfer, frequency of emissions reports, review and internal audit of calculations/data transfers.

The verification is based on criteria set by UNFCCC, the Kyoto Protocol and the CDM modalities and procedures.

1.2 Scope

Verification scope is defined as an independent and objective review and ex post determination by the Designated Operational Entity of the monitored reductions in GHG emissions. The verification is based on the submitted monitoring report and the validated project design documents including its monitoring plan. The monitoring report and associated documents are reviewed against Kyoto Protocol requirements, UNFCCC rules and associated interpretations. TÜV SÜD has, based on the recommendations in the Validation and Verification Manual employed a risk-based approach in the verification, focusing on the identification of significant risks of the project implementation and the generation of CERs.

The verification is not meant to provide any consulting towards the client. However, stated requests for clarifications and/or corrective actions may provide input for improvement of the monitoring activities.

The audit team has been provided with a Monitoring Report in December 14, 2006, covering the period June 2005 to October 2006. Due to the onsite-visits and some comments the Monitoring Report was revised and submitted to the audit team on January 30, 2007. This document serves as the basis for the assessment presented herewith. The first crediting period started also June 1, 2005.

Studying the existing documentation belonging to this project, it was obvious that the competence and capability of the audit team performing the verification has to cover at least the following aspects:

- Knowledge of Kyoto Protocol and the Marrakech Accords
- Environmental and Social Impact Assessment
- Quality assurance
- Technical aspects of hydro power production
- Monitoring technologies and concepts
- Political, economical and technical conditions in host country

According to these requirements TÜV SÜD has composed a project team in accordance with the appointment rules of the TÜV certification body "climate and energy":

Klaus Nürnberger

Klaus Nürnberger is head of the division energy certification at TÜV SÜD Industrie Service GmbH. In his position he is responsible for the implementation of verification and certifications processes for electricity production based on renewable sources. The division has assessed more than 600 plants and sites all over Europe in particular hydro power plants. He has received extensive training in the CDM and JI validation and verification processes and participated already in several CDM and JI project assessments.

Bratin Roy

Bratin Roy is a lead auditor for quality, environment and occupational health and safety management system (according to ISO 9001, ISO 14001 and OHSAS 18001) and an auditor for CDM/JI projects at TÜV South Asia. He holds a master degree in environmental science. He is based in Pune, India. Mr. Roy worked for 8 years as a consultant, trainer and auditor in the field of quality, environment, energy, safety and sustainability management .He has received extensive training in the CDM validation and verification processes and has already participated in several CDM project assessments."

The audit team covers the above mentioned requirements as follows:

- Knowledge of Kyoto Protocol and the Marrakech Accords (ALL)
- Environmental and Social Impact Assessment (ALL)
- Quality assurance (ALL)
- Technical aspects of renewable energy production (Nürnberger)
- Monitoring technologies and concepts (ALL)
- Political, economical and technical conditions in host country (Bratin Roy)

Responsibility for the internal quality control of the project was with Werner Betzenbichler, head of the certification body "climate and energy".

1.3 GHG Project Description

The project involves the implementation of 2 hydro power plants The installed capacity of the two plants is 3 and 6,5 MW_{el} respectively, totalling 9,5 MW_{el}. The water used comes from existing bassins or storage systems. The electricity generated will be sold completely to the national grid. The proposed Vaturu and Wainikasou Hydro Project is located in Fiji, on the main island Viti Levu. The Vaturu power plant is located in Sabeto, Nandi Province approximately 20 km from Nandi town. The Wainikasou power plant is located in the central highlands of Viti Levu in area called Waimala-Naidasiri near Monasavu dam.

Existing water flows will not be impacted as Vaturu projects uses the water of an existing water supply system and as all water into the station Wainikasou is returned to the stilling basin for transfer to Lake Monasavu as per the existence practice. The 1 metre high collapsible weir to be built on top of the existing weir will create more storage but this is not expected to effect the long-term operation of Wainisavulu Creek as the system will be essentially run-of-river with normal overflows during the wet season still occurring"

While SEL is the project owner and the operator of the hydro plant, SEL has assigned the maintenance to Fiji Electricity Authority FEA, the electricity utility in Fiji Island. The monitoring is also done by FEA, Unit Renewable Generation. The monitoring report will be elaborated by Pacific Hydro, commercial department.
SEL has signed a PPA with FEA for the next 15 years.

Participants at the audit were:

Bratin Roy	TUV SUD South Asia,
Mr. Uate Biutanaseva	Unit Leader Renewable Generation, Fiji Electricity authority(FEA)
Mr. Tupou Semesi	Team Leader Renewable Generation, Fiji Electricity authority(FEA)
Mr. Kenn Wood	Civils Manager, Sustainable energy Limited(SEL)

2 METHODOLOGY

Starting the initial verification the verifier's first task has been to familiarize with the project. Based on the received documents (see Annex 1) a verification checklist (VC) has been prepared, consisting of the Initial Verification Checklist (IVC, Table 1), the Periodic Verification Checklist (PVC Table 2-4) according to the VVM and the Compilation of open issues (Table 5).
These combined checklists serve the following purposes:

- it organizes details of the audit procedure and clarifies the requirements the project is expected to meet; and
- it documents how a particular requirement has been validated and the result of the verification.

During the verification a special focus was given to:

- the correct implementation of the project
  (installations, monitoring equipment and procedures, quality assurance procedures)
- the correctness of assumptions with impacts on the monitoring and verification process (e.g. baseline assumptions)
- sustainable development and environmental performance parameters
- training programs
- allocation of responsibilities
- the day-to-day operation of the system

After the document review the audit team conducted

- an on-site inspection at the two hydro power plants
- interviews with the members of the owner and the operator in the office of the geothermal power plant

The findings are the essential part of this verification report, which is based on the verification protocols of the VVM. Those protocols consist of five tables – one from the IVC, three from the PVC and the latest one regarding the Compilation of open issues. The completed protocol is enclosed in Annex 1, Annex 2 and Annex 3 to this report. The structure of the tables is shown in the following:

Initial Verification Checklist – table 1			
OBJECTIVE	Ref.	COMMENTS	Concl. (incl FARs/CARs)
The requirements the project must meet.	Gives reference to the legislation or agreement where the requirement is found.	Description of circumstances and further conclusions.	This is either acceptable based on evidence provided (**OK**)**,** or a **Corrective Action Request (CAR)** of risk or non-compliance with stated requirements. The corrective action requests are numbered and presented to the client in the Verification report. Forward Action Requests (FARs) indicate essential risks for further periodic verifications

Periodic Verification Checklist Table 2: Data Management System/Controls		
Expectations for GHG data management system/controls	Score	Verifiers Comments (including *Forward Action Requests*)
The project operator's data management system/controls are assessed to identify reporting risks and to assess the data management system's/control's ability to mitigate reporting risks. The GHG data management system/controls are assessed against the expectations detailed in the table.	A score is assigned as follows: **Full** all best-practice expectations are implemented. **Partial** a proportion of the best practice expectations is implemented **Limited** this should be given if little or none of the system component is in place.	Description of circumstances and further commendation to the conclusion. This is either acceptable based on evidence provided (**OK**)**,** or a **Corrective Action Request (CAR)** of risk or non-compliance with stated requirements. The corrective action requests are numbered and presented to the client in the Verification report. The Initial Verification has additional Forward Action Requests (FAR). FAR indicates essential risks for further periodic verifications

Periodic Verification Checklist Table 3: GHG calculation procedures and management control testing		
Identification of potential reporting risk	Identification, assessment and testing of management controls	Areas of residual risks

Periodic Verification Checklist Table 3: GHG calculation procedures and management control testing		
Identification of potential reporting risk	Identification, assessment and testing of management controls	Areas of residual risks
Identification of potential reporting risks based on an assessment of the emission estimation procedures. Identification of key source data. Focus on those risks that impact the accuracy, completeness and consistency of the reported data.	Identification of the key controls for each area with potential reporting risks. Assessment of adequacy of the key controls and eventually test that the key controls are actually in operation. Internal controls include, Understanding of responsibilities and roles, Reporting, reviewing and formal management approval of data; Procedures for ensuring data completeness, conformance with reporting guidelines, maintenance of data trails etc.	Identification of areas of residual risks, i.e. areas of potential reporting risks where there are no adequate management controls to mitigate potential reporting risks Areas where data accuracy, completeness and consistency could be improved are highlighted.

