

VERIFICATION OF “HYDRO POWER PROJECT IN BACKWARD DISTRICT OF ANDHRA PRADESH, INDIA”



Prepared By

EPIC Sustainability Services Pvt. Ltd.

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Summary:

EPIC Sustainability Services Pvt. Ltd., (hereinafter called ESSPL) has conducted the periodic verification of the “Hydro Power Project in backward district of Andhra Pradesh, India” project of APGENCO located across Krishna River near Revulapally village in Mahaboobnagar district of Andhra Pradesh, India. The verification was done based on Verified Carbon Standard (VCS) version 3.4 for the period starting from 18th August 2008 to 31st December 2013.

The run of the river hydro power plant consists of six hydroelectric units of 39 MW capacity each with a total installed capacity of 234 MW. It is a green field project developed by Andhra Pradesh generation Company, (hereinafter called APGENCO), located at Mahaboobnagar district Andhra Pradesh, India.

The power generated is exported to Andhra Pradesh State electricity grid, which is part of Southern regional grid in India. The verification scope is defined as a periodic independent review and ex post determination by the Designated Operational Entity (DoE) of the monitored reductions in GHG emissions during defined verification period, and consisted of the following three phases

1. Desk review of the registered project document including the baseline and the monitoring plan;
2. Physical site inspection and follow-up interviews with project stakeholders;
3. Resolution of outstanding issues and the issuance of the final verification report including verification opinion.

The overall verification, from Contract Review to Verification Report & Opinion, was conducted using ESSPL's internal procedures. On the basis of the physical site inspection of the project activity and review of the documents submitted by the project participant, the Verification team confirms that, for the VCS verification period from 18/08/2008 to 31/12/2013, the project has been implemented as planned and described in the registered VCS PD. The necessary equipment's, installed for generating emission reductions in the project activity, runs reliably and the measuring equipment's, essential for the measurement of electricity generated from the power plant have been verified to be calibrated in line with the calibration procedures in the validated Project Document. This verification report pertains to the VCS monitoring period starting from 18/08/2008 to 31/12/2013 (including both days). Three Corrective Action Requests (CARs) and Two Clarification Requests (CLs) were raised during this verification activity. Further, FARs raised during the previous validation was also raised. All the CARs CLs and FARs have been successfully closed by the verification team based on the satisfactory response from the project participant. The verification team confirms that total GHG reductions achieved during the current monitoring period are 8,44,571 tCO₂e and that emission reductions are calculated without material misstatements.

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APPENDIX I : VERIFICATION PROTOCOL

1 INTRODUCTION

1.1 Objective

Andhra Pradesh Generation Company (APGENCO) has contracted EPIC Sustainability Services Pvt. Ltd.(ESSPL) to verify the Verified Emission Reduction (VERs) of the project “Hydro Power Project in backward district of Andhra Pradesh, India” (hereafter referred to as “the Project”), which is located across Krishna River near Revulapally village in Mahaboobnagar district of Andhra Pradesh, India for the period from 18/08/2008 to 31/12/2013, for its first VCS Verification.

The verification scope is defined as a periodic independent review and ex post determination by the Designated Operational Entity (DoE) of the monitored reductions in GHG emissions during defined verification period leading to the certification of the greenhouse gas (GHG) emission reductions achieved by the project activity. The verification scope consisted of the following:

1. Implementation of the project activity in conformance with the requirements of the Project Document
2. Verification of the Monitoring systems in line with the requirements of the Project Document and assessment of their functionality
3. Assurance that the emission reductions generated by the project are verifiable and credible

The verification was carried out based on the requirements of the VCS standard version 3.4^{1/} and VCS Validation Verification Manual version 3.1^{2/} based on information made available to EPIC and a written assurance is provided on the GHG emission reductions achieved for the period specified.

1.2 Scope and Criteria

The scope of the verification covers independent objective review and ex-post determination of the monitored GHG emission reductions by the project activity “Hydro Power Project in backward district of Andhra Pradesh, India”.

The VCS Verification is based on verification of information in the VCS PD, the Project's baseline study and Monitoring Report (MR) and other relevant documents. The information in these documents is reviewed against VCS Standard Version 3.4 requirements, and other latest guidelines issued by VCSA.

The specific scope of the verification work involves:

- I. To verify that the project activity is implemented as per the project details of the validated project document (VCS PD) dated 1st August 2010, version 02^{3/}.
- II. To assess whether the emissions reductions determined are in conformance with the monitoring plan of the PD and the approved methodology ACM0002 Version 11.

- III. To express a conclusion whether reported data are accurate, complete, consistent, and transparent with a reasonable level of assurance and free of omission or material error, based on the review of the reported data and emission reduction calculations.

The project is assessed against the verification requirements of VCS standard version 3.4 including the criteria that the emission reductions are real, measurable, transparent and conservative. The approach adopted by ESSPL verification team is risk-based, drawing on an understanding of the risks associated with reporting of GHG emissions data and the controls in place to mitigate these.

The verification scope is defined as an independent and objective review of the voluntary emission reductions not meant to provide any consulting towards the client. However, stated requests for forward actions and/or corrective actions may provide input for improvement of the Project monitoring towards reductions in the GHG emissions. The work carried out by ESSPL is free from any conflict of interest.

The request for issuance of Verified Carbon Units (VCUs), verified and certified by ESSPL, shall be made by the project proponent to the VCS registry in accordance with the most recent version of the “VCS Guidance Document: VCS Project Registration and VCU Issuance process”. In view of the above, ESSPL’s responsibility is limited only to verification and certification of the GHG emission reductions achieved during the specified period.

1.3 Level of Assurance

In line with requirements of VCS standard version 3.4 and as per ISO 14064-3:2006 paragraph A.2.3.2, a “reasonable level of assurance” is defined for the verification of the project.

This implies that, based on the process and procedures conducted, review of the VCS-PD, the VCS Monitoring Report (MR), supporting evidences made available to the verifier and information collected through performing interviews and during the on-site assessment, ESSPL confirms that the GHG assertion in the monitoring report.

- is materially correct and is a fair representation of the GHG data and information, and
- is prepared in accordance with VCS requirements, the validated VCS PD and the approved methodology for information pertaining to GHG quantification, monitoring and reporting.

The verification work is carried out as per this requirement and details are presented in the Verification statement in section 2 below.

