




Verification and certification report form for CDM project activities

(Version 01.0)

Complete this form in accordance with the "Attachment: Instructions for filling out the verification and certification report form for CDM project activities" at the end of this form".

VERIFICATION AND CERTIFICATION REPORT

Title of the project activity	Gudauri Small Hydropower Project
Reference number of the project activity	9079
Version number of the verification and certification report	04
Completion date of the verification and certification report	28-04-2016
Monitoring period number and duration of this monitoring period	01, 31-12-2013 to 31-10-2015
Version number of monitoring report to which this report applies	8.0
Crediting period of the project activity corresponding to this monitoring period	31-12-2013 to 30-12-2020 (Renewable) (Changed from: 01 Jan 13 - 31 Dec 19)
Project participant(s)	Energio – Aragvi Ltd
Host Party	Georgia
Sectoral scope(s), selected methodology(ies), and where applicable, selected standardized baseline(s)	Scope- 1 : Energy industries (renewable - / non-renewable sources) AMS-I.D - 'Grid connected renewable electricity generation' (Version 17)
Estimated GHG emission reductions or net anthropogenic GHG removals for this monitoring period in the registered PDD	37,141 tCO ₂ e
Certified GHG emission reductions or net anthropogenic GHG removals for this monitoring period	33,030 tCO ₂ e
Name of DOE	TÜV SÜD South Asia Pvt. Ltd.
Name, position and signature of the approver of the verification and certification report	 Eswar Murty Certification Body "Environment and Energy"

SECTION A. Executive summary

TÜV SÜD South Asia Pvt. Ltd. has performed the 1st verification of the aforementioned CDM project activity. The verification is based on the currently valid documentation of the United Nations Framework Convention on Climate Change (UNFCCC).

Scope of Verification

The verification scope encompasses an independent and objective review and ex-post determination of the monitored reductions in GHG emissions by the Designated Operational Entity. The verification is based on the submitted monitoring report, the validated project design documents including its monitoring plan and validation report, previous verification reports (if any), the applied monitoring methodology, relevant decisions, clarifications and guidance from the CMP and the EB and any other information and references relevant to the project activity's resulting emission reductions. These documents are reviewed against the requirements of the Kyoto Protocol, the CDM Modalities and Procedures and related rules and guidance.

Based on the requirements in the VVS, TÜV SÜD has applied a rule-based approach for the verification of the project. The principles of accuracy, completeness, relevance, reliability and credibility were combined with a conservative approach to establish a traceable and transparent verification opinion.

The verification considers both quantitative and qualitative information on emission reductions. The verification is not meant to provide any consultancy towards the client. However, stated requests for clarifications, corrective and/or forward actions may provide input for improvement of the monitoring activities.

Verification Process

The information provided by the project participants is assessed by applying the means of verification specified in the VVS and in the absence of specific means of verification specified in the VVS the standard auditing techniques are applied.

Once TÜV SÜD receives the Monitoring Report and a confirmation from any PP to upload, the MR is made publicly available through a dedicated interface on the UNFCCC CDM website.

A competent assessment team is selected prior to the start of the verification. The team is selected to cover the technical area(s), sectoral scope(s) and relevant host country experience for evaluating the CDM project activity. Additionally a competent Technical Reviewer or Technical Reviewer Team is appointed to conduct checks on quality and completeness.

The verification process includes three phases:

- Desk review of documents;
- On-site audit and follow-up interviews with the relevant personnel;
- Resolution of outstanding issues and the issuance of final verification report and opinion.

The verification team performs first a desk review, followed by an on-site visit, which results in the formation of a draft report and a list of findings. The next step involves the evaluation of the findings through direct communication with the PPs and then finally the preparation of the verification report. This verification report and other supporting documents then undergo an internal quality control by the CB "Environment and energy" before submission to the CDM-EB.

Brief summary of the project activity

This small scale run of river hydro project activity in Gudauri Georgia implemented by Energo – Aragvi Ltd, the Project Participant, involves generation of renewable energy that is supplied to National Grid of Georgia via 110 kV transmission line. The project activity is located upstream the village Kvesheti on the river Tetri Aragvi close to the Gudauri ski resort (northern region of Georgia) at the Dusheti District of Georgia. The powerhouse is geographically located at 42°26'42"N latitude and 44°28'52"E longitude.

The project activity was envisaged with two staged implementation; Stage I (also referred as Aragavi I in Monitoring report and revised PDD) was planned with a capacity of 8 MW powered by two Pelton turbines and connected generators, each having an installed capacity of 4 MW; whereas, Stage II (also referred as Aragavi II in Monitoring report and revised PDD) was planned with two years difference from Stage I, with a total capacity of 1.2 MW. It is however important to note here that while Stage I started delivering power, as per plan to the national grid by 03-02-2014, the phase II implementation has been delayed until June-July 2016 due to an unexpected flood that had hit Georgia in July 2015. While the flood forced closure of stage I of project activity for repair and reinforcement work for almost a month, it also compelled PP to alter and redesign phase II to harbor a better design that could withstand such calamities, delaying the implementation of phase II. Thus the verification report presents assessment of generation and resultant emission reductions from stage I alone.

Furthermore, it is imperative to note that the actual installed capacity (name plate/rated capacity) of each of the two generators (under stage I) installed at site is 4260kW (4734kVA x 0.9 (power factor)) against 4000kW stated in the registered PDD, making the total installed capacity of Stage I (Aragavi I) as 8.52 MW against 8 MW mentioned in the registered PDD. Thus with this change the total installed capacity of the project activity (Stage I +Stage II) comes to 9.72 MW as opposed to 9.2 MW in the registered PDD. Secondly the volume of the Buffer basin (Referred as Reservoir/ Balance pond in registered PDD) is 53,463 m³ against 50,000 m³ mentioned in the registered PDD. PP has thus proposed a change in description of project activity to highlight these changes. It was however concluded that the changes proposed to the project design of the registered project activity as described in the revised PDD do not require prior approval as these changes do not do not impact the scale, additionality, applicability of the applied methodology and compliance with the monitoring plan as per p.06 of Appendix of Project Standard v9.0 (also read section E.4.6).

PP has also proposed permanent changes in the monitoring plan as referred in section E.4.5 of this report primarily to comply with local and regional regulations. It is however concluded that these change to the registered monitoring plan described in the revised PDD do not reduce the level of accuracy, in any which way, of the monitoring compared with the requirements contained in the registered monitoring plan. Furthermore it was confirmed that these changes do not require prior approval as per p.05 of Appendix I of Project Standard v9.0.

Conclusion

During the assessment a total of 06 Corrective Action Requests (CAR) and 01 Clarification Requests were raised during the course of verification process all issues were successfully closed. Furthermore, the verification team confirms that the emission reductions presented in the monitoring report are real and measurable. The verification team also confirms that there is no material misstatement in the calculation of reported emission reductions.

SECTION B. Verification team, technical reviewer and approver**B.1. Verification team member**

No.	Role	Type of resource	Last name	First name	Affiliation (e.g. name of central or other office of DOE or outsourced entity)	Involvement in			
						Desk review	On-site inspection	Interview(s)	Verification findings
1.	Team Leader	IR	Ranjan	Kumud	TUV SUD	✓	✓	✓	✓
2.	Verifier	IR	Ranjan	Kumud	TUV SUD	✓	✓	✓	✓
3.	Technical Expert	IR	Ranjan	Kumud	TUV SUD	✓	✓	✓	✓

B.2. Technical reviewer and approver of the verification and certification report

No.	Role	Type of resource	Last name	First name	Affiliation (e.g. name of central or other office of DOE or outsourced entity)
1.	Technical reviewer	IR	Supratik	Dutta	TUV SUD
2.	Approver	IR	Murty	Eswar	TUV SUD

SECTION C. Application of materiality**C.1. Consideration of materiality in planning the verification**

No.	Risk that could lead to material errors, omissions or misstatements	Assessment of the risk		Response to the risk in the verification plan and/or sampling plan
		Risk level	Justification	
1.	Human errors	Medium	Human error is likely to occur if the monitoring personnel are not trained well or inexperienced in data recording procedures and monitoring processes.	Wherever there is a greater likelihood of errors and chances of incorrect transfer of data, effective data verification should be done on those days/months data. Data related to holiday months need to be checked thoroughly.
2	Design of data management	Medium	Use of spreadsheets without adequate data control, changes/updates,	Depending on how data is generated, processed, and reported, place greater emphasis on verifying

			version tracking, traceability and security	data captured and processed manually and/or in spreadsheets versus those that are generated from an automated system.
3	Manual data	Low	Typographic errors in the spreadsheets and log books while recording.	Require the PPs to assess all the data again and confirm that no further errors are made.