Periodic Verification Checklist Table 4: Detailed audit testing of residual risk areas and random testing		
Areas of residual risks	**Additional verification testing performed**	**Conclusions and Areas Requiring Improvement (including *FARs*)**
List of residual areas of risks of Periodic Verification Checklist Table 2 where detailed audit testing is necessary. *In addition, other material areas may be selected for detailed audit testing.*	*The additional verification testing performed is described. Testing may include:* ▪ *Sample cross checking of manual transfers of data* ▪ *Recalculation* ▪ *Spreadsheet 'walk throughs' to check links and equations* ▪ *Inspection of calibration and maintenance records for key equipment* ▪ *Check sampling analysis results* *Discussions with process engineers who have detailed knowledge of process uncertainty/error bands.*	*Having investigated the residual risks, the conclusions are noted here. Errors and uncertainties are highlighted.*

Two CARs and one CR were encountered during the verification process. Further, the verification team has defined FARs, whenever

- the current status requires a special focus on this item for the next consecutive verification, or
- an adjustment of the MVP is recommended.

All FARs have to be reported to the verification team of the next Periodic Verification, which has to take into account all such findings.

Duration of the verification

Preparations: from December 12, 2006 to January 8, 2007

On-site verification: January 9, 2007 to January 12, 2007

Monitoring Period:

From June 1, 2005 to October 31, 2006

2.1 Review of Documentation and Site Visits

The verification was performed as a desk review of the project documents including PDD, monitoring plan, validation report, draft monitoring report (December 2006 – January 2007) and further documentations. The results of the validation were documented by TÜV SÜD in the validation report: "Vaturu and Wainikasou small-scale hydro project in Fiji Islands", report no. 566495, rev. 2, dated 11.08.2005. This validation report indicates no remaining issues.

The site visit included an on-site inspection at the hydro power plants, interviews with the responsible unit being responsible for monitoring and the local staff, being responsible for operation and maintenance of the plant.

2.2 Resolution of Corrective and Forward Action Requests

The objective of this phase of the verification was to resolve the requests for corrective actions and any other outstanding issues which needed to be clarified for TÜV SÜD`s positive conclusion on the GHG emission reduction calculation. Quality and accuracy of the data and documents presented during the on site visit was high and nevertheless CARs have to be reported. Four Forward Action Requests are defined for issues which do not effect the generation of emission reduction in the verified period, but shall be improved in order to ensure the reliability of future data. To guarantee the transparency of the verification process, the FARs raised and responses that have been given are summarized in chapter 3 below and documented in more detail in the verification protocol in annex 1 and 2.

3 INITIAL VERIFICATION FINDINGS

In the following sections the findings of the verification are stated. The verification findings for each verification subject are presented as follows:

The findings from the desk review of the final monitoring report and the findings from interviews during the follow up visit are summarized. A more detailed record of these findings can be found in the Verification Protocol in annex 1.

1) Where TÜV SÜD had identified issues that needed clarification or that represented a risk to the fulfillment of the project objectives, a Corrective or Forward Action Request, respectively, have been issued. The Corrective and Forward Action Requests are stated, where applicable, in the following sections and are further documented in the Verification Protocol in annex 1. The verification of the project resulted in four Forward Action Requests. Two Corrective Action Requests were raised.

2) In the context of Forward Action Requests, risks have been identified, which may endanger the delivery of high quality CERs in the future, i.e. by deviations from standard procedures as defined by the MP. As a consequence, such aspects should receive a special focus during the next consecutive verification. A FAR may originate from lack of data sustaining claimed emission reductions. Forward Action Requests are understood as recommendation for future project monitoring; they are stated, where applicable, in the following sections and are further documented in the Verification Protocol in annex 1.

3) The final conclusions for verification subject are presented.

The verification findings relate to the project implementation as documented and described in the final monitoring report.

3.1 Remaining issues, CARs, FARs from validation

One task of verification is to check the remaining issues from the previous validation or issues which are clearly defined for assessment in the PDD. The validation report, prepared by TÜV SÜD notes no open issues.

3.2 Project Implementation

3.2.1 Discussion

The scrutiny of a implementation of a project according to the information given in the validated PDD is a key issue of an Initial Verification, in order to have a climate change project ready for successful operation. The proposed development involves the implementation of two small hydro power plants.

The project has been implemented as defined in the PDD and there is no change in the major equipments. The installed capacities of 3 and 6,5 MW_{el} correspond to the data in the PDD.

The civil work has been done by Downer Engineering, New Zealand. The turbine is from Voith ESAC. Control panels and meters are supplied by reputed suppliers. All the meters are Landis and Gyr , Switzerland make. The implemented technical equipment can be regarded as state-of-the art.

The water is really coming from existing bassins or storage systems. The hydro power plant Vaturu is using the drinking water supply system and Wainikasou can be regarded as run-of-river power plant. The electricity generated is fed into the national grid.

The installed measurements for monitoring the project are conform to the requirements mentioned in the monitoring plan of the PDD and comparable to the measurements we find in new hydro power plants in Western Europe.

Despite of the fact that the physical implementation of the project and its technical equipment was more or less in line with to the foreseen schedule in the PDD in particular the full operation of Vaturu was delayed.
The Vaturu hydro power plant did not run at the beginning at its fullest capacity regularly due to discovered rocks in the pipeline which needed to shutdown the machine. In September 2006 a rocktrap was installed and made operational. Still after this the station was able to generate using the full flow into the hydro power plant. Now they are equipped with all spare parts and separate maintenance team takes care of the same.

The Wainikasou hydro power project has one main meter which indicates both export and import of power in. The meter number is HM00003. In Vaturu Project, there are one meter for export power generation and a separate meter for import power. Meters numbers are HM00023 and 58759687. All meters are of Landis and Gyr, Switzerland.
The meters are installed in the control panels in sheet steel enclosures. The cables entering this enclosure are routed through cable trenches.
No fault has occurred in the export and import meters from the date of installation May 2004 in Wainikasou and January 2006 in Vaturu.

The export and import meter which are at substation have been calibrated by the supplier of the meters originally. The meter of the Wainikasou project has been installed in April 2005 and the meters of the Vaturu project have been installed in January 2006. Till date, no malfunctioning of the meters has been recorded.

3.2.2 Findings

None

3.2.3 Conclusion

The project complies with the requirements.

3.3 Internal and External data

3.3.1 Discussion

There are no variable external data. Since a Simple Operational Margin (OM) and an ex-ante Build Margin (BM) are used, the methodology ASM I.D. Renewable electricity generation for a grid. does not require any related variables to be monitored *during* the crediting period.

