# 119.8 MW NATURAL GAS BASED COMBINED CYCLE POWER PLANT, AT TANJAVUR, TAMILNADU BY M/S ABAN POWER COMPANY LIMITED

Document Prepared By Earthood Services Private Limited

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**Summary:**

The project activity by Aban Power Company Limited (APCL) (now name changed to Lanco Tanjore Power Company Limited[1]) has installed 119.8 MW Natural Gas based Power Combined Cycle Power Plant at Karuppur Village, Thiruvidaimarudur Taluk, Tanjavur Dist, Tamilnadu, India. Start date of the project activity is 11-August-2005 which is also commissioning/commercial operation date of project. This is as per the registered CDM PPD and Final CDM Validation report. The commissioning report for the project activity is checked by the assessment team and found correct.

During the Current Monitoring Period from 16-December-2010 to 10-August-2015 (First and last date included) the project activity has supplied 3,368,443.52 MWh of electricity, and thus contributing to the GHG reductions 1,354,428 $tCO_2e$.

[1] Name change letter issued vide certificate of Incorporation issued by Registrar of Companies, Ministry of Corporate Affaires, Govt. of India dated 18-April-2011. VVB chdcked the said letter and found correct

**EKI Energy Services Limited** contracted **ESPL** to conduct the verification of the project. The scope of verification includes confirming the implementation of the monitoring plan in the registered PD and the application of methodology "AM0029: Baseline/ monitoring methodology for grid-connected electricity generation plants using natural gas (Version 01.1)"

The verification consisted of three phases: a. Desk review of the project; b. Follow-up interviews/remote audit; c. Resolution of outstanding issues and issuance of the final verification report and opinion. The overall verification, from Contract Review to Verification Report & Opinion, was conducted following ESPL's internal quality procedures.

A risk-based approach has been followed to perform this verification activity and No uncertainties associated with the verification. A total of 00 CL and 05 CARs have been raised during the verification process of the project activity which were successfully closed.

ESPL confirms that the monitoring system is in place and the emission reductions are calculated without material misstatements.

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# 1 INTRODUCTION

## 1.1 Objective

"EKI Energy Services Limited" has contracted ESPL (Hereinafter referred as Earthood) to conduct the 02nd VCS verification of the project activity "119.8 MW Natural Gas Based Combined Cycle Power Plant, at Tanjavur, Tamilnadu by M/s Aban Power Company Limited" according to the requirements of the Verified Carbon Standard Version 4.1.

The objective of this verification is to verify and certify emission reductions reported for the PA" 119.8 MW Natural Gas Based Combined Cycle Power Plant, at Tanjavur, Tamilnadu by M/s Aban Power Company Limited" for the period 16-December-2010 to 10-August-2015 (including both days).

## 1.2 Scope and Criteria

The scope of the verification is to establish/verify that:

- the appropriate VCS-MR form (and other templates) was used and correctly filled up; (As per https://verra.org/wp-content/uploads/2019/09/VCS-V4-Summary-of-Effective-Dates.pdf/ the use of updated version of all VCS Program templates and representations is mandatory from 19 March 2020)
- The project activity is in accordance with all relevant host country criteria (India);
- The project activity is in accordance with all relevant VCS rules and requirements;
- The project activity is in accordance with conditions of the latest version of applied methodology "AM0029: Baseline/ monitoring methodology for grid-connected electricity generation plants using natural gas (Version 01.1)".

The verification of the project activity is based on the CDM PDD and estimated GHG emission reduction calculations.

## 1.3 Level of Assurance

☒ Reasonable level of assurance

☐ Limited level of assurance

ESPL's verification approach is based on the understanding of the risks associated with reporting of GHG emission data and the controls in place to mitigate these. ESPL planned and performed the verification by obtaining evidence and other information and explanations that ESPL considers necessary to give reasonable assurance that reported estimated GHG emission reductions are fairly stated. All documentary evidences were checked, and remote audit was conducted to arrive at a verification conclusion by the assessment team.

In our opinion, the estimated GHG emissions reductions were calculated correctly on the basis of the approved baseline and monitoring methodology "AM0029: Baseline/ monitoring methodology for grid-connected electricity generation plants using natural gas (Version 01.1)" and the VCS standard, Version 4.1.

## 1.4 Summary Description of the Project

The project activity by Aban Power Company Limited (APCL) (now name changed to Lanco Tanjore Power Company Limited/24/) has installed 119.8 MW Natural Gas based Combined Cycle Power Project (CCPP) at Karuppur Village, Thiruvidaimarudur Taluk, Tanjavur Dist, Tamilnadu, India. The Power Project has one (1) Gas Turbine Generating (GTG) Unit of 68.6 MW rated capacity, one (1) Heat Recovery Steam Generator (HRSG) and one (1) Steam Turbine Generating (STG) Unit of 51.2 MW rated capacity. Start date of the project activity is 11-August-2005 which is also commissioning/commercial operation date of project. Assessment team checked the commissioning Certificates and found that project activity was commissioned on 11-August-2005 /9/. The project is implemented as per the description in the registered CDM PDD/1/. No event observed during the current monitoring period which can alter or deviate from the methodology requirement/2/.

The project is a voluntary action being undertaken by each project owner of the project activity. EKI Energy Services Limited (hereafter referred as "EKIESL") is acting as the other party for this project activity/8/.

# 2 VERIFICATION PROCESS

The registered VCS project is undergoing 02nd verification and the approach adopted to ensure the quality of emission reductions is described in the following sub-sections.

## 2.1 Method and Criteria

The overall verification, from Contract Review to Verification Report & Opinion, was conducted using ESPL's internal procedures. The Project was verified against the latest requirements (Version 4.1) and guidance set out in VCS Standards as applicable/11/,/12/.

- The verification process consists of the following three phases;
- A document review of the PD and VCS MR (described in Section 2.2)
- Remote audit and follow up interviews with project stakeholders (described in Section 2.3 and 2.4)

- The resolution of outstanding issues and issuance of the final report and opinion. (described in Section 2.5)

VVB's Sampling Approach: No sampling approach was required for undertaking the current verification since all monitored data was verified by the assessment team.

## 2.2 Document Review

The verification is performed primarily as a document review of the documents submitted at various stages of assessments. The review is performed by assessment team using dedicated protocols. The assessment team cross checks the information provided in the documents (PDD, MR, validation report) and information from sources other than those used, if available, and also conducts independent background investigations. Earthood conducted a desk review as under;

a) A review of the data and information presented to verify their completeness.

b) A review of the monitoring plan, the monitoring methodology including applicable tool(s) and, where applicable, the applied standardized baseline, paying particular attention to the frequency of measurements, the quality of metering equipment including calibration requirements, and the quality assurance and quality control procedures.

c) An evaluation of data management and the quality assurance and quality control system in the context of their influence on the generation and reporting of emission reductions.

