

VERIFICATION REPORT

ALKUMRU HEPP



Document Prepared By TÜV Rheinland Energie und Umwelt GmbH

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Summary:

TÜV Rheinland Energie und Umwelt GmbH has carried out a VCS verification of the project Alkumru Hydroelectric Power Plant, Turkey. The validated total installed capacity is 275.52 MW_e. At the time of verification three of the four turbines were installed and operational, providing an installed capacity of 261.27 MW¹.

The verification was performed against the currently valid documentation of the VCS Standard Version 3.4 based on the UN Framework Convention on Climate Change (UNFCCC), Article 12 of the Kyoto Protocol, the CDM modalities and procedures and subsequent decisions by CDM Executive Board.

The verification team concludes that the project as described in the VCS Monitoring Report, Version 3.01 as of 31/03/2014 covers all the relevant requirements of the criteria mentioned above. The development and maintenance of records and reporting procedures is consistent with this report. The responsibility of calculating and determining the GHG emission reductions from the project lies with the Project Proponent (PP) and has been carried out as defined in the project description.

The verification team confirms that the project is implemented as planned and described in the validated and registered project design documents, with the exception of the monitoring procedures for the internal electricity consumption during this first monitoring period. This deviation from the original monitoring plan has been described in the VCS Monitoring Report. Installed devices essential for gathering information about the electricity generation and self-consumption run reliably and the monitoring system is in place.

The verification team confirms that the GHG emissions reductions are calculated without material misstatements. The opinion relates to the project's emissions reductions reported and related to the valid and registered project baseline and monitoring, and its associated documents.

A brief overview of the verification steps covers the following points:

- Desk Review of preliminary the VCS monitoring report (Version 1.01, 11/12/2013), the registered PDD (Version 2.1, 10/12/2012), the validation report created by TÜV Rheinland Energie und Umwelt GmbH (14th December 2012, applied baseline and monitoring methodology ACM0002 "Consolidated methodology for grid-connected electricity generation from renewable sources", v.13 (EB67).
- On-site visit (13&14th November 2012)
- Issue of the checklist with corrective action request (CARs) and clarification requests (CLs) (see Annex 2)
- Desk review of revised VCS monitoring reports
- Review of proposed CARs and CLs
- Issue of the final verification report & protocol (see Annex 1)

In total, 9 CARs and 2 CLs have been raised and resolved by the PP. As a result TÜV Rheinland

¹ The fourth turbine has become operational on 17 February 2014, therefore after the first monitoring period.

Energie und Umwelt GmbH issues a positive verification opinion to the project.

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

Reporting period: From 10/03/2011 to 30/11/2013 (includes both days)

Verified emission in the above reporting period:

- Project emissions: 0 tCO₂
- GHG Emission Reductions: 1,172,984 tCO₂

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1 INTRODUCTION

Limak Hidroelektrik Santral Yatırımları A.Ş. as the project proponent (PP) has commissioned an independent verification by TÜV Rheinland Energie und Umwelt GmbH of the project: Alkumru Hydropower Plant. Ekobil Environmental Services and Consulting Ltd. is the responsible party for the quantification of emission reductions (ER).

1.1 Objective

The verification activity is the periodic independent review and ex-post determination by an independent entity of the monitored reductions in greenhouse gas (GHG) emissions during the defined verification period. TÜV Rheinland Energie und Umwelt GmbH as the verification body of the project has been accredited by the American National Standards Institute (ANSI) as a validation/verification body (VVB) and, in addition, meets the competence requirements as set out in ISO 14065:2007.

This initial verification is aimed at verifying and certifying the Voluntary Carbon Units (VCUs) reported for the Alkumru Hydropower Plant for the period 10/03/2011 to 30/11/2013. The verification report will assure that the project is implemented as planned and confirm that the monitoring system is in place and fully functional.

For the verification both, quantitative and qualitative, information on GHG emissions are being considered. Quantitative data comprises the monitoring reports submitted to the verifier by the project entity as well as underlying evidence such as calculation spreadsheets, monthly power production protocols, daily recorded power production data to be used as consistency check and electronic print-outs from the electricity regulation authority PMUM. Qualitative data comprises information on internal management controls, calculation procedures, procedures for data transfer and frequency of emissions reports, and internal audits of calculations and data transfers.

The verification follows the VCS Standard Version 3.4 based on UNFCCC criteria, referring to the Kyoto Protocol criteria and the modalities as agreed in the Bonn Agreement and the Marrakech Accord.

Verification is a requirement for all VCS projects and is necessary to provide assurance to stakeholders of the actual amount of voluntary emission reductions generated by the project activity.

1.2 Scope and Criteria

The verification comprises a review of the monitoring report over the monitoring period from 10/03/2011 to 30/11/2013, based on the registered Project Description Document in part of the project design, monitoring parameters, monitoring plan, emission reduction calculation, monitoring methodology and all related evidences provided by the project proponent. Those documents have been reviewed and verified against VCS Standard Version 3.4, VCS Program Guide 3.5,

UNFCCC rules and associated interpretations. The verification is based on the validated project design document including baseline calculations.