The following internal data are needed to calculate the emission reductions:

- Electrical energy delivered to the grid (in MWh); metered continuously
- Electrical energy supplied from the grid (in MWh); metered continuously

The data of the electricity meter were read weekly and transferred by email or phone to Mr. Uate Biutanaseva, Unit Leader Renewable Generation, Fiji Electricity Authority who is elaborating the monthly report. The monthly reports are sent to SEL board for final review and approval. The monitoring report is carried out by Pacific Hydro Pty. Ltd. .

The audit team can confirm that the used management and operational system is appropriate and is not in the contrary to the validated PDD. All of above data are stored in a logbook where a proper table is prepared and in the monthly report. The monthly report is archived as hard copy and electronically. Predefined algorithms are used to compute the entry values into the final emission reduction results.

Plausibility checks and experience allows detecting apparent misreading or transmission errors. The audit team did not spot any wrong data. There is however not yet a well documented process how to assure the quality of the CDM monitoring reports, especially the definitions of responsibilities and authorities.

Based on the operation experiences of the past year and of the verification audit it is recommended to define and introduce appropriate routines before the end of the next verification period.

3.3.2 Findings

OBJECTIVE	COMMENTS	Concl.
Documentation (IVC C.4.)	**Corrective Action Request No. 1**: The metering technician conveyed the reading to Mr. Uate by telephone or email. The technician records the reading in their own diary which can not be traceable for all the month. A separate log book or register must be maintained at the site for the record of the reading of the meter which can be verified at later stage if needed.	CAR#1
Documentation	**Clarification Request #1:** As per Section D.3. Table 4 of PDD, the meter reading recording	CR#1

OBJECTIVE	COMMENTS	Concl.
(IVC C.4.)	frequency is daily. Please explain, why the recording frequency is lowered?	
Documentation (IVC C.5.)	**Forward Action Request No.1:** Please submit the original calibration certificate given by the supplier for the meters in Wainikasou and Vaturu project sites.	FAR#1
Documentation (IVC C.5.)	**Forward Action Request No.2:** A documented procedure for calibration of meters indicating the frequency, accuracy of meters and methods of calibration needs to be established.	FAR#2

3.3.3 Conclusion

Re CAR#1: Mr. Uate Biutanaseva, FEA has confirmed that a metering log book is in place for each station. A scanned template was provided to the audit team. Hence this issue is considered to be resolved.

Re CR#1: FEA explained to the audit team, that the daily reading meter is a big effort due to remote power plant of Wainikasou. The weekly reading can be combined with the weekly servicing for each site. It is acceptable and reasonable to read the meter weekly, despite of the fact that daily is mentioned in the PDD. In the worst case the monitored production is lower than the real one, while an overestimation can be excluded as result of plausibility checks and the calibration records. Therefore TÜV SÜD requested EB to accept this deviation. The EB decided to accept the request for deviation for the monitoring period in request and instruct the DOE to apply an approved revised monitoring plan for future monitoring periods. Approval was given at EB-32 (see CDM-EB-32 meeting-report, para. 81). This issue is considered to be resolved.

The issues of the indicated Forward Action Requests have had no influence on the emission reduction results of the verified period. Fulfillment of these requests will be checked at the next periodic verification.

The project complies with the requirements.

3.4 Environmental and Social Indicators

3.4.1 Discussion

No environmental and social indicators are defined in the monitoring plan. No additional negative environmental and social indicators were identified.

3.4.2 Findings

None

3.4.3. Conclusion

The project complies with the requirements.

3.5 Management and Operational System

3.5.1 Discussion

While SEL is the project owner and the operator of the hydro plant, SEL has assigned the maintenance to Fiji Electricity Authority FEA, the electricity utility in Fiji Island. The monitoring is also done by FEA, Unit Renewable Generation. The monitoring report will be elaborated by Pacific Hydro, commercial department.

During verification, it was observed that the relevant documents and records are maintained to monitor the operation controls.

Meter is monitored by technician of metering team of the renewable The metering technician conveyed the reading to Mr. Uate Biutanaseva, Unit Leader Renewable Generation, Fiji Electricity Authority by telephone or email. A separate log book or register for the record of the reading of the record did not really exist when the onsite verification took place.

Generation team weekly and at the end of month consolidates the data in a spread sheet by Mr. Uate. The monthly report is send to SEL board for final review and approval. The chances of misstatement are not present in general.
Finally the monitoring report is elaborated by Pacific Hydro based in Melbourne, Australia, where Michael Wilson is responsible for.

Data are archived in the physical forms and then stored electronically.

However SEL does not have a documented procedure for monitoring and measurement and quality assurance of process parameters which defines responsibilities and authorities (Monitoring Plan and Monitoring Manual).

The overall authority of the project is personally supervised by Mr. Uate Biutanaseva, Unit Leader Renewable Generation, Fiji Electricity Authority(FEA). All the maintenance and operational related issues is supervised by Mr. Tupou Semesi, Team Leader Renewable Generation, FEA and his team. Mr. Tupou and Mr. Uate are trained engineers with large experience in operation and maintenance of the plant and academically qualified to carry out the task. The entire technicians at project site are qualified electrical engineer with more than 5 years of experience. In addition Mr. Uate is responsible to maintain all the meter reading and export and import summary all fuel related parameters with the assistance of metering person. The metering team is headed by Mr. Sandeep D Silva , who is a qualified engineer. He also received training from meter supplier additionally on the maintenance of the particular type of meter.

Quality assurance systems are in place as for example the metering reports are reviewed for accuracy and correctness by SEL Board members before submission. Members are made aware of the quality assurance procedures.

The responsibilities were clearly explained and are also operational.

Fallback solutions are not provided yet in case of instrument failures. There is not yet an explicit procedure related to unexpected data access / data quality problems.

3.5.2 Findings

The verifier identified following findings related to the Initial Verification Checklist V.3.0 of the VVM, annex "Initial Verification" objectives G1, G5, G7, and related to the Periodic Verification Checklist V.3.0 of the VVM, annex 3.2.

OBJECTIVE	COMMENTS	Concl.
Monitoring report (IVC G.6.)	**Corrective Action Request No. 2:** The baseline emissions and project emissions should be estimated and also indicated in the monitoring report. Emission reductions are calculated by deducting the project emissions from the baseline emissions.	CAR#2
Monitoring report (IVC G.6.)	**Corrective Action Request No. 3:** In the table of Monitoring report some typographical error has been incurred. The starting and closing data of energy import of the monitoring table for the month of November'05, December'05, February '06, March'06 for Wainikasau project and July'06 and August'06 of Vaturu project needs to be corrected. However, there is no error in total electricity import and import reporting.	CAR#3
Monitoring report (IVC G.6.)	**Corrective Action Request No. 4:** Table of the monitoring report for the Vaturu Hydropower station indicate about only one meter HM00023. However, there are two separate meter exist in the site for export and import monitoring.	CAR#4
Internal audits and management review (IVC G7)	**Forward Action Request No.3** The company does not have a documented procedure for monitoring and measurement and quality assurance of process parameters which defines responsibilities and authorities. Please submit the same.	FAR#3
Troubleshooting procedures (IVC C11)	**Forward Action Request No. 4** No standby meter is available in the site. Please clarify the procedure of determination/estimation of the production in the event of main meter failure.	FAR#4

3.5.3 Conclusion

Due to the above mentioned corrective action requests the monitoring report was revised accordingly. The above discussed issues are considered to be resolved.

The issues of the indicated Forward Action Requests have had no influence on the emission reduction results of the verified period. Fulfillment of these requests will be checked at the next periodic verification.

Quality assurance systems are in place. The operational staff is made aware of the quality assurance procedures. The responsibilities are operational in a proper way.