C.2. Consideration of materiality in conducting the verification

All data presented in the emission reduction excel sheet was checked from the data source 'electricity sale invoices' for all months and found correct. It is thus confirmed that all data sheet is free from material errors, omissions or misstatements. Thus it can be stated with reasonable level of assurance with the GHG emission reductions are calculated without material misstatements.

SECTION D. Means of verification**D.1. Desk review**

Publication has been initiated before the verification activities started. Based on the published MR the assessment team performed a desk review to:

- verify the completeness of the data and the information presented in the MR,
- Check the compliance of the MR with respect to the monitoring plan depicted in the registered PDD and verify that the applied methodology was carried out. Particular attention to the frequency of measurements, the quality of the metering equipment including calibration requirements, and the quality assurance and quality control procedures was paid,
- Evaluate the data management and the quality assurance and quality control system in the context of their influence on the generation and reporting of emission reductions.

The list of all documents reviewed or referenced during the verification is provided in Appendix 2.

D.2. On-site inspection

Duration of on-site inspection: 29/01/2016 to 30/01/2016				
No.	Activity performed on-site	Site location	Date	Team member
1.	Plant inspection, location of equipment, monitoring of current parameters, risks, project boundaries	Gudauri, Georgia	29/01/2016	Kumud Ranjan
2	Verified the technical description, daily and monthly plant records, outage details, evidence documents, trouble shooting procedure	Gudauri, Georgia	29/01/2016	Kumud Ranjan
3	Verified the socio economic issues, Environmental legislation, Rules and regulations, consent status during monitoring period	Gudauri, Georgia/ Head office, Tbilisi, Georgia	29/01/2016 and 30/01/2016	Kumud Ranjan
4	Assessed the calibration frequency and status of the monitoring equipments, accuracy label as described in the registered PDD, QA/QC procedures, responsibility, data review and controlling, training of monitoring personal	Gudauri, Georgia/ Head office, Tbilisi, Georgia	29/01/2016 and 30/01/2016	Kumud Ranjan
5	Assessed the emission reduction procedure and verified the emission reductions excel sheet data with plant records	Head office, Tbilisi, Georgia	30/01/2016	Kumud Ranjan

D.3. Interviews

No.	Interviewee			Date	Subject	Team member
	Last name	First name	Affiliation			
1.	Dzneladze	Archil	Energo – Aragvi Ltd	29/01/2016 and 30/01/2016	Plant operation and shut downs, metering, record keeping & SCADA, meter calibration, local and national regulations,	• Kumud Ranjan (TUV SUD)
2	Posch	Hannes	Energo – Aragvi Ltd	29/01/2016 and 30/01/2016	Management decision, project planning & implementation , Sustainable development	• Kumud Ranjan (TUV SUD)
3.	Beaurain	Francois	CDM Consultant (External)	29/01/2016 and 30/01/2016	MR, Project description, ER calculation	• Kumud Ranjan (TUV SUD)

D.4. Sampling approach

Not Applicable

D.5. Clarification requests, corrective action requests and forward action requests raised

Areas of verification findings	No. of CL	No. of CAR	No. of FAR
Compliance of the monitoring report with the monitoring report form			
Compliance of the project implementation with the registered PDD		01	
Post-registration changes		02	
Compliance of the monitoring plan with the monitoring methodology including applicable tool and standardized baseline			
Compliance of monitoring activities with the registered monitoring plan		01	
Compliance with the calibration frequency requirements for measuring instruments		01	
Assessment of data and calculation of emission reductions or net removals		01	
Documentary evidence	01		
Total	01	06	

SECTION E. Verification findings**E.1. Compliance of the monitoring report with the monitoring report form**

Means of verification	TUV SUD has checked the monitoring report provided by the PP against the latest monitoring report form in order to determine, whether the monitoring report is in compliance with it.
Findings	The latest version of MR form available at UNFCCC is 05.1 and same has been used by the project proponent in the monitoring report.
Conclusion	As per p.382 of VVS v9.0, the DOE confirms that the compliance of the monitoring report with the relevant form and instructions therein.

E.2. Remaining forward action requests from validation and/or previous verification

>> No FAR have been presented, neither in the validation report nor in the previous verification report.

E.3. Compliance of the project implementation with the registered project design document

Means of verification	The audit team has checked the project Implementation in accordance with the registered Project Design Document (PDD) according to the requirement of VVS (version.09). The audit team assessed implementation of all the physical features (technology, project equipment, monitoring & metering equipment) of the registered project activity.
Findings	<p>The actual installed capacity of each of the two generators (under stage I) installed at site is 4734kVA*0.9 (power factor) i.e. 4260kW against 4000kW stated in the registered PDD. Corrective Action Request 01 was also raised highlighting this issue. Secondly, the reservoir/ buffer basin/ balance pond capacity (volume) as verified on-site was 53,463 m³ against 50,000 m³ mentioned in the registered PDD.</p> <p>PP has proposed a change in description of project activity to highlight the installed capacity change and change in buffer basin capacity (volume).</p> <p>Secondly, was understood from the discussion with PP during the on-site audit that Stage II of the project activity would not commission as planned in the registered PDD. Stage II would now commission only by the end of 2017. The phase II was delayed due to the unexpected flood in Georgia in July 2015 that also forced closure of stage I of project activity for repair and reinforcement works for one month. The flood compelled PP to alter and redesign phase II to encompass a better design to withstand such calamities in future. This delayed the implementation of phase II. As per PP and as verified on site the construction of Phase II would start in June-July 2016. Corrective Action Request 02 was raised to ask PP incorporate the tentative date of commissioning of stage II in section B.1 of MR</p>
Conclusion	<p>As per p.384 of VVS v9.0, the DOE by means of an on-site inspection assessed that all physical features (technology, project equipment, and monitoring and metering equipment) of the registered CDM project activity are in place as per the registered PDD except for a few issues as identified above.</p> <p>Furthermore, an assessment was made in line with para p.320 of VVS v9.0 and it was confirmed that these changes do not impact the scale, additionality, applicability of the applied methodology and compliance with the monitoring plan.</p> <p>Also refer to validation opinion in section E.4.6. 'Changes to the project design of a registered project activity'.</p>

E.4. Post-registration changes**E.4.1. Temporary deviations from the registered monitoring plan, monitoring methodology or standardized baseline**

There are no temporary deviations from the registered monitoring plan or monitoring methodology.

E.4.2. Corrections

There are no corrections proposed for project parameters fixed at validation.

E.4.3. Changes to the start date of the crediting period

The start date of the crediting period was changed from 01-01-2013 to 31-12-2013. The change was approved by UNFCCC secretariat vide email dated 07-01-2016 from CDMRegistration@unfccc.int [IRL#27]

E.4.4. Inclusion of a monitoring plan to a registered project activity

There is no proposed inclusion of monitoring plan to the registered project activity.

E.4.5. Permanent changes from registered monitoring plan, monitoring methodology or standardized baseline

There are three prominent changes proposed in the registered monitoring plan primarily to comply with local and regional regulations.

- To comply with PPA requirements a bidirectional billing meter (main meter PM4) was installed after the transformer on the 110 kV. This change in the monitoring plan allows taking into account losses in the transformer and provides more conservative measures of the quantity of net electricity provided to the grid.
- The registered monitoring plan states that the power meters will have an accuracy level of 0.2S while the meters that have been installed have a 0.5S accuracy level. As per Appendix 1 of the version 9 of the CDM Project Standard, the net quantity of electricity supplied to the grid ($EG_{facility,y}$) will be discounted by a factor of 0.003.
- As per the registered monitoring plan the calibration of the energy meters were planned every 3 years, by an authorised laboratory. However, frequency of the calibration is set to 10 years as the lowest value between national regulation (12 years) and manufacturer's recommendations (10 years).