1.4 Summary Description of the Project

The project is a run-of-the-river hydro power plant with an installed capacity of 234MW, consisting of six numbers of 39MW bulb type turbines. The turbines are located across Krishna river near Ravulapally village in Mahboobnagar district of Andhra Pradesh. The Project is owned by APGENCO.

The power generated is exported to Andhra Pradesh State electricity grid by means of a contractual agreement ^{/4/}, which is part of Southern region (SR) grid in India. The Project activity generates emission reductions by displacing electricity generation from grid connected fossil fuel-fired power plants that would otherwise be generating electricity.

The turbines generate electricity at 11 KV which is stepped up to 220 KV by 50 MVA step up transformers before injecting the net electricity to the grid by means of four feeders. The electricity supplied and imported from the grid by the project is continuously monitored and recorded on monthly basis. The monitoring is performed by the set of main and check energy meters of accuracy class 0.2S at the 220 KV interface. The net electricity supplied by the project is monthly recorded by the APGENCO plant officials^{/5/}. The monthly joint meter reading (JMR) report^{/6/} generated from the monthly reading is signed jointly by APGENCO and APTRANSCO representatives.

2 VERIFICATION PROCESS

2.1 Method and Criteria

The overall verification process, beginning from the Contract Review to Verification report, certification statement & opinion, was conducted using internal procedures of EPIC Sustainability Services Pvt. Ltd. (ESSPL). The project is already validated as a VCS project and hence the VCS verification was based on criteria as per VCS Standard 3.4.

The project activity applies approved baseline and monitoring methodology ACM0002, Version 11 “Consolidated baseline methodology for grid-connected electricity generation from renewable sources”^{/7/}.

For verification of emission reductions the following steps were undertaken:

1. Completeness check of the Monitoring Report and desk review of the supporting documents
2. Onsite inspection and issuance of findings, conducted during 16-17 Jan. 2014.
3. Resolution of findings and preparation of Final Verification Report

The team members involved in the VCS verification of the project activity are as follows:

Team member	Qualification	Competency	Document review	Site Visit	Resolution of issues	Final Technical Review approval
Mr. A. Prabu Das	Lead Auditor	TA 1.2 – (Renewables)	Yes	Yes	Yes	NA
Mr. D.V. Mahesh Kumar	Technical Expert	TA 1.2 – (Renewables)	Yes	Yes	Yes	NA

Mr. K.Sudheendra	Technical Reviewer	TA 1.2 – (Renewables)	Yes	NA	NA	Yes
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2.2 Document Review

On receipt of the monitoring report from the PP, the completeness of information was checked as per VCS standard version 3.4^{/1/}. A desk review of the following documents was done:

- The validated VCS PD dated 1st August 2010, version 02^{/2/}
- The Monitoring Report dated 6th January 2014 version 1^{/8/}
- The revised Monitoring Report dated 19th February 2014 version 2^{/9/}
- The emissions reduction calculation sheets^{/10/}
- Other external documents like monthly billing invoices^{/5/,/6/}
- Commissioning certificates of all six turbines^{/11/}
- Grid emission factor from CEA database Version 05^{/12/}

A complete list of all documents reviewed is attached in Appendix I of this report

2.3 Interviews

Multiple level interviews were conducted to assess understanding of project requirements and to determine if monitoring conducted in the field was implemented in accordance with the requirements in the validated PD.

The following lists of persons were interviewed on the relevant topics by the verification team which visited onsite and office on January 16 to 17, 2014.

Name and Designation	Company / Entity	Topics covered
1. B. Raghu Ram / Deputy Engineer- Projects	APGENCO – Plant and Office	<ul style="list-style-type: none"> • Project Description • Monitoring Plan implementation • Operational procedures • Archiving of data • QA/ QC procedures • Internal review mechanisms • Emission reduction calculation procedures
2. K. Sarmash Vali – Asst. Deputy Engineer- Shift		
3. MSV Subramanyam-Suptd. Engineer-Comemrcial		
4. B. Ravinder- Asst. Deputy Engineer- Commercial		

2.4 Site Inspections

The physical site inspection was performed by the verification team to cover the scope on:

1. Verification of physical location of the site and confirm the boundaries of the project activity
2. Implementation and operation of the project activity as per the description in the validated PD.
3. Recording and monitoring of data in line with the applied monitoring methodology ACM0002, Version 11

The methods to verify the above mentioned information involved visit to the power generation facility premises, interaction with the plant personnel, verification of monitoring and recording aspects related to hydro power generation. While the generated net energy was verified from the monthly invoices maintained by APGENCO in the plant premises^{/5/}, the records of the Joint Meter readings accepted by APTRANSCO was verified from the office premises of APGENCO^{/6/}.

2.5 Resolution of Findings

Based on the site inspection and review of records including the monitoring plan, a list of non-conformities; Corrective Action Requests (CAR) –3 No.s and Clarification Requests (CLs) – 2 No.s were raised. Further two Forward Action Requests (FARs) raised during the previous validation were also raised. The non-conformities could be related to lack of adherence to the VCS standard version 3.4 requirements, non-conformance to the monitoring plan of as defined in the CDM validated PDD or where evidence provided is found insufficient to prove conformity. They could also be mistakes in applying data/ assumptions and in calculation of emission reductions.

- If information made available is insufficient to transparently arrive at the stated conclusion, a Clarification request (CL) is raised and communicated to the project proponent.
- Observations may also be raised which are for the benefit of future verification period. These, however, have no impact upon the completion of the current verification activity.
- On receipt of response from the project developer, the adequacy with compliance with VCS requirements is checked along with a revised monitoring report. Closure of comments raised occurs only if the response provided and correction made fully complies with the stated requirements of the methodology applied.

The list of CARs/ CLs raised and the response provided and reasons for closure are provided in Appendix-2.

2.5.1 Forward Action Requests

Two Forward Action Requests (FARs) raised during the previous validation were raised during the course of this verification. The list of CARs/ CLs raised and the response provided and reasons for closure are provided in Appendix-2.

2.6 Eligibility for Validation Activities

Not applicable as the project activity has already been validated as per VCS standard 2007.1.

3 VALIDATION FINDINGS

Not applicable as the project activity has already been validated as per VCS standard 2007.1.

3.1 Participation under Other GHG Programs

Not applicable as the project is participating only under VCS GHG program and also verified from the letter of undertaking submitted by the PP.

