



GRID CONNECTED ELECTRICITY GENERATION PLANT USING NATURAL GAS AT JURONG ISLAND IN SINGAPORE



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Summary:

Verification purpose: The project undertaken by Infinite Solutions, Indore, India was registered with UNFCCC on 14-July-2014¹. The project construct and operate an 800 MW natural gas-based power plant. The electricity generated is exported to the Singapore national grid. The project activity helps to reduce carbon intensity.

At the site ambient conditions and a frequency of 50 Hz, the rated capacity of the plant is 800 MW (two units 400 MW each). Each of the two units has one combustion turbine, one Heat recovery Steam Generator (HRSG) and one Steam Turbine Generator (STG). The heat content of the exhaust gas from the combustion turbine is recovered in individual heat recovery steam generators. The steam generated is then expanded in a condensing type steam turbine driving an electric generator.

Start date of the project activity is 29-June-2013. An undertaking has been submitted by PP for double counting confirming that no GHG reduction will be claimed in any other GHG mechanism for current monitoring period. Project activity undergoes continued operation and no major breakdown had taken place except routine maintenance/shutdown.

This is 3rd monitoring under VCS and covers this activity from 14-July-2014 to 31-December-2017(inclusive both days). During the Current Monitoring Period the project activity has supplied 15,300,882.38 MWh of electricity, and thus contributing to the GHG reductions of 565,599 tCO₂e.

VCS crediting period is of 10 years. The start date of crediting period is 01-January-2014 and 31-December-2023 is the end date of the crediting period.

A risk-based approach has been followed to perform this verification activity. In the course of verification, 02 Corrective Action requests (CAR), 01 Clarification Requests (CLs) and 01 Forward action requests (FARs) were raised and successfully closed. The review of the Monitoring report and additional documents related to baseline and monitoring methodology; the subsequent background investigation, follow-up interviews and PP have provided VVB with sufficient evidence to verify the fulfilment of the stated criteria of VCS.

LGAI Technological Center S.A. (Applus+ Certification) (Hereafter referred to as Applus+ Certification) has been appointed by “Infinite Solutions” to perform the 3rd periodic verification of the “Grid connected electricity generation plant using natural gas at Jurong Island in Singapore” under VCS standard 4.1 and VCS Program guide version 4. The objective of this verification activity is to have an independent third party for the assessment of the project design, monitoring report and Final Verification report and to ensure a thorough assessment of the

¹ <https://cdm.unfccc.int/Projects/DB/BVQI1373973780.44/view>

proposed project activity against the applicable CDM and VCS requirements. In particular; the project's baseline is assessed against applied methodologies "AM0029 (version 3) - Baseline Methodology for Grid Connected Electricity Generation Plants using Natural Gas The project's compliance with the requirements of Article 12 of the Kyoto Protocol, the CDM Modalities and Procedures as agreed in the Marrakech Accords under decision 3/CMP.1, the annexes to this decision, subsequent decisions and guidance made by COP/MOP & CDM Executive Board and other relevant rules, including the Host Country legislation and sustainability criteria along with VCS program guide 4 and standard, version 4.1

- CDM Validation and Verification Standard for project activities, version 03.0
- CDM Project Standard for project activities, version 03.0
- CDM project cycle procedure for project activities, version 03.0
- VCS standard version 4.1
- VCS program guide version 4

Verification is a requirement for all VCS projects and is seen as necessary to provide assurance to stakeholders of the quality of the project and its intended generation of verified carbon units (VCUs).

The scope of the verification is the independent and objective review of the monitoring report (MR). The MR is reviewed against the relevant criteria (see above) and decisions by the CDM Executive Board and VCS executive board, including the approved baseline and monitoring methodology. The verification was based on the guidance given in the CDM Validation and Verification Standard for the project activities, version 03.0, review against registered VCS-PD and Final Validation report, CDM Project Standard for project activities, version 03.0; CDM Project Cycle Procedure for project activities, version 03.0 and VCS program guide, version 4 and standard version 4.1.

The assessment team has employed a risk-based approach to assess the completeness and accuracy of the claims and conservativeness of the assumptions in the MR. The main focus of the assessment team is to identify the significant risks for the project implementation and the generation of VERs. The verification is not meant to provide any consulting towards the project participants. However, stated requests for clarifications and/or corrective actions may have provided input for improvement of the monitoring report combined.

The only purpose of the verification is its usage during the issuance process as part of the VCS project cycle. Therefore, LGAI Technological Center S.A. (Applus+ Certification) can't be held liable by any party for decisions made or not made based on the verification opinion, which will go beyond that purpose.

The verification has been planned and organized to achieve a Reasonable Level of assurance as per the requirement of VCS. No sampling procedure applied for remote audit or document verifications. The entire documents checked/plant verification conducted to arrive at positive verification conclusions.

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1 INTRODUCTION

1.1 Objective

LGA Technological Center S.A. (Hereinafter referred as Applus+ Certification) has been appointed by “Infinite Solutions” to perform the 3rd periodic verification of the project entitled “Grid connected electricity generation plant using natural gas at Jurong Island in Singapore” under VCS standard version 4.1 and program guide version 4. The objective of this verification activity is to have an independent third party for the assessment of the project design, monitoring report and final verification report and to ensure a thorough assessment of the proposed project activity against the applicable CDM and VCS requirements. In particular;

The project's baseline plan is assessed against applied methodologies – AM0029 (version 3) “Baseline Methodology for Grid Connected Electricity Generation Plants using Natural Gas”.

The project's compliance with the requirements of Article 12 of the Kyoto Protocol, the CDM Modalities and Procedures as agreed in the Marrakech Accords under decision 3/CMP.1, the annexes to this decision, subsequent decisions and guidance made by COP/MOP & CDM Executive Board and other relevant rules, including the Host Country legislation and sustainability criteria along with VCS program guide, version 4 and standard version 4.1.

CDM Validation and Verification Standard for project activities, version 03.0

CDM Project Standard for project activities, version 03.0

CDM project cycle procedure for project activities, version 03.0

Verification is a requirement for all VCS projects and is seen as necessary to provide assurance to stakeholders of the quality of the project and its intended generation of estimated verified carbon units (VCUs).

1.2 Scope and Criteria

The scope is defined as an independent and objective review of the Monitoring report (MR) prepared as per the registered VCS-PD and registered approved methodologies AM0029 version 3. The MR is reviewed against the criteria stated in Article 12 of the Kyoto Protocol, the CDM modalities and procedures as agreed in the Marrakech Accords and the relevant decisions by the CDM Executive Board and VCS standard, version 4.1 and VCS Program guide version 4, including the approved baseline and monitoring methodologies applied. The verification was based on the requirements in the CDM validation and verification standard for project activities, Version 03.0, CDM Project Standard for project activities, version 03.0, CDM project cycle procedure for project activities, version 03.0 and VCS program guide, version 4 and standard version 4.1.

The verification is not meant to provide any consulting towards the project participants. However, stated requests for clarifications and/or corrective actions may have provided input for improvement of the Monitoring report. In line with Guidelines for Application of materiality in verifications, the verification team has conducted a complete verification of all the information presented in the monitoring report and data monitored as presented in the emission reduction calculation spread sheet. There are no material errors, overestimation of ER, omission or misstatement. The verification team has reviewed all the documents like commissioning certificate, Energy generation records, fuel records etc.