The main steps in the verification process are:

- Verify whether the emission reductions generated by the project are in line with the VCS Verification Protocol and the information provided by the project participants contains all the necessary information to evidence the project's compliance with all criteria in the VCS.
- Verify that the project has been implemented as described in the Project Design Document (VCS PD) during the verification period.
- Confirm that the monitoring plan was implemented and fully functional to generate voluntary carbon units (VCU) without any double counting during the whole verification period.
- Give a conclusion whether reported data are accurate, complete, consistent, and transparent, with a high level of assurance and free of material error or misstatement.

In particular, the project baseline, monitoring plan and the project compliance with relevant applicable protocols and criteria (i.e. UNFCCC, VCS, host Party and others) are to be verified in order to confirm that the project implementation, as documented, is sound and reasonable and meets the applicable criteria.

The correct application of the CDM approved baseline and monitoring methodologies: ACM0002 "Consolidated methodology for grid-connected electricity generation from renewable sources", v.13 (EB67) and "Tool to calculate the emission factor for an electricity system", v.02 were already validated by TÜV Rheinland GmbH on December 14th, 2012.

1.3 Level of Assurance

The VCS Standard requires the assurance level of the verified emission reductions to be reasonable. Therefore TÜV Rheinland Energie und Umwelt GmbH has focused on providing a reasonable level of assurance that the emission reduction methodology is appropriate and correctly applied, and that the emission reductions have been accurately monitored. If required, TÜV Rheinland Energie und Umwelt GmbH may discount verified emission reductions or request a discount of these by applying conservative assumptions for uncertainties in emission reduction calculations that cannot be fully quantified or that cannot give the desired level of assurance.

1.4 Summary Description of the Project

The Alkumru hydroelectric power plant (HPP) project is located in the Eastern Anatolia Geographical District of Turkey at the Botan River, one of the major tributaries of the Tigris. It has been developed by Limak Hidroelektrik Santral Yatırımları Anonim Şirketi.

A concrete weir dams the Botan River to a maximum water level of 647 m (above sea level). A 124m long penstock with bottom trifurcation channels the water past the three vertical Francis turbines to a tail water level of 541.8m. The power house is located in close proximity to the

reservoir which has a maximum area of 10.99 km². The geographic coordinates of the power house are:

- Latitude: 37° 57' 25.24"N
- Longitude: 42° 05' 30.08"E

Each one of the three existing Francis turbines has a capacity of 87.09 MWe, resulting in an overall capacity of 261.27 MWe and an expected annual electricity production of 875.84 GWh. A fourth, horizontal Francis turbine with a 14.25 MWe capacity is currently under construction and has become operational in January 2014². By this year the total project capacity will reach 275.52 MWe and is estimated to produce 881.21 GWh per year.

The project has been identified as a large scale project in accordance with the rules set out in the VCS Standard v3.3 (published 4th Oct 2012; used to validate the project) as the anticipated emission reductions exceed the threshold of 300,000 tCO₂ per annum.

The project aims to reduce greenhouse gases in Turkey by substituting emissions from fossil fuel fired power plants. The validation team was able to confirm the accuracy of the project description by reviewing maps and technical drawing during the site visit, as well as interviews and inspections conducted during the on-site audit.

2 VERIFICATION PROCESS

2.1 Method and Criteria

The verification of the Alkumru HPP project has been performed in accordance to the internal procedures of TÜV Rheinland Energie und Umwelt GmbH for the verification of VCS projects, which strictly follow ISO 14046-3 and ANSI accreditation to ISO 14065.

The verification is based on the validated project design document, including emission baseline, and the monitoring report. These documents are reviewed against VCS Standard v3.4 requirements. TÜV Rheinland Energie und Umwelt GmbH 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 and reliability of project monitoring and generation of emission reductions.

The verification includes the following steps:

- a desk review of the project design document and monitoring report;
- an on-site visit and follow-up interviews;
- resolution of outstanding issues; and

² The fourth turbine has become operational on 17 February 2014, therefore after the first monitoring period.

- the issuance of the final verification report and opinion.

The following sections outline each step in more detail.

2.2 Document Review

The desk review phase is characterised by the assessment of the monitoring report and emission reduction workbooks substantiated by additional supportive documents, all of which have been provided by the carbon consultant. The following table outlines the documents reviewed as part of the verification process:

Table 1: List of reviewed documents

No.	Timeline	Reference Document
/DOC1/	08/10/2013	VCS Program Guide, v3.5
/DOC2/	08/10/2013	VCS Standard, v3.4
/DOC3/	08/10/2013	VCS Validation and Verification Manual, v3.1
/DOC4/	08/10/2013	VCS Monitoring report template, v3.3
/DOC5/	08/10/2013	VCS Verification report template, v3.3
/DOC6/	04/10/2012	VCS Verification representation template, v3.1
/DOC7/	11/05/2012	Approved baseline and monitoring methodology ACM0002 "Consolidated baseline methodology for grid-connected electricity generation from renewable sources", version 13
/DOC8/	10/12/2012	VCS PD v2.1
/DOC9/	14/12/2012	VCS Validation Report v1.0
/DOC10/	11/12/2013	VCS Monitoring Report v1.01
/DOC11/	11/12/2013	Emission reduction spreadsheet v1.01
/DOC12/	03/2011-11/2013	Data records of main meters
/DOC13/	03/2011-11/2013	Data records of back-up meters
/DOC14/	03/2011-11/2013	Invoices of electricity sold to the grid (PMUM)
/DOC15/	13/06/2008	Factors calibration reports for all main and back-up meters for electricity export
/DOC16/	19-22/01/2011	Meter testing (export) records prior to project commissioning
/DOC17/	03-12/2011	TEDAS invoices for imported electricity
/DOC18/	01/2012-11/2013	Meter records for internal electricity consumption
/DOC19/	01/06/2010	Factors calibration reports for internal electricity consumption meters
/DOC20/	10/03/2011	Letters of commissioning of Units 1 and 2 (project start date)
/DOC21/	12/04/2011	Letter of commissioning of Unit 3 (project start date)

No.	Timeline	Reference Document
/DOC22/	19/06/2009	Connection Agreement
/DOC23/	14/12/2010	System Usage Agreement
/DOC24/	27/09/2007	Special provisions licence indicating the final design of 4 turbines and the respective installed capacity
/DOC25/	14/11/2012	Generator name plates (photos)
/DOC26/	14/02/2013	Google Earth images of the HPP location from 2002 and 2010
/DOC27/	14/11/2012	Main and back-up meters displaying the serial numbers (photos)
/DOC28/	17/01/2014	Letter of commissioning of Unit 4
/DOC29/	07/03/2014	VCS Monitoring Report v2
/DOC30/	07/03/2014	Emission reduction spreadsheet v2
/DOC31/	17/03/2014	VCS Monitoring Report v3.00
/DOC32/	18/03/2014	Emission reduction spreadsheet v3.0
/DOC33/	31/03/2014	Final VCS Monitoring Report v3.01
/DOC34/	31/03/2014	Final Emission reduction spreadsheet v3.01

2.3 Interviews

During the course of the site inspection, TÜV Rheinland verification team carried out interviews with project representatives, carbon consultant, and relevant project stakeholders.

Table 2: Overview of interviews during the on-site validation visit

Name	Position/ Organisation	Topic
Cercis Güneş	Project Manager, Mechanical Equipment; Limak Enerji Üretim Dağıtım Sanayi ve Ticaret A.Ş.	Regulation, rules and regulation compliance, financial information.
Elçin Caner	Project Development Manager, Limak Holding A.Ş.	Rules and regulation compliance, sustainability and environmental issues.
Kasım Eren	Operations Manager, Limak Hidroelektrik Santral Yatırımları A.Ş.	Daily operation, technical set-up, maintenance, coordination of electricity accounting, data management, transmission of electricity production and consumption data.
Dr. Asli Sezer Özçelik	Carbon Consultant, Ekobil Ltd.	Primary contact for verification
Murat Özçelik	Carbon Consultant, Ekobil Ltd.	

2.4 Site Inspections

The on-site inspection took place on 13 & 14/11/2012 in Kurtalan, Turkey. The objective of the on-site inspection is to acquire details on project management and operation, prove validity and authenticity of delivered supporting documents, and to assess the situation on the ground against the description in the documents. An audit plan was provided to the carbon consultant and PP and agreed upon. The site inspection was carried out by means of interviews with the persons indicated in section 2.3 (above).

Table 3: Audit plan for the VCS verification onsite visit

Audit Day 1, 13/11/2011		
10:00 – 10:30	Alkumru HPP, Office	Opening Meeting - Introduction of participants - Introduction of audit procedure and method
10:30 – 16:30	Alkumru HPP, Office	Documents review of documents and interview with PP, especially on the topics: - Evidence of VCS consideration - Financial source of the project i.e. no ODA funding and equity/loan ratio - Plausibility of total investment expenditure - Common practice analysis - Training, maintenance and monitoring arrangements of the project - Actual status of the project activity - Technical specification of the project - Project design
Audit Day 2, 14/11/2011		
10:00 – 14:00	Alkumru HPP, Powerhouse and Plant	Visit of existing facilities installed in the project activity (dam, tunnel, powerhouse, turbine, generator, electricity connection system).
14:00 – 16:00	Alkumru HPP, Office	Closing Meeting - Presentation of audit results - Open issues and further procedure - Questions and answers

2.5 Resolution of Findings

The objective of this phase of the verification is to resolve any outstanding issues which have to be clarified prior to final verifier's conclusions on the project implementation, monitoring practices and achieved emission reductions. In order to ensure transparency a verification protocol (Annex 1) is completed for the project activity. The protocol shows the criteria (requirements), means of verification and resulting statements on the verification of the actual project activity against the identified criteria in a transparent manner.

The verification protocol serves the following purposes:

- It organises in a table form, details and clarifies the requirements, which the VCS project is expected to meet;

- It ensures a transparent verification process where the verification team will document how a particular requirement has been verified and the result of the verification.