Validation Opinion

- An extra meter was installed at 110 kV side (denoted as PM4) of the transformer to comply with the requirements of the PPA. As per the registered PDD energy meter PM5 installed at 10kV was the primary energy meter for measurement of energy generation ($EG_{facility,y}$). However, following the mandatory requirement in the PPA, PM4 was installed at 110kV side of the transformer and was used to measure net energy generation ($EG_{facility,y}$). As this meter accounted for the transformer losses, it added conservativeness to overall net electricity generation and the resulting emission reduction estimation. All other energy meters pertaining to stage I, PM1, PM2, PM3 and PM5 are installed as per the registered monitoring plan. Metering details of Stage II would be available after completion of stage II. Thus in line with p.312, 313, 315 of VVS v9.0 this change to the registered monitoring plan described in the revised PDD [IRL#26] do not reduce the level of accuracy, in any which way, of the calculation of emission reductions. Thus acceptable.

- Registered monitoring plan has considered an accuracy level of 0.2s for its energy meters power meters while the energy meters installed have a 0.5s accuracy level. This was primarily done to comply with national requirements and is in line with the PPA [IRL#18]. Moreover, in line with p 4(a) of Appendix 1 of the v9.0 of the CDM Project Standard, the net quantity of electricity supplied to the grid ($EG_{facility,y}$) was discounted by a factor of 0.003. In line with p.312, 313, 315 of VVS v9.0 this change to the registered monitoring plan described in the revised PDD [IRL#26] do not reduce the level of accuracy, in any which way, of the calculation of emission reductions. Thus acceptable.
- This change was made to comply with the Georgian legislation. The Georgian legislation [IRL#20] Law of Georgia, Product Safety and Free Movement Code, Article 80 'Legalised measurement means', specifies 12 year calibration frequency for energy meters where as the meter's technical specification (PM1, PM2, PM3 and PM4) specifies a calibration frequency of 10 years [IRL#09,10,11,12]. To be conservative in its approach PP has chosen the later (i.e. 10 years) as a requisite calibration frequency for the meters installed in the project activity. In line with p.312, 313, 315 of VVS v9.0 this change to the registered monitoring plan described in the revised PDD [IRL#26] do not reduce the level of accuracy, in any which way, of the calculation of emission reductions. Thus acceptable.
- Furthermore it is confirmed that the changes proposed to the registered monitoring plan described in the revised PDD [IRL#26] do not require prior approval as per p.05 of Appendix I of Project Standard v9.0.
- None of the changes referred impact the applicability conditions of the applicable methodology or its applicable tools. The change to the registered monitoring plan described in the revised PDD comply with relevant requirements in the Project Standard and the applied methodology and these changes that do not reduce the level of accuracy of the calculation of emission reductions, in any which way.

E.4.6. Changes to the project design of a registered project activity

There is a change in the installed capacity of the generating unit of stage I. As per the registered PDD the total installed capacity of the stage I of the project activity is 8000kW, achieved from two generating units of 4000 kW each. However, PP has installed two 4260kW generating units cumulating to installed capacity of 8520kW (8.52MW). Installed capacity of stage II however remains the same at 1.2 MW. Thus changing the total installed capacity of the project activity to 9.72 MW from 9.2 MW in the registered PDD.

Secondly, the volume of the Buffer basin (referred as Reservoir/ Balance pond in the registered PDD) is 53,463 m³ against 50,000 m³ mentioned in the registered PDD.

PP has thus proposed a change in description of project activity to highlight these changes.

Validation Opinion

The actual installed capacity (name plate/rated capacity) of each of the two generators under stage I installed at site is 4260kW (4734kVA x 0.9 (power factor)) against 4000kW stated in the registered PDD, thus making the total installed capacity of stage one as 8.52 MW (8520 kW) However installed capacity of stage II remains the same as 1.2 MW. Thus the total installed capacity of the project activity has changed to 9.72 MW from 9.2 MW in the registered PDD. Needless to say the PDD was developed at a very nascent stage and the generation calculation was based on the Detailed Project Report (DPR); that estimated generation capacity of Gudauri Stage I hydro based on the water availability, flow and other relevant parameters as 8000kW (4000kW each from two generating units). However, when two units (8520 kW each) are operated simultaneously, double volume water flows in the penstock and due to increased frictional loss and consequent head loss keep the total power output at 4000 kW from each unit. Though, the installed capacity of individual unit increased approx. by 6.5% the net generation capacity of each unit remained at around 4000kW, not impacting the power generation and the resultant emission reductions from the project activity. Same is evident from the monthly generation report [IRL#22,24] of the project activity during the current monitoring period.

Although the installed capacity has increased from 9.2 MW to 9.72 MW, it remains within the threshold limits of the small scale project activity i.e. 15MW, thus not impacting the applicability of a small scale methodology. Furthermore, as per the explanation above the generation of the project activity remains in line with projections in the registered PDD, thus not impacting the earnings from the project activity and the resulting additionality argument. In addition, change in the installed capacity does not impact the monitoring plan. Thus it is concluded that, the changes do not impact the conclusion of the validation report of the registered PDD in any which way.

Secondly it was verified during on-site audit that the volume of the buffer basin/ reservoir/ balance pond was 53,463 m³ [IRL#21] against 50,000 m³ mentioned in the registered PDD. The purpose of the buffer basin/ Reservoir/ Balance pond is to prevent generation loss during minor plant shut down and maintenance. The buffer basin constitutes an 8 hours power reserve (or 4h on maximum power load). The Reservoir volume was planned at 50,000 m³ on paper but in actual the capacity/volume of the reservoir was altered slightly to account for site specific conditions. The change in reservoir volume is minor when compared to the total volume (capacity) and would not impact the generation capacity of the project activity significantly. In addition the power density remains far above the 4W/m² threshold defined in para 04 of the applied methodology (AMS-I.D version 17) thus not impacting the methodological eligibility criteria. Power density of the project activity when calculated as per para 43 (a) of ACM0002, version 17 is 992.3 W/m² (surface area of water when reservoir is full is 9795m²). Furthermore, as per para 43 (c) of ACM0002, as the power density of the project activity is greater than 10 W/m², project emissions from water reservoir is zero. Based on the assessment in line with p.320 of VVS v9.0 it is confirmed that these changes do not impact the scale, additionality, applicability of the applied methodology and compliance with the monitoring plan, thus not impacting the conclusion of the validation report of the registered PDD in any which way.

Furthermore it is confirmed that the changes proposed to the project design of the registered project activity as described in the revised PDD [IRL#26] do not require prior approval as these changes do not do not impact the scale, additionality, applicability of the applied methodology and compliance with the monitoring plan as per p.06 of Appendix of Project Standard v9.0.

E.4.7. Types of changes specific to afforestation and reforestation project activities

Not Applicable, as the project activity is not an afforestation and reforestation project.

E.5. Compliance of monitoring plan with the monitoring methodology including applicable tool and standardized baseline

Means of verification	<p>The verification team has checked the revised monitoring plan referred in E.4.5 above and as proposed in the revised PDD against the monitoring methodology and applicable tools as below</p> <ul style="list-style-type: none"> AMS I.D. (Version 17.0 EB 61, Annex 17, Valid from 17 June 11 onwards). Tool to calculate the emission factor for an electricity system (Version 02.2.1), EB 63, Annex19, valid from 29/09/20117 Tool to calculate project or leakage CO₂ emissions from fossil fuel combustion, EB41, Annex11, version02
Findings	<p>There are three prominent changes proposed in the registered monitoring plan primarily to comply with local and regional regulations.</p> <ul style="list-style-type: none"> To comply with PPA requirements a bidirectional billing meter (main meter PM4 was installed after the transformer on the 110 kV. This change in the monitoring plan allows taking into account losses in the transformer and provides more conservative measures of the quantity of net electricity provided to the grid. The registered monitoring plan states that the power meters will have an accuracy level of 0.2S while the meters that have been installed have a 0.5S accuracy level. As per Appendix 1 of the version 9 of the CDM Project Standard, the net quantity of electricity supplied to the grid ($EG_{facility,y}$) will be discounted by a factor of 0.003. As per the registered monitoring plan the calibration of the energy meters were planned every 3 years, by an authorised laboratory. However, frequency of the calibration is set to 10 years as the lowest value between national regulation (12 years) and manufacturer's recommendations (10 years)
Conclusion	<p>Furthermore it is confirmed that the changes proposed to the registered monitoring plan described in the revised PDD [IRL#26] do not require prior approval as per p.05 of Appendix I of Project Standard v9.0. None of the changes referred impact the applicability conditions of the applicable methodology or its applicable tools. The change to the registered monitoring plan described in the revised PDD comply with relevant requirements in the Project Standard and the applied methodology and these changes that do not reduce the level of accuracy of the calculation of emission reductions, in any which way.</p> <p>Also refer to validation opinion in E.4.5.</p> <p>CAR no. 6 was raised requesting PP to submit the revised PDD in the latest PDD template highlighting the change in monitoring plan. CAR no 3 was raised to correct the description of metering arrangements and cross check measures in the MR and to further elaborate on specifications (meter no., accuracy class, make and model) of all types of meters. All CARs were successfully closed.</p>