1.3 Level of Assurance

The verification has been planned and organized to achieve a Reasonable Level of assurance as per the requirement of VCS. The entire documents checked/Power plant verification conducted to arrive at positive verification conclusions.

1.4 Summary Description of the Project

The project undertaken by Pacific Light Power Pte. Ltd. has developed a new, grid connected 800 MW natural gas fired combined cycle power plant. The plant, through its use of natural gas and advanced combined cycle technology, provides consumers in Singapore with a clean, highly efficient source of electricity.

The purpose of the project activity is to construct and operate an 800 MW natural gas-based power plant. The electricity generated is exported to the Singapore national grid. The project activity helps to reduce carbon intensity.

At the site ambient conditions and a frequency of 50 Hz, the rated capacity of the plant is 800 MW (two units 400 MW each). Each of the two units has one combustion turbine, one Heat recovery Steam Generator (HRSG) and one Steam Turbine Generator (STG). The heat content of the exhaust gas from the combustion turbine is recovered in individual heat recovery steam generators. The steam generated is then expanded in a condensing type steam turbine driving an electric generator.

During the Current Monitoring Period from 14-July-2014 to 31-December-2017 (First and last date included) the project activity has supplied 15,300,882.38 MWh of electricity, and thus contributing to the GHG reductions 565,599 tCO₂e.

2 VERIFICATIONPROCESS

2.1 Method and Criteria

Verification Process: The project assessment is based on the Clean Development Mechanism Validation and Verification Standard for project activities, version 03.0 and VCS standard 4.1 and VCS program guide, version 4 and is conducted using standard auditing techniques to assess the correctness of the information provided by the project participants. Before the assessment begins, members of the team covering the technical scope(s), sectoral scope(s), and relevant host country experience for evaluating the VCS project activity are appointed.

Once the project is received by the assessment team, the members of the assessment team carried out:

1. A desk review of the monitoring Report against the registered PD;
2. Follow-up interviews with project participant;
3. The resolution of outstanding issues and the issuance of the final verification report and opinion.

The prepared verification report and other supporting documents then undergo an internal quality control at the HQ (Accredited office) before being submitted to the VCS executive board.

In order to ensure transparency, assumptions must be clear and stated explicitly and background material must also be referenced. LGAI Technological Center, S.A. (Applus+ Certification) has developed a specific checklist customized for the project. The checklist demonstrates, in a transparent manner, the project criteria (requirements), discussion on each criterion by the assessment team, and the results from verifying the identified criteria.

Appointment of the assessment team;

According to the sectoral scope / technical area and experience in the sectoral or national business environment, LGAI Technological Center S.A. (Applus+ Certification) has composed a project assessment team in accordance with the appointment rules in the internal Quality Management System of LGAI Technological Center S.A. (Applus+ Certification).

The composition of audit team shall be approved by the LGAI Technological Center S.A. (Applus+ Certification) ensuring that the required skills are covered by the team.

The four qualification levels for team members that are assigned by formal appointment rules are as presented below:

- Lead Auditor (LA).
- Auditor (A) / Auditor in Training (AiT)
- Technical Expert (TE)
- Technical Reviewer (TR)

The sectoral scope / technical area knowledge linked to the applied methodology/ies shall be covered by the assessment team.

Name	Role	SS Coverage	TA Coverage	Financial aspect	Host country experience
Pankaj Kumar	LA/TE	YES	YES	NA	YES
Simon Shen	TR	YES	YES	NA	NA

The complete list of CVs is included as Appendix 3 of this report.

Document review

The Monitoring Report version 1 submitted by the PP was reviewed against the approved methodology, registered CDM PDD, final validation report and other relevant criteria to verify the correctness, credibility, and interpretation of the presented information. Furthermore, a cross-check between information provided and information from other sources has been done. A complete list of all documents and evidence material reviewed is included in this report below in appendix 1.

Follow-up interviews

A remote audit was conducted by LGAI Technological Center S.A. (Applus+ Certification) who performed interviews, telephone conferences with project stakeholders to confirm selected information and to resolve issues identified in the document review. The detail is provided in this report in the below sections.

Resolution of Clarification and Corrective Action Request

The objective of this phase of the Verification was to resolve the requests for corrective actions and clarification and any other outstanding issues which need to be clarified for Applus+ Certification positive conclusion on the Monitoring report. The Corrective Action Requests and Clarification Requests raised by Applus+ Certification were resolved during communications between the Client and Applus+ Certification to guarantee the transparency of the verification process, the concerns raised and responses given are summarized below in the Appendix 2.

The final MR Version 02 submitted by PP on 09-February-2022 serves as the basis for the final assessment presented. Additional changes to the project during the verification process are not considered to be significant with respect to the main CDM/VCS objectives. The two CDM/VCS main objectives are the reduction of anthropogenic GHG emissions and the contribution of sustainable development to the host country.

Internal quality control

As final step of a verification of the final documentation including the final verification report and the checklist have to undergo an internal quality control by the technical review committee, i.e., each report has to be finally approved either by the head of the technical review committee or the deputy. In case one of these two persons is part of the assessment team approval can only be given by the other one to avoid any conflict of Interest.

After confirmation of the project owners, the positive verification opinion and relevant documents are submitted to the VCS secretariat through the VCS web-platform.

2.2 Document Review

The details of the document observed during the verification process are listed below in appendix 1 of this report.

2.3 Interviews

A remote audit was conducted for the project activity on 17-Feb-2022. Remote audit was conducted due to ongoing COVID-19 pandemic situation in the entire country of India. Taking into account the rules of relevant national and local authorities (local to the VVB offices as well as to locality of the remote audits), World Health Organization (WHO) recommendations, policies of the VVB and other relevant travel restrictions and guidance (for example, a requirement to self-isolate upon return). Moreover, The VCS Program does not explicitly mandate remote audits as part of the validation and verification process, 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

The VVB has taken alternative measures to reach reasonable level of assurance and conducted remote audit through Skype/Telephone with site personal & consultant (refer section 2.3) with the PP representative. This is also in line with the COVID-19 travel guidance for projects of VERRA.

Technical details & metering/monitoring arrangement verified through onsite photographs/name plates and calibration certificates shared by PP. All the documents were cross checked to ensure conservative estimation of emission reduction.

During the remote audit, the PP representatives were questioned about the implementation of the project activity. Several topics like the verification of commissioning date of equipments, generation records, and monitoring of the data and the error accountability were discussed. To cross check the information provided by PP, various documents like technical specifications, commissioning certificates, PPA, fuel purchase invoices, Plant records, Energy Generation Record sheets, invoice, calibration certificates etc. were also verified. The names of the persons interviewed during remote audit through skype & telephonic interview is given below;

Organization	Name of Persons/Designation	Topics discussed	Team Member
Infinite Solutions	Mr. Vivek Zaveri, Consultant	Project activity implementation Operation, Calibration, O&M practices, ENERGY GENERATION RECORDS etc. LSC mechanism Mechanical maintenance Electrical maintenance Project description Invoicing practices Project activity implementation Operation, Calibration, O&M practices, ENERGY GENERATION RECORDS etc. LSC mechanism Mechanical maintenance Electrical maintenance Project description Invoicing practices MR, ER calculations etc.	Pankaj Kumar
PacificLight Energy Pte Ltd	Leonard Andrew Cuevas / Assistant Manager, Regulations		
PacificLight Energy Pte Ltd	Clare Savereux / Senior Manager, Regulations & Corporate Communications		
PacificLight Energy Pte Ltd	Rajivkumar Pinnamraju / Deputy General Manager, Operations		

During the remote audit, the PP representatives were questioned about the implementation of the project activity. Several topics like the verification of commissioning date of equipments, the generation, recording, and monitoring of the data and the error accountability were discussed. Various documents like the ENERGY GENERATION RECORDS sheets, plant records, invoices, on-site Photographs includes boiler nameplates, meter specifications, key technical specifications of the major equipment provided to assessment team were verified on skype video call to establish the current status and the implementation of the Project Activity.