The verification report includes three tables. Annex 1 (verification protocol) reflects the verification requirements and reference to the materials used to verify the project activity against those requirements, as well as means of verification, reference to Annex 2 (CAR/CL list) and preliminary and final opinion of the verification team, on every particular requirement. Annex 3 reflects the any carry forward actions initiated by the verification team if the monitoring and reporting require attention and/or adjustment for the next verification period.

Findings during the verification can be interpreted as a non-compliance with 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 have 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 (forward action request) during validation to be verified during verification or previous verification(s) have not been resolved by the project participants.

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

Altogether 9 CARs and 2 CLs have been raised, and the FAR from the validation report is being carried forward. Details about these can be found in Annex 1-3.

2.5.1 Forward Action Requests

During the validation process 1 FAR has been raised which regarded the installation of the 4th turbine which will bring the installed capacity to a total of 275.52 MW_e. Before the installation of the 4th turbine, i.e. within this first monitoring period, electricity is imported through an additional transmission line when the 1st and 3rd units are not in operation. Once the construction of the 4th turbine has been completed, the internal electricity consumption will be entirely covered by its own power supply.

The 4th turbine has not become operational during the 1st monitoring period of Alkumru HPP, but shortly after on 17/01/2014. Therefore, the original FAR will be carried over into the verification of the 2nd monitoring period.

2.6 Eligibility for Validation Activities

Not applicable.

3 VALIDATION FINDINGS

Not applicable.

3.1 Participation under Other GHG Programs

Not applicable.

3.2 Methodology Deviations

Not applicable.

3.3 Project Description Deviations

The monitoring procedure for the recording of the internal electricity consumption has deviated from the original VCS PD. Until the installation of the 4th turbine, the power plant and the construction site are supplied with electricity by an additional 33kV line (by TEDAS), at the times when unit 1 and unit 3 are not in operation. Therefore, the internal electricity consumption of the power plant was to be measured by an extra meter installed by the project owner on site.

During the verification it became evident that the meter recordings during 2011 were faulty. For this reason, the internal electricity consumption for the period of 10/03/2011 to 31/12/2011 has been sourced from the TEDAS invoices, which include the electricity used in the power plant as well as the construction site. This represents the conservative approach and consequently neither the applicability of the methodology nor the additionality nor the appropriateness of the baseline scenario has been affected.

Starting from 01/01/2012 until 30/11/2013, the monitoring procedure for the internal electricity consumption has been in line with the VCS PD.

3.4 Grouped Project

Not applicable.

4 VERIFICATION FINDINGS

The findings of the verification are stated in the following sections. The verification criteria, the means of verification and its results against the identified criteria are derived from an internal verification protocol and reflect the requirements of VCS v3.4.

4.1 Project Implementation Status

The project has started operation on 10 March 2011. The project activity is a newly built hydro power station, which has generated GHG emission reductions by avoiding CO₂ emissions from electricity generation from fossil fuels. Operation of the project does not lead to GHG emissions in itself. Thus, it is confirmed that the project was not implemented to create GHG emissions primarily for the purpose of subsequent removal or destruction.

During the onsite assessment, it was physically observed by the verification team that three vertical Francis turbines are in place as described in the registered VCS PD (/DOC8/). Each one has a capacity of 87.09 MW_e (/DOC25/), resulting in an overall capacity of 261.27 MW_e.

A fourth, horizontal Francis turbine with a 14.25 MW_e capacity was under construction during the 1st verification and became operational on 17/01/2014. A FAR has been included in the validation and this verification report to ensure that the implementation of the fourth turbine will be carried out as described in the PD.

The monitoring plan in the VCS PD (/DOC8/) describes how the requirements related to the data acquisition and storage are being met. As described in the monitoring report and physically observed by the verification team during the on-site visit, 6 meters (3 main meters, 3 back-up meters; /DOC27/) were installed at the powerhouse of the project site to measure electricity exported to and imported from the grid. The back-up meters ensure accuracy and exclusion of false readings.

Table 4: Main and back-up meters installed at the Alkumru powerhouse

	Unit 1	Unit 2	Unit 3
Main meter	419607	419609	419611
Back-up meter	419608	419610	419612

All six monitoring meters have been checked prior to the start of the project and are in compliance with the relevant regulation. The verification team has reviewed the calibration records (/DOC15/, /DOC16/) of the installed monitoring meters and confirmed that their calibration frequencies and measurement accuracies are in compliance with the monitoring plan of the registered VCS PD and hence all concerned meters were effective during this monitoring period.

TEİAŞ monitors the meter readings remotely and is responsible for transmitting the information onto to the PMUM database (/DOC14/). In addition, the meter readings are being emailed to the plant manager on a monthly basis. The plant manager ensures correctness of the data by cross checking it against the online PMUM records as well as the internal readings by its SCADA

system. The verification team assessed the data collection procedures by means of physical observation, interview and documentation review. There were no deviations to the monitoring activity of the gross electricity generation as described in the VCS PD.

The deviation in the monitoring procedure for the internal electricity consumption during 2011 has been described in section 3.3 above.