3.2 Methodology Deviations

The project activity has already been validated as per VCS standard 2007.1. The project activity has applied ACM0002, version 11. No methodology deviation is involved.

3.3 Project Description Deviations

No project deviations have been observed during the verification process. Hence there is no impact on the following in relation to the implementation of project and its conformance to VCS 3.4 requirements:

- The applicability of the methodology.
- Additionality.
- The appropriateness of the baseline scenario.

3.4 Grouped Project

Not Applicable as the project activity is not a grouped project.

4 VERIFICATION FINDINGS

4.1 Project Implementation Status

The verification team confirms that project activity has been implemented in accordance with the registered PD and operating successfully. The physical site visit was conducted by verification team members on January 16 to 17, 2014. Material discrepancies were not observed during the site visit with respect to the project implementation and the project description provided in the registered VCS PD.

The verification team also confirms from the review of the previous validation report that there were two FARs issued which were resolved during the current verification period.

From the review of the commissioning certificates^{11/} of six turbines (units) and onsite inspection, it was verified that the commissioning was done in the following periods:

Unit	COD
Unit 1	18/08/2008
Unit 2	29/11/2008

Unit 3	07/08/2009
Unit 4	08/09/2010
Unit 5	19/11/2010
Unit 6	04/08/2011

The monitoring of the energy generation from the project activity is being carried out with a pair of main and check energy meters located at 220 kV interface. The meters are of high accuracy class (0.2s) and monitor the electricity (export and import from the grid) on continuous basis with at least hourly measurement. The energy generation for the month is recorded by the plant officials of APGENCO. A Joint Meter Reading (JMR) report is prepared by the representatives of APTRANSCO (buyer) and APGENCO (seller) which become the basis for the monthly invoice raised towards net electricity supplied and calculation of the baseline emissions. The verification team confirms that monitoring requirement of the net electricity supplied to the grid is being met by the project participant.

Further, the verification team confirms that monitoring equipment's are running reliably and monitoring plan provided in the registered PD is being followed by the project participant. Further the following verifications as applicable to this section of the verification report are outlined below:

- It was verified whether the GHG emission reductions or removals generated by the project have become included in an emissions trading program or any other mechanism that includes GHG allowance trading. The Project has applied for GHG emission reductions under VCS scheme only. The same was verified by analysis of databases pertaining to GHG programs and confirmed by review of the undertaking letter issued by the PP to this effect during the verification process^{/13/}
- The project has not received or sought any other form of environmental credit, or has become eligible to do so since the validation. This is verified from the interviews conducted with the PP and the letter of undertaking^{/13/}.
- The project has not participated or been rejected under any other GHG programs since validation or previous verification. This is verified from the interviews conducted with the PP, review of the GHG program databases and the letter of undertaking^{/13/}.

The verification team is of the opinion that the project has been implemented as described in the project description and in line with VCS Standard ver 3.4 requirements.

4.2 Accuracy of GHG Emission Reduction and Removal Calculations

Baseline Emissions:

The project participant has calculated the baseline emissions based on net electricity supplied to the grid from the project activity from 18th Aug. 2008 to 31 Dec. 2013. The baseline grid electricity emission factor value based on the CEA database available for Southern Grid has been fixed ex ante at the time of validation of the project activity. The value of net electricity supplied to the grid was also cross-checked with invoices raised by the PP against the electricity sold to APTRANSCO. The net electricity supplied to the grid from the project activity for the current verification period from 18th August 2008 to 31st Dec. 2013 is 935580.60 MWh. In order to calculate the monthly accrued baseline emissions, project participant multiplied the net electricity supplied to the grid by the baseline grid electricity emission factor of 0.9027tCO₂/MWh which is applicable for Southern Grid.

The project participant has rounded down the accrued monthly baseline emissions for the current verification period. The verification team confirms that the total accrued baseline emissions for the current verification period starting from 18th Aug. 2008 to 31st Dec. 2013 are 8,44,571 tCO₂ (rounded down) and the formula applied for the computation of the baseline emissions are correct and meets the requirements of the applied methodology ACM 0002 version 11.0.

Project Emissions

The project activity is run-of-river based hydro-electric project. Moreover as per the methodology requirements for projects that result in a new reservoir or increase of existing reservoirs, the CH₄ and CO₂ emissions from the reservoir needs to be accounted as project emissions. Since the power density of the project is more than 10 W/m² (314 W/m²), Project emissions is considered to be zero which is acceptable.

Leakage Emissions

The project activity is a Greenfield project. The equipment's installed in the project activity are new and hence leakage is not applicable.

Emission Reductions

Based on the above-reported values of the baseline emissions and project emissions, the emission reductions accrued for the current verification period are 8,44,571 tCO₂. The verification team confirms that the baseline emissions, project emissions and emission reductions computed by the project participant are conservative and meet the requirements provided in the applied methodology ACM 0002 Version 11. The data and values applied in the monitoring report and emission reduction spreadsheet are consistent. The default emission factors used by the project participant for emission reduction calculations are appropriate and in line with the requirements in the PD. A summary of the baseline emissions, project emissions and emission reductions verified for the current verification period is provided in the Table below.

Period	Baseline Emission tCO2	Project Emission tCO2	Leakage Emission tCO2	Emission reductions tCO2
2008	59191	0	0	59191
2009	169155	0	0	169155
2010	66496	0	0	66496
2011	184074	0	0	184074
2012	126338	0	0	126338
2013	239316	0	0	239316
Total	844571*	0	0	844571

**the emissions are rounded off as a conservative estimate*

The verification team is of the opinion that the GHG emission reductions and removals have been quantified correctly in accordance with the project description and requirement of the applied methodology

4.3 Quality of Evidence to Determine GHG Emission Reductions and Removals

The verification team confirms that a complete set of data for this monitoring period was available to be verified and was in accordance with the approved monitoring plan. The ex-post parameter to be monitored is the Net Electricity supplied to the grid by the project activity which is justified as follows:

Parameter	Source and nature	Reliability	Justification by verification team
Quantity of net electricity generation supplied by the project plant to the grid for this monitoring period (MWh)- $EG_{\text{facility},y}$	Monthly Generation Reports signed by the Plant personnel of APGENO crosschecked with the Monthly JMR reports signed by APGENCO and APTRANSCO – internal and external	High	The data is highly reliable as it is based on continuously monitoring using high accuracy class (0.2s) energy meters. A set of main and check meter is installed for all the feeders.