2.4 Site Inspections

Remote Audit: 17-Feb -2022				
No.	Activity performed on-site	Site location	Date	Team member
1.	Assessment team checked the implementation of the project, Baseline emission, Emission reduction calculation, technical	Remote audit (Through Skype)	17-February-2022	Pankaj Kumar

	description of the project and Monitoring. Assessment team also checked that whether the monitoring plan as described in the CDM PDD is actually practised onsite. Also, assessment team checked any change in host country criteria which may affect the baseline of the project activity.			
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2.5 Resolution of Findings

The objective of this phase of the verification was to resolve the requests for corrective actions and clarification and any other outstanding issues which need to be clarified for LGAI Technological Center S.A. (Applus+ Certification)'s positive conclusion on the project design and Monitoring report. The Corrective Action Requests and Clarification Requests raised by LGAI Technological Center S.A. (Applus+ Certification) were resolved during communications between the Client and LGAI Technological Center S.A. (Applus+ Certification) to guarantee the transparency of the validation process, the concerns raised and responses given are summarized below in the appendix 2.

The final MR Version 02 submitted by project owners on 09-February-2022 serves as the basis for the final assessment presented. Additional changes to the project during the verification process are not considered to be significant with respect to the main CDM/VCS objectives. The CDM/VCS main objectives are the reduction of anthropogenic GHG emissions and the contribution of sustainable development to the host country.

Areas of verification findings	No. of CL	No. of CAR	No. of FAR
Project design document and Monitoring report	00	01	00
Description of project activity	00	01	00
Application of selected baseline and monitoring methodology and selected standardized baseline			
- Applicability of methodology and standardized baseline	01	00	00
- Deviation from methodology	00	00	00
- Clarification on applicability of methodology, tool and/or standardized baseline	00	00	00
Project boundary	00	00	00
Establishment and description of baseline scenario	00	00	00
Demonstration of additionality	00	00	00
Emission reductions	00	00	00
Calibration details	00	00	00
Monitoring plan	00	00	00
No Net harm assessment	00	00	00
Local stakeholder consultation	00	00	00
Others (please specify)- - Regarding double counting Declaration	00	00	01

Areas of verification findings	No. of CL	No. of CAR	No. of FAR
- ER Sheet - Supporting documents			
Total	01	02	01

The list of findings and their resolution is presented in appendix 2 of this report.

2.5.1 Forward Action Requests

This is 3rd periodic verification of the project activity and no FAR was raised from previous verification or validation. However, one FAR has been raised in the current verification which needs to be addressed in subsequent verification.

2.6 Eligibility for Validation Activities

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

3 VALIDATION FINDINGS

3.1 Participation under Other GHG Programs

The project activity is first registered under CDM (<http://cdm.unfccc.int/Projects/DB/BVQI1373973780.44/view>) with renewable crediting period as 01-January-2014 to 31-December-2020. The project proponent has not claimed any GHG credits under CDM mechanism during current monitoring period. The CDM Monitoring reports are only web hosted from 14/07/2014 till 31/12/2017 and the current monitoring period is 14/07/2014 to 31/12/2017 but no credits are issued. Though there is overlapping of Monitoring Reports. However, currently CDM verification is ongoing and CDM monitoring period is distinct and independent from VCS monitoring period.

The undertaking dated 17-August-2022 is provided to confirm that there is no any double accounting for current monitoring period.

3.2 Methodology Deviations

The project activity has applied correct methodologies which are as per the registered CDM PDD and thus no deviation is sought regarding the methodology. The project complies with all the requirement of the methodology and thus deviation to the methodology is not a requirement for the present project activity.

3.3 Project Description Deviations

This is 3rd monitoring period and no deviation requested for this monitoring period. Project description deviation requested for previous monitoring period which were approved already and no new deviation requested for this monitoring period.

3.4 Grouped Project

The project does not involve any addition of new project activity and thus the project do not fall under grouped project.

4 VERIFICATION FINDINGS

4.1 Project Implementation Status

During the remote audit, it was concluded that the project is implemented as per CDM PDD and this is verified from the commissioning certificate, statutory clearances submitted. During the current monitoring period it was observed that no unforeseen situation evolved which can impact the operation of the project activity. The same was verified through the shutdown summary sheet of the project activity submitted. Scheduled maintenance was carried out as per the instruction of the manufacturer and the same is acceptable to the assessment team.

Project location is confirmed by the assessment team through interview with PP during remote audit and assessment of monitoring report. Assessment team also checked the technical details of the project site containing latitude and longitude of the project site and confirmed that the details as mentioned in the registered CDM PDD are correct.

The project activity is located near City & District: Jurong Island, Singapore. The project site is located at 47 Jurong Island Highway Singapore, 627626

The geographical coordinates of the project activity are

1°17'24" N and 103°43'30" E.

The technical specifications have been verified during remote audit and also cross checked from the technical manuals of the Manufactures.

Technical Specification as per EPC contract with Siemens is provided:

Parameters	Manufacturer Specification
Model	SGT5-4000F
Make	Siemens
Mode	Siemens Combined Cycle Power Plant

Type	Single Shaft
Grid Frequency (Hz)	50
Net Power Output (MW)	423*2 @ ISO Conditions
Net Efficiency (%)	58.16
Net Heat Rate (kJ/kWh)	6,164
Net Heat Rate (Btu/kWh)	5,842
Exhaust mass flow (kg/s)	692
Pressure Ratio	18.2
Exhaust temperature (°C /°F)	577/1,071
Exhaust mass flow (lb/s)	1,526
Steam Parameter	565°C/125 bar (1,050°F/1,815 psi) 565°C/30 bar (1,050°F/435 psi) 565°C/5 bar (455°F/75 psi)

Generator terminal voltage is at 22kV and the power generated is exported to grid through step-up transformer and onsite switch house, after voltage increased to 230kV. The 230kV onsite switch house is connected to Singapore grid through three power evacuation lines.

The start date of the project is 29-June-2013 which is the initial date of commissioning of the first unit of the plant.

The assessment team confirmed through interview with O&M personal during remote audit that there are no changes into the project design during this monitoring period. It was found that the monitoring plan was implemented as per the requirement of the CDM PDD & approved monitoring Plan and applied methodologies. The organisational role and responsibility as mentioned in the registered CDM PDD is followed onsite. The calibration of energy meter is carried out as per the required frequency mentioned in the CDM PDD. All the emergency preparedness as mentioned in the registered CDM PDD is followed onsite and no discrepancies were found regarding the same.

The Project participant contribution from the project activity towards sustainable development in accordance to Singapore DNA (National Environment Agency, NEA, Singapore Government) are as explained below:

Environmental Sustainability

- i) The project activity meets NEA's Environmental Protection requirements, standards and regulations
- ii) The electricity generated by project activity supplied to Singapore grid, which otherwise would have been generated by more carbon intensive fossil fuels and existing old power plants that are less efficient. Hence the project activity help in reduction of the greenhouse gases emission and air pollutants (especially NOx).