## 2.3 Interviews

A remote audit was conducted on 05-July-2021 through Skype video call. No sampling procedures were adopted either in document verification and all the documents were cross checked to ensure conservative estimation of emission reduction. Remote audit conducted due to pandemic situation and technical details and metering/monitoring arrangement verified through certificates shared by PP. The names of the persons interviewed during remote audit through Skype/telephonic interview is given below;

| Name of Persons/Designation | Affiliation | Topics discussed | Team Member |
|---|---|---|---|
| Mr. Srinivas | Vice President, APCL (Lanco) | Project Implementation, Management practices, Grievance mechanism, Data collection, data storage, QA/QC etc. | Dr. Atul Takarkhede |
| Mr. Selvam | DGM, APCL (Lanco) | | |
| Mr. Anant Ladukar | Consultant, EKI Energy | GHG calculations, MR and ER preparation | |

## 2.4 Site Inspections

| Duration of on-site inspection: NA | | | | |
|---|---|---|---|---|
| **No.** | **Activity performed on-site** | **Site location** | **Date** | **Team member** |
| 1. | NA | NA | NA | NA |

At the time of verification, the host country, India, was witnessing increasing numbers of COVID-19 infected people in the country. There have been several restrictions regarding interstate travel under such circumstances, the verification team has avoided the risk of exposure by not conducting the on-site visit due to outbreak of global pandemic Covid-19, increased risk of exposure and contact due to travel, as the affected cases in the country are spurting[2].

The project developer has a Verified Emissions Reductions Agreement (VERPA) which requires delivery of credits by October 2021, and the project finances are reliant on the payment from sale of carbon credits/19/.

Moreover, the VCS program does not explicitly mandate site visits as part of the validation and verification process during such unprecedented circumstances, only that VVBs must achieve a reasonable level of assurance on all validations and verifications (per section 4.1.2 of the VCS Standard, Version 4.1/11/.

The DOE reached reasonable level of assurance through remote verification via Skype/Telephonic interview (refer section 2.3) with the representative PP, through review of documentation/evidences such as metering arrangements/specification of power Plant/15/, logbooks/6/, daily generation data/6/ and name plates of major equipment's, calibration certificates of meters/4/, validation and verification report/22/ of various issuance.

A remote audit was conducted by the assessment team (Dr. Atul Takarkhede) on 05-July-2021 to carry out the following;

a. An assessment of the implementation and operation of the registered project activity as per the registered CDM PDD or any approved revised PD/1/ and MR/2/;
b. A review of information flow for generating, aggregating and reporting the monitoring parameters;
c. Interviews with relevant personnel to determine whether the operational and data collection procedures are implemented in accordance with the monitoring plan in the PDD/1/;
d. A cross-check between information provided in the monitoring report and data from other sources such as Plant log books, etc./6/;
e. A check of the monitoring equipment including calibration performance and observations of monitoring practices against the requirements of the PDD/1/, the applied methodology including applicable tool(s), and, where applicable, the applied standardized baseline/7/;
f. A review of calculations and assumptions made in determining the GHG data and emission reductions/3/;
g. An identification of quality control and quality assurance procedures in place to prevent or identify and correct any errors or omissions in the reported monitoring parameters.

[2] *https://www.ciicovid19update.in/state-govt-notifications.html*

## 2.5 Resolution of Findings

The findings may be of the following types: CAR- Corrective Action Request, CL- Clarification Request and FAR- Forward Action Request.

The list of findings and their resolution are presented in Appendix 2 of this verification report. The section also includes the response, if provided, by the project participants and an assessment by the assessment team if it was closed or otherwise. It is to be noted that all the findings have been satisfactorily resolved by the assessment team.

A total of 05 CAR and 00 CL were raised in the current verification. All the findings that are raised and communicated to project participant during the verification are included under Appendix 2. The section also includes the response, if provided, by the project participants and an assessment by the verification team if it was closed out or otherwise

### 2.5.1 Forward Action Requests

This is 02nd VCS verification of the project activity and no FAR is raised during current verification and no FAR from CDM/VCS validation/previous verification as well.

## 2.6 Eligibility for Validation Activities

This section is not applicable for present verification, as ESPL holds the accreditation for Validation of projects for this Sectoral Scope.

# 3 VALIDATION FINDINGS

## 3.1 Participation under Other GHG Programs

The project activity has not participated in any other GHG programs except CDM. The project activity is registered as CDM project on 26-May-2007 under the UNFCCC Reference Number 999[3].

This VCS monitoring period 16-December-2010 to 10-August-2015 has excludes UNFCCC CDM Verification period covering 01-January-2006 to 15-December-2010. However, CDM MR for the monitoring period 16-December-2010 to 15-January-2012 is already web hosted on the project's UN webpage for which the CERs have not been yet claimed and verification contract have been terminated with DOE[4], and thus, if VCUs are issued for the period including UNFCCC CDM MR

[3] https://cdm.unfccc.int/Projects/DB/RWTUV1173779090.0/view

[4] https://cdm.unfccc.int/Projects/DB/RWTUV1173779090.0/iProcess/SGS-UKL1335533000.9/view

covered period, the CERs cannot be claimed. PP has given declaration that the project activity will not claim emission reductions for the monitoring period claimed in VCS and avoid double counting of the emission reductions including CDM monitoring period for which MR webhosted on UN webpage & DOE contract terminated[5]/13/.

Verification team has also checked REC India registry and confirms that project activity is not availing any REC benefits[6].

## 3.2 Methodology Deviations

No methodology deviation is envisaged for present verification.

## 3.3 Project Description Deviations

There is no Deviation in project activity during this monitoring period.

## 3.4 Grouped Project

This is not a grouped project.

# 4 VERIFICATION FINDINGS

## 4.1 Project Implementation Status

During the verification remote audit it was concluded that the project is implemented as per the requirement of the registered CDM PDD/1/. During the current monitoring period, it was observed that no unforeseen incident/event evolved which can impact the operation of the project activity. The project undergone continuous operation and only scheduled maintenance is observed as per the manufactures specification which is acceptable to the assessment team/8/.

Project location is confirmed by the assessment team during the remote audit/9/. Assessment team also checked with the GPS coordinates with Google Earth, CDM validation report & previous verification report/22/ and confirm that the details as mentioned in the MR are inline with registered CDM PDD/1/. The detail is as below:

| Address | State | Latitude | Longitude |
|---|---|---|---|

[5] https://cdm.unfccc.int/Projects/DB/RWTUV1173779090.0/iProcess/SGS-UKL1335533000.9/view

[6] https://www.recregistryindia.nic.in/

| | | | |
|---|---|---|---|
| Karuppur Village, Taluk Thiruvidaimarudur, Thanjavur District | Tamilnadu, India | 11° 07' 30" N | 79° 31' 30" E |

Assessment team also checked the technical details of the Power plant installed during remote audit and CDM PDD/1/ & previous verification reports/22/. The technical specifications are given below/15/:

| | |
|---|---|
| Gas Turbine | |
| Make | General Electric Europe |
| Model | PG-6101-FA |
| Rating | 70,100 KW (ISO condition) |
| Control system | Mark V speedtronic |
| Heat Rate | 10,300 kJ/kWh |
| Pressure Ratio | 14.9 : 1 |
| RPM | 5231 |
| Fuel | Natural Gas |
| Gas consumption | 19250 sm3/hr |
| Generator | |
| Apparent Power | 93882 KVA |
| Voltage | 11500 V + 10 % |
| Current | 4713 A |
| Cos ø | 0.85 |
| Frequency | 50Hz |
| Speed | 3000RPM |

| HRSG | |
|---|---|
| Manufacturer | Thermax Babcock & Wilcox Ltd |
| Maximum continuous rating (MCR) | 168 TPH |
| HP steam pressure at Main steam stop valve | 110 bar (a) |
| Design pressure | 130 Kg/cm$^2$ |
| Steam temp at HRSG outlet | 542 ± 5° C |
| Design pressure LP | 6.0 Kg/cm2 |
| Feed water temp at Eco inlet | 105 °C |

| Steam Turbine | |
|---|---|
| Type | ST4/C240S |
| Make | DeMag DeLaval Industrial Turbine license from Siemens |
| MCR output at Generator terminal | 55 MW |
| Turbine rated speed | 5810 rpm |
| Type | Multistage, Condensing, Radial Exhaust |
| Inlet pressure | 101 bar at 540 deg C |
| Steam Flow (MCR) | 177.3 TPH |
| Heat rate | 884.27Kcal/kw hr |
| Turbine Exhaust pressure | 0.152 kg/cm2 (A) [ vacuum -.85 kg/cm2] |

The electricity generated by project activity is exported to the regional grid/1/. Electricity is exported to grid through the four outgoing feeders. Details of the same are mentioned in the MR and found correct inline with JMRs/6/ & PP interviews/8/.