E.6. Compliance of monitoring activities with the registered monitoring plan

E.6.1. Data and parameters fixed ex ante or at renewal of crediting period

Means of verification	Data and parameters fixed ex-ante as listed in the monitoring report have been crosschecked and reviewed as applicable against the registered
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	PDD, monitoring plan as well as against the applied methodology		
Findings	Following parameter listed in the table was fixed ex-ante as per the registered PDD. Values of CO ₂ emission factor, Build margin for the grid and Simple Operating margin for the grid fixed ex ante was verified from the registered PDD and from Baseline Emission Factor for the Electricity System of Georgia, Version 01 [IRL#28]		
	Parameter	Description:	Value (in tCO ₂ / MWh)
	$EF_{CO_2,grid,y}$	CO ₂ emission factor of the grid electricity per year y	0.3999
	$EF_{grid,BM,y}$	Build margin for the grid electricity system of Georgia	0.523
Conclusion	$EF_{grid,OM,y}$	Simple Operating margin for the grid electricity system of Georgia	0.276
	TUV SUD confirms that the PP has correctly mentioned the <i>exante</i> parameters in the monitoring report in line with the registered PDD and the applied monitoring methodology. Furthermore it is confirmed that PP has correctly applied the values of CO ₂ emission factor, Build margin for the grid and Simple Operating margin for the grid in line with the registered PDD and Baseline Emission Factor for the Electricity System of Georgia, Version 01 [IRL#28]		

E.6.2. Data and parameters monitored

Means of verification	<p>Only parameter that is to be monitored as per the registered monitoring plan is $EG_{facility,y}$ Quantity of net electricity supplied to the grid in year y (reported in MWh/year).</p> <p>PP has installed 5 energy meters (under Stage I) that has following primary functions</p> <ul style="list-style-type: none"> - PM1 to measure the power generated by generator 1 - PM2 to measure the power generated by generator 2 - PM3 to measure the consumption of the auxiliaries. - PM4 to measure the power generated at 110 kV transformer side - PM5 to measure the electricity at the 10kV transformer side <p>The net MWh generated from the proposed project and supplied to the grid is monitored continuously by an on-site power meter (PM4) installed at the 110 kV level in the substation in accordance with applicable national standards. Thus, PM4 is the primary monitoring equipment for the project activity as it is used to bill generated electricity. All other meters are used for cross check.</p> <p>Apart from this there is a SCADA specially designed for this plant by Schubert Elektroanlagen Ges.m.b.H that continuously measures the voltage and amperage at several points and is used to cross-check the energy produced and exported.</p> <p>The parameter is continuously monitored/ metered and the readings are recorded electronically. PP, GSE (Georgian State Electrosystem) and ESCO jointly conduct visual readings of PM4 on the first day of each month based on which the parties then prepare joint statement recording the readings of the meter. This was verified from the JMR statements and the invoices [IRL#22]. Gross generation was also checked from generation details available on esco.ge website [IRL#29].</p>
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	<p>TUV SUD checked functioning of each and every meter and confirms that each and every meter was functional at the time of site audit. Historical generation readings were checked from electronic files and SCADA history [IRL#16]. TUV SUD performed an instant Gross generation check from the SCADA and PM5 readings.</p>
Findings	<p>An extra meter was installed at 110 kV side (denoted as PM4) of the transformer to comply with the requirements of the PPA. As per the registered PDD energy meter PM5 installed at 10kV was the primary energy meter for measurement of energy generation ($EG_{facility,y}$). PM4 was installed at 110kV side of the transformer and was used to measure net energy generation ($EG_{facility,y}$). All other energy meters PM1, PM2, PM3 and PM5 are installed as per the registered monitoring plan.</p> <p>Secondly, the registered monitoring plan states that the power meters will have an accuracy level of 0.2S while the meters that have been installed have a 0.5S accuracy level.</p> <p>According to Georgian regulations, in all HPPs (including Aragvi) there is always one billing power meter and the rest are balancing. In the case of project activity PM4 installed on 110 kV side is used for billing and all invoicing and payments are done according to it.</p> <p>Thus for project activity 4 power meter PM1, PM2, PM3 (all three power meters are balancing) and PM4 (used as billing/invoicing). PM5 is an extra meter installed at 10 kV for additional cross-check.</p> <p>During February 2014 to April 2014 only two power meters, PM4 and PM3 were in operation. During this period, as meters PM1 and PM2 were not available, balance check was performed using PM3, PM5 and SCADA. In line with the applicable regulation invoicing and billing for these two months was based on information from PM4. In beginning of April PM4 was replaced with new power meter with similar configuration and April invoice was based on sum of old power meter (serial number #01185826) and new power meter (serial number #01270885) readings. Same reflects in the table in section E.7 below.</p> <p>In May PM1 and PM2 was installed; but an installation problem surfaced immediately after installation and readings were not correct and PM1+PM2-PM3 was showing abnormally lower figure than PM4 (Same is shown in 'Act Summary' sheet of ER Excel file). To the end of September, meter technicians were able to identify the installation issue and the same was immediately rectified and since October 2014 PM1 and PM2 has been performing optimally (now PM1+PM2-PM3 value was logically higher than PM4 considering power losses in main 110/10 kV transformer).</p> <p>As explained earlier PM4 (at 110 kV side) is the primary energy meter for measurement of net energy generation. Errors were identified in balancing meters thus not affecting the accuracy of net generation figures used for emission reduction estimations. In addition to above, Energy-Aragvi the electricity generated and transmitted by PP has been confirmed and accepted by all parties involved viz. Georgian State Electrosystem and ESCO, Energo-Pro.</p>
Conclusion	<p>PP has aptly proposed a change in registered monitoring plan and has submitted a revised PDD making requisite changes. Refer to validation opinion in E.4.5. TUV SUD confirms that the data and parameters are monitored methodology and the revised monitoring plan of the project activity.</p> <p>CAR no. 6 was raised requesting PP to submit the revised PDD in the latest</p>

	PDD template highlighting the change in monitoring plan. CAR no 3 was raised to correct the description of metering arrangements and cross check measures in the MR and to further elaborate on specifications (meter no., accuracy class, make and model) of all types of meters. This CAR was successfully closed.
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E.6.3. Implementation of sampling plan

Means of verification	Not Applicable
Findings	Not Applicable
Conclusion	Not Applicable

E.7. Compliance with the calibration frequency requirements for measuring instruments

Means of verification	The audit team has checked the calibration certificates and records of the monitoring equipment as given below:				
	Name	Serial number	Comment	Model/Class	Last calibration
	PM1	16827095-13g	From October 2014	Mercury 230/0.5S	17/12/2013
	PM2	16827081-13g	From October 2014	Mercury 230/0.5S	13/12/2013
	PM3	11130132-12g	From February 2014	Mercury 230/0.5S	28/05/2012
	PM4	01270885	From April 2014	A1805RAL-Elster/ 0.5S	28/03/2014
		01185826	Feb and March 2014	A1805RAL-Elster/ 0.5S	27/05/2009
	PM5	00485666	From operation start (3/02/2014)	Elster A1500 /0.5S	10/12/2013
Findings	As per the registered monitoring plan the calibration of the energy meters were planned every 3 years, by an authorised laboratory. However, frequency of the calibration is set to 10 years as the lowest value between national regulation (12 years) and manufacturer's recommendations (10 years). The Georgian legislation [IRL#20] Law of Georgia, Product Safety and Free Movement Code, Article 80 'Legalised measurement means' specifies 12 year calibration frequency for energy meters where as the meter's technical specification (PM1, PM2, PM3 and PM4) specifies a calibration frequency of 10 years [IRL#09,10,11,12]. To be conservative in its approach PP has chosen the later (i.e. 10 years) as a requisite calibration frequency for the meters installed in the project activity.				
Conclusion	CAR no. 4 was raised to seek corrective action on the proposed changes pertaining to calibration. CAR 4 was successfully closed. PP has aptly proposed a change in registered monitoring plan and has submitted a revised PDD making requisite changes. Refer to validation opinion in E.4.5. In line with p.312, 313 of VVS v9.0 the change to calibration frequency described in the revised PDD [IRL#26] do not reduce the level of accuracy, in any which way, of the monitoring compared with the requirements contained in the registered monitoring				