Contribution to socio-economic well - being

Economic Sustainability

The project activity is utilizing latest F class turbines and this advanced technology is more efficient and environment friendly compared to older, existing power plants on the grid. This results in the CO2 emission reduction when compared with the build margin of the grid as discussed in Section B.6.3 of the registered CDM PDD.

Social Sustainability

The project activity provided direct employment to persons during construction and on an ongoing basis during normal operations. In addition, additional persons directly benefited through casual work, subcontracts, trading etc. Thus, the project activity helps to improve quality of life by creating opportunities for jobs and business.

Thus, the project activity contributes to the sustainable development of the country.

The project is not involved in any other form of GHG emission program and VCU's generated from this verification will not be used for other trading program to avoid any kind of double counting. The same is confirmed by the PP during the verification remote audit. Assessment team also conducted independent review regarding the same and found that the statement of the PP is accurate, and project is not involved in any other kind of GHG trading for the present verifications/monitoring period.

The assessment team observed that the project is in line with the registered CDM PDD and applied methodologies and thus no clarification/deviation is sought. 02 CAR and 01 CL was raised during the verification process. Please refer below Appendix 2 for the detail closure of the CARs.

Assessment team confirms following during the verification remote audit:

1. Start date of the project is 29-June-2013.
2. An undertaking letter has been submitted by PP for no double counting with any other GHG program. PP also has given a written declaration that project will not claim other form of GHG credit for the concerned monitoring period.
3. Assessment team confirms that this is the 3rd monitoring under VCS and covers the activity from 14-July-2014 to 31-December-2017(inclusive of both dates). VCS crediting period is of 10 years with 01-January-2014 as the start date of crediting period and end date as 31-December-2023.
4. GHG credits from 14-July-2014 to 31-December-2017 will be claimed under VCS only. At any point of time during the crediting period, the project proponent will abide by the "Double Counting".
5. Assessment team checked and found that the Project proponent of the project activity is as below for the current monitoring period:

Organization name	Infinite Solutions
Contact person	Mrs. Richa Thakur
Title	Sr. Manager - Sustainability

Address	611, Chetak Centre Main, 12/2 RNT Marg, Indore- 452001
Telephone	+91 9644130430
Email	richa@infosolutions.org

Finding: CAR 01, 02 and CL 01 were raised and successfully closed. Please refer appendix 3 for more information.

4.2 Safeguards

4.2.1 No Net Harm

No potential environment or socio-economic matter was found during the discussion with PP during remote audit. The project is renewable energy project and thus no negative impact observed onsite as confirmed by PP during remote audit.

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.

However, assessment team still conducted the No net harm assessment for some of the parameters and the result is described below:

Sr. No.	Indicator	Assessment team opinion
1	Air quality	The project activity leads to reduction of GHG emission and also the particulate emission is reduced to permissible limits by use of an ESP. Adequate measures were taken to mitigate the envisaged impacts like spraying water on the road side to reduce dust level etc. This was confirmed by the local stakeholders. Therefore, it is validated that mitigation measures were robustly implemented on ground for air quality issues project will have a positive impact on air quality.
2	Soil condition	For mitigating the impacts during construction, various mitigation measures were taken which is validated from the plant records of PP and the interview with local stakeholders. It was also confirmed that, the vegetation planted at project site helps to reduce soil erosion. The same is confirmed during the discussion with stakeholders during remote audit. Therefore, it can be concluded that the project has no effect on soil conditions during its operation because it has no waste coming out.
3	Water Pollution	The project site is not on the migration route of migratory bird nor is the project affecting aquatic life. With the implementation of Project, the green cover has increased at the Project site; the biodiversity in the vicinity will be improved with the vegetation improvement.

Sr. No.	Indicator	Assessment team opinion
4	Ecology	The project activity does not have any harmful impact on the ecology. There are no nearby forests, or zones high on biodiversity, or other sensitive locations around the factory that may be affected negatively due to the project. Further, no harmful impact is caused on the aquatic ecology as well as on the local vegetation. Individuals working in high noise zones is provided adequate gadgets for protection. Therefore, it can be concluded that the project has no effect on environment during its operation because it has no waste coming out.

4.2.2 Local Stakeholder Consultation

All the stakeholders are happy with the implementation and operation of the project activity and no negative comments envisaged for the project activity. There was no change in project description from the CDM PDD. Complaint/suggestion/feedback register is maintained at site as a part of ongoing communication with stakeholders in line with clause 3.16.17 of VCS Standard, version 4.1 and appropriate actions taken time to time by PP. Assessment team confirmed the same during the remote audit and document review i.e., grievance register.

4.3 AFOLU-Specific Safeguards

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 MR. 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 and MR.
Findings	No CAR or CL was raised.
Conclusion	As per the registered PDD and applied methodology, Formula used to calculate achieved emission reduction is as follow; $ER_y = BE_y - PE_y - LE_y$ As per registered PDD, option 1, The build margin, calculated according to “Tool to calculate emission factor for an electricity system has been followed for baseline CO2 emission factor (EFBL,CO2,y), Thus, $EBLCO2,y = 0.4031 \text{ t CO}_2/\text{MWh}$. The baseline emissions are calculated as below

$$BE_y = EG_{PJ,y} * EF_{BL,CO_2,y}$$

Where;

$EG_{PJ,y}$ = Total Net Electricity Generated in the project and delivered to the grid during the monitoring period

$EF_{BL,CO_2,y}$ = Baseline CO_2 emission factor during the year y in tCO_2/MWh

Monitored Parameters

$EG_{Export,y}$ Net electricity exported by the project plant in year y. The value monitored is 15,300,882.38 MWh.

The verification team has checked the entire monthly Energy generation records applicable for the monitoring period as per the project activity applied for verifications and found the monitoring parameter is monitored and recorded as per the monitoring plan in the registered CDM PDD. The net electricity supplied by project activity to grid is calculated by subtracting total electricity imported by project from grid from total electricity delivered by project to grid.

The verification team has reviewed the emission reduction sheet and monitoring report data with the energy generation reports and found all the values are consistent. Also same is cross checked with quantity of biomass fired found correct.

Other parameters monitored and their values were cross checked with the plant log/ records and found to be correct and values in the ER sheet are consistent with the plant records. These parameters are as below:

$FC_{NG,y}$ = Quantity of NG consumed in the project activity in year y. The total fuel consumption is monitored through gas metering equipment installed at consumer end (PP side) only and within the project activity at project site. The monitored data is cross verified by PP and gas supplier. Same was verified in remote audit and through submitted documents. The monitored value is 2,614,285,310 m^3 .

$NCV_{NG,y}$ = The calorific value of the gas would be based on the measurement readings recorded by Gas Chromatograph located at the PP plant boundary. The parameter is measured continuously and daily recorded in the plant logbook which were checked during remote audit along with the analysis reports.