Fallback solutions are not provided yet in case of instrument failures. There is not yet an explicit procedure related to unexpected data access / data quality problems.

Nevertheless at present no negative impact is visible on the quality and reliability of the calculation of emission data. Resolving above mentioned FARs within the following verification period will help to keep and document the present standard.

The project complies with the requirements.

Periodic Verification Findings

3.6 Completeness of Monitoring

3.6.1 Discussion

The reporting procedures reflect the monitoring plan completely. All parameters were determined as prescribed.

The submitted "workbook" is based on figures resulting from accumulative metering and monthly invoicing of the generated electricity. This is state of the art business and enables to deliver high quality data for the determination of emission reduction. As the monitoring plan requires a recording frequency of daily figures a breakdown own monthly figures to equal daily shares has been conducted in the workbook. Therefore daily figures are presented by the attached file. This does not result in any loss of essential information as log book readings are available to identify potential events.

No changes to the monitoring plan are required.

3.6.2 Findings

None.

3.6.3 Conclusion

The project complies with the requirements, assuming appropriate handling of FARs in the ongoing verification period.

3.7 Accuracy of Emission Reduction Calculations

3.7.1 Discussion

Due to the approved methodology there is no need to make corrections for data uncertainty. The audit team confirms that emission reduction calculations have been performed according to the Monitoring Plan and to the calculation methodology reported in the Monitoring Report..

3.7.2 Findings

None.

3.7.3 Conclusion

The project complies with the requirements, assuming appropriate handling of FARs in the ongoing verification period.

3.8. Quality of Evidence to Determine Emission Reductions

3.8.1 Discussion

Concerning verification the calculation of emission reductions is based on internal data (the external grid emission factor is fixed). The origin of those data was explicitly checked. Further on, entering and processing of those data in the monitoring workbook Excel sheet was checked.

Inspection of calibration and maintenance records for key equipment was performed for all relevant meters.

The manual transfer of data was checked on a random basis. Electricity production was checked against meter values and the monthly invoices which again are based onto the data of the FEA.

The observations of the auditing team left no doubt that the monitoring process operates in a proper way.

3.8.2 Findings

None.

3.8.3 Conclusion

The project complies with the requirements, assuming appropriate handling of FARs in the ongoing verification period.

3.9 Management System and Quality Assurance

3.9.1 Discussion

Due to the straightforward approach for calculating GHG emission reductions the existing management system is appropriate and quality assurance is guaranteed. There are some areas where improvement is needed; those are listed in section 3.5.

3.9.2 Findings

No additional findings as already mentioned in section 3.5.

3.9.3 Conclusion

The project complies with the requirements, assuming appropriate handling of FARs in the ongoing verification period.

4. PROJECT SCORECARD

The conclusions on this scorecard are based on the revised CDM monitoring report.

Risk Areas		Conclusions			Summary of findings and comments
		Baseline Emissions	Project Emissions	Emission Reductions	
Completeness	Source coverage/ boundary definition	✓	✓	✓	All relevant sources are covered by the monitoring plan and the boundaries of the project are defined correctly and transparently.
Accuracy	Physical Measurement and Analysis	✓	✓	✓	State-of-the-art technology is applied in an appropriate manner. Appropriate back-up solutions has to be provided.
	Data calculations	✓	✓	✓	Emission reductions are calculated correctly.
	Data management & reporting	✓	✓	✓	Data management and reporting were found to be satisfying. Potential for improvement is indicated by the mentioned FARs.
Consistency	Changes in the project	✓	✓	✓	Results are consistent to underlying raw data.

5 VERIFICATION STATEMENT

TÜV SÜD Industrie Service GmbH has performed an initial and first periodic verification of the registered CDM project: **"Vaturu and Wainikasou Hydro Projects"** in Fiji Islands. The verification is based on requirements of the UN Framework Convention on Climate Change (UNFCCC). In this context, the relevant documents are the "Marrakech Accords".

The management of SEL and FEA is responsible for the preparation of the GHG emissions data and PHL reported GHG emissions reductions on the basis set out within the document "Monitoring Report; period 1 June 2005 up to 31 October 2006".

The verifier confirms that the project is implemented as planned and described in the validated project design document. For the Vaturu Project some delays occurred due to rocks in the pipeline. Meanwhile the installed equipment being essential for generating emission reduction and for metering the data defined in the monitoring plan runs reliably and is calibrated appropriately. The monitoring system is in place and the project generates GHG emission reductions according to the approved methodology.

The verifier can confirm that the GHG emission reduction is calculated without material misstatements for the whole monitoring period.

Our opinion relates to the project's GHG emissions reductions reported and related to the valid project baseline and monitoring, and its associated documents.

Based on the information we have seen and evaluated, we confirm the following statement:

Reporting period: from June 01, 2005 to October 31, 2006.

Verified emission in the above reporting period:

Baseline Emissions:	18,176 t CO2
Project Emissions :	0 t CO2
Emission Reductions:	**18,176 t CO2**

The verification team also determined some areas of risks for the project in the context of the management system. Those issues indicated as "Forward Action Request" and should be submitted as indispensable information to the verification team of the next periodic verification.

Munich, August 23, 2007

Castro Javier
Deputy head of certification body „Climate and Energy"

Klaus Nürnberger
Project manager

6 REFERENCES

Category 1 Documents:

Documents provided by the Client that relate directly to the GHG components of the project. These have been used as direct sources of evidence for the initial verification conclusions.

1-1	PDD "VATURU AND WAINIKASOU HYDRO PROJECTS, FIJI", July 2005; Prepared by EcoSecurities Ltd.
1-2	Validation Report: "VATURU AND WAINIKASOU HYDRO PROJECTS, FIJI", report no. 566495, rev. 02, TUV Industrie Service, TÜV SÜD Group, August 2005
1-3	CDM Monitoring Report VATURU AND WAINIKASOU HYDRO PROJECTS, FIJI; period 1 June 2005 – 31 October 2006. submitted December 14, 2006
1-4	Spread Sheets of the VATURU AND WAINIKASOU HYDRO PROJECTS, FIJI.
1-5	Export invoices with corresponding meter reading for Wainikasou project.(January 05-December 06).
1-6	Export invoices with corresponding meter reading for Vaturu project.(February 06-Decemebr 06).
1-7	Import Bills for Wainikasou project.(February 05-Decemeber 06).
1-8	Import Bills for Vaturu project.(December 05- December 06).
1-9	CDM Monitoring Report VATURU AND WAINIKASOU HYDRO PROJECTS, FIJI ; period 1 June 2004 – 31 October 2006, submitted December 12, 2006
1-10	CDM Monitoring Report VATURU AND WAINIKASOU HYDRO PROJECTS, FIJI ; period 1 June 2005 – 31 October 2006; final version January 30, 2007

Category 2 Documents:

Background documents related to the design and/or methodologies employed in the design or other reference documents. These documents have been used to cross-check project assumptions and confirm the validity of information given in the Category 1 documents and in verification interviews.

2-1	Copy of confirmation of payment received against the export invoices raised.9June 06-Decemebr 06).
2-2	Copy of summary table of maintenance manual.
2-3	Copy of lease agreement between The Native Land Trust Board and SEL.
2-4	Copy of Stake holder consultation for Vaturu project.