	<p>plan. Thus acceptable.</p> <p>According to § 373 (b) and § 402 of VVS ver 09.0, verification team has checked calibration records to confirm it has been conducted as the frequency specified in the registered monitoring plan (§ 387, 390 and 394, VVS, v09.0).</p>
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E.8. Assessment of data and calculation of emission reductions or net removals

E.8.1. Calculation of baseline GHG emissions or baseline net GHG removals by sinks

Means of verification	<p>The assessment of data and the calculation of baseline emission reduction in the MR and the CER excel sheet [IRL#24] have been verified as per the following set of supporting documents:</p> <ol style="list-style-type: none"> 1. JMR signed by PP, GSE (Georgian State Electrosystem) and ESCO and invoices [IRL#22] showing values of Net electricity supplied to the grid from the project activity 2. Internal electronic logs on SCADA [IRL#16] showing gross generation, generation from individual generators, auxiliary consumption etc. <p>Formulae applied for baseline emission reduction was verified from registered PDD and the applied methodology.</p>
Findings	<p>Calculations, applied formulae and method for calculation of baseline emission are in accordance with the registered monitoring plan and are in line with the requirements of the applied methodology (AMS-I.D., Version 17).</p> <p>No CAR or CR has been raised on calculation of baseline GHG emissions or baseline net GHG removals by sinks.</p>
Conclusion	<p>The calculation of baseline emissions is correct. Further the information provided in the monitoring report and the emission reduction excel sheet has been cross-checked with other sources such as electronic log on SCADA confirm the correctness and for plausibility check. The verification team also confirms that there is no material misstatement in the calculation of reported emission reductions. The calculation of baseline emissions, project emissions and leakage is appropriate and has been carried out in accordance with the formulae and methods described in the registered monitoring plan and the applied methodology document.</p>

E.8.2. Calculation of project GHG emissions or actual net GHG removals by sinks

Means of verification	Not Applicable
Findings	Not Applicable
Conclusion	Not Applicable

E.8.3. Calculation of leakage GHG emissions

Means of verification	Not Applicable
Findings	Not Applicable
Conclusion	Not Applicable

E.8.4. Summary of calculation of GHG emission reductions or net anthropogenic GHG removals by sinks

Means of verification	PP has correctly presented Baseline emissions (baseline net GHG removals) by sinks as 33,030 tCO ₂ e and GHG emission reductions or net
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	GHG removals by sinks achieved in the monitoring period (reported from 01/01/2013) as 33,030 t CO ₂ e. Project emission and leakage emission have correctly been reported as zero. The values in the MR were checked from the emission reduction excel sheet [IRL#24].
Findings	No lack of evidence and missing data were detected. All values have been correctly mentioned in section E.4 of the Monitoring report. It is confirmed that the representation of data in this section of MR is complete and without any material error. There are no CARs or CLs raised for this section.
Conclusion	The verification team confirms that the emission reductions are real and measurable. The verification team also confirms that there is no material misstatement in reported emission reductions in section E.4 of MR.

E.8.5. Comparison of actual GHG emission reductions or net anthropogenic GHG removals by sinks with estimates in registered PDD

Means of verification	PDD estimates for year 2013-14 and 2014-2015 overall emission reduction of 20,234 tCO ₂ e. As during the monitoring period the project has run for 670 days the project activity would have generated $20,234 * 670/365 = 37,141$ tCO ₂ e during the current monitoring period; against which the project activity has achieved 33,030 tCO ₂ e emission reductions. This has been correctly mentioned in section E.5 of the MR. The no. of days of operation was checked from the plant records.
Findings	There are no CARs or CLs raised for this section.
Conclusion	The presentation of 'Comparison of actual GHG emission reductions or net anthropogenic GHG removals by sinks with estimates in registered PDD' in section E.5 is apt and correct.

E.8.6. Remarks on difference from estimated value in registered PDD

Means of verification	<p>TUV SUD compared the ex-ante estimation of emission reductions in the registered PDD with the emission reductions reported by the PPs in the monitoring report. PDD estimates for year 2013-14 and 2014-2015 overall emission reduction of 20,234 tCO₂e. As during the monitoring period the project has run for approximately 670 days the project activity would have generated $20,234 * 670/365 = 37,141$ tCO₂e during the current monitoring period; against which the project activity has achieved 33,030 tCO₂e emission reductions.</p> <p>Furthermore, the shut down details were assessed and it was confirmed with the PP that for any shut down shorter than 7-8 hrs is covered by the power reserve provided by the buffer basin during the lean period thus there is no net generation loss. Only major shut down encountered during the monitoring period was when there was a major flood in Georgia and the plant was shut from 08-07-2015 to 05-08-2015 for repair works. Thus there was a generation loss of 29 days.</p> <p>Secondly, plant started operation on 03-02-2014 and the crediting period start date was 31-12-2013, thus losing 34 days due to delays start of operation. Thus there is a total 63 days loss of generation during the monitoring period.</p> <p>Thus if we take the days of operation as 607 instead of 670 the project activity would have generated $20,234 * 607/365 = 33,649$ tCO₂e during the current monitoring period as per the registered PDD i.e. 1.87 higher against what the project activity has achieved (33,030 tCO₂e). Thus the reduction in emission reduction during the monitoring period is trivial; more so when the source of generation is capricious in nature.</p>
Findings	The reduction is insignificant thus acceptable. CAR 5 was raised to get

	from PP the plant shut down details.
Conclusion	PP has aptly stated the reason for reduction in generation in section E.6 of the MR. This is acceptable

E.8.7. Actual GHG emission reductions or net anthropogenic GHG removals by sinks during the first commitment period and the period from 1 January 2013 onwards

Means of verification	Plant started operation on 03-02-2014 and the crediting period start date is 31-12-2013 thus there is no way any emission reduction could have been achieved before 31-12-2012. GHG emission reductions or net GHG removals by sinks reported from 1-01-2013 onwards has been correctly reported as 33,030 tCO ₂ e.
Findings	There are no issues identified. No CAR and CLs were raised.
Conclusion	TUV SUD confirms that the GHG emission reductions reported in the monitoring report and claimed by the PPs are correctly determined and reported. This is acceptable

SECTION F. Internal quality control

Internal quality control within the team is assured by means of a technical review process that takes place after the on-site assessment and after closure of findings. The internal quality control in the verification process is given by the final decision (Verification and Certification Conclusion) made by the Certification Body.

SECTION G. Verification opinion

The DOE confirms that

- the development and maintenance of records and reporting procedures are in accordance with the registered monitoring plan;
- the project is operated as planned and described in the project design document approved by the EB barring permanent changes to project description proposed in E.4.6;
- the installed equipment being essential for generating emission reduction runs reliably and is calibrated appropriately;
- the monitoring system is in place and generates GHG emission reductions data;
- the monitoring plan in Monitoring Report is as per the PDD and monitoring plan approved by the EB with the exception of permanent changes to registered monitoring plan proposed in section E.4.5;
- the approved monitoring plan in the approved PDD is as per the applied methodology;
- there is an audit trail that contains the evidence and records that validate the stated figures.
- the change to the registered monitoring plan described in the revised PDD comply with relevant requirements in the Project Standard and the applied methodology and these changes that do not reduce the level of accuracy of the calculation of emission reductions, in any which way;
- the changes to the project design of the registered project activity do not impact the scale, additionality, applicability of the applied methodology and compliance with the monitoring plan and do not impact the conclusion of the validation report of the registered PDD and that these changes occurred after project registration and would not have been known prior to registration of the registered CDM project activity;
- it is confirmed that the changes proposed to the project design of the registered project activity and permanent changes from the registered monitoring plan as described in the revised PDD do not require prior approval;
- the post-registration changes to the registered PDD will be submitted together with the request for issuance.

Based on the information we have seen and evaluated, we confirm that the project activity achieved the verified amount of reductions in anthropogenic emissions by sources of greenhouse gases that would not have occurred in the absence of the project activity.