The electricity is generated at 11 kV and stepped up to 220 kV by means of a 50 MVA transformer in the switchyard located in plant premises. The electricity supplied is crosschecked with the records of the electricity sold to the buyer.

The grid emission factor - EF_y for the Southern Grid is calculated as per CEA database version 05^{/14/} in line with the Tool to calculate emission factor for an electricity system, Version 02^{/15/}. As this is fixed ex-ante and is based on National database provided by host country the reliability is high.

The monitoring responsibilities have been verified based on interviews during onsite visit and are as follows:

- Chief Engineer/Commercial: Overall responsibility of compliance with the VCS monitoring plan.
- Superintending Engineer/O&M/Jurala HES: Quality assurance of the data/report generated by Divisional Engineer.
- Divisional Engineer/O&M/Jurala HES: Responsibility for completeness of data, reliability of data (calibration of meters), and monthly report generation.
- Assistant Divisional Engineer (A.D.E) / MRT: Responsibility of daily report generation, log preparation, data recording.

The energy meters (main and check) have a calibration frequency of five years as specified by CEA and as per the procedure in the VCS PD. During this monitoring period from 18th August 2008 to 31st Dec 2013, the following were the observations:

UNIT (COD)	Meter Make	Meter Serial No. installed on COD	Accuracy class	Calibration validity Up to	Replacement date*
Unit 1 (18th Aug 08)	CWEC ltd ¹	20051147030042	0.2S	17th Aug 13	September 2011
Unit 2 (29th Nov 08)		20051147030046	0.2S	28th Nov 13	September 2011
Unit 3 (7th Aug 09)		20051147030043	0.2S	06th Aug 14	September 2011
Unit 4 (8th Sep 10)		20051147030040	0.2S	07th Sep 15	September 2011
Unit 5 (19th Nov 10)		20051147030044	0.2S	18th Nov 15	September 2011
Unit 6 (4th Aug 11)		20051147030041	0.2S	03rd Aug 16	September 2011

**the meters under consideration were not replaced but the monitoring mechanism changed from October 2011 onwards as evident from the details of the meters in the monthly JMR invoices.*

¹ Changsha Weisheng Electronics Co Ltd

From October 2011 onwards the following monitoring mechanism was observed for the monitoring period under verification as evident from the details in the JMR billing invoices:

Units	Meter Make	Metering mechanism	Meter Serial No.	Accuracy class	Date of Installation	Calibration validity up to
Unit 1 to 6	CWEC ltd ²	Feeder 1, 2, 3 and 4	Feeder 1: 200514703016	0.2S	Oct 2011	Oct 2016
			Feeder 2: 200514703018		Oct 2011	Oct 2016
			Feeder 3: 20051147030045		Feb 2013	Feb 2018
			Feeder 4: 20051147030047		Feb 2013	Feb 2018

Based on the above information it is observed that the calibration frequency requirements of once in five years are met from date of installation of energy meters with regard to the current verification period for all the energy meters for all units. Further, as the replacement meters were of the same make and accuracy class there was no material impact on the emissions recorded.

Hence the verification team is of the opinion that with the data available there was sufficient quantity and appropriate quality with which the GHG reductions were determined and assessed.

4.4 NON-PERMANENCE RISK ANALYSIS

Non-Permanence risk analysis is applicable to AFOLU projects and hence is not applicable to the project activity.

² Changsha Weisheng Electronics Co Ltd

5 VERIFICATION CONCLUSION

ESSPL’s verification approach basically included the desk review of the project design (as stated in the validated VCS PD, ver 02 and dated 1st August 2010); monitoring report version 02 dated 19th February 2014; approved baseline and monitoring methodology ACM0002, version 11, site verification of the reported emission reductions and resolution of outstanding issues and issuance of final verification report. The verification team also requested for the evidences, relevant information and explanations that were considered necessary to give a reasonable assurance of the reported emission reductions during the period from 18/08/2008 to 31/12/2013.



In ESSPL's opinion, the GHG emission reductions for " Hydro Power Project in backward district of Andhra Pradesh, India" for the period from 18/08/2008 to 31/12/2013 are fairly stated in the monitoring report, version 2.0, dated 19th February 2014. The GHG emissions were calculated correctly on the basis of approved baseline and monitoring methodology ACM0002, version 11 and the monitoring plan as included in the validated VCS PD, dated 01st August 2010, version 02. Based on the VCS Verification conducted, ESSPL is of the opinion that the project complies with the Verification criteria for projects set out in VCS Version 3.4.

Based on the information provided, verified and assessed, ESSPL is able to certify the following statement:

Verification period: From 18-August-2008 to 31-December-2013.

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

Year	Baseline emissions or removals (tCO ₂ e)	Project emissions or removals (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Net GHG emission reductions or removals (tCO ₂ e)
Year 2008	59191	0	0	59191
Year 2009	169155	0	0	169155
Year 2010	66496	0	0	66496
Year 2011	184074	0	0	184074
Year 2012	126338	0	0	126338
Year 2013	239316	0	0	239316
Total	844571*	0	0	844571

Prepared by	Approved by
	
Mr. A. Prabu das	Mr. G. T. KUMAR
(LEAD AUDITOR)	(MANAGING DIRECTOR)

6. LIST OF REFERENCES

REF NO.	DOCUMENT TITLE
/1/	VCS standard version 3.4
/2/	VCS Validation Verification Manual version 3.1
/3/	Validated VCS PD dated 01 st August 2010, version 02
/4/	Power Purchase Agreement with Andhra Pradesh State electricity grid
/5/	Net electricity supplied by the project recorded as Monthly Generation Report by APGENCO
/6/	The monthly joint meter reading (JMR) report generated and signed by the buyer
/7/	ACM0002, "Consolidated baseline methodology for grid-connected electricity generation from renewable sources". Version 11
/8/	Monitoring Report dated 6 th January 2014 version 01
/9/	Revised Monitoring Report dated 19 th February 2014 version 02
/10/	Emissions reduction calculation sheet
/11/	Commissioning certificates of all six turbines (6 x 39 MW)
/12/	Grid emission factor from CEA database Version 05
/13/	Undertaking letter issued APGENCO during the validation process
/14/	CEA database version 05
/15/	Tool to calculate emission factor for an electricity system, Version 02