Assessment team checked the commissioning certificate and confirmed that Project Activity was commissioned on 11-August-2005 is correct/9/.

The assessment team confirmed that there is no proposed or actual change to the project design during this monitoring period. The project design as mentioned in the registered CDM PDD/1/ is implemented and thus the same is acceptable to the assessment team. All required monitoring

equipment's and procedures as mentioned in the registered CDM PDD/1/ are available and implemented in an appropriate manner/6/,/8/.

The organisational role and responsibility as mentioned in the registered CDM PDD/1/ is followed onsite. All the monitoring equipment was calibrated as per the specified interval in the registered CDM PDD except some delay for energy export & gas flow meter/4/ which have been addressed inline with the para 366 (a) of the "CDM validation and verification standard for project activities, Version 02.0" by applying maximum permissible error for complete delayed period as conservative approach. Same was accepted by the assessment team being inline with standard and most conservative approach. All the emergency preparedness as mentioned in the registered PDD is followed onsite and no discrepancies were found regarding the same/8/.

The assessment team observed that the project is in line with the registered CDM PDD, FVR and approved methodology and thus no clarification/deviation is sought/10/,/22/. CAR 01 & CAR 02 were raised during the verification process and closed successfully. Please refer Appendix 2 for the detail closure of the CAR.
Assessment team confirms following during the verification site visit:

1. Start date of the project is 11-August-2005 which is the date of commissioning of the Project/9/.
2. Assessment team confirms that project has not received or sought any other form of environmental credit". An undertaking letter has been submitted by PP for double counting with any other GHG program. PP also has given a written declaration that project has not claimed other form of GHG credit for the concerned monitoring/13/. Further, assessment team confirms that project activity provided contribution in sustainable development to the host country/8/.
3. Assessment team confirms that this is the monitoring under VCS and covers the activity from 16-December-2010 to 10-August-2015 (inclusive of both dates). Thus, VCS crediting period should be maximum of 10 years. The start date was crediting period was 11-August-2005 and end date was 10-August-2015/1/.
   The GHG credits from 16-December-2010 to 10-August-2015 will be claimed under VCS only. At any point of time during the crediting period, the project proponent will abide by the "Double Counting"/13/.
4. Assessment team checked and found that the Project proponent of the project activity is same as per the registered PDD/1/. There is no change in details of the PP and the same is mentioned below:

| | |
|---|---|
| Organization name | Lanco Tanjore Power Company Limited (Formally Aban Power Company Limited) |
| Contact person | Mr. S. Kathir Kamanathan |
| Title | Chief Financial Officer |

| | |
|---|---|
| Address | No. 25, G N Chetty Road, T Nagar, Chennai, Tamilnadu, India – 600 017 |
| Telephone | NA |
| Email | NA |

5. Assessment team also checked the details of other entity and found that the detail as mentioned in the MR is correct.

| | |
|---|---|
| Organization name | EKI Energy Services Limited |
| Role in the project | Project Consultant |
| Contact person | Anant Ladukar |
| Title | Senior Manager |
| Address | Office No 201, Plot No 48, Scheme 78, Part 2, Vijay Nagar, Indore- 452010, Madhya Pradesh, India |
| Telephone | +91-9770900205 |
| Email | registry@enikingint.org / anant@enkingint.org |

The quantified emission reduction calculation for the monitoring period is correct and conservative/3/. Assessment team also compared actual VER with the estimated VER and found that the actual VER (1,354,428 $tCO_2e$) is 60.62% higher than the estimated emission reduction 843,230 $tCO_2e$ for 1699 days with 181,153 $tCO_2e$ per year estimated/3/ which is due to the increased Build Margin emission factor for current monitoring period against registered CDM PDD which is ex-post as required by the applied methodology/1/. There is no increase in Net Export to grid and Gas Consumption during the current monitoring period as compared to the estimated in registered PDD/6/. Further, assessment team reviewed the previous CDM verification the project; 3rd, 4th (increase by 37.8%) & 5th (increase by 45%) and found that there is increase in the Emission reductions achieved due to higher emission factor for all verifications[7]. Assessment team also reviewed other similar projects UN1352 (61.64% higher ER[8]) & UN4419 (325% higher ERs[9]). Thus, the increase in actual emission reduction in the current monitoring period is justified and acceptable to verification team/8/.

The project activity contributes to the sustainable development by generating employments, direct & indirect business opportunities and reducing the carbon intensive fossil fuel consumption & thus GHG emissions/8/.

[7] https://cdm.unfccc.int/Projects/DB/RWTUV1173779090.0/view

[8] https://cdm.unfccc.int/Projects/DB/BVQI1190262498.56/iProcess/RWTUV1395986628.16/view

[9] https://cdm.unfccc.int/Projects/DB/RWTUV1296210579.43/iProcess/SGS-UKL1363780084.25/view

## 4.2 Safeguards

### 4.2.1 No Net Harm

No potential environment or socio-economic matter was found during the site visit. The project is renewable energy project and thus no negative impact observed/1/.

The project activity promotes environmental and socio-economic well-being as it results in zero GHG emissions due to installation and operation of clean, renewable energy technology for electricity generation/1/.

Project Participant has conducted EIA study as per requirement of the Central Pollution Control Board. The EIA was conducted by third party M/s Nircon Engineering Consultants (Madras) Pvt. Ltd. PP have adopted the mitigation measures and same verified through interviews with PP/8/.

Thus, there are no any significant impacts due to implementation of project activity on air, water, soil quality and ambience are envisaged due to the project activity/8/.

### 4.2.2 Local Stakeholder Consultation

The PP also placed a grievance register onsite in order to ensure ongoing communication with relevant stakeholders where they can put down his/her complain and the same if found genuine will be addressed immediately. During the current monitoring period, eleven comments were received from the local stakeholders. PP have resolved the same as per the company policies/8/. However, CAR 03 was raised and same were resolved by submission of requested documents and closed successfully.

## 4.3 AFOLU-Specific Safeguards

This is non AFOLU projects, hence this section not applicable.