Verified emission reductions in this monitoring period: 33, 030 tCO₂e (Round down value)

Baseline:	33, 030 tCO ₂ e
Project emissions:	0 tCO ₂ e
Leakage:	0 tCO ₂ e

It is the opinion of TUV SUD that the amount of GHG emission reductions achieved by the project activity during this monitoring period is correct and that it complies with all applicable CDM requirements.

SECTION H. Certification statement

TÜV SÜD South Asia Pvt. Ltd. has performed the periodic verification CDM project activity "Gudaury Small Hydropower Project". The verification is based on the currently valid documentation of the United Nations Framework Convention on Climate Change (UNFCCC).

The management of "Energo -Aragvi Ltd" is responsible for the preparation of the GHG emissions data and the reported GHG emission reductions on the basis set out within the project's Monitoring Plan indicated in the registered PDD and the applied methodology

TUV SUD conducted the verification on the basis of the monitoring methodology "AMS-I.D- 'Grid connected renewable electricity generation' (Version 17)", registered PDD (Version 11) dated 03-12-2012, Revised PDD (Version 14) dated 08-04-2016, validation report of registered PDD and the monitoring report (version 08) dated 06-04-2016, emission reduction spreadsheets and all the supporting documentation listed in Appendix 3.

TÜV SUD confirms that the project is implemented as described in the validated and registered project design documents. Based on the information we have assessed, we confirm that the GHG emission reductions are calculated without material misstatements in a conservative and appropriate manner.

Pune, 28/04/2016



(Eswar Murty)

Certification Body "Environment and Energy"
TÜV SÜD South Asia

Appendix 1. Abbreviations

Abbreviations	Full texts
AMS	Approved Methodology for Small scale project activity
BM	Build Margin
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CDM-EB	CDM Executive Board
CER	Certified Emission Reduction
CM	Combined Margin
CMP	Conference of the Parties serving as the Meeting of the Parties to the Kyoto Protocol
CO ₂ e	Carbon dioxide equivalent
CL	Clarification Request
DNA	Designated National Authority
DOE	Designated Operational Entity
EF	Emission Factor
EIA / EA	Environmental Impact Assessment / Environmental Assessment
ER	Emission Reduction
ESCO	Electricity Commercial Operator
FAR	Forward Action Request
GHG	Greenhouse Gas(es)
GWP	Global Warming Potential
GSE	Georgian State Electrosystem
HPP	Hydro Power Project
IRL	Information Reference List (refers to document list in Appendix 3)
JMR	Joint Meter Reading
KP	Kyoto Protocol
kV	Kilo Volt
MP	Monitoring Plan
MR	Monitoring Report
OM	Operational Margin
PCP	Project Cycle Procedure
PDD	Project Design Document
PP	Project Participant
PS	Project Standard
PM	Power Meter
TÜV SÜD	TÜV SÜD South Asia Pvt. Ltd
UNFCCC	United Nations Framework Convention on Climate Change
VVS	Clean Development Mechanism Validation And Verification Standard

Appendix 2. Competence of team members and technical reviewers



South Asia

CERTIFICATE OF APPOINTMENT

Mr. Ranjan, Kumud fulfills the requirements of the Certification Body 'Environment and Energy' of TÜV SÜD South Asia Pvt Ltd to participate in audits.

Qualification applicable to					
Standard	CDM	GS	VCS	ISO-14064-1: 2006	Other
	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Qualification as						
Status	Validator	Verifier	ATL	Technical Reviewer	Financial Expert	Technical Expert
	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
TA (s)	1.2, 3.1					

Country Expertise						
Region	1	2	3	4	5	Other
	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Further countries						

Technical Area	
1.2_Renewables	
3.1_Energy demand	

This appointment is valid until 23.02.2017 and is bound by internal requirements of the Certification Body 'Environment and Energy' of TÜV SÜD South Asia Pvt Ltd.

In case of loss of validity of this certificate as per result of an assessment according to internal procedures or due to any other reason, it will be properly communicated to you.

Your Certificate has the internal reference no. CB-IND-CCP-0054/006.

Date	Signature
01/02/2016	

IS-CMS-CB-POG-01/05, version 03

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South Asia

CERTIFICATE OF APPOINTMENT

Mr. Dutta Supratik, fulfills the requirements of the Certification Body 'Environment and Energy' of TÜV SÜD South Asia Pvt Ltd to participate in audits.

Qualification applicable to					
Standard	CDM	GS	VCS	ISO-14064-1: 2006	Other
	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Qualification as						
Status	Validator	Verifier	ATL	Technical Reviewer	Financial Expert	Technical Expert
	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
TA (s)	1.2, 3.1					

Country Expertise						
Region	1	2	3	4	5	Other
	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Further countries						

Technical Area
1.2_Renewables
3.1_Energy Demand

This appointment is valid until 28.02.2017 and is bound by internal requirements of the Certification Body 'Environment and Energy' of TÜV SÜD South Asia Pvt Ltd.

In case of loss of validity of this certificate as per result of an assessment according to internal procedures or due to any other reason, it will be properly communicated to you.

Your Certificate has the internal reference no. CB-IND-CCP-0054/006.

Date	Signature
01/02/2016	

IS-CMS-CB-POG-01/05, version 03

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Appendix 3. Documents reviewed or referenced

No	Author	Title	References to the document	Provider
1.	UNFCCC	Registered Project Design Document titled 'Gudauri Small Hydropower Project' (Registered Project ID 9079), Version 11	Dated 03-12-2012 https://cdm.unfccc.int/Projects/DB/SGS-UKL1356112097.03/view	Others
2.	UNFCCC	AMS-I.D – Renewable electricity generation for a grid, version. 17	https://cdm.unfccc.int/methodologies/DB/W3TINZ7KKWCK7L8WTFQOQFQ/QH4SBK	Others
3.	UNFCCC	Published Monitoring report, version 01, titled 'Gudauri Small Hydropower Project', for first monitoring period number 31-12-2013 to 31-10-2015	https://cdm.unfccc.int/Projects/DB/SGS-UKL1356112097.03/view . Dated 08-01-2016	Project participant/ Others
4.	Georgian National Agency for Standards and Metrology	Certificate for Recognition of Primary Verification Results of Measurement Means dated 17-12-2013 for Mercury 230/ 0.5S meter of S No. 16827095-13g (PM1). Certificate no. 1767-13	Dated 17-12-2013	Project participant
5.	Georgian National Agency for Standards and Metrology	Certificate for Recognition of Primary Verification Results of Measurement Means dated 13-12-2013 for Mercury 230/ 0.5S meter of S No. 16827095-13g (PM2). Certificate no. 1767-13	Dated 13-12-2013	Project participant
6.	Georgian National Agency for Standards and Metrology	Certificate for Recognition of Primary Verification Results of Measurement Means dated 28-05-2012 for Mercury 230/ 0.5S meter of S No. 11130132-12g (PM3). Certificate no. 787-12	Dated 28-05-2012	Project participant
7.	Georgian National Agency for Standards and Metrology	Certificate for Recognition of Primary Verification Results of Measurement Means dated 27-05-2009 for Alfa A1800 type Electric Energy Meter manufactured by LTD "Elster Metronika" (Russian Federation) meter of S No. 01185826 (PM4-Feb and March 2014). Certificate no. 437-an	Dated 27-05-2009	Project participant
8.	Georgian National Agency for Standards and	Certificate for Recognition of Primary Verification Results of Measurement Means dated 28-03-2014 for Alfa A1800 type Electric Energy Meter manufactured by LTD "Elster Metronika" (Russian Federation) meter of S No.	Dated 28-03-2014	Project participant