Appendix I
Verification Checklist

Project name : **Hydro Power Project in backward district of Andhra Pradesh, India**

TABLE 1: VERIFICATION REQUIREMENTS BASED ON CDM VALIDATION AND VERIFICATION STANDARD VERSION 05.0

Checklist Questions	Ref.	§	Comments by verifier	Draft Concl	Final Concl
1. Project implementation in accordance with the registered PDD Any concern related to the conformity of the actual project activity and its operation with the registered PDD shall be identified.					
1.1 Was an on-site visit conducted for this verification? If no, please justify the rationale of the decision.	VVS	226	Yes. Onsite visit was conducted on January 16-17, 2014 to verify the emission reductions achieved.	OK	OK

Checklist Questions	Ref.	§	Comments by verifier	Draft Concl	Final Concl
1.2 Are all physical features of the proposed VCS project activity proposed in the registered PD in place?	VVS	226	<p>The physical features of the proposed VCS activity is in line with the registered PD which is as follows:</p> <p>6 numbers of hydro-electric turbines each of 39 MW capacities totalling to 234 MW by Andhra Pradesh Power Generation Corporation Limited, APGENCO (Project Proponent). The project is installed across Krishna River near Revulapally village in Mahaboobnagar district of Andhra Pradesh.</p>	OK	OK
1.3 Have the project participants operated the proposed VCS project activity as per the registered PD?	VVS	226	<p>Yes, the project proponent has operated the proposed VCS project activity as per the registered PD and the total capacity of 234 MW is operational.</p> <p>However the following CAR is asked –</p> <p>Annex 1 and Annex 2 of the MR version 01 has not been filled up for details regarding details of the energy meters and replacement meters used.</p> <p>Further, based on previous validation report the following FARs are raised:</p> <ol style="list-style-type: none"> 1) Commissioning certificates of all six turbines to be provided 2) PPA agreement with Govt. of Karnataka for power supply 	<p>CAR-1</p> <p>FAR-1</p> <p>FAR-2</p>	<p>OK</p> <p>OK</p> <p>OK</p>

Checklist Questions	Ref.	§	Comments by verifier	Draft Concl	Final Concl
1.4 Is there any implementation or operation of the VCS project activity not conforming with the description contained in the registered PD? If yes, proceed to 1.5.	VVS	226	Not Applicable		
1.5 Has an assessment been conducted on the potential impacts due to these changes following EB 48 report, paragraph 73 and its annex 67? If yes, proceed to 1.6.	VVS	226	Not Applicable		
1.6 Has a notification or a request for approval of changes been submitted from the project activity as described in the registered PDD prior to the conclusion of the verification/certification for the corresponding monitoring period based on the assessment above?	VVS	226	Not Applicable		
2. Compliance of the monitoring plan with the monitoring methodology The monitoring plan of the proposed VCS project activity shall comply with the applied methodology.					

Checklist Questions	Ref.	§	Comments by verifier	Draft Concl	Final Concl
2.1 Is the monitoring plan of the VCS project activity complying with the applied methodology?	VVS	230	Yes, the monitoring plan is according to the Applied Methodology ACM0002	OK	OK
2.2 If no, was a request for revision of the monitoring plan done? (Approval from EB for the revised monitoring plan shall be obtained prior to concluding the verification and certification decisions.)	VVS	230	Not Applicable		
2.3 Are there any monitoring aspects of the project activity that are not specified in the methodology, particularly in the case of small scale methodologies (e.g. additional monitoring parameters, monitoring frequency and calibration frequency)?	VVS	231	Not Applicable		
2.4 If yes, is the request for revision of the monitoring plan necessary? (This revision may contribute in enhancing the level of accuracy and completeness of the monitoring plan)	VVS	231	Not Applicable		

<p>3. Compliance of monitoring with the monitoring plan.</p> <p>Monitoring of reductions in GHG emissions to result from the proposed CDM project activity shall be implemented in accordance with the monitoring plan contained in the registered PDD or the accepted revised monitoring plan.</p>					
<p>3.1 Have the monitoring plan and the applied methodology been properly implemented and followed by the project participants?</p>	<p>VVS</p>	<p>234</p>	<p>The monitoring plan and the applied methodology ACM0002 has been correctly implemented by the project Participant – APGENCO.</p>	<p>OK</p>	<p>OK</p>

<p>3.2 Have all parameters stated in the monitoring plan, the applied methodology and relevant CDM Executive Board decisions been sufficiently monitored and updated as applicable, including:</p> <p>i) project emission parameters</p>	VVS	234 (b)	<p>$PE_{FF,y}$ and $PE_{GP,y}$ are not applicable as the project activity is hydro power plant. Project emissions in the form of methane might result from the operation of a water reservoir if biomass is permanently submerged in the process.</p> <p>However, the project activity is a hydropower plant project with existing reservoir where the volume of the reservoir is not increased, therefore there is no change in the size of the reservoir and no methane emissions from biomass decay. As per the applied methodology, for run of the river hydroelectric projects, project emissions are considered zero. Moreover, the power density for the project activity is 314 W/M^2 which is more than 10 W/M^2 so $PE_{HP,y}$ is zero which means project emissions is also zero.</p> <p>The same was confirmed from the onsite visit.</p>	OK	OK
<p>ii) baseline emission parameters</p>	VVS	234 (b)	<p>Baseline Emissions for the amount of electricity supplied by project activity, BE_y is calculated as:</p> $BE_y = EG PJ_y \times EF_{grid, CM_y}$	OK	OK

			<p>Where,</p> <p>EG PJ,y is the quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the project activity in year y (MWh/Yr).</p> <p>EFgrid, CM,y is the Combined margin CO2 emission factor for grid connected power generation in year y calculated using the latest version of the “Tool to calculate the emission factor for an electricity system” (tCO2e/Yr).</p> <p>The calculations are in line with the applied methodology ACM 0002 which has been verified to be correctly applied.</p>		
iii) leakage parameters	VVS	234 (b)	No leakage emissions are considered as it is a hydro Power plant which is in line with requirements of ACM0002	OK	OK