In addition to the capacity installed and the electricity generation and consumption, the SCADA system records the water levels which are utilized to monitor the reservoir's area and calculate its power density. Hand written records of water levels for the years 2011, 2012 and 2013 were made available to the verification team on-site and electronically for later dates, and have been spot checked against the log book data.

The verification team concludes that – with the exception of the completion of the 4th turbine and initial monitoring procedures of electricity for internal consumption, as described in the FAR – the project has been implemented as described in the VCS PD.

4.2 Accuracy of GHG Emission Reduction and Removal Calculations

The project owner claims the reduction of CO₂ emission by replacement of grid emission factor based electricity generation. The emission reductions are the baseline emissions using the combined margin emission factor of the grid.

The GHG emission reductions were calculated correctly using the quantity of net electricity generated and the CO₂ emission factor for an electricity system of 0.53985 tCO₂/MWh in accordance with the baseline methodology outlined in the validated VCS PD and applicable under the latest VCS Standard, v3.4.

The emission reductions of the project were calculated as the baseline emissions with consideration of both project emission and leakage as zero.

The accuracy of the main and back-up meters is less than 0.2% (CLASS2) as required by national legislation ("Elektrik Piyasasında Kullanılacak Sayaclar Hakkında Teblig" – Communiqué for metering devices to be used in the electricity market). All eight (three main meters for electricity generation, three back-up meters for electricity generation, one main meter for electricity consumption, one back-up meter for electricity consumption) meters are in compliance with the communiqué (/DOC15/, /DOC19/).

All calculations made in the emission reduction calculation spreadsheets (/DOC34/) have been verified through recomputation by the verification team. The data used in the spreadsheet has been transferred manually and was tracked back to its origin at a coverage rate of 100% using the monthly the PMUM data (/DOC14/) for the entire monitoring period of 10/03/2011 to 30/11/2013. The consistency of all values and monthly generation amounts has been verified.

The total electricity generation during the monitoring period have been verified as shown in Table 5.

Table 5: Overview of the electricity generation during the monitoring period

Monitoring period	Gross electricity generation (MWh)	Self-consumption electricity (MWh)	Net electricity generation (MWh)
10/03/2011 – 31/12/2011	665,751.46	1,910.01	663,841.45
01/01/2012 – 31/12/2012	687,675.51	478.79	687,196.72
01/01/2013 – 30/11/2013	822,094.69	334.59	821,760.10

The net amount of electricity supplied to the grid is determined as 2,172,798.27 MWh. The GHG emissions in the given monitoring period are therefore calculation as:

$$\begin{aligned}
 BE_y &= EG_{PJ,y} * EF_{grid,CM,y} \\
 &= 2,172,798.27 \text{ MWh} * 0.53985 \text{ tCO}_2/\text{MWh} \\
 &= \mathbf{1,172,984 \text{ tCO}_2} \text{ (conservatively rounded down)}
 \end{aligned}$$

The default values used in the calculations are appropriate and have been validated accordingly.

The verification team considered that the monitoring of the project is complete and in compliance with the selected monitoring methodology, UNFCCC methodology ACM0002 “Consolidated methodology for grid-connected electricity generation from renewable sources”, v.13 (EB67), and the grid emission factor in compliance with the “Tool to calculate the emission factor for an electricity system”, v.03.

4.3 Quality of Evidence to Determine GHG Emission Reductions and Removals

TÜV Rheinland GmbH was able to verify that adequate monitoring mechanisms have been implemented at Alkumru HPP. The electricity generation and consumption parameters have been monitored on a monthly basis. This was verified during the site visit when the plant records were verified to assess the correctness of the reported data.

Evidence has been provided of the meter's calibration (/DOC15/) as requested by Measurement and Measuring Tools Inspection Regulation”, Date: 24/07/1994, Official Gazette Number: 22000 - Article 9, in which periodical inspections of “gauges for electric, water, coal gas, natural gas and, current and voltage measuring transformers has to be made once in 10 years”. This is in line with the monitoring plan and national requirements. The accuracy of the meters is high, relative to the applied materiality threshold of 1%. Errors in meter readings are monitored by the operator TEİAŞ by comparison of both meter readings (/DOC12/, /DOC13/) from the main and back-up meters. In case the deviation between the two meters exceeds 0.2%, they are replaced by TEİAŞ.

The emission reductions have been correctly calculated as 1,172,984 tCO₂. A complete set of data (monthly monitoring records - /DOC12/, PMUM data - /DOC14/) was available for the entire monitoring period of 10/03/2011 to 30/11/2013.

As no further uncertainties or quality restrictions affect the calculations, the verification team has reviewed the above-mentioned evidences and considered that the calculations are in compliance with VCS Standard v3.4.

4.4 Non-Permanence Risk Analysis

Not relevant.