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	Metrology	01270885 (PM4- April 2014 onwards). Certificate no. 180-14		
9.	Georgian Metrology Center Ltd.	Certificate of calibration of energy meter Elster A1500 /0.5S of serial no. 00485666 (PM5). Certificate no. 00998/1-13	Dated 10-12-2013	Project participant
10.	INCOTEX	Technical specification Mercury 230/ 0.5S meter of S No. 16827095-13g (PM1) and Mercury 230/ 0.5S meter of S No. 16827095-13g (PM2)	Collected during audit on 29-01-2016	Project participant
11.	INCOTEX	Technical specification Mercury 230/ 0.5S meter of S No. 11130132-12g (PM3).	Collected during audit on 29-01-2016	Project participant
12.	Elster	Technical specification Alfa A1800 type Electric Energy Meter manufactured by LTD "Elster Metronika" meter of S No. 01270885 and S No. 01270885	Collected during audit on 29-01-2016	Project participant
13.	TUV SUD	Generator (Unit I & 2) name plate pictures	Taken during audit on 29-01-2016	Others
14.	TUV SUD	Turbine (Unit I & 2) name plate pictures	Taken during audit on 29-01-2016	Others
15.	TUV SUD	Energy meters pictures	Taken during audit on 29-01-2016	Others
16.	TUV SUD	SCADA snapshot	Taken during audit on 29-01-2016	Others
17.	SCHUBERT	SCADA Manual, Revision 01	19-02-2014	Project participant
18.	Energo - Aragvi Ltd and Alpiq TurkeyEnerji	Framework contract for the sale and purchase of electricity	Dated 28-10-2014	Project participant
19.	Kossler GmbH & Co KG	Provisional Acceptance Certificate (PAC)	Signed on 17-02-2014	Project participant
20.	Parliament of Georgia	Georgia regulation: "PRODUCT SAFETY AND FREE MOVEMENT CODE-matsne-1659419-11.pdf". Ref. article 80, 2.k for calibration frequency. The document is available online at https://matsne.gov.ge/en/document/view/1659419	https://matsne.gov.ge/en/document/view/1659419 . Date of issuing 08-05-2012	Project participant
21.	Energo - Aragvi Ltd	Survey Model-basin blue print (Schematic project reservoir)	Collected during audit on 29-01-2016	Project participant
22.	Energo - Aragvi Ltd Energo Pro Alpiq Turkey Enerji ESCO Georgia	Electricity sale invoices: February 2014- Energo Pro March 2014 to December 2014- ESCO Georgia January 2015 to April 2015- ESCO Georgia May 2015 to July 2015- Alpiq TurkeyEnerji August to October- ESCO Georgia	Collected during audit on 29-01-2016	Project participant
23.	Energo - Aragvi Ltd	Final Monitoring report, version 08, titled 'Gudauri Small Hydropower Project', for first monitoring period number 31-12-2013 to 31-10-2015	Dated 06-04-2016	Project participant
24.	Energo - Aragvi Ltd	Emission reduction sheet, Version 01	Dated 08-01-2016	Project participant

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25.	Energo - Aragvi Ltd	Plant shut down details	Submitted on 10-03-2016	Project participant
26.	Energo - Aragvi Ltd	Revised PDD titled 'Gudauri Small Hydropower Project' version 14 highlighting changes to project description and monitoring plan	Dated 08-04-2016	Project participant
27.	UNFCCC secretariat	Email dated 07-01-2016 from UNFCCC secretariat (CDMRegistration@unfccc.int) regarding change in start date of the crediting period.	Dated 07-01-2016	Others
28.	Ministry of Environment Protection and Natural Resources of Georgia Clean Development Mechanism Designated National Authority	Baseline Emission Factor for the Electricity System of Georgia, Version 01	http://moe.gov.ge/files/Klimatis%20Cvli%20eba/Sufta%20Ganv%20tarebis%20Mekanizmi/SMG%20Erovnuli%20Uflebamosili%20Organo/Baseline_EF_2004-2006.pdf , Published April 2008	Project participant
29.	ESCO	Gross generation report available on esco.ge website	http://www.esco.ge/index.php?article_id=1&clang=1	Project participant
30.	Energo - Aragvi Ltd	Emission reduction sheet, Version 02	Dated 06-04-2016	Project participant

Appendix 4. Clarification requests, corrective action requests and forward action requests

Table 1. Remaining FAR from validation and/or previous verification

No FAR was raised in validation or previous verification report.

Table 2. CL from this verification

CL ID	01	Section no.	E.3, E.7	Date:	15/02/2016
Description of CL					
Further evidence shall be provided to assess the relevance, completeness, consistency, and transparency of the information provided by project participants. Provide following documents for further assessment:					
<ol style="list-style-type: none"> 1. Commission certificate for Stage I 2. Calibration certificate of the meter on 10 kV Side highlighting the period of validity of calibration. 3. Copy of national standard that states that meter calibration is to be performed every 12 years (with reference to exact clause). 4. Documentary evidence that the reservoir volume is 53463m³ and water surface area is 9795m² 					
Project participant response				Date:	18/03/2016
The following documents are provided to the DOE :					
<ol style="list-style-type: none"> 1. A provisional acceptance certificate signed by the turbine manufacturer Kessler: "Provisional acceptance certificate.jpg". The document shows that the works were completed on the 3/02/2014. 2. Calibration certificate of PM5 located on the 10kV side of the transformer, dated 10/12/2013. "PM5- calibration report.pdf" 3. See Response to CAR 4 					
We provide a blue print of the buffer basin. The document clearly shows the surface and the volume of the basin. "Survey Model-basin blue print.pdf"					
Documentation provided by project participant					
IRL#09,19,20,21					
DOE assessment				Date:	18/03/2016
<ol style="list-style-type: none"> 1. PP has provided the Provisional Acceptance Certificate by the turbine manufacturer Kessler dated 17-02-2014 showing the work completion date as 03-02-2014. This is acceptable 2. PP has provided the calibration certificate of PM5 located on the 10kV side of the transformer from Georgian Metrology Centre Ltd., dated 10-12-2013 (Certificate no. 00998/1-13) valid until 10-12-2025. This is acceptable 3. PP has provided the copy of 'The Georgian legislation Law of Georgia, Product Safety and Free Movement Code', Article 80 'Legalised measurement means' that specifies 12 year calibration frequency for energy meters. This is acceptable 4. PP has provided Survey Model-basin blue print that clearly shows reservoir volume as 53463m³ and water surface area as 9795m². This is acceptable 					
The CR is closed					

Table 3. CAR from this verification

CAR ID	01	Section no.	E.3	Date: 15/02/2016
Description of CAR				
1.	Section A.1 of MR does not provide the identification details of important equipments (viz. Turbine and Generator). Furthermore section A.1 of MR does not provide the technical details (specifications) of generator sets. Provide in section A.1 of MR identification details of important equipments (viz. Turbine and Generator). Also in the same section technical details (specifications) of generator sets for a transparent representation of technology used.			
2.	The turbine nameplate verified on site, turbine's maximal output is 4397 kW, but installed capacity of single turbine is stated as 4000kW in the registered PDD and in the MR. PP shall provide documented evidence to justify the discrepancy.			
Project participant response				Date: 18/03/2016
1.	MR has been modified to include units I and II generator and turbine specifications. Pictures of the plates of Unit 1 are given. We also improved the description of the buffer basin.			
2.	The PDD was prepared at an early stage at a time when all technical details were still in elaboration. The PDD is by the way very vague as it does not make a difference between generator and turbine capacities. Finally the capacity of the two phase I generators has been chosen as 4260 kW each (the plate states 4734 KVA with a power factor of $\cos f=0,9$. $4734*0,9=4260$ kW) instead of 4000 kW in the PDD. This change affects each unit taken individually but not the maximum output of the two turbines. Indeed, when the two units are operated simultaneously, double volume water flows in the penstock and due to a more friction and consequently head loss the total power output is 4000 kW for each unit. In other words, the total rated capacity of stage I is 8520 kW but the total output is capped to 8000 kW and is unchanged compared to project design proposed in PDD. A change in project description has been proposed.			
Documentation provided by project participant				
IRL #13,14,23				
DOE assessment				Date: 18/03/2016

1. PP has now provided the Turbine and Generator specifications for Unit I. As for unit II the generator and turbine specifications are not yet known, thus only proposed installed capacity of turbine has been provided. PP has also included in section A.1 while describing the technical specification of key equipments the picture of name plates of turbines and generators units showing their specific technical specifications. PP has now also described the buffer basin (referred as balance pond in the PDD) that can hold 53,463 m³ of water with in 9795 m² of surface area. The buffer basin stores 8 hours of power reserve (or 4h on maximum power load) in the event of planned or forced shut downs.
2. PP has proposed a change in description of project activity to highlight the installed capacity change. The actual installed capacity of each of the two generators (under stage I) installed at site is 4734kVA*0.9 (power factor) i.e. 4260kW against 4000kW stated in the registered PDD.