<p>iv) Management and operational system: the responsibilities and authorities for monitoring and reporting are in accordance with the responsibilities and authorities stated in the monitoring plan?</p>	<p>VVS</p>	<p>234 (b)</p>	<ol style="list-style-type: none"> 1. Chief Engineer/Commercial: Overall responsibility of compliance with the VCS monitoring plan. 2. Superintending Engineer/O&M/Jurala HES: Quality assurance of the data/report generated by Divisional Engineer. 3. Divisional Engineer/O&M/Jurala HES: Responsibility for completeness of data, reliability of data (calibration of meters), and monthly report generation. 4. Assistant Divisional Engineer (A.D.E) / MRT: Responsibility of daily report generation, log preparation, data recording. <p>The above information was verified from the onsite visit and found to be implemented correctly.</p>		
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<p>3.3 Is the accuracy of equipment used for monitoring is in accordance with the relevant guidance provided by the CDM Executive Board and is controlled and calibrated in accordance with the monitoring plan?</p>	VVM	234 (c)	<p>The instrumentation system comprises of manual metering systems, microprocessor-based instruments of reputed make with the best accuracy available (0.2 class). The frequency of calibration is once every 5 years as per CEA regulations.</p> <p>Hence the onsite visit verified that the accuracy of energy meters used is in line with the accepted accuracy class and the calibration frequency is as per the national rules and regulations.</p> <p>However the following CL is asked for clarifying on the statement “The meter replacements occurred due to meter failure and the damaged meters were immediately replaced with new ones” as mentioned in the Monitoring report Version 01. The PP is also requested to mention that during the period the meter failed what was the backup monitoring method used to monitor the emission reductions.</p>	CL-1	OK
<p>3.4 Are monitoring results consistently recorded as per approved frequency?</p>	VVM	234 (d)	<p>Continuous monitoring, daily and monthly recording of the energy generated is consistently recorded for the monitoring period under verification. The same has been verified from the onsite visit.</p>	OK	OK
<p>3.5 Have quality assurance and quality control procedures been applied in accordance with the monitoring plan monitoring plan?</p>	VVM	234 (e)	<p>As per the monitoring plan, the energy will be cross verified with the receipts/invoices raised to the power distribution company as applicable. The invoices / bills accepted by APTRANSCO (buyer) from APGENCO (seller) has not been provided for the entire period under verification.</p>	CAR-2	OK

4. Compliance with the calibration frequency requirements for measuring instruments					
<p>4.1 If, during verification of a certain monitoring period, the DOE identifies that the calibration has been delayed and the calibration has been implemented after the monitoring period in consideration (i.e. the results of delayed calibration are available), the DOE may conclude its verification, provided the following conservative approach is adopted in the calculation of emission reductions</p> <p>Applying the maximum permissible error of the instrument to the measured values taken during the period between the scheduled date of calibration and the actual date of calibration, if the results of the delayed calibration do not show any errors in the measuring equipment, or if the error is smaller than the maximum permissible error</p>	VVS	238 (a)	<p>The calibration is once in 5 years as per CEA norms. Hence in line with this please provide calibration certificates for the following units in which energy is generated for the period under verification:</p> <p>Unit 1 - COD on 18/08/2008</p> <p>Unit 2 - COD on 29/11/2008</p>	CAR-3	OK
<p>4.2 Applying the error identified in the delayed calibration test, if the error is beyond the maximum permissible error of the measuring equipment.</p>	VVS	238 (b)	Depends on reply to CAR 3	Refer CAR 3	OK

<p>4.3 The DOE shall confirm that the error has been applied:</p> <p>(a) In a conservative manner, such that the adjusted measured values of the delayed calibration shall result in fewer claimed emission reductions;</p> <p>(b) For all measured values taken during the period between the scheduled date of calibration and the actual date of calibration.</p>	VVS	239	Depends on reply to CAR 3	Refer CAR 3	OK
<p>4.4 In cases where the results of the delayed calibration are not available, or the calibration has not been conducted at the time of verification, the DOE, prior to finalizing verification, shall request the project participants to conduct the required calibration and shall determine whether the project participants have calculated the emission reductions conservatively using the approach mentioned in paragraph 238 above.</p>	VVS	240	Depends on reply to CAR 3	Refer CAR 3	OK

<p>4.5 In cases where the DOE determines that it is not possible for the project participants to conduct the calibration at a frequency specified by either the applied methodology, guidance provided by the Board, and/or the registered monitoring plan due to reasons beyond the control of project participants,³⁹ the DOE, shall follow the requirements for post registration changes in section of E of this Standard</p>	VVS	241	Not Applicable		
<p>4.6 In cases where neither the monitoring methodology nor the monitoring plan specify any requirements for calibration frequency for measuring equipments, the DOE shall determine whether the equipments are calibrated either in accordance with the specifications of the local/national standards, or as per the manufacturer.s specification. If neither local/national standards nor the manufacturer.s specification are available, international standards may be used. Refer to appendix 1 for an illustrative example to apply the above requirements.</p>	VVS	242	Not Applicable		
<p>5. Assessment of data and calculation of emission reductions</p>					

<p>(a) A complete set of data for the specified monitoring period is available. If only partial data are available because activity levels or non-activity parameters have not been monitored in accordance with the registered monitoring plan, the DOE shall either raise a CAR for the project participants to comply with the requirements of appendix 1 of the Project standard or submit a request for deviation prior to submitting the request for issuance, if appropriate;</p>	VVS	245 a	<p>The VCU calculation sheet indicates the net energy generated to be sourced from the feeders in the project activity premises whereas the actual VERs generated which are certified and accepted by the buyer (APTRANSCO) is not reflected as the primary source document. Clarify.</p>	Refer CAR 4	OK
<p>(b) Information provided in the monitoring report has been cross-checked with other sources such as plant logbooks, inventories, purchase records, laboratory analysis</p>	VVS	245 b	<p>The Joint Monthly report of generation as raised by APGENCO and accepted by APTRANSCO is the primary source of emission reduction. This is to be cross checked with the monthly generation report as submitted by the Hydro Power plant personnel.</p> <p>Depends on reply to CAR 1</p>	Refer CAR 4	OK