## 4.4 Accuracy of GHG Emission Reduction and Removal Calculations

| | |
|---|---|
| Means of verification | The verification team assessed whether the data and calculations of GHG emission reductions achieved resulting from the CDM PDD/1/. The verification team has checked whether calculations of baseline GHG emissions, project GHG emissions and leakage GHG emissions have been carried out in accordance with the formulae and methods described in the monitoring plan of the CDM PDD/1/. |
| Findings | CAR 04 was raised during the verification process and closed successfully. Refer Appendix 2 of this report for the detail closure of the CAR. |

| | |
|---|---|
| Conclusion | Baseline emissions are calculated by multiplying the electricity generated in the project plant ($EG_{PJ,y}$) with a baseline $CO_2$ emission factor ($EF_{BL,CO2,y}$), as follows:<br><br>$BE_y = EG_{PJ,y} \times EF_{BL,CO2,y}$<br>Where:<br>$EG_{PJ,y}$ = Electricity exported to grid by the project activity (MWh)<br>$EF_{BL,CO2,y}$ = $EF_{BM,y}$ = CO2 Build Margin emission factor of the grid ($tCO_2$/MWh)<br>**Ex-ante Parameter:**<br>1. $EF_{NG,Upstream,CH4}$: As per registered PDD, Default values provided in the methodology 160 $tCH_4$/PJ have been considered.<br><br>**Ex-post parameter**:<br><br>As per the registered PDD/1/ and requirement of the applied methodology following parameters have been monitored by PP:<br><br>**Annual quantity of fuel "f" consumed in project activity ($FC_{f,y}$)**-<br>The natural gas consumption at the project site is continuously metered through panel mounted flow computer system installed at the project site/8/. The monitoring system for natural gas consumption has been found consistent with the requirement of applied methodology and monitoring plan of the registered PDD/1/. The specification of gas flow monitoring equipment was verified through the photographs submitted by PP and calibration certificates /4/. The natural gas consumption value measured through panel mounted flow computer system is being registered at two simultaneous procedures/5/. The monthly natural gas consumption is also registered in the Joint Meter Reading Report/6/ approved by Tamilnadu State Electricity Board and the project proponent.<br><br>Natural gas consumed by the project activity during the monitoring period is 702,162,595 $m^3$/6/. The value is cross checked with the plant records by the Verification team and found consistent/3/.<br><br>Net Calorific Value of fuel f **($NCV_{f,y}$)** - The calorific value of the gas has been provided by the supplier (GAIL) and recorded and verified by the project participant /8/. The supplier provided the monthly gas consumption and NCV data to the PP/6/. Same was verified by the assessment team and found correct. Average net calorific value of 9,401.42 KCal/SCM is take by the PP/2/. However, for the monthly project & leakage calculations/3/, monthly calorific values provided by the supplier have been used and same are found correct with the supporting documents submitted/5/,/6/.<br><br>Oxidation factor **($OXID_f$)**- The IPCC default value of 1.0/1/ have been considered for the parameter and same found correct/2/.<br><br>Emission factor for fuel 'f' **($EF_{CO2,f,y}$):**<br>IPCC default value of 0.0561 $tCO_2$/GJ has been considered since there is no local/national data available.<br>$CO_2$ emission coefficient **($COEF_y$):**<br>$CO_2$ emission coefficient of natural gas is calculated by multiplying the natural gas Net Calorific Value. $CO_2$ emission factor and Oxidation factor of the natural gas consumed. The formula applied is found consistent with the applied methodology & previous verification reports/22. Yearly values of the parameter are found correct and consistent in the MR/2/ & ER sheet/3/.<br><br>Project Emissions due to combustion of fuel ($PE_y$): Project emissions are calculated based on equation (2) of the approved methodology. Equations and the values provided in the MR/2/ and ER sheet/3/ are found correct and consistent. |

Electricity exported to grid by the project activity ($EG_{PJ,y}$):

Data measured and recorded from Energy meters installed in the plant and in substation. The electricity exported to the grid is being continuously measured by four sets of electronic trivector energy meters (main and check) which are installed at the project site and duly sealed by the Tamilnadu State Electricity Board. The four sets of energy meters are synchronised with grid system through four designated feeders. The monitoring system for net electricity exported to the grid has been found consistent with the requirement of applied methodology/7/ and monitoring plan of the registered PDD/1/.

The net exported electricity during the current monitoring period is 3,368,443.52 MWh/6/. Assessment team checked the monthly JMRs/6/ issued by the state electricity board and monthly values in the ER sheet found correct/3/.

$CO_2$ Build Margin emission factor of the grid ($EF_{BM,y}$): The Build Margin baseline emission factor for Indian Grid system of India as applied for the emission reduction calculation has been cross checked with CEA $CO_2$ Baseline Database for the Indian Power Sector, Version 11 to version 16, published by the Central Electricity Authority, Ministry of Power, Govt. of India. Values of Build Margin emission factor have been taken from the latest CEA database for the respective year/23/. Baseline emission factor value and source of the same are appropriately represented in the CER calculation sheet/3/ and final Monitoring report/2/ and taken as follows.

| CEA Version | | CEA Version 11 | CEA Version 12 | CEA Version 13 | CEA Version 14 | CEA Version 15 | CEA Version 16 | | |
|---|---|---|---|---|---|---|---|---|---|
| Applied on Year | | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | Unit | Remark |
| Option 1 | The Build Margin | 0.9284 | 0.9083 | 0.8723 | 0.8643 | 0.8810 | 0.8682 | $tCO_2/MWh$ | Determined Ex-post |
| Option 2 | Combined Margin | 0.9613 | 0.9468 | 0.9227 | 0.9127 | 0.9216 | 0.9124 | $tCO_2/MWh$ | Determined Ex-post |
| Option 3 | Baseline Emission Factor of the Technology Identified | 1.048 | 1.048 | 1.048 | 1.048 | 1.048 | 1.048 | $tCO_2/MWh$ | Determine at the time of registration |
| | **Estimation of Baseline Emission Factor on conservative basis** | **0.9284** | **0.9083** | **0.8723** | **0.8643** | **0.8810** | **0.8682** | **$tCO_2/MWh$** | Min of (BM, CM, $EF_{BLCO2y}$) |

Emission factor for upstream fugitive methane emissions occurring in the absence of the project activity ($EF_{BL,upstream\ CH4}$): $EF_{BL,upstreamCH4}$ has been calculated based on IPCC's default emission factors for fugitive $CH_4$ upstream emissions furnished in the methodology and the latest version i.e. CEA's CO2 Baseline Database for the Indian Power Sector/23/. Annual values provided in the ER sheet/3/ are found correct and consistent in the MR/2/. $EF_{BL,upstream\ CH4}$ has been calculated based on IPCC's default emission factors for fugitive CH4 upstream emissions furnished in the methodology and the latest version i.e. Version 8 dated January 2013 of CEA's $CO_2$ Baseline Database for the Indian Power Sector.

Thus baseline **Emissions are calculated as :**

| Year | Net Export to the grid (MWh) | Emission Factor of Grid ($tCO_2/MWh$) | Baseline Emission ($tCO_2$) (roundown values) |
|---|---|---|---|

| | | | |
|---|---|---|---|
| 2010 | 78,360 | 0.9284 | 72,749 |
| 2011 | 755,616 | 0.9083 | 686,325 |
| 2012 | 866,005 | 0.8723 | 755,415 |
| 2013 | 702,301 | 0.8643 | 606,998 |
| 2014 | 580,692 | 0.8810 | 511,589 |
| 2015 | 385,471 | 0.8682 | 334,665 |
| Total | 3,368,443.52 | | 2,967,741.00 |

**Project Emission:**

The project activity is on-site combustion of natural gas to generate electricity. The $CO_2$ emissions from electricity generation (PEy) are calculated as follows:

$$PE_y = \sum FC_{f,y} * COEF_{f,y}$$

Where:

$FC_{f,y}$ = is the total volume of natural gas or other fuel 'f' combusted in the proje other start-up fuel ($m^3$ or similar) in year(s) 'y'