The calculation of baseline emissions is as below,

Year 2014

$$= 1925733.198 \text{ MWh} * 0.4031 \text{ t } CO_2 / \text{MWh}$$

$$= 776,263 \text{ t } CO_2$$

Year 2015

$$= 4286550.162 \text{ MWh} * 0.4031 \text{ t } CO_2 / \text{MWh}$$

$$= 1,727,908 \text{ t } CO_2$$

Year 2016

	$= 4456030.468 \text{ MWh} * 0.4031 \text{ t CO}_2 / \text{MWh}$ $= 1,796,225 \text{ t CO}_2$
Year 2017	$= 4632568.553 \text{ MWh} * 0.4031 \text{ t CO}_2 / \text{MWh}$ $= 1,867,388 \text{ t CO}_2$
	Project emissions: As per registered PDD, the project emissions are calculated as below Volume of fuel combusted in project plant ($FC_{f,y}$) : 2,654,285,310 m³ Calculation of CO₂ Emission Co-efficient of natural gas (COEF_{f,y}) CO₂ Emission Co-efficient of natural gas is calculated as per equation number-1a of AM0029 Values of sub-variables: 1) Net Calorific Value of gas (NCV_y): XXX kcal/m³ (Please refer ER excel sheet for same) 2) CO₂ emission factor (EFCO_{2,f,y}): 56.1 t CO₂/TJ 3) Oxidation factor of gas (OXID_f): 1 . The following equation is used to calculate the total project emissions of the project activity during the monitoring period:
Year 2014	$\text{COEF}_{f,y} = \text{NCV}_{f,y} * \text{EF}_{\text{CO}_2,f,y} * \text{OXID}_f$ $= 0.03560 \text{ GJ/m}^3 * 0.0561 \text{ t CO}_2/\text{GJ} * 1$ $= 0.001997 \text{ t CO}_2/\text{m}^3$ $\text{PE}_y = \text{FC}_{f,y} * \text{COEF}_{f,y} + \text{FC}_{\text{Diesel},y} * \text{COEF}_{\text{Diesel},y}$ $= 333,190,204.59 \text{ m}^3 * 0.001997 \text{ t CO}_2/\text{m}^3 + 440.99 \text{ KL} * 0.8261 \text{ Tons/KL} * 3.18630 \text{ tCO}_2/\text{tons}$ $= 665457.02 \text{ t CO}_2 + 1160.78 \text{ t CO}_2$ $= 666,618 \text{ t CO}_2$
Year 2015	$\text{COEF}_{f,y} = \text{NCV}_{f,y} * \text{EF}_{\text{CO}_2,f,y} * \text{OXID}_f$ $= 0.03511 \text{ GJ/m}^3 * 0.0561 \text{ t CO}_2/\text{GJ} * 1$ $= 0.001970 \text{ t CO}_2/\text{m}^3$

	$PE_y = FC_{f,y} * COEF_{f,y} + FC_{Diesel,y} * COEF_{Diesel,y}$ $= 743,223,369.31 \text{ m}^3 * 0.001970 \text{ t CO}_2/\text{m}^3 + 322.72 \text{ KL} * 0.8261 \text{ Tons/KL} * 3.18630 \text{ tCO}_2/\text{tons}$ $= 1463781.53 \text{ t CO}_2 + 849.47 \text{ t CO}_2$ $= 1,464,632 \text{ t CO}_2$ Year 2016 $COEF_{f,y} = NCV_{f,y} * EF_{CO2,f,y} * OXID_f$ $= 0.03468 \text{ GJ/m}^3 * 0.0561 \text{ t CO}_2/\text{GJ} * 1$ $= 0.001945 \text{ t CO}_2/\text{m}^3$ $PE_y = FC_{f,y} * COEF_{f,y} + FC_{Diesel,y} * COEF_{Diesel,y}$ $= 757,565,940.93 \text{ m}^3 * 0.001945 \text{ t CO}_2/\text{m}^3 + 15457.16 \text{ KL} * 0.8261 \text{ Tons/KL} * 3.18630 \text{ tCO}_2/\text{tons}$ $= 1473810.29 \text{ t CO}_2 + 40686.36 \text{ t CO}_2$ $= 1,514,497 \text{ t CO}_2$ Year 2017 $COEF_{f,y} = NCV_{f,y} * EF_{CO2,f,y} * OXID_f$ $= 0.03515 \text{ GJ/m}^3 * 0.0561 \text{ t CO}_2/\text{GJ} * 1$ $= 0.001972 \text{ t CO}_2/\text{m}^3$ $PE_y = FC_{f,y} * COEF_{f,y} + FC_{Diesel,y} * COEF_{Diesel,y}$ $= 780,305,795.62 \text{ m}^3 * 0.001972 \text{ t CO}_2/\text{m}^3 + 1630.24 \text{ KL} * 0.8261 \text{ Tons/KL} * 3.18630 \text{ tCO}_2/\text{tons}$ $= 1538753.30 \text{ t CO}_2 + 4291.13 \text{ t CO}_2$ $= 1,543,045 \text{ t CO}_2$ Leakage Emission $LE_y = LE_{CH4,y} + LE_{LNG,CO2,y}$ LECH4,y is calculated as: As per registered PDD, Leakage emissions due to fugitive upstream CH4 emissions are calculated as below Year 2014
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$$\begin{aligned}
 \text{LECH4,y} &= [\text{FCf,y} * \text{NCVf,y} * \text{EFNG,upstream,CH4} - \text{EGPJ,y} * \\
 &\quad \text{EFBL,upstream,CH4}] * \text{GWP}_{\text{CH4}} \\
 &= [333190204.59 \text{ m}^3 * 0.03560 \text{ GJ/m}^3 * 0.000296 \text{ tCH4/GJ} - \\
 &\quad 1925733.20 * 0.00213 \text{ tCH4/MWh}] * 25 \\
 &= - \\
 &14,766.65 \text{ t} \\
 &\text{CO2}
 \end{aligned}$$

$$\begin{aligned}
 \text{LELNG,CO2,y} &= \text{FCy} * \text{EFCO2,upstream,LNG} \\
 &= 11861.98 * 6 \text{ t CO2/ TJ} \\
 &= 71,171.87 \text{ t CO2}
 \end{aligned}$$

$$\begin{aligned}
 \text{LEy} &= \text{LECH4,y} + \text{LELNG,CO2,y} \\
 &= -14,766.65 + 71,171.87 \\
 &= 56,406 \text{ t CO2}
 \end{aligned}$$

Year 2015

$$\begin{aligned}
 \text{LECH4,y} &= [\text{FCf,y} * \text{NCVf,y} * \text{EFNG,upstream,CH4} - \text{EGPJ,y} * \\
 &\quad \text{EFBL,upstream,CH4}] * \text{GWP}_{\text{CH4}} \\
 &= [743223369.31 \text{ m}^3 * 0.03510 \text{ GJ/m}^3 * 0.000296 \text{ tCH4/GJ} - \\
 &\quad 4286550.16 \text{ MWh} * 0.00213 \text{ tCH4/MWh}] * 25 \\
 &= - \\
 &35,175.31 \\
 &\text{t CO2}
 \end{aligned}$$

$$\begin{aligned}
 \text{LELNG,CO2,y} &= \text{FCy} * \text{EFCO2,upstream,LNG} \\
 &= 26092.36 \text{ TJ} * 6 \text{ t CO2/ TJ} \\
 &= 156554.17 \text{ t CO2}
 \end{aligned}$$

$$\begin{aligned}
 \text{LEy} &= \text{LECH4,y} + \text{LELNG,CO2,y} \\
 &= -35,175.31 + 156554.17 \\
 &= 121,379 \text{ CO2}
 \end{aligned}$$