The PDD was developed at a very nascent stage and the generation calculation was based on the Detailed Project Report (DPR), that estimated generation capacity of Gudauri Stage I hydro based on the water availability, flow and other parameters as 8000kW (4000kW each for two generators). But to generate 4000kW of net electricity from one turbine considering various losses, a 4260kW generating unit was found more suited. Although, the installed capacity of each turbine increased approx. by 6.5% the net generation capacity of each turbine remained at around 4000kW, not impacting the power generation capacity of the hydro project. This is also evident from the monthly generation from the project activity. Thus this change in installed capacity does not impact the scale and additionality of the project activity. Furthermore, this change does not alter emission reduction projections in the registered PDD.

The CAR is closed.

CAR ID	02	Section no.	E.2	Date: 15/02/2016
Description of CAR				
It is understood from the discussion with PP during the on-site audit that Stage II of the project activity would now commission only by the end of 2017 after an unexpected flood led to disruption in its implementation. Section B.1 of the MR is not clear on the expected date of implementation and commissioning of stage II.				
Provide in section B.1 of MR the expected date of implementation and commissioning of Stage II of the project activity.				
Project participant response				Date: 18/03/2016
Section B1 has been improved and gives a tentative schedule for phase II. It is the flooding during summer 2015 which has delayed the construction of Phase II and has convinced the Energo Aravi Ltd. to redesign Phase II. Phase II is expected to start construction in 2016 and operation start end of 2017.				
Documentation provided by project participant				
IRL#23				
DOE assessment				Date: 18/03/2016
The phase II was delayed due to the unexpected flood in Georgia in July 2015 that also forced closure of stage I of project activity for repair and reinforcement works for one month. The flood compelled PP to alter and redesign phase II to encompass a better design to withstand such calamities in future. This delayed the implementation of phase II. As per PP and as verified on site the construction of Phase II would start in June-July 2016. The CAR is closed				
CAR ID	03	Section no.	E.6.2	Date: 15/02/2016
Description of CAR				

Section B.2.5 of the MR states "...bidirectional billing meter has been installed after the transformer on the 110kV side and not before the transformer on the 10kV site as stated in the registered monitoring plan".

However as per the observations made during the on-site audit there is an elster make bidirectional meter with Sr. no. 00485666 on the 10kV side. Although it is true that the readings from this meter is used only for cross-check and the readings from bi directional energy meter on the 110kV side is used for Emission Reduction estimation.

Furthermore it was explained during the on-site visit that the Meter reading from PM4 is cross-checked from the readings of PM1, PM2, PM3 and during the period (between February 2014 to end of September 2014) when PM1 and PM2 were not functioning properly SCADA readings (calculated using Voltage and Ampere readings), PM3 and PM5 were referred for cross referencing net generation.

1. PP shall correct the misstatement in section B.2.5 regarding metering arrangements. Specifications (S. No., accuracy class) of the meter on the 10kV site shall be provided in section D.2 while elaborating on the purpose of this meter in monitoring. Furthermore, Section C of MR shall correctly represent the metering system and meter locations.
2. Section D.2 shall further elaborate on specifications (meter no., accuracy class, make and model) of all types of meters and role of each meter in monitoring and the metering cross-check methods used.

Project participant response	Date: 18/03/2016
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Section B2.5, C and D.2 have been modified. We added the description of PM5, the meter at the inlet of the transformer and the SCADA System PM1 to PM5 specifications are now clearly stated in section D.2. Diagram with meters' locations has been modified in section C.

Documentation provided by project participant

IRL#9,15,23

DOE assessment	Date: 18/03/2016
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1. PP has corrected the misstatement in section B.2.5 regarding metering arrangements. Furthermore, PP has now included in section C and D.2 of MR the details and location of elster make bidirectional meter with Sr. no. 00485666 installed at the 10kV side and accordingly PP has corrected the meter location the line diagram. As per the registered PDD energy meter PM5 installed at 10kV was the primary energy meter for measurement of energy generation ($EG_{facility,y}$). However, during the monitoring period another meter PM4 installed at 110kV side of the transformer was used instead for measurement of energy generation ($EG_{facility,y}$). This meter was primarily used as it accounted for the transformer losses, adding conservativeness to overall net electricity generation and resulting emission reduction estimation.
2. Section D.2 of MR now elaborates on specifications (meter no., accuracy class, make and model) and role of all types of meters. This is thus acceptable.

CAR ID	04	Section no.	E.7	Date: 15/02/2016
Description of CAR				

<p>As per the discussion with the PP during on-site audit calibration of energy meters would be performed every 10 years in line with the meter manufacturer's specifications and that the mention of a frequency of 3 years in section D.2 of the MR is erroneous, though in line with the monitoring plan of registered PDD. PP also highlighted that in no case it is possible to perform calibration at a lesser frequency as it involves removing meters from the main system and that it would require shutting down of the power plant. Moreover as per the regulatory requirement (national standards) in Georgia, meter calibration is required every 12 years.</p> <p>PP shall categorically enunciate in section B.2.5 of its intention to calibrate meters in line with the meter manufacturer's specifications and or national standards. This change shall also be highlighted as a revision to the monitoring plan in the requisite section of revised PDD (see CAR 6).</p>	
Project participant response	Date: 18/03/2016
<p>The calibration of the electronic meters will be done every 10 years by an authorised laboratory. 10 years has been chosen conservatively as the shortest period between manufacturer's recommendation (10 years) and Georgian legislation (12 years).</p> <p>This point has been added to section B.2.5 and modified in section C and D. We also provide :</p> <ul style="list-style-type: none"> PM1, PM2, PM3 and PM4 technical specifications which indicate the calibration frequency : "PM1-PM2 tecspec.pdf", "PM2 tecspec.pdf" and "PM4 tecspec.pdf" An extract of the Georgia regulation: "PRODUCT SAFETY AND FREE MOVEMENT CODE-matsne-1659419-11.pdf". See article 80, 2.k for calibration frequency. The document is available online at https://matsne.gov.ge/en/document/view/1659419 	
Documentation provided by project participant	
IRL#04,05,06,07,08,09,10,11,12,20,23	
DOE assessment	Date: 18/03/2016
<p>The Georgian legislation Law of Georgia, Product Safety and Free Movement Code, Article 80 'Legalised measurement means', specifies 12 year calibration frequency for energy meters where as the meter's technical specification (PM1, PM2, PM3 and PM4) specifies a calibration frequency of 10 years. To be conservative in its approach PP has chosen the later (i.e. 10 years) as a requisite calibration frequency for the meters installed in the project activity.</p>	

CAR ID	05	Section no.	E.8.6	Date: 15/02/2016
Description of CAR				
Further evidence shall be provided to assess the relevance, completeness, consistency, and transparency of the information provided by project participants, thus PP shall provide shut down details in relevant section of the MR				
Project participant response				Date: 18/03/2016
<p>The list of shutdowns occurring from 03/02/2014 to 12/11/2015 is provided as an Excel file called 'Aragvi HPP shutdowns 2014.03.02_2015.11.12.xlsx'</p> <p>The file is compiling for both units the starting time, ending time, length of each shutdown and the reason for the shutdown.</p> <p>The list of shutdown has been added as an annex to the MR.</p>				
Documentation provided by project participant				
IRL#23,25				
DOE assessment				Date: 18/03/2016
PP has now incorporated the shut down details as Appendix 2 of the MR. The CAR is closed.				

CAR ID	06	Section no.	E.4.5, E.4.6	Date: 15/02/2016
Description of CAR				

In line with §295, § 296 of VVS, to comply with requirements pertaining to permanent changes from registered monitoring plan and project description, PP shall submit a revised PDD in the latest PDD template highlighting the change in monitoring plan in track change and while transferring the information to the later version of PDD keeping the information materially same as that in the registered PDD.	
PP shall submit a revised PDD in the latest PDD template highlighting the change in monitoring plan and project description in track change and while transferring the information to the later version of PDD keeping the information materially same (verbatim) as that in the registered PDD.	
Project participant response	Date: 18/03/2016
Updated PDD has been submitted along with the MR.	
Documentation provided by project participant	
IRL#23,26	
DOE assessment	Date: 18/03/2016
PP has submitted a revised PDD in the latest PDD template highlighting the changes in monitoring plan and project description in line with In line with §295, § 296 of VVS. The CAR is closed	

Table 4. FAR from this verification

No FAR has been raised by the DOE during the assessment.