Table 1: Initial Verification Checklist

OBJECTIVE	Ref.	COMMENTS	Concl.(incl FARs/CARs)
A. Opening Session			
A.1. Introduction to audits	1-1 1-2 1-3	The intention and the target of the audit were illustrated to the participants of the audit. Participants at the audit were the following persons: Verification team: Bratin Roy TUV SUD South Asia. Interviewed persons: Mr. Uate Biutanaseva Unit Leader Renewable Generation, Fiji Electricity authority(FEA) Mr. Tupou Semesi Team Leader Renewable Generation, Fiji Electricity authority(FEA) Mr. Kenn Wood Civils Manager, Sustainable energy Limited(SEL)	☑

OBJECTIVE	Ref.	COMMENTS	Concl.(incl FARs/CARs)
A.2. Clarification of access to data archives, records, plans, drawings etc.	1-3 1-4 1-5 1-6 1-6 1-8	The verification team got open access to all required plans, data, records, drawings and to all relevant facilities.	☑
A.3. Contractors for equipment and installation works *Who has installed the equipment? Who was contracted for planning etc.?*	1-1 1-2	Project has been implemented as defined in the PDD and there is no change in the major equipments. The civil work has been done by Downer Engineering, New Zealand. The turbine is from Voith ESAC. Control panels and meters are supplied by reputed suppliers. All the meters are Landis and Gyr , Switzerland make.	☑
A.4. Actual status of installation works *Project installation should be finished at time of initial verification in so far as the project should be ready to generate emission reductions afterwards.*	1-1 1-2 1-3	Project has been fully implemented as defined in the PDD. During this period of June 1, 2005 to October 31 net electricity export to grid is 27,407.47 MWh. Despite of the fact that the physical implementation of the project and its technical equipment was in line with to the foreseen schedule in the PDD in particular the commissioning of Vaturu was delayed. The Vaturu hydro power plant did not run at the beginning at its fullest capacity regularly due to some maintenance problems in some spare parts. Now they are equipped with all spare parts and separate maintenance team takes care of the same.	☑

OBJECTIVE	Ref.	COMMENTS	Concl.(incl FARs/CARs)
B. Open issues indicated in validation report *Especially in projects which are not yet registered at CDM-EB or JI-SB, there might be some outstanding issues which should have been indicated by the validation report.*			
B.1. Missing steps to final approval	1-2	Based on the validation report the verification team identified no missing steps. The project has been registered under the CDM under the registration number 0089.	☑
C. Implementation of the project *This part is covering the essential checks during the on-site inspection at the project's site, which is indispensably for an initial verification*			
C.1. Physical components *Check the installation of all required facilities and equipment as described by the PDD.*	1-1	Project has been implemented as defined in the PDD and there is no change in the major equipments. The civil work has been done by Downer Engineering, New Zealand. The turbine is from Voith ESAC. Control panels and meters are supplied by reputed suppliers. All the meters are Lendis and Gyr , Switzerland make.	☑
C.2. Project boundaries *Check whether the project boundaries are still in compliance with the ones indicated by the PDD.*	1-1	Yes the project boundaries are as defined in the PDD.	☑

OBJECTIVE	Ref.	COMMENTS	Concl.(incl FARs/CARs)
C.3. Monitoring and metering systems *Check whether the required metering systems have been installed. The meters have to comply with appropriate quality standards applicable for the used technology.* P*lease read and indicate meter number, meter constant, meter unit, accuracy, supplier and current meter values at on-site (if the meter has the historical values available please read also values from end of 2005, and end of Oct. 2006)*	1-1 1-3	The plant has one main meter which indicates both export and import of power in Wainikasou hydo power project. The meter number is HM00003.In Vaturu Project, there are one meter for export power generation and a separate meter for import power. Meters numbers are HM00023 and 58759687.All meters are of Landis and Gyr, Switzerland. The meters are installed in the control panels in sheet steel enclosures. The cables entering this enclosure are routed through cable trenches.	☑
C.4. Data uncertainty *How will data uncertainty be determined for later calculations of emission reductions? Is this in compliance with monitoring and metering equipment?*	1-1 1-2 1-3 1-4 2-1	No fault has occurred in the export and import meters from the date of installation May 2004 in Wainikasou and January 2006 in Vaturu. Meter is monitored by technician of metering team of the renewable Generation team weekly and at the end of month data is consolidated in a spread sheet by Mr. Uate Biutanaseva, Unit Leader Renewable Generation, Fiji Electricity Authority. The monthly report is send to SEL board for final review and approval. The chances of misstatement are not present in general. **Corrective Action Request No. 1**: The metering technician conveyed the reading to Mr. Uate by telephone or email. The technician records the reading in their own diary which can not be traceable for all the month. A separate log book or register must be maintained at the site for the	CAR 1 CR1

OBJECTIVE	Ref.	COMMENTS	Concl.(incl FARs/CARs)
		record of the reading of the meter which can be verified at later stage if needed. **Clarification Request #1:** As per Section D.3. Table 4 of PDD, the meter reading recording frequency is daily. Please explain, why the recording frequency is lowered?	
C.5. Calibration and quality assurance *Check how monitoring and metering systems are subject to calibration and quality assurance routines* *a) with installation* *b) during future operation*	1-1 1-2 1-3 2-2	The export and import meter which is at substation has been calibrated by the supplier of the meters originally. The meter of the Wainikasou project has been installed in April 2005 and the meters of the Vaturu project have been installed in January 2006. Till date, no malfunctioning of the meters has been recorded. **Forward Action Request No.1:** Please submit the original calibration certificate given by the supplier for the meters in Wainikasou and Vaturu project sites. **Forward Action Request No.2:** A documented procedure for calibration of meters indicating the frequency, accuracy of meters and methods of calibration needs to be established.	FAR 1 FAR2
C.6. Data acquisition and data processing systems	1-1 1-2	Meter is monitored by technician of the metering team of renewable Generation team weekly and at the end of month data is consolidated by	☑

OBJECTIVE	Ref.	COMMENTS	Concl.(incl FARs/CARs)
Check the eligibility of used systems.	2-1	Mr. Uate Biutanaseva, Unit Leader Renewable Generation in a spread-sheet. The monthly report is send to SEL board for final review and approval. See C.4	
C.7. Reporting procedures *Check how reports with relevance for the later determination of emission reductions will be generated*	1-1 1-2 1-3 2-1	Meter is monitored by technician of the metering team of renewable Generation team weekly and at the end of month data is consolidated by Mr. Uate Biutanaseva, Unit Leader Renewable Generation in a spread-sheet. The monthly report is send to SEL board for final review and approval.	☑
C.8. Documented instructions *Check whether the personnel performing tasks with sensitivity for the monitoring of emission reductions have access and knowledge of documented instructions, forming a part of the project's management system.*	1-3 1-4 1-5 1-6 1-7 1-8 2-1 2-2	During verification, it was observed that the documents and records are maintained to monitor the operation controls: • Import Bills • Export Bills • Meter reading of generation meter and import meter • Confirmation of payment receipt against the export • Operational guidelines The records were verified for the monitoring period. **Forward Action Request No.3** The company does not have a documented procedure for monitoring and measurement and quality assurance of process parameters which defines responsibilities and authorities. Please submit the same.	FAR 3