<p>(c) Calculations of baseline emissions, and project activity emissions and leakage, as appropriate, have been carried out in accordance with the formulae and methods described in the monitoring plan and the applied methodology document;</p>	VVS	245 c	<p>The recording of the net energy generated by the plant for the monitoring period under verification has been done in two ways as observed from the evidences:</p> <ol style="list-style-type: none"> 1. In some bills the “generator transformer” reading is taken. 2. In some bills the “feeder” reading has been taken. <p>Clarify on the different sources used for calculating the net energy and the effect of any material impact on the emission reductions thus achieved.</p>	CL-2	OK
<p>(d) Any assumptions used in emission calculations have been justified;</p>	VVS	245 d	<p>The emission factor of the southern regional grid as per combined margin approach as per registered PD is used for estimation of emission reductions of the project activity. For calculating the CO2 emission factor as per combined margin method for the wind power generation project activities the weights of 0.5 for operating margin and 0.5 for build margin are considered as per ‘Tool to calculate the emission factor for an electricity system (Version 2.0). CO2 baseline database for the Indian Power Sector –Central Electricity Authority (CEA), Ministry of Power, Version 5.0, dated November 2009 has been adopted to determine operating margin and build margin.</p> <p>Depends on reply to CL 1</p>	Refer CL-1	OK

(e) Appropriate emission factors, IPCC default values and other reference values have been correctly applied.	VVS	245 e	Emission factors as published by the national CEA database has been used which is correct and appropriate.	OK	OK
6. Post registration changes			Not Applicable		
<u>Temporary deviations from the registered monitoring plan and / or monitoring methodology</u>					
Where the deviation is identified during verification, the DOE shall indicate in the verification report how the monitoring report reflects the application of the approved guidance from the Board regarding the deviation from the provisions of the registered monitoring plan and/or methodology.	VVS	255	Not Applicable		
Where the deviation is identified prior to verification, the DOE shall state its opinion on whether the deviation reflects the application of the approved guidance from the Board regarding the deviation from the provisions of the registered monitoring plan and/or methodology and as per the applicable provisions of the Project Standard.	VVS	256	Not Applicable		
<u>Corrections</u>					

<p>If the DOE identifies that the project participants have made corrections to project information or parameters determined at validation, the DOE shall determine whether:</p> <p>(a) The corrected information is an accurate reflection of actual project information; and/or</p>	VVS	258 a	Not Applicable		
<p>(b) The corrected parameters are in accordance with the applied methodology and/or selected monitoring plan</p>	VVS	258 b	Not Applicable		
<p><u>Changes to the start date of the crediting period</u></p>			Not Applicable		
<p>The DOE shall indicate if the requirements in the Project standard have been met and shall submit a request for post registration changes in accordance with the Project cycle procedure.</p>	VVS	261	Not Applicable		
<p><u>Permanent changes from the registered monitoring plan or monitoring methodology</u></p>			Not Applicable		

<p>The DOE shall determine whether the changes to the monitoring plan contained in the registered PDD proposed by the project participants are in compliance with the applied methodology and do not reduce the level of accuracy of the monitoring compared with the requirements contained in the registered monitoring plan.</p>	VVS	263	Not Applicable		
<p>In cases where the proposed changes refer to a later version of the applied methodology in the registered PDD, the DOE shall determine whether the application of any later version of the applied methodology and tools does not impact the conservativeness of the monitoring and verification process, including the related emission reduction calculations.</p>	VVS	264	Not Applicable		

<p>If the DOE identifies that the project participants are unable to implement the monitoring plan contained in the registered PDD and it will not be possible to monitor the registered CDM project activity in accordance with a monitoring plan that would comply with the applied methodology and any applicable tools or the relevant provisions of appendix 1 of the Project standard, the DOE shall request guidance from the Board concerning the acceptability of the permanent changes in accordance with the section on post registration changes in the Project cycle procedure.</p>	VVS	265	Not Applicable		
<p>The DOE shall determine whether the permanent changes are likely to lead to a reduction in the accuracy of the calculation of emission reductions. In cases where the DOE considers that the permanent changes will lead to a reduction in the accuracy of the calculation of emission reductions, the DOE shall request the project participants to apply conservative assumptions or discount factors to the calculations to the extent required to ensure that emission reductions will not be over-estimated as a result of the permanent change.</p>	VVS	266	Not Applicable		
<p><u>Changes to the project design of a registered project activity</u></p>					

<p>If the DOE identifies that the project design in the implementation or operation of the project activity does not conform with the description contained in the registered PDD or the relevant provisions of appendix 1 of the Project standard, the DOE shall request guidance from the Board concerning the acceptability of the proposed or actual changes in accordance with the section on post registration changes in the Project cycle procedure.</p>	VVS	270	Not Applicable		
<p>In case of actual changes, the DOE shall, by means of an on-site visit and review of the submitted revised PDD by the project participants, which describes the nature and extent of the actual changes, determine whether this description accurately reflects the implementation, operation and monitoring of the modified project activity.</p>	VVS	271	Not Applicable		
<p>The DOE shall conduct an on-site inspection to assess the impacts of the actual changes on the compliance of the monitoring plan, the applied monitoring methodology and tools and/or the level of accuracy of the monitoring activity.</p>	VVS	272	Not Applicable		

<p>The DOE shall, by means of reviewing the revised PDD against applicable additionality and methodological requirements, determine whether the proposed or actual changes would adversely affect the conclusions of the validation report of the registered PDD with regard to:</p> <p>(a) Additionality of the project activity;</p> <p>(b) Scale of the project activity;</p> <p>(c) Applicability and application of approved baseline methodology under which the project activity has been registered; or</p> <p>(d) The compliance of the monitoring plan with the applied monitoring methodology</p>	VVS	273	Not Applicable		
<p>If the proposed or actual changes affect the additionality of the project activity then the DOE shall confirm that:</p> <p>(a) In the case of investment analysis, project participants have only modified the key parameters in the original spreadsheet calculations affected by the proposed or actual changes to the project activity;</p> <p>(b) In the case where only barriers have been claimed to demonstrate additionality, project participants have demonstrated that the barriers are still valid under the new circumstances.</p>	VVS	274	Not Applicable		

<p>In cases where the proposed or actual changes impact the implementation of the project activity and where the original methodology would no longer be applicable, and where the project participant applies a later version of the methodology or another methodology that is applicable to the project activity, the DOE shall confirm that the applied methodology and tools do not impact the conservativeness of the monitoring and verification process and the related emission reduction calculations.</p>	VVS	275	Not Applicable		
<p>The DOE shall assess whether the revised PDD complies with the applied monitoring methodology and tools or any later version of the methodology or the requirements of another methodology that is applicable to the project activity.</p>	VVS	276	Not Applicable		