Year 2016

$$\begin{aligned}
 \text{LECH4,y} &= [\text{FCf,y} * \text{NCVf,y} * \text{EFNG,upstream,CH4} - \text{EGPJ,y} * \\
 &\quad \text{EFBL,upstream,CH4}] * \text{GWP}_{\text{CH4}}
 \end{aligned}$$

	$= [757565940.93 \text{ m}^3 * 0.03468 \text{ GJ/m}^3 * 0.000296 \text{ tCH}_4/\text{GJ} - 4456030.47 \text{ MWh} * 0.00213 \text{ t CH}_4/\text{MWh}] * 25$ $= -$ 42877.27 t CO_2
	$\text{LE}_{\text{LNG},\text{CO}_2,y} = \text{FC}_y * \text{EFCO}_2, \text{ upstream,LNG}$ $= 26271.13 \text{ TJ} * 6 \text{ t CO}_2/\text{ TJ}$ $= 157626.77 \text{ t CO}_2$
	$\text{LE}_y = \text{LECH}_4,y + \text{LE}_{\text{LNG},\text{CO}_2,y}$ $= -42877.27 + 157626.77$ $= 114,750 \text{ t CO}_2$
	Year 2017
	$\text{LECH}_4,y = [\text{FCf},y * \text{NCVf},y * \text{EFNG},\text{upstream,CH}_4 - \text{EGPJ},y * \text{EFBL},\text{upstream,CH}_4] * \text{GWP}_{\text{CH}_4}$ $= [780305795.62 \text{ m}^3 * 0.03515 \text{ GJ/m}^3 * 0.000296 \text{ tCH}_4/\text{GJ} - 4632568.55 \text{ MWh} * 0.00213 \text{ t CH}_4/\text{MWh}] * 25$ $= -$ 43711.47 t CO_2
	$\text{LE}_{\text{LNG},\text{CO}_2,y} = \text{FC}_y * \text{EFCO}_2, \text{ upstream,LNG}$ $= 27428.76 \text{ TJ} * 6 \text{ t CO}_2/\text{ TJ}$ $= 164572.55 \text{ t CO}_2$
	$\text{LE}_y = \text{LECH}_4,y + \text{LE}_{\text{LNG},\text{CO}_2,y}$ $= -43711.47 + 164572.55$ $= 120,862 \text{ t CO}_2$
	Net GHG Emission Reductions and Removals
	$\text{ER}_y = \text{BE}_y - \text{PE}_y - \text{LE}_y$
	Year 2014
	$= 776263.05 \text{ t CO}_2 - 666617.80 \text{ t CO}_2 - 56405.23 \text{ t CO}_2$ $= 53239 \text{ t CO}_2$

	Year 2015				
	$= 1727908.37\text{t CO}_2 - 1464631.01 \text{ t CO}_2 - 121378.86 \text{ t CO}_2$				
	$= 141,897 \text{ t CO}_2$				
	Year 2016				
	$= 1796225.88 \text{ t CO}_2 - 1514496.65 \text{ t CO}_2 - 114749.49 \text{ t CO}_2$				
	$= 166,978\text{t CO}_2$				
	Year 2017				
	$= 1867388.38 \text{ t CO}_2 - 1543044 \text{ t CO}_2 - 120861.08 \text{ t CO}_2$				
	$= 2,03,481 \text{ t CO}_2$				
	Year	Baseline emissions or removals (tCO₂e)	Project emissions or removals (tCO₂e)	Leakage emissions (tCO₂e)	Net GHG emissions reductions or removals (tCO₂e)
2014	776263	666618	56406	53239	
2015	1727908	1464632	121379	141897	
2016	1796225	1514497	114750	166978	
2017	1867388	1543045	120862	203481	
Total	6,167,784	51,88,792	4,13,397	5,65,5955,65,59	
VVB confirmed that GHG reductions and removals have been quantified correctly and in line with monitoring procedure in CDM PDD and applied methodology.					

4.5 Quality of Evidence to Determine GHG Emission Reductions and Removals

Means of verification	The verification team checked the shutdown/break down log for the monitoring period. During the verification of remote audit, the energy meters are also checked. The Calibration details of the monitoring meters are also checked with calibration certificates.
Findings	No CAR or CL was raised
Conclusion	The project activity has two transmission lines and each line has one main (by PP) and one check meter (by grid operator). These meters read both total export and import of electricity. The net export is being calculated from readings of these meters (total export – total import). Calibration of all the meters is done as per the registered CDM PDD.

	Assessment team has checked the calibration certificate and found that meters are calibrated as per calibration frequency mentioned in registered CDM PDD. Meters are calibrated as per the standard procedures and documents for the same are maintained throughout. Cross check by recipient of sales. Calibration of pressure and temperature transmitters is 6 months and delay in the calibration observed for the current monitoring period. However, PP has applied correction factor for the delayed duration which verified by VVB through ER sheet and confirmed the calculation as correct. The responsibilities and authorities of project management, data handling and recording, measurement methods and QA/QC procedure have been systematically established and formalized and the same was verified during the remote audit. Remote audit and interview with site personnel also confirms that the operational and organizational chart as mentioned in registered CDM PDD is as per the site practice and thus assessment team confirms that the details are correct. The shutdown / break down reports are checked and found that the plant undergone scheduled maintenance and break down. Assessment team checked the routine maintenance log book and confirmed that it does not have any impact on project design and monitoring procedures. No unforced error observed. Assessment team confirmed that data/ information used for determining GHG reductions and removals were sufficient in quantity and of appropriate quality. Calibration certificates of meters/ QA/QC procedure checked and found to be appropriate.
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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	
1.	Not applicable	Not applicable	Not applicable	Not applicable

5 VERIFICATION CONCLUSIONS

Applus+ Certification has been engaged by Infinite Solutions to perform the 3rd periodic verification of the “Grid connected electricity generation plant using natural gas at Jurong Island in Singapore”.

The management of the project participant/owner is responsible for the preparation of the GHG emissions data and the reported/estimated GHG emissions reductions on the basis set out within the project’s Monitoring Plan in the CDM PDD and MR and the approved methodologies.

Our Verification approach was based on the requirements as defined under the Kyoto Protocol, Marrakesh accord, as well as those defined by the CDM Executive Board and VCS Standard version 4.1. Our approach is risk-based, drawing on an understanding of the risks associated with reporting GHG emissions data and the controls in place to mitigate these. The verification can confirm that:

- the project is operated as planned and described in the project document;
- the monitoring plan is as per the applied methodology;
- the monitoring process in Monitoring Report is as per the CDM PDD
- the development and maintenance of records and reporting procedures are in accordance with the monitoring plan
- the monitoring system is in place and generates GHG emission reductions data;
- the GHG emission reductions are calculated without material misstatements.
- A reasonable level of assurance was achieved during the verification.
- No limitation observed for the present verification

Verification period: From 14-July-2014 to 31-Dec-2017(first and last date included).

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)
2014	776263	666618	56406	53239
2015	1727908	1464632	121379	141897
2016	1796225	1514497	114750	166978
2017	1867388	1543045	120862	203481
Total	6,167,784	51,88,792	4,13,397	5,65,595

The estimated emission reduction achieved from the project activity for the current monitoring period is 5,65,595 tCO₂e.