5 VERIFICATION CONCLUSION

Limak Hidroelektrik Santral Yatırımları Anonim Şirketi
Hafta Sokak No:9
G.O.P. Çankaya/Ankara
Turkey

03/04/2014

RE: Verification conclusion for Alkumru Hydro Electricity Power Plant under VCS, first monitoring period from 10/03/2011 to 30/11/2013

Limak Hidroelektrik Santral Yatırımları A.Ş., with a registered office at Hafta Sokak No:9 G.O.P. Çankaya/Ankara - Turkey has contracted TÜV Rheinland Energie und Umwelt GmbH to review and verify the VCS Monitoring Report and all assertions related to the GHG project under the VCS Standard v3.4.

We have conducted the VCS Verification in accordance with the requirements of the VCS Standard Version 3.4 based on the UN Framework Convention on Climate Change (UNFCCC), Article 12 of the Kyoto Protocol, the CDM modalities and procedures. The project information has been verified and the VCS Verification Report "VERIFICATION REPORT 21220554 – Alkumru HEPP, Turkey" delivered on 03/04/2014 includes all relevant information and evidence acquired during the verification process.

The verification team concluded that based on our review and all available documentation the assertions are made in accordance with the requirements of the VCS program, the VCS Monitoring Report (version 3.01, 31/03/2014) meets all relevant requirements of the above-defined criteria, are material correct and fairly represents the required parameters without material discrepancies. The Emission Reductions claimed for the monitoring period 10/03/2011 to 30/11/2013 are verified to be 1,172,984 tCO₂ distributed amount the years as indicated below:

Year	Baseline emissions or removals (tCO ₂ e) ³	Project emissions or removals (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Net GHG emission reductions or removals (tCO ₂ e) ³
2011 (10/03 – 31/12)	358,374	0	0	358,374
2012 (01/01 – 31/12)	370,983	0	0	370,983
2013 (01/01 – 30/11)	443,627	0	0	443,627
Total	1,172,984	0	0	1,172,984

TÜV Rheinland Energie und Umwelt GmbH therefore issues a positive verification opinion.

Cologne, 03/04/2014



Andrea Nuesse

³ Conservatively rounded down

ANNEX 1: VERIFICATION PROTOCOL⁴

Checklist question	Ref.	MoV[1]			Findings, comments, references, data sources	Draft conclusion	Final conclusion
		DR	I	FA			
1. Implementation							
1.1 Have all physical features proposed in the registered PDD been implemented at the project site? 3 vertical axis Francis (87.09 MWe each) Reservoir (10.99 km ²)	/DOC24/ /DOC25/ /DOC26/			X	The project has been implemented as validated. The installed capacity of each turbines as per nameplate is 88.59 MWm which corresponds to app. 87.09 Mwe, resulting in a total capacity of 261.27 Mwe. A 4th turbine of 14.25 Mwe was under construction during the 1 st verification and became operation on 17/01/2014, i.e. during the 2 nd monitoring period.	CAR1 FAR1	OK
1.2 Has the project activity been operated in accordance with the project scenario described in the registered PDD and relevant guidance?	/DOC8/	X		X	During the retroactive validation procedure it has already been confirmed that the project is operating in accordance with the scenario described in the registered PDD and relevant guidance. This was reinforced during the consequent verification process.		OK
1.3 If the project activity is implemented on a number of different locations, has the Monitoring report provided the verifiable starting dates for each site?					Not applicable since the project is located at one single site.		OK
2. Monitoring plan and methodology							
2.1 Is the monitoring plan established in accordance with the monitoring methodology?	/DOC7/	X	X	X	The monitoring methodology has been established in accordance with the methodology. No parameters have been neglected.		OK
2.2 In case the implemented monitoring plan defers from the monitoring methodology, has any requests for revision to or deviation from the monitoring methodology been officially communicated to the CDM EB (if applicable methodology is subject to EB approval)?	/DOC7/ /DOC8/ /DOC10/	X	X		The implemented monitoring plan does not differ from the initial monitoring methodology.		OK
2.2.1 Have the above changes to the monitoring plan been approved by the CDM EB?					Not applicable as no changes have been made.		OK
3. Monitoring and the monitoring plan							

⁴ Verification requirements (based on VCS Standard Version 3.2; §56, §57 and §62 of the CDM Modalities and Procedures and on CDM Verification and Verification Manual, Annex 1 of EB55)