$COEF_{f,y}$ = is the $CO_2$ emission coefficient ($tCO_2/m^3$ or similar) in year(s) for each obtained

Also $COEF_{f,y}$ is calculated using the below formula

$$COEF_{f,y} = \sum NCV_y * EF_{CO2,f,y} * OXID_f$$

Where:

$NCV_y$ : is the net calorific value (energy content) per volume unit of natural gas ($GJ/m^3$) as determined from the fuel supplier, wherever possible, otherwise or national data

$EF_{CO2,f,y}$ : is the $CO_2$ emission factor per unit of energy of natural gas in year 'y' (t determined from the fuel supplier, wherever possible, otherwise from local data

$OXID_f$ : is the oxidation factor of natural gas (as per latest IPCC guidelines)

For startup fuels, IPCC default calorific values and $CO_2$ emission factors are acceptable, if local or national estimates are unavailable

Project Emission are calculated as follows

| Year | Gas Consumption (SCM) | Avg. Net Calorific value of gas (kcal/SCM) | Emission factor of Gas (IPCC) ($tCO_2/GJ$) | Oxidation Factor of Gas | COEF of Gas $tCO_2/m^3$ | Project Emissions; $tCO_2$ (roundup values) |
|---|---|---|---|---|---|---|
| 2010 | 16,430,416.84 | 9258.97 | 0.0561 | 1 | 0.00217 | 35,726.00 |
| 2011 | 156,487,263.08 | 9353.46 | 0.0561 | 1 | 0.00220 | 343,715.00 |
| 2012 | 179,572,906.65 | 9381.17 | 0.0561 | 1 | 0.00220 | 395,554.00 |
| 2013 | 144,106,649.27 | 9396.60 | 0.0561 | 1 | 0.00221 | 317,952.00 |
| 2014 | 125,104,010.41 | 9408.52 | 0.0561 | 1 | 0.00221 | 276,419.00 |
| 2015 | 80,461,348.38 | 9485.26 | 0.0561 | 1 | 0.00223 | 179,040.00 |
| Total | **702,162,594.62** | **9380.66** | | | **0.00220** | **1,548,406.00** |

**Leakage Emission**:

There is no LNG consumption in the project activity, so $LE_{LNG,CO2,y}$ are considered zero.

As per the applied meth/7/, for the purpose of estimating fugitive CH4 emissions, project participants should multiply the quantity of natural gas consumed by the project in year y with an emission factor for fugitive $CH_4$ emissions ($EF_{NG,upstream,CH4}$) from natural gas consumption and subtract the emissions occurring from fossil fuels used in the absence of the project activity

Therefore, same have been calculated as follows;

| Year | Net Export to the grid (MWh) | Fugitive Emission Factor in Baseline ($tCO_2/MWh$) | Fugitive Emission in Baseline ($tCO_2$) | Net Leakage Attributable to the project activity ($tCO_2$) = Fugitive Emissions for NG - Fugitive Emission in Baseline |
|---|---|---|---|---|
| 2010 | 78,360 | 0.013287 | 1,041.16 | 1,507.00 |
| 2011 | 755,616 | 0.013854 | 10,468.02 | 14,040.00 |
| 2012 | 866,005 | 0.013853 | 11,996.97 | 16,207.00 |
| 2013 | 702,301 | 0.013030 | 9,151.15 | 13,520.00 |
| 2014 | 580,692 | 0.013260 | 7,699.80 | 12,010.00 |

| | | | | | |
|---|---|---|---|---|---|
| | 2015 | 385,471 | 0.013326 | 5,136.96 | 7,629.00 |
| | **Total** | | | | **64,913.00** |

Total emission reductions by the project activity during the monitoring period are 1,354,428 $tCO_2e$. VVB confirms that GHG emission reductions and removals have been quantified correctly in accordance with the project description/1/ and applied methodology/7/.

## 4.5 Quality of Evidence to Determine GHG Emission Reductions and Removals

| | |
|---|---|
| Means of verification | The verification team checked the Calibration details of the monitoring meters with the calibration certificates. |
| Findings | No finding was raised on the section. |
| Conclusion | The assessment team confirms that the value of net electricity exported to the grid and other monitoring parameters as used in emission reduction calculation is correct/5/,/6/.<br><br>Interview with O&M personnel during remote verification audit also confirms that the operational and organizational chart as mentioned in MR is as per the site practice and thus assessment team confirms that the details are correct/8/.<br><br>The metering facilities are installed within the plant premises & substation. Verification team checked the calibration certificates/4/ of the monitoring requirement and found that energy meters have delayed calibration observed for the 16-Dec-2010 to 10-Aug-2015 for the electricity meters/4/. Also delayed calibration is observed for the natural gas flow meter for some dates as 12-Jan-2011, 12-Jan-2012 to 17-Jan-2012, 17-April-2012 to 20-May-2012, 09-April-2013 to 25-April-2013, 17-Oct-2013, 17-Jan-2014 to 27-Jan-2014, 21-Dec-2014 & 18-June-2015.<br>The dates have been checked from the calibration certificates/4/. During calibration process meters were tested for the error and found that error of meters is within permissible limit. Same was confirmed from test certificates/4/. PP has submitted records of the meter calibration for the meters and the observed percent error for all meters was within the maximum permissible limit of 0.2% for energy meters and 0.075% for gas flow meters. Thus, delayed calibration is addressed in line with para 366 (a) of the "CDM validation and verification standard for project activities, Version 02" by applying maximum permissible error for complete delayed period (error subtracted from export & added to import monthwise for energy meters & daywise for gas flow meter)/3/. Thus, accepted by the assessment team. The calibration details of monitoring equipment are provided in Appendix 5 below.<br>Assessment team has checked the calibration certificates of all meters and confirms that meters are calibrated by NABL accredited laboratories. The calibration details of monitoring equipment are provided in Annexure 1 of the MR also/2/.<br><br>Verification team confirms the sufficiency of quantity and appropriate quality of the evidences used to determine the GHG reductions and removals. |

## 4.6 Non-Permanence Risk Analysis

| 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 | |
| NA | NA | NA | NA | NA |

# 5 VERIFICATION CONCLUSION

Earthood Services Private Limited (Earthood), contracted by EKI Energy Services Limited, has performed the independent verification of the emission reductions for the VCS project activity reference number VCS 68 "119.8 MW Natural Gas Based Combined Cycle Power Plant, at Tanjavur, Tamilnadu by M/s Aban Power Company Limited" in India for the monitoring period 16-December-2010 to 10-August-2015 (inclusive both days) reported in the Monitoring Report Version 02 dated 20-September-2021.

It is our responsibility to express an independent verification statement on the reported GHG emission reductions from the project activity.

Earthood commenced the verification on the basis of the baseline and monitoring methodology "AM0029: Baseline/ monitoring methodology for grid-connected electricity generation plants using natural gas (Version 01.1)", the monitoring plan contained in the registered CDM PDD and VCS guidelines version 4.0, Monitoring Report Version 02 dated 20-September-2021 as per the process described under Section 2 of this report.

Earthood's verification approach is based on the understanding of the risks associated with reporting of GHG emission data and the controls in place to mitigate these. Earthood planned and performed the verification by obtaining evidence and other information and explanations that Earthood considered necessary to give reasonable assurance that reported GHG emission reductions are fairly stated.