Difference in ex post and ex ante estimations for current monitoring period:

ER Comparison for Year 2014	
Start Date of monitoring period	14-Jul-14
End Date of Monitoring Period	31-Dec-14
Number of Days for Current Monitoring Period	171
Annual (365 Days) estimation as per Registered PDD	334221
ER Estimation for Current Monitoring Period	156580
Actual ER for Current Monitoring Period	53239
% Variation in Actual Vs Estimated ER	-66.00%

ER Comparison for Year 2015	
Start Date of monitoring period	1-Jan-15
End Date of Monitoring Period	31-Dec-15
Number of Days for Current Monitoring Period	365
Annual (365 Days) estimation as per Registered PDD	334221
ER Estimation for Current Monitoring Period	334221
Actual ER for Current Monitoring Period	141897
% Variation in Actual Vs Estimated ER	-57.54%

ER Comparison for Year 2016	
Start Date of monitoring period	1-Jan-16
End Date of Monitoring Period	31-Dec-16
Number of Days for Current Monitoring Period	366
Annual (365 Days) estimation as per Registered PDD	334221
ER Estimation for Current monitoring Period	335137
Actual ER for Current Monitoring Period	166978
% Variation in Actual Vs Estimated ER	-50.18%

ER Comparison for Year 2017	
Start Date of monitoring period	1-Jan-17
End Date of Monitoring Period	31-Dec-17
Number of Days for Current Monitoring Period	365
Annual (365 Days) estimation as per Registered PDD	334221
ER Estimation for Current Monitoring Period	334221

Actual ER for Current Monitoring Period	203481
% Variation in Actual Vs Estimated ER	-39.12%

APPENDIX I: DOCUMENTS REVIEWED DURING VERIFICATION

No.	Author	Title	References to the document	Provider
1.	NA	Commissioning Certificate	Commissioning of the natural gas fired combined cycle power plant	Project participant
2.	NA	Technical specifications	Technical specifications of Biomass residue-based Power project manufactured	Project participant
3.	NA	Registered CDM PDD and validation report	http://cdm.unfccc.int/Projects/DB/BVQI1373973780.44/view	UNFCCC
4.	NA	Registered VCS PD and validation report	https://registry.terra.org/app/projectDetail/VCS/1736	VERRA
5.	NA	1 st monitoring report and verification report for the same	https://registry.terra.org/app/projectDetail/VCS/1736	VERRA
6.	NA	Initial Monitoring report Final Monitoring report	Version 01, dated 01/12/2021 Version 02, dated 09/02/2022	Project participant
7.	NA	Emission Calculation sheet	Version 01, dated 01/12/2021	Project participant
8.	NA	Tools/ guidelines used in the project activity - Tool for the demonstration and assessment of additionally (Version 07.0.0, EB 70, Annex 8) - Tool to calculate the emission factor for an electricity system (Version 03.0.0, EB 70, Annex 22) - VCS Standard, version 4.1	UNFCCC CDM web site VERRA website	UNFCCC & VERRA
9.	NA	Calibration details of the project activity undergoing verification	Calibration certificates	Project participant
10.	NA	Energy generation reports and fuel purchase / consumption records for the complete monitoring period	Plant log book / Gas Bills	Project participant
11.	NA	Shut down/Break down details of the complete monitoring period	Log Sheet	Project participant

No.	Author	Title	References to the document	Provider
12.	NA	No Double Counting Declaration	Declaration from PP	Project participant

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

CAR ID	01	Section no.	1.1/1.2/1.11	Date: 18/02/2022
Description of CAR				
1. PP is requested to provide the technical specifications of the plant mentioned in section 1.1 of the MR saying EPC contract with Siemens. 2. The start date of the project activity is mentioned 29/06/2013 whereas in Commissioning Generation Facility, the registration date is 18/06/2013. Please clarify the same. 3. In section 1.5 of the MR it is mentioned that, Unit 10 was synchronized to grid for the first time on 29/06/2013 and Unit 20 was first time synchronized on 30/08/2013. PP is requested to provide the supportive documents for the same. 4. In section 1.9 of the MR, please clarify the sentence “The CDM Monitoring reports are only web hosted from 14/07/2014 till 31/12/2017”				
Project participant response				Date: 18/02/2022
1. PP has revised the section 1.1 of MR with the technical specification of the plant. 2. PP wants to clarify that though the registartion date as per Commissioning generation facility is 18/06/2013, however, since synchronization with grid happens on 29/06/2013. Hence the start date of Project activity is considered 29/06/2013. 3. PP wants to clarify that testing and commissioning has been completed in Dec-2013 & Jan -14 & supporting documents for the final commissioning has already been submitted. 4. The section 1.9 of VCS MR has been updated with mention of other programs and details of CDM MR webhosted. There is no any double accounting occurred during current VCS monitoring period. The project activity has participated under other GHG program i.e. Project has been registered with UNFCCC under Clean Development Mechanism (CDM) program. Registration reference number is 9687. The project proponent has not claimed any GHG credits under CDM mechanism during current monitoring period. Thus there is no any double accounting occurred during current VCS monitoring period. MR is also modified to reflect the same.				
Documentation provided by project participant				
1. Revised MR v02 2. Declaration of No Double Counting				
DOE assessment				Date: 18/02/2022

1. PP has now revised the section 1.1 of MR and mentioned the technical specification of plant, hence this part of CAR is closed.
2. PP has now clarified and submitted the supportive document of synchronization with grid dated 29/06/2013. Hence, this part of the CAR is closed.
3. PP has now submitted the commissioning certificates of both unit which has been verified by the assessment team and now this part of the CAR is closed.
4. Section 1.9 of the MR has now updated with other programs and details. PP has also submitted the declaration of no double counting. Hence, this part of the CAR is closed now.

CAR 01 is closed.

CAR ID	02	Section no.	3	Date: 18/02/2022
Description of CAR				
1. In section 3.1 of the MR, it is mentioned "Unit 10 was synchronized to grid for the first time on 29/06/2013 and Unit 20 was first time synchronized on 30/08/2013" is different from the date mentioned in commissioning certificate. PP is requested to clarify and provide the supportive documents. 2. Some section of 3.2 of the MR are incomplete. PP is requested to clarify. 3. PP is requested to provide the evidence related to requested and approved deviation of the project activity.				
Project participant response				Date: 18/02/2022
1. PP wants to clarify and explain that it is different because the testing and commissioning was carried out from the first synchronization with the grid on 29/06/2013 till the final commissioning on Dec-13. Supporting documents are already submitted. 2. PP wants to clarify that section 3.2 is checked and is consistent as per MR template by VCS 3. PP wants to clarify that it was typo error and the same is rectified and MR is revised accordingly.				
Documentation provided by project participant				
1. Revised MR v02				
VVB assessment				Date: 18/02/2022
1. PP has submitted the commissioning and generation facility of both the unit which has been verified by the assessment team. Hence, this part of the CAR is closed. 2. PP has now updated the MR as per the VCS template of VCS. The comment is closed. 3. PP has now revised and rectified section 3 of the MR. This part of the CAR is closed.				
CAR 02 is closed.				