OBJECTIVE	Ref.	COMMENTS	Concl.(incl FARs/CARs)
C.9. Qualification and training *Check whether the personnel performing tasks with sensitivity for the monitoring of emission reductions has the appropriate competences, capabilities and qualifications to ensure the required data quality.*	1-1 1-2	The overall authority of the project is personally supervised by Mr. Uate Biutanaseva, Unit Leader Renewable Generation, Fiji Electricity Authority(FEA). All the maintenance and operational related issues is supervised by Mr. Tupou Semesi, Team Leader Renewable Generation, FEA and his team. Mr. Tupou and Mr. Uate are trained engineers with large experience in operation and maintenance of the plant and academically qualified to carry out the task. The entire Technicians at project site are qualified electrical engineer with more than 5 years of experience. In addition Mr. Uate is responsible to maintain all the meter reading and export and import summary all fuel related parameters with the assistance of metering person. The metering team is headed by Mr. Sandeep D Silva , who is a qualified engineer. He also received training from meter supplier additionally on the maintenance of the particular type of meter.	☑
C.10. Responsibilities *Check whether all tasks required to gather data and prepare a monitoring report with the necessary quality have been allocated to responsible employees.*	1-1 1-2	See comment above.	☑
C.11. Troubleshooting procedures *Check whether there are possibilities of redundant data monitoring in case of having problems with the used monitoring equipment. Such procedures may reduce risks for the buyers of emission reductions (e.g. the Client)*	1-1	**Forward Action Request No. 4** No standby meter is available in the site. Please clarify the procedure of determination/estimation of the production in the event of main meter failure.	FAR 4

OBJECTIVE	Ref.	COMMENTS	Concl.(incl FARs/CARs)
		For regular operation of hydropower project, a detailed maintenance manual DT-0003/0 is available and the same has been followed by the maintenance team.	
D. Internal Data *Identifying the internal GHG data sources and ways in which the data have been collected, calculated, processed, aggregated and stored should be part of initial verification to assess accuracy and reliability of the internal GHG data..*			
D.1. Type and sources of internal data *Acquire information on type and source of internal GHG data, which is used in calculations of emission reductions. E.g..” continuous direct measurements”, “site-specific correlations”, “periodic direct measurements”, “use of models” and/or “use of default emissions factors”.*	1-1 1-2 1-3 1-5 1-6 1-7 1-8	The following internal parameters need to be obtained according to the monitoring plan: • Net Electricity generation continuously measured by calibrated export and import meters **See Also C.4.** **CAR 1**	☑
D.2. Data collection *How is data collected and processed? What are the means of quantifying emissions from the different data sources?*	1-1 1-2 1-3 1-5 1-6 1-7 1-8	Meter is monitored by technician of the metering team of renewable Generation team and at the end of month data is consolidated by Mr. Uate Biutanaseva, Unit Leader Renewable Generation in a spread sheet. The monthly report is send to SEL board for final review and approval.	☑

OBJECTIVE	Ref.	COMMENTS	Concl.(incl FARs/CARs)
D.3. Quality assurance *Does internal data collection underlie sufficient quality assurance routines?*	1-1 1-2 1-3	Quality assurance systems are in place as for example the metering reports are reviewed for accuracy and correctness by SEL Board members before submission. Members are made aware of the quality assurance procedures. See also C.8.	☑
D.4. Significance and reporting risks *Assess the significance and reporting risks related to the different internal data sources. Potential reporting risks may be related to the calculation methods, accuracy of data sources and data collection and/or the information systems from which data is obtained. The significance of and risks associated with the data source indicate the level of verification effort required at a later stage.*	1-1, 1-3	Meter is monitored by technician of the metering team of the renewable Generation team and at the end of month data is consolidated by Mr. Uate Biutanaseva, Unit Leader Renewable Generation, Fiji Electricity Authority. The monthly report is send to SEL board for final review and approval. The chances of misstatement are not present.	☑
E. External Data *Especially for data of baseline emissions there might be the necessity to include external data sources. The access to such data and a proof of data quality should be part of initial verification. If it is deemed to be necessary, an entity delivering such data should be audited.*			
E.1. Type and sources of external data *Acquire information on type and source of external data, which is used in calculations of emission reductions*	1-1	No use is made of external data during monitoring. Hence the question is not applicable.	☑
E.2. Access to external data	1-1	See E.1.	☑

OBJECTIVE	Ref.	COMMENTS	Concl.(incl FARs/CARs)
How is data transferred? How can reproducibility of data set be ensured?			
E.3. Quality assurance *Does external data underlie any quality assurance routines?*	1-1	See E.1.	☑
E.4. Data uncertainty *Is it possible to assess the data uncertainty of external data? Are such routines included in reporting procedures?*	1-1	See E.1.	☑
E.5. Emergency procedures *Are there any procedures which will be applicable if there is no access to relevant external data?*	1-1	See E.1.	☑
F. Environmental and Social Indicators *A Monitoring Plan may comprise environmental and/or social indicators which could be necessary to monitor for the success of the project activity.*			
F.1. Implementation of measures *A project activity may demand for the installation of measures (e.g. filtering systems or compensation areas), which are exceeding the local legal requirements. A check of the implementation or realization of such measures should be part of the initial verification.*	1-1, 2-3 2-4	No environmental and social indicators are defined in the monitoring plan. Hence the question is not applicable. Client has conducted Environment Impact Assessment for both the project. No negative environmental impacts expected from the project related to air, water and land contamination.	☑

OBJECTIVE	Ref.	COMMENTS	Concl.(incl FARs/CARs)
		Extensive stakeholder consultation has also been undertaken for both of the project. The entire stakeholder has given approval for the project without any major comment.	
F.2. Monitoring equipment *Check where necessary whether the required metering systems have been installed. The meters have to comply with appropriate quality standards applicable for the used technology.*	1-1 2-3 2-4	See F.1.	☑
F.3. Quality assurance procedures *What quality assurance procedures will be applied for such data?*	1-1 2-3 2-4	See F.1.	☑
F.4. External data *Check the quality, reproducibility and uncertainty of external data.*	1-1 2-3 2-4	See F.1.	☑
G. Management and Operational System *In order to ensure a successful operation of a Client project and the credibility and verifiability of the ERs achieved, the project must have a well defined management and operational system.*			
G.1. Documentation *The system should be documented by manuals and instructions for all procedures and routines with relevance to the quality of emission reductions. The*	1-1, 1-2, 1-3	See C.8.	☑

OBJECTIVE	Ref.	COMMENTS	Concl.(incl FARs/CARs)
accessibility of such documentations to persons working on the project has to be secured.			
G.2. Qualification and training *The system should describe the requirements on qualification and the need of training programs for all persons working on the emission reduction project. Performed training programs and certificates should be archived by the system.*	1-1, 1-3	The overall authority of the project is personally supervised by Mr. Uate Biutanaseva, Unit Leader Renewable Generation, Fiji Electricity Authority(FEA). All the maintenance and operational related issues is supervised by Mr. Tupou Semesi, Team Leader Renewable Generation, FEA and his team. Mr. Tupou and Mr. Uate are trained engineers with large experience in operation and maintenance of the plant and academically qualified to carry out the task. The entire Technicians at project site are qualified electrical engineer with more than 5 years of experience. In addition Mr. Uate is responsible to maintain all the meter reading and export and import summary all fuel related parameters with the assistance of metering person. The metering team is headed by Mr. Sandeep D Silva , who is a qualified engineer. He also received training from meter supplier additionally on the maintenance of the particular type of meter.	☑
G.3. Allocation of responsibilities *The allocation of responsibilities should be documented in written manner.*	1-1, 1-3	Person working at plant are aware of their responsibilities. However a documented procedure of the same will be more useful. See Chapter C.8	☑
G.4. Emergency procedures *The system should contain procedures which provide emergency concepts in case of unexpected problems with data access and/or data quality.*	1-1, 1-3	In General. See C.11. FAR 4.	☑
G.5. Data archiving *The system should provide routines for the archiv-*	1-1, 1-3	Data are archived in the physical forms and then stored electronically.	☑