TABLE 2 : RESOLUTION OF CORRECTIVE ACTION AND CLARIFICATION REQUESTS

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Verification team conclusion
<p><u>CAR 1</u></p> <p>Annex 1 and Annex 2 of the MR version 01 has not been filled up for details regarding details of the energy meters and replacement meters used.</p>	1.3	<p>Meter details viz make, s.no, accuracy class, calibration details are updated in appendix 1 in the revised MR version 02. Appendix 2 is not applicable hence removed, as meters were not replaced during this monitoring period.</p>	<p>The Details of the calibration validity of the energy meters for all six turbines have been updated in the revised MR and is verified to be correct</p> <p>Conclusion: CAR 1 Closed</p>
<p><u>CAR 2</u></p> <p>As per the monitoring plan, the energy will be cross verified with the receipts/invoices raised to the power distribution company as applicable. The invoices / bills accepted by APTRANSCO (buyer) from APGENCO (seller) has not been provided for the entire period under verification.</p>	3.5	<p>Copy of invoices indicating the net energy supplied to the grid, for this entire monitoring period, jointly accepted by APTRANSCO and APGENCO is submitted to the validator along with DVer1 response.</p>	<p>The JMR signed by the seller- APGENCO and the buyer – APTRANSCO has been submitted and verified to be appropriate.</p> <p>Conclusion CAR 2 closed</p>
<p><u>CAR 3</u></p> <p>The calibration is once in 5 years as per CEA norms. Hence in line with this please provide calibration certificates for the following units in which energy is generated for the period under verification:</p>	4.1	<p>From the start date (Unit I COD – Aug 2008) of the project activity, the EG_y was monitored through the energy meters at each of the Generation transformers, referred as GT (1 to 6) even though Feeder 1 and 2 was installed. From Oct 2011 i.e</p>	<p>The Details of the calibration validity of the energy meters for all six turbines have been updated in the revised MR and is verified to be correct and the calibration requirements are verified to be met.</p>

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Verification team conclusion
Unit 1 - COD on 18/08/2008 Unit 2 - COD on 29/11/2008		third year onwards, there was a change in the monitoring of EG_y for operational convenience, and EG_y is monitored through the new energy meters at the four Feeders (1 to 4). Presently, the EG_y is determined by new meters within five years of the start date, calibration details pertaining to Unit 1 and 2 are not relevant considering the present scenario.	Conclusion: CAR 3 Resolved
<p><u>CL 1</u></p> <p>Clarify on the statement “The meter replacements occurred due to meter failure and the damaged meters were immediately replaced with new ones” as mentioned in the Monitoring report Version 01. The PP is also requested to mention that during the period the meter failed what was the backup monitoring method used to monitor the emission reductions.</p>	3.3	Energy meters were never replaced during this monitoring period although there was a change in the mechanism for determining EG_y . Inclusion of the statement “ <i>The meter replacements occurred due to meter failure and the damaged meters were immediately replaced with new ones</i> ” in the MR was a typo error which is removed in the revised MR version 2.0.	<p>The justification by the PP is acceptable as the replacement meters were also the same make and accuracy class and hence there is no material impact on the recording of the emission reductions as such.</p> <p>Conclusion: CL 1 resolved</p>
<p><u>CL 2</u></p> <p>The recording of the net energy generated by the plant for the monitoring period under verification has been done in two ways as observed from the evidences:</p>	5 c	The net energy generated and supplied to the grid by the project activity is monitored by main and check meters. For the period from Aug 2008 to Sep 2011, the EG_y is determined from the Generation	The Source document for the baseline emissions is the JMR accepted by APGENCO and APTRANSCO which is acceptable.

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response	Verification team conclusion												
<p>1. In some bills the “generator transformer” reading is taken.</p> <p>2. In some bills the “feeder” reading has been taken.</p> <p>Clarify on the different sources used for calculating the net energy and the effect of any material impact on the emission reductions thus achieved.</p>		<p>Transformer readings referred as GT 1 to 6. And from Oct 2011 to present EGy is determined from the feeder readings. Both the mechanisms are jointly accepted by both the buyer and seller, receipts to this effect are also submitted now, refer CAR 2. Source document is now referred uniformly for the entire monitoring period. VCU sheet and MR are updated accordingly to version 2.0.</p>	<p>Conclusion: CL 2 Resolved</p>												
<p><u>FAR 1</u></p> <p>The commissioning certificates for all six turbines to be provided.</p>	<p>1.3</p>	<p>The Commissioning certificates for all six turbines is provided with following details:</p> <table border="1" data-bbox="1106 938 1442 1359"> <thead> <tr> <th><u>Unit</u></th> <th><u>COD</u></th> </tr> </thead> <tbody> <tr> <td>Unit 1</td> <td>18/08/2008</td> </tr> <tr> <td>Unit 2</td> <td>29/11/2008</td> </tr> <tr> <td>Unit 3</td> <td>07/08/2009</td> </tr> <tr> <td>Unit 4</td> <td>08/09/2010</td> </tr> <tr> <td>Unit 5</td> <td>19/11/2010</td> </tr> </tbody> </table>	<u>Unit</u>	<u>COD</u>	Unit 1	18/08/2008	Unit 2	29/11/2008	Unit 3	07/08/2009	Unit 4	08/09/2010	Unit 5	19/11/2010	<p>The commissioning certificates for all six turbines have been provided and verified to be in line with the requirements.</p> <p>Conclusion: FAR 1 Resolved</p>
<u>Unit</u>	<u>COD</u>														
Unit 1	18/08/2008														
Unit 2	29/11/2008														
Unit 3	07/08/2009														
Unit 4	08/09/2010														
Unit 5	19/11/2010														

Draft report clarifications and corrective action requests by validation team	Ref. to checklist question in table 2	Summary of project owner response		Verification team conclusion
		Unit 6	04/08/2011	
<p><u>FAR 2</u></p> <p>PPA agreement with Govt. of Karnataka for power supply</p>	1.3	<p>The Agreement for power supply signed with govt of Karnataka dated 28th March 2013 is provided</p>		<p>The Agreement has been provided and is verified to be in order.</p> <p>Conclusion: FAR 2 resolved</p>