In our opinion the GHG emissions reductions reported for the project activity for the period 16-December-2010 to 10-August-2015 are fairly stated in the Monitoring Report Version 02 dated 20-September-2021. The GHG emission reductions were calculated correctly on the basis of the approved baseline and monitoring methodology "AM0029: Baseline/ monitoring methodology for grid-connected electricity generation plants using natural gas (Version 01.1)" and the VCS standard.

Verification period: 16-December-2010 to 10-August-2015 (inclusive of both days).

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

| Year | Baseline emissions or removals ($tCO_2e$) | Project emissions or removals ($tCO_2e$) | Leakage emissions ($tCO_2e$) | Net GHG emission reductions or removals ($tCO_2e$) |
|---|---|---|---|---|
| 16-December-2010 to 31-December-2010 | 72,749 | 35,726 | 1,507 | 35,516 |
| 01-January-2011 to 31-December-2011 | 686,325 | 343,715 | 14,040 | 328,572 |

| | | | | |
|---|---|---|---|---|
| 01-January-2012 to 31-December-2012 | 755,415 | 395,554 | 16,207 | 343,655 |
| 01-January-2013 to 31-December-2013 | 606,998 | 317,952 | 13,520 | 275,527 |
| 01-January-2014 to 31-December-2014 | 511,589 | 276,419 | 12,010 | 223,162 |
| 01-January-2015 to 10-August-2015 | 334,665 | 179,040 | 7,629 | 147,996 |
| Total | **2,967,741** | **1,548,406** | **64,913** | **1,354,428** |

**Approved by**



**Dr. Kaviraj Singh**

**Managing Director** **Date: 24-September-2021**

**Earthood Services Privated Limited** **Place: Gurgaon, Haryana**

# APPENDIX 1: DOCUMENTS REVIEWED OR REFERENCED (VERIFICATION)

| S.No | Title of Document | Version | Date |
|---|---|---|---|
| 1. | Registered CDM PDD | 05 | 27-November-2011 |
| 2. | Initial VCS Monitoring Report<br>Final VCS Monitoring Report | 01<br>02 | 14-June-2021<br>20-September-2021 |
| 3. | Draft ER sheet<br>Final ER sheet | 01<br>02 | 14-June-2021<br>20-September-2021 |
| 4. | Certificates of calibration for energy meters and Gas flow meters | - | - |
| 5. | Natural Gas Purchase/Invoice Records | - | - |
| 6. | Plant Records/Log books/DCS record for the complete of monitoring period<br>1. Joint Meter Readings for Electricity export & import issued by Tamilnadu Transmission Corporation Limited<br>2. Fortnightly Statement for NG consumption & calorific value | - | - |
| 7. | AM0029: Baseline/ monitoring methodology for grid-connected electricity generation plants using natural gas | 01.1 | - |
| 8. | Remote Audit through Skype video call/Telephonic discussions | - | 05-July-2021 |
| 9. | Commissioning certificate from TNEB dated 30-August-2005 for COD on 11-August-2005 | - | 11-August-2005 |
| 10. | VCS webpage for the project, https://registry.verra.org/app/projectDetail/VCS/68 | - | Last accessed on 24-August-2021 |
| 11. | VCS Standard | Version 4.1 | Last accessed on 24-August-2021 |
| 12. | VCS Program Guide | Version 4.0 | Last accessed on 24-August-2021 |
| 13. | Letter of declaration dated from PP regarding not having created or sought any other form of environmental credit for the same period and double counting | - | - |
| 14. | Google Earth desktop/Mobile application | - | Last accessed on 24-August-2021 |
| 15. | Technical specifications by technology supplier for Gas Turbine, HRSG & Steam turbine | - | - |
| 16. | Break down log sheet of Plants | - | - |
| 17. | Plant personnel training records | - | - |
| 18. | Copies of the grievance registers maintained at sites | - | - |
| 19. | ERPA signed for sale of credits from the project activity | - | 21-December-2020 |
| 20. | Copy of EIA report prepared for project activity | - | - |
| 21. | Power Purchase Agreement (PPA) between PP & TNEB | - | 01-Septeber-2003 |
| 22. | CDM Registered documents & verification reports https://cdm.unfccc.int/Projects/DB/RWTUV1173779090.0/view | - | - |
| 23. | CEA $CO_2$ baseline database released by CEA https://cea.nic.in/cdm-co2-baseline-database/?lang=en | - | - |
| 24. | Name change letter issued for Aban Power Company Limited to Lanco Tanjore Power Company Limited by Registrar of Companies, Ministry of Corporate Affaires, Govt. of India dated 18-April-2011 | - | 18-April-2011 |

# APPENDIX 2: CORRECTIVE ACTION REQUESTS, CLARIFICATION REQUESTS AND FORWARD ACTION REQUESTS (CAR/CL/FAR)

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

| FAR ID | 00 | Section no. | E.2 | Date : DD/MM/YYYY |
|---|---|---|---|---|
| Description of FAR | | | | |
| There is no FAR from the validation of the project activity | | | | |
| Project participant response | | | | Date : DD/MM/YYYY |
| NA | | | | |
| Documentation provided by project participant | | | | |
| NA | | | | |
| DOE assessment | | | | Date: DD/MM/YYYY |
| NA | | | | |

Table 2. CL from this verification

| CL ID | 00 | Section no. | 4.1 | Date : DD/MM/YYYY |
|---|---|---|---|---|
| Description of CL | | | | |
| | | | | |
| Project participant response | | | | Date : DD/MM/YYYY |
| | | | | |
| Documentation provided by project participant | | | | |
| | | | | |
| DOE assessment | | | | Date: DD/MM/YYYY |
| | | | | |

Table 3. CAR from this verification

| CAR ID | 01 | Section no. | 4.1 | Date : 17-July-2021 |
|---|---|---|---|---|
| Description of CAR | | | | |
| Following discrepancies observed during review of the MR:<br>1. MR template: Table of contents missing Appendix names. Corrective action sought.<br>2. Date format is not inline with guidelines to complete MR throughout MR. Corrective action sought.<br>3. Google Map image/s showing plant location is missing in the section 1.7 of MR. Corrective action sought.<br>4. PP requested to review and revised parameter notations inline with the PDD/meth. Corrective action sought. | | | | |
| Project participant response | | | | Date : 30-July-2021 |
| Following discrepancies observed during review of the MR:<br>1. MR template: Table of contents Appendix names has been updated in MR<br>2. Date format has made inline with guidelines to complete MR throughout MR<br>3. Google Map image/s showing plant location has been updated in the section 1.7 of MR.<br>4. Parameter notations has been made inline with the PDD/meth. | | | | |
| Documentation provided by project participant | | | | |
| Revised MR | | | | |
| DOE assessment | | | | Date: 14-August-2021 |

1. PP have submitted the revised MR & found inline with the VCS MR template. CAR thus closed.
2. PP have submitted revised MR with revised Date format throughout MR inline with guidelines to complete MR. CAR is closed.
3. Google Map image/s showing plant location is added in the section 1.7 of MR & found correct. CAR thus closed.
4. PP have revised parameter notations inline with the PDD/meth throughout the MR and found correct. CAR thus closed.