3.1 Is the monitoring established in full compliance with the monitoring plan, contained in the registered PDD (or new monitoring plan approved by the applicable standard)					The monitoring period is consistent with the start date of the crediting period, but not consistent throughout the report. The monitoring of the parameters: - Electricity produced by the power plant - Total installed capacity - Water reservoir area is in full compliance with the monitoring plan as documented in the registered PD. More information is requested for the parameter - Electricity imported by the power plant from the grid for self-consumption.	CAR3 CL1	The monitoring procedure for the internal electricity consumption deviated from the description in the VCS PD. The actual monitoring procedure has been accurately described in the MR vXX. This deviation follows a conservative approach and has no impact on the applicability of the methodology, the additionality or the appropriateness of the baseline.
<i>Monitoring period</i>	/DOC10/	X					OK
<i>Parameters</i>	/DOC10/ /DOC7/	X					
<i>Meter Ser.-No., physical location, transcription</i>	/DOC27/	X		X			
3.2 Are all baseline emission parameters monitored and updated in accordance with monitoring plan, monitoring methodology and relevant CDM EB decisions?	/DOC7/ /DOC9/ /DOC10/				Yes, all baseline emission parameters, apart from internal electricity consumption – see 3.1, are monitored in accordance with registered monitoring plan and monitoring methodology – ACM0002, version 13.		OK
3.2.1 Was the monitoring equipment for baseline emission parameters controlled and monitoring results recorded as per approved frequency?	/DOC9/ /DOC10/	X	X		The monitoring equipment for baseline emission has been controlled and tested according to the monitoring plan. The monitoring parameters are recorded monthly as per registered monitoring plan.		OK
3.2.2 Was the monitoring equipment for baseline emission parameters calibrated in accordance with QA&QC procedures described in the registered monitoring plan?	/DOC9/ /DOC10/ /DOC16/ /DOC19/ /DOC12/ /DOC13/ /DOC14/ /DOC19/	X	X		The meters have been factory calibrated and tested prior to commissioning. To ensure the accuracy of the main meter readings, the PMUM data has been compared to the meter records. No unusual discrepancy could be found during this or the following period.		OK
3.3 Are all project emission parameters monitored and updated in accordance with monitoring plan, monitoring methodology and relevant CDM EB decisions?	/DOC10/	X			Not applicable		OK
3.3.1 Was the monitoring equipment for project emission parameters controlled and monitoring results recorded as per approved frequency?	/DOC10/	X			Not applicable		OK
3.3.2 Was the monitoring equipment for project emission parameters calibrated in accordance with QA&QC procedures described in the registered monitoring plan?	/DOC10/	X			Not applicable		OK
3.4 Are all leakage emission parameters monitored and updated in accordance with monitoring plan, monitoring methodology and relevant CDM EB decisions?	/DOC10/	X			Not applicable		OK

3.4.1 Was the monitoring equipment for leakage emission parameters controlled and monitoring results recorded as per approved frequency?	/DOC10/	X			Not applicable		OK
3.4.2 Was the monitoring equipment for leakage emission parameters calibrated in accordance with QA&QC procedures described in the registered monitoring plan?	/DOC10/	X			Not applicable		OK
3.5 Were all monitoring parameters available and verifiable through the whole monitoring period?	/DOC12/ /DOC13/ /DOC14/	X			All monitoring parameters were available and verifiable during the whole monitoring period.		OK
3.5.1 In case, only partial monitoring data is available and PP(s) provide estimations or assumptions for the rest of data, was it possible to verify those estimations and assumptions? Reference: < http://cdm.unfccc.int/EB/026/eb26rep.pdf >, § 109(b)					Not applicable.		OK
3.6 Was management and operation system established and operated in accordance with the monitoring plan?	/DOC9/ /DOC10/	X	X		The data management system has been established in accordance with the monitoring plan. The data will be kept on file for at least 2 years after the end of the first crediting period.		OK
3.7 Was it possible to verify that involved management and operation personal is fully aware of the responsibilities and perform all operations according to the registered monitoring plan and internally developed manuals?	/DOC10/	X	X		The monitoring of the monitored parameters is being undertaken by the respective Limak staff as per the monitoring plan. During the onsite visit it could be confirmed that the staff is aware of their responsibilities.		OK
4. Parameters							
4.1 Monitored parameter Title: EG(PP-self consumption) Description: Electricity imported by the power plant from the grid for self consumption Units: MWh Estimated value (ex-ante): To be determined Measured value (ex-post): 2,720.25		X			See CL1 and CAR5.	CL1 CAR5	The electricity imported by the power plant from the grid for self-consumption as sourced from the TEDAS invoices during 2011 and after that from the PO's own meter for this purpose as described in the monitoring report. OK
4.1 Monitored parameter Title: EG(PP-gross)					The electricity production is currently recorded by 3 main and 3 back-up meters. The recordings from the main meters are used to calculate the		

Description: Electricity produced by the power plant Units: MWh Estimated value (ex-ante): 475,143 annually Measured value (ex-post): 2,175,521.66 (for entire monitoring period)	/DOC12/ /DOC13/ /DOC14/	X			net electricity production. The PMUM data is used as the control measure to ensure the correctness of the data. The figures have been cross checked by the verification team and deemed to be correct.	CAR5	OK
Monitored parameter Title: Cap(PJ) Description: Installed capacity Units: W Estimated value (ex-ante): 261,270,000 Measured value (ex-post): 261,270,000	/DOC25/ /DOC24/	X			The installed capacity of the 3 turbines currently in operation has been checked against the names plates and is consistent with the registered PD. The special provisions license confirms the interim situation before a 4 th turbine is installed in 2014.	CAR6 CAR7	OK
Monitored parameter Title: A(PJ) Description: Reservoir surface area Units: m2 Estimated value (ex-ante): 10,990,000 Measured value (ex-post): 11,530,000	/DOC8/ /DOC10/	X			The reservoir area can be calculated using the water levels which are recorded hourly by the SCADA system. Using SCADA records of the reservoir water levels in 2011, 2012 and 2013 and the water depth-surface area correlation graph shown in Annex 5 of the VCS PD indicate that the maximum reservoir surface area is 11,530,000 m2.		OK
5. Calculations							
5.1 Have all the calculations related to the baseline emissions been carried out according to the formulae and methods described in the registered PDD and applied methodology?	/DOC7/ /DOC8/ /DOC11/	X			The calculations for the baseline emissions are correct and in line with the methodology outlined in the PDD.		OK
5.2 Have all the calculations related to the project emissions been carried according to the formulae and methods described in the registered PDD and applied methodology?	/DOC7/ /DOC8/ /DOC10/	X			Not applicable - Leakage emissions equal zero as per ACM0002.		OK
5.3 Have all the calculations related to the leakage emissions been carried according to the formulae and methods described in the registered PDD and applied methodology?	/DOC7/ /DOC8/ /DOC10/	X			Not applicable - Leakage emissions equal zero as per ACM0002.		OK