CL ID	01	Section no.	1.8	Date: 18/02/2022
Description of CAR				

The methodology used in MR is AM0029 whereas this methodology is withdrawn and replaced by methodology ACM0025 in EB 83. Hence, assessment team sought clarification from the PP to not used the current methodology.	
Project participant response	Date: 18/02/2022
PP wants to clarify that methodology is kept in consistent with registered VCS PD and the same has already been used and approved in previous monitoring period. Also It does not impact the applicability of the methodology, additionality or the appropriateness of the baseline scenario since all the deviations are related to metering and monitoring.	
Documentation provided by project participant	
-	
VVB assessment	Date: 18/02/2022
PP has used the same methodology AM0029 as per registered VCS PD which has been verified. Also this methodology was used for the previous monitoring period. Hence, the CL 01 is closed.	

FAR ID	01	Section no.		Date: 10/08/2022
Description of FAR				
VVB shall check and assess the status of double counting in the subsequent verification as for the current monitoring period, MR is also hosted on UNFCCC website. Hence, VVB shall check and ensure there was no double counting of emission reductions				
Project participant response				Date:
Documentation provided by project participant				
-				
VVB assessment				Date:

APPENDIX 3: COMPETENCE OF TEAM MEMBERS AND TECHNICAL REVIEWERS

Verification team member

No.	Role	Type of resource	Last name	First name	Affiliation (e.g. name of central or other office of DOE or outsourced entity)	Involvement in			
						Desk review	On-site inspection	Interview(s)	Verification findings
1.	Lead Auditor/Technical Expert	OR	Kumar	Pankaj	TQC-Outsourced entity	Yes	No	Yes	Yes

Technical reviewer and approver of the verification and certification report

No.	Role	Type of resource	Last name	First name	Affiliation (e.g. name of central or other office of DOE or outsourced entity)
1.	Technical reviewer (TR)	EI	Shen	Simon	Applus+ Certification
2.	Approver	IR	Calle de Miguel	Agustin	Applus+ Certification

Short CVs of the Team:

1. **Pankaj Kumar** worked as team leader – Bihar for South Asia Climate Proofing and Growth Development (CPGD) – Climate Change Innovation Programme (CCIP) supported by DFID that seeks to mainstream climate change resilience into planning and budgeting at the national and sub-national level in India, Pakistan, Nepal, and Afghanistan. Pankaj Kumar has worked previously with IL&FS Infrastructure Development Corporation and BUIDCO (Bihar Urban Infrastructure Development Corporation), Govt. Of Bihar as Environmental Specialist for WB & ADB funded projects. Prior to this, he worked with Carbon Check (UNFCCC accredited DoE), Johannesburg, RSA as Team Leader for validation, verification of around 100 GHG projects in Asia, Africa, USA, Asia Pacific & Americas. Pankaj is accredited Lead Auditor, Validator, Verifier and Technical Expert for Sectoral Scope/Technical Area – 1.1, 1.2, 3.1 & 13.1 by UNFCCC DoE (Designated Operational Entity), APPLUS, Spain. He is also member of task force on climate change & human health, Health Department, GoB and on roster of UNICEF's WASH experts.

He is an experienced, qualified and result oriented Environment Professional having more than 14 yrs. Of relevant experience in Climate Change (Mitigation & Adaptation), Environmental Due Diligence, Disaster Risk Reduction, Validation and Verification of GHG project under CDM, Verified Carbon Standard, Gold Standard & Social Carbon Standard, Brazil. He provides technical support for environmental investigative, consultative and remedial projects involving air, water and soil, Waste management, EIA, Environmental Compliance, ISO 14001, OHSAS 18001, GHG accounting (ISO 14064) and Carbon foot printing

Pankaj Kumar is Masters in Environment Management from Forest Research Institute (University), I.C.F.R.E, Dehradun, which is Centre of Excellence in South East Asia for Forestry education & research and PGDEL from National Law School of India University, Bangalore (India).

2. **Mr. Simon Shen** Mr. Simon Shen (Master's Degree in Thermal Energy Engineering, Bachelor's Degree in Environmental Engineering) is an Auditor appointed by Applus+ LGAI for the GHG project assessment, auditing and technical review. He has more than 6 years of work experience in CDM/GS4GG/VCS project assessment and review with Applus+, apart from the years of experience working as GHG Auditor and ISO 9001/14001 in TUV SUD for 3.5 years before he joined Applus+. Mr. Simon Shen has extensive experience also as former Applus+ Shanghai CDM Technical Manager.

APPENDIX 4: Abbreviations

Abbreviations	Full texts
BM	Build Margin
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CER	Certified Emission Reduction(s)
CL	Clarification Request
CM	Combined Margin
CO ₂	Carbon Dioxide
CO ₂ e	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

APPENDIX 5: CALIBRATION DETAILS

The Energy meter calibration details are as below

	Line 1 Main Meter	Line 1 Check Meter	Line 2 Main Meter	Line 2 Check Meter
Manufacturer	Landis+Gyr	Landis+Gyr	Landis+Gyr	Landis+Gyr
Serial Number	99654212	99654213	99654214	99654215
Accuracy class	0.2s	0.2s	0.2s	0.2s
Date of Calibration	31-08-2012	31-08-2012	31-08-2012	31-08-2012
	29-08-2014	29-08-2014	31-10-2014	31-10-2014
	29-12-2016	09-12-2016	29-12-2016	09-12-2016
	06-12-2018	09-11-2018	06-12-2018	09-11-2018

The Gas flow meter and pressure and Temp transmitter calibration details are as below

Gas Flow Meter

	EX-I SFC 300	Flowsic 600	EX-I SFC 300	Flowsic 600
Serial Number	12359001	12098674	12359003	12098673
Accuracy class	1%	0.3%	1%	0.3%
Date of Calibration	02-07-2014	01-07-2014	02-07-2014	01-07-2014
	15-01-2015	15-01-2015	15-01-2015	16-01-2015
	03-11-2016	30-09-2016	03-11-2016	29-09-2016
	12-10-2017	12-10-2017	12-10-2017	11-10-2017
	31-10-2018	31-10-2018	31-10-2018	31-10-2018

Pressure and Temperature Transmitter

	Pressure transmitter	Temp Transmitter	Pressure	Temp Transmitter
Serial Number	91M601972 220	C2M600274 216	91M601973 220	C2M600275 216
Accuracy class	0.50%	0.20%	0.50%	0.20%
Date of Calibration	01-07-2014	01-07-2014	02-07-2014	02-07-2014
	16-01-2015	15-01-2015	15-01-2015	16-01-2015
	30-09-2016	30-09-2016	29-09-2016	29-09-2016
	11-10-2017	12-10-2017	12-10-2017	11-10-2017
	08-05-2018	08-05-2018	07-05-2018	07-05-2018

Gas Chromatograph calibration details

PP has two GC having serial number as 61200687 and 61200688 which are configured for auto calibration once every two weeks. Hence it complies with the Gas Metering Code requirement.

GCs	Encal 3000 Quad 61200687				Encal 3000 Quad 61200688			
Date of Calibration	2014-15	2015-16	2016-17	2017-18	2014-15	2015-16	2016-17	2017-18
	13 th Jan	12 th May	8 th Jun	21 st Mar	13 th Jan	13 th May	9 th Jun	20 th Mar
	05 th Nov	06 th Jul	8 th Sep	27 th Jul	05 th Nov	06 th Jul	9 th Sep	27 th Jul
		15 th Oct	7 th Dec	5 th Oct		19 th Oct	8 th Dec	05 th Oct
		8 th Mar	21 st Mar	15 th Jan		9 th Mar	20 th Mar	16 th Jan