| CAR ID | 02 | Section no. | 4.1 | Date : 17-July-2021 |
|---|---|---|---|---|
| **Description of CAR** | | | | |
| PP requested to submit declaration in effect of avoiding double counting with regard to participation under other GHG Programs/Other forms credits, rejection under other GHG program etc. including REC mechanism of India. Corrective action sought. | | | | |
| **Project participant response** | | | | **Date :** 30-July-2021 |
| Declaration in effect of avoiding double counting with regard to participation under other GHG Programs/Other forms credits, rejection under other GHG program etc. including REC mechanism of India has been submitted to DOE for verification | | | | |
| **Documentation provided by project participant** | | | | |
| Declaration | | | | |
| **DOE assessment** | | | | **Date:** 14-August-2021 |
| The project activity is registered as CDM project on 26-May-2007 under the UNFCCC Reference Number 999 & CDM MR for the monitoring period 16-December-2010 to 15-January-2012 is already web hosted on the project's UN webpage for which the CERs have not been yet claimed and verification contract have been terminated with DOE. PP has given declaration that the project activity will not claim emission reductions for the monitoring period claimed in VCS and avoid double counting of the emission reductions including CDM monitoring period for which MR webhosted on UN webpage & DOE contract terminated including REC mechanism & found correct. CAR thus closed. | | | | |

| CAR ID | 03 | Section no. | 4.2.2 | Date : 17-July-2021 |
|---|---|---|---|---|
| **Description of CAR** | | | | |
| Section 2.2 of the MR is not completed in line with Guidelines to complete MR & ongoing LSC mechanism found missing. Further, PP requested to submit copies of grievance registers for the monitoring period. Corrective action sought. | | | | |
| **Project participant response** | | | | **Date :** 30-July-2021 |
| Section 2.2 of the MR has been completed in line with Guidelines to complete MR & ongoing LSC mechanism has been updated. Copies of grievance registers for the monitoring period has been submitted to DOE for verification. | | | | |
| **Documentation provided by project participant** | | | | |
| Grievance register | | | | |
| **DOE assessment** | | | | **Date:** 14-August-2021 |
| PP have revised the section 2.2 of the MR and found correct inline with the VCS guidelines and supporting documents submitted. CAR thus closed. | | | | |

| CAR ID | 04 | Section no. | 4.4 | Date : 17-July2021 |
|---|---|---|---|---|
| **Description of CAR** | | | | |
| Ex-ante calculations of Baseline emissions, Project Emissions & Leakages are missing in the section 5.1 of the MR. Corrective action sought.<br>Further, ER sheet/MR lacks the application of rounddown formulae to baseline emissions and roundup for the project & leakage emissions for conservative estimation of emission reductions. Corrective action sought. | | | | |
| **Project participant response** | | | | **Date :** 30-July-2021 |

| |
|---|
| Ex-ante calculations of Baseline emissions, Project Emissions & Leakages has been updated in the section 5.1 of the MR.<br>ER sheet/MR updated the application of round down formulae to baseline emissions and roundup for the project & leakage emissions for conservative estimation of emission reductions. |
| **Documentation provided by project participant** |
| Revised MR & ER sheet |
| **DOE assessment** **Date:** 14-August-2021 |
| PP have submitted the revised MR with Ex-ante calculations of Baseline emissions, Project Emissions & Leakages and ER sheet with roundown baseline emissions and roundup project & leakage emissions appropriately. CAR thus closed. |

| | | | | |
|---|---|---|---|---|
| **CAR ID** | 05 | **Section no.** | 4.4 | **Date :** 14-July-2021 |
| **Description of CAR** | | | | |
| Impact of the increased emission reductions on the additionality, attributable to increased generation & baseline emission factor & project/leakage emission factors is missing in the MR. Corrective action sought. | | | | |
| **Project participant response** | | | | **Date :** 30-July-2021 |
| There has no increase in Net Export to grid and Gas Consumption during the current monitoring period as compared to the estimated in registered PDD. Hence there has no impact on the additionality.<br>However, there is an increase in the actual emission reduction achieved during the current monitoring period as compared to registered CDM PDD, due to the increase in the Build Margin emission factor 0.8811 tCO2/MWh (current monitoring period) against 0.6733 tCO2/MWh (registered CDM PDD) which is ex-post and PP don't have control over it. | | | | |
| **Documentation provided by project participant** | | | | |
| Revised MR & ER sheet | | | | |
| **DOE assessment** | | | | **Date:** 14-August-2021 |
| The increased ER are attributable to the increased Build Margin emission factor during current monitoring period against registered CDM PDD (for PRC) which is ex-post. PP have calculated emission factor for each year from the CEA database available for that respective year and found correct. Further, there is no increase in Net Export to grid and Gas Consumption during the current monitoring period as compared to the estimated in registered PDD. Ex-ante emission factor is not under the control of PP and there is no increase in electricity export & gas consumption, thus, increase in accepted by assessment team. | | | | |

**Table 4. FAR from this verification**

| | | | | |
|---|---|---|---|---|
| **FAR ID** | XX | **Section No.** | | **Date :** DD/MM/YYYY |
| **Description of FAR** | | | | |
| There is no FAR from this verification | | | | |
| **Project participant response** | | | | **Date :** DD/MM/YYYY |
| NA | | | | |
| **Documentation provided by project participant** | | | | |
| NA | | | | |
| **DOE assessment** | | | | **Date:** DD/MM/YYYY |
| NA | | | | |

# APPENDIX 3: COMPETENCE OF TEAM MEMBERS AND TECHNICAL REVIEWERS

| Competence Statement | | | |
|---|---|---|---|
| **Name** | Atul Takarkhede | | |
| **Education** | Ph.D. Environmental Science | | |
| **Experience** | 12 years | | |
| **Field** | Climate Change and environment | | |
| **Approved Roles** | | | |
| **Team Leader** | YES | | |
| **Validator** | NO | | |
| **Verifier** | NO | | |
| **Methodology Expert** | NO | | |
| **Local expert** | NO | | |
| **Financial Expert** | NO | | |
| **Technical Reviewer** | NO | | |
| **TA Expert** | YES (1.2) | | |
| | | | |
| **Reviewed by** | Shreya Garg | **Date** | 24/04/2019 |
| **Approved by** | Anshika Gupta | **Date** | 25/04/2019 |

| Competence Statement | |
|---|---|
| **Name** | Sanjeev Kumar |
| **Country** | India |
| **Education** | B. Tech. (Chemical Engineering)<br>M.Tech. (Energy Management) |
| **Experience** | 13.5 years + |
| **Field** | Climate Change, Environment, Energy |
| **Approved Roles** | |
| **Team Leader** | YES |
| **Validator** | YES |
| **Verifier** | YES |
| **Methodology Expert** | YES (ACM0002, ACM0006, ACM0004, ACM0009, ACM0012, ACM0001, AMS I.D, AMS I.F, AMS I.C, AMS I.A, AMS II.C, AMS II.D, AMS II.E, AMS III.H, AM0009, AM0013, AM0025, AM0056, AM0028, AM0029, AM0008, AMS III.R, ACM0003 ) |
| **Local expert** | YES (India) |
| **Financial Expert** | NO |
| **Technical Reviewer** | YES |

| | | | |
|---|---|---|---|
| **TA Expert** | YES (TA 1.1, TA 1.2, 4.1, 13.1) | | |
| | | | |
| **Reviewed by** | Shreya Garg | **Date** | 16/01/2020 |
| **Approved by** | Anshika Gupta | **Date** | 16/01/2020 |

| **Competence Statement** | | | |
|---|---|---|---|
| **Name** | Shreya Garg | | |
| **Country** | India | | |
| **Education** | M.Sc. (Climate Science & Policy), TERI University | | |
| **Experience** | 7 Years + | | |
| **Field** | Climate Change | | |
| **Approved Roles** | | | |
| **Team Leader** | YES | | |
| **Validator** | YES | | |
| **Verifier** | YES | | |
| **Methodology Expert** | AMS.I.A., AMS.I.C., AMS.I.D., AMS.I.F., AMS.II.D., AMS.II.G., AMS.II.J., AMS.III.AV., AMS I.C., ACM0012 | | |
| **Local expert** | YES (India) | | |
| **Financial Expert** | NO | | |
| **Technical Reviewer** | YES | | |
| **TA Expert** | YES (TA 1.2, TA 3.1) | | |
| | | | |
| **Reviewed by** | Abhishek Mahawar | **Date** | 01/03/2018 |
| **Approved by** | Ashok Gautam | **Date** | 01/03/2018 |