ANNEX 2: LIST OF CORRECTIVE ACTION REQUESTS (CAR) AND CLARIFICATION (CL)

CAR	CL	List of Requests for Corrective Action (CAR) and Clarification (CL)			
		Observation (CAR/CL)	Reference	Summary of project owner response	Validation team conclusion
1		The implementation of the project activity as described in the project summary leaves room for different interpretations as to the current status of implementation of the installed capacity. Please clarify in the text which turbines have been installed and are operational. If the time of installation of the 4 th turbine can be anticipated better at this point in time, please update.	MR, Section 1.1	The fourth unit was not yet commissioned when the monitoring report was prepared. The fourth unit became operational in January 17 th , 2014. (See attached commissioning letter, "doc 1"). Please see the updated version of the MR (version 2.0) where we have added a sentence to clarify the implementation status of the Project Activity.	OK
2		The template used for the monitoring report is not the latest version (3.3) but version 3.2. Please update.	MR	Please see MR version 2.0 we have updated it to version 3.3.	OK
3		The monitoring period is not consistent throughout the report.	MR: Title sheet Section 2.1 Section 4.1	Please see MR version 2.0, the monitoring dates have been changed to be consistent throughout the MR.	OK
4		The tables in Section 3.1 (Data and parameters available at validation) refer to tables in the annexes. Please update these references by either including the relevant tables or by referring to the validation report.	MR, Section 3.1	Please see MR version 2.0, we have corrected the annexes referred to in the parameters. (For the parameters submitted at validation we have added a phrase indicating that the referred annex is in the validated PDD.)	OK
	1	It is unclear how the amount of self-consumed electricity is calculated and whether the main source is the PO's own meter or the TEDAS meter. Please clarify and supply any outstanding documentation (serial number of the meter, calibration records, outstanding invoices, monthly meter records).	MR, Section 3.2	Please see version 3.0 of the MR, we have added more explanation and an Annex 2 to describe how the internal consumption was made. The calibration documents of the meters mentioned in Annex 2 are provided as "Doc(2)IntMeterCalibrations".	OK, but see CL2.
5		The tables for the monitored parameters $EG_{PP-self}$ and $EG_{PP-gross,y}$ still stated in the "Value applied" cell: "Will be determined at the monitoring stage". Please update with the actual values.	MR, Section 3.2	Please see MR version 3.0, as the necessary corrections are now made.	OK
6		If a confirmed timeline is available for the operation start of the 4 th turbine, please update the cell "Value applied" of the table of the monitored parameter CAP_{PJ} accordingly.	MR, Section 3.2	Please see MR version 2.0, as the necessary corrections are now made.	OK
7		Please update the number of units operating in the project activity in the cell "QA/QC procedures" of the table of the monitored parameter CAP_{PJ} .	MR, Section 3.2	Please see MR version 2.0, as the necessary corrections are now made.	OK

CAR	CL	List of Requests for Corrective Action (CAR) and Clarification (CL)			
		Observation (CAR/CL)	Reference	Summary of project owner response	Validation team conclusion
8		A few minor inconsistencies exist in the transcription of the gross electricity generation ("electricity export") and internal consumption from the meter recordings to the ER spreadsheet.	ER v2.3, "raw data" sheet, cells E11, I8, D9	Please see ER version 3.0, as the necessary corrections are now made.	OK
9		The description of the monitoring procedure for the internal consumption data in Section 2.6 "Monitoring Plan" does not reflect the deviations from initial monitoring plan.	MR v3.00, Section 2.6 (p16)	A paragraph indicating the deviation is added to the version 3.01 of the Monitoring report section 2.6.	OK
	2	Please provide evidence for the TEDAS meter recordings for March 2011, April 2011 and September 2011 (illegible).	ER v2.3, "InternalConsumption2" sheet	Please find attached the missing documents in zip folder "TEDASMissing2011"	OK

ANNEX 3: LIST OF FORWARD ACTION REQUESTS (FAR)

#	Forward Action Request (FAR)
1	Once the 4th turbine has been installed and operation has started operation, and the internal consumption will be satisfied through the 154 kVa transmission line instead of the TEDAS line, the new situation needs to be validated.