OBJECTIVE	Ref.	COMMENTS	Concl.(incl FARs/CARs)
ing of all data which is required for verifying the project's performance in the context of consecutive verifications.			
G.6. Monitoring report *The system includes procedures for the calculation of emission reductions and the preparation of the monitoring report.*	1-1, 1-3	Calculations are laid down in the monitoring report. As the approach to calculate the emission reduction is a simple method of net electricity export to grid times the emission factor determined in the PDD such an approach is deemed to be acceptable. However , following points needs to be corrected: **Corrective Action Request No. 2:** The baseline emissions and project emissions should be estimated and also indicated in the monitoring report. Emission reductions are calculated by deducting the project emissions from the baseline emissions. **Corrective Action Request No. 3:** In the table of Monitoring report some typographical error has been incurred. The starting and closing data of energy import of the monitoring table for the month of November'05, December'05, February '06, March'06 for Wainikasau project and July'06 and August'06 of Vaturu project needs to be corrected. However, there is no error in total electricity import and import reporting. **Corrective Action Request No. 4:** Table of the monitoring report for the Vaturu Hydropower station indicate about only one meter HM00023. However, there are two separate	CAR 2 CAR 3 CAR 4

OBJECTIVE	Ref.	COMMENTS	Concl.(incl FARs/CARs)
		meter exist in the site for export and import monitoring.	
G.7. Internal audits and management review *The system includes internal control procedures, which allow the identification and solution of problems at an early stage.*	1-1, 1-2, 1-3	No CDM specific internal audits are required as such because the monitoring and measurement of power exports and imports are done diligently every month as core business if the company and hence a permanent control of the figures in Export and Import Meter readings as well as invoices raised takes place.	☑

Table 2: PVC; Data Management System/Controls

The project operator's data management system/controls are assessed to identify reporting risks and to assess the data management system's/control's ability to mitigate reporting risks. The GHG data management system/controls are assessed against the expectations detailed in the table. A score is assigned as follows:

- Full - all best-practice expectations are implemented.
- Partial - a proportion of the best practice expectations is implemented
- Limited - this should be given if little or none of the system component is in place.

Expectations for GHG data management system/controls	Score	Verifiers Comments (including *Forward Action Requests*)
1. Defined organisational structure, responsibilities and competencies		
1.1. Position and roles *Position and role of each person in the GHG data management process is clearly defined and implemented, from raw data generation to submission of the final data. Accountability of senior management must also be demonstrated.*	Full	The overall authority of the project is personally supervised by Mr. Uate Biutanaseva, Unit Leader Renewable Generation, Fiji Electricity Authority(FEA). All the maintenance and operational related issues is supervised by Mr. Tupou Semesi, Team Leader Renewable Generation, FEA and his team. Mr. Tupou and Mr. Uate are trained engineers with large experience in operation and maintenance of the plant and academically qualified to carry out the task. The entire Technicians at project site are qualified electrical engineer with more than 5 years of experience.

Expectations for GHG data management system/controls	Score	Verifiers Comments (including *Forward Action Requests*)
		In addition Mr. Uate is responsible to maintain all the meter reading and export and import summary all fuel related parameters with the assistance of metering person. The same is finally reviewed and approved by SEL Board. The metering team is headed by Mr. Sandeep D Silva , who is a qualified engineer. He also received training from meter supplier additionally on the maintenance of the particular type of meter.
1.2. Responsibilities *Specific monitoring and reporting tasks and responsibilities are included in job descriptions or special instructions for employees.*	Full	See comment above.
1.3. *Competencies needed* *Competencies needed for each aspect of the GHG determination process are analysed. Personnel competencies are assessed and training programme implemented as required.*	Full	See comment above.
2. Conformance with monitoring plan		
2.1. Reporting procedures *Reporting procedures should reflect the monitoring plan content. Where deviations from the monitoring plan occur, the impact of this on the data is estimated and the reasons justified.*	Limited	The reporting procedures reflect the monitoring plan content in general. See Chapter D.1 and G.6 of initial verification checklist. See CAR 1, CAR 2 and CAR 3

Expectations for GHG data management system/controls	Score	Verifiers Comments (including *Forward Action Requests*)
2.2. Necessary Changes *Necessary changes to the monitoring plan are identified and changes are integrated in local procedures as necessary.*	Limited	See above.
3. Application of GHG determination methods		
3.1. Methods used *There are documented description of the methods used to determine GHG emissions and justification for the chosen methods. If applicable, procedures for capturing emissions from non-routine or exceptional events are in place and implemented.*	Full	The calculations reflect the methodology as mentioned in the initial verification and are applied according to monitoring plan.
3.2. Information/process flow *An information/process flow diagram, describing the entire process from raw data to reported totals is developed.*	Limited	The necessary procedures have been defined in internal procedures and additional internal documents relevant for the determination of the electricity exported and imported from the Grid. See CAR 1 and FAR 3
3.3. Data transfer *Where data is transferred between or within systems/spreadsheets, the method of transfer (automatic/manual) is highlighted - automatic links/updates are implemented where possible. All assumptions and the references to original data sources are documented.*	Limited	See Above.

Expectations for GHG data management system/controls	Score	Verifiers Comments (including *Forward Action Requests*)
3.4. Data trails *Requirements for documented data trails are defined and implemented and all documentation are physically available.* *Data trail in exceptional cases like meter exchanges should be also arranged; e.g. meter exchange protocol with all relevant data indicated.*	Limited	See above
4. Identification and maintenance of key process parameters		
4.1. Identification of key parameters *The key physical process parameters that are critical for the determination of GHG emissions (e.g. meters, sampling methods) are identified.*	Full	The critical parameters for the determination of GHG emissions are the imported and exported amount of electricity which is measured by calibrated meter.
4.2. Calibration/maintenance *Appropriate calibration/maintenance requirements are determined.*	Limited	The calibration certificate has been given by the supplier originally. However, same was not available at the site. See C.5. of Initial checklist FAR 1
5. GHG Calculations		
5.1. Use of estimates and default data *Where estimates or default data are used, these are validated and periodically evaluated to ensure their ongoing appropriateness and accuracy, particularly following changes to circumstances, equipment etc. The validation and periodic evaluation of this is documented.*	Full	The carbon emission factor is used as a predetermined default value which has been defined in the PDD and confirmed during validation of the project.

Expectations for GHG data management system/controls	Score	Verifiers Comments (including *Forward Action Requests*)
5.2. Guidance on checks and reviews *Guidance is provided on when, where and how checks and reviews are to be carried out, and what evidence needs to be documented. This includes spot checks by a second person not performing the calculations over manual data transfers, changes in assumptions and the overall reliability of the calculation processes.*	Limited	No CDM specific internal audits are required as such because the monitoring and measurement of power exports and imports are done diligently every month as core business of the company and hence a permanent control of the figures in Export and Import Meter readings as well as invoices raised takes place. Quality assurance procedures are in place as for example the Export and Import Meter Reports and respective billings are reviewed for accuracy and correctness by Board member of SEL though it is not documented. Staff is made aware of the quality assurance procedures. See FAR 2 and FAR 3

Expectations for GHG data management system/controls	Score	Verifiers Comments (including *Forward Action Requests*)
5.3. Internal verification *Internal verifications include the GHG data management systems, to ensure consistent application of calculation methods.*	Full	No CDM specific internal audits are required as such because the monitoring and measurement of power exports and imports are done diligently every month as core business of the company and hence a permanent control of the figures in Export and Import Meter readings as well as invoices raised takes place. Quality assurance procedures are in place as for example the Export and Import Meter Reports and respective billings are reviewed for accuracy and correctness by Board member of SEL. Staff is made aware of the quality assurance procedures. The audit team did verify the following parameters: • meter spread sheets summary for each month • Invoices and bills for export and import • Payment received copy All data is in compliance with the figures stated in the monitoring report
5.4. Internal validation *Data reported from internal departments should be validated visibly (by signature or electronically) by an employee who is able to assess the accuracy and completeness of the data. Supporting information on the data limitations, problems should also be included in the data trail.*	Full	See Above.