# APPENDIX 4: ABBREVIATIONS

| Abbreviations | Full texts |
|---|---|
| BM | Build Margin |
| CAR | Corrective Action Request |
| CDM | Clean Development Mechanism |
| CER | Certified Emission Reduction(s) |
| CEA | Central Electricity Authority |
| CL | Clarification request |
| CM | Combined Margin |
| CMS | Central Monitoring system |
| $CO_2$ | Carbon dioxide |
| $CO_2e$ | Carbon dioxide equivalent |
| DNA | Designated National Authority |
| DOE | Designated Operational Entity |
| DR | Document Review |
| EF | Emission Factor |
| EIA | Environmental Impact Assessment |
| ER | Emission Reductions |
| FAR | Forward Action Request |
| GHG | Greenhouse gas(es) |
| GWP | Global Warming potential |
| PP | Project Participant |
| VVB | Validation & Verification Body |

# APPENDIX 5: CALIBRATION DETAILS

| Feeder | GTG | STG | Manalmedu Feeder | Kattumannarkoil Feeder | Cuddalore Feeder | Kadalangudi Feeder | | Calibration compliance |
|---|---|---|---|---|---|---|---|---|
| Meter Details | Main meter | Main meter | Main meter | Main meter | Main meter | Main meter | | |
| Serial Number | 04248996 | 04248994 | 04249077 | 04249074 | 04187300 | 04187302 | Validity of Calibration | |
| Date of Calibration | 06-Jan-2010 | | | | | | 05-July-2010 | |
| | 07-July-2010 | | | | | | 06-Jan-2011 | Delay 06-July-2010 |
| | 04-Jan-2011 | | | | | | 03-July-2011 | |
| | 05-July-2011 | | | | | | 04-Jan-2012 | Delay 04-July-2011 |
| | 04-Jan-2012 | | | | | | 03-July-2012 | |
| | 04-July-2012 | | | | | | 03-Jan-2013 | Delay of less than 24 hrs[10] |
| | 08-Jan-2013 | | | | | | 07-July-2013 | Delay 04-Jan-2013 to 07-Jan-2013 |
| | 24-July-2013 | | | | | | 23-Jan-2014 | 08-July-2013 to 23-July-2013 |
| | 07-Jan-2014 | | | | | | 06-July-2014 | |
| | 09-July-2014 | | | | | | 08-Jan-2015 | 04-July-2014 to 08-July-2014 |
| | 21-Jan-2015 | | | | | | 20-July-2015 | 09-Jan-2015 to 20-Jan-2015 |
| | 07-July-2015 | | | | | | 06-Jan-2016 | |
| Meter Details | Check meter | Check meter | Check meter | Check meter | Check meter | Check meter | | |
| Serial Number | 04248997 | 04248995 | 04249078 | 04249081 | 04187301 | 04187303 | Validity of Calibration | |
| Date of Calibration | 28-Jan-2010 | | | | | | 05-July-2010 | |
| | 21-July-2010 | | | | | | 06-Jan-2011 | 06-July-2010 to 20-July-2010 |
| | 19-Jan-2011 | | | | | | 03-July-2011 | 07-Jan-2011 to 18-Jan-2011 |

[10] Though delay is less than a day, PP have applied error factor for complete month for conservative estimation of ERs

| | | | |
|---|---|---|---|
| | 20-July-2011 | 04-Jan-2012 | 04-Jul-2011 to 19-July-2011 |
| | 24-Jan-2012 | 03-July-2012 | 05-Jan-2012 to 23-Jan-2012 |
| | 18-July-2012 | 03-Jan-2013 | 04-July-2012 to 17-July-2012 |
| | 22-Jan-2013 | 07-July-2013 | 04-Jan-2013 to 21-Jan-2013 |
| | 21-August-2013 | 23-Jan-2014 | 08-July-2013 to 20-August-2013 |
| | 22-Jan-2014 | 06-July-2014 | 07-July-2014 to 22-July-2014 |
| | 23-July-2014 | 08-Jan-2015 | 09-Jan-2015 to |
| | 18-Feb-2015 | 20-July-2015 | 17-Feb-2015 |
| | 22-July-2015 | 06-Jan-2016 | 21-July-2015 |

| **Fuel Flow Meter** | **DP Transmitter** | **Pressure Transmitter** | **Temperature Transmitter** | | **Calibration compliance** |
|---|---|---|---|---|---|
| **Meter Serial No.** | **51309424** | **51309423** | **DGR-1215** | **Validity of Calibration** | |
| **Date of Calibration** | 16-Jan-2010 | | | 15-April-2010 | 12-Jan-2011, 12-Jan-2012 to 17-Jan-2012, 17-April-2012 to 20-May-2012, 09-April-2013 to 25-April-2013, 17-Oct-2013, 17-Jan-2014 to 27-Jan-2014, 21-Dec-2014 & 18-June-2015 |
| | 15-March-2010 | | | 14-July-2010 | |
| | 19-July-2010 | | | 18-Oct-2010 | |
| | 13-Oct-2010 | | | 12-Jan-2011 | |
| | 13-Jan-2011 | | | 12-April-2011 | |
| | 04-March-2011 | | | 03-June-2011 | |
| | 26-April-2011 | | | 25-July-2011 | |
| | 25-July-2011 | | | 24-Oct-2011 | |
| | 13-Oct-2011 | | | 12-Jan-2012 | |
| | 18-Jan-2012 | | | 17-April-2012 | |
| | 21-May-2012 | | | 20-August-2012 | |
| | 27-July-2012 | | | 26-Oct-2012 | |
| | 17-Oct-2012 | | | 16-Jan-2013 | |

| Fuel Flow Meter | DP Transmitter | Pressure Transmitter | Temperature Transmitter | | Calibration compliance |
|---|---|---|---|---|---|
| Meter Serial No. | 51309424 | 51309423 | DGR-1215 | Validity of Calibration | |
| | 10-Jan-2013 | | | 09-April-2013 | |
| | 26-April-2013 | | | 25-July-2013 | |
| | 18-July-2013 | | | 17-Oct-2013 | |
| | 18-Oct-2013 | | | 17-Jan-2014 | |
| | 28-Jan-2014 | | | 27-April-2014 | |
| | 17-April-2014 | | | 16-July-2014 | |
| | 26-June-2014 | | | 25-Sept-2014 | |
| | 22-Sept-2014 | | | 21-Dec-2014 | |
| | 22-Dec-2014 | | | 21-March-2015 | |
| | 19-March-2015 | | | 18-June-2015 | |
| | 19-June-2015 | | | 19-Sept-2015 | |
| | 30-Oct-2015 | | | 29-Jan-2016 | |
| | 23-Dec-2015 | | | 22-March-2016 | |