Expectations for GHG data management system/controls	Score	Verifiers Comments (including *Forward Action Requests*)
5.5. Data protection measures *Data protection measures for databases/spreadsheets should be in place (access restrictions and editor rights).*	Full	The key parameters are measured by calibrated meters. Although only three team i.e. maintenance team, metering team and billing team other than unit leader Mr. Uate, Unit leader Renewable generation are involved, the verification team feels confident with data protection.
5.6. IT systems *IT systems used for GHG monitoring and reporting should be tested and documented.*	Full	The IT system is based on standard PC and MS-office solutions. Hence the verification team feels confident about its use.

Table 2: GHG calculation procedures and management control testing

Identification of potential reporting risk	Identification, assessment and testing of management controls	Areas of residual risks
Potential reporting risks based on an assessment of the emission estimation procedures can be expected to occur in the following fields of action: 1. raw data collection 2. recording and billing methods, Key source data applicable to the project assessed are hereby: • Metering records (electricity export and import) • Accounting records (from communication to Costing Sections , invoices, bills and payment receipt), Appropriate calibration and maintenance of equipment resulting in a high accuracy of data supplied should be in place. It is hereby needed to focus on those risks that impact the accuracy, completeness and consistency of the reported data. Risks are weakness in	Regarding the potential reporting risks identified in the left column the following mitigation measures have been observed during the document review and the on site mission: Raw data collection: The amount of electricity imported and exported to the grid remains to be the main parameter to be obtained for the GHG calculation. Key source data for this parameter are: • Export and import meter reading. • Invoices and bills for electricity import and exported. The meters are installed in the sheet steel enclosure panels. The meters are of reputed make in Switzerland. The company does not have a documented procedure for monitoring and measurement and quality assurance of process parameters which defines responsibilities and authorities.	The issue remaining is the way the data obtained is used to calculate the emission reduction in a conservative manner as well and recording and reporting of the same according to the approach prescribed in the PDD.

Identification of potential reporting risk	Identification, assessment and testing of management controls	Areas of residual risks
the GHG calculation systems and may include: ➢ manual transfer of data/manual calculations, ➢ position of metering equipment ➢ unclear origins of data, ➢ accuracy due to technological limitations,	Calculation methods: The reporting procedures reflect the monitoring plan content & the calculation of the emission reduction is correct.	

Table 3: Detailed audit testing of residual risk areas and random testing

Areas of residual risks	Additional verification testing performed	Conclusions and Areas Requiring Improvement (including *Forward Action Requests*)
The issue remaining is the way the data obtained is used to calculate the emission reduction in a conservative manner as well and recording and reporting of the same according to the approach prescribed in the PDD.	• Sample cross checking of manual transfers of data*:* All data which were used in the emission reduction calculations were explicitly checked. On a random basis data were checked at their primary source. • Recalculation Recalculation of the import and export bills and invoice was performed. • Spreadsheet 'walk throughs' to check links and equations All equations and algorithms used in the spread sheets were checked. • Inspection of calibration and maintenance records for key equipment The seals and the documents for the key equipment were inspected.	Having investigated the residual risks, the audit team comes to the following conclusion: **Corrective Action Request No. 1**: The metering technician conveyed the reading to Mr. Uate by telephone or email. The technician records the reading in their own diary which can not be traceable for all the month. A separate log book or register must be maintained at the site for the record of the weekly reading of the meter which can be verified at later stage if needed. **Forward Action Request No.1:** Please submit the original calibration certificate given by the supplier for the meters in Wainikasou and Vaturu project sites. **Forward Action Request No.2:** A documented procedure for calibration of meters indicating the frequency, accuracy of meters and methods of calibration needs to be established. **Forward Action Request No.3** The company does not have a documented procedure for monitoring and measurement and quality

Areas of residual risks	Additional verification testing performed	Conclusions and Areas Requiring Improvement (including *Forward Action Requests*)
		assurance of process parameters which defines responsibilities and authorities. Please submit the same. **Forward Action Request No. 4** No standby meter is available in the site. Please clarify the procedure of metering in the event of main meter failure. **Corrective Action Request No. 2:** In the table of Monitoring report some typographical error has been incurred. The starting and closing data of energy import of the monitoring table for the month of November'05, December'05, February '06, March'06 for Wainikasau project and July'06 and August'06 of Vaturu project needs to be corrected. However, there is no error in total electricity import and import reporting. **Corrective Action Request No. 3:** Table of the monitoring report for the Vaturu Hydropower station indicate about only one meter HM00023. However, there are two separate meter exist in the site for export and import monitoring.

Table 4: Compilation of open issues

Corrective and Forward Action Requests by audit team	Summary of project owner response	Audit team conclusion
Corrective Action Request No. 1: The metering technician conveyed the reading to Mr. Uate by telephone or email. The technician records the reading in their own diary which can not be traceable for all the month. A separate log book or register must be maintained at the site for the record of the weekly reading of the meter which can be verified at later stage if needed.	Mr. Uate Biutanaseva, FEA has confirmed that a metering log book is in place for each station. A scanned template was provided to the audit team. Hence this issue is considered to be resolved.	This issue is considered to be resolved.
Corrective Action Request No. 2: The baseline emissions and project emissions should be estimated and also indicated in the monitoring report. Emission reductions are calculated by deducting the project emissions from the baseline emissions.	A revised Monitoring Report was delivered.	This issue is considered to be resolved.
Corrective Action Request No. 3: In the table of Monitoring report some typographical error has been incurred. The starting and closing data of energy import of the monitoring table for the month of November'05, December'05, February '06, March'06 for Wainikasau project and July'06 and August'06 of Vaturu project needs to be corrected. However, there is no error in total electricity import and import reporting. Please indicate also the original title of the project on the cover page "VATURU AND WAINIKASOU HYDRO PROJECTS, FIJI	A revised Monitoring Report was delivered.	This issue is considered to be resolved.
Corrective Action Request No. 4: Table of the monitoring report for the Vaturu Hydropower station indicate about only one meter HM00023. However, there are two separate meter exist in the site	A revised Monitoring Report was delivered. The respective meter number are indicated in the log book.	This issue is considered to be resolved.

Corrective and Forward Action Requests by audit team	Summary of project owner response	Audit team conclusion
for export and import monitoring.		
Forward Action Request No.1: Please submit the original calibration certificate given by the supplier for the meters in Wainikasou and Vaturu project sites		Fulfillment of these requests will be checked at the next periodic verification.
Forward Action Request No.2: A documented procedure for calibration of meters indicating the frequency, accuracy of meters and methods of calibration needs to be established.		See comment above.
Forward Action Request No.3 The company does not have a documented procedure for monitoring and measurement and quality assurance of process parameters which defines responsibilities and authorities. Please submit the same.		See comment above.
Forward Action Request No. 4 No standby meter is available in the site. Please clarify the procedure of metering in the event of main meter failure. In the case of meter exchange dates, meter identification and meter values have to be documented thoroughly.		See comment above.
Clarification Request #1: As per Section D.3. Table 4 of PDD, the meter reading recording frequency is daily. Please explain, why the recording frequency is lowered?	FEA explained to the audit team, that the daily reading meter is a big effort due to remote power plant of Wainikasou. The weekly reading can be combined with the weekly servicing for each site.	Weekly meter reading is acceptable. This issue is considered to be resolved.